Clean energy and energy supply have become a concern worldwide, for energy itself is deemed a strategic trading commodity. This book explores whether the consideration of cross-border interconnection of transmission grids at a large-scale along with unrestrained legally-secured power transit might play a significant role in solving such a concern whilst contributing to achieve sustainable development. This book addresses the question of what international legal mechanisms could be employed to remove barriers hindering cross-border grid interconnections, thus facilitating power-trade and transit as well as to take advantage of opportunities for energy efficiency capable to secure 'green' energy supply, reduce atmospheric emissions and, ultimately, targeting sustainable development, at least, in regional contexts. The author advances the proposition that cross-border power grid interconnection coupled with an international legal framework realigned to harmonise energy mixes may solve the concerns on clean energy and energy security by contributing to the integration of renewable energy technologies at a large-scale and promoting unrestrained power flow and trade across-borders.

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Transnational Power Transmission

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TRANSNATIONAL TRANSMISSION
OF
RENEWABLE ENERGIES

A STUDY ON INTERNATIONAL LEGAL MECHANISMS TO FURTHER CROSS-BORDER INTERCONNECTIONS OF POWER TRANSMISSION FACILITIES

by

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April, 2014

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To my father, Dr Alvaro Plaza H.

ABSTRACT

Clean energy and energy supply have become a concern worldwide, for energy itself is deemed a strategic trading commodity. This inquiry explores whether the consideration of cross-border interconnection of transmission grids at a large-scale along with unrestrained legally-secured power transit might play a significant role in solving such a concern whilst contributing to achieve sustainable development.

Despite potential benefits of such a configuration, power grid interconnection is far from being the standard at international level. Although legal doctrines and rules have been developed for protecting international energy-related investments, power-trading and power transit remains inadequately regulated and subjected to political whims and calculations.

By using a thematic approach to three selected case-studies, the research delves into the Brazilian scheme to set up an energy mix based mostly on renewable sources and its relationship with transmission grid expansion processes. Despite failing to create a single power market, the European Union is worth analysing as the most advanced regulatory model for transnational power transit. Lastly, a non-integrated developing area: South America is considered as a suitable regional context in which testing the research's argument.

This research explores, therefore, from a legal perspective, the paradoxical phenomenon of power grid isolation and looks for an explanation about why it still prevails internationally. Specifically, it addresses the question of what international legal mechanisms could be employed to remove barriers – whether internal or external - hindering cross-border grid interconnections, thus facilitating power-trade and transit as well as to take advantage of opportunities for energy efficiency capable to secure 'green' energy supply, reduce atmospheric emissions and, ultimately, targeting sustainable development, at least, in regional contexts.

The book advances the proposition that cross-border power grid interconnection coupled with an international legal framework realigned to harmonise energy mixes may solve the concerns on clean energy and energy security by contributing to the integration of renewable energy technologies at a large-scale and promoting unrestrained power flow and trade across-borders.

As a practical outcome the book develops legal recommendations and models of an international declaration and a transnational agreement on grid interconnection and power transit in which the findings of the inquiry are embodied in the form of a set of international legal propositions.

PREFACE

Part of this work has been published in peer-reviewed journals, as contribution to other books and presented in international conferences.

Contents of Chapter IV with regard to the role of international cooperation and domestic politics (section 4) have been published twice. Firstly in Australia by Macquarie University (New South Wales) in the *Macquarie Journal of International and Comparative Environmental Law* (MJICL), Vol 7(2) in 2011. Following they were published in Germany, in 2012, in Michael Rodi (ed) *Energy Infrastructure and Policy Options for a Sustainable Future* (Institute fur Klimaschütz, Energie und Mobilität IKEM/Lexxion Verlag GmbH, Berlin) as a part of the book Chapter III on 'Transnational Energy Grids'. In addition, work in Chapter IV of this book dealing with the role of international trade and economics (section 3) was the subject of a paper which the author was invited to present at the King's College London at the 6th Annual International Graduate Legal Research Conference held on April 2012, in London, UK.

Contents of Chapter III regarding transnational power transmission and international law (sections 3 and 4) have recently been published in Qatar, by Bloomsbury Qatar Foundation Journals in the 2013 issue of the *International Review of Law* (IRL).

Contents of Chapter II regarding energy selection policies (section 4) were presented at the University of Deusto, in Bilbao, Spain, in the ATLAS 2011 Agora Symposium, to which the author was nominated as representative of the University of Melbourne (UNIMELB).

Finally, part of the analysis presented in Chapter II on energy planning instruments and sovereignty (section 2) and in Chapter V about legal recommendations for a harmonised multilateral integration of renewable sources-based energy policies (section 6) were presented at the 2011 Sydney Law School Postgraduate Conference, held in Sydney, Australia, to which the author was invited by the University of Sydney Law School (New South Wales).

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CHAPTER I. POWER GRIDS: INTERNATIONAL ISOLATION

I.1. INTRODUCTION

At the origin of this inquiry, three main facts stand. Firstly, there are 196 countries in the world,[1] most pursuing different interests and often in dispute with each other over economic development involving the use of natural resources and the production or trading of goods.[2] Each has its own power grid and at international level some are power-excess and others are power-deficit States,[3] which may or not be neighbouring countries. Secondly, whilst a mature[4] cost-efficient technology for long distance power transportation[5] does currently exist,[6] it is a fact that bulk-power storage technologies are not yet cost-efficient. Lastly, the third fact is that, although the most sensible thing to do would be to have as many different energy sources and generating plants as possible interconnected to larger, flexible, and smarter grids, the reality is quite different. Indeed, although representing outstanding opportunities for power trading, economic integration, and sustainable development, surprisingly, cross-border energy

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[1] Out of them, 193 are current members of the United Nations. Kosovo, Taiwan and the Holy See are not. See United Nations website <http://www.un.org/en/aboutun/index.shtml>, Central Intelligence Agency <https://www.cia.gov>.

[2] World Trade Organisation (WTO) <www.wto.org>.

[3] The condition of being power-excess or power-deficit depends on any given country's balance between domestic installed generation capacity and domestic power output consumption. If a country produces more electricity than what is domestically consumed, it is a power-excess country. On the contrary, if its domestic production does not meet internal power demand, it is called a power-deficit country. Power-surpluses can be traded internationally to power-deficit countries as long as interconnected compatible transmission lines do exist between them.

[4] In fact, current grids are deeply rooted in technology that was modern more than a hundred years ago. International Electrotechnical Commission, *Smartgrid* (12 February 2011) IEC <http://www.iec.ch/smartgrid/>.

[5] Thus making possible potential power-excess to be transported over long-distances and traded to power-deficit countries.

[6] The technology for high power transmission referred to is ±800 kV High Voltage Direct Current (HVDC) transmission, designed to long-distance power transmission (over 7000 kms for direct current and 4000 kms for alternating current). Claverton Energy-Research Group, *HVDC* (22 February 2011) Claverton Energy < http://www.claverton-energy.com/tag/hvdc >.

integration is far from being the general rule in the international domain,[7] for most national grids operate in complete independence, isolated from each other and not even one is truly jointly operated.

Joint operation as such is unknown. Largely, nations deem their grids (or sections of a cross-border one sited in their territories) as strategic assets under a restrictive view of sovereign powers. What is routinely seen, however, is the synchronisation of two (or more) power grids independently operated by a corresponding number of technical operators. This happens either domestically if there is no single network but several; or transnationally, when nations decide to interconnect their grids for non-permanent power export/import purposes.

Taking that triangle of facts as a starting point and considering the global deficiency[8] in terms of interconnectedness of large-scale power transmission infrastructure, the research calls upon envisioning what the situation would be if a multilateral regional harmonised policy on renewable energy sources integration and a transnational power grid did exist. At least regionally, vast power savings and renewable energy sources

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[7] Illustrative is the European Union (hereinafter, EU). Although being the oldest, most comprehensive, and successful example of economic integration it acknowledges that even under any conventional modelling of European power infrastructure requirements (being its current network conceived as a 29-node system), there are still 54 identified possibilities for interconnections between EU Member States. European Commission-Directorate General for Transport and Energy, *The Revision of the trans-European energy network policy (TEN-E) - Final Report* (Cambridge and KEWA Imperial College London, 2010), 5-6, 9-11, 13.

[8] Currently, apart from the regional, limited attempt of the European Union, there is no multilateral energy policy as such. Furthermore, not even the EU's energy policy confers predominance to renewable sources. In contrast, the uniqueness of the Brazilian energy policy is to confer priority to renewable sources though just a national policy and, thus, of innate limited applicability.

becoming cheaper and economically competitive at a faster[9] rate are at the top of the list of potential benefits.

If the synergy between two ideas: large-scale power grids interconnection and global renewable sources integration were possible, energy efficiency, greenhouse gas (GHG) abatement, and energy security would improve. The research takes these two ideas as *general* objectives and builds upon that synergy through the study of principles and international legal instruments that might make such potential a reality. It also aims *specifically* at identifying legal barriers hindering cross-border interconnections and renewable energy sources integration as well as developing a set of legal recommendations for advancing such integration in practical legal documents through synchronised (better still harmonised) energy portfolios, and developing a neutral international legal framework for power trading and unrestrained power transit.

The research is, therefore, an inquiry into the causes of the paradoxical power grids isolation phenomenon at international level and the role that the Law might play in surmounting it.[10]

In the following sections, this Chapter sets up this inquiry in the current scholarly context, introduces the scope of the book, the research question, and outlines its legal argument in detail. Through emphasizing their *functionality*, it examines a conceptualization of power networks and how

[9] By means of contributing to solve their 'intermittency' problem when large-scale grids are integrated. Even more, potential benefits not only can be viewed from the standpoint of the energy sources. There is a strong correlation between power output injected to a grid and the grid's own stability.
[10] Separated operation embodies huge potential for de-synchronization and grid failure. These facts have enormous cost in energy efficiency (transmission losses), CO_2 emissions (forest devastation), development opportunities lost, nations being left economically laggard, political tensions and, ultimately, war.

they operate. It also covers the legal implications of the twofold thematic focus of the research: *energy selection* and *cross-border power transmission*. The general and specific aims of the inquiry: to explain the international grid isolation phenomenon, identifying opportunities derived from an efficient energy selection and legal barriers to effective transnational transmission grids operation amongst them are also addressed here in detail.

Finally, this Chapter explains the methodology, including the criteria for choosing selected case-studies; suggests its practical outcomes as a possible answer to the research question, and sets forth the extent to which its findings on transnational power transmission might be applied.

I.2. THE RESEARCH QUESTION

The research explores from a legal perspective the phenomenon of power grid isolation and looks for an explanation about why this still prevails internationally. Specifically, it addresses the question of what international legal mechanisms could be employed to remove barriers hindering cross-border grid interconnections, thus facilitating power-trade and transit; as well as to take advantage of opportunities for energy efficiency at large scale capable to secure 'green' energy supply, reduce greenhouse gas emissions and, ultimately, targeting sustainable development at least in regional contexts.

I.2.1. Contextual framework and original contribution to scholarship

Current academic visions of the future of energy have largely evolved around sustainable *energy production*. For instance, A. J. Bradbrook's approach,[11] in Australia, is mainly focused on the 'general energy-production', rather than in the 'specific energy-saving' side of the energy cycle spectrum. Evidence of this is that his two principal propositions: international conventions or protocols to existing treaties, require *per se* an energy production scope wide enough to encompass all kinds of renewable sources. The same academic approach may be attributed to S. Boyle and followers on predicting oil-peak production.[12]

[11] Adrian Bradbrook, 'The Development of Renewable Energy Technologies and Energy Efficiency Measures through Public International Law', in Donald N. Zillman, Catherine Redgwell, Yinka O. Omorogbe, and Lila K. Barrera-Hernandez (eds), *Beyond the Carbon Economy* (Oxford University Press, 2008) 109 et seq. This is a very interesting article in which Professor Bradbrook advances a four-fold proposition about future involvement of Public International Law in promoting renewable energy and energy efficiency technologies (for consumption), basically, in the form of international conventions or protocols to existing treaties, as well as soft-law declarations, international agencies arrangements, and the action of non-governmental organisations. For a general description of the field see Adrian Bradbrook, 'Energy Law as an Academic Discipline' (1996) 14 *Journal of Energy and Natural Resources Law* 180. See also the European perspective in Martha Roggenkamp, C. Redgwell, I. Del Guayo, and A. Rønne (eds), 'Energy Law in Europe: Comparisons and Conclusions' in *Energy Law in Europe: National, EU and International Regulation* (Oxford University Press, 2nd ed, 2008) ch 1, 16.

[12] S. Boyle, 'A Global Fossil-free Energy Scenario: Towards Climate Stabilization' (1994) 22 *Energy Policy* 106. Back in the 50s, M. King Hubbert was the first in conducting studies and making predictions on oil-peak consumption in the U.S. From an historic point of view see M. King Hubbert, 'Nuclear Energy and the Fossil Fuels' in American Petroleum Institute (API), *Drilling and Production Practice* (API, 1956) 36. Since then, many others have formulated their own predictions on the subject with notable variability of results. Amongst these works are the yearly IHS Cambridge Energy Research Associates (IHS-CERA) Reports, or the yearly World Energy Outlooks issued by the International Energy Agency (IEA), the U.S. Department of Energy - National Energy Technology Laboratory, *Peaking of World Oil Production: Impacts, Mitigation, & Risk Management* (U.S. Department of Energy, 2005) 64, appendices I, III; those from scholars such as Professor S. Boyle already mentioned or John Bonnardeaux, *Crude Oil–Facing the End of the Oil Age* (State of Western Australia, 2006) 2, 12, 18.

As such, transmission issues seem to be taken for granted by most Energy Law scholars including K. Palmer, D. Burtraw, [13] R. Bharvirkar,[14] or R. Lyster[15] and A. Bradbrook. These authors neither address nor analyze transmission issues to the extent that the topic deserves in the light of its potential benefits and implications. A transmission-focused analysis has, therefore, long lagged behind energy generation and climate change-oriented outlooks.[16]

By contrast, this research adopts an innovative focus, firstly, by addressing a new dimension as to energy efficiency and security of supply, namely, downstream energy production (promotion of renewable energy), but not as far as reaching consumption (energy efficiency measures). In other words, the subject-matter of the book deals with what happens with energy in between (transmission) and what can be done specifically in order to reduce or phase-out technical, economic inefficiencies of the isolated operation of transmission networks, as well as examining the legal flaws in enforceability mechanisms at international level. Secondly, the approach is

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[13] Dallas Burtraw and Karen Palmer, 'Compensation Rules for Climate Policy in the Electricity Sector' (2007) 27(4) *Journal of Public Policy Analysis and Management* 819-847; see also related discussion in Dallas Burtraw, Karen Palmer, and M. Heintzelman, 'Electricity Restructuring: Consequences and Opportunities for the Environment' (2000) *Resources for the Future* 7, 41; Karen Palmer, A. Paula, and M. Woerman, *Federal Policies for Renewable Electricity* (12 February 2011) Economics Climate Change <http://www.economicsclimatechange.com/2011/02/federal-policies-for-renewable.html>.

[14] Ranjit Bharvirkar, N. Hopper, C. Goldman and B. Neenan, 'Demand Response from Day-Ahead Hourly Pricing for Large Customers' (2006) 19(3) *The Electricity Journal* 52-63.

[15] Rosemary Lyster and Adrian Bradbrook, *Energy Law and the Environment* (Cambridge University Press, 2008) ch 3.

[16] See Nicola Durrant, *Legal Response to Climate Change* (Federation Press 2010); T. Cottier, O. Nartova, and S. Z. Bigdeli (eds), *International Trade Regulation and the Mitigation of Climate Change* (Cambridge University Press, 2009); A. Boyle, P. Birnie and C. Redgwell, *International Law and the Environment* (Oxford University Press, 3rd ed, 2009); Crispin Aubrey (ed), *Energy Revolution. A Sustainable Global Energy Outlook. Report 2008* (European Renewable Energy Council EREC, 2008); G. Bates, *Environmental Law in Australia* (LexisNexis Butterworths, 6th ed, 2006); C. Hamilton and R. Denniss, 'Generation Emissions? The impact of microeconomic reforms on the electricity industry' (2001) 20(3) *Economic Papers* 15; Ross Garnaut, *The Garnaut Climate Change Review: Final Report* (Cambridge University Press, 2008).

also innovative because it is applicable not only to energy produced from non-conventional renewable sources, but also applies to conventional ones. In this particular context, enquiring into the inefficiencies of non-interconnected systems at large-scale is significant as it may represent a better chance to achieve sustainable development.

In regard to examining the laws relating to energy supply, K. Nakatani's[17] approach is useful. His scholarship concerns Japan's oil dependence and the geopolitical/economic considerations leading to an urgent shift in this country towards non carbon-based energy resources. However, except for the very particular circumstances of Japan, the analysis is oriented to production considerations, this time, in support of nuclear energy as the preferable option for a naturally resource-poor and high-populated country. This approach, again, follows paths of power generation-oriented analysis and, thus, cannot be categorized as distinctive. Japan is constrained by its lack of natural resources and its geophysical configuration, CO2 emissions reduction commitments under the Kyoto Protocol and later commitment under the UNFCCC, and its dependence on imported oil,[18] natural gas, coal, and most importantly uranium. Japan, therefore, cannot afford energy-inefficiency in any sector - including that of transmission - or to renounce international openness and trade. The ongoing energy crisis that

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[17] Kazuhiro Nakatani, 'Energy Security and Japan: The Role of International Law, Domestic Law, and Diplomacy' in Barry Barton et al (eds), Energy Security: *Managing Risk in a Dynamic Legal and Regulatory Environment* (Oxford University Press, 2004) 413. In an article entitled *In Search of the Optimum Energy Mix: Japanese Laws Promoting Non-Fossil-Fuel Energy* (2008), Nakatani gives an overview of the Japanese legal reforms to promote renewable energies and, remarkably, nuclear energy. Kazuhiro Nakatani, 'In Search of the Optimum Energy Mix: Japanese Laws Promoting Non-Fossil-Fuel Energy' in Don Zillman, Catherine Redgwell, Yinka Omorogbe, and Lila K. Barrera-Hernández (eds) *Beyond the Carbon Economy* (Oxford University Press, 2008) part IV, 21. For Japanese energy policy issues regarding trends of supply and demand of oil see especially Japanese Agency for Natural Resources and Energy, *Energi Hakusho 2010 (13 September 2010) Enecho* < *http://www.enecho.meti.go.jp/english/report/outline.pdf*> [Energy Report 2010] * All translations are by the author, except where otherwise indicated.

[18] Imported mainly from Middle East.

has unfolded since the Fukushima-Daichii events are an irrefutable example of Japan's problems.

One of the latest scholar contributions to the field is the editorial work led by Martha Roggenkamp, Barrera-Hernández, Zillman and del Guayo, *Energy Networks and the Law*.[19] The book analyses the changes and challenges to power networks and pipelines, many of them international by necessity, following market liberalization, climate change and security of supply policies leading to the integration of new energy sources. The work at stake, however, still assumes some sort of identity between power grids and pipelines which – as it shall be seen[20] – is not accurate and has different legal implications. Firstly, its approach is national rather than international in line with other similar approaches to the matter. Although the book is interesting as to the analysis of the role of networks in facilitating the production and use of renewable energies (Norway and China, for instance),[21] its approach still looks at the problem from a domestic point of view and not as to how renewable sources can be promoted at a large cross-border scale, namely, delving into a possible solution to the problem of power grids isolation internationally. Furthermore, in regard to Third Party access, the matter is analysed from the competition and investment perspective, which is a conventional approach already regulated internationally, particularly, under the

[19] Martha M. Roggenkamp et al, (eds) *Energy Networks and the Law. Innovative Solutions in Changing Markets* (Oxford University Press, 2012).
[20] See below Legal characterization of electricity, p 22.
[21] Ulf Hammer, 'The Role of Energy Networks in facilitating the production and use of renewable energy sources in Norway' in Martha M. Roggenkamp et al, (eds) *Energy Networks and the Law. Innovative Solutions in Changing Markets* (Oxford University Press, 2012); Wang Myngyuan, 'The Role of Energy Networks in developing renewable energy sources in China' in Martha M. Roggenkamp et al, (eds) *Energy Networks and the Law. Innovative Solutions in Changing Markets* (Oxford University Press, 2012).

European Union framework.[22] Interestingly, Barrera-Hernández takes a look at South America and the possibility for energy network integration. She rightly asserts that energy infrastructure is 'increasingly unable to handle existing and growing [power] demand' in the region as well as acknowledging 'sharp ideological differences'[23] between governments. Unfortunately, the analysis is limited in scope scope and consists only of a revision of a limited number of regional general integration initiatives such as UNASUR, MERCOSUR and CAN without a clear focus on cross-border energy network development, nor does it address specific and realistic legal avenues to achieve grid integration.

By contrast this proposed analysis claims to be innovative for it not only places power transmission in the scholarly spotlight, but also because it does so examining by the specific legal dimensions of the problem. Unlike most current academic analysis on Energy Law – which are largely focused on how domestic legal instruments regulate generation issues, GHG abatement, carbon capture mechanisms, or alternatively how competition disputes and other aspects of the industry can be managed - the research has as starting point that the discussion on appropriate generation options should be over; and the existence of power output is a fact, irrespective of the source such power comes from or the volatility of energy consumption-patterns. In this manner, the focus of the research transcends many current local-based academic approaches to energy

[22] Tjarda van der Vijver, 'Third Party access exemption policy in the EU Gas and Electricity Sectors: Finding the right balance between competition and investments' in Martha M. Roggenkamp et al, (eds) *Energy Networks and the Law. Innovative Solutions in Changing Markets* (Oxford University Press, 2012).

[23] Lila K. Barrera-Hernández, 'South America Energy Network Integration: Mission Possible?' in Martha M. Roggenkamp et al, (eds) *Energy Networks and the Law. Innovative Solutions in Changing Markets* (Oxford University Press, 2012).

regulation by considering transnational law and regulation for transmission.

The analysis is also innovative by giving priority to a regional-based energy mix in which the share of renewable sources is predominant. In this sense, it is important not only to identify current legal international instruments dealing with the promotion of renewable sources and the harmonization of energy portfolios, but also to envisage new legal paths through which such promotion may become more significant in the transmission field. Therefore, for instance, the examination takes a specific interest in the way in which energy selection[24] is being addressed in Brazil.

Finally, the proposed outcome of a transnational energy grid with international status is highly relevant if the underlying idea is that of countries cooperating to achieve the best possible result for all of them in a permanent and consistent manner, and that legal models should facilitate this outcome. From this perspective, the research envisages a multinational – thus harmonised and cooperative - energy matrix configuration. Concurrently, the book examines possible common mechanisms to remove legal obstacles - whether internal or external - to making transnational transmission of energy not only possible, but internationally enforceable. The case of the European Union - is one of the most interesting as to both the vital necessity of change in the existing energy matrix and in terms of international energy supply – and it well illustrates this focus of the research.

[24] For instance, the tariff process and price structure in a grid that is confined in its extension.

I.2.2. International legal vacuum and specific research question

Currently the world faces two enormous imminent challenges: clean energy and energy supply. States cannot resolve either of these issues acting individually. Both challenges transcend national borders and require countries to work together to overcome them. As to clean energy, although there is a pressing need for making markets of green technologies competitive and global; the market interest is still set on creating efficient carbon emissions trading schemes. The supply problem, in turn, finds its origin in States' acknowledgement of both shared dependence on a finite energy resource: carbon-based fuels; and trade interdependence, which leads to the principle of trade liberalization and the need to diversify energy matrices.

Despite the Energy Charter Treaty (ECT) and World Trade Organization (WTO) general rules for trading in goods, there is still no specific regulatory framework dealing with international power-trading and cross-border power transit. Indeed, there are no WTO specific rules on power-trading; whilst negotiations for giving Article7 of the ECT on transit issues further development have not yet crystallised in a complete binding protocol.[25]

[25] A Transit Protocol draft, in negotiation since 2002, further elaborate art 7 of the ECT, but it is still subject of bilateral consultations between the EU and the Russian Federation as to several issues such as the way in which potential mismatches between the duration of supply and transit contracts can be avoided or the applicability of the Transit Protocol inside the EU. Some progress, however, has been achieved as to the definition for available capacity, principles of transit tariffication, transparent and non-discriminatory congestion management rules, and provisions for the creation of new capacity. See especially EU-Directorate General for Energy, *EU-Russia. Energy Dialogue. The First Ten Years: 2000-2010* (European Commission, 2011). See also *Energy Charter Treaty* (*ECT*) *and Energy Charter Protocol on Energy Efficiency and related Environmental Aspects* (*PEEREA*), opened for signature 17 December 1994, 33 ILM 360 (entered into force 16 April 1998).

Moreover, there are doubts about the ECT being the only regulatory domain applicable to the energy sector.[26] The ECT was originally designed as a multilateral investment treaty which entered into force and became part of International Law on 16 April 1998. In regard to power trading, Third-Party access, and energy policies, the ECT was ineffectual though. After rounds of negotiations, the so-called 'Trade Amendment' entered into effect in 2004 and this made possible the application by reference of the WTO rules to energy trading, but the other issues still remain unsolved.

Even in terms of trading, the new set of rules was insufficient and inappropriate. For a number of reasons,[27] the WTO rules were not specifically designed to deal with energy as a strategic commodity. Many vital issues for securing power-trade liberalization, like Third-Party access and interconnections with grids, as well as key power-transit issues still have no solution in the ECT/WTO framework. The 'Trade Amendment' was supposed to fill-in the trading-gap of the ECT, as well as to open-up the possibility of covering energy-related equipment and move into a WTO-like binding tariffs regime for electricity. However, none of this has happened.

As for the diversification of energy matrices, the ECT framework is even more powerless, since by explicitly applying the sovereignty principle - in

[26] The Energy Community Treaty, for instance, is a multilateral agreement and one of the EU complementary frameworks derived from the EU's external energy policy to address the issue of energy security. The treaty promotes market integration, but also *acquis* transposition and implementation on potential areas for EU's enlargement processes. *Treaty establishing the Energy Community (also known as EEC and ECSEE)*, opened for signature 25 October 2005, OJ L 198/18 (entered into force 1 July 2006).

[27] Amongst such reasons, not surprisingly, was the WTO's own multilateral design of which instance is the so-called '*chappeau*' provision. *Marrakesh Agreement establishing the World Trade Organization (with Final Act embodying the results of the Uruguay Round of Multilateral Trade Negotiations, Annexes and Protocol)*, opened for signature 15 April 1994, 1867 UNTS I-31874 (entered into force 1 January 1995).

its traditional interpretation – it simply does not deal with domestic energy policies. From a legal perspective, then, it could be said that neither the nature, nor the strategic relevance of power fits well into the general frame of Article V of the GATT, which deals with trade on goods. Unfortunately, by the same token, limited scope and inadequacies also characterize Articles 5, 29 and 7 of the ECT, the first two dealing with power trading and the latter with transit matters.

Having set the scene and outlined its general scope, the research's fundamental question is set at the international level. The specific research problem, thus, is to explain the international power grids isolation phenomenon, and to identify legal barriers preventing cross-border interconnections and unrestrained power-transit in the context of a multilateral renewable source-based energy mix. The research also proposes concrete measures to address the problem at an international or transnational level.

As an inquiry into the causes of the international power grid isolation, the investigation looks primarily at those matters of an *international legal nature* arising from the interaction of certain *actors* and in regard to a very specific *subject-matter*. As for actors, the book considers the manner in which sovereign nation-states/independent organisations - enjoying international status - interact with each other. In turn, the subject-matter around which such interaction revolves is narrow and specific: cross-border transmission of electricity and power transit.

The interaction referred to above relates specifically to power transmission systems placed in different countries and capable of being interconnected, owned and operated by either public or private entities having international legal status. These systems could carry on power transactions involving the conveyance of electricity across the borders of States which may or not be neighbouring countries. Essential to this interaction are trading and transit issues considered to be international in character and, thus, subjected to International Law.[28] Notably, when analysing the European Union case-study[29] and the need for developing comprehensive legal structures to facilitate power transit and guide prospective and independent operation of cross-border power grids, the research will address the interaction between international and supranational law.[30]

The research question is, therefore, why countries do not interconnect their power-networks even if, by doing so, they would benefit from trade and better opportunities for economic growth, and also contribute towards meeting the global challenges of clean energy, widespread cross-border energy supply, and ultimately sustainable development. The research explores particularly the shortcomings of current international legal frameworks, namely, that of the ECT/WTO system as to energy trading/transit[31] and potential energy policy synchronisation. It aims not only at identifying such deficiencies but also to advance innovative legal propositions to overcome them by using selected case studies. The book will explore what the international legal system should do to remove such barriers and facilitate transnational interconnection of grids and unrestrained power transit.

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[28] For these purposes, the body of law composed of principles and rules of conduct which States feel themselves bound to observe.

[29] See below ch III.

[30] Ibid. Often defined as the law of supranational organisations or regional agreements, where a distinguishing feature is that the domestic law of its Member States are deemed inapplicable when conflicting with the supranational legal order in which those States partake.

[31] Yulia Selivanova, *Trade in Energy: Challenges for International Trade Regulation* (2010) WTO <http://www.wto.org/english/res_e/publications_e/wtr10_11june10_e.htm#top>.

1.2.3. Legal issues relevant to international power transmission

International Law approach

In the international sphere there is a growing trend favouring bilateral or regional agreements over multilateral treaties.[32] However, as opposed to bilateralism, multilateralism better serves the interest of States in having uniform standards, e.g. for international investment protection. This feature is of utmost significance for the legal argument developed in this book which involves a multinational power infrastructure. Therefore, the relationship between international and domestic law, particularly Constitutional Law,[33] is a significant one and is addressed in Chapters III and IV.[34]

Independent status for grid operation

Should transnational transmission facilities be independently operated and maintained? Whenever countries invoke territorial sovereignty, namely, control over facilities located in their territories, the risk of having transnational power-flow interrupted (for legal or extra-legal reasons) is extremely high. In the context of securing transnational power supply (notably, though not exclusively, that directed towards Third-Party countries) it does make sense to explore new legal ways to have the operation of interconnected transmission facilities rid of opportunistic

[32] Stephan Schill, *The Multilateralization of International Investment Law* (Cambridge University Press, 2009) 106.
[33] Anthony Hust, *Handbook of International Law* (Cambridge University Press, 3rd ed, 2007).
[34] Two main issues are at stake. On the one hand, the intertwining of multiple domestic legal realms or each country's particular energy choice with international common legal targets e.g. GHG abatement, securing energy supply, or sustainable development. On the other hand, the hierarchy and efficacy of international law mechanisms on cross-border power interconnections vis a vis domestic regulation on the use of natural resources.

political manipulation. The question is vital, for domestic grids are mostly operated and maintained under local and particular schemes, regardless of whether they are private or State-owned. At its best, synchronic operation and maintenance occur in connexion with international nodes pertaining to bilateral undertakings as it will be seen in Chapter II. However, this constitutes a major legal issue, for international power trading takes place at these specific spots.[35]

Legal characterization of electricity

Unlike regulatory frameworks for pipelines, the nature of electricity as the subject of international trade poses quite different legal issues. One of them is that of legal characterization, or how does electricity fit into legal categories for regulation. In this regard it is fundamental to determining whether or not power can be deemed fungible,[36] movable, tangible,

[35] Since transmission networks are normally characterized as oligopolies or monopolies, domestic regulatory authorities must often deal with situations of undue discrimination or preference in the provision of service. In this regard, an appropriate regulatory goal is to ensure that transmission services are provided on a just, reasonable, and not undue preferential or discriminatory manner when involving international nodes.

[36] The question of whether or not electric power is a fungible or an intangible commodity has been long debated in scholarship, as well as in the United Nations Commission on International Trade Law (UNCITRAL). In some jurisdictions, power is stated to be a service rather than a tradeable good. Power's mobility is a physical-based feature. Its legal characterization as fungible or not is far more troublesome and poses several interesting questions. For instance, it can properly be said that power is fungible in the context of each industry sector, for the power produced by any generator; conveyed by any transmitter; and delivered by any distributor is or might be interchangeable. However, if one considers power outcome at certain tension (say low voltage) undertaking step-up voltage transformation (to be transported long distances, for example) could it be legally said that it is still the same interchangeable product? Similar legal question could arise after step-down voltage transformation process undertaken. Furthermore, if economic characterization of 'goods' factors are got into consideration, the outlook might get even more daunting, for as far as economics is concerned, power (regardless of voltage transformation) simply cannot be replaced by anything alike, economically, there is no substitute 'good' for electricity. In the current state of exceptional interconnected power grids, States' sovereign power-prone policies tend to look at electric power as a tradeable good, a mere seasonal export commodity rather than as a long-term service of cross-border electricity supply. The argument of this book aimed at putting on the spotlight the relevance of dedicated long-term power grid interconnection and transit international agreements to change mainstream views whilst strengthening International Law's legitimacy and enforceability in the

apprehensible, and distinguishable for legal purposes. Different legal questions also arise from electricity's multi-directional nature, since this makes supplier-identification and the determination of legal ownership extremely difficult once incorporated to a grid. Again, unlike pipeline regulatory schemes, legal challenges also derive from product identity and mutability. Indeed, conveying electricity is subject to voltage transformation,[37] oscillation, and other physical factors capable of altering it. These transformations are ones which international business transactions must deal with from a legal perspective. Related legal problems that arise in regard to the special nature of energy include problems about preservation of energy and the risk of loss.[38]

New approach to sovereignty

Whereas the research engages with the ways in which States seek to secure a reliable supply of the kind of energy that their matrix relies on, this goal

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specific area of regional cross-border electricity transmission. For an introductory approach see Jeff Vail Law Office LLC (Litigation Strategy and Innovation), *Why does fungibility matter (and where did it go)?* At < http://www.jeffvail.net/2008/10/why-does-fungibility-matter-and-where.html>. A good approach to fungibility from a technical point of view in regard to energy sources can be found in NTNU Trondheim, November 6, 2002, Lecture in Electric Conversion, Systems and methods for electric generation – PowerPoint PPT presentation at < http://www.powershow.com/view/102b35-OThiY/From_Renewables_to_Electrical_Power_and_Fungible_Energy_powerpoint_ppt_presentation>. From a legal point of view, see Bunge Corp. v. Recker, U.S. Ct of App, 8th Cir, 1975; Restatement (Second) of Contracts Ch 16 (1981). The book argument is based upon the assumption that the distinction is more relevant in the national domestic realm than in that of the international community, largely because in this latter the International Law imposes certain constraints over national sovereign powers. Furthermore, domestically and by large, in market-based economies only the distribution of electricity is deemed a service; not the generation and transmission sectors. The argument of this book is, precisely, that well-framed, technically-based interconnection and transit agreements might strengthen International Law's enforceability and, therefore, pave the way to substitute the current predominant view at international level of electric power as a mere good or commodity and– over time - to replace it with one in which cross-border supply of electricity through interconnected power grids be considered more as a service between nations and, therefore, triggering State liability whether in securing delivery and/or unobstructed power transit.

[37] High/low voltage and vice versa.

[38] Long-distance transmission/conversion losses or total loss due to network instability or power outages.

compels a new approach to some legal concepts, with sovereignty being the most relevant since world's energy supply schemes are interdependent rather than self-sufficient.

The first conceptual challenge is to look at sovereignty in a radical new way. This book does so by tackling persistent anachronistic legal views on sovereignty and their implications for State prerogatives and/or capacities,[39] particularly those concerning ownership, possession, and control over territory, and natural resources. Re-examining these constructs are of vital importance for achieving interconnection of large-scale multinational transmission infrastructure projects - either in whole or part - in a given territory or when crossing multiple countries that link distant energy sources and consumer centres.

In classical politics literature, sovereignty is typically conceived as having certain attributes.[40] *Absoluteness* is one of them, namely, the material

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[39] Hust, above n 33.

[40] The historic and classic concept of sovereignty is based much on the views of theorists like Jean Bodin or Thomas Hobbes for whom the sovereign is conceived as a superior power being above the Law and corresponding implications to the relationship between States and national individuals as well as between States. However, the content of it can be tracked back in time to the Roman Empire, going through the Middle Age up to the Peace of Westphalia in 1648 and its subsequent development. Jean Bodin, *On Sovereignty: Four Chapters from Six Books of the Commonwealt*h (Cambridge University Press, 1992); Thomas Hobbes, *Leviathan* (Harmondsworth Penguin, first published 1651, 1968 ed); see Ernst H. Kantorowicz, *The King's Two Bodies. A Study in Mediaeval Political Theology* (Princeton University Press, first published 1957, 7th ed, 1997) for the evolution of the concept in the Middle Age. A modern approach, though still 'classical' is available in D. J. Devine, 'The Requirements of Statehood Re-Examined' (1971) 34(4) *The Modern Law Review* 410; Andreas Osiander, 'Sovereignty, International Relations, and the Westphalian Myth' (2001) 55(2) *International Organization* 281. A more innovative approach but still limited is delivered by D. Philpott, *Revolutions in Sovereignty: How Ideas Shaped Modern International Relations* (Princeton University Press, 2001) ch 1. For a classic logic analysis of concepts and categories see, particularly, Aristotle, *The Categories* (Harvard University Press/William Heinemann Ltd, 4th ed, 1962) translated by Harold P. Cook, Aristotle, *On Interpretation* (Harvard University Press/William Heinemann Ltd, 4th ed, 1962) translated by Harold P. Cook, Aristotle, *Prior Analytics* (Harvard University Press/William Heinemann Ltd, 4th ed, 1962) translated by Hugh Tredennick, Aristotle, *Posterior Analytics* (Harvard University Press/William Heinemann Ltd, 2nd ed, 1966) translated by Hugh Tredennick.

scope pertaining to the sovereign entity having no restraints and its authority reaching any and all matters of its interest. This attribute of the traditional understanding of sovereignty is profoundly challenged by the idea of energy flowing freely and unrestrained from one State's territory to another, no matter where such energy is sourced or whose territories it passes through. The concept is further challenged because power might be conveyed and appurtenant facilities operated independently. Furthermore, particular situations envisaged by this book involve, in many aspects, the sovereign entity's international responsibility.

The traditional understanding of sovereignty prevents external restrictions imposed upon sovereign States. The research aimed at overcoming this construction by casting a different light upon it and proposing international mechanisms that modify the traditional 'absolute' model of territorial sovereignty. It advances the proposition that what is key to the concept of sovereignty, this is, the power of an entity[41] to act independently in an international context (even subjected to limitations coming from the regulatory framework of such context) could be applied (in whole or part) as a legal attribute conferred on the independent an operator of a transnational power grid, thus, enabling not only the management of territories occupied by transmission facilities, but also the independent and unbiased operation of a multi-cross-border energy network.[42]

Currently, International Law provides a source of mutual recognition and legitimacy for State's decisions,[43] and a framework of necessary minimal

[41] Either subject of International Law like the States are *per se* or others that currently are not, such as non-governmental organisations or the individual (outside the human rights field).
[42] Particularly based on renewable sources, either in balancing base energy loads and/or recording energy transactions.
[43] See generally Ian Brownlie, *Principles of Public International Law* (Oxford Clarendon Press, 7th ed, 2008).

rules which are designed to lower the levels of uncertainty between States in their international interaction. At its best, such a framework can also encourage cooperation in achieving common beneficial goals. However, this is not enough to make transnational power interconnections a reality as envisioned by this book. At a theoretical level the possibility of having a sovereign nation willing to limit the exercise of its capacities, even in a confined area (e.g. to allow foreign electricity en route to a Third-Party country flow through the local grid and across its territory without legal appropriation nor interruption), and to have this state-of-affairs being guaranteed to, and enforceable by third parties, would certainly be a useful concept at the international domain.[44]

Accordingly, from a legal point of view, the book explores new ways to understand sovereignty in an object-sense rather than subject-based approach, where the object might well be a *functionality* such as long-term interconnectedness. In other words, the functionality of achieving the objective goal of transnational/international power transmission should take priority over the particular interests of the nation states taking part in the regime. In this fashion, the activities of international agents in power transmission would be furthered and these institutions could deploy its effects beyond national territorial limits and the traditional jurisdiction of domestic laws. It will also open up discussion for new applications of such concepts when setting-up transnational energy networks. The book, therefore, advocates for a *re-orientation of certain categories of International Law* to deal with multilateral cooperation on transnational interconnections. Likewise, with globally securing energy transmission through either expanding existing international governance structures

[44] In this sense, just consider the number of possibilities opened for international trade, development of financial markets, globalized GHG abatement process, furtherance of renewable sources worldwide, and International Law efficacy.

(thus, diminishing the scope of sovereignty in domestic laws terms) or creating a new intergovernmental actor (an operator, a new subject of International Law) in the international sphere.

In the end, what a new approach to sovereignty could offer in addressing these issues is a legal ground for building confidence and cooperation in the interaction of interdependent States in developing transnational transmission facilities and the legal modes to secure them.

A globalized trade-based perspective for transnational power grids

Owing to the integration of new energy sources to the global energy matrix, at the end, transnational power transmission is about market globalization and open trade. Therefore, a multilateral trading setting becomes a necessary conceptual point of reference, since the current reality depicts a completely opposite scenario.

Indeed, the general rule is having multiple domestic isolated markets, many of them not even consolidated, many fragmented, and with rare interconnections. Looking at this scenario not only are there a number of suitable providers acting separately and not taking advantage of international cooperation opportunities, not even at regional level, but also there is great potential for competition disputes.[45] This, because the particulars of power business transactions may easily confer market power,

[45] David Morgan, 'Dispute Settlement under PTAs: Political or Legal?' in Ross Buckley, Vailo Lo, and Laurence Boulle (eds), *Challenges to Multilateral Trade. The impacts of bilateral, preferential, and regional agreements*, Global Trade Law Series (Wolters Kluwer Law & Business 2008) vol 14, part V.

on the one hand; or constitute barriers to trade, on the other. In sum, there exists a myriad of isolated markets closed to international exchange.

On the contrary, open trade allows consumers - either domestic or foreigners - to enjoy overseas goods, in this case, electricity produced in countries other than their own. Often this may be less expensive whilst giving foreign generators wider market opportunities to sell their power output. The advantages of open trade will require examining the role of the WTO in Chapter IV.

I.2.4. Scope and restrictions

In a wide perspective, this inquiry aims at promoting energy efficiency and energy security at a large-scale. Interestingly, however, it looks neither at the supply nor at the demand-side of the energy issue, but at something in between, often overlooked and neglected: the power-transmission system. The book aims to develop an international law-based solution to the problems of cross-border interconnections and secure enforceable power transit.

To narrow down to the core of the research question, some restrictions, assumptions, and exclusions as to what will be covered under the scope of the inquiry must be stated from the outset.

The first basic assumption is that power grid interconnections are technically feasible, irrespective of the specific long-distance transmission technology employed.[46] Further, from an economic perspective, this inquiry assumes that States prefer exchange-based economies rather than

[46] High Voltage Alternate Current (HV/AC) or High Voltage Direct Current (HV/DC).

those seeking self-sufficiency. It assumes power-transmission, furthermore, as a separate organizational component of modern electric utilities. This is a result of liberalization processes,[47] which led to the prevalent fragmented vision of the industry.[48] In addition, and unlike generation and distribution which are essentially local, the transmission sector is by definition *trans-local* or, depending on whether it extends its functionality (through interconnections) beyond domestic borders, *transnational*, thus, challenging by definition territorial sovereignties.

Beyond the old and often exhausting debate on the nature of the relationship, eventual hierarchy, and enforceability mechanisms between domestic and international legal systems,[49] the research builds upon the assumption that – although important at a theoretical level - attempting to solve the first two issues has little relevance as long as international businesses are carried out as usual and all relevant actors - those enjoying international status - agree on the value of cooperation to achieve common goals and in mutually benefiting from them. Similarly, the enforceability-objection so-often brought against International Law wanes when considered from a practical perspective: the pressing economic need for power-trading across-borders supports the harmonisation of energy policies and the reliability of power supply, both of which are practical aims of this inquiry. In the end, these assumptions of normality and

[47] Liberalization processes in the power industry have been unfolding worldwide since the late 90s.
[48] European Commission's Directorate-General for Energy <http://ec.europa.eu/dgs/energy>, International Electrotechnical Commission <http://www.iec.ch>.
[49] Martii Koskenniemi, 'What is International Law for' in Malcom D. Evans (ed) International Law (Oxford University Press, 2nd ed, 2003); Gillian Triggs, *International Law: Contemporary Principles and Practices* (LexisNexis, 2010); Robert McCorquodale, 'An inclusive International Legal System' (2004) 17 *Leiden Journal of International Law* 477.

pragmatism in carrying out international business power-transactions rest firmly upon the rule that facts create Law,[50] not vice versa.

The research rests on the final assumption that integration of widespread renewable energy sources into domestic power grids may naturally contribute to driving network expansion processes at regional/international level.

Although propositions from the politics, economics, social sciences, or even cultural perspectives might well be advanced to explain the power grid international isolation phenomenon, they are not considered in depth here, for the research concentrates largely on possible *legal explanations* for this phenomenon.

The research does not inquire either into the causes of transmission being a non-competitive market and relies on the economic theory to explain such configuration.[51] Domestically, the issue is commonly addressed by Antitrust Laws and regulations, but no similar framework exists at international level.[52]

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[50] This is particularly true when considering Customary International Law, where over time a consistent practice is acknowledged as law. Moreover, customary International Law is also significant as to treaty law, for it is a well-established principle that a treaty must be interpreted in good faith and with due regard for all relevant rules of international law. See foreword by Jakob Kellenberger, President of the International Committee of the Red Cross in Jean-Marie Henckaerts and Louise Doswald-Beck, Customary International Humanitarian Law (International Committee of the Red Cross, ICRC-Cambridge University Press, 2009) vol I, xvi.

[51] As to the nature of this economic theory and references to scholarship in the field, see below ch IV.

[52] As a consequence, the inquiry deals neither with domestic competition issues, for they fall out of its transnational-oriented scope; nor with the lack of regulatory framework for monopolies at the international domain, for this clearly goes far beyond the research focus. The research might deal with competition issues at international level, however, when analysing, for instance, accessibility requirements to a potential transnational electricity market, in the context of large-scale efficiencies in power-trading.

Environmental protection or mechanisms for climate change abatement are not the focus of the inquiry either, but clearly these ideas will be important in the policy context in which moves to adopt more efficient and sustainable interconnections at transnational law will be advanced.[53] The research does not directly deal with climate change effects and/or environmental protection. Although a transnational power grid might contribute to alleviate the former or to foster the latter, they are not the primary focus of the inquiry.

The research also seeks pre-eminently to examine the situation with respect to renewable energy rather than conventional sources of energy. Historically, it can be said that the use of fossil fuels has led to the current power transmission situation, since the supply of these energy sources tends to be stable and this characteristic is reinforced by the fact that oil and oil-derivatives can be easily stored. These features promote neither the creation of, nor power grid expansion. On the contrary, the storage difficulty and intermittency of renewable energy sources – which is of specific interest to the research - do require grid expansion to both balance power-load gaps between demand and supply and in terms of channelling power-output through to where it is needed. The research thus is focused

[53] To get a glimpse of 'clean energy' concerns see, e.g., Greenpeace, *[R]evolution scenario on global transitioning to renewable energy and energy efficiency by 2050* (20 January 2011) Greenpeace <http://www.greenpeace.org/international/en/campaigns/climate-change/energyrevolution/>. The global concern on 'energy supply' or 'energy security' has arisen, in turn, through acknowledging the significance of increasing global interdependence in energy. However, this process of gradual awareness began rather abruptly in the 70s with the so-called 'oil-crisis'. Not surprisingly, at that time, 28 advanced economies established the International Energy Agency (IEA) signing the 1974 Agreement on an International Energy Programme (IEP) having as one of the main objectives to maintain and improve systems for copying with oil supply disruptions. The Agreement enabled coordinated and collective action by requiring IEA countries to hold or release oil stocks, restrain demand, switch to other fuels, increase domestic production and, if necessary, share available oil in a timely and coordinated manner in the event of oil-supply emergencies. Over time, this target has been complemented with promoting energy supply diversification, efficiency and flexibility within the energy sector as basic conditions for the long-term energy security of the IEA Member States as a whole.

on the potential for renewable energy sources to be integrated into a transnational power grid as a means to overcome the problems of balance and intermittency.

The research scope is also restricted by addressing neither generation nor distribution of electricity, but only long-distance transnational power-transmission. The two former industry sectors are essentially local, and thus, predominantly under the scope of domestic laws and regulations. As a consequence, neither the local configuration of the transmission market, nor that of the domestic energy market is directly examined. Instead, the inquiry does consider the potential of a transnational grid to promote rearrangements of domestic energy choices and, ultimately, the harmonisation of such choices at international level favouring renewable sources.

Finally, the research does not seek to examine the involvement of multinational corporations and/or organisations based on different countries holding stakes in transmission projects. In this sense, the research is not meant to cover 'vertical' issues linking investors with the corresponding government of the State within whose territory a given project is undertaken. Instead, the research is focused on 'horizontal' issues concerning intergovernmental cooperative relationships leading to power grid interconnections.

I.3. STRUCTURE

The book is structured in five chapters.

Chapter I has already introduced the topic: transnational power grids, what are they? What function do power grids serve? This introductory chapter presents the research question in detail, as a study on international legal mechanisms able to contribute to sustainable development through transnational interconnection of transmission facilities conveying electricity produced by renewable sources and unrestricted transboundary power transit. The material scope of the inquiry was narrowed down by certain assumptions and exclusions which maintain a focus on two specific elements: *energy selection and cross-border power transmission*. The methodology, including the case-studies selection criteria is also explained in detail in this Chapter. The aims of the inquiry: to identify opportunities for sustainable development derived from energy matrices integrating renewable sources of energy, as well as the potential legal barriers that may exist against transnational transmission grids operation are also analysed here. Accordingly, the book examines possible ways to remove such barriers and proposes legal mechanisms to make cross border energy transmission possible and reliable. Finally, Chapter I presents the research's main findings, such as the identification of legal barriers and legal recommendations for advancing a harmonised multilateral integration of renewable sources. The practical outcomes of the inquiry are models for an International Declaration and Intergovernmental Agreement on power-trading and transit are included in Appendices. The chapter concludes by stating the regional context in which the findings of the research are meant to be applicable.

Chapter II addresses the first aspect of the research focus: *energy selection* or what are nation states' choices on energy matrices. Energy matrices or mixes are tools of economic policy, whether indicative or compulsory, aimed at setting up – under certain conditions - the energy-producing infrastructure baseline of a country for a given period of time. The book advances the proposition that part of the answer to why countries do not interconnect their transmission grids is because there are legal factors which tend to produce certain kind of energy mixes - mostly based on conventional energy sources. As the research aims at identifying *international legal factors* inducing or imposing such mixes, this Chapter conducts a selective comparative analysis of energy policy configurations in Canada and Saudi Arabia, as well as an inquiry into International Law mechanisms for promoting renewable power generation. The thematic aspects here are the integration of renewable sources into energy matrices and its relationship with power transmission expansion plans. The first case-study on these topics is introduced: Brazil.

Chapter III deals with *transnational transmission*. It explains the main features of power grids and how they might be effectively transposed to the legal and regulatory field in order to foster interconnections. It examines the legal nature of international power transmission operations, and the challenges posed by transmitting renewable-generated electricity. Again, in the light of a thematic approach, the European Union serves as the paradigm for a regulatory approach to the matter. The analysis explores the EU 2020 policy, the European Transmission System, and the efforts towards creating a single power market. The focus of the analysis is on the EU legal framework for power-trading with, and transit across non EU-countries, whether through bilateral legal mechanisms (like Cooperation and Energy Integration Agreements) or multilateral tools (like the Energy Community Treaty and the Energy Charter Treaty (ECT).

The connecting legal argument between Chapter I (energy matrices selection) and II (international transmission) is common: identifying legal instruments capable of advancing 'green' supply of electricity through a reliable large-scale system of interconnected trunk-power grids. Once identified, on the one hand, the legal factors inducing non renewable sources-prone mixes (Chapter II) and a suitable legal approach to deal with transmission regulatory issues (Chapter III) on the other, the *next methodological step is* to contrast the transnational power-transmission ideal with the real current situation to identify legal barriers or deficiencies in the current state of affairs in terms of cross border power transmission.

Chapter IV deals with the role of the Law, particularly International Law in configuring a framework of cross-border power grid interconnections and uninterrupted power-flow across and between countries. The role of International Law and International Trade Law, as well as crucial legal problems involving the concept of sovereignty, State liability, property regimes, possession and control, and trade among others will be analyzed. Here, a proposition is introduced about the need for re-interpreting certain International Law principles, such as cooperation, freedom of transit, non-discrimination, and non-interruption of power-flow. Further, a discussion of property rights over transmission facilities will also be presented. The Chapter aims to develop a justification for a regulatory model based on a regional coordinated strategic plan capable not only to overcome identified legal impediments, but also one that is cost-effective, efficient, and sustainable. The research's findings on this energy transmission regulatory model will be tested against extreme conditions for cross-border energy supply in the light of International Trade Law, namely, the WTO system. In order to identify legal mechanisms that are potentially applicable in the international power-trading sphere, the Most-Favored-Nation (MFN) provision, key to the WTO framework, is analyzed. One crucial problem in having countries cooperate to create a single interconnected power market is assuring them that the international legal obligations to supply power will be duly honored. Chapter IV explores this difficulty and proposes arguments for reaching consensus on the need for and advantages of independent - though not necessarily centralized - interconnected grid operation. The Chapter, therefore, addresses cooperative mechanisms to facilitate the operation of the grid interconnections. This includes examination of how to legally deal with situations when things go wrong, which might involve issues of international liability, enforceability, and dispute resolution mechanisms.[54]

At this stage of the book, a number of opportunities for energy efficiency in trans-boundary electricity transmission have been identified. Two of them are developed in greater depth: the potential for creating a transnational single electricity market; and that for constituting a mechanism for sustainable development. The selection criteria for these opportunities correlate precisely with ongoing global challenges: energy supply and sustainable development identified at the origin of this inquiry. Using South America as the background for analysis, the research advances the proposition that a *broader (regional) but convergent*

[54] Even though the Chapter does not go into further analysis on the matter, it advocates for transnational power grids to be operated independently and to enjoy international status (protected *common functionality*) as a possible way to make cross border energy transmission possible and reliable. Operation does not only require synchronization between multiple domestic energy policies as it occurs, particularly, in bilateral Energy Agreements (mostly for import/exports transactions) or Network Arrangements (as in connection with joint power-generating undertakings), but also innovative approaches as to greater effectiveness in multilateral cooperation (like the WTO framework in the trade area).

substantial legal response on network interconnection and power transit might contribute to meet those challenges. Chapter IV, thus, relates directly to the research's *practical outcomes* or how its findings might promote cross-border interconnections and multilateral harmonised renewable sources integration. Two legal instruments are devised: a *Model International Declaration* on cooperation for implementing and using international power transmission facilities and a *Model Agreement* on energy trading and transit through a regional network, neutrally drafted that offers operational value for States interested in undertaking prospective cross border interconnections or exploring renewable energy-based mixes harmonisation.

The final Chapter V draws conclusions from and summarizes the outcomes of the analysis, namely, the *identification of barriers* hindering cross-border grids interconnections and unrestricted transit, *and the listing of legal recommendations* for advancing a harmonised multilateral integration of renewable sources-based energy policies as a means to achieve sustainable development and reliable 'green' energy supply.

I.4. METHODOLOGY

I.4.1. Legal focus

Although addressing topics of power grids or renewable energy sources may require resort to some extent to other disciplines like engineering[55] or

[55] M. D. Ilić, 'Fundamental engineering problems and opportunities in operating power transmission grids of the future' (1995) 17(3) *Massachusetts Institute of Technology (MIT) Electrical Power & Energy Systems*, 207-214. See also Jianqing Zhangand, and Carl Gunter, *IEC 61850, Communication Networks and Systems in Substations: An Overview of Computer Science* (2010) Illinois Security Lab, University of Illinois <http://seclab.uiuc.edu/docs/iec61850-intro.pdf>.

economics,[56] both the research question and methodology of the book remain strictly legally-focused. As an International Energy Law-oriented inquiry, the literature review and the analysis of different legal/regulatory frameworks and case-studies will use under a thematic approach designed to identify relevant legal factors.

I.4.2. Comparative Analysis and Positivist Approach

A potential approach to investigating the research question is to examine it in the light of two independent focuses: *energy selection* or what sources of energy should be preferred in configuring a multinational energy matrix; and *energy security* or international cooperation for guarantying energy flow and sharing. By itself, the latter approach is not followed. In contrast, the research employs an approach which considers the subject-matter *unilaterally*, though formed by complementary elements. Energy security issues cannot be considered independently from energy selection, because the former are not only affected by the innate variability of transnational renewable power output, but also by the way in which countries - participating in a grid - expect others to behave in terms of delivering and/or demanding power.[57] Since the scope of the book is primarily

[56] For instance, when inquiring into the reasons hindering grids interconnections or those relating to security policies impeding cross-borders power flow. Tanaka, Makoto, 'Extended price cap mechanism for efficient transmission expansion under nodal pricing', (2007) 7(3) *Networks and Spatial Economics* 257; S. Bourdon, S. Choteau, C. Pflanz, E. Spire, S. Bruijns, J. Vanzetta, R. Neumaier, and C. Bartocci, 'Harmonization of cross-border transmission capacity allocation within the Central West Europe region' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-102-2010.

[57] Newsdigest, *RosUkrEnergo demanding Stockholm Arbitration that Naftohaz Ukrainy compensate USD 5.4 billion of losses for withdrawal of 11 billion cubic meters of gas* (20 May 2010) Transnational Dispute Management (TDM) <http://www.investmentarbitration.net/news/tdmnews-2010-09.htm>; *Hulley Enterprises Limited v. the Russian Federation* (PCA Case No AA226); *Yukos Universal Limited v. the Russian Federation* (PCA Case No AA227); *Veteran Petroleum Limited v. the Russian*

focused on the integration - at least at regional level - of renewable-generated power into transnational power grids,[58] the methodology reflects this particular feature.

The power-market structure permitted by the law and the competition framework might in itself represent barriers to international trade (Bilateral Trade Agreements, Regional Trade Agreements, and/or the WTO system). Therefore, the research will conduct a comparative analysis of several legal systems when examining legal barriers hindering renewable sources forming part of energy mixes, such as those according preferential treatment to conventional energy sources or those making it harder for renewable-based generators to access existing grids or international nodes. This exercise is performed when analysing the regimes of Canada, the European Union, and Saudi Arabia. In addition, when using Comparative Law techniques, employs a positivist approach. This means that when the subject matter lacks political neutrality or is contentious, the focus will be regulatory rather than political with a view to find pathways for legal harmonisation, as it has done in examining the Brazilian case study. On the contrary, if matters were heavily tainted by political bias, the comparative approach should not account for synchronisation.

I.4.3. Case studies and selection criteria

In the context of a transnational transmission power grid, the examination concerning energy supply or how can power-supply expectations and cooperative behaviour be transposed into international legally binding

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Federation (PCA Case No AA228), *Interim Awards on Jurisdiction and Admisibility*, 30 November 2009 available in the Energy Charter Treaty's website at <www.encharter.org>.

[58] Therefore, the research excludes the consideration of nuclear power in regard to matrix configuration issues; though keeping it for the analysis of the energy security aspect.

agreements is to be restricted in two ways. Firstly, by focusing attention on the need for *legal instruments* enabling international grid interconnection, the operability and reliability of transnational grids, and the opportunities for renewable energy sources-based efficiency offered by them. Secondly, the discussion is framed by the *thematic use* of three selected case-studies: Brazil, the European Union, and South America. In other words, instead of approaching security of supply in a broad manner, the research perspective is focused on legal mechanisms needed to secure power supply. In this fashion, the research question is not only confined in substance, but also becomes methodologically manageable.

The case-studies selection criteria are explained as follows.

Brazil. Promising Renewable Sources Integration

Inextricably linked to the growing trend of renewable sources integration, the case-study of Brazil was selected for a number of significant reasons.

Firstly, Brazil has not only one of the largest single state-owned transmission networks, but also one of the largest grid expansion-rates in the world.[59] However, its international nodes are relatively few, and all of them relate to joint undertakings with neighbouring countries.[60]

[59] Brazil requires investing c. US$23.5 billion from now to 2019 in new transmission lines to keep power supply stable due to the country's economic growth. Brazil will have to add 36 000 kms of new transmission lines in order to integrate new energy projects to the national power grid and several zones to the main power distribution networks. From a study conducted by the think-tank Instituto de Pesquisa Econômica Aplicada (IPEA) [Applied Economics Research Institute] linked to the Brazilian government. IPEA, <http://www.ipea.gov.br/portal/>.

[60] The most relevant bilateral treaties entered into by Brazil concerning shared natural resources and transnational cooperation in the electricity area are: *Tratado entre a República Federativa do Brasil e a República do Paraguai para o aproveitamento hidroelétrico dos Recursos Hídricos do Rio Paraná, pertencentes em condomínio aos dois países, desde e inclusive o Salto Grande de Sete Quedas ou Salto de Guairá até a Foz do Rio Iguaçú* [Treaty between the Federative Republic of Brazil and the Republic of Paraguay for the hydroelectric exploitation

Secondly, Brazil currently faces a huge and pressing power-deficit which it is trying to overcome through strengthening the diversification of its energy matrix and entering into international energy cooperation agreements focused on transnational interconnections.

Thirdly, Brazil has followed its own independent way on energy issues making renewable sources its long-run energy choice since the 1970s. Over time, this led to a situation where circa 70 per cent per cent of the energy produced in Brazil comes from renewable sources. The Brazilian commitment to having an even larger share of renewable energy holds up.[61] Moreover, it keeps a firm policy of domestic oil-substitution and oil-exports.[62]

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of water resources of the Paraná River, belonging in a condominium to both countries, from and including the Salto Grande Seven Falls or Guairá Falls to Foz do Iguaçú River], opened for signature 26 April 1973, UNTS 13164 (entered into force 26 April 1973), art XXIII; *Acordo Tripartite entre Brasil, Paraguai e Argentina para aproveitamento dos recursos hidráulicos no trecho do Rio Parana desde as Sete Quedas até a foz do Rio da Prata* [Tripartite Agreement between Brazil, Paraguay and Argentina to use of water resources in the stretch of the Parana River from the Seven Falls to the mouth of the River Plate] opened for signature 19 October 1979, 2216 UNTS I-39389 (entered into force 5 December 1979); *Protocolo de Entendimiento entre los Gobiernos de la República Argentina y de la República Federativa del Brasil sobre Cooperación e Interconexión Energética* [Protocol of Undestanding between the Governments of the Republic of Argentina and of the Federative Republic of Brazil on Energy Co-operation and Interconnection], opened for signature 9 April 1996 2015 UNTS I-34706 (entered into force 18 March 1998); *Tratado entre el Gobierno de la República Federativa del Brasil y el Gobierno de la República Argentina para el aprovechamiento de los Recursos Hídricos compartidos en los tramos limítrofes del Río Uruguay y de su afluente el Río Pepirí-Guazú* [Treaty between the Government of the Federative Republic of Brazil and the Government of the Republic of Argentina for the exploitation of shared water resources in border sections of the river Uruguay and its afluent river Pepirí-Guazú], opened for signature 17 May 1980 1339 UNTS I-22475 (entered into force 1st June 1983); *Memorandum de Entendimiento entre la Republica Argentina y la Republica Federativa del Brasil sobre el desarrollo de Intercambios Eléctricos y futura Integración Eléctrica* [Memorandum of Understanding between the Republic of Argentina and the Federative Republic of Brazil on the carrying on of Power Exchanges and future Electric Integration], opened for signature 13 August 1997, 1995 UNTS I-34147 (entered into force 13 August 1997). For a technical example on implementation see ABB Power, *Power Systems/HVDC. HVDC International Interconnection between Argentina 50 Hz and Brazil 60 Hz* (ABB Power Technologies AB, 2010) POW-0037.

[61] The Brazilian Energy Planning is made up, basically, of the following policy instruments: Empresa de Pesquisa Energética (EPE), *Plano Decenal de Expansão de Energia 2019 (PDE-2019)* (Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento

Fourthly, this particular economic model comprising emphasis on renewable energy, consistent policy, and adequate planning and regulation is working fairly well. It has placed Brazil on the verge of becoming a developed country in terms of macro-economic parameters like growth-rate and industrial production. All these impressive achievements – in terms of what concerns this research and its methodological approach – would not have been possible had Brazil not effectively addressed *energy selection* and planned and regulated the expansion and improvement of its transmission network accordingly.

However, being a single country, Brazil's regulatory experience might not be suitable for direct replication. To address this limitation, the methodology includes a comparative analysis of energy planning instruments of other countries in a similar quest for reorganizing their energy mixes around renewable sources, such as Canada and Saudi Arabia, whilst still restricting the analysis of the Brazilian case-study just to energy matrix issues and its relationship with power-transmission enhancement.

European Union. Regulatory Model, though still carbon-based

The second case-study is the EU. The research, evidently, will not investigate the entire EU Law system. From both a research scope and methodological points of view, the focus refers primarily to the EU's

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Energético, 2010) [Ten-year Energy Expansion Plan 2019 (PDE-2019)]; Empresa de Pesquisa Energética (EPE), *Programa de Expansão da Transmissão – PET 2010-2014. Estudos para licitação da expansão da transmissão. Consolidação das análises e pareceres técnicos* (Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento Energético, 2009) [Transmission Expansion Plan – PET 2010-2014. Studies for the procurement of the Transmission Expansion Procurement Studies. Consolidated analysis and technical opinions].

[62] Since Brazil has large proved oil reserves.

energy-related body of laws regarding electricity; and, even more specifically, that concerned with the transmission sector.[63] Moreover, the EU regulation on transmission is of interest only to the extent that it relates with cross-border transmission and, even further, exclusively with the rules dealing with EU-zone inbound/outbound power-transmission, namely, those involving the EU and interested trading and/or transit non-EU countries.

This case-study was selected for four main reasons. The first is that the EU is the most successful example of progressive economic and political integration since the 1950s. Secondly, the EU has a comprehensive common regulatory system: the EU Law, which is multinational and supranational, mandatory at certain levels, and a leader in the regulatory treatment of many substantive matters, including energy and environment.[64]

The EU case-study is of interest, thirdly, because despite targets having been set to integrate a bigger share of renewable sources by 2020,[65] the EU has still in effect a common energy policy based mainly on fossil-fuels.

[63] Therefore, avoiding all issues concerning direct power generation and distribution.
[64] The current EU framework for energy and environment is massive. However, a selected part relevant to the research is presented as follows: *Council Directive 2003/54/CE of 26 June 2003 concerning common rules for the internal market in electricity* [2003] OJ L176/37; *Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (the 'Energy Taxation Directive')* [2003] OJ L 283/51; *Council Directive 90/547/EEC of 29 October 1990 on Transmission of Electricity through Transmission Grids* [1990] OJ L 313, 30–33; ; *Council Directive 2009/73/ of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC* [2009] OJ L 211; *Council Directive 2004/101/EC of 27 October 2004 amending Directive 2003/87/EC establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community, in respect of the Kyoto Protocol's project mechanisms* [2004] OJ L 338/18; *Council Directive 2003/87/EC of 13 October 2003 on Scheme for Greenhouse Gas Emission Allowance Trading within the Community* [2003] OJ L 275. From the scholarly side, an interesting general reference can be found in Roggenkamp et al (eds), above n 11, ch 1, 16.
[65] Directorate General for Energy. *Energy 2020. A Strategy for Competitive, Sustainable, and Secure Energy* (European Commission, 2011).

This is of utmost relevance, since the EU supranational legal framework is being challenged by a reality for which it was not originally designed: the pressing need to multilaterally and predominantly integrate renewable energy sources.

Finally, the example was chosen because despite its urgent need for securing energy supply the EU has blatantly failed in its attempt to create a common electricity market, even one fed with conventional power output. In this sense, the research again looks ahead and attempts to envisage what the international legal system's response would be to the problem of making the renewable energy share of power supply not marginal, but principal in energy mixes. This scenario not only renders the research innovative in addressing legal issues of a more-than-plausible and not-so-far in the future, but also it justifies looking at what has been going wrong with the EU's efforts.

In sum, despite its current failure in fully transitioning to a non carbon-based economy and securing energy supply,[66] the EU still leads grid issues, cross-border energy transmission, and international cooperation, thus, standing out in terms of extensive regulatory experience on multilateral integration processes.

South America. In search for Sustainable Development

In contrast to the EU, South America struggles to achieve substantial development. Although enjoying a multicultural common background, economic, social, and political differences have long played their part in keeping the region far removed from any serious attempt at integration

[66] The EU has experienced critical power supply shortages caused beyond its frontiers.

whether economic or even less political. The region, in general, is not technologically advanced either. Further, from a comparative law point of view it remains as diverse as Europe before the advent of the European Community.

Although the political ideal of a 'united' South America dates back to the eighteenth century, no serious integration process has been carried out since. Current economic integration schemes such as MERCOSUR and UNASUR have been neither comprehensive nor widely successful. Further, the political differences in the region are wide and varied, whilst international cooperation is always constrained by economic limitations and political interests.

In contrast to less developed regions, such as Africa or south-east Asia, in South America power grid coverage is adequate. Evidently, not as intensive as in Europe or other developed countries areas, but it allows a good rate of power transmission expansion plans. Further, in terms of energy-demand and propelled by Brazil, Argentina, and Chile, the region is in need of extensive investments in all sectors of the electricity industry. Furthermore, power transmission is a mature technology in use and this fact sets-off any technological shortcoming amongst South American countries.

All this makes South America a perfect case-study for analysing how the idea of interconnecting power grids across-borders might contribute to reassess and harmonize energy policies throughout the region in favour of renewable sources and thus, ultimately, to contribute achieving sustainable development.

I.5. FINDINGS AND APPLICABILITY

The research does not purport to provide the ultimate answer for why there is no a single international power grid yet. In finding such an answer many relevant and different approaches[67] might be considered. This, however, would go far beyond its scope and legal focus. Since cross-border grid interconnections are subjected to numerous specific requirements, the investigation focuses primarily on possible legal explanations arising from International Law.

The Energy Charter Treaty framework works reasonably well in protecting investments, though it lags behind as to power-trading and transit. In this context, what the research aims to achieve is a neutral specialized legal framework for transnational energy trading and transit based on reoriented principles of cooperation, freedom of movement, and non-discrimination as to power-origin, destination, or ownership i.e. treated no less favourably than energy originating in or destined to a transit-country itself.

The first practical outcome of the investigation is the identification of international legal barriers hindering cross-border interconnections of power grids or unrestricted power-flow. As part of this goal, the investigation is intended to produce a model International Declaration and a template for an international multilateral treaty between States willing to interconnect their respective power grids, and through whose territories a transnational power grid is to be established and operated.

[67] In finding such explanation economic, political, social, and other perspectives should be considered. However, the research is methodologically restricted to analysing just one of those approaches: the legal perspective and its implications.

Secondly, the research will provide legal recommendations for advancing the integration of renewable sources through the identification of opportunities for energy efficiency and harmonisation/synchronisation of energy policies, as well as for furthering independent operation of transnational transmission facilities.[68]

The research outcome, thus, will seek to advance a regional transnational power transmission system, namely, a transnational power grid capable of contributing both to the integration of new, far apart energy sources (preferably renewable ones) and to the unrestrained flow of electricity over long-distances and territorial borders; ultimately, contributing to improvements in energy efficiency and assisting in attaining sustainable development.

Although the applicability of the research findings might potentially be wider, in this book the extent to which a transnational power transmission system is analysed as feasible for implementation is confined to a regional level. Moreover, as South America is one of the cases selected for study, the extent of the application of the research findings is largely confined to a situation where there are a number of developing countries in similar economic standing to that in South America. Whether the application of legal mechanisms for transnational power-transmission might work in other economic contexts and/or social or cultural environments is beyond the remit of the book and for subsequent enquiries to examine.

[68] Notably applicable to South America and Africa, which mostly are not part of the ECT system and have much more flexibility than developed countries to configure their energy matrices since they lack infrastructure and rely much more on mutual cooperation. The energy sector, though crucial, should be viewed as a pioneer and a much delimitated area for early integration efforts.

CHAPTER II. ENERGY SELECTION & ENERGY SECURITY

II.1. INTRODUCTION

Climate change, energy security, and energy choices are currently global concerns.[69] All of them, however, have primarily local manifestations. The way in which a country's resources - whether social, economic, or cultural - are affected by climate variability does have an influence on the policies that local or domestic government adopt in order to meet the needs of its population and to pursue the State's own interests. One of these latter is, precisely, securing the production and/or delivery of energy required for the carrying-out of economic activities. Every State has its own productive infrastructure, but all require some sort of energy to put it in motion and carry out their activities, whether carbon or renewable-based sources of energy. States are compelled to make a decision on what kind of energy such infrastructures will be based upon. Energy choices, then, becomes an issue of major concern to nation States.

This chapter addresses *energy selection* or the way in which States configure their energy portfolio. The book advances the view that part of the answer as to why countries are reluctant to interconnect their power grids are legal factors inducing certain types of energy matrices, mostly based on the use of carbon-based sources. This Chapter aims to identify such factors. For this purpose, it examines legal mechanisms for setting up energy mixes and promoting the integration of renewable power generation. It conducts an international comparative analysis about energy-

[69] Boyle et al, above n 12. See also *United Nations Framework Convention on Climate Change* (*UNFCCC*), opened for signature 9 May 1992, 31 ILM 854 (entered into force 21 March 1994); *Kyoto Protocol to the Framework Convention on Climate Change*, opened for signature 11 December 1997, 37 ILM 22 (1998) (entered into force 16th February 2005).

policy configurations between Brazilian, Canadian, and Saudi Arabian energy planning instruments. The former two rely mainly on hydro-power though with fundamental differences, whilst the latter - mostly and relatively - rests upon the use of fossil fuels. The aim is to show that certain regulatory frameworks hinder renewable energy source integration and international grid interconnections or, by contrast, how States may harmonize their domestic energy mixes including renewable sources in a long-term, secure, and reliable fashion. The Brazilian case excels as an instance of clear integration of renewable sources-based energy portfolio together with an associated relationship with power transmission; both exhibiting a history of consistent implementation.

Lastly, the chapter will draw conclusions as to legal approaches to sovereignty, energy security, and the use of legal and/or regulatory mechanisms to further energy source integration and grid interconnections more widely.

II.2. ENERGY PLANNING INSTRUMENTS

The actions taken by a government to influence its economy constitute its economic policy. Types of economic policy actions can include regulation, information strategies, voluntarism, and a wide variety of economic instruments including setting interest rates, regulating the level of government expenditures, planning public infrastructure, creating private property rights, and levying taxes. They all can be employed to either influence or determine what kind of energy will drive economic growth and increase Gross Domestic Product.[70]

[70] Investorwords <http://www.investorwords.com>.

This section deals with the possibility, from an international legal point of view, of structuring diverse energy mix configurations, either by identifying common legal barriers hindering the baseline for achieving a policy on international energy cooperation (which might include transnational grid interconnections at large-scale) or by pointing to legal mechanisms (mostly international) that are capable of advancing the harmonisation of energy mixes to foster a rising share of renewable energy sources in a nation's energy matrix. Assuming that policy intervention is needed to tackle a given social, economic, or environmental problem,[71] choosing the right policy tools, either from a government or a globalised standpoint, it is essential, firstly, to understand how a policy instrument works.

Throughout history, policy decision-making processes have shown a great disparity between political and economic interests resulting in many different approaches to accessing natural resources, property rights, development, and ultimately global sustainability.[72] From a comparative viewpoint there are three main models to facilitate ownership over natural resources. Firstly, the *accesio* regime, whereby resources belong to the owner of the land in which they are placed -either in reality or constructively- being a system that basically allows private dominion; secondly stands the *national property model*, distinguishing property in the land and property of subsoil-based resources such as minerals and hydrocarbons, thus, making possible a dual ownership system whereby surface tracts of land can be subjected to private dominion whilst the State

[71] Orly Lobel, 'The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought' (2004) 89 *Minnesota Law Review*, 354.
[72] See generally K.J. Gaston, J.I. Spicer, *Biodiversity: An Introduction* (Blackwell Publishing Company, Malden, 2004). See also E. Ostrom, L. Schroeder, S. Wynne, *Institutional incentives and sustainable development: infrastructure policies in perspective* (Westview Press. Oxford, 1993), 153.

has exclusive right to grant concessions to exploit all other resources. Finally, *absolute state property* stands at the other end of the spectrum whereby any kind of private appropriation of natural resources is prohibited.

Producing electricity demands extensive use of resources. Those different policy perspectives on resource-treatments are inextricably connected with the understanding of one of the most important legal concepts in political theory: sovereignty.[73] Indeed, when the sovereignty concept is seen as providing absolute control over natural resources, then it influences national policy decisions (and consequently, actions) having permanent and specific effects on natural resources,[74] determining the people entitled to use them,[75] and radical forms of resource-management including exclusive rights for extraction and exploitation and preference for regulatory tools of the kind of command and control. On the contrary, non-absolute views on national sovereignty tend to lead to different legal frameworks to secure the overall sustainable management of natural resources. As part of this arrangement a rights-based approach might empower people in possession thereof and limit the scope of government's actions to use, control, and dispose of natural resources. It may also influence future directions for energy policy and law. This latter perspective represents a concept of non-exclusive rights of States to exploit natural resources and legislate in the field. These corollaries are of utmost relevance, particularly, when the prerogatives of States at international

[73] For a comprehensive outlook on the subject see Bodin, above n 39; Osiander, above n 39; Philpott, above n 39, ch 1; John Braithwaite and Ian Ayres, *Responsive Regulation: Transcending the Deregulation Debate* (Oxford University Press, 1992).

[74] Burtraw, Palmer, and Heintzelman, above n 13.

[75] E.g. indigenous inhabitants in possession and control of the natural resources. See United Nations, *Declaration on the Rights of Indigenous Peoples*, UNGA Res 61/295 (13 September 2007) arts 3, 4, 26-28, 32.

level are analysed because - under this view - 'the sovereign rights of states over natural resources can be limited by international agreements'.[76]

In making energy choices the characterization of energy as a strategic resource *per se* often underpins the entire selection process. A problematic scenario for any State is to be curtailed or deprived of the means with which to meet the needs of its population, electricity being an essential service. The lack of energy supply or even the possibility of experiencing a shortage has the potential to destabilize the economic, social, and political environment of a State. The magnitude of the threat is directly proportional to the level of insecurity experienced. Insecurity is relevant to three main factors: the first being the objective level of *exposure* to energy shortfalls e.g. represented by the kind and availability of energy-producing sources at economic cost. The second element to be taken into account when assessing a State's energy insecurity level is its *sensitivity*. This reflects the degree in which the interplay among a given set of available energy choices affect the overall balance of a State's needs-satisfying functionality e.g. in terms of economic cost or missing production due to energy shortages or problems in the supply chain. Lastly, *vulnerability* is about adaptive capacity, the less available the greater the sense of insecurity. This is particularly relevant when an energy mix lacks diversification (i.e. it is configured with a few power supply components), some of the components enjoy a clear predominant position, or they basically contain energy sources whose project-design and implementation require long-term maturity periods. In all these cases, the power system's response-capacity to unplanned contingencies might jeopardize a country's short/medium-term production capacity and economic position.

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[76] Elena Blanco and Jona Razzaque, *Globalisation and Natural Resources Law. Challenges, Key Issues and Perspectives* (Edward Elgar Publishing, 2011) 7.

It is worth recalling that, although an energy mix is set to meet effectively and efficiently the energy demand, there is no guarantee it will do so. This is because, as it shall be seen in detail in Chapter III, in the short-term, increases in energy demand are constrained by the supply, whilst this latter - in the long-run - is functional to demand. An energy mix – being an evolving policy instrument - has, therefore, two time-facets: On the one hand it looks at the future in an indicative way most of the time, compulsorily in others, in an effort to predict energy demand and supply scenarios, technology-related improvements, appurtenant economic cost, and investment incentives for a certain period of time. On the other hand, it presents the current configuration of the mix as a baseline, normally accompanied by appurtenant legal rules designed for implementing the policy. This Chapter is focused on the prospective aspect of energy mixes, since it represents a contextual insight into the way in which a country foresees the energy-security horizon in a given timeframe. Being a prospective outlook on meeting future (often increasing) energy demand, the consideration of the required investments in energy expansion, power generation, transmission lines, and substations, as well as other suitable incentives for the industry, makes this instrument essential for the planning of domestic power infrastructure. More specifically, this process will allow for envisioning the best cost-effective combination of available energy sources in a projected scenario.

As a result, an energy matrix is a mix of energy sources that a given country/area /community employs to carry out its economic production and social objectives. It is a strategic instrument of economic policy designed to meet a country's energy demand in a given period of time, based both on current available resources and energy demand projections.

For the sake of simplicity, nation state will be the level at which the inquiry's analysis will be conducted.

Energy planning instruments are designed as a response to different situations of energy supply disruptions, namely, energy vulnerability. However, the way in which such scenarios can be addressed to determine the best solution might differ radically when looking at them in broader contexts, beyond the traditional notion of sovereignty.

Indeed, the traditional model of sovereignty used the State as a point of reference and the defence of that position is often called 'national security'. In this approach to sovereignty and national energy security there are a number of values that are regarded by nations as at risk, whose defence is necessary, and which matches fairly well with traditional features of the nineteenth century theory of the State. Following this path, firstly, the capacity of a State to pass its own legislation and regulate crucial activities like energy supply constitutes 'national autonomy'. Secondly, the ability to posses, control, and exploit natural resources within a given area represents the ultimate way of exercising the defence of the State's territorial integrity.[77] In this regard, third-parties are excluded from conducting such activities without the consent of corresponding State authorities. Finally, the third value at risk where sovereignty is conceived in a traditional way is by reference to a collection of attributes and

[77] An illustrative restriction to this absolute notion, although not binding per se, is the principle contained in *International Regulations regarding the Use of International watercourses for Purposes other than Navigation*, by which 'neither [riparian] state may, on its own territory, utilise or allowed the utilisation of the water in such a way as seriously to interfere with its utilisation by the other state or by individuals, corporations, etc. thereof'. These Regulations where conceived early in the twentieth century by the Institut de Droit International, a private association of lawyers. See Institut de Droit International, *International Regulations regarding the Use of International watercourses for Purposes other than Navigation* (20 April 1911), 11 IPE 5702.

competences acknowledged to be possessed by a State in order to fulfil its objectives.[78] Although sovereign powers are considered absolute within the normative and territorial competences of a State, they are outwardly constrained by the consideration of other States having and pretending to exert similar competences. In this scenario, energy policy is unique to each State and draws its configuration from what is intrinsically relevant for the preservation of the State as a super-structure valuable in itself. No consideration is given to any goals or needs different than those of the State, so energy-related decisions are dependent upon them.

The image is quite different if broader and contemporary understandings of sovereignty and national security are taken into account.[79] For instance, 'human security' approaches have identified individual and human communities as the main referent. In this context, the goals to be achieved are no longer exclusive manifestations of an impersonal State, but expressions of basic innate human needs, such as survival, wellbeing, and quality of life. This approach to security enables a whole new spectrum of energy policy decisions to be made, mostly around the idea of empowering people with the tools and/or incentives required. Examples can include to self-produce electricity (whatever the source), securing for them the right to access private or public grids, to transporting and individually selling self-produced power, appropriate and/or exploit some natural resources or, still more sophisticated, (provided smart-metering is available) to select their energy retailer. It is apparent that this broader notion of security - though still heavily anthropocentric – both transcends and assists in refocusing the limited scope of a national, territory-constrained energy

[78] See also Philippe Sands, *The New Architecture of International Environmental Law* (RBDI, 1997) 512.
[79] Franz X. Perrez, *Co-operative Sovereignty: From Independence to Interdependence in International Environmental Law* (Kluwer Law International, 2000) 395.

policy. In this sense, energy decision-making processes should accommodate human communities' energy needs and options, which then become drivers of energy mixes and adaptation measures. This facilitates a modification of traditional obsolete models of national sovereignty.

To overcome some of the limitations of such human-centred views, current trends led by Boyle look for an even broader notion of security based on the interactions of all species inhabiting Earth, namely, ecosystems. According to this 'ecological' view of security, the objective is to pursue the preservation of life-sustaining systems at global scale since all of them interact with each other. The environment *per se* is regarded as a value to be safeguarded from pernicious human activities or to be restored via mitigation measures if the damage has already been inflicted. Accordingly, the realisation of a bond between human and environment should logically influence energy policy making-processes at the international level. Hence issues affecting common life-sustaining systems such as the acidification of the seas and climate change[80] pose daunting threats, not only upon humankind, but also most generally upon the Earth's life-supporting capacity. This new security approach might work in cases like climate change, where the conceptual frame for thinking and solving problems has been challenged by matters not previously subjected to regulation or often considered to be outside the scope of the conventional notion of national security.

To better understand how the 'ecological energy security' approach works, it is worth briefly explaining what this specific kind of regulatory approach to governance entails. Since the work of John Braithwaite and Ian Ayres,

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[80] Boyle et al, above n 12.

Responsive Regulation,[81] a great deal has been written on regulation theory. Over time, the literature has not only attempted to describe the different possible models of governance adopting concepts such as the pyramid of regulatory intervention which is used to represent a graded regulatory continuum of governance, but also to identify what the features of such regulation might be.[82] According to De Búrca, the rise of new governance systems can be seen as a response to both complex policy matters that are not suitable to resolution through command regulation, market, or otherwise, by the need to manage interdependent though divergent regulatory regimes. Such 'strategic uncertainty' and 'interdependence' are seen as background conditions[83] with the potential for triggering new approaches to policy making and implementation processes. For Ayres and Braithwaite, regulation need not be only a State-centred mechanism of the 'command and control' type; regulation can be a combination of persuasion and sanctions, including ideas of empowerment of private and public interest groups and how government might support self-regulation or co-regulation. At the same time, scholars have analysed the particular attributes of this new regulatory approach employing a typology featuring benchmarking, transparency, democratic participation. At the operational level there is the capacity to blur the boundaries of regulatory actors' roles (state and private-sector actors), the stages (law and enforcement) and modes of regulation (from state-centred command regulation, through intermediate approaches such as enforced self-regulation and co-regulation, to none at all), and even the structure of a given regulatory regime.[84] It is suggested that this approach should be

[81] Braithwaite et al, above n 72.
[82] Lobel, above n 71.
[83] Gráine De Búrca, 'New Governance and Experimentalism: An Introduction' [2010] *Wisconsin Law Review* 232, II.
[84] Jason M Solomon, 'New Governance, Preemptive Self-Regulation, and the Blurring of Boundaries in Regulatory Theory and Practice' [2010] *Wisconsin Law Review* 592-596.

considered in relation to national energy security concepts and associated regulation.

The 'ecological' notion of energy security then - advancing both international energy policies coordination and cooperation in implementation - fits in the world of regulatory theories under so-called 'new governance' approaches in regard to its capacity for 'blurring boundaries'[85] on the modes of regulation, particularly thinking through the potential of not only using multiples approaches at once, but also in the possibility of moving from one mode to a another depending on changing scenarios. The flexible attribute is most often emphasized by regulation scholars.[86]

Worldwide, the energy industry mobilises billions of dollars in capital. Economic globalisation has accelerated the movement of commodities and capital. Year by year, huge capital investments in energy projects are made in several countries; all of them with different regulatory structures and functions as well as in the roles of relevant actors. Investments of this kind require an extremely stable environment in which the consideration of regulatory approaches to industry activities is essential.

It is clear that a country's spectrum of energy requirements fit themselves well into De Búrca's first background condition of 'strategic uncertainty'.[87] It is also true that many other economic activities depend upon energy supply to occur, thus, permitting the interaction of different regulatory frames and realising the second background condition of regulatory 'interdependence'. In fact, in seeking to configure the energy

[85] Ibid.
[86] Ibid.
[87] Above n 83.

mix of a country, the whole current productive structure must be revisited along with the economic policy outline, due to the interplay between economic sectors and corresponding regulatory frameworks.

Having outlined how new concepts of governance and regulation can influence national state models for energy matrices that have been based on the traditional model, we shall soon turn to some case studies that illustrate aspects of these trends.[88]

In the following section new approaches to sovereignty and energy will be presented and a comparison will be made between selected countries in terms of the manner in which they have addressed the set-up of their respective energy matrices. The principles for determining appropriate models considers at two key factors: the first being the correlation between accessible natural resources and energy mix configuration. The second factor is the level at which renewable energy sources are integrated into the energy mix; in other words, the incentives that the legal system provides for doing so.[89] The objective of this comparative exercise is to identify the legal elements that might play a role in both materially expanding the concept of energy security (to include common environmental concerns not covered by traditional understandings of 'national security' or merely anthropocentric notions thereof) and enabling natural resources - mainly renewable resources, typically regarded as out of the scope of national sovereignty issues - to be considered in the design and implementation of domestic energy mixes. These elements should be regarded as essential components of the mix under an overarching coordinating legal instrument, whether at international, regional or bilateral level.

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[88] Bourdon et al, above n 56.
[89] Burtraw, Palmer, and Heintzelman, above n 13.

II.3. NEW APPROACHES TO ENERGY SECURITY.

The research will now examine how some features of transnational power grids are aligned to legal frameworks. Significantly, the most important aspect in transnational energy transmission is the way in which different legal systems interact with each other. The relationship between national and international legal realms could be framed in different ways. Some scholars emphasize an alleged difference in nature between the two spheres;[90] others highlight the fact that international law does not arise from any national legal system, thus, identifying legal sources as the key differentiating factor.[91] Still others scholars focus the attention on the enforceability of the rules emanating from each system. As it shall be seen, this inquiry uses a pragmatic approach to the unavoidable, though commonly problematic, concept of sovereignty when applied to international contexts.

The book advances the idea that some powers that are akin to those which typically are held to define sovereignty, namely, the possibility for an entity to act independently in an international context and to exclude the interference of other international actors (whether nation States and other organisations) could be applied as specific legal competences to allow the operation of a transnational energy grid, even under the normal limitations imposed by the current international regime. Further, depending upon the competences that are recognised as belonging to this self-regulating entity, the independent grid operating organisation could manage territories that are dedicated to bear cross-border power nodes and other transmission

[90] Monism vs dualism.
[91] Hust, above n 33, 2.

power facilities, as well as the neutral operation and uninterrupted functionality of a transnational energy network.

II.3.1 Sovereignty analysis

Drawing on the overview above, this section presents an innovative approach to sovereignty, the underlying idea of energy security. It has been developed specifically for an international and power-related context - expressly where an entity is recognised internationally (or trans-nationally) to have specific competences that enable it at a technical level to manage an interconnected grid and keep its functionality operative and secure. This would require the independent entity to exert those competences beyond national territorial and jurisdictional limits and the reach of any one nation's domestic laws. On the other hand, as most commonly understood sovereignty, national security; and the designation of natural resources, scientific/technical knowledge or infrastructure as strategic (for national security purposes) or other expressions of the sovereignty/ national security concept might hinder power network interconnection projects. These power interconnection projects, it is argued, would be more readily implemented where the traditional model of sovereignty did not pose a barrier to their development and operation. But it is acknowledged that this latter scenario is not entirely feasible as yet, and that nation state sovereignty is still an unavoidable and powerful concept in international relationships. Therefore, the book takes an alternative approach: it certainly does not intend to eradicate sovereignty concepts from the area of transnational power transmission, but to find a specific way to make it more adaptable in the case of energy network transnational interconnections.

Such a way, it is proposed to focus on very specific matters between nations that are then capable of driving international consensus as the relevant nations recognise that this might represent common benefits for those willing to participate in transnational power transmission. The book, therefore, advocates for a different interpretation of certain specific principles of International Law. Such a view is suggested in order to deal with the global concern of securing energy transmission through either expanding the existing international governance structure (impacting on national sovereignty over resources in domestic realms) or the preferred approach of creating a new intergovernmental actor (Transnational Grid Operator) in the international sphere, subjected to International Law but enabled with specific competences around the facilitation of international grid interconnection and, particularly, transit control that are not dependent upon decisions by States. As such it would require some change to the ideas about sovereignty and the exercise of powers in International Law, but as discussed below ideas of sovereignty have changed over the course of history.

The inquiry about the source of political and legal power has been conducted extensively throughout history. Sovereignty – as with most ideas – is an evolving concept, a feature that this section shall emphasize.

As traditionally understood, sovereignty is a concept that has long been associated with exclusive control or jurisdiction over territory, its inhabitants, and even transient visitors. Further, in a broader sense this element of exclusivity of jurisdiction is applicable to all the sovereign entity's affairs, not only those occurring within its borders, but also to decisions concerning such affairs made by the sovereign entity having cross border repercussions.[92] Thirdly, inextricably linked to the previous element, sovereignty also entails law-making and regulatory capacity. The evolution of these three constituent elements has significant relevance in envisioning a viable regulatory framework enabling, first, the cross-border interconnection of grids and energy-trading and, thereafter, for potential energy integration.[93]

As to what constitutes sovereignty *per se*, a long accepted definition is that it comprises a power of self-determination or the ability to act independently and free from the intervention of third parties, 'a supreme authority within a territory'.[94] The possibility for any given entity to make its own decisions and through them to determine its own conduct and actions in relation to third parties has important consequences in Law. In the first place, self-determination in this absolute manner must necessarily be understood in general, namely, to be neither materially nor formally restrained. Having limited or restrained choices runs squarely against the idea of a sovereign power being able to make different options.

In political and International Law literature, therefore, sovereignty classically encompasses an idea of the power of a State to act independently of other nations within certain limits. These limits have evolved over time from being practically non-existent (when sovereignty was considered absolute); through to the period in which International Law started imposing certain formal constraints to sovereign powers of States,

[92] G. Handl, 'Territorial Sovereignty and the Problem of Transnational Pollution' (1975) 69 *Australian Journal of International Law (AJIL)* 50.
[93] Energy integration, a process that this book sees furthered through both common energy policy making renewable sources a material part of energy matrices and the creation of an independently-operated grid.
[94] Stanford Encyclopedia of Philosophy <http://plato.stanford.edu>. In regard to the territory element see below II.3.3, n 101.

to the present day in which imposes material restrictions upon them in very specific areas. Examples of these areas where such constraints upon the powers of states have emerged include Human Rights and Humanitarian Law.[95] These concepts have gradually impacted on the long-standing formal idea about sovereignty by allowing qualified restrictions in the scope of nation state self-determination.

In light of these developments, this book critiques the traditional sovereignty approach in order to search for new ways that could be used in furthering interconnection of energy grids and unrestrained power-transit across national borders. In terms of a transnational power transmission concept, there is no difficulty in accepting the view that the legal nature of sovereignty is that of a power, together with a collection of innate prerogatives and competences which an actor is entitled with and which are capable of being exerted in relation with transnational power transmission, for instance. Other issues - such as how nation States' powers are exercised or constrained - are, however, more problematic, as we shall examine in detail as follows.

Further support for the idea of adopting this qualified view of sovereignty for the purposes of transnational power transmission is the proliferation of entities enjoying certain international immunities and privileges.[96] This

[95] Jean-Marie Henckaerts and Louise Doswald-Beck, Customary International Humanitarian Law (International Committee of the Red Cross, ICRC-Cambridge University Press, 2005) vol II; Jean-Marie Henckaerts and Louise Doswald-Beck, Customary International Humanitarian Law (International Committee of the Red Cross, ICRC-Cambridge University Press, 2009) vol I. See also ICRC databases on Humanitarian Law in the International Committee of the Red Cross website at < http://www.icrc.org/>.
[96] M. Loughlin, *The Idea of Public Law* (Oxford University Press, 2003). See also G. Marshal, 'The Constitution: Its Theory and Interpretation' in N. V. Bogdanor (ed), *The British Constitution in the Twentieth Century* (Oxford University Press, 2003); C. Sustein, *Designing Democracy: What Constitutions Do* (Oxford University Press, 2001).

development together with the emergence of many international organisations with recognised powers to act in the international sphere is a process that has made the traditional approach to sovereignty vary in particular degrees. These trends, for instance, have been responsible for some erosion of the originally exclusive association of sovereignty with Statehood. These processes are of interest for the book' contention in terms of challenging the exclusive link between nations and the exercise of powers in the international sphere, but also, and most importantly for showing that some particular attributes or competences thought to be inherent and exclusive to States can also be associated with other entities. These organisations thereby, enjoy to varying degrees, legal capacity, international liability, independence and autonomy (self-regulating capacity). These ideas about reframing the exercise of powers internationally can be of assistance in resolving problems around power grid interconnection. A functional transnational power network poses an important operation challenge: there must be either a single operator or multiple ones, duly synchronised. However, even in this latter case, a common coordinator across the operators seems appropriate. As shall be seen in chapter IV, the International Trade Law applicable to power transit issues involving Third Parties falls short of meeting the regulation and protection needs arising from possible transnational disputes and conflicts. For this reason, it is of particular importance to secure unbiased and independent operation of interconnected energy grids under International Law, whether arising from treaty or customary law.

The idea of external limitations is, however, inconsistent with that of innate sovereign powers; and so the concept of innate and absolute powers needs to be modified. Further, if from the outset a transnational grid entity is regarded as having tightly delimited powers related to a specific material field (cross border power transmission, for instance) it is possible to accord the entity a degree of autonomy and independence. The delimited material field may, for instance, be as simple as allowing or not the entry to a tract of land where an international node or a substation is located; or, as concrete as regulating the load-balance of an isolated transmission system.

A conclusion can be drawn from this: a clear, well-framed material field for the legal operation of the grid. For this entity, the capacity to choose and act freely indeed secures the content of sovereignty within pre-defined boundaries, in other words, such a framework sets out the type of competences and powers that can be exercised by the grid operator reflecting various degrees of autonomy and independence. In the traditional view of sovereignty, exceptions to such capacity comes from the outside and have the effect of reducing the scope of self-determination of that organisation; for this reason, in the case of a transnational interconnected grid with the sole duty and competence to keep the functionality of the network through managing uninterrupted transit and transnational power nodes, no exception should be allowed. Therefore, although the scope of self-determination might be reduced and constrained, what it is important is that it remains supreme and untouchable within its own boundaries.

Moreover, the making of International Law is, in essence, a matter of agreement between nation states based on State practice and consent, either to allow or prohibit something. In this context, the book argues that an agreement such as that proposed in the model agreement (see appendix C) or a set of common practices around transnational grid operation should be acknowledged as law governing the area of grid interconnection.

Further, there are relevant international trade rules or new interpretations of existing International Law principles that could be applied to further power grid interconnection processes across countries and to protect the uninterrupted functionality of the resulting common power network.

Another problem that is often raised is that International Law lacks effective enforcement. One answer to this problem was given by H.L.A. Hart, for whom the essence of Law does not reside so much in its actual capacity for being enforced, but much more upon the level of acceptance that rules achieve from their target group.[97] On this view International Law is reinstated because, despite the media attention given to breach cases, the truth is that compliance with International Law rules and principles is far more common than default. The underlying question is why, voluntarily, would nation states seek to conform to International Law? Is there any gain in doing so?

The answer is affirmative because States or more broadly the so-called international community acknowledges its own frailty and weaknesses. Human interest in satisfying common needs - whether basics or complex - like security and survival, prompts agents to meet up and cooperate with each other in furtherance of a common beneficial target. In a similar way, nation states would willingly conform to International Law in seeking to diminish the level of uncertainty caused, among others, by unequal endowment of natural resources, differences in economic performance and development, or by ideological diversity.

[97] Herbert L. A. Hart, The Concept of Law (Clarendon Press Oxford, 2nd ed, 1994), 50, 66, 100, 213-237.

II.3.2. Nature and content of Sovereignty

We will now move on to examine how a qualified concept of sovereignty can be applicable to the renewable energy and transmission fields. As analysed, the nature of sovereignty is a power to behave (either to act or omit) oneself free of external interference. For the purposes of this book, this notion may be applied to the energy field. It is worth recalling that, primarily, the sense of insecurity and fear of not getting basic needs satisfied is often what compels States to interact with each other; and this has direct expression when it comes to energy security and energy matrix configuration.

The global implications of climate change pose a number of obligations on the international community, one being collectively reducing GHG emissions.[98] In turn, depleting natural resources and rising international prices of carbon-based fuels threaten conventional economies. Simultaneously, the search for new technologies based on non-traditional energy sources and the efforts to make them economically viable have reoriented political interests in the way countries configure their energy matrices. Although renewable energy potential may not be a problem in most cases, its readily availability certainly is. Renewable sources are not yet a complete substitute for a carbon-based energy mix. Wind-power, for instance, is not even cost-efficient unless used at a very large-scale. It requires power storage mechanisms capable of overtaking load fluctuations, isolation of transmission systems, and structural inefficiencies of conventional grids. But, even if all these efficiency issues could be

[98] For instance, *United Nations Framework Convention on Climate Change* (*UNFCCC*), opened for signature 9 May 1992, 31 ILM 854 (entered into force 21 March 1994).

successfully surmounted, there is yet the problem of managing power facilities sited in, and lines crossing multiple States.

Since it still lacks a long-standing comprehensive normative system as in domestic realms, the international community and its participants are easily attracted by the idea of their own existence, hierarchy, status, legitimacy, and interaction being first recognised and, ultimately, respected. International Law is therefore an evolving normative system which provides a source of mutual recognition and legitimacy for State's decisions and, most importantly, a framework of necessary minimal rules to lower levels of uncertainty and mutual suspicion between States at international level. At its best, such a framework can also encourage cooperation in achieving mutually beneficial goals.

Natural resources sharing, developing suitable property regimes (as to resources, facilities, power outcome, etc), international power trading, the possibility of creating an integrated single power market, and securing an independent operation of transmission facilities all lie ahead as issues to be politically and legally addressed by multiple States, all keen to secure the best possible outcomes to their own interests.

Basically, what a new interpretation of sovereignty or the use of a concept of an organisation having a particular set of competences in relation to facilitating transnational power transmission could offer is a legal base upon which to build security in the transnational intercourse between energy interdependent States. This approach takes advantage of certain features of the concept already analysed. Firstly, if the organisation had autonomy it would imply for a transnational power grid Operator, the capacity to manage cross border power nodes, transmission facilities and the appurtenant territories on which all of them are placed on without external interference or restrictions. Finally, these specific competences are strongly associated with the capacity to act internationally, thus, it might constitute a way to vest international legal personality (to the fullest extent) upon newly-created entities designed to carry out independent operation of transnational grids. In the light of this approach, some of the competences associated to sovereignty could be used to extend the range of International Law by recognising international status to new organisations an, valid *erga omnes*, aimed at operating transnational interconnected grids in an unbiased and independent manner for the sake of common interests, such as integrating and benefiting from non-conventional renewable technologies, creating an integrated power market, and securing a reliable power supply under a renewable power source-based scheme for energy matrices.

II.3.3. Sovereignty and Statehood: A common misleading link

Although sovereignty and statehood are different concepts, people often get confused about them, mainly, because both share some characteristics.[99] Whereas sovereignty as a legal notion has already been analysed, something must be briefly said on Statehood, since this refers to the status of being a political entity in International Law. It is this branch of Law that establishes the requirements for Statehood: the existence of a territory, a population, stable and effective government, and international intercourse capacity.[100]

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[99] R. van Caenegem, *An Introduction to Western Constitutional Law* (Cambridge University Press, 1995).
[100] Devine, above n 40.

The confusion between sovereignty and statehood can be more easily understood recalling the traditional features of sovereignty: territory, jurisdiction, and law-making authority. Territory is patently an overlapping requirement since, normally, the making and execution of a sovereign State's decisions take place or render effect in a territorial context. However, there are cases in which International Law recognises some non-territorial entities the privileges and capacities of a State. Therefore, it can be concluded that the existence of a territory, although being a traditional feature of sovereign entities, is not essential. Sovereign entities may lack territory; not States.[101] However, the confusion arises from what an entity is capable of doing rather than where it can be done. Whilst sovereignty provides for jurisdiction (which includes law-making authority); a State requires stability and effectiveness of its governmental decisions. The difference is apparent, but it is worth noting that Statehood's requirements are factual in nature and, thus, subject to external interference like that of time or other States' conduct,[102] whilst this is not possible with regard to legal competences as those akin to sovereignty.

In sum, in contrast to sovereignty, Statehood is largely a fact-based notion, therefore, not suitable for a legal framework for transnational power grid interconnections. This, in turn, gives additional support to the legal argument of this book based upon a particular set of legal competences and

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[101] Above n 94. The entry of sovereignty in the Stanford Encyclopedia of Philosophy illustrates the point clearly: 'Territoriality is now deeply taken for granted.... This universality... underlines sovereignty's connection with modernity. Though territoriality has existed in different eras and locales, other principles of membership like family kinship, religion, tribe, and feudal ties have also held great prestige. Most vividly contrasting with territoriality is a wandering tribe, whose authority structure is completely disassociated with a particular piece of land'. See also International Commission on Intervention and State Sovereignty, *Report. 2001. The Responsibility to Protect* (International Development Research Centre Publications, 2001).

[102] Here, regarding to constitutive theories of statehood (recognition).

jurisdiction conferred to an organisation (operator) to facilitate power grid interconnections and transnational power transit.

II.3.4. Conclusions

If the justification for transnational energy transmission is a growing fear of shortage of energy supply and global warming, does this mean that there was no such concern in the past? Were transnational interconnections then, less necessary than at present? A critique of these propositions is why power grid interconnections have not happened before? Arguably we have long had interconnections for fossil fuels (pipelines), which may be seen as a reduction in a small aspect of a nation's sovereignty and statehood. Clearly, global warming and climate change fears did not exist, at least, in the conscious way they currently do. Fossil fuels and electricity are different by nature. As for energy supply, the world's present economies are and will be - at least for a while - based upon carbon-fuels. Therefore, the answers to such questions are different. Even not engaging with alarmist views about imminent depletion of carbon-based fuels, it is a fact that the trend of international prices of conventional fuels is showing a consistent and significant rise.[103] The search for new technologies and the improvement of existing ones are making competitive the use of different sources of energy that is supplied by diversified agents. Simultaneously, the global political panorama has experienced fundamental changes: the 'iron curtain' and the 'cold war' era both have passed; the gradual political openness of eastern European countries as well as that of trading from China have shattered many conventional patterns of political cooperation,

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103 See, consistently, Investorwords <http://www.investorwords.com>, Gulfnews <http://gulfnews.com>, Bloomberg <http://www.bloomberg.com/>, The Independent <http://www.independent.co.uk/>.

global consumption and trade. However, this new energy outlook is far from being just a matter of commodities pricing and bilateral supply agreements. Instead, it involves considerations about policy coordination, multilateral trade agreements, and global environmental sustainability. These factors put more pressure on the integration of renewable sources into energy mixes and - as a logical consequence - in the infrastructure needed to make them work efficiently.

Due to this change of circumstances, what was not crucial when carbon-based fuels were cheaper, relatively abundant, and easy to obtain within each block of a then highly ideology-polarized world, it is now in the world's urgent-to-do list: how to increase international cooperation to meet growing energy demand and tackle climate change effects? Although usually political and particularly legal frameworks do not keep pace with reality, at least they have forced the abandonment of some old-fashioned ideas, the *aggiornamento* of some others, and the revision of procedures on a somehow regular basis. However, a concept in urgent need of updating is that of sovereignty. While acknowledging its nature of competence and its essential contents of self-determination and autonomy, a new legal approach suitable to further energy grids interconnections, should necessarily emphasize both characteristics (thus applicable to non-State actors) as equal to that of not being subject to external scope restrictions (making its holder fully independent as to the decisions that can be made within a given scope).

The need to consider emerging ideas around qualifications to sovereignty to facilitate legal frameworks for power grid interconnection constitutes a background factor for examining the following case studies.

II.4. ENERGY SELECTION POLICIES: A COMPARATIVE ANALYSIS

This section presents a comparative analysis of energy matrix configurations in two selected countries: Canada and Saudi Arabia. The objectives of this comparison are: firstly, looking at what their mixes are currently composed and why. Secondly, to give a synopsis of two dissimilar countries attempting changes to their energy portfolios for integrating renewable energy sources in varying degrees: either in a predominant, balanced, or residual way in subsequent periods of analysis. Finally, the section tests the consistency of a given energy choice against security of supply by analyzing the legal understanding of sovereignty and national security concepts.

It is proposed that in countries in which the legal construction of sovereignty is seen as instrumental rather than material a fact-based substratum pervades most relevant policy and regulatory decisions. The underlying position being that energy self-sufficiency is not worth-seeking. This influences the way in which a country's energy portfolio is configured. Indeed, despite only a few countries are likely to achieve energy self-sufficiency, it could be assumed that even these would be willing to partake in and benefit from a globalised scheme of power-trading in which stakeholders agree on synchronizing (or better still harmonizing) their energy choices to enable a cost-efficient sustainable energy supply. Even these countries would be better-off partaking in such a scheme. The proposition goes further to affirm that a flexible legal conception on sovereignty/energy security is more likely to develop the more restricted the aim of an international agreement is. In this context, this aim can best be furthered as a legal recommendation for a potential international energy-related agreement to deal solely with grids interconnection and uninterrupted power-transit.

II. 4.1. Canada's energy mix. An integrative instance

Canada was chosen as a case study because its energy matrix is predominantly made of renewable sources of energy and it has a long-standing transnational power grid interconnection with the United States, although not jointly operated. Canada is the world's second largest exporter of electricity.[104] In 2010, the energy mix of Canada was made of 62.23 per cent renewable energy sources of which 60.97 per cent came from hydropower,[105] 1.26 per cent from wind and tidal power which compared with the preceding year experienced a noticeable increase of 9 per cent.[106] From the rest, 22.84 per cent of the electricity was produced by conventional sources mostly coal, natural gas, and petroleum. Nuclear power production accounted for 14.92 per cent. A final 0.2 per cent was reported as coming from unidentified sources.[107] Power demand is driven by economic growth, which for 2011 according to the Bank of Canada was expected to grow just under 3 per cent in terms of real Gross Domestic Product (GDP).[108] The energy sector alone accounted for 6.7 per cent (24.6 billion)[109] of the Canadian GDP in 2010.

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[104] Canada typically exports 6 to 10 per cent of its production to the United States. International Energy Agency <www.iea.org>.

[105] National Energy Board, *Energy Briefing Note. Canadian Energy Overview 2010* (July, 2010) Canada National Energy Board, 15 Table 5 <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyvrvw/cndnnrgyvrvw2010/cndnnrgyvrvw2010-eng.pdf>.

[106] Ibid 1. In 2010, the total installed wind-based capacity increased by 690MW or 21 per cent, reaching 4008MW.

[107] WWF-Canada, *Earth Hour* (July, 2010) WWF-Canada <http://wwf.ca/_earthhour/img/national_energymix.swf.>.

[108] In 2010, Canada's economy got a 3.1 per cent growth rate in GDP. See also above n 103, 1.

[109] CBC News, 'Canada Power grid Investment', (online), August 2011 <http://www.cbc.ca/news/canada/story/2011/04/06/canada-power grid-investment.html>.

Third after China and Brazil, Canada is a world-leading producer of hydropower, which accounted for 570.9TW/h in 2010 and it is still the predominant power-source in the country.[110] Moreover, hydro sources are not yet believed to be fully exploited. This feature is vital, since the sector currently provides an important source of revenue by means of power-exports to the U.S., largely from the hydro-based provinces of Ontario and Quebec.[111]

Canada is also the seventh largest crude-oil producer in the world and it has large oil reserves.[112] It is a net exporter of petroleum products whose main destination is the U.S. East-Coast market. Mostly due to new mechanisms of horizontal drilling, Canada has been able to increase its crude-oil production by 5 per cent and its exports by 10.9 per cent compared to 2009 which, further, contributed to 65 per cent of the Canadian net energy export revenue in 2010. In turn, conventional thermal powered-electricity -which embodies coal, natural gas, oil or biomass used to turn high-pressure steam-driven turbines accounted for 124.1TW/h. Nuclear power accounted for 86.2TW/h in the same year, about 15 per cent of the country's total generation. Finally, non-conventional renewable sources such as wind-power generated 4,000 MW whilst in combination with tidal and solar energy non-conventional renewable sources produced three per cent of Canada's total electricity output in that year.[113]

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[110] Although in 2010 domestic hydro-electricity generation declined 1.6 per cent compared to 2009, mostly due to substantially lower precipitation levels below historical average.
[111] Above n 105, 17 Table 5. However, in 2010 the power-surplus trading declined in 14 per cent from 2009. In 2010, net energy export revenues accounted for CA$94 billions.
[112] Ibid 19, Appendix 1. Estimates of established reserves of crude oil and bitumen at 31st December, 2010.
[113] Ibid 1-14. See also Centre for Energy, Energy in Canada (July 2010), 5 Centre for Energy <http://www.centreforenergy.com/AboutEnergy/CanadianEnergy/EnergyInCanada/Default.asp?page=5#Top>.

A balanced configuration of energy portfolios must take into account transmission infrastructure. Unlike other countries and mostly for historical reasons the Canadian grid has developed in a fairly organized manner. Canada's bulk transmission network consists of more than 160.000 kilometres of high voltage lines spreading out in a vast territory of widely different geography. Canada has three main power networks: the Western and Eastern grids, and the Quebec grid. All of them cross international, provincial and territorial borders. Since they all are interconnected, they provide several alternative power-paths for utilities to trade power from each other and overseas, particularly, through the Western and Eastern Interconnections, and the Texas Interconnection in the U.S.[114] This physical and commercial interchange not only stabilizes and benefits the markets, but also greatly contributes to improve the interconnected transmission system reliability as a whole, primarily, due to complementary off-setting demand peaking seasons.[115] The Canadian transmission system is mostly based on a north-south bound scheme of power demand. East-west transmission is less common but occurs between Ontario and Manitoba and Ontario and Quebec. Finally, it is worth noting that most Canadian Provinces[116] offer open non-discriminatory access to the transmission lines, thus, enabling consumers to get electricity from the most competitive sources. Canada has two open wholesale markets, Alberta and Ontario, which have different prices mostly due to inherent costs of local utilities and variable weather conditions.

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[114] Exports are sent primarily to the New England states, New York State, the Midwest, and the Pacific Northwest, and California.

[115] Centre for Energy, Transmission (August 2011), 6 Centre for Energy <http://www.centreforenergy.com/AboutEnergy/Electricity/Transmission/Overview.asp?page=6>.

[116] Alberta, Ontario, British Columbia, Saskatchewan, Manitoba and Quebec. A different situation occurs in Yukon, Newfoundland and Labrador, Nunavut and the Northwest Territories.

Since the early 1990s the *Energy Efficiency Act*[117] enables the promotion of energy from alternative sources. However, its implementation was predominantly focused on energy efficiency measures. In this context, the Act enables the Canadian Energy Agency to adopt and enforce regulations.[118] In the mid-90s the strategic objectives of the Canadian energy policy were no longer largely focused on energy efficiency but on the development of renewable energy technologies.

The 1996 *Renewable Energy Strategy* drew on cooperative action principles to speed the renewable energy business start-ups as well as to develop the markets for emerging renewable sources. This action was formalized two years later through the *Renewable Energy Deployment Initiative* mostly focused on developing cost-effective markets for heating and cooling systems. Further, the *Government Action Plan* 2000 on Climate Change included new strategies aimed at developing markets for renewable electricity sources. The plan pledged to purchase 20 per cent of the Government's electricity demand from emerging low- or non-emitting sources, to install non-GHG-emitting technologies at government facilities, and to work with interested jurisdictions on access to electricity grids for low- and non-emitting generation. In 2002, the *Federal Climate Change Plan* set the target of at least 10 per cent of new electricity generating capacity to come from emerging renewable sources.[119] Currently, the Canadian Federal Government has developed several strategy measures of

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[117] Energy Efficiency Act (S.C. 1992, c. 36). Department of Justice, Canada. At <http://laws-lois.justice.gc.ca/eng/acts/e-6.4/>.

[118] Such as minimum levels of energy performance in products using energy.

[119] Government of Canada, Climate *Change Plan for Canada, 2002* (July 2011), 34 Climate Change Canada <http://www.climatechange.gc.ca/plan_for_canada/plan/index.html>. For provincial and territorial governments' strategic objectives of renewable energy see Table 2 in Huang Liming, Emdad Haque and Stephan Barg, 'Public policy discourse, planning and measures toward sustainable energy strategies in Canada' (2008) 12(1) *Renewable and Sustainable Energy Reviews* 91-115.

renewable energy which are classified in four types: Regulatory strategies and government mandate, Economic incentives, R&D support, and Market development.

From a transnational legal point of view, the Canadian approach to energy security offers several points of interest. One being the almost complete overcoming of conventional understandings on power infrastructure-management that is deemed strategic, which is complemented with a similar view in the U.S.[120] Indeed, in a continuing process, regulatory agencies in both countries have developed a cooperative relationship, not only for integrating their grids beyond borders, but also to operate and maintain them in a synchronised manner. Although the core of this common regulation looks more technical than legal, this is only apparent for it is based upon bilateral protocols on energy integration, some of them quite simple and - maybe due to this - remarkably long-lasting.[121] From a formal legal perspective, the straightforward language of these pioneering bilateral interconnection agreements foresees the way in which the wording of any proposed multilateral international agreement like those under the auspices of the WTO could be approached.[122] In a substantive sense, simplicity and a well-defined scope work it out: the subject-matter is clearly limited in order to achieve an interconnection, working in favour the technical nature of the processes to be carried out. Further, a closely-related point in the grid interconnection between Canada and the U.S. is that any territorial sovereignty issues that have unfolded as a result of the

[120] Palmer, Paula, and Woerman, above n 13.
[121] International Boundary Water Treaty Act (Canada), *Great Lakes Water Quality Agreement 1972* entered into Canada and the United States of America, *International Boundary Waters Treaty 1909* entered into Canada and the United States of America.
[122] *Marrakesh Agreement establishing the World Trade Organization (with Final Act embodying the results of the Uruguay Round of Multilateral Trade Negotiations, Annexes and Protocol) (Marrakesh)*, opened for signature 15 April 1994, 1867 UNTS I-31874 (entered into force 1 January 1995).

implementation of energy integration goals are addressed bilaterally, worked out rapidly, and in a way that is functional to the goals to be achieved.

A further point deserving attention is the role that transparency and information-sharing play in setting-up the energy mixes of two countries in terms of the relevant power exchange. Annually, Canada exports to the U.S. from 7 to 10 per cent of its power output. The U.S.'s power-deficit status, which is communicated in advance, assists Canada in shaping-up its energy matrix in the short and medium-term. In a symmetrical way, the information disclosed by its Canadian counterpart helps the U.S. to configure its own energy portfolio, taking into account Canadian generation commitments. In this fashion the understanding of what is energy security includes flexibility. Literally, it transcends national borders to accommodate the energy needs of both countries in a more efficient way, thus, enabling the linkage between generating units and far-apart consumer centres, the integration of different sources of energy to a larger, flexible, and more reliable grid as well as to combine and enlarge both markets.

In turn, a combined transnational market not only represents the apparent flow of power and trade between two countries:[123] Canada and the U.S. Although not yet detailing what specific sources of energy are to be used for keeping power flowing across the borders, in effect, this correlative energy policy represents a somehow implied understanding between both parties on the basic acknowledgement of keeping energy policies synchronised. At this level, a practical legal approach to an Energy

[123] Ross Buckley, Vailo Lo, and Laurence Boulle (eds) *Challenges to Multilateral Trade. The impacts of bilateral, preferential, and regional agreements* Global Trade Law Series (Wolters Kluwer Law & Business 2008) vol 14, 87.

Agreement would lead to the conclusion that building an international interconnection node is purportedly destined to be operative anyway, but in a sporadic way.

On the contrary, an intention to carry on transactions on a continuing basis can be construed from the mere fact of arranging the interconnection, which is long-term mature, costly, capital-intensive projects, with long-term investment rate returns, fixed, and destined to be permanent. However, even setting aside this purposive approach, what is to be emphasized here is the capacity of Energy Integration Agreements to cast a different light upon traditional conceptions of energy security and, ultimately, sovereignty.

This kind of 'integration arrangements' are highly specific, subject-matter-focused and have the rare quality of softening - at international level - the rigours of legal concepts that are far less flexible in domestic realms.

II.4.2. Saudi Arabia's energy mix. A trading dilemma

Despite Saudi Arabia being the world's largest Organization of the Petroleum Exporting Countries (OPEC) producer, it is currently facing a conundrum between economic diversification and sustainability. Not surprisingly, Saudi Arabia gets most of its energy from fossil fuels and energy demand is growing at a fast rate.[124]

[124] To merely satisfy local power demand Saudi Arabia must burn an equivalent to c. 800 000 barrels of oil per day. According to consumption forecasts, demand would more than double to 8.3 million barrels of oil equivalent in 2028 from 3.4 million barrels in 2009. Aramco, *Saudi Arabia and Solar Energy* (July 2011), 198105 Saudiaramcoworld <http://www.saudiaramcoworld.com.htm>.

According to 2010 statistics, Saudi Arabia's installed power capacity stands at 45 000 MW[125] of which 45 per cent is produced from natural gas, 13 per cent out of burning heavy fuel-oil, 22 per cent from diesel, and 20 per cent from crude-oil. Liquid fuels generate about half of its electricity now, with the rest coming from gas. For Saudi Arabia, rich in fossil fuel resources and boasting large proven reserves of both oil and natural gas, it would not be a problem to set-up an energy mix based upon burning crude and refined oil-products to fuel its power stations over the long term. But Saudi Arabia is not a case of normal conditions that impose a classic fossil fuel-based energy mix. Indeed, to maximize income, oil-producers have been diverting most of the crude production to international trade because they prefer exporting and, therefore, to maximize revenues. The Saudis have had to allocate natural gas to make petrochemicals to meet domestic energy demand. However, according to Saudi Arabia's *National Development Plans* it lacks enough natural gas to generate all the power its economy is currently demanding.

The Saudi-Arabian case is worth analysing because Saudi Arabia has a large oil production; vast fossil fuel reserves, and a huge readily available stock which renders energy security not a big issue. This case study demonstrates that financial decisions can also play a role in the legal configuration of an energy portfolio. Indeed, the Saudi energy portfolio is currently influenced by an opportunity-cost dilemma: when international oil prices are high, it is economically convenient for Saudi Arabia trying to introduce renewable energy sources into the matrix to service the domestic power demand now to be met by means of resources other than exportable

[125] Current generating capacity is expected to increase to 75 000 MW by 2018 and to more than 120000MW by 2030. Central Intelligence Agency, *The World Factbook* (November 2011) Central Intelligence Agency <https://www.cia.gov>.

crude-oil.[126] In this fashion, the country takes full advantage of the opportunity costs to produce (and export) crude-oil and oil-related products. At the same time, the revenues obtained from international trade can be destined to promote Research and Development (R&D) and further integration of renewable energy technologies into the energy matrix.

Saudi Arabia's domestic power demand is rising steady and rapidly at a minimum rate of 5 per cent per annum and is expected to triple over the next 20 years, in line with its economic expansion and demographic rates. This need for energy is expected to boost the domestic oil demand by more than double by 2028, to reach over 8.3 million barrels per day.[127] In the present Saudi-Arabian economy, the way in which its expenditures are financed, is highly dependent on oil-exporting revenues. This oil-related consumption scenario - both international and domestic - places enormous pressure on the Saudi oil-industry, as well as on the national budget. The difficulties are keeping up with timing and volumes - demanded by both markets: domestic and international which, though feasible, is not an easy task from the production perspective. The pressure is even higher from the financial point of view, given rising international oil-prices and subsidised oil-prices serving domestic demand. The result is a pricing gap between both markets meaning that for each barrel diverted to local consumption there is an important loss in export revenues.

[126] According to Lovato, the domestic energy demand led to US$40.3 billion in lost income for 2011. These losses are expected to rise to US$54.9 billion by 2015. W. Lovato, 'Six Solar Market Myths: An Investor Perspective' (Paper presented at the Third Saudi Solar Energy Forum, Riyadh, Saudi Arabia, 2011) 1-41.
[127] King Abdullah City for Atomic and Renewable Energy. 'Towards a Sustainable Energy Mix for Saudi Arabia' (Paper presented at the Third Saudi Solar Energy Forum, Riyadh, Saudi Arabia, 2011) 1-41.

This widening pricing gap is forcing the country to put into practice a new energy strategy. Whilst the gap between oil-revenues and expenditure remains minimal, Saudi Arabia invests heavily in renewable energy technologies to meet domestic demand by itself. It is doing so, precisely, before the pricing gap gets even wider. Over the next decade, investments over US$100 billion have been announced.[128] One third of that amount will be allocated to new technologies and renewable energy sources, mainly, concentrated solar power (CSP).[129]

However, this direction in regard to policy on research and governmental support to alternative sources of energy is far from new. Since the 70s the Saudis started developing research projects on solar technology in international cooperation with the U.S. (project SOLERAS),[130] Germany (project HYSOLAR), and in partnerships with local universities, particularly, the then King Abdullah University for Science and Technology (KAUST).[131] In the 80s it was thought that solar power generation would enter the grid at a large-scale within a decade. It did not happen. The solar-movement lost momentum against sky-rocketing oil prices and huge export revenues (the Saudi Oil-Boom) which led the then policy-makers to focus on fossil sources as major drivers of socio-economic development. At that time, the disparity between local and international oil prices was still negligible as to divert short term-based

[128] These investments are designed to curb the domestic dependence on crude oil; developing nuclear facilities, maximizing oil-exporting revenues, expanding the generating capacity, and to perform required improvements to the transmission grid. Bonnardeaux, above n 12.

[129]Bloomberg, Saudi Arabia to target solar power in 100 billion energy plan (31 March 2011) Bloomberg <http://www.bloomberg.com/news/2011-03-31.htm>.

[130] The Solar Energy Research American-Saudi (SOLERAS) program was a 5-year joint venture of US$50 million committed to partake and benefit from joint research collaboration on solar technologies. Aramco, above n 124.

[131] King Fahd University of Petroleum and Minerals (KFUPM) and the current King Abdullah City for Science and Technology (KACST). King Abdullah City for Science and Technology (KACST) < http://www.kacst.edu.sa/en/Pages/default.aspx>.

policy goals (aimed at maximizing benefits) for a wider and varied energy source mix. Over time, however, the escalating international oil prices kept widening the gap between domestic supply and fuel exports. Thus meeting local demand for energy out of a matrix wholly made up of fossil sources became much less cost-efficient than simply refloating the idea of diversifying the energy portfolio.

Saudi Arabia is regaining enthusiasm for becoming a '*solar energy exporting nation*'.[132] Ali Al Naimi, Saudi Arabia's Oil Minister has declared that the country '*has the potential by 2020 to produce enough solar power to meet more than four times the global demand for electricity*'.[133] The current Saudi energy policy is therefore to go solar. The barriers preventing Saudi Arabia from capitalizing on its competitive geographical advantage in producing solar energy mainly include increasing opportunity-costs in terms of international exports and the fact that the industry is highly technological and capital-intensive. Further, the industry sector had to face the consequences of the recent economic downturn and credit crunch within financial institutions. Against this background, the government is conducting efforts to once again position Saudi Arabia as a global leader in research and manufacturing of renewable energy technologies. It has issued mandates for setting-up a specialized research centre: the King Abdullah City for Renewable Energy (KA-CARE) and restructuring the King Abdullah City for Science and Technology (KACST) as national science agency. Some of the measures adopted include the development of human technical capacity, empowering the private sector to initiate innovation and energy-efficiency

[132] Aramco, above n 124.
[133] Gulfnews, Saudis go full steam into solar energy (July 2011), 1.828438 Gulfsnews <http://gulfnews.com/business/opinion>.

through subsidies and other financial incentives such as loan guarantees, removal of market entry barriers, central procurement, and feed-in tariffs.

Saudi Arabia envisions a mix of solar, wind, nuclear, and other non-fossil power sources as essential for increasing generating capacity by 50 per cent before 2020. The specific policy target is to have 15 per cent of Saudi Arabia's energy produced from solar power by that year. A further projection about the composition of the energy mix recently released by the King Abdullah City for Atomic and Renewable Energy indicated that energy sources other than oil, gas and other fossil fuels may account for more than 50 per cent of the country's supply by 2030. Any investments made at present into solar-projects are expected to achieve long-term returns. The potential benefits are substantial. It was expected back in 2010 that US$1 billion investment could double by 2013 for a 72 per cent return on investment.

In the drive towards energy mix diversification, the Saudi oil-giant Aramco is playing an active role in the public sector strategy to maximize income, as well as in international cooperation. As to the latter, Solar Frontier, for instance, is a Japanese company seeking to establish a joint venture with Aramco for creating a 20 MW solar facility. A further example is Solterra Renewable Technologies Inc, whose technology of quantum-dot-solar cells[134] has the potential to produce low-cost,[135] high efficiency solar cells.[136]

Unlike Canada, in Saudi Arabia, energy selection has less to do with a long-term idea about a sustainable way to meet present and future power

[134] Ibid. Under license of University of Toronto.
[135] Above n 124. Half cheaper than manufacturing of closer competitors.
[136] Ibid, 42 per cent efficient whilst common solar cells are roughly 10 per cent efficient.

demand than with seeing the configuration of the current energy portfolio as a means to perpetuate an income stream able to support current Saudi Arabia's economic growth rate and development targets.

At least in the short-term, it is clear that the consideration of economic security is prevalent, where maximizing oil-exports revenue is the predominant reason to alter the energy matrix. In the medium-term, however, and as long as oil-related income can effectively be channelled to drive a qualitative jump forward, both in R&D and infrastructure focused on non-conventional sources of energy and grids, the security axis would abandon its current economic emphasis. Otherwise, had Saudis been able to adequately finance structural modifications, at least for the time needed to get the capital investment back, the proposed changes to the energy mix would place the country in a compromised security position. Many consider that CSP would in the long-term displace other renewable generation schemes (like wind-power), but for that to happen CSP should get its cost reduced considerably.[137]

Further, even in the best scenario of a long-term radical change in its energy matrix, namely, that Saudi Arabia finally goes wholly solar-based, the prospect in terms of legal security approaches does not get better. Although the emphasis would have shifted from financing to energy self-sufficiency, the construction of legal terms such as security and national sovereignty do not become more flexible. Further, it is also concern as to how these legal concepts are finally implemented. Both, in fact, might become even more rigid and restrictive. A country's political search for energy self-sufficiency is the antithesis of integration processes, natural

[137] Claverton Energy-Research Group, *Europe should rely on power imports from Africa and the Middle East is completely barmy assertion challenged* (April 2010) Claverton Energy <http://www.claverton-energy.com.html>.

resources sharing, and international cooperation. Unless going solar ends up being as successful as to represent an export-business opportunity, neither transnational power grid integration, nor power flow and trade are guaranteed. Although it is true that the sun shines for everybody, it does not shine equally for everybody. If each and every country seeks to become energy self-sufficient there is no point in the sharing of natural resources, for they are largely opposite concepts. In a similar way, unless they represent the opportunity to attain other benefits, integration and international cooperation are hindered by self-sufficiency-oriented policies.

In sum, Saudi Arabia boasts enormous potential for renewable energy generation, namely, CSP. However, due to short-term based policy views on economic growth and development, it wasted crucial research-time for developing low-cost and high-efficient solar technology. Due to financial reasons, linked to domestic and international oil pricing issues, Saudi Arabia is now forced to look back at its own policy history, dust-off some predictable policy mechanisms to resume R&D in the renewable energy sector, lure the private sector, set compulsory targets for the public realm, and quickly put in place a market which faces fierce competition not only domestically from its own oil-industry, but also from abroad in regard to other, already established major solar-business pioneers. In the Saudi case, the initial rush towards achieving the 80s motto of becoming the 'solar energy-exporting nation of the world' can be explained in terms of taking all possible financial advantage from the pricing gap between domestic and international oil crude prices.

However, when the Saudi case is analysed in terms of energy security, much more is revealed. Indeed, the domestic oil-consumption substitution process carried out to divert the high priced oil production for exports reveals a quite conventional approach to both fossil fuel trade and national security. Saudi Arabia has neither rejected the liberal market-based approach founded on opportunity-cost-based practice, nor has it relinquished the classic understanding of national sovereignty over resources as it still aspires to become energy self-sufficient. The desire for overcoming oil-dependency and, therefore, to make the energy mix diversified and fossil-free at a large scale, does not arise necessarily out of any alleged impossibility to provide for the current and future social and economic needs of its population. Rather, it is based on an intention to maximise the financial profits arising out of current international petroleum transactions. The incremental move to solar power requires significant R&D, capital investment, and fast and substantial change in energy infrastructure, the financing of which should come out of additional oil-related revenues. But, for this policy to succeed, it must be consistent over time, something that stands as a flaw in Saudi Arabia's recent energy policy history.

II.4.3. Brazil: a case study on balancing energy selection

More than 80 per cent of global energy comes from oil, gas and coal. The remainder is generated by nuclear and renewable sources of energy, mainly hydroelectricity and biomass. Hydroelectricity at the moment is the world's largest renewable power source and responsible for one-fifth of all power outcome worldwide.[138] Hydro-generation provides power on demand in a relatively inexpensive and reliable manner, but it can also

[138] World Wild Fund for Nature International - WWF, ECOFYS, OMA, *The 2011 International Energy Report: 100 per cent renewable energy by 2050* (July 2011) WWF–World Wide Fund For Nature formerly World Wildlife Fund <http://wwf.ca/newsroom/wwf_in_the_news/?9002/The-Energy-Report>.

bring about considerable environmental impacts.[139] Brazil's energy mix relies mostly upon hydro-generation.

Brazil's current economic expansion is mostly due to vast structural and legal reforms dating back to mid 60s and 70s aimed at doubling the industrial capacity and decoupling the economy from imported-oil dependence; furthering the biofuel industry. There were also dramatic reforms introduced as a response to the mid-90s economic downturn that were intended to liberalize markets by giving access to private companies into businesses traditionally wholly operated by public companies, being this the case of electricity and oil markets.[140]

More recently, Brazil's economic growth has sky-rocketed due to huge offshore oil-field discoveries the exploitation of which has enabled Brazil to become oil self-sufficient in 2006 and since 2010, finally, a net oil-exporter country. Likewise, the associated production of liquefied natural-gas (LNG) has experienced a big rise which has, in turn, boosted interest in installing a number of gas–fired power plants as back-up for hydro-generation.[141] The prospect of large investments and exploitation of these resources has led the government to produce a new legal framework to manage it. A plan has been proposed, emphasizing governmental control over oil extracted from the new fields as well as taking half of the production for the State through a newly-created state oil-company:

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[139] Burtraw, Palmer, and Heintzelman, above n 13.

[140] In 1997, for instance, the Agência Nacional do Petróleo (ANP) was introduced by statute having as a goal to carry out competitive biddings processes for developing a vast portion (c. 90 per cent) of Brazil's available oil and natural-gas fields.

[141] Ministério de Minas e Energia (MME), Secretaria de Planejamento e Desenvolvimento Energético (SPE), Empresa de Pesquisa Energética (EPE), *Plano Decenal de Expansão de Energia 2020 (PDE-2020)* (2011) MME/SPE/EPE <http://www.mme.gov.br/mme/galerias/arquivos/publicacoes/boletins_de_energia/boletins_atuais/08_-_BRAZIL_Energy_Expansion_Investment_Opportunities_ing.pdf> [Ten-year Energy Expansion Plan 2020].

Petrosal, which has been initiated to handle the State's interests in the fields.[142]

Medium-term economic growth rate projections for Brazil do not go below 5 per cent per annum up to 2020.[143] The private investment in the energy sector is expected to rise up to 44 per cent by 2015. The energy demand itself has increased sharply to 448.01TW[144] in 2010, and it is expected to reach 583.43TW by 2015. Further, a 4.8 per cent increase - meaning 69.2 GW of installed generation capacity- is expected annually.[145] Brazil, currently, is the world's tenth largest energy consumer and, by far, the largest in South America.[146] According to the latest *National Growth Acceleration Program report*,[147] in 2011 Brazil's energy sector received investments of US$67.4 billion. In the first semester, 31 per cent of that amount entered the country destined to energy projects covering the oil, gas, and electric sectors.

The vast Amazon basin provides an ideal setting for hydro-generation, which over time has proven itself crucial for Brazil's economic development.[148] Brazil boasts the world's largest capacity for water storage

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142 PSI, *Brazil Energy Handbook* (PSI Media, 2009), 14.
143 Ministério de Minas e Energia (MME), Secretaria de Planejamento e Desenvolvimento Energético (SPE), Empresa de Pesquisa Energética (EPE), above n 61, 141. See also Empresa de Pesquisa Energética (EPE), *Plano Decenal de Expansão de Energia 2019 (PDE-2019)* (Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento Energético, 2010) [Ten-year Energy Expansion Plan 2019 (PDE-2019)].
144 1 TW equals 1000 GW. Electricity Forum <http://www.electricityforum.com>.
145 Ministério de Minas e Energia (MME), Secretaria de Planejamento e Desenvolvimento Energético (SPE), Empresa de Pesquisa Energética (EPE), above n 61, 141.
146 Ibid, Brazil's power market almost doubles the rest of South America's market combined. Its installed generating capacity more than doubled in ten years (1998-2008) from 49.6 GW to 102.61 GW. Ministério de Minas e Energia (MME), Secretaria de Planejamento e Desenvolvimento Energético (SPE), Empresa de Pesquisa Energética (EPE).
147 Ibid.
148 For a generally accepted definition on sustainable development see World Commission on Environment and Development, *Brundtland Commission's Report 1987. Our Common Future*

and 82.8 per cent of its current energy consumption is based on hydroelectric power of which 74.3 per cent[149] comes from domestic production, and 8.5 per cent corresponds to imported hydro-power. Conventional thermo-generation –oil, coal, and natural gas- follows in the energy mix with 14.7 per cent. The final component of power demand is met with nuclear power, which contributes 2.5 per cent to it. Thus, more than 80 per cent of Brazil's power needs are met by hydro-generation, which makes the Brazilian power market distinctive in two main aspects: firstly, its profound reliance on a single source of energy[150] and, secondly, the fact that this source happens to be a renewable one. These features of the Brazilian power market have several implications for this book' argument. However, as it shall be seen, such implications upon cross border energy transmission are quite different depending on which energy security concept is used in policy and legal terms.[151]

The first implication of the current energy configuration is Brazil's apparent need to achieve a more diversified energy mix. However, this

(Oxford University Press, 1987); World Economic Forum, *Global Competitiveness Report 2009-2010* (WEF, 2011); World Bank, *World Development Report 2010* (World Bank, 2011).

[149] The quota is made of 72.60 per cent share of 'big-hydro' (>= 30MW) plus 1.70 per cent share of 'small-hydro' (<= 30MW).

[150] PSI, above n 142. There are 24 hydroelectric plants of greater than 1000 MW of installed capacity, including the massive 14GW Itaipú facility which by itself produces a fifth of Brazil's electricity. 75 hydroelectric facilities have installed capacity of more than 100 MW. Brazil's installed generation capacity is currently slightly more than 69 GW.

[151] *Lei 10.847, de 15 de Março de 2004, autoriza a criação da Empresa de Pesquisa Energética - EPE e dá outras providências* [Act 10,847 of 15 March 2004 authorizing the establishment of the Energy Research Company –EPE and sets forth other provisions], art 4(I); *Lei 12.111, de 9 Dezembro de 2009* [Act 12,111 of 9 December 2009]; *Lei 8.666, de 21 Junho de 1993* [Act 8,666 of 21 June 1993]; *Decreto 5.184 , de 16 de Agosto de 2004, cria a Empresa de Pesquisa Energética - EPE, aprova seu Estatuto Social e dá outras providências* [Decree 5,184 of 16 August 2004 establishes the Energy Research Company – EPE, authorizes its Social Charter and sets forth other provisions]; *Decreto 6,685, de 10 de Dezembro de 2008, dá nova redação aos arts. 2º e 4º do Decreto 3.520, de 21 de junho de 2000, que dispõe sobre a estrutura e o funcionamento do Conselho Nacional de Política Energética – CNPE, e dá outras providências* [Decree 6,685 of 10 December 2008 restating arts 2 and 4 of Decree 3,250 of 21 June 2000 on structure and functioning of the National Energy Policy Council – CNPE, and sets forth other provisions].

requirement only holds true in the context of a conventional understanding of energy security. This approach would suggest that a heavy dependence on a single source threatens the State's response capacity to secure energy supply during eventualities and, thus, continued satisfaction of social demands. While a significant reliance on hydro-generation makes baseload-energy costs notably low, it also exposes Brazil to specific vulnerabilities.

The perspective gets darker according to traditional understandings of energy security if external power-supply is brought into the calculations. As if a single domestic power source were not bad enough, having to depend upon another country for the delivery of such energy is even worse *per se,* no matter what source the electricity delivered is ultimately generated from. In this scenario, the problem of security is not only one about policy (when, for how long, how, and what type of energy is used), but one that brings in strictly legal issues regarding enforceability mechanisms under International Law. These issues relate to security concerns driven by the potential risk to a country of being deprived of energy supply as a result of another State's suspension of non legally-binding agreements. Such agreements mostly arise from governmental acts receiving various non-committal denominations i.a. political agreements, memoranda of understanding, statements of intentions, non-normative agreements, or gentlemen's agreements. These agreements bind only the immediate authorities and they avoid mentioning the States which, consequently, assume no legal obligation whatsoever. For this book the most relevant are the so-called 'energy integration agreements' or 'energy integration declarations'. In contrast, it is argued that by adopting an 'ecological approach' to energy security, a strategy that includes large-scale renewable sources integration and international energy policies coordination,[152] the fact that Brazil's energy mix is focused mostly on one generating-source is much less dramatic.

The second implication is even more remarkable. While having a low-cost matrix and one that is largely based on renewable sources could surely be pointed out as a virtue, this overwhelming dependence on a particular source makes the Brazilian mix highly vulnerable to climatic conditions, particularly, rainfall patterns and droughts. For example, Brazil suffered a drought in the late 90s which heavily impacted the generation capacity in 2001. It was a time when quotas and rolling blackouts were imposed as drastic measures for cutting energy usage. Again, under a traditional view of 'national security' the policy response would be – as it is in the Brazilian case - to look for diversifying the sources of energy generation.

In principle, there is nothing wrong in wanting to diversify energy mixes. The alternatives to do so are multiple and fossil-based fuels, renewable sources, or most likely a combination of the two might be used to reduce the security tension. However, a solution might be to push for diversification of the energy matrix, whilst also furthering the integration and use of environment-friendly energy sources. Under the book argument this can be achieved by fostering transnational interconnections since they not only assist local integration processes, but also diversify the matrix by means of adopting a share on how diversified imported production might be.

In this context, the Brazilian government is pursuing an interesting two-fold objective. On the one hand Brazil is determined to take advantage of the momentum of rejuvenated oil and oil-related industry, particularly,

[152] Bourdon et al, above n 56.

since the new oil-fields discoveries in Campos and Santos basins, which assisted the country to achieve self-sufficiency in oil and the recently acquired oil-exporting status. In this sense, the policy drive cannot be straight forwardly attributed to energy security-related interests,[153] but these factors are compelling enough to drive 67 per cent of total investments in the period 2010-2020, amounting R$686 billion.

On the other hand, in the short-run the Brazilian government is calling for the creation of 27 000 MW of new hydroelectric capacity. This is supposed to be achieved through a comprehensive auctioning plan for concessions.[154] Brazil is aware of the danger of overdependence on hydroelectric power, thus, it has been struggling to diversify its energy matrix by means of reinforcing biomass, biofuels,[155] bagasse,[156] and nuclear energy industries in both the medium and long-term. Simultaneously, it seeks to integrate non-conventional renewable energy sources such as wind, tidal, and solar power through Clean Development Mechanisms (CDM) and the *Programa de Incentivo às Fontes Alternativas de Energia Elétrica* (PROINFA program), which has led to awarding several long-term power purchase agreements for wind-projects. In this sense, although the hydro-generation share should decline from c.76 per cent to 67 per cent in 2020, the power produced by alternatives sources

[153] In fact, for the decade 2010-2020 R$686 billions will be destined to oil & natural gas exploration and production (R$510billions), oil-related sub-products supply (R$167billions), and natural gas supply (R$9billions). Reuters <www.reuters.com>.

[154] Ibid. This plan has stirred wide opposition from environmentalist groups concerned with the potential environmental damage to be caused by new dams.

[155] See also, *National Program of Biodiesel Production and Use*, PNPB, 2003. IPEA - Instituto de Pesquisa Econômica Aplicada <http://www.ipea.gov.br/portal/> [IPEA – Applied Economics Research Institute]. See also *Programa de Incentivo às Fontes Alternativas de Energia Elétrica (PROINFA) - Ministério de Minas e Energia* [Program of Incentives to Alternative Electricity Sources (PROINFA) – Ministry of Mining and Energy] Document available at <http://www.mme.gov.br/programas/proinfa/>.

[156] Mostly used to fire thermal plants and refine low-cost ethanol.

(including wind-power, thermo, biomass, and PCHs) should double from current 8 per cent to 16 per cent in the same 10-year period.

Brazil, therefore, is committed to keeping its reputation as the country having the world's cleanest energy matrix, and to do so it has approved investments in the area of R$190 billion.

However, an important energy mix-related vulnerability of the Brazilian system is one that deals precisely with transmission issues.[157] Brazil's transmission high-voltage lines have north-south and west-south patterns which have developed over time to supply energy from generation plants based in northern and western areas, and to deliver electricity to huge urban markets, mostly located in the south. On the one hand, the vast size of the country has led for several years to the creation of many unsophisticated transmission networks designed exclusively for delivering power to remote areas, mostly linked to mining/forestry undertakings and rural consumer centres. In other words, a situation characterised by the proliferation of relatively small isolated/independent power networks and the building up of several solitary regional markets.[158] Further, distances between major generating plants and urban load-centres have progressively become larger, thus posing additional pressure upon any possible faster implementation of generation projects; and increasing the already substantial distance-associated power-transmission losses occurred when electricity is conveyed over thousands of kilometres.[159]

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[157] Empresa de Pesquisa Energética (EPE), *Programa de Expansão da Transmissão – PET 2010-2014. Estudos para licitação da expansão da transmissão. Consolidação das análises e pareceres técnicos* (Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento Energético, 2009) [Transmission Expansion Plan – PET 2010-2014. Studies for the procurement of the Transmission Expansion Procurement Studies. Consolidated analysis and technical opinions].

[158] Eletrobras, *Administration Report 2009* (Eletrobras, 2010) 6.

[159] Ibid, transmission losses are historically estimated around 16 per cent.

The two major grids in Brazil are those placed in the south and northeast part of the country, which were gradually implemented in a three-phase project in 1999, 2006, and 2008 through extending more than 21 500 kms of new lines, when a basic trunk-interconnected network between the two regions was finally achieved. However, interconnecting all these isolated systems, upgrading them, and expanding the existing network according to the requirements of demand growth poses a major challenge for the country. In response, the government has launched a R$2.2 billion plan for new lines and substations to be constructed by late 2017. Internationally, Brazil has also sought to arrange power-supply from its neighbours, thus, fostering international interconnections.[160] Venezuela, Argentina,[161] and

[160] See *Acordo Tripartite entre Brasil, Paraguai e Argentina para aproveitamento dos recursos hidráulicos no trecho do Rio Parana desde as Sete Quedas até a foz do Rio da Prata* [Tripartite Agreement between Brazil, Paraguay and Argentina to use of water resources in the stretch of the Paraná River from the Seven Falls to the mouth of the River Plate] opened for signature 19 October 1979, 2216 UNTS I-39389 (entered into force 5 december 1979); *Protocolo de Entendimiento entre los Gobiernos de la República Argentina y de la República Federativa del Brasil sobre Cooperación e Interconexión Energética* [Protocol of Undestanding between the Governments of the Republic of Argentina and of the Federative Republic of Brazil on Energy Co-operation and Interconnection], opened for signature 9 April 1996 2015 UNTS I-34706 (entered into force 18 march 1998); *Tratado entre el Gobierno de la República Federativa del Brasil y el Gobierno de la República Argentina para el aprovechamiento de los Recursos Hídricos compartidos en los tramos limítrofes del Río Uruguay y de su afluente el Río Pepirí-Guazú* [Treaty between the Government of the Federative Republic of Brazil and the Government of the Republic of Argentina for the exploitation of shared water resources in border sections of the river Uruguay and its afluent river Pepirí-Guazú], opened for signature 17 May 1980 1339 UNTS I-22475 (entered into force 1st June 1983); *Memorandum de Entendimiento entre la Republica Argentina y la Republica Federativa del Brasil sobre el desarrollo de Intercambios Eléctricos y futura Integración Eléctrica* [Memorandum of Understanding between the Republic of Argentina and the Federative Republic of Brazil on the carrying on of Power Exchanges and future Electric Integration], opened for signature 13 August 1997, 1995 UNTS I-34147 (entered into force 13 August 1997). See also *Decreto Legislativo Nº 23, de 30.5.1973 – Aprova o texto do Tratado de 26.4.1973 celebrado entre a República Federativa do Brasil e a República do Paraguai, bem como as Notas então trocadas entre os Ministros das Relações Exteriores dos dois países (Publicado no "Diário do Congresso Nacional" de 1º.6.1973, pág. 1,659)* [Law Decree Nr 23 of 30 May 1973 – Aproves the text of the Treaty of 26 April 1973 entered into the Federative Republic of Brazil and the Republic of Paraguay as well as the Exchanging of Notes between Foreign Offices of both countries (Published in 'National Congress Newspaper' of 1 June 1973, p 1,659]; *Decreto Nº 72.707, de 28.8.1973 – Promulga o Tratado de 26.4.1973, celebrado entre a República Federativa do Brasil e a República do Paraguai, bem como as seis Notas trocadas entre os Ministros das Relações Exteriores dos dois países (Publicado no "Diário Oficial" de*

Uruguay are within the framework of long-term power purchase agreements with Brazil, as well as in the multilateral realm of regional integration frameworks.[162] Brazil has the world's largest integrated power grid, but when something goes wrong, the domino effect is also a major inconvenience. Such a situation occurred in November 2009 when 18 out of 26 states of the country experienced a power-outage due to lightning strikes on transmission lines.[163] The aforementioned weaknesses in transmission have played a significant role in exposing the grid possible to failing. In response, Brazil has launched a policy aimed at diversifying its overwhelming reliance on hydro-generation in its energy mix and to address the lack of upgrading of its transmission infrastructure through increasing both qualitative and quantitative investment in the coming years, with an instance of this being the 2020-Decennial Energy Plan (DEP-2020).[164] The DEP-2020 is Brazil's official policy instrument on energy planning and energy-related investment drivers. It is issued by the *Empresa de Pesquisa Energetica* [Energy Research Company], the Brazilian Energy Agency. It contains a ten-year energy expansion plan,

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30.8.1973, págs. 8.642-45) [Decree Nr 72,707 of 28 August 1973 – Enacts the Treaty of 26 April 1973 entered into the Federative Republic of Brazil and the Republic of Paraguay as well as the Exchanging of Notes between Foreign Offices' Secretaries of both countries (Published in 'Official Gazette' of 30 August 1973, p 8, 642-45].

161 ABB Power, *Power Systems/HVDC. HVDC International Interconnection between Argentina 50 Hz and Brazil 60 Hz* (ABB Power Technologies AB, 2010) POW-0037.

162 See *Montevideo Treaty constitutive of the Latin American Integration Association (ALADI, Montevideo), opened for signature 12 August 1980, UNTS I-22309 (entered into force 18 March 1981)*; *Treaty Establishing a Common Market between the Argentine Republic, the Federal Republic of Brazil, the Republic of Paraguay and the Eastern Republic of Uruguay* (MERCOSUR) (*Asunción Treaty),* opened for signature 26 March 2011, 2145 UNTS 252 (entered into force 29 November 1991); *Treaty for Amazonian Co-operation (Brasilia), opened for signature 3 July 1978, 17 ILM 1045 (entered into force 2 February 1980)*; *Memorandum de entendimiento relativo a los intercambios eléctricos e integración eléctrica en el MERCOSUR,* MERCOSUR/MC/DEC Nº 10/98 (23 July 1998) XIV CMC [Memorandum of Understanding on Power Exchanges and Electric Integration within MERCOSUR]; *Constitutive Treaty of South American Union of Nations (UNASUR)(Brasilia*), opened for signature 23 May 2008 (entered into force 11 March 2011).

163 Distance can also be held responsible for creating susceptibility of grids disruption.

164 Ministério de Minas e Energia (MME), Secretaria de Planejamento e Desenvolvimento Energético (SPE), Empresa de Pesquisa Energética (EPE), above n 145.

forecasts of the outcomes of energy demand, supply studies, information on energy-related projects and infrastructure needs; as well as the outcomes of energy auctions.

In itself, the energy policy can be viewed as having three main lines. The oldest but still crucial is that which strives to harness the complete hydropower potential, which is estimated in 260 GW and hence more than 70 per cent of it has not been developed yet. In this context, massive, as well as small, hydro projects are on their way to completion to meet the country's rapidly expanding power needs. The second line of policy is that focusing on consolidating Brazil as a net oil-exporter country, as well as on expanding and deepening its pioneering world's leadership in producing low-cost biofuels. Finally, the current policy trend is to achieve a more diversified energy portfolio, without sacrificing the distinctive 'green-character' of Brazil's historic energy mix. It aspires to achieve this latter policy objective by means of integrating different renewable energy sources through ambitious investment plans which certainly include expanding, upgrading, and interconnecting power networks.

To sum up, Brazil is an awakening economic giant. Throughout its contemporary history – although not exempted from economic setbacks, social inequalities, and political struggles - it has had the merit of conducting its energy policy in a remarkably consistent manner. It is true that this is more likely to happen when a country has vast and natural resources relatively at hand as Brazil does, but its recent political history shows several opportunities in which the policy might well have turned into a different direction. That, however, did not happen. In general terms, the policy can fairly be defined as market-based in essence, but also it has taken advantage of externalities derived from its implementation to include elements that contribute to income redistribution and social welfare. In this sense, its long-term implementation has depended on the support of an ample social base.[165]

II.5. CONCLUSIONS

This Chapter has advanced as a legal explanation for countries not interconnecting their power grids, the different ways of interpreting concepts of sovereignty and energy security in the process by which nations configure their energy matrices for power generation. To test the validity of this proposition, two countries: Canada and Saudi Arabia were selected as case studies and a comparative analysis of their energy matrices was conducted. In different degrees, both countries are seeking to change their current energy mixes, whether through keeping or increasing the share of renewable sources as in the case of Canada; or to entirely but progressively reshape its energy matrix, as in the Saudi case. From the outside, both situations seem to involve promoting energy matrix changes, this similarity however might appear misleading; as the two countries economic and regulatory inner motivations differ widely.

Canada is not only a world-leader in hydro-generation, but along with the U.S., it is also a pioneer in transnational grid interconnection and,

[165] See, for instance, the popular support derived from the implementation of *Programa de Integração Social/Programa de Formaçao do Patrimônio do Servidor Público* [Social Integration Program/Civil Servant Training Program] (PIS/PASEP) of the Institute for Agricultural and Trade Policy. Programa de Integração Social (PIS) - Instituto de Agricultura e Comerço [Social Integration Program (PIS) - Institute for Agriculture and Trade]; *Programa de Formaçao do Patrimônio do Servidor Público (PASEP) – Instituto de Agricultura e Comerço* [Civil Servant Training Program (PASEP) - Institute for Agricultural and Trade Policy]. See also in connection the *National Program of Biodiesel Production and Use*, PNPB, 2003, IPEA - Instituto de Pesquisa Econômica Aplicada <http://www.ipea.gov.br/portal/> [Applied Economics Research Institute].

therefore, *avant la léttre* in natural resources sharing.[166] Once focused on strategic objectives of energy efficiency, the Canadian policy emphasis is currently promoting the development of renewable energy technologies and planning to increase the generation capacity coming from emerging renewable sources, such as those produced in British Columbia.[167] This case study that the establishment of a particular energy mix – mostly based on conventional renewable sources, namely, hydro-generation – which has been kept consistent over time enables energy configurations complementary with other countries. An example of this is the long-term grid interconnection between Canada and the U.S.

It might be said that both the renewable character of, and the symbiotic Canada-U.S. process, is more a product of gradual historic development rather than a direct common policy approach deliberately planned.[168] However, the relevant conclusion to be drawn is less about contingent policy-making rather than a more fundamental fact: mutual acknowledgement by the two nation states about complementary energy needs and a common – sometimes implicit - understanding about the most efficient way to address such needs. Evidently, there is a strong economic motivation for reaching this understanding in reducing the factors in a somewhat simplistic way around cost-efficiency to solve the energy security problem, whether at a local or transnational level. In response to criticism, the Canadian situation works as a long-standing case study of an evolving but consistent regulatory framework in which, on the one hand, unconventional renewable sources are complementing the conventional

[166] *United Nations Convention on the Law of the Sea (UNCLOS, Montego Bay),* opened for signature 10 December 1982, 21 ILM 1261 (entered into force 16 November 1994).

[167] At the same time, however, Canada also continues fossil fuel exploitation.

[168] Also historically, the grid interconnection was very much about fossil fuel exports from Canada, as well as renewable energy based on hydro-generation.

hydro capacity;[169] whilst, on the other hand, bi-national energy integration has been progressively developed in a way that has enabled the Canadian and U.S. energy mixes to become complementary, in terms of supply demand, as well as for their grids to be interconnected thus making possible cross border power-market integration.

In contrast, from the Saudi case a conclusion that can be drawn is that certain policy frameworks - particularly those inspired by short-term opportunistic economic-driven decisions - can have devastating long-term effects upon the consistent implementation of a given energy mix-design. In turn, this inconsistency plays a role in hindering international power grid interconnections. This factor is even more significant if the outcome of economic-based decisions does not turn out to be as successful as originally envisaged. In both instances, the risks associated in the decision-making process, and subsequent potential implications, might be too high to be taken up. Supposedly, Saudi Arabia's financial reserves and the progressive implementation of its aspiration to 'go solar' might alleviate such risks, but this assessment is not relevant to this inquiry. What it does reveal, however, is to point to the Saudi's conventional approach to national sovereignty and associated security of energy supply even though based upon seeking solar self-sufficiency. This view, as expected, opposes both natural resources sharing and international cooperation approaches.

In designing energy mixes, countries look to meet power demand in the most cost-effective way possible. However, these possibilities have been long constrained by the adoption of particular understandings about national sovereignty and by its territorial manifestation as national independent control over energy supply sources. In a classic scenario, the

[169] National Energy Board - Canada < http://www.neb-one.gc.ca >.

use of natural resources would be reduced to those strictly available within the limits of the territory or economic zones belonging to a given country. Instead, in the light of contemporary views, given the trend of worldwide trade liberalization it has made it possible to share the use of natural resources scattered around the world. This has largely been limited to date, to conventional forms, predominantly, fossil fuels like oil, natural gas, and coal, since they are commodities that are relatively abundant, often inexpensive to obtain, and most importantly, suitable for transport and storage. Notwithstanding, as seen,[170] the character of electricity is different and, therefore, does not fit well in the beaten tracks of conventional international trade.[171]

The comparison between the Canada and Saudi Arabia case studies and the conclusions drawn from them were, thereafter, contrasted with a relatively unique case as to energy mix configuration: Brazil, a country keen to strike a balance between a sustainable energy portfolio and the pressing needs of its booming economy.

Through the analysis of the Brazilian case a new approach to energy matrixes and national energy policies was introduced. This approach is one in which the national interest is regarded as relying decidedly upon renewable sources of energy and where transmission expansion plans and connectivity issues are essential. Brazil's experience is unique as to renewable sources integration in an energy portfolio, as well as in regard to its history of consistent implementation of such an energy policy, despite being a developing country. We saw that the three main lines of the

[170] See above ch I, 22, Legal characterization of electricity.
[171] See below ch IV. See also Bradbrook, above n 11; Timothy Richards and Lawrence Herman, *Relationship between International Trade and Energy* (2010) WTO-World Energy Council Task Force <http://www.wto.org/english/res_e/publications_e/wtr10_richards_herman_e.htm>.

Brazilian policy are: harnessing the vast hydro potential not yet developed; consolidating itself as a net oil-exporter also expanding the biofuels industry. Finally, it is moving to a more diversified energy portfolio, whilst still remaining distinctively ‘green’. These objectives, in fact, are more difficult to achieve than may appear, given how vulnerable the Brazilian matrix is to climatic conditions, mostly based on hydro-generation. There is little doubt that Brazil is blessed by a diverse abundance of natural resources, but it is also true that except for hydro-power, under present conditions, the exploitation of these is fairly expensive (particularly offshore shale-oil fields). Further, Brazil has to deal with a severe lack of appropriate power-transmission infrastructure. Solving these problems, however, has propelled bilateral interconnection projects with neighbouring countries in an effort to supply and give greater reliability to the local system. In this context, the PDE 2020 constitutes a road-map for expanding and diversifying the energy supply with new generation and transmission projects. These latter, however, are particularly urgent at the international level, since Brazil’s current electricity needs will need to be satisfied on a basis far beyond that achievable by sporadic power export transactions. Thus, the situation is breaking new ground for transnational power market integration in South America.

From this practical and technical situation, some implications can be drawn as to how Brazil understands national sovereignty issues and particularly energy security in a most flexible way. Its long-time experience in sharing resources and joint management with Paraguay is a real ‘every-day’ instance thereof. Open markets and shared transmission lines between these two countries enable electricity to be sold across vast distances, one of Brazil’s highest objectives.

Here, the book argument builds upon the previous analysis to draw findings about the utilisation of legal and regulatory mechanisms that may further energy sources integration and grid interconnections. Integration of energy sources - it can be argued - is the best economic option once comparative advantages, opportunity costs, and availability of resources are brought into sustainability analysis.[172] However, it is worth recalling that integrated electricity markets having several nodes, linking multiple supply regions, have the effect that events occurring in any one region might affect prices in others, such as power-demand changes from weather conditions or other variables, new transmission infrastructure, supply additions, or interruptions. Further, integration processes require some level of structural similarity to fully work out. Prior to implementing integration, some countries will have to undergo structural changes to have their markets reorganized through unbundling generation, transmission, and distribution sectors.[173] The extent of this restructuring varies since the regulating of the electricity sector is, generally, matter of statute; or, in some places, even one of Constitutional Law.

The argument of this thesis: promoting cross border power grid interconnections to achieve the reorientation of national energy mixes towards renewable energy sources, aims at overcoming the flaws that represent current arrangements based merely on weak, unstable, and unenforceable ‘energy integration agreements’. Even though these instruments - largely entered into by State authorities – aim to facilitate some energy integration measures, they are neither subjected to International Law nor to any other legal system and, therefore, the

[172] P. K. Rao, *International Environmental Law and Economics* (J. Wiley & Sons Inc, 2001).
[173] Z. Zafirova, ‘Unbundling the Network: the Case of Ownership Unbundling?’ (2007) 2 IELTR 29-36.

commitments created thereby are enforceable only at political level, but not by Law.

In summary, underlying transnational power transmission is the idea of countries co-operating with each other in terms of having their power grid interconnected with open access to all along the resulting network. This interconnection increases the cost-efficiency and reliability of the network as a whole, making electricity flow freely, facilitating its trade across-borders. For this to happen, however, some conditions are required. One of them is a basic acknowledgement of the un-sustainability of self-sufficiency energy policy approaches. If countries do adopt this position, this common realisation is likely to lead towards more flexible understandings of long-time legal concepts of absolute sovereignty and national security, of which energy security and energy portfolio configurations are a central part. Although vital as local planning instruments, in the context of more than two countries being aware of mutual resources constraints and opportunity costs, energy matrix synchronisation (or better still, harmonisation) becomes a tool of international relevance. As seen, energy integration measures - such as regional power grid interconnections - do further energy mixes harmonisation processes, thus, favouring faster renewable energy sources integration, making their cost decrease and get their load more manageable at a large-scale.

However, despite the importance of energy mixes or how even promising their harmonisation might be, the success or failure of a harmonised mix at international or at least regional level is equally dependent upon the existence of cross border interconnecting nodes.[174] International power trading relies upon such interconnections and by this means can reduce grid isolation[175] and climate change effects,[176] whilst still favouring socio-economic development and peaceful co-existence between nations. Transnational power transmission, therefore, will be the topic of the following Chapter.

[174] The configuration of an independent proper transmission infrastructure will be the subject-matter of coming Chapters.
[175] Buckley et al, above n 45, 123.
[176] Boyle, Birnie, and Redgwell, above n 16.

CHAPTER III. TRANSNATIONAL POWER TRASMISSION

III.1. INTRODUCTION

Chapter I presented the research question: what can explain the paradoxical phenomenon of the international isolation of power grids, despite interconnections being technically feasible and making economic sense. Within its scope, the book advanced the proposition that certain legal factors hinder interconnection processes for transmission networks. In testing such a proposition, Chapter II examined the energy-planning instruments of selected case-studies finding that in contrast to carbon-based energy mix configurations, renewable sources-based networks not only secure interconnections between power grids, but also contribute to harmonisation processes in transnational contexts. This finding supports the legal argument of *energy selection* being part of the answer as to why States do not interconnect their power grids. Indeed, States are compelled to make decisions on what power generating sources will drive their economies and how to organize them to meet increasing power demand and other political goals, like energy security.

This Chapter builds upon such findings and tests the legal argument of the book with regards to a different political goal: *energy security*. While the previous Chapter the thesis focused on how to ensure power grids are both physically and in a legal sense interconnected in the context of harmonised renewable sources-based energy mixes; here the analysis is about how to secure unrestrained power transits once such interconnections have been achieved in a single power market. The European Union 2020 Energy Policy and the European Transmission System will serve as a case study and potential approach for a single power market enhanced model regulation, with an emphasis on the enforceability of power trading and transit across national borders.

While the kind of energy sources available to a given country may vary widely depending on its particular conditions, the need for a power transmission network is vital everywhere. This Chapter, therefore, deals with transnational power transmission networks. It aims to explain the main features of power grids and the legal aspects associated with international power transmission operations. It considers the International Law challenges posed by transmitting electricity across borders as well as the complexities of effectively transposing the grids' unique features within legal and regulatory frameworks to foster interconnections and to secure unrestrained cross-border transit of electricity.

Drawing on the analysis made in Chapter I, the research proposes that a well framed, technically based, and dedicated international legal framework for transnational power grid interconnections and power transit is required. In this Chapter, it adds that such a framework can be integrated into an ongoing international trading scheme - such as the WTO or an improved Energy Charter Treaty. All this would further international energy trade and sustainable economic development, matters to be analysed in Chapter IV. A limited technical scope covering cross-border power grid interconnections and unrestrained power transit would act as drivers for International Law to achieve greater acceptance and, thus, enhanced enforceability.

III.2. POWER NETWORKS

What characterises a power transmission network? What are their various types? What are the standard compatibility conditions for international interconnection? This section provides an overview of power transmission, its elements and features as well as some regulatory conditions making international power transmission possible. It will finally attempt a legal conceptualisation and classification of power transmission grids.

III.2.1 Power transmission networks

Transmission (from Latin *transmission*, *-onis*) denotes the act of passing something on from one person or place to another.[177] When it comes to power transmission, it refers specifically to the process of delivering electricity from one point to another (called nodes). Historically, power transmission refers to the process involving bulk-transfer of electricity from power generating plants to final consumers. Over time, however, the concept has been refined and restricted only to the transfer of high-voltage electricity from generating step-up units to substation step-down transformers.

III.2.2. Power grids elements

The notion of power transmission conveys at least three elements: firstly, an entity (either an individual or a juridical person e.g. a generating power unit) acting as remitter in a designated point of origin; secondly, a recipient entity in a different place as the final destination and, lastly, something which is carried and delivered between such two points.

[177] Cambridge Advanced Learner’s Dictionary <http://dictionary.cambridge.org>.

From a legal point of view, these elements are relevant since they refer to legal problems common to decision-making and regulatory processes, such as acquisition of property and proprietorship issues on territory borders, transnational environmental risk management, and dispute resolution mechanisms, for instance, power measuring delivery and restrictions to trade.

III.2.3. Characteristics of Power grids

Two *basic features* associated with all grids are functionality and robustness. The former refers to the primary function of a power grid operating under normal conditions, which is to transport blocks of energy from the point at which it is generated to another in which it is needed at a given moment. The latter refers to the fact that transmission networks must be designed to both transfer bulk power and withstand network failure events, either involving single or multiple network components, as well as such events occurring either separately or in any credible combination.[178]

The *economic operation* is an outcome of grid expansion processes and the rise of investment and construction costs. Although grid operation is constrained by power transfer capacities and engineering limitations, under normal conditions, it is cost-efficient where marginal power generating

[178] The failure of a single element of a grid e.g. a transformer or a transmission line, is referred to as an 'N-1' event. Simultaneous failures of multiple elements such as that of a transmission line when a parallel line has been disconnected for maintenance, are termed 'N-2' events. In any case, the transmission network that is capable of holding up such events is considered 'robust', as opposed to a 'weak' grid. Claverton Energy <http://www.claverton-energy.com.html>.

units are dispatched,[179] full transfer capacity is in use, and transmission losses are kept to a minimum.

A grid is also said to be *double-focused*, because it both conveys electricity and also serves a load balancing function, physically matching supply and demand of power. Conventional power grids are designed for given parameters of real and reactive power as well as load requirements, thus, substantial deviations from them require compensation devices to regulate load voltage. The so-called 'smart' power grids are responsive to real load-demands and rapid time-variability of inputs. Contemporary electric utilities not only produce power for consumers, but also pool and coordinate volatile excess power among them,[180] thus making excess power trading possible.

In sum, power transmission networks are networks of interconnected high to very high voltage transmission lines,[181] substations and transformers that enable bulk-carrying of electron flows (electrical energy) from one place to another and, ultimately, the delivery of power from generation sources to areas of demand.[182] Electricity transmission grids can be classified into two major subgroups: bulk transmission grids[183] and distribution grids.[184] This inquiry is restricted to the former.

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[179] In other words, the cheapest generating unit. For a good overview of power systems see Steven W. Blume, , *Electric Power System. Basics for the Non-Electrical Professional* (Institute of Electrical and Electronics Engineers, Inc. John Wiley & Sons, 2007) p 3.

[180] Günther Oettinger, 'An integrated and competitive electricity market: a stepping stone to a sustainable future' (Speech delivered at the Eurelectric Conference: "Building a secure and sustainable future: how can market integration contribute", Brussels, 17 March 2010 <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/10/102&format=HTML&aged=0&language=EN&guiLanguage=en>.

[181] Overhead, underground, or undersea power-transmission lines of insulated conductors.

[182] Either large customers directly connected to the transmission network; or, most commonly, power distribution companies.

[183] Transmission network voltages are typically above 100 kV and, in general, the higher the voltage the larger the network's transfer capacity. High Voltage Transmission can be split into

III.3. TRANSNATIONAL POWER TRANSMISSION. FERTILE GROUND FOR INTERNATIONAL LAW

As a general proposition, International Law is commonly regarded as a fragmentary body of rules. Its provisions are not necessarily designed to cover a given field of law exhaustively;[185] instead, they provide minimalistic procedural legal principles to deal with situations that have an international element, leaving the bulk of detailed regulation to domestic *fora*. Power-transmission is normally a heavily regulated activity at the domestic level. In contrast, there is little direct regulation of transboundary power transmission in the international realm. In order to foster cross-

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two subsections: Extra (very High Voltage Transmission, over 230 kV up to about 800 kV) and Ultra High-Voltage Power Transmission Lines (higher than 800 kV). Claverton Energy-Research Group, *HVDC* (22 February 2011) Claverton Energy < http://www.claverton-energy.com/tag/hvdc >.

[184] Ibid. The technology for high power transmission referred to is ±800 kV High Voltage Direct Current (HVDC) transmission, designed to long-distance power transmission (over 7000 kms for direct current and 4000 for alternate current). This type of power transmission system can convey approximately 6.5 GW through a single bipole (i.e. two conductor bundles – one for each pole – on each electrical tower) overhead line system. Thereafter, when further transmission systems are built, on a double bipole system, it can transport twice the power. Distribution grids operate regularly beneath 100 kV and their purpose is to distribute power from the transmission network to end-users. Currently, setting aside wind and other renewable power sources (mostly experimental), not as much of generation is connected to distribution networks (and when it does, it is called 'embedded generation'). Like its transfer capacity, its reliability is also less than those of a transmission network. Distribution networks are operated by Distribution Systems Operators (DSOs).

[185] From a historic point of view it is useful to recall the United Nations Organization's Survey of International Law in relation to the work of Codification of the International Law Commission: Preparatory work within the purview of article 18, paragraph 1, of the Statute of the International Law Commission, A/CN.4.1.Rev.1 (1949) from the Yearbook of the International Law Commission at <http://www/un/org/law/ilc/index.htm>. Contemporary views on same fragmentary character of International Law can be found also in International Law Commission, *The Work of the International Law Commission* (United Nations Publications, 7th ed, 2007) vol 1; International Law Commission website at <http://untreaty.un.org/ilc/ilcintro.htm>; Grant, Thomas D. *Admission to the United Nations. Charter Article 4 and the rise of Universal Organization* (Martinus Nijhoff Publishers, 2009), ch 1, 6; Fabry, Mikulas, *Recognizing States. International Society & the establishment of new States since 1776* (Oxford University Press, 2010) p 1; Diehl, Paul and Ku, Charlotte, *The Dynamics of International Law* (Cambridge University Press, 2010) p 1, 28, 74.

border interconnections, this section analyses how relevant features of power grids might be efficiently aligned with International Law.

It is proposed that transboundary power transmission presents a number of advantages for enabling International Law to achieve greater levels of substantiveness and, thus, enforceability. The argument rests upon the following. Firstly, cross-border energy transmission is largely a technical matter in which the how-to-do-it question is basically resolved. Secondly, the concept of interconnecting grids of different countries is strongly supported by economics: the achievement of economies of scale, cost reductions, integration of new generating units, and a resulting enhanced market largely favour its consideration.[186] Thirdly, not even the common characterisation of transmission grids as monopolistic (or oligopolistic) prevents States from getting their facilities interconnected because, as long as a proper regulation on these imperfect markets is set up, the shortcomings of a monopolistic operation can effectively be overcome.[187]

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[186] As a general overview on the economics of interconnected power systems see Steven W. Blume, *Electric Power System. Basics for the Non-Electrical Professional* (Institute of Electrical and Electronics Engineers, Inc. John Wiley & Sons, 2007) p 180; for a current detailed explanation on the matter see, particularly, Mei, Shengwei Zhang, Xuemin, and Cao, Ming, *Power Grid Complexity* (Tsinghua University Press/Springer, 2011) p 79, 87, 141, 161, 179, 229. For the analysis of the economics even in domestic local contexts see the USA power grid case in Tongosopit, Sopitsuda, *The Political Economy of Grid-connected distributed power generation systems in California* (University of California, 2008) p 33, 77. At bilateral practice level, the economics of interconnection is also largely reaffirmed; an instance of this is the Ecuador-Perú power transmission interconnection project to be due online by 2016. The power authorities of both countries have entered into a political agreement to advance a bilateral connection which will include 2.75 GW of new hydro generation capacity in Ecuador and the construction of a transmission line of 450 kms to interconnect both countries' 500kV main transmission systems. See Business News Americas at <http://bnamericas.com/news/electricpower/minister-ink-interconnection-study-agreement/330179704>.

[187] Ibid. See also Working Papers on Technology Governance and Dynamics Nr. 44: Matthews, John *The Renewable Energies technology surge: A new techno-paradigm in the making?* (Technology Governance/The other Canon Foundation/Tallinn University of Technology, 2012) at <http://www.ourenergypolicy.org/wp-content/uploads/2012/09/2012082809441414.pdf>; an interesting study on effects of distorted competition in an apparently similar market see Working Paper 2012-26 Bank of Canada:

Due to the capital-intensive nature of supplying electricity and the diminishing costs of generating units and transmission line construction, it is far more cost-effective to spread these costs over a large customer-base provided by a monopolistic market set-up. If the alternative model of fostering widespread competition between smaller economic agents (e.g. transmission facilities owners) were to be implemented, economies of scale could hardly be achieved. Finally, in circumstances where several States depend on energy being provided by a non-neighbouring country, requiring the power supply to cross the territory of other States having vested interests in any of the former ones, this provides an incentive for interconnecting their grids, assures permanent supply, and furthers mechanisms of enforcement.[188]

In sum, cross-border transmission provides an opportunity for International Law to gain greater acceptance and legitimacy. To achieve this, the legal nature of international power transmission operations shall first be analysed.

III.3.1. Legal Nature of Transnational Power Transmission operations

Some legal concepts and interests relate directly to power transmission – ownership of facilities and the electricity produced being amongst the most relevant. However, there are also different legal regimes that may – or may not – construct legal models and interests in a way that is consistent with

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Minamihashi, Naoaki, *Natural Monopoly and Distorted Competition: Evidence from unbundling fiber-optic networks* (Bank of Canada, 2012).

[188] With regard to primeval mechanisms of enforcement in the realm of International Private Law see *Convention on Jurisdiction and Enforcement of judgments in civil and commercial matters,* opened for signature 27 September, 1968, 8 ILM 229 (entered into force 1 February, 1973).

promoting interconnections. Regarding the first two elements of power transmission: a remitter in a designated point of origin and a recipient in a different final destination, it is crucial to bear in mind that power - although it may be consumed domestically or destined beyond the frontiers of the State in which is produced - is always generated locally and, therefore, it is primarily the focus of domestic regulation.

However, where excess power generation is sent across country boundaries (where interconnected grids apply and, generally, in bilateral contexts), the underlying legal transaction is characterized as an international purchase of electricity - an export - which constitutes International Power Trading. WTO rules, therefore, apply. As to the third element: what is conveyed through the grid and delivered between two such points, electricity is an electron-flow, a fungible element which once injected into the grid through a nodal point, becomes physically and legally undistinguishable from other loads presently being transported through the grid.[189]

Therefore, power transmission operations occur where electricity is transported across borders of different countries whose power grids are somehow interconnected. From the standpoint of the most relevant specific operations involved in power-transmission i.e. power injections/withdrawals, transit, and load-balancing,[190] the distinctive international element arises from such activities taking place and having effects in different countries.

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[189] See above n 36.
[190] Frequency regulation. Claverton Energy <http://www.claverton-energy.com.html>.

III.3.2. Conditions for transnational transmission

To assist in enhancing the viability of International Law, a framework of cross-border interconnected power networks and harmonised domestic energy matrices (preferably based on renewable sources) is required. Such a framework calls for both *technical* and *economic* compatibility as well as a specific *common driving force.*

Technical compatibility

Among the conditions upon which renewable energy mixes configuration and transboundary interconnection relies, the technical one is the less troublesome. Current technology transmission schemes of superconductors have expanded transmission capacity and carrying-distances, reduced energy-losses, and made possible the crossing of time-zones, seasonal demand compensation, pooling, and more effective electrical-flow coordination.[191] Indeed, only four decades ago, electricity could only be efficiently transferred 600 kms. Further scientific breakthroughs allowed distant transfer capacity to increase up to 2500 kms making the crossing of time-zones and seasonal demand compensation possible. Current technology transmission schemes of High Voltage Alternate Current (HVAC) and High Voltage Direct Current (HVDC) have extended the transmission distance to 4000 and 7000 kms respectively. Furthermore, high-voltage wires, known as superconductors, are designed to allow power transmission at a lower current, thus generating less heat and consequently less energy loss in the process.

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[191] William W. Hogan, *Electricity Market Design: Market Models for Coordination and Pricing* (Energy Information Administration, Harvard University, 2008) p 14, 22, 27. See also Hogan, William W. 'Electricity Market Design: Coordination, Pricing and Incentives' (Paper presented at ERCOT Energized Conference, Austin, Texas, USA, 2 May 2008), p 3, 7, 17.

Economic compatibility

Here, two questions are crucial: is it economically efficient to integrate distant renewable sources into energy matrices? And, if the answer is in the affirmative, do variations in the distance have significant economic consequences? Consistently, studies[192] on the limits and costs of long-distance transmission systems have concluded that even exploitation of remote energy sources at low cost '[is] feasible and economical for distances never before entertained',[193] thus offering acceptable reliability levels and costs low enough as to make convenient its economic exploitation.[194] Currently, the rising costs of conventional fuels and the advances in superconductor technology reaffirm the economic conclusion that it is economically desirable to transfer local and cheaply produced power over distances.

In turn, the convenience of long-distance transmission is justified in a twofold way. On the one hand, HVDC transmission schemes experience negligible electric power unit cost increases when transmission distances go up.[195] In fact, it has been calculated that for transmitting 10GW the increase is c. 1.5mills/kWh for every additional 1000 kms. On the other hand, upward variations in the cost of power generated close to demand centres (as determined by market prices) bring about notable variations of kilometres in competitive distances of remote sources.

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[192] Historically, see L. Paris, G. Zini, M. Valtorta, G. Manzoni, A. Invernizzi, N. De Franco, A. Vian, 'Present Limits of very Long Distance Transmission Systems' (Paper presented at International Conference on Large High Voltage Electric Systems, Paris, France, 29 August – 6 September, 1984) 8. For a current perspective see, specially, Michael Rodi (ed), *Energy Infrastructure and Policy Options for a Sustainable Future* (Lexxion, 2012, Berlin).

[193] Ibid.

[194] 5 to 20 mills/kWh. Claverton Energy <http://www.claverton-energy.com.html>.

[195] Ibid. It has been calculated that for transmitting 10GW the increase is c.1.5 mills/kWh for each additional 1000 kms. Electricity Forum <http://www.electricityforum.com>.

Transboundary transmission poses several other questions: whether it would be more efficient to have a single or multiple markets; what the features of such market(s) would look like; and how the share of participants' market-power would be calculated. Transnational grids are a means to deliver reliable, secure, and efficient power supply. Reliability is, in a great part, a technical issue;[196] whilst security of supply relies mostly on international regulatory aspects. Efficiency, however, pertains to the field of economics. To understand the economic efficiency problem of a transnational network two points must be emphasized: that it is a global macroeconomic endeavour which effects are meant to reach local economies; and that pursuing economic efficiency leads to market-structure.

Common supranational interest-oriented policy

Human economic behaviour is normally driven by the pursuit of an interest. Though usually true at individual level, it can be quite different when looking at social conduct i.e. at what motivates joint-actions by a group of people living in a social framework. The benefit question is relevant because collective interests will normally end up transformed first in policies and later in regulations or statutes.

Current environmental concerns about climate change not only attract growing popular support, but they also fit in the category of collective supranational interest, compelling multilateral negotiations and the development of policies and implementation mechanisms. In this sense, a

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[196] William W. Hogan, *Electricity Market Design: Market Models for Coordination and Pricing (Energy Information Administration* (Harvard University Press, 2008) p 14, 22, 27. See also William W. Hogan, 'Electricity Market Design: Coordination, Pricing and Incentives' (Paper presented at ERCOT Energized Conference, Austin, Texas, USA, 2 May 2008).

supranational interest is one that transcends boundaries or spheres of interest held by separate nations. It is about governments understanding and acknowledging that achieving some targets goes well beyond a single country's capability and that they could be better achieved through joint efforts. Under what conditions, then, may one expect the development of supranational/international authority and a common policy on worldwide grid interconnection?

Recalling the pioneering path of entities like the European Communities, one might be tempted to first isolate the transmission sector of the energy industry, then to regulate it, and finally - if applicable or needed – to deregulate it. But, is it necessary to do things the same way? Currently, policy-making processes are more sophisticated and the trend points towards redefining the energy sector in relation to the market, environment, and foreign issues.

So far, and with few exceptions, national energy policies have been related to the question of how to meet domestic energy demand, rather than being focussed on the sustainability of the energy-scheme adopted. Under predominant views, decisions tend to be firmly controlled by the States, as a natural emanation of sovereignty and the regulatory powers conferred upon national authorities over natural resources, proprietorship, and competition regimes. From an international point of view, however, the limited interaction between States is channelled through the traditional rules of *international cooperation*, which mostly, foster bilateral arrangements. Supranational decisions made by organisations, in turn, require more than that.

The development of supranational authorities and policies that seek to promote the common interest points to the progressive appearance of common and overlapping intergovernmental interests. Normally, at international level, this process manifests itself through the formation of coalitions focused on achieving a particular goal by means of concerted actions in the sphere of their common interest. Conversely, one of the main causes for not having a common policy in energy does not rest on States and/or industry sectors lacking overlapping interests, rather it arises from legal obstacles such as discriminatory rules, outdated legal regimes, and lack of transparency.

The three conditions analysed above have enormous potential for driving up the development of legal models that could foster international power trade and renewable source-based sustainable economic development. The enhancement process works through exploiting the common know-how on power transmission thus levelling the technical ground for players; getting the most out of the comparative advantage economic theory as a matter of practice, and in building upon the interdependence created by supranational interests articulated by policy harmonisation processes.

III.3.3. European Union: a case study on regulation

For many observers, the European Union stands out as a model of integration and international cooperation. In the following sections, a comprehensive overview of the EU's electricity regulation is provided. The overview starts by describing the overarching legal framework sustaining the EU's relevant institutions before focusing on energy and, finally, it addresses the specific legal regulation of power transmission. The focus of the analysis is aimed at identifying legal tools useful for energy regulation and those potentially applicable to foster grid interconnection and power transit between countries not already engaged in integration processes.

General legal framework

Several international treaties - with no strict hierarchy among them – give form to the European Union.[197] The EU is an international organization,[198] established by international treaties[199] that impose mutual rights and obligations upon its Contracting States and which limits their sovereign rights in specific matters.[200] In effect, this transfers competences/powers to EU institutions over which the Member States have no direct control. This

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[197] *Treaty on European Union or Maastricht Treaty (EU Treaty),* opened for signature 7 February 1992, consolidated version [2008] O.J. C115/1 (entered into force on 1 November 1993). The EU Treaty was amended by the *Treaty of Amsterdam, opened for signature 2 October 1997 OJ C 340/1 (entered into force 1 May 1999)*; the *Treaty of Nice amending the TEU, the Treaties establishing the European Communities and certain related acts, opened for signature 26 February 2001,* [2001] O.J. C80/1 (entered into force 1 February 2003), and by the *Lisbon Treaty or Treaty of the Functioning of the European Union (TFEU),* opened for signature 20 June 2007 OJ C 306/1 (entered into force 1 December 2009) art 4(1)-(2). The consolidated version can be retrieved in: *Maastricht Treaty* (*EU Treaty*), [2008] O.J. C115/1. See also *Treaty Establishing the European Atomic Energy Community (EAEC or EURATOM Treaty)*, opened for signature 25 March 1957, 298 UNTS 167 (entered into force 1 January 1958).

[198] Ibid.

[199] *Treaty on European Union or Maastricht Treaty (EU Treaty),* opened for signature 7 February 1992, consolidated version [2008] O.J. C115/1 (entered into force on 1 November 1993). The EU Treaty was amended by the *Treaty of Amsterdam, opened for signature 2 October 1997 OJ C 340/1 (entered into force 1 May 1999)*; the *Treaty of Nice amending the TEU, the Treaties establishing the European Communities and certain related acts, opened for signature 26 February 2001,* [2001] O.J. C80/1 (entered into force 1 February 2003), and by the *Lisbon Treaty or Treaty of the Functioning of the European Union (TFEU),* opened for signature 20 June 2007 OJ C 306/1 (entered into force 1 December 2009) art 4(1)-(2). The consolidated version can be found in: *Maastricht Treaty* (*EU Treaty*), [2008] O.J. C115/1. See also *Treaty Establishing the European Atomic Energy Community (EAEC or EURATOM Treaty)*, opened for signature 25 March 1957, 298 UNTS 167 (entered into force 1 January 1958).

[200] *Van Gend & Loos v Nederlandse Administratie der Belastigen* (26/62) [1963] E.C.R. 1 at 12; [1963] C.M.L.R. 105.

particular legal system is, therefore, 'supranational' in nature,[201] for it constitutes a common legal system for the Contracting States although it is not national law *per se*.

The 'shared competences' between the EU and the Member States include energy issues, trans-European power networks, security, the internal market, and economic and territorial cohesion.[202] Policies relating to these areas are entrusted jointly to the EU and the Member States. The European Council has been empowered, however, to 'adopt broad guidelines of the economic policies of the Member States and the Union'.[203] Nonetheless, since the EU - acting alone - has no competence to implement what has been recommended, cooperation and flexible coordination between Member States is necessary.

In the following section the scope of analysis shall be narrowed down to the current European energy policy and how the EU Law appurtenant thereto deals with energy markets in general with a focus on networks and security of supply. This will provide a case study to support the exploration of model rules on interconnection and integrated markets potentially applicable to other regional contexts.

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201 Although the term 'supranational' –in use in art 9(5, 6) of the ECSC- was totally left out of the two Treaties of Rome by the repealing of the said art 9 ECSC by the Merger Treaty and replaced with an identical text in the three European Treaties. See below n 347.

202 *Lisbon Treaty or Treaty of the Functioning of the European Union (TFEU),* opened for signature 20 June 2007 OJ C 306/1 (entered into force 1 December 2009) art 4(1)-(2).

203 Ibid [99] art 121(2)3.

European Energy policy. Internal market and infrastructure investment

The internal market of the EU is defined by the Treaty of the Functioning of the European Union (TFEU) as ‘an area without internal frontiers in which the free movements of goods, persons, services and capital is ensured in accordance with the provisions of the Treaties’.[204] We are concerned here, only, with the goods-movement aspect of the internal market since power is acknowledged as a fungible commodity:[205] a movable good which, in accordance to the EU Law, can circulate freely, without obstacles, across the territory enclosed by the external frontiers of the Union. This creates, in theory, a single market for electricity.

The EU energy policy is embedded in the overarching European internal market policy. Creating a competitive internal market for energy is one of the EU's priority objectives. For this to occur, a reliable and integrated energy network is required and, therefore, infrastructure investment to support this objective. In line with this aim, the Council Regulation (EU, EURATOM) 617/20101 of 24th June 2010 provides for a harmonised reporting framework to the Commission of investment projects in energy infrastructure (of any kind) within the European Union.[206] This information enables the Commission to conduct analysis on the market and to prepare annual network development plans for electricity.[207]

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[204] Ibid [14(2)] art 26(2).
[205] See above n 36.
[206] *Council Regulation 617/20101/EU-EURATOM of 24 June 2010 concerning the notification to the Commission of investment projects in energy infrastructure within the European Union and repealing Regulation No 736/96/EC* [2010] OJ L 180/7.
[207] The Commission must forward this analysis to the European Parliament, the Council and the European Economic and Social Committee.

When it comes to security of supply, each Member State must designate a transmission system operator for a certain period, which is responsible for ensuring that the system's transmission capacity and reliability meet reasonable demands for power transmission. In this field, the EU has the Agency for Cooperation of Energy Regulators (ACER), a body established in 2010 by Regulation (EC) 713/2009 of the European Parliament and of the Council of 13 July 2009. The Agency has an overarching mission 'to assist national energy regulatory authorities (NRAs) to perform their duties at EU level and to coordinate their actions'.[208] These actions are focused on the development of common network and market rules, and the coordination of regional initiatives to support the European power market integration.[209] In doing so, ACER boasts a quite distinctive feature: it may allow third party countries *outside* the EU to participate in the market and transmission network.[210]

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[208] *Regulation 713/2009/EC of the European Parliament and of the Council of 13 July 2009 establishing the Agency for Cooperation of Energy Regulators (ACER)* [2009] OJ L 211/1. See also Agency for Cooperation of Energy Regulators (ACER), 'Possibility of Neighbouring Countries and their Transmission System Operators to Participate in ACER and in the ENTSOs' (Staff Working Paper No 546, SEC, 28 April 2011).

[209] *Council Directive 303/54 concerning common rules for the internal market in electricity* [2003] O.J. L176/37. See also A. Mathijsen, *A Guide to European Union Law as amended by the Treaty of Lisbon* (Sweet & Maxwell – Thomson Reuters, 10th ed, 2010) 191, 208-209. See especially, *Council Directive 2003/54/EC of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC* [2003] OJ L 176/37, 37-56; *Regulation 714/2009/EC of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003* [2009] OJ L 211/15.

[210] Agency for Cooperation of Energy Regulators – ACER <http://www.acer.europa.eu>.

The Energy Policy. Targeting the future: 2020

The EU energy policy has evolved around the common objective of securing uninterrupted physical availability of electricity in the market, at an affordable price, while contributing to the EU's social and climate goals.[211] In November 2010, the Commission communicated its vision of a European energy strategy for competitive, sustainable and secure energy: Energy 2020.[212]

The new energy strategy focuses on five priorities:[213] Firstly, energy efficiency is to be a key-factor for long-term energy use, for achieving climate goals, and in assisting Member States to decouple energy use from economic growth. The second priority is to develop a truly pan-European integrated, interconnected, and competitive energy market. Thirdly, priority is to be given to empowering consumers to exercise rights conferred by the EU in regard to accessing the power services they need as well as in achieving the highest level of safety and energy security on the basis of sufficient transmission and storage infrastructure. The fourth

[211] Article 194 of the *Treaty on the functioning of the European Union* (TFEU). See also *Council Directive 2003/54/EC of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC* [2003] OJ L 176/37, 56.

[212] Worth noting is the legal mechanism -'Joint Support Schemes', whereby a certain amount of energy from renewable sources which is produced in the territory of a Member State may count towards the national overall target of another. See Directive 2009/28/EC including mandatory national targets for the overall share of energy from renewable sources in gross final consumption by 2020. Being the first that (a) statistical transfer of specified amounts of energy from renewable sources from one Member State to another Member State has been made in accordance with art 6; or (b) set up a distribution rule agreed by participating Member States that allocates amounts of energy from renewable sources between the participating Member States. These mechanisms are in force since 2011, thus, the impact of the Renewable Energy Directive is still a matter to be assessed against conventional policy support schemes.

[213] European Commission, *Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Energy 2020 a strategy for competitive, sustainable and secure energy COM 639 final* (2010) Eur-Lex <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0639:EN:HTML:NOT>. See also Energy Community, *The Energy Community. Legal framework* (Energy Community Secretariat (ECS), 2nd ed, 2010), document available at <www.energy-community.org>.

priority is energy technology development and innovation leadership through cooperation at EU level. The fifth priority is to strengthen the external dimension of the EU energy market. For this to be achieved, the EU acts with third-party-country energy partners, with a common voice, beyond mere national initiatives, thus, formalising the principle whereby Member States act in the benefit of the EU as a whole in bilateral energy-related negotiations.

A couple of years after its release, a critical assessment of what has been achieved in implementing this strategy reveals mixed results. There have been positives in measures taken for developing new energy technologies (e.g. plasma, nuclear fission projects supported by EU funding)[214] and those adopted for increasing energy efficiency.[215] However, as these measures are intrinsically long-term in nature, it is difficult to directly attribute these advances to the impact of the new strategy. In turn, if any directly derived improvements exist, they could well be considered modest. The remainder of this section will turn to examining the downsides of the model in practice and, to this end, shall look at priorities two and five in more detail.

[214] The Max Planck Institut für Plasmaphysik (Institute for Plasma Physics, IPP), for instance, is an institute of the Max Planck Gesellschaft, part of the European Fusion Programme (EURATOM) and an associate member of the Helmholtz-Gemeinschaft Deutscher Forschungszentren. The Institute has undertaken projects on Plasma Physics and Controlled Fusion for several years in conjunction with the European Union. To that effect, a plasma vessel of Wendelstein 7-X is currently under construction at the Institute's facilities in Greifswald, Germany. The completion of the assembly of Wendelstein 7-X is foreseen for 2014. Max Planck Institut für Plasmaphysik, *Annual Report 2011* (Druckerei Behr, Scheyern-Fernhag, 2011).

[215] The origin of such measures can be fairly dated back as far as the early 70s, just after the so-called 'oil crisis' that causes a shocking acknowledgement of the European and USA oil-based energy dependency. See also n 53.

The pan-European energy market and its external dimension

This section considers the legal framework for international cooperation relevant to the transmission sector within the EU and then focussing upon those facets of a multilateral character, such as the Energy Charter Treaty and the WTO. In most cases, the policy-making action of the European Council in the energy and power transmission area is determined by the submission of a proposal by the Commission whose conferred powers will be commented in connection with the priorities above.

One of the Commission's priorities is to establish a pan-European integrated energy market and it has already taken concrete actions to that end. Its *first action* is, not surprisingly, regulatory in nature: to efficiently and accurately implement the existing internal market legislation and to strengthen the competition policy. The third Internal Energy Market Package created new tools of public policy, including an Agency for the Cooperation of Energy Regulators (ACER)[216] and the new European Networks of Transmission System Operators for Electricity and Gas (ENTSO-E and ENTSO-G) which should play a major role in finally integrating energy markets. Regional initiatives, such as the Baltic Energy Market and the Mediterranean Ring should also serve as building blocks for a European energy market.[217]

The *second action* taken is to establish the strategic infrastructure priorities needed for 2020-2030. Accordingly, the Commission is preparing a

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[216] Agency for Cooperation of Energy Regulators (ACER), 'Possibility of Neighbouring Countries and their Transmission System Operators to Participate in ACER and in the ENTSOs' (Staff Working Paper No 546, SEC, 28 April 2011), Regulation 713/2009/EC of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators [2009] OJ L 211/1.

[217] European Commission at <http://ec.europa.eu/energy/infrastructure/bemip_en.htm>.

communication aimed at identifying what is required for a functioning internal market, integration of renewable sources, and security of supply; as well as a set of policy instruments to implement them in the next two decades. By the same token, ENTSO-E and ENTSO-G have been entrusted by the Commission to develop the blueprint for European Electricity and Gas grids. The target is getting all Member States interconnected through cross-border corridors by 2015, whilst taking into account network connections with third countries on the basis of the energy 2050 roadmap, which was released in 2011.

The *third action* of the Commission is reforming and improving permit procedures and rules for grid infrastructure projects of 'European interest'. The method for defining 'strategic infrastructure' or 'European interest' will prove to be essential in terms of energy selection, sustainability, access, and secure competitive supply.

On 7 September 2011, the Commission released the Communication entitled 'The EU Energy Policy: Engaging with Partners beyond Our Borders' which addresses security of the energy supply and international cooperation.[218] This document furthers and strengthens an idea embodied in the Energy Strategy 2020: that of the EU having, effectively, a common voice as to external energy policy. To this effect, the Union has set up *four specific priorities*.

The *first* priority is to create an external dimension to the energy market, in other words, one reflecting the interconnectedness and transparency of the

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[218] European Commission, *Communication on security of energy supply and international cooperation – The EU Energy Policy: Engaging with Partners beyond Our Borders COM 539 final* (7 September 2011) Europe < http://ec.europa.eu/energy/international/security_of_supply/doc/com_2011_0539.pdf>.

internal market beyond its boundaries. This works as an express recognition of the interdependence between Member States which is seen as the best option for the Union to face the challenges of ever-increasing energy costs and energy supply disruptions. The EU is also attempting to build up the external dimension of the energy market by revitalising the principle of solidarity among Member States. In accordance with this concept, the EU is configuring a regular information-exchange on intergovernmental energy-related agreements that are planned and entered into by Member States and third countries. As seen, bilateral agreements with third-party countries impact upon the implementation of infrastructure projects and energy supply to the Union. Apart from the need to abide in full with EU legislation, particularly notification procedures, the negotiation and conclusion of these agreements have resulted in the imposition upon States of obligations to exchange information at the EU level. These requirements in respect of the bilateral agreements might be seen to represent a new erosion of traditional views of State sovereignty. Moreover, as this book has advanced in previous sections, to achieve a legal model capable of facilitating transboundary power transmission, certain reinterpretation of the concept of sovereignty and derived competences are required.

A *further priority* is to strengthen partnerships with key non-EU energy suppliers for secure, safe, sustainable, and competitive energy. In this context, the Union must deal comprehensively with Russia,[219] and other

[219] EU-Directorate for Energy, *Common Understanding on the preparation of the Roadmap of the EU-Russia Energy Cooperation until 2050 between the coordinators of the EU-Russia Energy Dialogue, the European Commissioner for Energy and the Minister of Energy of the Russian Federation* (24 February 2011) EC-Europe <http://ec.europa.eu/energy/publications/doc/2011_eu-russia_energy_relations.pdf>. See also EU-Directorate for Energy, *Progress Report on the Roadmap of the EU-Russia Energy Cooperation until 2050* (29 July 2011) EC-Europe <http://ec.europa.eu/energy/international/russia/doc/20110729_eu_russia_roadmap_2050_repor

hydrocarbon-exporting countries such as Algeria, Qatar, Australia, and OPEC countries, which all provide natural gas and crude-oil to the EU. It is important, also, to recognise the long-standing interaction that the EU has with Norway through the European Economic Area and via the EU-Norway Energy Dialogue.[220] The EU's carbon-abatement targets require, however, new sorts of partnerships involving reliable supply of renewable energy from countries like Brazil and the USA with regard to biofuels.[221] This goal is of utmost importance for the EU, particularly, after the winter of 2009 that witnessed serious gas transit disputes between Russia and Ukraine, ultimately resulting in cut-offs of Russian gas supply destined for Europe traversing Ukraine's territory. As shall be seen in this area,[222] the EU encourages the participation of major suppliers in the Energy Charter Treaty (ECT) framework, something which it has yet to substantially achieve.[223]

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t.pdf>. See also The Independent, *Dependence on Russian energy places Europe at risk* (2009), The Independent <http://www.independent.co.uk/voices/editorials/leading-article-dependence-on-russian-energy-places-europe-at-risk-1229945.html>; Cameron, Fraser *The Politics of EU-Russia Energy Relations* (EU-Russia Centre, 2010) at < http://scholar.google.cl/scholar?q=EU+energy+dependence+from+Russia+fraser+cameron+&btnG=&hl=es&as_sdt=0&as_vis=1>; Aalto, Pami and Korkmaz Temel, Dicle, European/Eurasia Energy Security: From Vulnerability to Viability and Sustainability in Aalto, Pami, Harle, Vilho and Moisio Sami (eds) *Global and Regional Problems. Towards an Interdisciplinary Studio* (The International Political Economy of New Regionalism Series Ashgate Publishing Limited, 2012), ch 4, 79.

220 See European Commission website <www.ec.europa.eu>. The EU-Norway Energy Dialogue is described as follows: '[b]ilaterally, the EU-Norway Energy Dialogue principally aims at the coordination of energy policies in a wider sense, including research and technological development in the energy sector and relations with other energy producing countries' at <http://ec.europa.eu/energy/international/bilateral_cooperation/norway_en.htm>.

221 Rafael M. Plaza, *Biofuels Regulatory Frameworks in the context of Energy Security and Climate Change* (2012) New Jurist (European Union – Environmental Law) <http://www.newjurist.com/biofuels-regulatory-frameworks-in-the-context-of-energy-security-and-climate-change.html>.

222 See ch III. 4.2 on Energy Charter Treaty, 88.

223 For a detailed analysis of the 2009 Russia-Ukraine gas dispute and implications as to the Energy Charter Treaty, see Anna Marhold, 'Is there Light at the End of the Gas Pipe? – Provisional Application of the Energy Charter Treaty to the 2009 Russia-Ukraine Gas Dispute' in Rodi, Michael, *Energy Infrastructure and Policy Options for a Sustainable Future* (Lexxion, Berlin, 2012) p.127. See also EU-Directorate for Energy, *Common Understanding on the preparation of the Roadmap of the EU-Russia Energy Cooperation until 2050 between the coordinators of the EU-Russia Energy Dialogue, the European Commissioner for Energy and*

The *third priority* is to improve access to sustainable energy for developing countries. Here, the Union is seeking to achieve the Millennium Development Goals as reflected in the EU-Africa 2020 energy targets which aim to promote inclusive growth, eradicate poverty, and to achieve the reliable supply of energy and increased access to energy services for Africa. In the view of the Union, energy is a key driver of sustainable development.[224] Accordingly, energy access is one of the main challenges. In close connection, efforts revolve around making the energy markets more stable, since oil-price fluctuations have substantial impacts on developing economies.

The final priority is to better promote EU policies beyond its borders by using a strategic approach involving flexibility in scope, with different sorts of legal relationships entertained with EU partners, and legal instruments tailored for each country or organisation. In this sense, the Union has clearly set forth that amongst Member States (market

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the Minister of Energy of the Russian Federation (24 February 2011) EC-Europe <http://ec.europa.eu/energy/publications/doc/2011_eu-russia_energy_relations.pdf>. See also EU-Directorate for Energy, *Progress Report on the Roadmap of the EU-Russia Energy Cooperation until 2050* (29 July 2011) EC-Europe <http://ec.europa.eu/energy/international/russia/doc/20110729_eu_russia_roadmap_2050_report.pdf>. See also The Independent, *Dependence on Russian energy places Europe at risk* (2009), The Independent <http://www.independent.co.uk/voices/editorials/leading-article-dependence-on-russian-energy-places-europe-at-risk-1229945.html>; Cameron, Fraser *The Politics of EU-Russia Energy Relations* (EU-Russia Centre, 2010) at < http://scholar.google.cl/scholar?q=EU+energy+dependence+from+Russia+fraser+cameron+&btnG=&hl=es&as_sdt=0&as_vis=1>; Aalto, Pami and Korkmaz Temel, Dicle, European/Eurasia Energy Security: From Vulnerability to Viability and Sustainability in Aalto, Pami, Harle, Vilho and Moisio Sami (eds) *Global and Regional Problems. Towards an Interdisciplinary Studio* (Ashgate Publishing Limited 2012) The International Political Economy of New Regionalism Series, ch 4 p 79. On the question about the provisional application of the ECT in the Russia-Ukraine gas dispute of 2009, see *Hulley Enterprises Limited v. the Russian Federation* (PCA Case No AA226), *Yukos Universal Limited v. the Russian Federation* (PCA Case No AA227) and *Veteran Petroleum Limited v. the Russian Federation* (PCA Case No AA228), *Interim Awards on Jurisdiction and Admisibility*, 30 November 2009 available in the Energy Charter Treaty's website at <www.encharter.org>.

[224] European Commission's Directorate-General for Energy <http://ec.europa.eu/dgs/energy>.

integration relationship) and in the relationships between the Union and its key energy suppliers and transit countries (consumer/supplier relationship) common instruments are to be used to deal with EU energy policy and issues of common interest (such as security of supply/demand). These instruments, under the European Neighbourhood Policy, are specific partnerships, crisis response-related and/or cooperation and trade agreements on energy, particularly, the ECT. In line with these decisions, the EU is committed to improving the coordination among Member States in relevant *fora,* such as the International Energy Agency (IEA),[225] the International Energy Forum (IEF), the International Partnership for Energy Efficiency Cooperation (IPEEC), and the International Renewable Energy Agency (IRENA). In these *fora* the unity of interests and cooperation among Member States should prevail as the foundation for the conduct of negotiations.

As a way of optimising the EU's external assistance in the energy sector, the Union seeks to promote the alignment of the instruments used by international financial institutions with EU external energy policy priorities, in order to improve visibility and impact of EU policies in non-EU countries. The proposed creation of a database on EU and Member States' energy projects in third-party countries is another important project. Of course these actions can equally be viewed under a more critical light and interpreted as efforts to control the financing of energy projects in third countries by institutions such as the European Investment Bank (EIB), the European Bank for Reconstruction and Development (EBRD), other European development banks, and even the World Bank (WB) where financing is provided in alignment with EU energy policy interests.

[225] International Energy Agency <www.iea.org>.

III.4. THE INTERNATIONAL COOPERATION LEGAL FRAMEWORK

The EU's desire to expand the external dimension of its energy policy would have little attraction if a net of intertwined international cooperation schemes and instruments relevant to the energy sector had not already existed. Examples of these systems can be found in multilateral organisations such as the WTO and ECT. These organisations create an environment in which the EU can not only deploy its co-ordinated and external common energy strategy,[226] and in doing so seek to influence other bodies' goals and actions, but which allow the EU to interact with other countries or groups which are often in pursuit of divergent interests to the EU. The concept of a pan-European energy market has been strongly criticised by many outsiders as simply a revival of an anti-competitive strategy.

The EU's current international instruments can be classified in two categories: political and legal instruments. The distinction is relevant because the EU's legal framework for international cooperation comprises the European Energy Community (EEC), the Energy Charter Treaty (ECT),[227] and the WTO.[228] As such, the WTO framework primarily lies

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[226] As proposed by the European Commission.
[227] The current EU framework also comprises the Non-Proliferation Treaty and the ITER Agreement which deal with nuclear weapons and a multilateral scientific project involving the EU, U.S., India, China, South Korea, Russia, and Japan to demonstrate the feasibility of nuclear fusion as energy source, respectively. The EU, acting on the basis of the Treaty establishing the European Atomic Energy Community, confirmed ITER Agreement's adoption to the International Atomic Energy Authority (IAEA) on 5 February 2007. Since both agreements cover atomic issues they are out of the scope of this research. *Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project (International Thermonuclear Experimental Reactor - ITER)*, signed on 21 November 2006 (entered into force 24 October 2007).

beyond the scope of this inquiry. Discussion of the WTO implications are not analysed in detail here although the specific role of the organisation is analysed in Chapter IV with regard to the economics of energy markets and the International Trade Law mechanisms used to secure energy supply. Therefore at this stage, the scope of this inquiry deals primarily with the EEC and ECT, being subject-specific, international regulatory frameworks of direct concern to Europe.[229]

III.4.1. The European Energy Community

The international treaty establishing the European Energy Community (EEC) was signed in Athens on 25 October 2005 and entered into force on 1 July 2006. The contracting parties are the EU on the one hand; and a number of third-party countries, on the other.[230] All determined to establish among themselves an Energy Community[231] with a stable market and regulatory framework capable of attracting investment in gas, power generation, and transmission networks,[232] and enabling all Parties to have access to continuous energy supply.

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[228] As such, the WTO framework largely exceeds the material scope of this book, thus, it shall not be analysed except for what concerns to International Trade Law mechanisms used to secure energy supply by reference of the Energy Charter Treaty.

[229] In this sense, current political tools as Energy Dialogues, Memoranda of Understanding, Partnership Action Plans or Roadmaps, Association Agendas, or other similar political instruments are not considered.

[230] Original signatories were Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the former Yugoslav Republic of Macedonia, the Republic of Montenegro, Serbia, Romania, Turkey and Kosovo represented by United Nations Mission Interim in Kosovo (UNMIK) under UNSC Res 1244. Later, in 2010, the treaty was signed by Moldova and Ukraine this latter with effect as of February 2011. Neighbouring third countries interested in, and having observer status according to the treaty, are Norway, Georgia, and Turkey. Lately, Armenia has applied for observer status, which is worthy of note since it is a country falling outside the European Neighbourhood Policy Area.

[231] *Treaty establishing the Energy Community (also known as EEC and ECSEE),* opened for signature 25 October 2005, OJ L 198, 18–37 (entered into force 1 July 2006), art 1(1).

[232] The European Energy Community defines 'network energy' in art 2(2) as including the gas and electricity sectors falling within the scope of the European Community Directives 2003/54/EC and 2003/55/EC. See *Council Directive 2003/54/EC of 26 June 2003 concerning*

Acknowledging the importance of the security of energy supply to economic development and social stability, the Energy Community is mostly concerned with extending the internal gas and electricity market towards South-East Europe through facilitating energy investments in that direction. In fact, the scope of the EEC deals mostly with the EU directives on security of electricity and gas supply towards which the *acquis communautaire* was extended in 2007, the EU legislation on energy efficiency,[233] selected Directives on environmental protection, competition, and State-aid rules.

For these objectives to be achieved, one of the important instruments of the Treaty is the implementation of key parts of the EU Law into the territories of non-EU participating countries. Indeed, by joining the EEC, the Contracting Parties commit themselves to implement relevant EU rules on energy, environment, and competition within specific timeframes. In this fashion, the EEC purports to create a common regulatory framework for gas and electricity markets via the extension of the EU Law. Title II of the Treaty addresses the legally-binding commitment to extend energy-related core parts of the *acquis communautaire* to non-EU Contracting Parties.

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common rules for the internal market in electricity and repealing Directive 96/92/EC [2003] OJ L 176/37, 37-56; *Council Directive 2003/55/EC of 26 June 2003 concerning common rules for the internal market in natural gas repealing Directive 98/30/EC* [2003] OJ L 176/57, 57; *Regulation 1775/2005/EC of the European Parliament and of the Council of 28 September 2005 on conditions for access to the natural gas transmission networks* [2005] OJ L 289/1, 1-13; *Council Directive 2004/67/EC concerning measures to safeguard security of natural gas supply* [2003] OJ L 176/57, 57-78.

[233] This includes, particularly, Directives on the energy performance of buildings, energy labelling, and energy services, which according to the ECC-Treaty should have been implemented in general by late 2011. However, the Contracting Parties have also agreed to implement parts of *Council Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (the 'Third Package' on the internal market in electricity and gas)* [2009] OJ L 140/16 on a voluntary basis.

With regard to electricity,[234] the Parties have agreed to transposing: the common rules for the internal market;[235] the rules on conditions for access to the network for cross-border exchanges in electricity;[236] those rules dealing with the management and allocation of available transfer capacity of interconnections between nations;[237] and the rules promoting power generation from renewable energy sources in the internal electricity market, among others.[238] The timeline set up to achieve the entire liberalisation of the electricity market in the common area imposes a deadline of January, 2015.

Title III of the treaty is of particular relevance for this book as it contains 'provisions on creating mechanisms for long-distance transportation of

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[234] The ECC-Treaty makes explicit, as well, the core parts of the *acquis* on gas, environment, competition, and energy efficiency that must be implemented by the Contracting Parties. On gas, for instance, the following Directives must be transposed to national realms: *Council Directive 2003/55/EC of 26 June 2003 concerning common rules for the internal market in natural gas repealing Directive 98/30/EC* [2003] OJ L 176/57, 57. As to environment, *Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment* [1985] OJ L 175/40, 40-48; *Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment* [1997] OJ L 073/5; *Council Directive 2003/35/EC providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC* [2003] OJ L 156/17, 17-24; *Council Directive 2001/80/EC of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants* [2001] OJ L 309/1; *Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC* [1999] OJ L 121/13, 13-18 must be implemented. In regard to competition, essential rules are arts 81, 82, 86(1)-(2), and 87 of the EC Treaty prohibiting cartels and the abuse of dominant positions.

[235] *Council Directive 2003/54/EC of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC* [2003] OJ L 176/37, 37-56.

[236] Ibid.

[237] *European Commission Decision 2006/770/EC of 9 November 2006 amending the Annex to Regulation (EC) No 1228/2003 on conditions for access to the network for cross-border exchanges in electricity (guidelines on the management and allocation of available transfer capacity of interconnections)* [2006] OJ L 312/59. See also *Regulation 1228/2003/EC of the European Parliament and of the Council of 26 June 2003 on conditions for access to the network for cross-border exchanges in electricity* [2003] OJ L 176/1.

[238] *Council Directive 2001/77/EC of 27 September 2001on the promotion of electricity produced from renewable energy sources in the internal electricity market* [2001] OJ L 283/33.

Network Energy'[239] as well as for providing safeguard-measures in crisis events. Article 28 sets forth that the EEC 'shall take additional Measures establishing a single mechanism for the cross-border transmission and/or transportation of Network Energy'.[240] However, for the greater part, the provisions in Title II and III call for the implementation of actions to be taken either by the Parties or by Energy Community bodies. The main bodies established are the Ministerial Council, the Permanent High Level Group, the Energy Community Regulatory Board (ECRB), the Fora, and the Secretariat.[241]

According to Title VII provisions, the implementation of decisions addressed to the Parties in their domestic legal systems shall be performed within the period specified in the decision.[242] Failure by a Party to comply with the decision may be brought to the attention of the Ministerial Council by a reasoned request of any Party, the Secretariat or the Regulatory Board. It is also possible for private bodies to approach the Secretariat with complaints.[243] The Party concerned has a right to respond to any complaint or request that arises.[244] According to different *quora*, it is a matter of the Ministerial Council's competence to determine the existence of a breach of a Treaty obligation: by simple majority if it relates to Title II; or by two-thirds majority if it concerns Title III.[245] Serious and persistent breaches by a Party of its obligations might cause certain Treaty

[239] Energy-Community, *About the Treaty* (2011) Energy-Community <http://www.energy-community.org >.
[240] Ibid.
[241] *Treaty establishing the Energy Community (also known as EEC and ECSEE),* opened for signature 25 October 2005, OJ L 198, 18–37 (entered into force 1 July 2006),
[242] Ibid, art 89.
[243] Ibid, art 90(1)-(2).
[244] Ibid, art 90(2).
[245] Ibid, art. 91.

rights to be suspended, if so determined unanimously by the Ministerial Council.[246]

The final objective of the EEC is to attract investment in power generation and networks in order to ensure stable and continuous energy supply, to create an integrated energy market allowing for cross-border energy trade,[247] and linked to the EU power market, to enhance the security of energy, whilst improving the regional environmental situation.

III.4.2 The Energy Charter Treaty

The Energy Charter Treaty (ECT) and the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) were signed in Lisbon, in December of 1994 and entered into force in April of 1998. The ECT is a multilateral international treaty concerning energy investments and trade. To date, the Treaty has been signed or acceded to by fifty-one States, the EURATOM and the EU.[248] With regard to the EU, the ECT is a relevant part of its external legal framework.

From an organisational point of view, the Energy Charter Treaty sets up the Conference as an inter-governmental decision-making body which main relevant functions are to 'authorize the negotiation of and consider and approve or adopt association agreements',[249] 'facilitate the

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[246] Ibid art 92(1). The vote of the representative of the Party concerned is, naturally, not taken into account for this purpose, art 93.
[247] The Energy Charter Treaty <www.encharter.org>.
[248] The current number of contracting parties is, to date, fifty-three. It is pertinent to note here, however, that Russia signed the ECT Treaty although it *was applying it provisionally until 18 October 2009 inclusive;* it does not ratify it yet. *Energy Charter Treaty* (*ECT*) *and Energy Charter Protocol on Energy Efficiency and related Environmental Aspects* (*PEEREA*), opened for signature 17 December 1994, 33 ILM 360 (entered into force 16 April 1998).
[249] Ibid art 34(3)(k). See also ECT, art 43 on Association Agreements.

implementation of the principles of the Charter',[250] and 'the coordination of appropriate general measures to carry out [such] principles'.[251] The Conference has created several subsidiary bodies[252] in the form of Working Groups and Committees which report to it and which deal with particular issues, such as the Strategy, Investment, Trade and Transit, and Protocol on Energy Efficiency and related Environmental Aspects (PEEREA) groups as well as Budget and Legal Advisory Committees. We are particularly concerned here with the tasks of the Trade and Transit Group, because it assists and monitors the implementation process of Treaty rules in the relevant areas and it considers ways to facilitate energy flows across the ECT constituency.

Apart from the bodies on investments in infrastructure and power production mentioned above,[253] the ECT also sets forth a more innovative body of rules covering trade and cross-border energy flows that deal with the way in which energy-products can be transported across multiple domestic jurisdictions to reach international markets. Its scope, however, is limited to the transit of energy products through fixed infrastructure.

The ECT relies on the WTO general rules with regard to power trading, applying them by reference for trade between ECT members as well as between those Contracting Parties who have not yet acceded to the WTO.[254] However, in certain areas such as tariffs, services, and trade-related intellectual property rights, the ECT's scope is more restricted, and

[250] Ibid art 34(3)(b).
[251] Ibid art 34(3)(c).
[252] According to ECT art 34(5).
[253] As for energy-related investments it is noteworthy that the treaty contains a set of rules capable of being enforced through a dispute settlement system.
[254] Energy Charter Secretariat, *The Energy Charter Treaty and related documents. A legal framework for International Energy Cooperation* (ECT, 2010) p 15.

the appurtenant WTO rules do not apply. Concerning the strategic issue of energy transit, ECT provisions oblige Contracting Parties to adopt measures to facilitate power-flow in line with the principles of freedom of transit and non discrimination.[255] Moreover, the Treaty compels transit-countries not to interrupt or obstruct current power flow, even in the presence of disputes concerning the transit.

The basic rule on transit is set forth in Article 7(1) according to which: 'Each Contracting Party shall take the necessary measures to facilitate the Transit of Energy Materials and Products consistent with the principle of freedom of transit and without distinction as to the origin, destination or ownership of such Energy Materials and Products or discrimination as to pricing on the basis of such distinctions, and without imposing any unreasonable delays, restrictions or charges'. For the purposes of this article, 'transit' is defined in a twofold manner. In Article 7(10)(a)(i) transit is defined as 'the carriage through the Area of a Contracting Party, or to or from port facilities in its Area… of Energy Materials and Products originating in the Area of another state and destined for the Area of a third state, so long as either the other state or the third state is a Contracting Party'.[256] Alternatively, under Article 7(10)(a)(ii) transit is 'the carriage through the Area of a Contracting Party of [said items] originating in the Area of another Contracting Party and destined for the Area of that other Contracting Party…', this latter definition being the default situation.

[255] Ibid.

[256] The exception is set forth in 4. Annex N which list Canada and the United States of America as Contracting Parties requiring at least three separate areas to be involved in 'transit' in accordance with art 7(10)(a) of the Energy Charter Treaty. However, both countries have not yet signed the ECT. *Energy Charter Treaty* (*ECT*) *and Energy Charter Protocol on Energy Efficiency and related Environmental Aspects* (*PEEREA*), opened for signature 17 December 1994, 33 ILM 360 (entered into force 16 April 1998).

However, contrary to the rules concerning investments – where a failure to comply might trigger international arbitration - material rules concerning energy transit are supposed to be enforced through a distinctive bilateral dispute settlement mechanism: conciliation.[257] It is distinctive because for disputes concerning transit (as defined in paragraph 10 of Article 7 ECT) issues specially described in paragraph 6 of article 7 ECT, the general dispute settlement mechanism between Contracting Parties set forth in Article 27 ECT does not apply (this mechanism entails default arbitration after failed diplomatic negotiations). This special mechanism of conciliation designed to address potential power-transit disputes, though understandable in the light of multiple cross-border transits which require the consent of several sovereign States, may also be deemed as the fundamental flaw of a system purportedly designed to secure unrestricted flow of energy-outputs. Indeed, there is a strong conviction among Contracting Parties – particularly the EU - that the provisions on transit in the ECT ought to be enhanced in order to develop a more robust operative framework capable of securing transit flow of energy resources in

[257] *Energy Charter Treaty* (*ECT, Annex 1 to the final act of the European Energy Charter Conference*) opened for signature 17 December 1994, 33 ILM 360 (entered into force 16 April 1998), arts 5, 6, 26, 27, 28. ECT Article 7(6) states: 'A Contracting Party through whose Area Energy Materials and Products transit shall not, in the event of a dispute over any matter arising from that Transit, interrupt or reduce, permit any entity subject to its control to interrupt or reduce, or require any entity subject to its jurisdiction to interrupt or reduce the existing flow of Energy materials and Products prior to the conclusion of the dispute resolution procedures set out in paragraph (7), except where this is specifically provided for in a contract or other agreement governing such Transit or permitted in accordance with the conciliators' decision'. ECT Article 7(7), in turn, sets forth provisions applicable to disputes described in paragraph (6) only after exhaustion of 'all relevant contractual or other dispute resolution remedies'. Only then, resort is given to the conciliation paragraphs (a) to (f) of the Article. According to them, the claimant Contracting Party may refer the dispute to the Secretary-General of the ECT. This, in consultation with the Parties to the dispute and other Contracting Parties concerned, shall appoint a conciliator. The conciliator shall seek the agreement of the Parties to the dispute to a resolution thereof or upon a procedure to achieve such resolution within 90 days of his/her appointment. If the conciliator does not succeed within that time in securing such agreement, he/she shall recommend a resolution to the dispute or a procedure to achieve such resolution and 'shall decide the interim tariffs and other terms and conditions to be observed for Transit from a date which he shall specify until the dispute is resolved'. The Parties to the dispute must observe the interim decisions set forth by the conciliator for twelve months, unless a solution is found earlier.

situations where transboundary crossing takes place at least between three countries.[258] For this reason, in early 2000, the ECT Contracting Parties initiated formal negotiations aimed at elaborating a Transit Protocol. Twelve years later, this protocol remains under discussion. In lieu of a concluded Transit Protocol, the parties resort to either embedded legal principles of the treaty or other non-legal mechanisms in order to deal with transit disputes.

The role of International Law principles

Three principles of International Law contribute to shaping the legal framework on energy in relation to the Charter: international cooperation, non-discrimination, and liberalization of trade.

The *principle of international cooperation* is paramount and underlies most of the ECT Treaty provisions, particularly, those relating to energy transit and competition.[259] The Treaty obliges the Contracting Parties to encourage cooperation in developing, modernizing, and operating energy transport facilities serving areas of more than one Contracting Party. Thus the principle mitigates the effects of supply interruptions whilst facilitating interconnections of energy transport facilities.[260] As to competition, the ECT encourages consultation and information-exchange processes among Contracting Parties as a means for mutual assistance when enforcing competition rules.[261]

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[258] European Commission's Directorate-General for Energy <http://ec.europa.eu/dgs/energy>.
[259] Above n 248, art 7 (p 48) and 6 respectively (p 46).
[260] Ibid art 7(2).
[261] Ibid art 6(4). See for instance European Commission, COM/39.316, Gas de France (3 December 2009) 37 et seq, COMP/M.2684, EnBW/EDP?Cajastur/Hidrocantábrico (19 March 2002) 33 et seq, COMP/M.2432, Grupo Villar Mir/EnBW/Hidroeléctrica del Cantábrico (26 September 2001) 67, VABA/VIAG, OJ 2001 L 188/1 (13 June 2000) 224. See also Regulation (EC) No 714 of the European Parliament and of the Council (13 July 2009) on conditions for

The *principle of non-discrimination* imposes a domestic regulatory duty on Contracting Parties not to discriminate or treat less favorably energy materials and/or products in transit, in connection with the domestic provisions relating to energy transport and use of transport facilities, unless an existing international agreement provides otherwise.[262] This, in essence, is a conventional positive application to energy matters of the well-known WTO 'Most Favoured Nation' clause.[263] The same provision also contains a negative formulation of the said principle where energy infrastructure proves itself insufficient. In this scenario, Contracting Parties are compelled not to obstruct new transport capacity being established.[264]

A third principle informing the ECT framework is that of *liberalization of international trade*. This brings the ECT provisions in line with WTO rules which hold that a process of progressive trade liberalization is essential to achieve competitive markets. The Contracting Parties are expected to mitigate any possible market distortion and eliminate barriers to competition in the energy sector.[265] On the one hand, each Contracting

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access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003, OJ 2009 L 211/15. A good contrasting analysis on competition rules applied to the area can be found in Quick, David M and Carey, James M, Transmission capacity and market power: the Effect on a Dominant Generation Firm. 30 Energy Policy (2002), 699 et seq and Borenstein, Severin, Bushnell, James and Stoft, Steven, The Competitive Effects of transmission capacity in a Deregulated Electricity Industry, 31 RAND Journal of Economics (2000), 294 et seq, 305.

[262] Above n 248, art 7(3).

[263] GATT 1947 or GATT 1994, or both of them where both are applicable. *GATT 1947 General Agreement on Tariffs and Trade dated 30 October 1947*, annexed to the Final Act adopted at the conclusion of the Second Session of the Preparatory Committee of the United Nations Conference on Trade and Employment, as subsequently rectified, amended or modified. *GATT 1994 General Agreement on Tariffs and Trade as specified in Annex 1A* of the Agreement establishing the World Trade Organization, as subsequently rectified, amended or modified. *General Agreement on Tariffs and Trade (GATT) 1994. Marrakesh Agreement establishing the World Trade Organization* (*WTO*), opened for signature 15 April 1994, 1867 UNTS I-31874 (entered into force 1 January 1995) Annex 1A.

[264] Above n 248 art 7(4).

[265] Ibid art 6(1).

Party is obliged to have and enforce an appropriate regulatory framework capable of dealing with both unilateral and joint anti-competitive conduct in the relevant market.[266] Any Contracting Party may request appropriate enforcement action of the competition rules of another Contracting Party, if it believes that an anti-competitive conduct has been carried out in the territory of the requested State. Such conduct must be that which 'adversely affect[s] an important interest relevant to the purposes identified in…' Article 6 of the Treaty, which is the one dealing with competition.[267] The provision sets forth a procedure for notification and exchange of information on the alleged anti-competitive conduct, for assessment on the part of the notified Contracting Party (or its competent authorities), and a decision on the issue of initiating enforcement actions (or any relevant interim development).[268] The procedure referred to, along with that for the settlement of disputes between Contracting Parties, is provided for in Article 27(1) ECT, namely, diplomatic channels, as the sole means established in the ECT for resolving disputes with regard to the implementation or interpretation of Article 6.[269]

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[266] Ibid art 6(2).
[267] Ibid art 6(5).
[268] Ibid.
[269] Ibid art 6(7). ECT Article 27 provides for the settlement of disputes between Contracting Parties. Article 27(1) sets forth that 'Contracting parties shall endeavour to settle disputes concerning the application or interpretation of this Treaty through diplomatic channels'. Paragraph (2) of the said Article, in turn, states that '[i]f a dispute has not been settled in accordance with paragraph (1) within a reasonable period of time, either party thereto may, except as otherwise provided in this Treaty or agreed in writing by Contracting parties, and *except as concerns the application or interpretation of Article 6* [emphasis added] or Article 19 or, for Contracting parties listed in Annex IA, the last sentence of Article 10(1), upon written notice to the other party to the dispute submit the matter to an ad hoc [arbitral] tribunal under this Article'. In other way, under the ECT, a competition dispute based on the application or interpretation of Article 6 ECT might only be resolved using either the ad hoc mechanism sets forth in Article 6 or through that of Article 27(1). Unless reaching agreement in writing on the contrary, Article 27(2) bans Arbitral Tribunals for solving the matter. Transit disputes under Article 7 which may not be limited as to applicable Treaty mechanisms of Article 27 face, however, different challenges in connection with Treaty's general applicability, as is the case of State energy suppliers not ratifying it (such as the Russian Federation) or making express reservations that hinder dispute settlement provisions.

Although the Energy Charter Treaty sets out a general framework for cooperation in facilitating transboundary power transmission, this inquiry is specifically concerned with the operational phase of a transmission line carrying power across-borders of several Contracting Parties. Therefore, it is necessary to consider what happens when things go wrong, which is typically the case in unilateral power supply interruptions, reversions of flow and similar instances involving at least three parties generally known as transit disputes. The international legal solution proposed by the ECT to this core problem is, however, substantively disappointing for it ultimately relies upon the conciliation paragraphs (a) to (f) of Article 7 ECT which are enlivened only after total exhaustion of 'all relevant contractual or other dispute resolution remedies'.[270] As seen, under Article 7(1), Contracting parties are compelled to act 'to facilitate the Transit of Energy Materials and Products'.[271] Not to do so, i.e. not to take 'necessary measures' in pursuing that, could amount to a breach of the Treaty.

Article 27 ECT provides for a dispute settlement mechanism applicable to that situation. According to the Treaty, Contracting Parties in dispute should first resort to diplomatic negotiation to settle the matter within a reasonable period of time. Otherwise, submitting the matter to an ad hoc tribunal is possible. The Charter provides for the establishment of the Tribunal, which consists of a panel of three judges. Default governing rules are those of the United Nations Commission on International Trade Law (UNCITRAL).[272] The arbitral award must solve the dispute according to the 'Treaty and applicable rules and principles of international law',[273] and this award is to be 'final and binding upon the Contracting Parties to

[270] Above n 248 art 7(7).
[271] Ibid Annex 1, EM Energy Materials and Products (in accordance with Article 1(4), 27, 16 lists in 'Electrical Energy'.
[272] See UNCITRAL website <www.uncitral.org>. See above n 36.
[273] Above n 248 art 27(3)(g).

the dispute'.[274] However, unless otherwise agreed upon by the Contracting Parties in dispute, the mechanism at stake do not apply to trade-related investment measures,[275] nor to Energy Materials and Products–related trade between Contracting Parties while any of them is not a party to the GATT or other relevant GATT-related instrument governing the matter.[276]

Finally, as other platform-Treaties do in pursuing their objectives and furthering their principles, the ECT permits the negotiation of association agreements with States, Regional Economic Integration Organisations or other International Organisations.[277] In analysing agreements which facilitate comprehensive interconnections between power grids the ECT framework is, undoubtedly, a suitable model to look at on several heads. Unfortunately, due to its limited transit scope (Parties involved) and insufficient dispute settlement mechanism (conciliation) not as to what might favour unrestrained energy transit.

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[274] Ibid art 27(3)(h).
[275] Ibid, concerning art 5.
[276] Article 29 of the Energy Charter Treaty (ECT) contains interim provisions on trade-related matters applicable to trade in Energy Materials and Products, while any Contracting Party is not a party to the GATT and related instruments. It is worth noting that Art 29(4) ECT contains GATT mimic rules limiting the taxation capacity of a Contracting Party when importing/exporting Energy materials and Products when a Contracting Party is not a party to the GATT. In accordance thereto, Contracting Parties shall endeavour not to increase tariff rates or other charge levied above the levels set forth in appurtenant GATT Schedules. Notwithstanding that this rule seems to be useful in terms of trade-related conditions, a critical analysis reveals its true character as a mere consequential provision on potential tax-related issues, thus not addressing a previous sine qua non subject matter which is the focus of this book, namely, getting power grids interconnected and securing unrestricted power transit.
[277] *Energy Charter Treaty* (*ECT*) *and Energy Charter Protocol on Energy Efficiency and related Environmental Aspects* (*PEEREA*), opened for signature 17 December 1994, 33 ILM 360 (entered into force 16 April 1998), art 43.

III.4.3. International Standards and Grid Codes: A case study of international cooperation

In the context of the European Energy Community, for instance, Title II of the EEC Treaty requires the Parties to bring their energy sectors in line with generally applicable standards of the EU. In order for the EU to set up the market coupling[278] by 2014, for instance, a clear policy and common standards are needed well in advance to ensure interoperability across the power network in the EU.[279] For the EU, smart-meters and power grids are vital to the 'full exploitation of the potential for renewable energy and energy savings as well as improvements in energy services'.[280] A detailed action-programme is to be prepared to assist Member States in rolling out smart-metering, the information to consumers, and in making available new services. In this challenging context, the Agency for Cooperation of Energy Regulators (ACER) must ensure the standardisation of all necessary technical issues that are linked to access to renewable sources and cross-border grid interconnection. In the latter context, 'international standards' - sometimes referred to as the 'universal system' - are the technical foundations for trans-boundary systems.[281]

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[278] Ch IV.3.5 on power pricing and market coupling, 140, 142.

[279] The European Commission has set up a smart grid task force to discuss the implementation of smart grids at the European level. European Union, *Task Force on SmartGrids* (2011) Europe <http://ec.europa.eu/energy/gas_electricity/smartgrids/taskforce_en.htm>. See also, in the context of international standards on safety, *International Convention on Load Lines,* as amended, opened for signature 5 April 1966, 604 UKTS 133 (entered into force 21 July 1968); *Protocol to the International Convention on Load Lines (London)*, opened for signature 11 November 1988, 604 UKTS 133 (entered into force 3 February 2000).

[280] Notification to the Commission.

[281] *Regulation 713/2009/EC of the European Parliament and of the Council of 13 July 2009 establishing the Agency for Cooperation of Energy Regulators (ACER)* [2009] OJ L 211/1. See also Agency for Cooperation of Energy Regulators (ACER), 'Possibility of Neighbouring Countries and their Transmission System Operators to Participate in ACER and in the ENTSOs' (Staff Working Paper No 546, SEC, 28 April 2011).

International standards for electronic and related technologies are developed in accordance with Annex 3: Code of Good Practice for the Preparation, Adoption and Application of Standards of the WTO Agreement on Technical Barriers to Trade (TBT). These standards must be accepted by standardisation bodies - whether national or international – and must be abided by. The International Electrotechnical Commission (IEC) is one of the global organisations that prepares and publishes international standards for all electric-related technologies, including transmission, and carries out assessment of conformity to those standards. Indeed, one of the IEC's Technical Committees - TC90 - is currently working to define terms and a measuring method for superconducting wires; while TC20 has been in charge of similar tasks in regard to insulated electrical power and control cables, accessories, and cable systems for use in transmission.

The following example can explain the relevance of these standard setting bodies in relation to transformers. Transformers are an essential component of any interconnected transmission system, as they allow voltage homogenisation of alternating electric currents produced by different generating units - either conventional or based on renewable sources of energies - which might be located in different States. In regard thereto, international efforts for standardisation and appurtenant assessment systems play a critical role, firstly, because international standards not only improve industrial efficiency (economies of design, better production, product quality and delivery), but also and most importantly they facilitate interconnection and inter-operability of grids. Further, they allow electricity, electrical devices or any component produced by a given country under international standards to be introduced, marketed, and sold in countries with different electrical systems, thus, preventing any technical barrier or unnecessary obstacle for trading power across-borders.

III.5. CONCLUSIONS

This Chapter addressed *transnational power-transmission* through a thematic approach based on grid interconnections and power transit. The inquiry looked at the main features of power networks, the legal nature of international power transmission operations, and the most relevant challenges posed by conveying electricity transnationally. It aimed at drawing lessons from the analysis of transnational (EU) and international (EEC and ECT) examples that might be capable of being transposed to wider legal and regulatory fields in order to foster cross-border power grids interconnections and unrestrained power transit in regional non-integrated realms.

An apparent conclusion is that there is no current technical limitation for power network interconnections to be accomplished. Largely, this network interconnection at a technical level is due to the use of International Standards for electricity transformation and the development of high-voltage superconducting technologies.[282] Further, compliance with up-to-date international standards for interconnection, minimum transfer capacities, reliability and security must form part of any proposed regulatory framework.

Another finding is that the most important challenges that cross-border networks face are of an economic nature with potential legal solutions. In particular there are issues around how to secure investments for

[282] For example, Sumitomo's or Hitachi's.

interconnecting different transmission systems in the context of vertically-integrated companies, the kind of disputes falling in the scope of Article 6 ECT. On the one hand, this kind of vertically integrated company – to pursue their own corporate interest - are fairly willing to extend their generation sections into the transmission field, but they are more reluctant to do so when it comes to investing in interconnecting systems across-borders. This reluctance can be attributed to the fact that the process contributes to an enlarged integrated electricity market within which such companies would see their market share diminished or where they have to strive to compete.[283] For such reasons, although the economics of potential cross-border interconnected transmission systems might appear complex, the outlook changes considerably for the better when analysing renewable energy instead of conventional power sources for supplying the grid at a large scale. However, the development of renewable energy sources to supply the grid requires a considerable regulatory effort at international and domestic levels on expanding antitrust legal mechanisms.

In addition, due to greater diversification,[284] expansion,[285] increased competitiveness,[286] and uniformity[287] of the resulting power generating market, as well as the consequent overall cost-reductions and environmental advantages that it represents, the inquiry found that the economic outlook is better-off if the share of renewable sources in energy

[283] Above ch III.3.4, specially, sections on European Energy Policy. Internal Market and Infrastructure investment, 79; the pan-European energy market and its external dimension, 82. See also ch III.4.2, the role of International Law principles, 91.
[284] In the sense that the energy mix is opened up to foster several types of conventional and alternative energy sources.
[285]These factors make possible, not only the extension of the geographical area of the market by adding more power stations to the grid (production side), but also - and equally important - the customer base (demand side) that has access to the market.
[286] By progressively reducing the capital and/or operational costs, achieving economies at scale, and removing from the market inefficiently power units.
[287] This is the idea of a single power market which is to take the place of several domestic isolated power markets.

mixes is predominant. From a legal point of view, an international power transmission network theory is based upon the idea of internationalising, operating, and maintaining a common asset which is deemed to be, precisely, off-the-market. However, the conventional legal theory is challenged by power grids functioning simultaneously as a means to articulate the enhancement and efficiency of two other different economic markets: the generation market at one end of the spectrum, and the distribution market at the other. The book's legal proposition overcomes the usual economic characterizations of power grids as imperfect markets, that is as either monopolies or, at least, oligopolistic markets, by introducing the idea of competing markets internationally and facilitated through power grids legal interconnectedness.

Among non-technical problems posed by power grid interconnections is optimisation: how to minimise energy losses, particularly, in long-distance exchanges involving synchronisation of cross-border systems. In sum, interconnections help to expand and make more efficient the power generation markets to which these latter are attached.

More concerning, however, are the findings in this chapter in relation to policy issues that could hinder international power transmission projects, including some that are strictly legal and/or regulatory in nature, such as those involving equality of treatment in accessing transmission services and setting reliability standards. Here, the correlation between sustainable development and international cooperation on the one hand and, in contrast, security and national sovereignty on the other is crucial to understanding the stagnation which has affected transboundary power transmission projects which are economically sensible and which might provide viable transmission for quite a long time. This situation arises, basically, because the two former concepts seem to appear to be in conflict with the issues of security and national sovereignty. However, in advancing the proposition that the two sets of factors are not really irreconcilable, it is argued here that the paramount goal of a regulatory framework is to strike an appropriate balance.

As seen, International Law is usually considered as a minimal, fragmentary body of rules and principles that parties resort to for solving a conflict that presents an international component. International Law typically does not exhaustively cover a given legal-field but more often exhibit a more or less procedural character relying on domestic *fora* for detailed regulation. Further, in many areas International Law will be limited in its enforceability.

The analysis in the chapter has argued that cross-border interconnected power networks and proper regulation around power transit, under certain conditions (*technical*, *economic*, and *political*), has the potential to improve the acceptance, legitimacy and enforceability of International Law.

Indeed, the analysis presents five concrete arguments through which International Law might strengthen its applicability and enforceability by cross-border grid interconnections. In the first place: the technical aspects of cross-border grid interconnection. Secondly, interconnecting grids in a cross-border context makes economic sense, even in the limited sense of measuring the benefits of international power-trading. Thirdly, the usual characterisation of transmission systems as monopolistic does not represent a serious obstacle to States having their facilities interconnected provided there is adequate regulation. Fourthly, energy dependency and corresponding energy security policies constitute real incentives for grid interconnections and legal mechanisms of enforcement.[288] Finally, the possibility of linking a single, technically-based, well-defined scope (cross-border grid interconnection) with an already established and ongoing international law framework (such as the WTO or an improved ECT-scheme) with due guarantees of non-discrimination, full grid access, independent operation, and non-interrupted power flow would contribute to International Law achieving greater enforceability. The motivation for nations adopting such a scheme would be fair and unrestricted power trade, energy security, and sustainable economic development, as overarching objectives shared by all stakeholders of the international community.

In that sense, the analysis of the case study of the European Union is particularly significant. Energy-related issues, such as trans-European networks, the internal market and territorial cohesion, are 'shared competences' between the EU and the Member States.[289] These policies therefore, are jointly agreed upon all Member States and the Union, in compliance with guidelines and recommendations adopted by the Council. Since the EU by itself has no competence to implement what has been recommended, cooperation and flexible coordination between the Member States is required. Nonetheless, higher-rank measures, such as Regulations, Directives, or Decisions adopted by the Council are compulsory at European level and their implementation - to a certain extent – has the effect of eroding traditional views of national sovereignty. As seen, the EU

[288] An important development in sovereign States transferring some enforcement power to international organisations and their secretariats is found in arts 162(2) (a), (u), (v), (w) and (z) and 176 of the 1982 UNCLOS. Through these provisions the Authority is endowed with legal personality and capacity as may be necessary for the exercise of its functions and the fulfilment of its purposes. *United Nations Convention on the Law of the Sea (UNCLOS, Montego Bay), opened for signature 10 December 1982, 21 ILM 1261 (entered into force 16 November 1994)*.

[289] *Lisbon Treaty or Treaty of the Functioning of the European Union (TFEU)*, opened for signature 20 June 2007 OJ C 306/1 (entered into force 1 December 2009) art 4(1)-(2).

Law is currently regarded as a set of rules constituting 'a separate [autonomous] legal order, whose provisions belong neither to international law nor to the municipal law of the Member States'.[290] Some of the rules features direct applicability, direct effect, and these prevail over domestic law; including imposing on Member States liability for EU-Law breaches. This supranational aspect of the EU-Law is, by far, the most important feature for the argument outlined in this book. The impact of this supranational character of EU Law upon the understandings of sovereignty and energy security are to support the proposition that transboundary interconnections are better advanced through certain types of domestic energy portfolios: those 'green' and harmonised[291] through a large-scale (regional) single system of interconnected bulk-power grids.

Turning to the current European energy policy, two aspects are particularly relevant for this analysis. The first one is *internal* to the EU and it consists in the setting up a pan-European integrated, interconnected and competitive energy market through the development of several infrastructure projects whilst simultaneously moving towards sustainable decentralised energy production. The integration of renewable energy sources is essential. As set forth by Directive 2009/28/EC this integration will include mandatory national targets for achieving higher proportions in the overall share of energy from renewable sources in gross final consumption by 2020.[292]

However, in terms of European energy policy concerns, the *external* aspect has been gaining momentum over recent years. Under this new direction, successive enlargements of the Union, as well as outside-EU projects have

[290] *Common Market Law Revue* (1967) 483.
[291] See ch II, particularly, the Brazil case study, II.4.3, 58.
[292] As well as for the share of energy from renewable sources in transport.

begun to influence policy decisions. Projects such as Nabucco, ITGI, and the Southern Corridor make transboundary transmission possible and are all essential for EU network stability and security of supply. These developments have sparked European eagerness for placing interconnectors at the outbound limits of the Union or even within third countries or maritime areas. While at one level these developments could be presented as a manifestation of the obligation of solidarity among Member States, under a more critical analysis, the placing of interconnectors across external borders is a natural consequence of the perceived need for strengthening the external character of the EU energy market. In this sense the EU's interest in attracting Russia, North Africa, and the Far East to participate in the Energy Charter Treaty framework, even though their involvement may be limited, is in line with this policy intention. The EU is also pressing for improvements to transnational instruments, particularly, the transit provision of the ECT and/or the finalisation of a Protocol on Transit. In continuing to pursue this interest, the EU conducts sustained efforts in trade in the power generation field at the WTO arena.

In the future, guidance applicable to both dimensions of the EU market: internal and external, could be drawn from future European Court of Justice decisions as to mechanisms to settle disputes between Member States where these are encompassed by an international agreement on international transmission interconnections.

For countries not embarking upon on integration processes but nonetheless willing to engage in an international legal framework capable of sustaining cross-border power trading and transit, both the wider analysis and the case study offer a number of valuable lessons. The first is the importance of setting up an area of influence, whether that is territory-based as in the EU model or functional (connectivity and transit), as this book advances. Secondly, there must be a clear identification of the transmission projects or current facilities deemed to be of mutual interest. Thirdly, an overarching operative structure, preferably enjoying independent international status, is required. Fourth, shared competences between States, as to the normal operation of an interconnected power grid should not be permitted. If shared competences are allowed, they should be limited in scope, accurately framed, and restrictively construed. Fifth, participation of third parties in transmission projects or accession to already established legal frameworks should be allowed and encouraged. Sixth, the principle of solidarity whereby bilateral negotiations on energy issues benefit all common stakeholders is essential and must be strengthened. Finally, competition issues and, particularly, grid access should – in principle - be addressed domestically, but in any case Contracting Parties should enjoy good standing at national courts and be reciprocally entitled to request appropriate antitrust enforcement actions.

Amongst a group of States, whether neighbouring countries or not, the analysis and case study on power transmission concluded ultimately that, for further energy mix regulatory convergence to occur the legal approach to it must be selective and coherent as to the relationships between transit, power-deficit, and power-surplus countries and include both internal legal measures, such as the synchronisation (or better still, harmonisation) of energy mixes for integrating renewable sources; as well as outbound common legal decisions on cross-border grid interconnections, power trade, and unrestricted energy transit.

In sum, a well-framed, technically-based, dedicated scope for transnational power grid interconnections and energy transit at regional level, into ongoing international trading schemes such as the WTO or an improved Energy Charter Treaty, would further international power trading and sustainable economic development as drivers for International Law to achieve greater enforceability.

CHAPTER IV. BARRIERS TO TRANSNATIONAL ELECTRICITY TRANSMISSION

IV.1. INTRODUCTION

Along with presenting the research question: why are power grids not interconnected transnationally, Chapter I introduced some of the outcomes of this inquiry. It was advanced, then, that power transmission interconnectedness and unrestricted power-transit across-borders might facilitate the gradual harmonisation of energy matrices[293] between nation states and allow faster integration of renewable energy sources. Through the case study of Brazil's energy mix development, Chapter II analysed the prospects for potential harmonisation of multiple domestic policies on energy matrices to allow the integration of renewable energy sources. Chapter III, in turn, focused on existing regulatory models for transnational energy transmission, being the European Union the most advanced example of overcoming traditional views of sovereignty, although it has been unable to create a single electricity market. Simultaneously, the overarching scheme of the Energy Charter Treaty represents a step forward in terms of internationalising energy transmission. Although true that the ECT framework overcomes many sovereignty issues among Contracting Parties, it is still fragmentary in its application and falls short in terms of effectively securing unrestrained transit when Third Parties are involved.

Having explored some of the barriers to transnational energy transmission and the EU model that outlines a possible role for international rules, this Chapter builds upon the conclusions drawn in previous ones and explores

[293] See ch I, especially, I.4.2 about comparative analysis, 31; and I.4.3 with regard to case studies, 32.

the role of International Trade Law and international cooperation as potential mechanisms for advancing policy harmonisation between nations to assist the integration of renewable sources of energy and cross-border power grid interconnection within the regional scope of applicability of this thesis.

In its first part, this Chapter examines the role of International Law in the light of a proposed reinterpretation of some of its principles that would allow International Law to serve regulatory goals in transnational contexts. Once considered merely as a limitation to the absolute sovereign power of States, International Law has gradually evolved - both in theory and practice – to become a legitimate system with a distinct set of legal norms. Although the academic discussion continues as to whether its features qualify it as a 'proper' legal system,[294] day-to-day practice and compliance by international agents seem to cast no doubt that it has significant effect in guiding relations between nation states. However, when applied to transnational power transmission and the integration of renewable energy sources, there are still structural deficiencies in the International Law system which this Chapter seeks to identify. The close relationship between International Law and domestic legal regimes as to certain energy regulatory matters will be examined through the principle of international cooperation; whilst the issues of freedom of energy transit and non-interruption of energy flow shall be considered in the light of the principle of extraterritoriality. In turn, the principle of non-discrimination shall be used to examine matters about fair legal treatment as to origin and destiny of conveyed electricity. Finally, the problem of characterising rights over transnational transmission facilities – whether public, private or under international status – shall be analysed.

[294] This is to say, substantial and fully enforceable.

The second part, deals with the role of International Trade and Economics. Over four sections, an economic analysis of trans-boundary power transmission markets is conducted. The analysis aims at depicting the particularities of power transmission markets relevant to the thesis. The first section examines the economic theory perspective by presenting some features of power markets and explaining how they work. The section presents an argument for integrating renewable sources of energy in the context of economic competitive advantages and potential cross-border interconnected power grids. The theoretical energy mix-configuration aspect is supplemented, in the next section, with a more practical perspective on the power market: one focused on the transmission sector and an appropriate regulatory approach. The main peculiarities of the transmission market are outlined there, such as conversion issues, pricing, and restrictions in transmission capacity; continuing flow, load balance, and mix openness are depicted in order to convey a detailed illustration of how the power transmission market works. The third section is devoted to the functioning of the international electricity market in relation to the WTO regime. The last section deals with the crucial issues of conventional and renewable sources-related generators accessing a market that is mostly regarded as monopolistic. It also assesses the possibilities for, and obstacles to, creating a single electricity market.

The third part analyses the role of international cooperation and the problematic relationship that this concept has with domestic politics, particularly, in securing the attainment of global interests such as sustainable development, the harmonisation of energy mixes in pursuit of the integration of renewable energy sources at a large-scale, and cross-border interconnection of power grids. In the current climate change context, the dilemma in terms of attaining associated goals such as the avoidance of dangerous levels of climatic change is presented through the regional case study of South America and the efforts of South American nations to reach sustainable development by not necessarily following the path to fossil fuel-based economies. As stated in Chapter I, much of the analysis is focused upon assessing the barriers to, and opportunities for, a unified South-American energy policy in which a common transmission network could arise.

Finally, the chapter presents some conclusions about the legal barriers which are hindering transnational grid interconnections and unrestrained power transit among nations. It also outlines a number of diverse legal mechanisms that have the potential to overcome these difficulties.

IV.2. THE ROLE OF INTERNATIONAL LAW

In the simplest terms, it is clear that Law serves many varied purposes. Hence, it may well serve the stated aims of this research. Indeed, utilitarianism and further pragmatic developments in the area of economics and trade is just one approach to considering the functionality of the Law. In fact, a philosophical-historical analysis shows that one of the oldest basic legal purposes is to secure self-preservation of the human species, as the very least that living in community should guarantee. As human societies have evolved and gained in complexity, the demand for Law to meet a variety of societal demands becomes more sophisticated, but rarely modifies the basic idea of securing human self-preservation.

While the principle of safeguarding human life is irreducible and essential, the trend towards more concentrated and integrated communities has lead to a range of different social and political structures, of which States are currently the most representative examples. The clash between societies that are politically organised pursuing their own – sometimes – ill-defined goals (policies included) calls for a mechanism to guarantee the subsistence and development of all of them in the *community of nations* as the international realm is often referred to. This mechanism is the International Law.

Much academic debate has arisen about the character and features of that legal branch;[295] including whether it can be properly characterised as a legal system and the application of monism and dualism theories when domestic and international rules interact with each other.[296] For the purposes of this inquiry, however, it is recognised that there exists both a domestic legal order and norms and rules that govern the conduct of nation states internationally. Although, theoretically at least, transposing the character and features of an established domestic legal system to the international domain might explain real-life practical difficulties

[295] From an historical point of view on International Law see Cyril E. Black, Richard Falk, Klaus Knorr, Oran R. Young, *Neutralization and World Politics* (Princeton University Press, 1968). Further, the book is interesting, particularly, for being illustrative on the definition of and areas suitable for neutralization (see Ch III, p 66 et seq), obligations derived from that status, functions of neutralization, and international legal problems arising from it including supporting or restoring international order, maintenance, and enforcement. The idea of neutralization of cross-border transmission facilities might serve the purposes of joint operation between multiple States. Furthermore, see specially p 90-92 on 'Removal from Contention-Space' and other non-State entities. The astonishing evolution experienced by International Law can be seen decades later in P. Allot, *Eunomia: A New Order for a New World* (1990) where the author reflects on the challenges posed to International Law by shared natural resources, unequal distribution of them, and world transforming economic activities among others. More than a decade later, Philippe Sands in 'Turtles and Torturers: The Transformation of International Law' (2001) 33 *NYUJILP* 527-558 acknowledges the large body of principles and rules of International Environmental Law of bilateral, regional and global application reflecting international interdependence in a globalised world. Eleven years later, P. Sands and Jacqueline Peel reviewed the International Environmental Law state of affairs in *Principles of International Environmental Law* (Cambridge University Press, 2012), see particularly Part I, p 10 on International Legal Order.

[296] For a good contemporary overview in the European and United Kingdom context, see G. Anthony, *UK Public Law and European Law: The Dynamics of Legal Integration* (Oxford Hart Publishing, 2002).

encountered by International Law as the result of historical factors, ongoing development, lack of formal structures, or immature consensus-forming processes; the legal argument on the role of International Law advanced here has no need for such an approach. Instead, the research question is answered at theoretical level through the decoupling of domestic legal systems from its foundations, namely, the need for human survival. These systems have emerged, grown, and become so extremely layered and sophisticated that they have lost sight of cooperation as a suitable way of survival. In contrast, the so-called underdevelopment of International Law, many times considered as a fundamental flaw, becomes advantageous due to the accessibility of its rules and consensus to the basic principle of self-preservation and thus lack of excessive structuralism.

The awareness of a global common danger, either as a result of climate change impacts, peak oil, water resources depletion, or even the incapacity of the world's nations to sustain levels of economic growth due to shortages of energy production, might make countries favourable to reach agreements on matters of mutual benefit, e.g. making energy generation and transmission more efficient by creating a shared power grid. Through mechanisms such as international conferences, direct negotiations and specialised technical team-work, International Law is well equipped for reaching meaningful, more efficient, and enforceable agreements on matters concerning multiple parties.

However, International Law is seen as lacking a comprehensive framework to enforce its rules.[297] Enforceability is generally regarded as an essential feature of a legal system. On this point, scholars group

[297] A. Boyle, 'Some Reflections on the Relationship of Treaties and Soft Law', (1999) 48 *International and Comparative Law Quarterly*, 907.

themselves in those who denies any legal character whatsoever to a norm unable to be enforced by external means and thus not distinguishable from one of a mere moral character;[298] and those who see the nature of Law not by reference to outside factors, but in the level of voluntary acceptance that a rule elicits.[299] In the light of the latter approach, International Law qualifies as a legal system and surmounts the unenforceability objection. Moreover, abiding by International Law – something that is commonly seen as a mere pragmatic occurrence by its detractors – is reinforced as indelible mark of lawfulness since it represents, instead, not only the international community's awareness of the rules, but also and most importantly, the level of acknowledgement that they ought to be abided by the entire international community. In this way, International Law is viewed as an instrument to resolve disputes between nations.[300]

In this context, despite acknowledged disadvantages it is remarkable that International Law has played such a significant role as the instrument that States have primarily chosen to deal with matters normally considered strategic, like energy supply and transboundary transmission. These issues have been a major challenge faced by China, Brazil, the EU, and Japan, just to name a few. The energy supply problem has its origin in the recognition by countries of trading interdependence and shared dependence on a finite resource: carbon-based fuels. This twofold realisation has led to the principles of trade liberalisation on the one hand

[298] D. Walker, *The Oxford Companion to Law* (Oxford, Clarendon Press, 1980) p 722 defines 'Law' and 'Morals', D. Bederman, The Spirit of International Law (University of Georgia Press, 2002) p 2 which defines International Law as a legal system of 'positive international morality', S. Atapattu, Emerging principles of International Environmental Law (Transnational Publishers, 2006) p 384 in considering equity as one of the oldest principles in International Law.
[299] R. Dworkin, *Taking Rights Seriously* (Oxford University Press, 1977).
[300] R. Higgins, 'International Law and the Avoidance, Containment and resolution of Disputes (General Course of International Law)' (1991) 230 *Recueil des cours*, 292.

and the diversification of energy mixes on the other. Illustrative of the role played by International Law is Japan's energy supply scheme. This scheme is made up of several interrelated bilateral trade treaties. The treaties deal with the provision of raw materials (uranium) for its nuclear plants, and contain detailed provisions on delivery and timelines, as well as on safeguards, penalties, and dispute settlement mechanisms. Another instance is the European Union supranational legal framework on pipelines and its international agreements dealing with those crossing its outer boundaries into non-EU countries.

Similar levels of success have not been achieved in securing trading and cross-border transit of electricity though. This is, however, not surprising due to the different physical peculiarities of natural gas and electricity. There is also a less apparent and strategic reason that oil/natural-gas pipelines treaties tend to succeed while those on electricity does not. The former are designed to carry energy to designated consumer centres from fully geographically identified sources, which undeniably means crossing sovereign territories of countries interested in the trade and transit; a key reason why pipelines agreements are rarely breached. Not only are these agreements usually abided by because the trading partners, the object of the transaction, and the territorial source and final destiny of the product are accurately determined and fixed, but also because each party has a common interest in securing the supply in a synergistic fashion. This is unlikely to happen in a power network fed with a fungible[301] product where the source cannot be identified, it can be used anywhere along the grid, and where territorial-based production claims are difficult to establish.

[301] See above n 36.

Therefore, national domestic regulations seem inappropriate since they mostly rely upon anachronistic territorial sovereign ownership-based concepts. In turn, standard international law-based solutions, like those currently applied for oil/natural-gas pipelines are insufficient to meet the specifications of transnational electricity trading. The challenge posed to International Law is to develop legal mechanisms capable of dealing with this task. The legal difficulty in configuring a transnational power grid resides in finding a way to permanently interconnect trunk power grids allowing free and unrestricted flow of electricity across-borders. If the interconnection, power trading and transit take place between two or more specific countries, but requires in any way the acknowledgement, assent, non interference or abstention of a third country, the challenge to International Law is greater.

The thesis argues that, for International Law to meet such challenges and deliver effective solutions some reinterpretation of some principles and basic structures must be accomplished. The nature of this task shall be the topic of the following section.

IV.2.1. Reinterpretation of International Law principles

A brief overview of the philosophical and legal evolution of International Law shall serve to explain what a specific reinterpretation of principles of International Law means in the context of the book focus as well as what such reinterpretation is not about. It is worth stating that this research does not advocate changes to the sovereign right to exploit natural resources within the territorial boundaries of a State, nor to the right of a sovereign State to be free from external interference over their exploitation. Instead, it looks at how to improve the efficient use of energy, irrespective of how and where energy is generated.

Despite long standing concentration of political power at international level by a few nations, the international system has struggled but finally succeeded at creating specific areas in which it is possible to overstep both inbound sovereignty and oligarchic international control. In areas such as Humanitarian Law,[302] Human Rights, and more recently International Criminal Law,[303] the development of rules of *jus cogens,* the activity conducted by the International Court of Justice,[304] and the creation of the International Criminal Court signal a fundamental shift in the dynamics of the international arena dealing with armed conflicts, violations to human rights, and/or transgressions considered to be international crimes. Such principles and decision-making bodies have operated not only to supersede domestic jurisdictions which might not integrate them explicitly, but also to show that a set of rules can be developed and function independently from the tight political control exerted by the permanent members of the UN Security Council.

To extend the applicability of International Law in transnational power transmission, it is argued the necessity to introduce certain modifications to its principles in highly selective areas, specifically, where states have

[302] See *Corfu Channel Case* (United Kingdom v Albania) [1949] ICJ Reports 4, 22 in regard to 'elementary considerations of humanity', *Military and Paramilitary Activities in and against Nicaragua Case* (Nicaragua v United States) [1986] ICJ Reports 14, 113-115 and 129-130 on 'fundamental general principles of humanitarian law'.

[303] Reservations to the Convention on the Prevention and Punishment of the Crime of Genocide [1951] ICJ Reports 15.

[304] For example, *Fisheries* (United Kingdom v Norway) (Jurisdiction) [1951] ICJ Reports 116, *Estai* (Canada v Spain) [1998] ICJ Reports 432, *Fisheries* (United Kingdom v Iceland) (Jurisdiction) [1973] ICJ Reports 3, *Legality of the Use of Force* (Yugoslavia v United Kingdom) [1999] ICJ Reports 218, *Legality of the Threat or Use of Nuclear Weapons* [1996] ICJ Reports 226.

consented to be bound in a way that either modifies the domestic laws or creates supranational legal frameworks. Normally, these kinds of rules and principles elicit acknowledgement and acceptance due to wide *ex profeso* utterance.[305] This does make sense in factual situations or in terms of legal constructive issues in which too many details might risk reaching consensus in sensitive matters which naturally demand a wide-open focus. This book advances the idea of seeking international binding consensus at the other end of the spectrum, namely, on two technical highly restricted subject-matters: grid interconnection and cross-border unimpeded power transit (through third party countries). For this purpose, the more technical and clearly defined the legal scope of a treaty, the better; difficulties in reaching agreements in sensitive political matters are often due to the fact that the expected benefits arising from the transaction are diffuse or significantly more favourable for one side. By contrast, concrete technical issues in which the realisation of benefits is normally uncontested and straightforward follow a different path. The argument is more compelling if the subject-matter presents a clear advantage for all participants. Consensus upon grid interconnection and cross border power transit matters would provide tangible benefits for all parties. The ability to upload and download power from the grid would make possible to achieve wider scale integration of renewable energy sources, whilst taking advantage - at the local level - of stabilising the capacity of an extended power network.

Therefore, whilst retaining its characteristic detachment from the specific law of a given place, International Law needs to undergo a process of scope specialisation in regard to both specific subject matters referred to

[305] Namely, express consent, which is the basis of Treaty Law. See generally Alan Boyle and Christine Chinkin, *The Making of International Law* (Oxford University Press, 2007).

above. As to energy, this means building a set of unique principles, norms, and institutions that cover interconnections and power-transit.

In regard to what would be needed to configure an international legal framework capable of sustaining a transnational power network and unrestricted flow of electricity, contemporary International Law offers a range of instruments and suitable structures. The extraterritoriality principle, for instance, has allowed agreements to be entered into for the peaceful use of international areas like the high seas[306] and also the neutralisation of territories in conflict.[307] A similar tool might well sustain the installation of transnational transmission facilities (substations and/or lines). Even the territorial managerial aspect of pipeline-related international agreements could serve a similar purpose[308] as long as its dispute settlement mechanisms are truly independent, global in application, and any resulting decisions are readily enforceable.

However, these kinds of agreements do not solve the problem of securing unrestrained transit through unrelated third parties' territories. In other words, the principle of extraterritoriality needs to be cast in terms of evolving from regulating pacific uses of common spaces and maintaining the status quo of areas in conflict, towards regulating the limited use of sovereign territories for the sake of commonly derived benefits. It is worth

[306] S. Marr, *The Precautionary Principle in the Law of the Sea – Modern Decision-Making in International Law* (Kluwer Law International, 2003) 197, 214.
[307] Cyril E. Black, Richard Falk, Klaus Knorr, Oran R. Young, *Neutralization and World Politics* (Princeton University Press, 1968).
[308] A. Kovacevic, *The Impact of the Russia-Ukraine Gas Crisis in South Eastern Europe* (Oxford Institute for Energy Studies, 2009) available at <http://oxfordenergy.org/wpcms/wp-content/uploads/2010/11/NG29-TheImpactoftheRussiaUkrainianCrisisinSouthEasternEurope-AleksandarKovacevic-2009.pdf>, A. Konoplyanik, 'Russian-Ukrainian Gas Dispute: Prices, Pricing and the ECT' (2006) *IV Russian/CIS/Energy & Mining Journal*, 15-16, S. Pirani, J. Stern and K. Yafimava, 'The Russo-Ukrainian Gas Dispute of January 2009: A Comprehensive Assessment' 7 Oil, Gas & Energy Law (OGEL) (Oxford Institute for Energy Studies, 2009), 22.

noting that, at an early stage, this reinterpretation would require no change whatsoever in the ownership regime or international status of the spaces subjected to cross-border transmission projects, since the primary obligations on the part of the States whose territories are subject in such endeavors would be, firstly, not to impede the development of investments and infrastructure and, later on, *not to interrupt or disturb in any way* the operation and regular maintenance of the facilities concerned.

In this context, it is essential the differentiation between domestic legal orders whether associated with citizenship, territory, or other exclusive jurisdictional connector on the one hand; and, on the other, an alternative legal order in which jurisdictional connectors are solely international. This is reminiscent of the ancient dichotomy between legal systems in which applicability and enforceability were based on individual connections to a territory rather than on a subject-matter devoid of territorial connections.[309] In other words, the enforceable applicable law must be international in character and entirely subject-matter-based.

Although clearly advantageous from several points of view, the recasting of International Law in a way that facilitates interconnection and cross border power sharing is easier said than done. The proposed International

[309] Gillian D. Triggs (ed), *The Antarctic Treaty Regime. Law, Environment and Resources* (Cambridge University Press, 1987) makes a good example on the question of jurisdiction when applied to an specific territory (Antarctica) over which different legal doctrines of territorial acquisition have been used whether to assert sovereign territorial claims and jurisdiction or to deny them. The outcomes are, not surprisingly, disparaging from one another. The book is illustrative on the challenges that an international space (as Antarctica is normally categorized) poses on legal instruments. Further, the Antarctic regime is a remarkable example of a Treaty-created legal framework based upon international cooperation (on scientific research foremost) over an area in which territorial claims have been 'freezed'. The book comments on Article IV of the Antarctic Treaty as the base for a 'bi-focal' interpretation of the Antarctic Treaty obligations consistent with each Contracting Party's juridical position on sovereignty, thus, allowing simultaneously the preservation of the *statu quo* and proceedings to regulate or manage the Antarctic environment (in the Antarctic Treaty area).

Law realignment faces a different more complex challenge: political unbundling. In the current state of affairs, a great amount of political power is concentrated in just a handful of international actors due to their vast economic power, concentration of weaponry of mass-destruction, and/or superior technological capacity among other things. Thus it is these actors who are capable of influencing world-scale rule-making processes.[310]

However, it is worth pointing out that none of such factors turns out to be decisive - whether separate or jointly - in preventing non-influential, low-tech, ill-armed, developing and/or poor countries from pursuing a mutually beneficial goal such as a single power network. The explanation has several reasons. Firstly, although initial investment costs could be high, in the long run a transnational power network project is highly cost-efficient, since it reduces transmission losses as well as power generation costs by allowing renewable sources to become integrated to the grid very rapidly. Secondly, a transnational power grid project may contribute towards international peace-making and regional political stabilisation processes, through making the Parties strategically (both in trade and energy supply) interdependent, thus, making armament rallies redundant, lowering political tensions between countries, and phasing out energy supply interruptions as a bargaining tool. Thirdly, there is no need for top-notch transmission technology since the one required is standard and readily

[310] A.D. McNair, *The Law of Treaties* (1961, rev ed.); P.Szasz, 'International Norm-Making' in E. Brown Weiss (ed), *Environmental Change and International Law: New Challenges and Dimensions* (1992); J.E. Carrol (ed), *International Environmental Diplomacy: The Management and Resolution of Transfrontier Environmental Problems* (1987); W. Lang, 'Diplomacy and International Environmental Law-Making: Some Observations' (1992) *3 Yearbook of International Environmental Law* 108; U. Beyerlin and T. Marauhn, 'Law-Making and Law-Enforcement in International Environmental Law after the 1992 Rio Conference' (1997) *Berichte* 4; I. Brownlie, *Principles of Public International Law* (Oxford Clarendon Press, 7th ed, 2008).

available to all countries. Finally, some of the most influential developed countries are also high-energy dependent; therefore, they would not - in theory - oppose an initiative which they may well benefit from.

Nevertheless, for this change in power dynamics to occur, International Law requires a shift in focus towards more cooperative and regional integrative processes. The EU case study is relevant for it demonstrates the sustained integration of many processes (including politics, economics, and supranational legislation among other aspects). However, at present, EU policy efforts have failed both in configuring a single comprehensive electricity market within its own borders and in securing overseas electricity supply. Energy Integration Agreements entered into by the EU either lack transit guarantees from relevant third party countries (as under the ECT framework without its corresponding Protocol); or, if they do exist, they are defective or unenforceable (such as those in the EU-Russia Treaty in regard to Ukraine). International Law rules, particularly those concerning treaty negotiation on energy integration issues should explore new terms and conditions for clauses regarding energy transit.[311]

Perhaps a better way to attract the adhesion of prospective Third party countries to provisions dealing with energy transit issues would be to state - clear and straightforwardly – the right of transit countries not to take out but to inject their electricity production into the grid (or at the very least, into the dedicated transnational transmission line) as long as the power injected was renewable-sourced and the price thereof at the time was less than the one charged and informed by the regular Contracting provider,

[311] *Energy Charter Treaty* (*ECT*) *and Energy Charter Protocol on Energy Efficiency and related Environmental Aspects* (*PEEREA*) (Lisbon), opened for signature 17 December 1994, 33 ILM 360 (entered into force 16 April 1998), arts 2 (Purpose of the Treaty) and 7 (Transit) (7) (on 'Transit' disputes and (10) (on 'Transit' definition).

(less any cost of transmission). In this fashion, a new International Law transit provision (contained in a treaty) not only guarantees the deal made between two or more Contracting Parties on power supply, but also it serves a double purpose. On the one hand, at an international level, it promotes the extension of the application of the treaty by encouraging potential transit countries to adhere to the provision, thus, making them responsible for any eventual breach, such as energy supply interruptions. It also gives these countries a strong incentive not only to commit to allowing fee-free and unrestricted transit through their territories, but also to take active participation in the operation (particularly metering) and maintenance of transnational transmission facilities in their territories. On the other hand, and even more important, this sort of International Law treaty provision is designed to have a direct impact over domestic energy policies, whether by promoting the use of the existing local trunk grid as part of the transnational project or by incentivising connection to the transnational power grid as a means for attracting local power injections.

Further, for international agreements to influence domestic law, they should be utilised to encourage the improvement of domestic renewable power generating capacity, efficiency and cutting-off costs, whilst taking advantage of possible shorter transmission distances. Therefore, a transit-State adhering to a provision as proposed, which is also an excess-power country with an energy matrix based on fossil fuels would not be interested in restraining the power flow through its territory. On the contrary, it would seek to rapidly shift into a 'greener' mix to dispose of its surplus power production by exercising the option provided by the treaty provision.

In a critical scenario in which a power deficit transit-State, might be tempted to withdraw electricity from the grid, whether for itself or Third Parties and thereby disturbing the power flow, the transit provision may still be complied with by giving to the power-deficit transit-State the option to be supplied in terms alike to those agreed on by the original State further down the line demanding power supply, which should be compensated due to the disturbance in supply.

Naturally, other general conditions should be imposed in the treaty and integrated into the wording of the new proposed transit provision. For instance, one recommendation is that transit States' power injections and/or withdrawal of power be subjected to operating instructions, technical capacities, and reliability security standards of the transmission line. Of course, traditional legal guarantees such as bonds, deposits, fines, and suspension or termination of rights could as well be included to secure the transit State abiding by the transit clause. However, the concern here is how to work out a provision that is not just capable of attracting consensus between Contracting Parties and prospective transit States *per se*, but that is of intrinsic value in forging transactions and providing common-sense solutions as a rule of International Law regulating a transnational power transmission network conceived for the common interest of a number of nations.

In this manner, the introduction of a new International Law rule (provision, clause or custom) becomes a powerful incentive to transit-States to abide by (or adhere to, if embodied in a treaty) and, for that reason, to be internationally responsible as to the transit is concerned. It also becomes a powerful tool to influence important changes in regard to the type of energy mix that such States might promote and as a means to regulate competition and improvement in the local power generation sector.

The proposed reinterpretation of specific principles of International Law around grid interconnection and transboundary power transit reinforces State liability in a new dimension. This dimension is inextricably connected with regional common interests. States signatories to the treaty would have a multilateral relationship, meaning that apart from being liable to their counterparts, they would also be liable to the international community as long as the objectives of the treaty provide for the attainment of extended common interests. These common interests might well proceed from mutual survival at the very least, through securing economic growth or regional energy supply, or up to achieving environmental protection and sustainable development. The appurtenant principles of International Law that it is argued should undergo modification, are the content of the following section.

IV.2.2.The principles

Cooperation (v individualism)

The development of contemporary International Law relies mostly upon its governed agencies giving consent, whether openly expressed or implicit.[312] States and international organisations pursue their objectives through interacting with each other, entering into agreements, and/or consistently behaving in a certain manner by which all participants agree has legal

[312] See generally *Declaration on Principles of International Law concerning friendly relations and cooperation among States in accordance with the Charter of the United Nations*, UNGA Res. 2625 (XXV) (1970); I. Brownlie, *Principles of Public International Law* (Oxford Clarendon Press, 7th ed, 2008); P. Sands, 'The Environment, Community and International Law' (1989) 30 *Harvard International Law Journal* 393.

consequences attributed to it.[313] This multi-fold rule-making process is particularly useful where two or more conflicting interests are at stake, because it compels equally-powerful counterparts to negotiate and, eventually, settle for an intermediate solution which accommodates part of their interest in a mutually satisfactory manner. The legal outcome of this process is normally thought to be fair and just. Out of this perception largely comes the belief that the understanding or rule so created must be honored and that parties must abide thereby.

Since that process can accommodate wide and varied interests, it could aptly serve a single common interest which transcends national borders and which requires nations to work together to sort it out: for example, sustainable energy supply. No State can resolve this issue acting alone and the solution goes far beyond minimal bilateral efforts on energy integration. This goal calls naturally for unity and cooperation, for the general wellbeing of the international community relies upon large-scale energy generation to help meeting its basic needs. Although International Law has played an important role in addressing cross-border power generation and transmission in a few countries, such as Canada and the United States, Spain and Morocco, and Brazil and Paraguay; or in backing-up power generation agreements between some European countries, these are merely isolated examples of bilateral cooperation. The configuration of a large-scale grid interconnecting several countries requires a different qualitative approach towards understanding what international cooperation really means when dealing with transnational energy generation and sustainable development.

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[313] See generally, P. Sands and P. Klein, *Bowett's Law of International Institutions* (2001, 5th ed).

The principle of cooperation is articulated as 'good-neighbourliness' in Article 74 of the United Nations Charter in the context of social, economic, and trade matters.[314] International Law has embraced this principle to successfully achieve common goals or deal with common threats, particularly in regard to hazardous activities and/or international emergencies. Indeed, when faced with the appalling consequences derived from global warming, the common interest of human self-preservation has resurfaced and proven to be better advanced through cooperation, rather than advocating particular national interests. The Stockholm Declaration[315] and the Rio Declaration[316] as well as other international instruments[317] have showed this evolution into areas of environment protection.

The principle has traditionally been understood in general terms, more or less, as an emanation of the principle of good-faith needed to implement the objectives of the treaties. However, the nature and extent of what good-neighbourliness comprises requires further specification.

For some, good-neighbourliness, as it has been invoked in a number of international disputes, refers to the obligation to exchange information or to give notice about facts or situations of public concern or having the potential to affect a particular State or international agent.[318] For others, the principle also conveys more specific commitments, such as entering into

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[314] *Charter of the United Nations,* art 74.
[315] *Stockholm Declaration* UNGA Res 2398 (XXIII) (1972), Principle 24.
[316] *Rio Declaration* UNGA Res 47/190 (1992), Principle 27. See also Ileana Porras, 'The Rio Declaration: A New Basis for International Co-operation' (1992) 1 *RECIEL* 245.
[317] Such as the *Convention on Biological Diversity* (*Rio de Janeiro*), opened for signature 5 June 1992, 31 ILM 822 (entered into force 29 December 1993); *Convention on the Law of Non-Navigational uses of International Watercourses (New York), opened for signature 21 May 1997, 36 ILM 700 (not yet in force)*; UNEP Draft Principles (1978) or the ILC's draft Articles on prevention of Transboundary Harm.
[318] *Kasiliki/Sedudu Island* (*Bostwana v Namibia*) (*Judgment*) [1999] ICJ Rep 1045, 102; *Lac Lanoux Arbitration* (*Spain v. France*) (*Awards*) (1957) 24 ILR 101.

previous consultation or an invitation to participate in decision-making processes before carrying out activities which may bring irreversible effects,[319] particularly in trans-boundary contexts. The litigation entertained between Ireland and the United Kingdom before the International Tribunal for the Law of the Sea (ITLOS) on the decommissioning of the MOX plant is a landmark case as to the vital information sharing necessary to preserve the marine environment under Part XII of UNCLOS. In this situation, the tribunal understood the obligation to co-operate by ordering the Parties - setting aside information exchange and potential risks monitoring - to '(c) devise, as appropriate, measures to prevent pollution of the marine environment which might result from the operation of the MOX plant'. [320] What - at the outset - was conceived as a provisional measure order by the tribunal was later on affirmed,[321] with a recommendation to set forth further arrangements to address the tribunal's concern on timeliness and effectiveness of cooperation and consultation.

Further development of this principle on cooperation would greatly benefit the cause of a transnational power grid, since the interconnected operation - when not confined to a separate international body – demands not only that signatory States practice good-faith in implementing treaties and building the interconnections, but also – and even more importantly – to secure safe, continuous and sustainable operation of the transmission facilities. This involves devising measures to not only to prevent potential damage to the environment coming from the installation and operation of

[319] *Gabcikovo-Nagymaros* (*Hungary v Slovakia*) (*Judgment*) [1997] ICJ Rep 7.
[320] *MOX Plant (Ireland v United Kingdom) (Provisional Measures)* (International Tribunal for the Law of the Sea-ITLOS, 3 December 2001) [83].
[321] *MOX Plant* (*Ireland v United Kingdom*) (*Order affirmed*) (International Tribunal for the Law of the Sea-ITLOS, 24 June 2003) [66-7].

facilities, but also to secure their maintenance programs, emergency drills as well as unrestrained continuous power supply.

Implied into the normal operation of a power grid is the requirement of transparent information flow and monitoring of risks to keep the system balanced and safe. However, the task of synchronising two or more grids, with different components and operating systems can be a major challenge. This is particularly true when load-balancing grids fed with high rates of variable power generation, such as that coming from wind-farms. The difficulty lies in achieving timely and meaningful information sharing to make the interconnected cooperation both efficient and sustainable which, in turn, pass through making material legal changes, particularly, in regard to real time operation of the grid, unified management, and grid operator selection-process.

In sum, for serving the purpose of a worldwide/regional power grid, the International Law principle of cooperation should be specified in two ways. Firstly, its legal construction should go beyond the mere achievement of the treaty-embedded goals of certain Parties in managing their relations towards fostering the imposition of international legal obligations deemed essential to achieving common goals, such as species survival, global environmental protection, and energy efficiency. Secondly, cooperation should be understood both in an active and passive way. The former refers to actions and measures consciously taken by stakeholders to promote grid interconnections and project environmental neutrality; whilst the latter goes to what should not be done to hinder the flow of energy through the territories of States involved in a project, particularly, that of transit-States.

Extraterritoriality (Freedom of energy transit - Non-interruption of flow v territoriality)

The territory is seen as a constitutive element of the modern State. No State can be conceived without it, whether physical or constructively. The actual power to control a certain population in a given territory or area - and to expel other contesting powers from it - is the fundamental basis of sovereignty.

In the context of this inquiry, extraterritoriality concerns international use of spaces or areas supporting transmission facilities needed for the operation of an interconnected power network. In extending this principle, it is important to emphasise that no attempt is being made to question the right of a State to its territorial jurisdiction or the capacity of any State to impose its legislation over activities taking place in spaces beyond its national jurisdiction. Rather the thesis seeks to construct the territorial principle in a way that is capable of allowing the non-interrupted operation of an isolated power grid and independent maintenance of such facilities in the territory in which they are located. From a legal point of view, the kind of use and features attached to this construction might be conceptualised as a *functional commonality*, a notion that avoids traditional understandings of national resources and property by emphasising not its physical aspect – though the network certainly comprises physical structures – but its *functional aspect*: power-flow connectivity.

In this fashion, there is no need for a revision of the limits placed on the exercise of national sovereign rights, an approach rooted in WTO

Appellate Body's decisions,[322] for instance. Instead, the connectivity required by an interdependent world to enable regional power generation flow should be deemed a common good worth preserving. In this particular sense, it is argued that States should be deemed as having a shared obligation towards the protection of the grid's *functionality* (conveying uninterrupted flow of electricity) irrespective of the characteristics and nature, physical location, ownership status, and/or historic usage of any given transmission facility associated with it. This means that no territorial sovereign claim (nor award upon them) should interfere with its goal of assuring permanent and reliable power supply among States. In view of global energy efficiency, therefore, the functionality of the grid in delivering interconnected power transmission could be considered as an 'international resource'.[323]

Non discrimination (as to origin and destiny v inequality)

An interconnected power grid allows varied generators along the line to contribute their power output to meeting overall power demand. The larger the power grid, the more opportunities for generators to join in and assist power-load balancing. Setting aside the decision of what type of energy to produce, having a cross-border interconnection represents for a generator a twofold opportunity: on the one hand, to deliver their power output either in a local or international power market irrespective of current conditions in power demand; and, on the other, to take advantage of power deficit

[322] Appellate Body Report, *United States – Import Prohibition of certain Shrimp and Shrimp Products*, WTO Doc WT/AB/R, AB-1998-4 (12 October 1998) [133].
[323] The notion of an 'international resource' was first utilised in the *Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat* (*Ramsar*), opened for signature 2 February 1971 (entered into force 21 December 1975), Preamble, which uses that expression.

conditions present in closer or distant markets, since power pooling would make transmission costs drop.

The good news about power transmission comes from electricity's economical fungible character.[324] Unlike fossil fuels, fossil derivatives, and chemical compounds which can be accurately tracked down and differentiated, electricity is a current or flow of electrons occurring at sub-atomic level conveyed through particular 'conductors' designed to keep flowing on with minimum transmission losses.[325] In addition, once produced, there is no difference between carbon-sourced and 'green' power generation, because the final product is exactly the same: electricity. The homogeneity of the product is important in terms of, from the outset, dispelling the possibility of a generator being discriminated against on a product-basis once admitted to the network.[326]

However, this is not the end of the story. Legal and economic fungibility aside,[327] there are further potential legal inequalities, literally, along the line, in terms of accessing the grid.[328] Indeed, although an interconnection between two or more national grids may have been set up, different local regulations for domestic generators to have access to the domestic section of the grid can pose challenges to the equal treatment of similar producers that are placed upon other sections. Generating conditions may differ – in fact, they normally do - but entry access requirements to the grid (if any) for international business transactions should not. Consider for a moment

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[324] See above n 36.
[325] Centre for Energy <http://www.centreforenergy.com>.
[326] Source physical identification is only possible indirectly through load measuring at nodes: the points of power injection or withdrawal, voltage transformation, or interconnection. However, such measuring will always be subject to transmission and/or voltage loses adjustments among other technical factors.
[327] Above n 36.
[328] Topic to be analysed shortly in this chapter, see ch IV.3.5 on market access, 137.

the case of two power generators: A and B based in different countries where grids are interconnected. While generator A is free to access the grid and trades its power output freely along the grid; generator B's access to the grid is constrained by excessive domestic regulation and/or local lobbying by conventional power generators eager to prevent others from entering the market and obtaining a share of the already scarce transmission capacity. Although the commodity is the same, the trading conditions imposed upon producers are not. A way to avoid this inequality of access would be to advance in interconnection agreements a provision making Parties guarantee – under international State liability – grid access, at the very least, in similar conditions to the Party facing fewer requirements.

The need for equality of treatment extends not just to those who inject power into the grid, but also to whom the electricity is destined for. This matter brings into consideration the issues around transmission distance and how this could produce inequalities, particularly, in regard to transport tariffs.[329] While our primary focus is finding out how to interconnect isolated, thus, less efficient grids, once this goal is achieved the costs associated with carrying electricity over long distances must also be considered.

Setting aside security factors, the transmission cost is made up of two relevant factors: transmission capacity of the lines and distance. However, this is the cost-structure in a conventional non-interconnected network, in which, normally, energy input and output flows are fairly determined and

[329] A typical example is the cost of power supply to needy consumer centres close to nodes, to which also generators are close by. Being electricity produced close by and injected to the grid undistinguishable from than produced and injected far away, formulas have been designed to fairly allocate transport costs to the portion of electricity conveyed from afar and needed to meet the local demand which cannot be satisfied by local production.

follow particular directional patterns if the infrastructure does not change. Unlike this situation, the scenario of a regional or globally interconnected grid has actual impact on the functional capacity factor, since the limited transmitting and balancing load capacity of a domestic grid is greatly increased and, more importantly, several new consumption centres are brought on line demanding larger generation.

But, does the distance factor remains unaffected? Not necessarily. From a technical point of view, with appropriate technology longer distances mean bigger efficiencies in transmission due to lower transmission losses and increased capacity, although this does require improvements in power storage (batteries) and superconductors.[330] From a legal point of view, if the protection of the grid functionality is deemed a *common international resource*, it would imply a correlative common duty to contribute to its operation, maintenance and expansion. This can be calculated according to usage (whether taking power in or out) or another objectively derived parameter. Distance, instead, only regains relevance when a regional/global flow pattern can be set up among surplus and deficit power areas placed in different time zones, for example. Further, transfers from one area to the other are capable to be accurately measured, and so is tariffication.

In sum, although the physical features of electricity lend themselves to the application of the International Law principle of non-discrimination, there are still outstanding legal questions with respect to grid access requirements and fair treatment connected to the grid's functioning, common contribution, and power transmission fees. It is worth noting how

[330] Working Papers on Technology Governance and Dynamics Nr. 44: Matthews, John *The Renewable Energies technology surge: A new techno-paradigm in the making?* (Technology Governance/The other Canon Foundation/Tallinn University of Technology, 2012).

important the application of this principle is, as unfair discrimination directly undermines the core aim of a power grid which acts as a *shared common resource*: the *functionality* of an interconnected power transmission system. Indeed, if the benefits derived from the utilisation of the grid are not fairly proportionate with the duties associated with maintaining the grid functionality, the entire project is doomed to failure. It is essential that the commitment of States to treating others fairly matches the self- interest of participating states seeking fair and balanced treatment.

Most-Favoured-Nation treatment

As seen, the new ECT set of international rules on power trading entered into force in 1998. These were wholly reliant upon WTO general rules which, in turn, rendered the ECT insufficient to deal with electricity as a strategic commodity. Vital issues of grid interconnection, third-party access to grids, and power transit still have no solution in the ECT/WTO framework. Even conventional WTO-style issues such as binding tariffs regimes for electricity have not succeeded.

It must also be borne in mind that the current scope of the WTO is largely ineffectual in dealing with national energy policies and, therefore, with potential diversification and/or synchronisation of energy matrices. This feature, consequently, was also inherited by the ECT system.

If the traditional interpretation of the sovereignty principle is added as a general backdrop, it is understandable why grid isolation still prevails at a global scale. What has to be done to overcome this unfavourable worldwide scenario? Is the WTO framework of any use in promoting the sought-after goals of grid interconnection and unrestrained power transit?

To answer these questions, this research explores the shortcomings of the WTO system as to energy trading/transit, as there are no specific WTO rules to deal with international power-trading let alone with cross-border power transit. This section aims not only to identify such deficiencies but also to suggest innovative legal trading-related propositions to overcome them, whilst bearing in mind potential global energy policy synchronisation. While detailed analysis on these matters will shortly follow,[331] here, we will look at them from the particular point of view of the most successful WTO instrument for trade-liberalization: the Most-Favoured-Nation clause (hereinafter, MFN).[332]

Despite the development of an extensive WTO institutional regime, the GATT 1994 – the agreement which aims to encourage trade by reducing tariffs and preventing trade barriers between its members[333] – remains central and material for the purposes of this research. Firstly, because electricity remains, in essence, a commodity there is a need to return to the basics of the trade law system. The classification of electricity as 'strategic' is, arguably, largely a political decision mostly based upon the mistaken belief that the national interest in preserving sovereign rights over energy resources surmounts the interests of any other managing system in 'sensitive' areas, including cooperativism, joint ventures, business associations, foreign investment regimes, and natural resources sharing, just to name a few. In fact, once the idea of global energy scarcity or the urgent need for energy efficiency is internalized by national policymakers and it is deemed a common problem, WTO instruments like tariff reduction commitments, and bans on trade barriers could end up

[331] See below ch IV.3. on the role of International Trade and Economics, 120.
[332] *General Agreement on Tariffs and Trade (GATT) 1994. Marrakesh Agreement establishing the World Trade Organization* (*WTO*), opened for signature 15 April 1994, 1867 UNTS I-31874 (entered into force 1 January 1995).
[333] Ibid Annex 1A.

being reaffirmed and revitalised. In this context, the WTO as a multilateral forum would assist in achieving this target.

Secondly, it is suggested that the WTO framework should also be amended by limiting or specifying the scope of Article XX in terms of excluding electricity trading from it.[334] This provision contains exceptions to the ban on import restrictions,[335] to levy taxes and other internal charges of any kind on imported products,[336] imposing requirements designed merely to afford protection to domestic products, and prohibitions or restrictions, including licenses or quotas[337] amongst other measures. The proposed exclusion for electricity trading rests upon several intertwined principles, the first of those being that securing power supply is vital for maintaining the goods production chain and the provision of services. Secondly, is the idea that global power generation must enjoy the most wide-reaching and open market possible to increase generation capacity and make it more efficient. The third principle to be invoked is that the exception must contribute to environmental protection. This principle is identified by Article 2.2 of the Agreement on Technical Barriers to Trade as a 'legitimate objective' to be considered when assessing the compatibility of the GATT rules with environmental regulations.

The MFN should, thus, be modified to specifically address electricity and become standard in all energy integration agreements. Indeed, it is a clause that has served well the objectives of liberalising general trade, but it has not produced similar effects in the power trading area. The appropriate

[334] Ibid Annex 1A art XX.
[335] Ibid art III(1).
[336] Ibid art III(2).
[337] Ibid art IX, XX. As to the scope of art XX see generally L. Godden and J. Peel, *Environmental Law. Scientific, Policy and Regulatory dimensions* (OUP Australia and New Zealand, 2009), ch 7.

functioning of the clause in multilateral agreements contexts is well understood[338] and its potential to extend rights and/or preferences to third parties in a given market should be applied to widespread electricity transmission. Unfortunately, multilateral energy cooperation agreements are rare. In spite of the scarcity of relevant agreements, this inquiry envisions using the MFN more as a mechanism for automatic accession to interconnection agreements entered into by a few Parties, rather than as a tool for allowing the dissemination of rights among parties to a multilateral treaty.[339]

Outside general integration processes, International Law could require specific tools to ensure that power grid interconnection is achieved. In this context, the specific use of the MFN treatment would make it possible for third parties to accede to interconnection agreements entered into between other Parties under the auspices of a multilateral framework, allowing equal enjoyment of rights (though differentiated obligations) according to the particulars of a transmission project and/or the costs of expanding the project to reach the new interested Party. The following example will illustrate this process.

Unlike other countries explored in previous case studies such as Brazil, Japan is not rich in natural resources. Further, in contrast to the EU, it has not undergone any physical or regional governance integration process with other nations. In terms of power consumption, Japan is only 16 per cent self-sufficient. Almost one-third of the Japanese power comes from

[338] World Trade Organisation (WTO) <www.wto.org>.
[339] See below Appendix C, Model Treaty establishing a regional Power-transmission Network and on Transnational Power Transit, art 12, 227.

nuclear power-stations[340], all relying on imported uranium as raw-material. The country is the world's third largest producer of nuclear power after the US and France. The remainder of the power comes from conventional thermal sources (approximately 57 per cent).[341] Only 10 per cent of the total energy produced in the country comes from renewable energy sources.[342] According to the Energy International Agency (EIA), Japan is the world's largest importer of liquefied natural-gas and coal and in 2009 was the second largest net importer of oil after the US. In fact, Japan relies on oil imports to meet 45 per cent of its energy needs.[343] Although almost entirely dependent on international trade, Japan has been extremely successful in securing power supply and coordinating energy mixes in a multilateral non-integrated setting.

Now, imagine an international trade framework was developed covering Asia and neighbouring countries to Japan that embarked on a transnational transmission project. Japan[344] is seeking to be a part of this trading arrangement even though it may likely have to finance a large part of it

[340] There are 17 of them, with 54 operational reactors and two more under construction which, in 2010, produced 280 000 Gigawatt-hour, about 30 per cent of the total electricity production. CNN Wire Staff, *An Overview of Japan's nuclear issues* (2011) CNN <http://edition.cnn.com/2011/WORLD/asiapcf/03/13/japan.nuclear.facts/index.html>.

[341] Ibid, natural-gas and coal-fired power plants which raw-material is also imported.

[342] Ibid, hydro-generation accounting for 7 per cent whilst wind, solar, and geothermal power account for the remainder 3 per cent.

[343] U.S. Energy Information Administration, *Country Analysis Briefs, Japan* (September, 2010) EIA <http://www.eia.doe.gov/cabs/Japan/Electricity.html>.

[344] A general and useful overview on Japan's energy situation can be found in Japanese Agency for Natural Resources and Energy, *Energi Hakusho 2010* (13 September 2010) Enecho < http://www.enecho.meti.go.jp/english/report/outline.pdf> [Energy Report 2010]. See also Kazuhiro Nakatani, 'Energy Security and Japan: The Role of International Law, Domestic Law, and Diplomacy' in Barry Barton et. al. (eds), *Energy Security: Managing Risk in a Dynamic Legal and Regulatory Environment* (Oxford University Press, 2004). See also, generally, Kazuhiro Nakatani, 'In Search of the Optimum Energy Mix: Japanese Laws Promoting Non-Fossil-Fuel Energy' in Don Zillman, Catherine Redgwell, Yinka Omorogbe, and Lila K. Barrera-Hernández (eds) *Beyond the Carbon Economy* (Oxford University Press, 2008). See also, CNN Wire Staff, *An Overview of Japan's nuclear issues* (2011) CNN <http://edition.cnn.com/2011/WORLD/asiapcf/03/13/japan.nuclear.facts/index.html>.

(for instance, because the Japanese interconnection would require large and costly submarine cables or because transmission tariffs were high), but was prevented from doing so due to political or other non-technical reasons. The application of the MFN principle to the energy field, utilised in the context of an overall international trade framework (like the WTO, for instance), would represent neither a disadvantage for the original Parties nor an imposition on a State cautious of becoming dependent on others in such a sensitive matter. The principle, as interpreted here, would not deter potential stakeholders from becoming Parties to the overall trading scheme (for participation in energy projects within the scheme would be optional, though automatically open to relevant States), once in operation under the terms of the agreement, equal treatment would be guaranteed when new interested participants have opted in.

From a different point of view, the opportunity to attract financing and/or technological assistance from potential, though politically unapproachable neighbouring stakeholders is emphasized by this 'automatic option' to take part of the energy project. Again, the option-to-participate would be materially limited to power grids interconnection and transit and available only in the realm of a multilateral trading framework.

In the example, for securing its energy supply, even as backup, Japan might consider engaging in power trading (through an interconnection or other trading mechanism) with – what in political terms might could be called – 'unsuitable' partners by exerting the constructive 'MFN automatic option', thereby making all stakeholders part of the same 'umbrella' trading framework. The 'MNF option', then, comprises of a general trading framework (i.a. WTO, ECT) in which the common features of the MNF are applicable alongside an special, automatic option for Contracting

Parties or Third Parties to access and take part in energy-related projects carried out within such framework, and a guarantee of non-discriminatory treatment under State liability provisions when in operation. In regard to Third Parties interested, invoking the option would amount to acceding to the Treaty insofar as the energy project and trading derived from it is concerned.

This specific interpretation of the MFN also enables nations to set aside ideological bias and political differences from decision-making processes in regard to energy- related matters. Furthermore, according to this view the potential use of the MFN-option would become an incentive for States lacking funds to put forward infrastructure projects which might be of interest to other States, including non-political allies, the implementation of which would bring mutual benefits.

Finally, in the same line of thought, this MFN treatment measure would assist in displacing the 'strategic' energy concept and thus helping to secure the attainment of global energy supply whilst enabling a vast potential for peace-keeping goals at global scale.

Transmission facilities property rights. Public, private property or international domain?

The focus of this section rests upon those power transmission systems placed in different countries, which are capable of being interconnected, owned and operated by either public or private entities. These systems, it is envisaged, would obtain international legal status, and carry out power transactions involving the conveyance of electricity across the borders of countries which may or not be neighbouring States. Essential to the functioning of this trading and transit regime is the consideration of international issues, namely, that the system is subject to International Law.[345] In analysing previous case-studies[346] and the need to develop comprehensive and functional legal structures to facilitate power transit as well as the independent operation of cross-border power grids the research has, this far, addressed topics of supranational law.[347] Here, the assessment of the adoption of supranational laws in a given context is to be complemented with an International Law analysis.

It is argued that International rules governing the property regime of shared infrastructure could be established under bilateral agreements, for example, the treaty between Brazil and Paraguay for the construction, operation and maintenance of the Itaipú dam in the river Paraná;[348] or the rules regarding the interconnections between particular grids of Canada and the US.[349] The bulk of the regulation, however, would still deal with ownership issues in terms of a traditional understanding of national sovereignty, this meaning, as an emanation consistent with the territorial aspect of a sovereign power and the control that a State exert over its territory.

[345] For these purposes, the body of law composed of principles and rules of conduct which States feel themselves bound to observe.
[346] That of the European Union. See ch III, 78.
[347] Often defined as the law of supranational organisations or regional agreements, where a distinguishing feature is that the domestic law of its Member States are deemed inapplicable when conflicting with the supranational legal order in which those States partake. See above n 201.
[348] *Tratado entre a República Federativa do Brasil e a República do Paraguai para o aproveitamento hidroelétrico dos Recursos Hídricos do Rio Paraná, pertencentes em condomínio aos dois países, desde e inclusive o Salto Grande de Sete Quedas ou Salto de Guairá até a Foz do Rio Iguaçú* [Treaty between the Federative Republic of Brazil and the Republic of Paraguay for the hydroelectric exploitation of water resources of the Paraná River, belonging in a condominium to both countries, from and including the Salto Grande Seven Falls or Guairá Falls to Foz do Iguaçú River], opened for signature 26 April 1973, UNTS 13164 (entered into force 26 April 1973).
[349] *Great Lakes Water Quality Agreement 1972* entered into Canada and the United States of America, *International Boundary Waters Treaty 1909* entered into Canada and the United States of America.

However, to achieve the goals sought by this research,[350] a different approach to ownership regimes in respect of electricity transmission infrastructure appears desirable. A new framework aimed at establishing a transnational, interconnected power grid to facilitate efficient (synchronised) operation for the sake of all its stakeholders is required. Following conventional approaches to property would put at risk the attainment of interconnection and unrestrained transit. Scholars - such as Kevin Gray - contend that underlying property is the desire for control over resources and a mere 'assertion of self-interest in the beneficial control of valued resources'.[351] This powerful notion permeates the concepts of property in private law as much as it does in the international sphere of territorial sovereign rights.

As discussed, this research aims at identifying legal barriers impinging on cross-border electricity interconnections, harmonisation of renewable source-based energy policies, and facilitating unrestrained power trading. Arguably, one of the biggest obstacles to a greater altruism in international relations is the sharing of natural resources. This affects the attainment of common goals and largely concerns the idea that property is aligned with 'excludability'.[352] Indeed, the legal classification of the relations between objects and resources involved in property concepts can be reduced to that of a shared interest, thus, allowing non-conflicting concentrations of power rights and obligations over the same thing or resource. Excludability,

[350] See ch I.
[351] Kevin Gray, 'Property in Thin Air' [1991] *Cambridge Law Journal* 252, 306-7.
[352] Ibid, 269. K. Gray acknowledges three different sorts of non-excludability: physical, legal, and moral. According to Gray, '[t]he differentiation of excludable and non-excludable resources points up the irreducible elements which lie at the core of the 'property' notion'. In his view, 'the concept of excludability... merely demarcates the categories of resource in which it is possible to claim 'property', at 295.

however, constitutes an irreducible constraint, which characterises a sovereign right to exploit on an unrestrained basis things and resources in its own territory. What it is needed to develop a transnational power grid sharing system is, firstly, acceptance of the notion that the retention of property rights to a resource – in this case, over the transnational grid – may be perfectly consistent with other parties acquiring and/or retaining compatible property rights enabling access and beneficial use over the same resource. Secondly, a new approach should be taken as to the intertwined relationship between international obligations and sovereign property rights. In the same way as in domestic realms personal obligations and property rights usually coexist over a particular subject-matter, sovereign rights over specific transmission facilities within a transnational grid should be subject to international obligations concerning vital operative issues, such as interconnecting nodes, synchronised operation, reliability standards, maintenance programs and the peaceful settlement of disputes.

International obligations thus may provide mechanisms for the protection of the common interest embedded in the notion of a transnational grid. Whilst direct exploitation of nationally-based resources to produce electricity may still be subjected to domestic regulations, once the power output is uploaded to a network other rules ideally should govern. In regard to any limitations of a particular power transit, participating States, ideally, should not be allowed to invoke exclusive sovereign property rights over either the injected power or any segment of the interconnected grid in their respective territories.

IV.3. THE ROLE OF INTERNATIONAL TRADE AND ECONOMICS

IV.3.1. Trans-boundary Power Transmission Markets: An economic analysis.

Energy markets are interdependent.[353] Economic situations happening in one country often have effects in another. These collateral consequences may be ameliorated in part through adequate and coordinated market regulation. The power market itself exhibits essential features such as output immediateness, electricity's price volatility, and power storage difficulties, which all make it unique.

The challenge for any transnational energy market regulation is twofold. On the one hand, it must aim at minimising the multiple economic risks embedded in energy interdependency, such as price and product manipulation, insider-trading, lack of continuing supply, and payment default, amongst others, whilst still promoting international trade. On the other hand, transnational energy market regulation has to be careful not to interfere with the actual or potential competitive positions of any given country's domestic markets involved in any single energy market proposal. In turn, markets must be trusted by participants and the general public alike, which requires information and transparency.

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[353] EU Directorate-General Commissioner said: 'Our energy markets are interdependent'. Günther Oettinger, 'Wholesale energy markets: Commission proposes rules to prevent market abuse' (press Release, IP/10/1676, 08 December 2010) < http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/1676&format=HTML&aged=0&language=EN&guiLanguage=en>.

In searching for large-scale efficiencies in energy production and transport, many economic aspects should be considered.[354] Setting aside those dependent on mere natural resources allocation, this inquiry takes a closer look at two key aspects: firstly, the problem of market accessibility or what States can do to become part of, and benefit from, widespread grid interconnection; the other is the economic potential for a transnational (regional, at least) wholesale single electricity market.

The solution envisaged by this book (cross-border power transmission) acknowledges the economic nature of transmission networks as natural monopolies, but builds upon what might be considered an advantage, for in the process of gaining consensus on transnational interconnection the fewer actors, the better. At domestic level, on the contrary, the solution is characterized by guaranteeing access to the grid to any generator. A legal mechanism of this character is a powerful signal to economic agents to enhance transmission infrastructure in response to increasing demand for connectivity.[355]

As it shall be seen, for the purpose of analysis, in overcoming those challenges, this inquiry advocates, firstly, for a distinction between international and domestic power transmission markets; and, secondly, for a complementary use of *de minimis* specific legal instruments to foster cooperation in transnational bulk power transmission (either in individual or joint initiatives, public, private, or joint undertakings - including those

[354] Just to name a few instances of economic facts conditioning power production: the availability of natural resources and their comparative readiness for exploitation, as well as any possible competitive advantage in trading them are paramount, though they are more or less subjected to natural disposition and/or industrial activity, have an important effect on the economic baseline for producing and trading (including transporting) energy.
[355] The legal system should provide as well sanctions for those who unduly obstruct access to third parties. Incidentally, it may also cause significant power rate reductions.

involving participation of international organisations) and to open up and secure access not to multiple trunk power transmission suppliers, but to an existing interconnected network of as many as possible renewable energy sources.

IV.3.2. The power market. An overview from the economic theory

What does contemporary economics say about the power market? To give an appropriate response it is worth recalling the nature of electricity as a market-subject (i.e. economic good) as well as about the agents participating in the market.

Many recognizable phenomena present in nature are embedded in what physics called 'electricity',[356] but from the economic point of view electricity is a commodity, something either produced by human activity or derived from nature suitable to be used in satisfying present or future human needs and capable to be valued ($/kWhr) and traded in a certain place: a market, whether real or simply virtual. But this commodity, in

[356] The term 'electricity' comes from the greek *ήλεκτρον* (electron) meaning 'amber' and mostly referred to Thales' experiment on electro-magnetism rubbing amber rods. However, the presence of electric charge in nature is far more antique than that. The man had been long aware of these kind of phenomena, for instance, when in contact to animals known for discharging electricity like the electric eel, *Electrophorus electricus* pertaining to the Gymnotiformes order, the so-called electric-rays from the Torpediniformes order, and catfishes genus *Malapterurus* from the Siluriformes order just to name a few; and the latter very well-known and documented since the Old Egypt era (about 3100BC) as the 'Thunderer of the Nile'. To this, it can further be added the wonder and amazement caused to early humankind by lightning and other then unexplained atmospheric phenomena. Only in the 17th century, after William Gilbert's work on magnetism, a new term in Latin: *ēlectricus* or 'resembling amber' was coined, further giving rise to 'electric' and 'electricity', this latter term which meaning, due to further scientific researches has become rather vague and thus substituted by others more descriptive of the particular phenomenon at stake, like electric charge, field, current, fluid, and so on. In addition, long-standing conjectures about atmospheric electric charge of storm-clouds and lightning were not confirmed until mid eighteen century through the experiments proposed (and conducted) by Benjamin Franklin and a long list of precursors in the field (Volta, Faraday, Edison, Amperè, Ohm, Maxwell, Tesla, Swan, Westinghouse, Siemens, Graham Bell, Kelvin, Joule, Galvani, etc). Martin Uman, 'Why did Benjamin Franklin fly the kite?' in *All about Lightning* (Dover Publications, 1986) ISBN 048625237X.

itself, is rather peculiar: it has no technical substitute; nothing can take its place and perform the function of continuing electric current. Some relief for breakdowns and power-outages can certainly be found in batteries, power cells, and other types of power-storage means, but in the current state-of-the-art, all of them are not long-lasting.

This commodity can be produced from a number of sources: hydro, sun, wind, tides, etc. This means, economically, that the market can potentially be quite diversified with numerous types of power suppliers. Such supply-side pluralism would allow, in theory, a flexible response to demand variations, but what it is valid for most manufactured goods; it is not the case of electricity. In other words, providers may be many, but they are extremely slow in responding to increasing power demand, since investment in power generating infrastructure projects are highly capital-intensive and have long maturation periods. In sum, the supply-side of the power market may (or not) be atomized, but typically lacks elasticity due to structural reasons.[357]

At the opposite end of the market spectrum stand electricity consumers, whether individuals or big corporate consumers. From this perspective, it is an atomistic setting, far more than the supply-side. As to its capacity to respond to variations in the offer to supply electricity, the demand-side presents peculiarities as well. From the consumer's point of view, choices are very limited: on the one hand, he cannot consume more than what is actually produced, a simple physical limitation; whilst on the other, he only has leeway to consume less or just not to use power at all. In other words, the demand-side of the power market becomes progressively

[357] Tanaka, Makoto, 'Extended price cap mechanism for efficient transmission expansion under nodal pricing', (2007) 7(3) *Networks and Spatial Economics* 257.

inelastic while approaching the system's physical installed capacity limit.[358]

At this stage, some relevant economics conclusions can be drawn out from these power market's features. The first is that the uniqueness of the power market is shaped by the peculiarities of its subject: a nondurable, irreplaceable, fungible, unable to be stored, tangible fluid.[359] Thus the physical properties of electricity impose a different economic approach from that of conventional markets; but also - this far - by two economic agents partaking in them: power generators and consumers.

Secondly, at least in theory, nothing prevents the supply-side of the market from being atomistic; though in practice, both high initial investment cost and delayed rate of returns normally deter such ideal situation from occurring. This structural circumstance gives birth to two different considerations: on the one hand, it may cause economic dominant positions to come up in the struggle for obtaining a bigger share in the market; on the other hand, it emphasizes -from this side of the market - the need for some kind of regulation.

In third place, since power is generated almost instantaneously on demand, in the short-run the demand is limited by the full generating capacity of current facilities. The situation is different in the long-run, since long-time unmet demand for power should give the market signals to invest in, and

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[358] Strictly speaking, when approaching the current real power outcome of the system, since not all installed capacity might be in full operation. Moreover, a further limitation will be added when addressing transmission capacity limitations.

[359] See above n 36. See also R.A.C. van der Veen, G.L. Doorman, O.S. Grande, A. Abbasy, R.A. Hakvoort, F.A. Nobel, D.A.M. Klaar, 'Harmonization and integration of national balancing markets in Europe – regulatory challenges' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-104-2010.

so increase, generation capacity. It can thus be said that actual power-consumers are 'captured', since they cannot immediately obtain the power they need, nor get anything similar instead.[360] They can only share what they are getting, reduce, or cut off present consumption.

The facts and conclusions described above assist in describing how the power market works in a standard theoretical framework in which consumers meet suppliers and trade over a given commodity. However, the power industry in general and the transmission sector in particular are far from being standard, as it shall be seen as follows.

IV.3.3. Power Market in practice. An overview from the Power Transmission sector

There are three the major organizational components of the electricity market: generation (power facilities), transmission (high-voltage bulk power moved between utilities),[361] and consumers,[362] all three converge in creating a market with special features and interactions and increasingly complex, in which some of the results of a two-sided theoretical market (supply/demand) are - in practice - profoundly modified.[363]

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[360] Electricity Forum <http://www.electricityforum.com>.

[361] The book scope expressly sets aside the distribution component: low-voltage transmission networks delivering power to ultimate consumers.

[362] For the purposes of analysis, we are referring here not to individual but to final 'big' consumers.

[363] In fact, several economic agents take part in the contemporary power industry. There are financial institutions, exchanges, hedge funds, and international companies hovering around power trading. This is so because of 'the correlation between power and other energy commodities, such as coal, oil, natural gas, emissions and freight'. See Jim Banks, *European Power Trading: Competition and Complexity* (2011) Future Industry <http://www.futuresindustry.org/fi-magazine-home.asp?a=1184>. Financial institutions are particularly relevant since they participate as risk management, market access, and liquidity providers for third parties as well as traders in their own right. Power Exchanges have themselves become crucial in providing central counterparty clearing, where in association with owners and/or operators of international interconnectors offering trading services in both spot

Indeed, apart from generators and consumers, transmission stands in between. But, unlike conventional markets in which intermediaries are merely part of a more or less interchangeable logistics and distribution chains profiting through reselling and spread-earning in each subsequent transaction, in the power industry the transmitter plays a different economic role.

The transmitter economic role goes beyond that of a simple intermediary or reseller. It has often been described as to resembling that of a 'gate-keeper', particularly, when the lines are owned by the utilities and they close them off to newcomers interested in having their power transported through. Their role is anything but neutral, since lines have both physical, technical carrying-capacity and predefined security standards that cannot be exceeded without risking the network's own reliability.[364] Thus, from an economic point of view, along with generation restrictions (on capacity, plus reserve margins)[365] there is also transport restrictions based on limited transmission capacities, along with operational restrictions like transmission lines reserve margins.[366] In addition, transmission lines and facilities enable electric utilities to pool and coordinate surplus electricity with other utilities as well as to stabilize the system as a whole since the

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and future contracts, thus allowing reliable reference prices for electricity at some stages (up to now, a single uniform price for a common single zone has been achieved for day-ahead transactions) and, potentially, market coupling, a first step towards power market integration, as it will be shortly analysed, see ch IV.3.5, 139. Hedge funds, in turn, are instruments useful to manage the financial risk resulting from market downturns and upswings.

364 Hogan, William W. 'Electricity Market Design: Coordination, Pricing and Incentives' (Paper presented at ERCOT Energized Conference, Austin, Texas, USA, 2 May 2008).

365 Reserve margins represent the capacity of the generating system - considered as a whole - to assume instantaneously a determined rate of increased power demand in case of loss of a generating unit. Electricity Forum <http://www.electricityforum.com>.

366 Ibid, transmission lines reserve margins are operational criteria which restrict the actual carrying-capacity of a line in order to secure the carrying-capacity of the network as a whole enabling this latter to instantaneously carry up to certain increased power flows in the event of losing a transmission line.

supply will be less disrupted if any one source is lost or defective; provided the sources are all interconnected.[367]

In addressing the economic functioning of the power market away from the theoretical realm, three practical things are worthy of attention, not only because they are intrinsic to the pivotal role of transmission networks, but also because they have relevance when analysing the relationship between transmission networks and integration of renewable energies.

The first aspect is the long-time configuration of typical power-agreements. The inelasticity of the supply in the short-run and medium-run is relevant because the capital investment needed to undertake a power generating or a transmission project also requires long and steady cash-flow financing. In addition, operational costs can be significantly reduced if full employment of facilities is secured for as long as possible. In a similar way, amortization costs are met. Let this relevance be better illustrated with an example associated to pricing. It has long been supposed that if given long-term power contracts, economic agents would more likely be willing to enter and invest in the power market, which - in general - makes sense. However, what it is not frequently realised is that those contract terms are inextricably linked to franchise or concession terms granted either to produce energy or to transport it. Also, sometimes, uncertainties about policy or regulatory issues affecting the renovation of such franchise or concessions may cause distortions in economic decision-making processes with unwanted effects in the market.

A second practical aspect to be considered is the availability of a given transmission network. Maintenance - either planned or unplanned - is a

[367] This, of course, assuming a reasonable transmission-line reserve margin in operation.

major issue when the system must face the loss or disconnection of a line beyond reserve margins. When power demand exceeds what is available, failures are difficult to avoid. To prevent problems, power-lines capacities can be realigned, power loads can be pooled or redirected in a way that is consistent with the goal of delivering the energy where is needed[368] and, hopefully, never having to resort to rationing. The availability of network facilities and carrying-capacity is vital for real-time operation, but they are also crucial in calculating other operational parameters and in designing grid modernization and expansion projects.

Finally, the third aspect having significant effects on the way in which the power market works is real-time operation. In part, due to its fluid-like nature and to due to the fact that, for the time being, no highly efficient and long-lasting method for storage is available, one of the most remarkable features of the power market is the simultaneity between power demand and supply. It is more than a figurative expression, as it is true to say that anytime a switch is turned on, so does a generating plant along with a transmission network. This feature, however, also constitutes the main weakness of the system, as given that the supply capacity is fixed and limited (in real-time operation) while the power demand is unrestrained (in the same timeframe scenario), unless no regulation (either operative and/or technical) exists for energy resilience,[369] the network would most likely collapse.[370] Demand-supply simultaneity, therefore, makes the power market (and the transmission grid) essentially interdependent, variable, and vulnerable.

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[368] David M. Quick and Janis M. Carey, 'Transmission Capacity and Market Power: the Effect on a Dominant Generation Firm' (2002) 30 *Energy Policy*, 699.
[369] The ability to adjust to interruptions in the supply of energy.
[370] Electrical power grids are mostly centralized and - for that reason - susceptible to major disruptions.

How is the economic theoretical framework affected by the peculiarities of the power market in practice, particularly, when considering unbundled power grids? A first consequence is that the theoretical configuration of a standard market is profoundly altered not just by the need for integrating a third wholly different actor (the transmission network), but mostly due to the fact that this new actor is the only one which - while meeting the needs of the two traditional - responds better under a so-called 'imperfect market' form. Transmission networks are economically characterized as natural monopolies. This means that normally there is no option for the demand-side of customers;[371] and though some alternatives might be available to the supply-side of generators, in fact, they are not common either. The implications of this characterization will be analysed further on.[372]

The second consequence deals, specifically, with the non-atomistic nature of the generating sector in practice,[373] as well as with the potential of this condition to create dominant market positions. Indeed, a non vertically-integrated transmission sector could represent, by itself, a barrier to newcomers, either from the side of the producers or the consumers. Although being an improvement, when compared to a highly vertically integrated structure, there is still room for regulation on lowering this barrier. It must be acknowledged that vertical integration between generation and transmission sectors make things even worse with no competition in a pre-determined concession-area. On the opposite side, the

[371] At least, for individual end-consumers.
[372] See below ch IV.3.3 on common features of the transmission market, 127.
[373] Non-atomistic market refers to oligopolistic markets, few participant generators in this particular context.

unbundling of these sectors has not yet proved to be an adequate solution either, in terms of access, to the newly separated markets.[374]

Finally, the real-time demand limitation that is integral to current generating capacity (the third economic result) is deeply enhanced by a 'grid factor', since grids not only link suppliers and consumers, but power grids themselves are constrained by the availability of infrastructure (transmission-lines capacity) and operation (transmission reserve margins).

Peculiarities of the power transmission market

Transmission grids are basically high voltage transmission lines, interconnected with each other. Historically, generating power plants, high-voltage transmission and distribution lines were often part of the same vertically-integrated company which, depending upon local regulations, could keep in one entity the lines connecting power generating units and substations (often low-voltage lines); those connecting substations (mostly high-voltage); and finally those distributing the electricity to end consumers (often, low-voltage lines). Over time, however, many countries have chosen to liberalize their power markets in fashions leading to the unbundling of the electricity industry.[375]

For purposes of economic analysis, the characterization of the power transmission sector to be presented is mostly based on the current

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[374] See, for instance, *Regulation 714/2009/EC of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation 1228/2003/EC* [2009] OJ L 211/15.

[375] See generally Karen Palmer, A. Paula, and M. Woerman, *Federal Policies for Renewable Electricity* (12 February 2011) Economics Climate Change <http://www.economicsclimatechange.com/2011/02/federal-policies-for-renewable.html>. See also Jim Banks, *European Power Trading: Competition and Complexity* (2011) Future Industry <http://www.futuresindustry.org/fi-magazine-home.asp?a=1184>.

prevailing view of power market liberalization.[376] Therefore, the power transmission referred hereto concerns the bulk transport of high voltage electrical power through lines connecting only power transformation substations. Nevertheless, this characterization does not take into consideration whether such substations belong or not to any national system.

The liberal approach in vogue at the moment, although widely successful in separating industry sectors, particularly that of power generation is still unable to efficiently address what is a dominant structural feature of the transmission sector: being a natural monopoly or, in plain words, the fact that a single power transmission line is always better than many. Economics defines a natural monopoly as an industry[377] where fixed capital costs are so high that it is not profitable for a suitable competitor to enter the relevant market. The economic explanation for such an industry resides upon the idea that economies of scale require one, rather than several agents to get a profit. The only chance for this type of business to be profitable is by letting a single supplier to incur such costs (thus avoiding duplicity) whilst securing its status afterwards, since - considered the market as a whole - many small-scale agents render it less efficient.

Utilities such as natural gas, water, and electricity are commonly labelled as natural monopolies by Economics, since the setting up of their infrastructure is highly intensive in fixed capital costs. However, once in operation their variable costs are typically very low. As it is in the water and natural-gas pipeline systems, it would be inefficient and very costly to

[376] See generally Martha Roggenkamp, C. Redgwell, I. Del Guayo, and A. Rønne (eds), ‘Energy Law in Europe: Comparisons and Conclusions’ in *Energy Law in Europe: National, EU and International Regulation* (Oxford University Press, 2nd ed, 2008), Rosemary Lyster and Adrian Bradbrook, *Energy Law and the Environment* (Cambridge University Press, 2008).
[377] Or a sector within an industry already unbundled and/or deregulated.

install multiple sets of transmission lines instead of a single one with sufficient transport capacity. Unlike the generating sector, which is mostly deregulated and competitive; the transmission industry usually remains a natural monopoly, with a grid resembling a sole highway through which multiple companies transport their power output.

The uniqueness of the power transmission market is apparent not only when analysed in a domestic setting; it is unusual also when observed from an international perspective. Accordingly, this section demonstrates that the monopolistic structure of the power transmission market - rather than being a disadvantage - could turn out to be beneficial for attaining an international single power market. In the power transmission instance, the peculiarity does not arise from this being a monopolistic market, thus, a single market by definition; but rather for being a feature that would naturally assist the development of a single grid. Explicitly, it could comprise a far more extended though still unitary power market, where both suppliers and end consumers would be countries (municipal markets) instead of national or transnational corporations or individuals.

International Features of the Transmission Market

Two of the most relevant features of the power transmission market for our argument, at an international level, are the interrelationship between States and energy multinational corporations and the high level of risks associated with transmission projects.[378]

[378] R. Plaza, 'Market and Revenue Risk Allocation in Public-Private Partnership on Energy Infrastructure Projects' (Paper presented at the 6th Annual International Graduate Student Conference at King's College London, UK, April 2012).

From the economic standpoint, the relationship between States and corporate interests strikingly resembles the evolution that International Law has undergone in acknowledging the international legal standing for new actors, something long considered an exclusive privilege of States. Over time, corporate entities - once confined to the boundaries of the States in which incorporated - had steadily extended their activities beyond them.[379] Historically, natural resource-related companies - among them the power industry - have led the trend.

The need for low-cost resources has driven capital overseas seeking in foreign States, appropriate environments for carrying out economic activities: including favourable tax treatment of profits, access to currency markets and financial services, repatriation regimes, and regulatory frameworks designed to assure both market stability and lower risks associated with foreign investment. In this context, the economic and negotiating power of multinational global energy-producing companies can match that of some States, particularly host developing countries in need of infrastructure, technology, or income-producing activities.[380] Currently, most of these arrangements are channelled through conventional legal paths, initially, under the scope of domestic regulations embedding high sovereign risk. Later, although still using domestic investment-protecting schemes, legal instruments (such as investment contracts) turned out to be specific and to allow resort to international *fora* in case of infringement, thus, pledging host-countries' international liability bringing about lower investment associated risk. However, despite a number of international features, multinational corporate entities are not yet recognised as having the status of conventional international subjects.

[379] P. Sands, *Vers une transformation du droit international? Institutionaliser le doute* (Editions A. Pedone, Paris, 2000).
[380] United Nations Organisation, *The Millennium Development Goals Report 2009* (UN, 2009).

Interestingly, however, this legal inconvenience has barely deterred the surge and expansion of transnational corporate agents.[381]

Common Features of the Transmission Market

After isolating international factors relevant to legal mechanisms potentially applicable in designing model frameworks for grid interconnection and power transport, the following analysis will focus on relevant economic features common to power transmission markets, either domestic or international.

Pricing Volatility

Like other commodity markets, the price of electricity is subjected to fluctuations. However, unlike other commodities, power pricing volatility might not only be typically sustained by imbalances between supply and demand and other factors must be accounted for. One of the most important to this research is the tariff or transmission fee, mostly associated with factors of distance and current conversion.

Transmission Line Capacity Restrictions

The transmission capacity of current wires and conductors is not unrestricted. Indeed, depending upon materials, design specifications, and purpose, their capacity to convey electricity is limited.[382] Two technical

[381] OECD, *Guidelines for Multinational Enterprises* (2011) OECD <*www.oecd.org/dataoecd/12/21/1903291.pdf*>.
[382] David M. Quick and Janis M. Carey, 'Transmission Capacity and Market Power: the Effect on a Dominant Generation Firm' (2002) 30 *Energy Policy*, 699. See also Severin Borenstein, James Bushnell, and Steven Stoft, 'The Competitive Effects of Transmission Capacity in a De-Regulated Electricity Industry' (2000) 31 *RAND Journal of Economics*, 294; Bert Willems,

constraints deserve special mention: the lack of storage capacity at large-scale and long distance-related losses.

At present, large amounts of power output cannot still be stored efficiently. As long as bulk battery cells and other power storage mechanisms' durability are still an issue of experimental and/or low-efficient technologies, the synchronisation problem between power demand and supply still represents a flaw of the networks. As it is not possible to delay power consumption, but instead power has to be used in the moment in which it is actually demanded has significant implications in the way in which a network can be used and operated. Moreover, this factor renders it vital to seek proper legal conceptualizations of 'available transmission capacity' on the one hand, and 'coordinated operation' or 'synchronisation' on the other.

Apart from technical-related limitations, there are also restrictions driven by security and legal security related concerns. Normally, legal frameworks dealing with power transmission are keen to safeguard the reliability of the networks.[383] Naturally, this can be achieved only to a certain extent by legal provisions. An appropriate background policy should increase the network's security level as much as possible by securing a certain flexibility margin for operation. Unfortunately, most of the times something is lost in translating policy goals into legal terms and what was meant to be a flexible legal device for securing the operation of the grid ends up being construed as a rigid threshold limiting the lines'

'Modelling Cornout Competition in an Electricity Market with Transmission Constraints' (2002) 23 *Energy Journal*, 95-126.

[383] See, for instance, U.S. Energy Policy Act of 2005 (EPA 2005) Public Law 109-58-Aug 8th, 2005 109th Congress 119 STAT. 594, Title XII Electricity of the H.R.6, Subtitle A (Reliability Standards). See also, in the European regulatory context, *Council Directive 90/547/EEC of 29 October 1990 on Transmission of Electricity through Transmission Grids* [1990] OJ L 313/30.

transmission capacity.[384] Moreover, in the long-run, this interpretation impairs the return rate of investments in power transmission, since even if the technical transport capacity of a system were able to sustain a given load, as an additional security measure, the transport capacity of a line is artificially constrained by regulation. These regulatory restrictions on the transport capacity of a network are known as transmission reserve margins.[385]

Continuing Flow issues

Power networks constitute themselves a relevant market from an economic point of view. As in any conventional market there are consumers (both power end-consumers and power facilities in need of their output to be channelled to the formers) and suppliers of this service (companies specialized in constructing and operating this pieces of infrastructure), consisting in transporting energy. Regardless of the monopolistic market-power of the supplier to influence the price of the service, the transmission market is - by itself - functional to the 'main' market of power producers and consumers. This latter group indeed might be served by many transmitters, but not in an economically rational manner.

Instead, the most economically efficient way to link those agents is through a single intermediary, a unique network towards which producers and consumers might resort to reciprocally inject and take out power from the grid. This functional relationship between the two markets works for both sides, but in a completely different manner. While a single

[384] Bourdon et al, above n 56.
[385] Centre for Energy, Transmission (August 2011), 6 Centre for Energy <http://www.centreforenergy.com/AboutEnergy/Electricity/Transmission/Overview.asp?page=6>.

monopolistic transmission market serves more efficiently (thus, cheaper) the function that multiple transmitters could perform at higher costs; the intermediary function can only be carried out in a continuing mode of automatic power demand/supply matching. Where the demand exceeds power reserves or the producers cannot deliver a steady flow of power supply, the network's stability is jeopardised. Power grids are pieces of infrastructure designed to sustain and carry power output so they need to be continuously energised to serve its function, otherwise they are rendered useless.[386] Since power output is mostly unable to be stored in order to react to sudden variations of demand, and at times it is also constrained by reserve margins, the stability of a network (a non-smart network, particularly) mostly depends on flexible reserve margins and load balancing. In sum, for the normal operation of conventional networks the stability of power flow is crucial.

Load Balancing and Matrix openness

The integration of non-conventional renewable sources - to which intermittency is connatural[387] - represents a remarkable challenge not only for innovative network design, but also for new smarter forms of grid

[386] International Electrotechnical Commission, *Smartgrid* (12 February 2011) IEC <http://www.iec.ch/smartgrid/>. For a retrospective overview see M. D. Ilić, 'Fundamental engineering problems and opportunities in operating power transmission grids of the future' (1995) 17(3) *Massachusetts Institute of Technology (MIT) Electrical Power & Energy Systems,* 207.

[387] See generally W. Lovato, 'Six Solar Market Myths: An Investor Perspective' (Paper presented at the Third Saudi Solar Energy Forum, Riyadh, Saudi Arabia, 2011) 1-41. For a regulatory application acknowledging such feature see *Commission Regulation 838/2010/EU of 23 September 2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission* [2010] OJ L 250/5. From the policy perspectives see Directorate General for Energy, *Renewable Energy Roadmap - Renewable energies in the 21st century: building a more sustainable future* (28 August 2008) OJ C 219 E, DLR, *Renewable Energy and the Clean Development Mechanism. Potential barriers and ways forward. A guide for policy-makers* (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)-Germany, 2007).

operation. In a similar way to a juggler balancing multiple spinning plates, the operator of a smart grid[388] must deal with many different generating units producing power at dissimilar pace (or not producing at all) in diverse and distant countries, but all them connected to a single grid in which power-load flowing along the grid must be balanced in real-time in the most efficient way possible to avoid letting the system fall down. From an economic perspective the challenge is to secure the lines being energised continuously and in a stable manner; as this delivers not only the best economic result – full intensive use of the infrastructure concerned at the lesser possible price – but also provides an additional justification for the transmission market's monopolistic configuration.

IV.3.4. International Power Trade and the WTO framework

Following the analysis of the economic behaviour of the power market in a domestic context, firstly in theory and then in practice, we will now turn to look at it when performed at international level.

This section analyses market economic interdependency and how this could promote, firstly, international access to domestic grids or transnational integration of transmission networks; and, secondly, an international single electricity market that integrates renewable generated power. According to the focus of this research,[389] this section looks at international power trade, its current mechanisms, limitations, and potentialities. Who are the economic agents at the international level? How do they interact with each other? Is the power demand or supply different

[388] G. Mauri, D. Moneta, J. Silva De Assis Carneiro, S. Pugliese, S. Fratti, 'Integration of active customers into smartgrids: experimental test facility and results' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C6-205-2010.
[389] See ch I.4, 31.

in this context? Does the transmission sector play a similar role to that which it does in the domestic realm? These are some of the questions that this section will address, to be followed up with the analysis of the WTO framework of potential interest for a transnational power grid.

Let the relevant transnational setting and its complexity be illustrated through a relative comparison.[390] As discussed, physical characteristics of electricity as a commodity impose particular configurations on any domestic market: power cannot be stored in sufficient scale or for long time; it experiences sharp variations in supply and demand; all making its understanding not an easy task even when having all pertinent information. Imagine now how more complex this situation can be between different countries among which even basic market information is neither transparent nor available or complete, such as that relating to pricing, planned infrastructure, physical generation, regulatory framework, and energy or security policies. The scenario can be even more challenging (or discouraging depending on the point of view) when having multiple market structures involving liberalized and not liberalized domestic markets, vertically integrated in one country and wholly or partly bundled in another, as well as the threat of financial non-liquidity hovering all around and making insecure the concrete implementation of power infrastructure projects and international payments between power traders.[391] This complex situation operates in conjunction with an equally complex legal and regulatory international sphere.

[390] Comparison made with a single domestic power market.
[391] With regard to the financial insecurity of international power markets see Investorwords <http://www.investorwords.com>, Bloomberg ≤http://www.bloomberg.com/>, Business News Americas <http://www.bnamericas.com>, The Independent <http://www.independent.co.uk/>. With regard to particular legal constraints see above n 201, 347. As to financial risk analysis of energy projects see, specially, Rafael M. Plaza, 'Market and Revenue Risk Allocation in Public-Private Partnership on Energy Infrastructure Projects' (Paper presented at the 6th

International trade is about international business transactions; and International Trade Law is the body of rules relating to them. It is of interest, therefore, to know what makes a commercial deal an international business transaction. In answering this, the features of international trade will also be unveiled. An international business transaction is a trading deal encompassing an international element. This latter refers to two different aspects: firstly, the need for determining the set of norms applicable when more than one legal system (or forum, in case of dispute) may rule the transaction (either materially and/or in connection with its jurisdictional proceedings). A situation most accurately described in legal terms as one in which *conflict of law rules* must be applied (an element considered as the truly essential aspect of internationality).[392] The second aspect relates to the additional risk in the trade of goods, services or capital investment circulating across national boundaries. This aspect, although not essential for defining a business transaction as international, is of utmost relevance since it deals explicitly with the scenario in which transnational power trading occurs.[393]

To assist further analysis, we will resort to the following set of hypothetical facts for an international power transaction: a private power generating company incorporated in country A, a developed country which belongs to the Common Law sphere of influence, wants to sell part of its

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Annual International Graduate Legal Research Conference at King's College London, UK, April 2012).

[392] See generally Ian Brownlie, *Principles of Public International Law* (Oxford Clarendon Press, 7th ed, 2008).

[393] Moreover, it gives rise to further topics of r interest, such as international legal remedies for dispute resolution, problems with the availability of assets in certain country upon which to enforce international decisions, or preventive legal principles to resort to in balancing the protection for the international parties involved. For a perspective from Non-State entities see P. Kalas, 'International Environmental Dispute Resolution and the Need for Access by Non-State Entities' (2001) 12 *Colorado Journal of Environmental Law and Policy* 191.

power surplus to the state-owned energy company of country B, a developing country which has a large power-deficit and is governed under a Civil Law system. Further, under this hypothetical scenario, there is no international trade/investment agreement between them or any domestic specific conflict of law rule. They both have agreed on the power load that is required to be supplied, pricing and payment method, however, their respective transmission networks, though suitable to be interconnected to one another are not actually physically connected, since interconnecting demands laying a 220Kv dual transmission line across-borders, mostly in country A's territory.

Let begin our case analysis on international trade and regulation with the transnational investment issue: what are the options for the interconnecting line to be finally laid? Should country A, country B, or both jointly pay for the capital investment cost that laying the line requires? In any case, what would be the legal commitments the relevant government should undertake to protect the potential foreign direct investment? Where treatment of foreign investments is concerned, the question for bilateral investment treaties (BITs) arise first, hence BITs normally address the issue of to what extent foreign direct investment is admitted? Who can make it (whether natural persons, corporations, trusts, agents, etc)? What are the rights and duties accorded to foreign investors (including property rights, expropriation and nationalisation issues, umbrella clauses, tax treatment, currency and profits repatriation issues etc)? What is the way foreign investors are treated? What qualifies as a foreign interest? And what are the dispute settlement mechanisms?

Since in this case there is neither a bilateral agreement in force - nor any multilateral treaty on investment,[394] the next step is to search for applicable International Law rules. Although it is not an easy task, some useful and general principles on foreign investment have been enshrined in Codes of Conduct, like the 1976 OECD Guidelines for Multinational Enterprises,[395] the ICC Guidelines for Investment,[396] or the United Nations Draft Code on Transnational Corporations.[397]

In the case of conflicts arising from investments already completed, relief could be sought under the Convention of Investment Disputes between States and Nationals of Other States which hosts the International Centre for Settlement of Investment Disputes (ICSID).[398] Notwithstanding that these are examples of limited success of multilateralism; it is worth noting that this trend is of interest for States to create a framework of uniform rules for the protection of foreign investment, as well as to level the playing field for equal competition among foreign investors. In effect this normally ends up enhancing innovation and contributing to economic development.[399] This inquiry does not intend to address the advantages or shortcomings of choosing one trend or another, but it is worth pointing out that - as opposed to bilateralism – multilateralism better serves the interest

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[394] The only initiative on this matter has been the proposal made by the OECD in 1995 for negotiating a Multilateral Agreement on Investment (MAI), which was formally halted in 1998. Some of the contents proposed, though highly controversial at the time, were government incentives, environmental issues, national treatment and most favoured nation obligations, prohibitions on domestic content, technology transfer and minimum export requirements, and expropriation rules among others.

[395] OECD, *Guidelines for Multinational Enterprises* (2011) OECD <www.oecd.org/dataoecd/12/21/1903291.pdf>.

[396] ICC, *Guidelines for Investment* (2011) Neda <www.neda5.net/icc_guidelines/icc_guidelines.pdf>.

[397] United Nations, *Draft Code on Transnational Corporations* (2011) Transnational Dispute Management <http://www.transnational-dispute-management.com>.

[398] International Centre for Settlement of Investment Disputes, *Convention of Investment Disputes between States and Nationals of Other States* (2011) ICSID <icsid.worldbank.org>.

[399] Stephan Schill, *The Multilateralization of International Investment Law* (Cambridge University Press, 2009) 106.

of States in having uniform standards either for international investment protection or other interests. Further, this feature is of utmost significance for a thesis involving multi-transnational power infrastructure.

Setting aside the fact that laying a transmission line always represents an engineering technical challenge, the interconnection part of the problem will now be addressed. Here, the interest is to look at the cross-border aspect from an International Law point of view: a power line crossing the border between country A and B. According to the hypothetical facts given, most of the transmission line will hang over country A's territory leading up to a substation sited on the same territory. Let us assume now that the transmission infrastructure project was designed, carried out, and financed solely by country B under a bilateral investment treaty (hereafter, BIT) offering sufficient legal warranties about the project finance and capital investment. However, the regular content of a BIT is insufficient to secure either the execution of the basic power purchase agreement or the future implementation of the promised power supply by country A.

Even though the commercial aspects of the substantive deal will be analysed in greater depth when addressing the role of WTO rules in power agreements, the focus here is on how to solve the issue of physical control over the transmission facilities and territorial status of the ground-corridor beneath overhead power lines. A classic approach to territorial sovereignty would answer these questions straightforwardly: country A has total control both of the lines themselves and the corresponding ground. In other words, country A's territorial sovereignty could not be an issue for discussion or negotiation.

Contemporary approaches, instead, see things differently. International Law has adopted mechanisms to allocate actual possession and control over a piece of land to a third party for limited and specific purposes.[400] While still acknowledging eminent domain over these areas to the traditional national legal owner; in some particular cases (and mostly when dominion itself is under discussion) a given territory can be neutralized. In our hypothetical case, these problems are most commonly worked out in a practical manner through protocols for interconnection or more generally, agreements on energy complementariness. These kinds of arrangements normally assume that land control belongs to the country in whose territory the line is placed, whilst all matters pertaining to the interconnection itself, its operation and testing, as well as the maintenance of the facilities must be coordinated by the technical bodies designated by all parties involved.

The difference in legal systems, in turn, should not represent an unsurmountable problem, particularly when mutually beneficial economic interests are at stake. Additionally, a system-defining feature for the power

[400] Cedric Ryngaert, *Jurisdiction in International Law* (Oxford University Press, 2009) p 241. The book explains how the principles of sovereignty and territoriality have been undermined by piecemeal developments. Particularly interesting is Howard J. Taubenfeld, The Antarctic and Outer Space: An Analogy in retrospect in Joyner, Christopher and Chopra, Sudhir K. *The Antarctic Legal Regime* (Martinus Hijhoff Publishers/Kluwer Academic Publishers, The Netherlands, 1988) 269. The article is worth looking at since deals with a comparison of two not so different regimes addressing jurisdictional matters in areas where a strict application and/or enforcement of the principle of territorial sovereignty is not exempted of serious difficulties: Antarctica and Outer Space. See also Darrel C. Menthe, 'Jurisdiction in Cyberspace: a theory on International Spaces', (1998) 4 *Mich. Telecomm. Tech. L. Rev.* 69, section V 'theory for international spaces' and section I for an overview on *Principles of jurisdiction*. See also p 88 et seq. sub-section C.2. *Jurisdiction in Antarctica* among the 'case for international spaces', available online at <http://mttlr.org/volfour/menthe.pdf>. As to Antarctica, particularly, see specially Donald R. Rothwell, *The Polar Regions and the development of International Law* (Cambridge University Press, 1996); Todd P, Chatham, 'Criminal jurisdiction in Antarctica: a proposal for dealing with jurisdictional uncertainty and lack of effect of enforcement'. (2010) *Emory International Law Review* Vol. 24 Issue 1, p 331-356; Harold G. Maier, Jurisdictional rules in Customary International Law, in Karl M. Meessen (ed) *Extraterritorial Jurisdiction in Theory and Practice* (1996) p 64, 67; Suter, Keith D. *Antarctica: private property or public heritage?* (Leichhardt, N.S.W.: Pluto Press Australia; London; Atlantic Highlands, N.J.: Zed Books, 1991).

transmission model proposed here is comprehensiveness, the ability to provide solutions for a problem not specifically envisaged. This is the issue of possible impacts of the divergent domestic laws on the proposed transaction's economic functions and the problem of how to deal with such regulatory divergence. Each system may have particular responses as to how legally consider a domestic transaction and what would be the appropriate legal treatment. Energy Complementariness Agreements set forth that the relevant legal framework applicable to energy purchases, power exports/imports, and transmission shall be that of each party to the transmission agreement. This type of clause does not resolve matters. Indeed, this situation leads first to the problem of determining what are the domestic rules applicable — largely a matter of comparative law. Secondly, in the absence of conflict of law rules or any specific and expressed clause in the Agreement, the chances for a dispute to arise on the transnational effects of the transaction are high. In cases of divergent legal systems, the potential applicability to solve a problem as in our case study, it is not unusual that far more important than the existence of a material rule of law in any of the systems, it is the presence of a procedural rule capable of overcoming the conflict. It is preferable that such a rule be embedded in an international instrument.

Finally, the commercial part of the deal between country A and B seems to be the less troublesome. Agreeing on the amount of energy needed and how much to pay for it should not represent particular legal problems. In a multilateral trading setting, however, having more than one suitable provider or a regional trade agreement might reasonably give rise to disputes, since the particulars of power business transactions may constitute barriers to trade. On the contrary, open trade allows consumers to enjoy goods - here, electricity - produced in countries other than their own which often is less expensive, whilst also giving foreign generators wider market opportunities to place their power output. Open trade and worldwide market opportunities are now encouraged under the auspices of the World Trade Organization (WTO).

Principles and functioning of the WTO relevant to energy

The WTO constitutes the most relevant contemporary multilateral trading system.[401] The WTO deals with three main areas: goods, services, and intellectual property covered by three different treaties.[402] The system is purported to be equitable, transparent, and non-discriminatory. Let these basic principles be explained briefly.

The equity principle is much better known as the 'most-favoured-nation (MFN) treatment' and refers to the general obligation of WTO members not to grant to other WTO member any special trading favour; but, if it does so, it is obliged to grant the same preferential treatment to the remainder WTO members, so that - at the end - all WTO members and trading partners be treated equally.[403]

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[401] Which basic rules have been provided by the General Agreement on Tariffs and Trade (GATT). *General Agreement on Tariffs and Trade (GATT) 1994. Marrakesh Agreement establishing the World Trade Organization* (*WTO*), opened for signature 15 April 1994, 1867 UNTS I-31874 (entered into force 1 January 1995) Annex 1A.

[402] The General Agreement on Tariffs and Trade (GATT 1994) ruling on goods trading, the General Agreement on Trade in Services (GATS), and the Agreement on Trade-related Aspects of Intellectual property Rights (TRIPS), respectively. See *General Agreement on Trade in Services (GATS). Marrakesh Agreement establishing the World Trade Organization (with final act, annexes and protocol) (Marrakesh)*, opened for signature 15 April 1994, 1869 UNTS I-31874 Annex 1B (entered into force 1 January 1995); *General Agreement on Trade-related Aspects of Intellectual property Rights (TRIPS). Marrakesh Agreement establishing the World Trade Organization (with final act, annexes and protocol) (Marrakesh)*, opened for signature 15 April 1994, 1869 UNTS I-31874 Annex 1C (entered into force 1 January 1995).

[403] World Trade Organisation (WTO) <www.wto.org>.

The principle of transparency, in turn, requires WTO members to provide as much information as possible about trading policies they have adopted, laws in force, or measures they may adopt, when these can have significant impact on trade.[404]

Finally, the principle of non-discrimination, also known as 'national treatment', involves the idea of treating the same way foreigner and locally-produced goods at least when the formers have entered the domestic market at stake.[405]

The economic idea behind WTO rules is that through furthering the flow of goods and services in unrestricted manner,[406] competition will flourish and likewise will do innovation. All this, supposedly, resulting in better products at the best price. In other words, trade liberalization conceived as a means for achieving economic efficiency.

How does the system works? Basically, WTO negotiations produce general rules that apply to all Members. Also, - under GATT - regarding goods-trading - the WTO system contains detailed lists of binding commitments (or schedules of concessions) made by individual countries[407] allowing: a) specific foreign products or providers access to their markets (under MFN concession), b) in general, to cut and "bind" their maximum tariffs or customs duty rates on imports of goods from other WTO Members;[408] in some cases, cut to zero or not to increase the

[404] Ibid.
[405] Ibid.
[406] Or trading liberalization.
[407] Either annexed to the Marrakesh Protocol to the GATT 1994 or to a Protocol of Accession. Above n 253.
[408] *General Agreement on Tariffs and Trade (GATT) 1994. Marrakesh Agreement establishing the World Trade Organization* (*WTO*), opened for signature 15 April 1994, 1867 UNTS I-31874 (entered into force 1 January 1995) Annex 1A, art II.

existing ones, c) to combine tariffs and quotas for some particular goods,[409] d) preferential concessions,[410] e) concessions on non-tariff measures (NTMs),[411] and f) specific commitments on domestic support and export subsidies.[412] This kind of WTO mechanism: the binding commitments boomed after the Uruguay Round. These are interesting mechanisms for increasing trade, though they may also make the system rather intricate to use in view of the variability affecting the schedules.

What is worth noting in this approach to the WTO framework regarding energy trade is that WTO Agreements do not contain rules specifically aimed at it, but the general rules of the multilateral trading system do cover trade on energy.[413]

Indeed, for WTO rules, electricity qualifies as a good, a commodity, which international trading falls within its scope when performed between WTO members. Furthermore, the International Convention on The Harmonised Commodity Description and Coding System from the Customs Co-operation Council[414] codifies 'Electricity Energy' under the heading HS 2716 (Harmonised System 2002/2007 Nomenclature) placed in Chapter 27 which deals with "Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes".[415] Moreover, among WTO rules for the trade of electricity is the application of the WTO

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[409] Ibid. Specifically, combinations of tariffs and quotas are applicable to agricultural goods. The mechanisms referred in a), b), and c) above belong to Part I of the respective Schedule of Concessions.
[410] Ibid. Tariffs relating to trade arrangements listed in GATT, art I, all this set forth in Part II of the respective Schedule of Concessions.
[411] Ibid. Set forth in Part III of the respective Schedule of Concessions.
[412] Ibid. Only in regard to agricultural products and established in Part IV of the respective Schedule of Concessions.
[413] Selivanova, above n 31.
[414] C.C.C., but also informally known as the 'World Customs Organization (WCO)'.
[415] Leonardo Macedo, *Electricity energy and the WTO customs valuation agreement* (2 July 2010) WTO < http://www.wto.org/english/res_e/publications_e/wtr10_2july10_e.htm>.

Customs Valuation Agreement (CVA). In sum, electricity is a commodity and international business transactions dealing with it might, in principle, be subjected to customs duties and/or tariffs for industrial products. However, the WTO is about trade liberalization through government's commitments on keeping their trade policies, trade measures, and trade-related taxes within agreed limits.

The Energy Charter Treaty (ECT), as seen, is the only international instrument setting legal rules specific to energy trade and energy investment, though its scope is constrained to the transit of energy materials and products through fixed infrastructure. As to energy trading, the ECT system builds upon the WTO general rules and the principle of non-derogation. Moreover, it applies the WTO rules by reference for trade between its members that have not yet acceded to the WTO. As for energy investment, the ECT is the only international energy investment treaty containing enforceable *investment* rules through a dispute settlement system.

The Doha Development Agenda emphasized that open trade in energy goods and services is vital for both economic progress general and meeting the needs of developing countries in particular, thus, making a link between energy trade and matters of sustainable development.[416] In this

[416] In the Doha Ministerial Declaration (Doha Development Agenda, DDA)[16] Members agreed 'to negotiations which shall aim, by modalities to be agreed, to reduce or as appropriate eliminate tariffs, including the reduction or elimination of tariff peaks, high tariffs, and tariff escalation, as well as non-tariff barriers, in particular on products of export interest to developing countries. Product coverage shall be comprehensive and without *a priori* exclusions. The negotiations shall take fully into account the special needs and interests of developing and least-developed Members, including through less than full reciprocity in reduction commitments, in accordance with the relevant provisions of Article XXVIII bis of GATT 1994 and the provisions cited in the Doha Ministerial Declaration [50]. To this end, the modalities to be agreed will include appropriate studies and capacity-building measures to assist least-developed countries to participate effectively in the negotiations'. See generally Christine Lagarde, 'Multilateralism: The Doha Round and the Hong Kong' in Ross Buckley,

context, the World Energy Council Task Force submitted recommendations to the WTO for encouraging a more efficient management of energy resources through two specific actions: firstly, by prioritising the reduction of trade barriers and the opening of energy markets, including environmentally-friendly goods and services; and, secondly, ensuring the integrity of the rule of law under the WTO Agreement in ongoing considerations under the UNFCCC and other international settings.[417]

Part of those recommendations are embedded in the fourth revision of the draft Modalities for Non-Agricultural Market Access (NAMA)[418] which – although one of the non-mandatory sectoral initiatives - sets out modalities for the reduction or elimination of tariffs on the electronics/electrical products[419] sector as a means of achieving the target set forth in the Doha Development Agenda. Such modalities, in turn, should become new schedules of concessions to be submitted and finalized in the Harmonised System 2002 nomenclature. The revision proposes these modalities on tariff reductions to be reflected in a formula (the so-called Swiss formula) with separate coefficients for developed or for developing country members and a scale of flexibility options for the latter.[420]

Vailo Lo, and Laurence Boulle (eds), *Challenges to Multilateral Trade. The impacts of bilateral, preferential, and regional agreements* Global Trade Law Series (Wolters Kluwer Law & Business 2008) vol 14, part I.

[417] Richards and Herman, above n 171.

[418] Market Access WTO Negotiating Group. *Fourth revision of the draft modalities for Non-Agricultural Market Access* (*NAMA*) WTO Doc TN/MA/W/103 (6 December 2008) Rev.4.

[419] The electronics/electrical products are identified in paragraph 10 (‘covered products’).

[420] A ‘Swiss formula’ is supposedly to produce deeper cuts on higher tariffs. A higher coefficient (as envisaged for developing members) means lower reductions in tariffs. The opposite, for lower coefficients (envisaged for developed countries). World Trade Organisation <www.wto.org>.

IV.3.5. Economic Challenges

Market access, vital for a Transnational Power Transmission Market

The economic justification for letting monopolistic markets exist is efficiency.[421] Due to their capital intensive nature and high capital investment costs this argument is particularly compelling as to the power transmission industry. Such natural configuration - through which a sole supplier delivers goods or services at a very large scale thus securing a more efficient supply at lower costs – has long been the rule in the transmission sector in liberalised economies, either domestic or internationally. Moreover, in the latter the rule applies even more strongly, since potential suitable providers, technically and economically capable and interested in undertaking a transnational transmission project, are a few.[422] For this reason, addressing the issue of access at international level appears to be both economically inefficient and regulatory unimportant.

In Chapter III the seemingly contradictory problem of giving access to a natural monopolistic market, whilst still trying to keep the market's inherent efficiency-related advantages was introduced. It is time to address this paradox and explain the market accessibility issue in further detail from a different outlook.

Firstly, it is not about intervening ongoing market configurations. Such approach would not only be internationally unrealistic, but also highly disruptive and allegedly inefficient at national level.[423] Instead, a better approach is one of the type 'divide and rule', in which is crucial to

[421] Business News Americas <http://www.bnamericas.com>.
[422] OECD <www.oecd.org>.
[423] Given the trend of liberalising economies.

differentiate levels of analysis: whether dealing with international trunk transmission infrastructure or domestic transmission facilities. In fact, setting aside the distribution level, in general, wide access to bulk power transmission should be encouraged through adequate regulatory mechanisms and tender processes to secure as much competence as possible in setting up new transmission lines. Secondly, any legal approach should be minimal, so as to not unduly obstruct competition and also to favour informed, free decision-making by economic agents, in relation to a minimal, clear, and scope-restricted set of rules to regulate transnational transmission grid operation.

At domestic level, on the contrary, the solution generally is characterized by instituting legally-guaranteed access to the grid to any power producer.[424] A device like this, though legal in character, may also become a powerful economic sign to respond to increasing connection-demand and enhanced transmission infrastructure. In close connection, lower power rates resulting from a growing domestic market with improved transmission facilities constitute an objective competitive advantage which, internationally, may act as an incentive for the unification of the markets through interconnecting and/or updating transmission facilities, therefore, enabling cross-border transit and power trading. At municipal level such rules can be framed by national domestic regulation, particularly, facilitating users the access to essential services provided by facilities that operate as natural monopolies. But beyond national frontiers where International Law still struggles for enforceability mechanisms, the decision making-processes rely only upon consensus and mutual cooperation.

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[424] U.S. Energy Information Administration, *Country Analysis Briefs* (September, 2010) EIA <http://www.eia.doe.gov/cabs.html>

One of the purposes of a regulatory framework for power transmission is to promote competition in the generation market. The idea is to put in place a legal regime designed to facilitate multiple and diverse electricity generators' access to the transmission grid. Here, the grid remains unified and singular as this secures economic efficiency, but opening up and widening the access to the grid either to generators upstream; or distributors or end users downstream allowing their businesses to compete more effectively and to improve economic efficiency as a whole. How to do this? Part of the solution has been market liberalization and deregulation processes, since these measures have removed some of the general and most common entry-requirements to markets: pricing mechanisms, subsidies, controls, and excessive regulation. However, much of the solution is attributable to unbundling vertically-integrated businesses to create potentially competitive activities in upstream or downstream markets. This process used to be the case with power generation and transmission lines where the pricing market power (or the potential to charge monopoly prices) by generators commonly went along with strong incentives to inhibit access to the grid by competitors, thus, restricting competition between generators.[425] An owner of an essential power facility competing in upstream or downstream markets will usually have an interest in denying access thereto, lessening competition in vertically related markets and thus increasing its monopolistic position by profiting at the expense of economic efficiency.

[425] R.A.C. van der Veen, G.L. Doorman, O.S. Grande, A. Abbasy, R.A. Hakvoort, F.A. Nobel, D.A.M. Klaar, 'Harmonization and integration of national balancing markets in Europe – regulatory challenges' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-104-2010.

Access pricing, for that reason, is an important issue to be addressed by regulatory schemes. It seems, however, more achievable from the domestic side since - normally - unbundling rules coupled with the application of the non-discrimination principle to parties interested in accessing the national grid should suffice to gain access to an eligible infrastructure service. Although not unrealistic, reaching access pricing consensus appears to be more complex, and it presupposes the existence of a single common power grid. In other words, a situation where there are multiple national grids already interconnected to which generators even though they are situated far apart could gain access.

From the legal standpoint, it becomes relevant to consider the way in which such pricing access agreement could be entered into, since bilateral negotiations could lead to different outcomes. Instead, a multilateral negotiation – for instance, under the auspices of the WTO – might better suit achievement of the goal. This, because the mandate of the Doha Development Agenda (DDA) and the outcomes of the 'NAMA Framework'[426]gave birth to modalities for non-agricultural market access (NAMA) for all non-agricultural tariff lines[427] reflected in schedules of concessions contained in the Harmonised System nomenclature, including electricity. If 'binding commitments' in tariff reductions can be achieved for specialized markets under the WTO framework (in this case, for non-agricultural ones), thus, impacting international commodities pricing mechanisms and subsequently access and competitiveness in such markets, the feasibility for attempting a multilateral agreement on pricing-access to

[426] *The Hong Kong Ministerial Declaration* WTO Doc WT/MIN(05)/DEC, 18 December 2005 (General Council Decision of 1 August 2004), Annex B, [13]-[24]. Document available at <http://www.wto.org/english/thewto_e/minist_e/min05_e/final_text_e.pdf>. See also Ian F. Fergusson et al. (eds), *The World Trade Organization: The Hong Kong Ministerial Declaration* (CRS, 2010) CRS Report RL33176.
[427] As defined in Annex 1.

an international power network would represent a vast potential for widely integrating new and competitive power sources to the grid as well as for opening up domestic markets to international trade. This, for grid interconnectivity (or the possibility for a local producer to join an international market place) should tend to level prices along the grid's area of influence and to provide potential stakeholders with strong economic signals, just as prices are, even under existing price structures.

Single Market: key, but… unproblematic?

The idea of creating a single power market has been around for some time but it has received a boost owing to the potential of renewable sources integration. But, what is a single power market?

A single power market can be conceptualized as one in which the exchange between electricity producers and consumers is assisted through a pool where the power output from all generators is aggregated and scheduled to instantly meet power demand.[428] Almost everywhere national electricity markets are structured in this fashion. The market operator being, normally, a technical body in charge of - abiding by domestic laws and regulations - managing and applying the set of procedures and information technology systems allowing real-time centrally-coordinated power load balancing and dispatch. The technical operator's main tasks are balancing load (electricity output and demand), establishing pricing margins and reserves, as well as determining electricity spot prices.[429] At domestic level, normally where there is a single trunk grid serving as backbone to the electric system, the chance to attain stability and reliability

[428] Australian Energy Market Operator (AEMO), *An Introduction to Australia's National Electricity Market* (AEMO, 2010) 4.
[429] Ibid.

is normally good, therefore, facilitating the financial settlement of a physically changing market. The outlook seems even better if the national system has uniformity of rules, thus, avoiding consistency issues between standards and/or technical requirements.

Due to the particular transportation features of electricity, its trading has been mainly local. A single transnational power grid, instead, needs interconnectors to transport electricity between adjacent regions or countries. The European Union, for instance, well aware of the current challenges in configuring a grid and a single power market fit for the 2020 challenges has proposed to focus attention on so-called priority corridors.[430] The priority corridors include those facilities, such as the one designed to connect the offshore grid in the Northern Seas to Northern and Central Europe; interconnectors in South Western Europe to integrate Northern African renewable energy sources; connections in Central Eastern and South Eastern Europe, and the completion of the Baltic Energy Market Interconnection Plan (BEMIT).[431]

The European Commission still targets a single integrated European market but many challenges lie ahead. Recently, the Commission called for action to 'integrate physical networks, improve the regulatory framework, increase transparency and invest in transmission capacity, all of which could foster further development of futures trading'.[432] However,

[430] European Commission, *Permitting Procedures for Energy Infrastructure Projects in the EU: Evaluation and Legal Recommendations – Final Report* (31 July 2011) European Commission <http://ec.europa.eu/energy/infrastructure/studies/doc/2011_ten_e_permitting_report.pdf>.

[431] The BEMIP aims at integrating the Baltic States' grids (Lithuania, Latvia and Estonia) into the European market through concrete measures for the reinforcement and strengthening of the interconnections with Finland, Sweden and Poland (EU energy nertworks). See European Commission's Directorate-General for Energy <http://ec.europa.eu/energy/infrastructure/bemip_en.htm>.

[432] Banks, above n 375.

issues related to energy transit, common network operation, or how to deal with restrictive practices of energy surplus countries and power companies that occupy monopolistic position at domestic level are still not addressed to a substantial degree by the existing multilateral framework.[433]

Power pricing

One of the most important challenges posed by the idea of a single market is power pricing, since bigger markets normally represent bigger fluctuations between power demand and supply. Dispatch price always represent marginal cost, namely, the cost of producing the last unit to meet demand. But, unfortunately, this is not the only price in the industry upon which harmonisation could be arranged. There are more aspects to be considered, such as the spot price normally an average of all trading-intervals' dispatch prices; and they all might vary widely. Greater difficulty applies when pricing power internationally, for many factors - such as limitations to an interconnectors' capacity to supply power or reliance on more expensive sources of supply - may contribute to variations in the electricity price produced and transported from different regions.

We know already that electricity *per se* has peculiar characteristics which differentiate it from other commodities, one of them being its difficulty to be stored.[434] A single interconnected grid, instead, offers an unprecedented chance to technically keep electricity flowing, rather than wasting it as it is unable to be stored. In other words, creating a big single network allows

[433] See above ch III.3.3, analysis of the European Union case study, 78.
[434] F.J. Adamek, 'Optimal storage location and layout in power supply systems' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C1-209-2010.

more lines getting into the system, thus, increasing the number of generating units and consumer centres and making the transmission grid in itself a power storage system, through expanding the grid's load-balancing function which makes the grid more stable, predictable, and robust. This is so because what a grid achieves when drawing in new generating plants is flickering and load oscillation control capacity.[435] This can occur, for instance, by means of using additional spinning reserves which in turn has a financial implication: the possibility to predict (or control) in some degree the movements of the market; or, at least, to react to them efficiently. This remains true, however, as long as generation is constant as it is in the case of nuclear energy, for instance; but it is not necessarily the case when wind, photovoltaic, or other inherently variable energy sources are integrated into the grid.[436]

Fragmented power markets along national lines, in turn, also cause different prices for electricity. The problem of getting a common price when different markets are united is twofold. On the one hand, it requires finding a basis for pricing the same object in different productive, financial, and even consumer environments; whilst on the other this must be done in different timeframes according to operational planning i.e. spot, intraday, and/or day-ahead power pricing as well as future power contracts pricing. In this sense, a promising attempt in regional power market

[435] M. Bollen, M. Häger, M. Olofsson, 'Allocation of emission limits for individual emitters at different voltage levels: flicker and harmonics' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C4-106-2010.

[436] H-J. Herrmann, H. Kühn, H. Föhring, A. Ludwig, F. Oechsle, P. Schegner 'Impact of renewable generation on protection and disconnecting solutions – German Practice and Experiences' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) B5-208-2010.

coupling[437] is being conducted between the Central Western European and Nordic regions and Great Britain. Here, the starting point is an interconnection: the BritNed cable,[438] a submarine transmission line which connects Great Britain (Isle of Grain) with the Netherlands (Maasvlakte). In this fashion, the isolated British power market is connected with the Dutch power market and, through this, on the one hand with the wider Central Western European market in which the Dutch market partakes; and, on the other, with the Nordic European regions, as the Dutch market is also interconnected to Norway through the NorNed interconnector.[439]

The European Union's Electricity Regulatory Forum held on December 2010, in Florence, agreed that price coupling in north-west Europe (CWE, Nordic regions and GB) should be 'developed and implemented by end 2012 as a first step for pan European price coupling'[440] and 'stressed that the work on governance should continue, for intraday and day ahead

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[437] In 2005, the European Commission first raised a regional power market as a step towards a single European power market. On January 2007, the Commission launched a package pointing at a common energy policy emphasizing the need for a more transparent and competitive European power market. Since then, regional projects started amongst them: the Central Western European (CWE) and the European Market Coupling Company (EMCC). The EMCC's so-called 'tight volume coupling' project initiated the Nordic-German market coupling on November, 2009 by steps: the first one, involving interconnectors Denmark-Germany (in 2008-2009) and Germany-Sweden (in May 2010, using the Baltic cable). The second step, initiated in January 2010 aimed at creating a system integrating CWE price coupling and Nordic market splitting (this time, the mechanism deployed was the so-called 'Interim Tight Volume Coupling'. Finally, since November 2010, the EMCC is undertaking an interconnection between Norway and the Netherlands through the NorNed cable. It represents the world's largest single power market of 1,816TWh, about 60 per cent of European power consumption. APX-Endex, *A decisive step towards a single European Electricity Market* (November, 2010) APX-Endex <http://www.apx-endex.com/index.php?id=24&tx_ttnews[tt_news]=436&tx_ttnews[backPid]=94&cHash=3205567a37>.

[438] BritNed is a 260 kms long 1000 MW High Voltage Direct Current (HVDC) line owned by a joint venture formed by two transmission companies: British (British National Grid) and Dutch (Dutch TenneT). BNamericas <www.bnamericas.com>.

[439] P.G.H. Jacobs, M.A.M.M. Van Der Meuden, F.J.C.M. Spaan, I. J. Tigschelaar, 'Long-term grid planning in the Netherlands' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-104-2010.

[440] EU Electricity Regulatory Forum, 'Final Conclusions on Internal Market' (Conclusions presented at 19th EU Electricity Regulatory Forum, Florence, Italy, December 2010) Nr 3.

market coupling'.[441] However, for this to occur and for due regulations to be applied by 2012 the Council and the European Parliament had to reach an agreement on a proposal submitted by the Commission on Energy Market Integrity and Transparency.

Market Coupling

The market coupling mechanism[442] was jointly developed by power exchanges (PEXs) and transmission systems operators (STOs). The mechanism operates on the basis of running day-ahead auctions daily in the linked set of markets where members submit anonymous firm orders which are matched to power offers on the basis of available transmission capacity and economic welfare criteria to determine the optimal power flow from low-price power areas into areas of higher prices.[443] The mechanism also has the advantage of allowing traders to continue biding into local auction markets though auction times synchronised in anticipation by a centralised counterparty clearing system.[444]

It must not be overlooked that all power output and trade is carried on through fixed infrastructure: grids which are costly to expand and

[441] Ibid.
[442] See above n 437.
[443] This method, basically, coordinates a cross-border volume calculation considered as price-firm, on the one hand; with a (up to the moment) day-ahead reference (baseload) price calculation on the other. Then, bids and offers are automatically matched across-borders without need for participants to separately secure transmission capacity (from owners or operators unrelated to the system) for this is booked beforehand and guaranteed from line trips and losses (secure collateralisation). See generally, R. Beune, J. Van Putten, K. A. Barmsnes, O. Gjerde, 'Interregional market coupling - a challenge for the NorNed cable' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-103-2010. For a practical view of coupling mechanism see M. Luther, I. Biernacka, A. Menze, J.M. Rodríguez-García, D. Preotescu, 'Feasibility aspects of a synchronous coupling of the IPS/UPS with the UCTE' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C1-204-2010.
[444] Above n 437.

duplicate. In addition, important pieces of infrastructure are owned and operated by State governments, whilst others are run by private businesses arrangements. Even more, currently in Europe there are more than half a dozen exchanges offering trading services in both ends of grid interconnectors.[445] Furthermore, the infrastructure problem is not just of upgrading existing grids, but one of a more challenging nature: transforming and/or replacing current conventional grids for Smarts Grids.[446] This latter is a concept embodying not only the usual conveyance of electricity, but also the function of providing two-way digital communication between all grid users, this is, generators, transmitters, distributors, retail-suppliers, and end-consumers. A Smart Grid is designed to have intelligent metering and monitoring systems enabling information to be obtained in real-time about several parameters such as power output variability, total load, demand, etc vital to efficient synchronised operation. In Europe, the European Commission has established a Smart Grids Task Force which has issued a report on the matter.[447] The United States, for example, has created the 100-Smart Grid Investment Grant Programme valued at $3.4 billion.[448] China, in turn, has allocated $7.3 billion in loan and grant programmes concerning Smart Grids projects.[449] Smart metering has been introduced into the Australian jurisdiction of Victoria as a step towards Smart Grids.

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[445] Mehmet Baha Karan, Hasan Kazdaǧli, 'The Development of Energy Markets in Europe in A. Dorsman, W. Westerman, M.B. Karan, Ö. Arslan, Financial Aspects in Energy. A European Perspective' (Springer-Verlag, Berlin, Heidelberg, 2011), ch 2, 27.

[446] G. Mauri, D. Moneta, J. Silva De Assis Carneiro, S. Pugliese, S. Fratti, 'Integration of active customers into smartgrids: experimental test facility and results' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C6-205-2010.

[447] European Union, Task Force on SmartGrids (2011) Europe <http://ec.europa.eu/energy/gas_electricity/smartgrids/taskforce_en.htm>.

[448] U.S. Energy Information Administration (September, 2010) EIA <http://www.eia.doe.gov.html>.

[449] Bloomberg <http://www.bloomberg.com/>.

Therefore, from several perspectives - operational, economic/financial, and regulatory - the integration of power markets looks strikingly complex. However, some clarifying ideas can be drawn from this complexity.[450] In the first place, due to the characteristics of the commodity at stake, its trading in a single market requires it to be continuous and synchronised. Continuity of trading refers to the possibility for transactions to take place upon a 24-hour /7 days a week basis in order to resolve the problem of the lack of storage capacity. Synchronised trading, in turn, means that far apart, though linked, markets must converge in terms of time and exchange zones, subject to available interconnection capacities. In this fashion, the output from all generators can be pooled and scheduled to meet demand in different time-scenarios: whether spot market (or real-time) or future transactions (intraday, day-, month-, year-ahead transactions).

Secondly, due to characteristics of the electricity power market it is essential that all interested parties can access transmission facilities under equal conditions, thus, avoiding any abuse of their dominant position by the owners or operators of the monopolistic power line. In this sense, it creates a pool of bids and offers, procuring anonymity for potential bidders, and securing the transparency of the transactions by means of giving integrated notification to all its participants would contribute to achieve such a goal of equality. In addition, when multiple lines are available to conduct power flow between two or more regions with

[450] The conclusions are generally inspired on P. Favre-Perrod, T. Krause, 'Multi-energy transmission – an option for system development?' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C1-106-2010. In checking out these conclusions it is interesting to look at a particular case in detail, which can be found in M.A. Avila, H.G. Sarmiento, D. León, 'International Power Grid Interconnections in Mexico' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C2-110-2010.

different baseload prices it should to be possible for customers to nominate preferred interconnectors. This would not only cause more competition between transmission lines operators resulting in lower prices, but also allow the market to optimise the use of infrastructure by means of selling unreserved or unused transmission capacity.

Finally, for appropriate planning and operation of electricity supply, critical information about key factors such as the level of physical generation (power liquidity or volume), available transmission capacities (interconnection capacities reserved for cross-border power exchanges), expected baseload or reference prices calculations must be transparent and complete, made available in a timely fashion, and shared by all participants in the setting of linked markets. Moreover, this information must be coordinated either by the transmission system operators as to the availability of transmission capacity; or by the power exchanges, in regard to reference price calculation for forward transactions. Further, volume-bids logged into an integrated system must be considered price-inelastic (or firm). In a similar way, reservations of transmission capacity (either exclusive or nominated, if this latter option is available) must be strictly honoured, otherwise no realistic feasible matching could be possible.

IV.3.6. Conclusions

In terms of prospective regulation, a single power market poses key challenges in connection with the economic perspective addressed in this section. But, it is the view adopted here that two basic ideas ought to inform the way in which International Law may contribute to meet these challenges.

The first thing is to bear in mind the fact that the transmission sector is a natural monopoly but that this condition not necessarily represents a bad thing. In this sense, a regulatory approach should facilitate international business undertakings (joint ventures, for instance) leading them to develop, built, and commercially operate electricity interconnectors with other countries, as well as facilitating all subsequent exchange of information about liquidity (volume), internal prices, and transmission capacity on a transparent, complete, and mutual basis across the sector.

Secondly, a transnational regulatory approach to a single market should carefully address the coordination issue between transmission system operators and the pricing authority, which currently is separated amongst power exchanges. Market coupling is a step forward in coordinating such two factors, but there is still a long way to reach a single power market that effectively integrates renewable sources at a large scale on the one hand, and which receives feedback from the demand side on the other, as required by a SmartGrid. Such a market would require - at least - some new regulatory configuration and functioning for a new significant factor: the transmission system operator.

Indeed, while the segregated structure of power exchanges as local pricing authorities might continue in this function in a fairly unmodified manner (and, even more, in a way consistent with determining reference price for electricity according to volume demand, production time, distance, and characteristics of the markets involved in a given flow), the envisaged single market would require - as a system - an overseeing body. This oversight function should be required to determine which, at what time, and for how long generators are required to meet power demand in a process that,(taking into consideration current applicable methods) could best be described as coordinating/scheduling multiple market coupling. For taking up this challenge, the solution seems to be achieving international consensus on transnational interconnection; whilst at domestic level the relevant law and regulation should guarantee all generators clear access to the trunk grid. In this sense, domestic legal systems should provide sanctions for those who unduly obstruct or impede access by third parties. This regulation would then work as a powerful economic signal for agents to enter into the market and respond through enhancing the transmission infrastructure. In turn, lower power rates resulting from a growing domestic market with improved transmission infrastructure represent a competitive advantage which, at international level, might drive the integration of the market via interconnectors, power output pooling, and market coupling. The desirability of such processes can be illustrated by the following case study.

IV.4. THE ROLE OF INTERNATIONAL COOPERATION V. DOMESTIC POLITICS

Sustainable Development, Renewable Energy, and Power Grids in South America

Sustained economic development in South American countries has been elusive. Despite common social and cultural heritages,[451] there is a history

[451] The section assumes the homogeneous socio-cultural environment of Latin-America. Thus, the book excludes the consideration of Suriname, Guyana, and the French Guiana's power systems and regulatory frameworks, in its analysis. These systems being deemed - respectively- neither significant in terms of installed capacity, demand or power output; nor entirely representative of the socio-cultural evolution of Latin America. See generally Central Intelligence Agency, *The World Factbook* (November 2011) Central Intelligence Agency <https://www.cia.gov>.

of mutual political suspicions, lack of capital investment,[452] and disparate approaches to law and regulatory decisions. While the region struggles not to lag behind economically, South America also faces major environmental issues and the critical dilemma of achieving sustainable development without going down the path of industrialized carbon-based economies.[453]

Critical to ensuring effective development, a key regulatory decision concerns the energy base upon which economic growth is to be grounded, particularly in consideration of the rising of international prices of carbon-based fuels and associated climate change consequences.

The majority of South American countries still focus themselves on achieving the best possible domestic energy output and energy matrices acting independently, in isolation from each other.[454] Much less attention has been placed on seeking a unified solution to optimise existing economic and environmental resources by integrating power transmission networks throughout South America. The relationship between energy matrix configurations and energy-supply policies presented in Chapter II is addressed anew in this section along with an examination of its effect on development opportunities in the specific context of South America. By considering domestic and international regulation, this section explores the constitutional treatment of the production, allocation and distribution of

[452] This rather endemic lack of capital investment contrasts profoundly with the relative wealth and diversity of natural resources enjoyed by South America. Accordingly, the potential for renewable energy sources in the region is vast, particularly, in terms of world's water reserves. See especially International Energy Agency <www.iea.org>.
[453] As seen in chapters I and III.
[454] This may happen for various reasons. For instance, in the case of Venezuela, Ecuador, Colombia, Uruguay and Paraguay that approach is natural, due to the relative abundance of energy sources coupled with a lower to moderate domestic power demand. For Peru and Bolivia, in turn, it is a matter of achieving more efficiency in the exploitation and use of power sources; whilst for Brazil, Argentina and Chile it is almost an imperative for keeping their industrial and economic models going.

energy in the region along with relevant political, social, and technical factors to determine whether cross-border interconnection of transmission grids could play a positive role in the efforts of the region to achieve sustainable development.

The inquiry analyses South American experiences of cross-border power transmission and the opportunities and barriers for renewable energy sources integration and grid interconnection. In so doing, it uses a constructive-epistemic methodology.[455] This means that its central proposition will be tested against facts, legal framework, and selected case studies. Then, findings will be constructively drawn out of the exercise in order to validate, discard, or amend the original proposition.

The proposition to be tested is whether despite the vastly different regulatory frameworks, the establishment of transnational transmission networks in South America could assist in achieving a regional convergent policy goal of sustainable development based on legal mechanisms to achieve such transnational transmission. The inquiry argues that, as long as regional countries promote the integration and give priority to a greater share of renewable sources into their energy mixes, they are capable of coordinating their energy policy instruments by removing relevant technical and legal barriers. Further, cross-border interconnection of transmission grids could play an invaluable role in addressing both the threats posed by climate change and the issues associated with sustainable development.

[455] Kristoffer Ahlström, *Constructive Analysis. A Study in Epistemological Methodology* (Acta Universitatis Gothoburgensis, Göteborg, Sweden, 2007) ch IV, 122.

IV.4.1. South America's Dilemma

Sustainable Development in a Climate Change context

A few decades ago, the answer to the problem of development in South America may have seemed easy. Presumably it would have entailed focusing on the lessons learnt by developed countries in relation to consumption, productivity, depletion of natural resources and adopting similar strategies tailored to South America. With the cumulative effects of climate change, the current geopolitical environment is vastly different and has resulted in the need to foster the concept of sustainable development.[456] Unlike developed countries however, the region constantly struggles against the impediments caused by a lack of capital investment, a lack of strategic natural resources management plans, and political instability.

This section looks at South America's energy policies and focuses on the way in which South American countries have addressed the integration of renewable energy forms in domestic energy matrices in an effort to deal with sustainable development programs, climate change abatement goals, and security threats to energy supply.

[456] Sustainable development is defined by the Brundtland Commission Report. See World Commission on Environment and Development, above n 148. In the particular matter of indigenous land rights in territories containing huge power potential capacity being on a collision course with transnational companies, see Lila K. Barrera-Hernández, 'Sovereignty over Natural resources under Examination: The Inter American System for Human Rights and Natural Resource Allocation' (2006) *XII Annual Survey of International & Comparative Law*, 43; Lila K. Barrera-Hernández, 'Sustainable Energy development in Latin America and Donor driven Reform: What will the World Bank do?' in Barton et al (eds), *Regulating Energy and Natural Resources* (Oxford University Press, 2006); Lila K. Barrera-Hernández, 'Got Title; Will Sell: Indigenous Rights to Land in Chile and Argentina' in Aileen McHarg et al (eds), *Property and the Law in Energy and Natural Resources* (Oxford University Press, 2010) 185.

South America's approaches towards unified Energy Policy

In analysing South America's regional policy-making processes, national sovereignty and the implications for energy policy must be addressed. Whilst in other countries, sovereignty may convey a rather flexible and modified approach as to the inherent prerogatives of the State such as control over territory. In South America, by contrast, the conventional approach to national sovereignty is one of a more absolutist content and its characteristics are held to be comprehensive and rather formal.[457] This approach to sovereignty matters since the ideal of unifying energy-related transnational decisions under a common energy policy will have major impacts on how the relevant South American States approach the question of territorial sovereignty and the idea of non-exclusive use of resources. As such, the possibility of mutual cooperation or even integration is seriously constrained. In circumstances where concerns about national security take priority, the sovereignty question becomes even more restrictive.

In analysing the actual political frameworks in the region, however, a more diverse and fragmented treatment of sovereignty over natural resources and territorial ownership is revealed. Indeed, the Constitutions of Argentina,[458] Brazil,[459] Uruguay,[460] and Chile[461] have many elements

[457] This is so, mainly, for historical reasons. After the Independence movements away the Spanish Crown in early XIX century, South American national States needed to emphatically assert their newly acquired sovereign status. Over time, there was an evolution toward both strong presidential regimes and highly centralized political systems led up to an even more paramount model of national sovereignty.

[458] *Constitución Nacional de la República Argentina* [National Constitution of the Republic of Argentina] (Argentina) art 14, 20.

[459] *Constituição da República Federativa do Brasil* [Constitution of the Federal Republic of Brazil] (Brazil) art 5(XXII), (XXIII), (XXIV), (XXV).

[460] *Constitución de la República Oriental del Uruguay*, 1967 [Constitution of the Eastern Republic of Uruguay, 1967] (Uruguay) arts 7, 32.

[461] *Constitución Política de la República de Chile* [Political Constitution of the Republic of Chile] (Chile) art 19(24).

which derived from liberal principles of freedom for economic initiative. These Constitutions emphasise the pre-eminence of property rights which guarantees for the individual that are subject to no other limitations than those arising from the social function assigned to property.[462] Further, the Constitutions do not give the State any particular role in the conduct of the economy. Two of them, even, accord the right to acquire property similar status and legal protection.[463]

In general, in Argentina, Brazil, Uruguay, and Chile the subsidiary principle confines the role of the State more or less to that of a regulator and watchdog. State economic activities are allowed in a few strategic sectors but these are carried out under a general non-discriminatory regulatory framework. A less minimalist approach towards the control over private property, though still committed to an open economy model, can be found in the Constitutions of Perú[464] and Paraguay,[465] in which limitations can be imposed on individual property rights by reference to concerns based on national security,[466] public necessity,[467] and the public interest.[468]

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[462] *Constituição da República Federativa do Brasil* [Constitution of the Federal Republic of Brazil] (Brazil) 5(XXIII), 170(III), 186; *Constitución Política de la República de Chile* [Political Constitution of the Republic of Chile] (Chile) art 19(24).

[463] *Constitución Política de la República de Chile* [Political Constitution of the Republic of Chile] (Chile) art 19(23).

[464] *Constitución Política de la República de Perú* 1993 [Political Constitution of the Republic of Peru] (Perú) arts 2(16), 70.

[465] *Constitución Política de la República de Paraguay* 1992 [1992 Political Constitution of the Republic of Paraguay] (Paraguay) art 128.

[466] *Constitución Política de la* República *Perú* 1993 [Political Constitution of the Republic of Peru] (Perú) art 70.

[467] *Constitución de la República Oriental del Uruguay*, 1967 [Constitution of the Eastern Republic of Uruguay, 1967] (Uruguay) art 32; *Constitución Política de la República de Perú* 1993 [Political Constitution of the Republic of Perú] (Perú) art 70.

[468] *Constitución de la República Oriental del Uruguay*, 1967 [Constitution of the Eastern Republic of Uruguay, 1967] (Uruguay) art 7, 32; *Constitución Política de la República de Paraguay* 1992 [1992 Political Constitution of the Republic of Paraguay] (Paraguay) arts 109, 128; *Constitución de la República Bolivariana de Venezuela* [Constitution of the Bolivarian Republic of Venezuela] (Venezuela) art 115.

A more radical approach towards restrictions on private ownership is evident where precedence is given to socio-economic[469] and/or ecological[470] functions considered essential for economic growth and development. Along with the previously-delineated constraints on property from a social and constitutional standpoint, issues such as native title and the exploitation of natural resources – whether renewable or not – on indigenous lands can be matters regulated by the Constitution as can be observed in Paraguay,[471] Colombia,[472]and more particularly Ecuador[473] and Bolivia.[474] In addition, in Venezuela, the economic role of the State is strengthened and normally it includes processes of redistribution of lands (agrarian reforms), [475] public sector involvement in productive activities, and reserved or state monopolies over exploitation of natural resources.

In a traditional view, the interplay between sovereignty and national territory on the one hand and natural resources sited within on the other requires the territory not to be transferred, leased, or alienated in any way to a foreign entity. In fact, most constitutional charters in South America

[469] *Constitución Política de la República de Paraguay* 1992 [1992 Political Constitution of the Republic of Paraguay] (Paraguay) art 109.

[470] *Constitución Política de la República de Colombia* [Political Constitution of the Republic of Colombia] (Colombia) arts 58, 60.

[471] *Constitución Política de la República de Paraguay* 1992 [1992 Political Constitution of the Republic of Paraguay] (Paraguay) art 64.

[472] *Constitución Política de la República de Colombia* [Political Constitution of the Republic of Colombia] (Colombia)] art 329.

[473] *Constitución Política de la República del Ecuador* [Political Constitution of the Republic of Ecuador] (Ecuador) art 57(4)-(6).

[474] *República de Bolivia Constitución de 2009* [Republic of Bolivia 2009 Constitution] (Bolivia) art 30(4), (14), (17).

[475] *Constitución de la República Bolivariana de Venezuela* [Constitution of the Bolivarian Republic of Venezuela] (Venezuela) art 115. For agrarian reform situation in Brazil see *Constituição da República Federativa do Brasil* [Constitution of the Federal Republic of Brazil] (Brazil) chs III (arts 184-191), VII. The agrarian reform process here, however, is regarding rural property not performing its social function. See also *Constituição da República Federativa do Brasil* [Constitution of the Federal Republic of Brazil] (Brazil) ch VIII (art 231,232) in respect of indigenous peoples, these section provides for acknowledgement of native title over lands traditionally occupied by indigenous people; declaring them inalienable and not able to be alienated, though subject to constitutional exceptions such as those set forth in art 231(3) on hydro resources and energy potential.

restrict the extent of foreign ownership of land, most particularly, in border areas.[476] However, over time, this somewhat harsh and mostly unrealistic view of national sovereignty has been weakened by several factors including the pragmatism derived from trading needs. Under pressure from transnational corporate action and international tender processes for infrastructure projects, many states grant concessions for the exploration and exploitation of natural resources, as well as allowing foreign private or public investment upon lands which in effect means that controls over property are being granted, particularly by developing countries. In practice, if a nation state in this way gives up some aspects of absolute control in respect to territorial sovereignty it can be counterbalanced by reserving activities or some control over the territory granted under the concessions for the State, and pursuing termination rights where necessary. Obviously, one of the major benefits for the nation state is the opportunity to benefit from royalty regimes. A similar trade-off may be suggested in regard to transnational power transmission.

To establish transnational transmission networks, participating countries should not necessarily approach the required changes as being an erosion of their territorial sovereignty. Many International frameworks for regional integration including UNASUR,[477] ALADI,[478] and MERCOSUR[479] attempt

[476] See, eg, *República de Bolivia Constitución de 2009* [Republic of Bolivia 2009 Constitution] (Bolivia) art 262.
[477] *The Constitutive Treaty of South American Union of Nations* (*UNASUR)(Brasilia)*, opened for signature 23 May 2008 (entered into force 11 March 2011).
[478] *Montevideo Treaty establishing the Latin American Integration Association* (*ALADI*), opened for signature 12 August 1980, 1329 UNTS 225 (entered into force 18 March 1981).
[479] *Treaty Establishing a Common Market between the Republic of Argentina, the Federal Republic of Brazil, the Republic of Paraguay and the Eastern Republic of Uruguay* (MERCOSUR) (*Asunción Treaty),* opened for signature 26 March 2011, 2145 UNTS 252 (entered into force 29 November 1991).

to overcome issues of national sovereignty in order to explore joint paths to development.[480]

In fact, for such goals to be achieved in relation to power grid integration, the focus should be upon highlighting the pragmatic benefits of furthering transnational power grid interconnection and related infrastructure projects.[481] Unfortunately though, a general overview of the regional constitutional frameworks in South America over the last decade rather casts shadows upon the potential for success in such efforts. From the standpoint of development opportunities there is an apparent disconnection between the demand for energy from growing industrialised economies like Brazil, Argentina, and Chile; and other countries with the potential to generate vast amounts of power but which lack adequate infrastructure such as Paraguay; or countries that lack safe foreign investment frameworks as can be observed in Bolivia or Venezuela.

The noticeable gap between South American countries is increasingly worrying because, instead of allowing power-surplus countries to take advantage of their current condition to realize their economic potential, their Constitutional framework in respect of property rights over power generating assets or resources acts as *a priori* barrier, especially when combined with restrictive understandings of national sovereignty. Thus the development of a single common transmission line project across South America would entail significant cultural, social, and economic revisions

[480] However, not all South American countries take part in them or do so in full operation, this refers to the broad practice of making reservations in international agreements, in order to except the application or even interpretations of certain clauses which potentially conflict with the reservation of a State's interests, position, or circumstances.
[481] A critical view of the politic and social history of Latin America, however, reveals a tendency to rank political factors higher than potential economic advantages. This feature has been identified as one of the pervasive elements making South America's development opportunities almost endemically fail.

that have influenced entrenched legal concepts such as property rights and territory management, as well as the creation of new ways of governing common resources.

A further obstacle to the establishment of transnational transmission networks are domestic regulations relating to energy mixes configuration. In the liberal developing economies of Argentina, Chile, Colombia, Perú, and Uruguay, the role of regulation is largely seen as one that ensures there is proper resource allocation by the market but also one of sending signals to market participants about the policy shift to more diversified energy matrices, including non-conventional renewable energies and interregional regulatory frameworks for interconnection. In centralized economies like those of Venezuela, Ecuador, and Bolivia, the diversification of the energy mix is part of the energy sector planning which the State is dedicated to carrying out with variable degrees of private participation.

In the region, border taxes, which are a common manifestation of the traditional sovereignty concept, are not only a permanent source of conflict in the WTO trading framework, but also a hindrance to importing new renewable technologies. Intellectual property issues must also be addressed to allow a faster dissemination of such renewable energy technologies. Joint international legal arrangements for the standardisation and granting of both international status and independent management to network operation centres are crucial for securing politically neutral and reliable power supply. It is important for South American nations to agree on opening up and unifying the power market and to provide for a transparent legally-binding tariff-scheme, independent operation and dispute-resolution mechanism. There is also a need for a technical revolution in the transmission sector ranging from the development of new superconductors able both to increase transmission capacity and reduce losses,[482] through to the introduction of 'smart' meters, and enhanced designs for grid balancing operating software, still unavailable for some countries in the area. Furthermore, against this daunting regulatory and technical background, energy policy-making in South America is still confined to national State boundaries. Even more, setting aside the Brazilian exception to be analysed further on, innovative energy policies in most countries have been erratically pursued.[483]

In summary, South America lacks both regional common energy and power transmission policies.[484]

Transmission Networks and renewable sources in South American energy matrices

Could the energy sector and power transmission, in particular, become a joint path to development in South America worthy of exploration? To the extent that policy-making process should be multilateral, focussed on

[482] At present, the high-voltage grid's maximum capacity is 380 kV. New conductors are expected to have 740 kV of transmission capacity. The lines are mostly made of copper and each meter of its weighs 38 k. In turn, high-voltage direct-current technology is suitable for long-distance power transmission, but requires converter substations to transform direct current into alternating current. Its loss rate is just 3 per cent of the power conveyed for every 1000 kms of line.

[483] This has been the case, for instance, of Chile's energy policy.

[484] There is no common policy, but some multilateral initiatives for conducting studies on the subject of the feasibility of international power integration between Latin American countries. For instance, within the United Nations' framework a study has been commended to the UNDP on the power interconnection between Bolivia, Chile, Colombia, Ecuador, and Perú, which is coordinated jointly by the Energy Vice-Ministers of the Members States of the Andean Community of Nations (CAN) and that of Chile (non-Member State). Also, within the CAN's framework there exists a similar Project under the charge of the Technical Group of Planning Agencies (GOPLAN) of the CAN's Member States. Additionally, regional non-governmental organisations bearing international status, like the CIER, are already conducting research on electric interconnections between Mexico, Central, and South America (CIER Project 15, phase II). See *Andean Subregional Integration Agreement* (*Cartagena Agreement, Andean Community of Nations, CAN)*, opened for signature 26 May 1969 (entered into force 16 October 1969); CAN's Rulings Nrs. 536 of 19 December 2002 and 720 of 5 November 2009.

efficiency and sustainability, and steady and consistently implemented, the answer is affirmative.

Why then is it important to design a proper energy matrix? One of the main factors in answering this question is that energy investments have a long maturation time in which the economic agents - either public or private - require a prediction of future energy outcomes and power demand that is as accurate as possible. A matrix is a flexible strategic policy tool which serves that goal whilst it also advances legal reforms. Its methodology encompasses regular up-to-date information gathering processes on energy resources available (whether in use or as a reserve), macro-economic projection models acknowledging annual growth-rate limitations (including economical activities or sectors), energy sector structure and sector growth estimates, coefficients of energy equivalence/product, and energy consumption models.[485] The importance of energy planning and the significance of energy matrices for the argument advanced in this book about the processes required for transnational power grids can be illustrated by the following example of Brazil.

[485] Estimates indicate that continuous economic growth in the region will be accompanied by rising energy demand. According to the Comisión de Integración Energética Regional (CIER) [Regional Commission of Energy Integration], in 2007 Brazil generated 49.1 per cent of the total power produced in South America, Argentina 12,8 per cent, Venezuela 12.6 per cent, Chile 6.5 per cent, Colombia 6.0 per cent, Paraguay 5.9 per cent, Perú 3.3 per cent, Ecuador 1.8 per cent, Uruguay 1.0 per cent, and Bolivia 0.6 per cent. A renewable energies overview in South America indicates that its main source is hydropower. In 2007 it accounted for 71 per cent of the regional total generation, of which 71 per cent is produced by only three countries: Brazil (58 per cent), Argentina (5 per cent), and Paraguay (8 per cent). See Comisión de Integración Energética Regional (CIER), *Regional Statistics* (2008) CIER <www.cier.org> [Regional Commission for Energy Integration].

Case Study: Brazil

At the South American regional level, Brazil is a commendable exception in terms of integrating renewable power sources into the energy mix and in realizing the importance of cross-border power transmission interconnections. It also highlights the importance of a gradual but continuous public policy on renewable energy promotion,[486] particularly biomass and biofuels.[487] Despite the earlier economic setbacks associated with the fall in crude oil price and the increase in the price of cane sugar, successive Brazilian governments have continued focusing on renewable energy sources.[488]

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[486] Relevant examples include the Incentive Program for Alternative Electricity Sources (PROINFA) which includes wind, small hydroelectricity power stations, and biomass. The program is designed to constitute a system in line with the *Kyoto Protocol to the Framework Convention on Climate Change*, opened for signature 11 December 1997, 37 ILM 22 (1998) (entered into force 16th February 2005) and the *United Nations Framework Convention on Climate Change* (*UNFCCC*), opened for signature 9 May 1992, 31 ILM 854 (entered into force 21 March 1994). See also *Programa de Incentivo às Fontes Alternativas de Energia Elétrica (PROINFA) - Ministério de Minas e Energia* [Program of Incentives to Alternative Electricity Sources (PROINFA) – Ministry of Mining and Energy] Document available at <http://www.mme.gov.br/programas/proinfa/>.

[487] See *National Program of Biodiesel Production and Use* (PNPB) started 6 December 2004 and predecessor PROÁLCOOL (Programa Nacional do Álcool). See Ministério de Minas e Energia (Brazil), 'National Program of Biodiesel Production and Use (PNPB)' (2003) *IAGS-Journal for Energy Security*. Document available at <http://www.biodiesel.gov.br/docs/Apres_MinistraME_06-12-04.pdf>; *Decreto Nº 76.593, de 14.11.1975 – Programa Nacional do Álcool (PROÁLCOOL)* [Decree Nr 76,593 of 14 November 1975 - National Alcohol Program (PROALCOOL]. Document available at <http://www.biodieselbr.com/proalcool/pro-alcool/programa-etanol.htm>.

[488] Remarkably, the Brazilians have done so along with programs aimed to create jobs, reduce inequalities and encourage social inclusion. Known as *Programa de Integração Social/Programa de Formaçao do Patrimônio do Servidor Público* [Social Integration Program/Civil Servant Training Program] (PIS/PASEP) of the Institute for Agricultural and Trade Policy in the area of biofuels. These programs were designed to promote cellulose-rich energy crops and biofuel-oriented agricultural feedstock. See *Programa de Integração Social (PIS) - Instituto de Agricultura e Comerço* [Social Integration Program (PIS) - Institute for Agriculture and Trade]; *Programa de Formaçao do Patrimônio do Servidor Público (PASEP) – Instituto de Agricultura e Comerço* [Civil Servant Training Program (PASEP) - Institute for Agricultural and Trade Policy].

Among the emerging economies of South America, Brazil's has the greatest potential to achieve the status of a developed country in terms of consumption, productivity, and income.[489] Brazil has been successful in the past in putting into effect, suitable economic,[490] legal,[491] and political decisions that have led to a promising economic and social situation, but new challenges lay ahead, particularly that of developing a sustainable economy with energy efficiencies.[492] In 2002, the Program of Incentives for Alternative Electricity Sources (*Programa de Incentivo a Fontes Alternativas de Energia Elétrica*) was created aiming to increase the share of wind power, biomass and small hydropower systems in the grid through Autonomous Independent Producers. Under similar auspices, the Brazilian Energy Research Corporation (*Empresa de Pesquisa Energetica* - EPE) [493]

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[489] The Brazilian economy is astonishing in many ways. For instance, it finished 2009 with the IPCA (Consumer Price National Index) in 4.31 per cent below the inflation target and with an economical growth rate near zero. See Eletrobras, *Administration Report* 2009 (Eletrobras, 2010). However, in only four months (from January to April) of the first semester of 2010 it was capable to create 962,000 new formal-sector jobs and in only a six-month period boost its annualised growth rate over 10 per cent. Analysts forecasted for 2010 a growth of 7 per cent. See The Economist (The Americas), Flying too high for safety (The Economist, 22 May 2010) 41-42.

[490] For example, see the monetary policy followed by the Brazilian Central Bank in regard to the Selic interest rate over the past three years. See The Economist (The Americas), *Flying too high for safety* (The Economist, 22 May 2010) 41-42.

[491] For instance, through the issuing of Decree 76,593 (14 November 1975) on the Programa Nacional do Álcool [National Alcohol Program] also known as PROÁLCOOL, originated as a response to the 1973 oil crisis. This program was in force until 2002 and it was responsible for introducing ethanol in the Brazilian fuel matrix via mandatory programs to replace gasoline, the first measure attacking the then Brazil's dependency on imports of foreign energy sources, particularly oil. *Decreto Nº 76.593, de 14.11.1975 – Programa Nacional do Álcool (PROÁLCOOL)* [Decree Nr 76,593 of 14 November 1975 - National Alcohol Program (PROALCOOL]. Document available at <http://www.biodieselbr.com/proalcool/pro-alcool/programa-etanol.htm>.

[492] It is expected that by 2019 the energy efficiencies derived from the Brazilian new energy mix will equal 12.5per cent of the current domestic oil consumption. Eletrobras, above n 158.

[493] *Lei 10.847, de 15 de Março de 2004, autoriza a criação da Empresa de Pesquisa Energética - EPE e dá outras providências* [Act 10,847 of 15 March 2004 authorizing the establishment of the Energy Research Company –EPE and sets forth other provisions], art 4(I); *Decreto 5.184 , de 16 de Agosto de 2004, cria a Empresa de Pesquisa Energética - EPE, aprova seu Estatuto Social e dá outras providências* [Decree 5,184 of 16 August 2004 establishes the Energy Research Company – EPE, authorizes its Social Charter and sets forth other provisions]. The EPE depends on the Ministry of Mining and Energy. See also *Decreto 6,685, de 10 de Dezembro de 2008, dá nova redação aos arts. 2º e 4º do Decreto 3.520, de 21 de Junho de 2000, que dispõe sobre a estrutura e o funcionamento do Conselho Nacional de Política*

was established. The EPE is responsible for conducting research and in producing estimates on the Brazilian energy mix,[494] as well as identifying and quantifying the potential of energy resources,[495] conducting the research needed for preparation of planning electric power generation and transmission expansion plans,[496] performing studies to avail and increase the use of renewable sources.[497] Significantly for the arguments raised in this book, the Research Energy Corporation assists and takes part in grid interconnections, as well as authorizing energy integration with other countries.[498]

In May 2010, the 10-year Energy Expansion Plan 2019 (*Plano Decenal de Expansão de Energia 2019* – PDE 2019) prepared by EPE was released.[499] It is the main federal-level energy planning tool for Brazil and, according to the relevant Ministry, the Brazilian mix proposal places high importance on renewable sources of energy. This builds on the existing situation where by 2009, the Brazilian national energy supply matrix consisted of hydropower (77.7 per cent),[500] thermo-power (12.8 per cent),[501] nuclear power (1.9 per cent), and other renewable sources (7.4 per cent) of the

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Energética – CNPE, e dá outras providências [Decree 6,685 of 10 December 2008 restating arts 2 and 4 of Decree 3,250 of 21 June 2000 on structure and functioning of the National Energy Policy Council – CNPE, and sets forth other provisions]. All documents available at Brazilian Government's website <http://www.prfb.gov.br>.

[494] *Lei 10.847, de 15 de Março de 2004, autoriza a criação da Empresa de Pesquisa Energética - EPE e dá outras providências* [Act 10,847 of 15 March 2004 authorizing the establishment of the Energy Research Company –EPE and sets forth other provisions], art 4(I).

[495] Ibid art 4(III).

[496] Ibid art 4(VII).

[497] Ibid art 4(XIII).

[498] Ibid art 4(XIV).

[499] Empresa de Pesquisa Energética (EPE), *Plano Decenal de Expansão de Energia 2019 (PDE-2019)* (Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento Energético, 2010) [Ten-year Energy Expansion Plan 2019 (PDE-2019)].

[500] As of 31st December 2009, the share of hydropower was 71 per cent of the total generation capacity. See Eletrobras, above n 155, 6.

[501] Ibid. As of 31st December 2009, the share of thermo was 23.59 per cent of the total generation capacity.

installed capacity[502] in the National Interconnected System. According to projections contained in the PDE, the Brazilian government aims to maintain the current energy mix of renewable sources at 48 per cent (the world's largest) by prioritising hydropower generation and grid interconnections,[503] expanding the production of ethanol[504] and biodiesel,[505] and by promoting various forms of alternative energy sources including biomass and wind power.[506]

The Brazilian electricity regulatory model is almost entirely deregulated, though power pricing rates are dictated by the government.[507] This latter feature, which normally implies low investment return, is, however, counteracted through soft loans schemes and tax-breaks[508] to lure investors as well as through the Brazilian government's ambitious public-investment programmes.[509]

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[502] Ibid. This representing, on 31st December 2009, 103,598MW of regular power generation connected to the national grid (SIN).

[503] Above n 158, 62 et seq. For instance, in April 2010, a consortium of contractors led by Chesf - a state-owned hydropower generator –obtained the procurement contract to build Belo Monte, the world's third largest hydroelectric facility (designed as a run-of-river dam) on the Volta Grande region of the river Xingu in the Amazon basin. The project requires an investment of nearly USD 11 billion and it has stirred massive environmentalist demonstrations because it will flood approximately 516 km^2 of rainforest while degrading other areas, as well as forcing the relocation of indigenous inhabitants.

[504] Ibid 219.

[505] Ibid 267.

[506] In this scenario, the optimal operational load dispatch prioritizes renewable sources: hydro, biomass, and wind generating units. At the same time, estimates of thermoelectric generation (including nuclear power) are low and deemed, mostly, to be back-up for emergency situations. In other aspects, this seems to be the accomplishment of Brazils 1970s oil-substitution policy, in this manner the PDE, laid the foundations for Brazil to become an exporter of oil and oil by-products for the energy sector.

[507] Power rates are caped at USD 0.47 per megawatt hour.

[508] Like the IPI exemption policy (tax on Industrialized Products) which exempted power companies with excessive fuel costs to operate isolated systems. See *Lei 12.111, de 9 Dezembro de 2009* [Act 12.111 of 9 December 2009].

[509] See, eg, *Lei 8.666, de 21 Junho de 1993* [Act 8,666 of 21 June 1993] which regulates hiring in the public sector. However, provisional measure Acts, like *Lei 450, de DD MM de 2009* [Act 450 of DD MM 2009] made bidding rules flexible (simplified bidding procedure) for state-owned power companies, like Eletrobras, as to acquisition of assets and hiring of services.

As to the actual physical electricity network, the National Interconnected System comprises power transmission facilities[510] in four sub-systems: South including Rio Grande do Sul, Santa Catarina, and Paraná; South-East/Centre-West including Espírito Santo, Rio de Janeiro, Minas Gerais, São Paulo, Goiás, Distrito Federal, Mato Grosso, Mato Grosso do Sul, Acre, and Rondônia; North-East including Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, and Bahia; and part of the North Pará, Tocantins e Maranhão.[511] In total, 96.6 per cent of the total electric energy production in Brazil is conveyed by the National Interconnected System.

Until recently the transmission sector remained almost exclusively under public control through both federal[512] and provincial level companies.[513] However, the 10-year Energy Expansion Plan has budgeted for a R$39 billion expansion plan[514] including interconnection between currently isolated domestic sub-systems,[515] and transnational interconnections with Argentina, Uruguay, and Venezuela. The expansion and interconnection of

[510] *Resolucion Nº 67, de 8 de Junho de 2004 de Agência Nacíonal de Energia Elétrica* [Resolution Nr 67 of 8 June 2004 - Electric Energy National Agency]; *Resolucion Nº 68, de 8 de Junho de 2004 de Agência Nacíonal de Energia Elétrica* [Resolution Nr 68 of 8 June 2004 - Electric Energy National Agency].

[511] In 2012, part of the Amazonas and Amapá became part of this sub-system and by 2014 part of Roraima will also become part of this sub-system.

[512] The state-owned Eletrobras holding (through its subsidiary transmission companies: Chesf, Eletronorte, Amazonas Energia, Eletrosul, and Furnas) owns 53 148 kms of transmission lines (above 230 kV throughout Brazil) which represent 69 per cent of the country's total transmission lines. See Eletrobras, above n 152, 6. The rest of the lines, operated in circumscribed concession areas, are owned by Copel (in the State of Parana, with 7045 kms), Cemig (state of Minas Gerais with 21 184 kms), Terna Participacoes (a subsidiary of the Italian company Terna, in Brazilian and Maranhao), and CTEEP (subsidiary of the Colombian ISA, in the State of São Paulo, Goias, and Bahia with 11 837 kms).

[513] Sao Paulo-CTEEP, Minas Gerais-Cemig, and Parana-Copel. Currently, there are about 40 transmission concessions in Brazil.

[514] *The Constitutive Treaty of South American Union of Nations* (*UNASUR)(Brasilia)*, opened for signature 23 May 2008 (entered into force 11 March 2011).

[515] Regional interconnections South-East/Centre-West (SE/CO), North/North-East (N/NE), South-East/Centre-West/North-East (SE/CO/NE), South/South-East/Centre-West (S/SE/CO). Interconnection South-East/Centre-West (SE/CO) - Acre/Rondônia, Tucurui-Macapá-Manaus, and Manaus-Boa Vista.

the power transmission grid will enable efficient large-scale integration of renewable energy in the power system throughout the country. Moreover, since Brazil's energy mix is based predominantly on hydro-generation, the increased transmission capacity becomes essential in order to take advantage of the hydrological diversity among the various sub-systems, which means that particular areas can experience droughts or significant rainfalls. Through using interconnected grids, a decline in power production in one area could be offset by increased production in a different region, irrespective of distance between them.[516]

In summary, Brazil's consistent policy on renewable power sources, coupled with a reinforced interest in transmission (through interconnecting sub-systems and regional power markets) not only allows Brazil to meet the escalating demand for power, but also contributes to the promotion of power-price homogenization-processes among sub-systems by averting 'bottle-necks'. Thus, overall it allows for optimizing the load dispatch of power generating units.

IV.4.2. Energy and transmission policy in South America

The regional constitutional framework in South America, which focus particularly on property rights over natural resources and the impact this aspects has on power generation capacity has been already been analysed.[517] Here, the discussion turns to an emphasis upon the efficient use of power that has been generated irrespective of where its source is located. When looking at policy-making processes at an international level,

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[516] The 2001-2002 power crisis affecting the South-East sub-system was not entirely due to a lack of generation, but also to an inadequate transmission capacity from the South sub-system, which could have set off the SE generating deficit.
[517] See above IV.4.1, 147 on South America's approaches towards unified energy policy.

it is argued that consideration should be given to querying the general proposition that things can always be better and more efficiently done when carried out jointly rather than separately. The energy sector (including renewable sources) must also pass this test. It generally does, though, because while generation sources (particularly renewable ones) are commonly dissociated from consumption centres, transmission networks are inextricably associated to both of them.

The Security Approach and the threats to energy integration

The main considerations of South American countries when designing energy policies are domestic and industry-related power demand coupled with national security issues and sovereignty concerns. From a regional policy point of view, transnational grids interconnection is still viewed more as a means to overcome national shortfalls of energy supply or to improve a nation's own network reliability rate, rather than as a real alternative to energy integration based on the use of renewable sources scattered all over the region. The following case study explores this approach.

Case Study: Bolivia and Chile

The interactions between Bolivia and Chile are illustrative of the South American general approach when it comes to sovereignty concerns in relation to natural resources and power supply. Over many years, even basic economic relationships between these two countries have been strained due to opposing views around Bolivia's claim of access to the Pacific Ocean through Chilean territory. This has implications for transnational power grid interconnection.

The Bolivian National Interconnected System encompasses generation, transmission, and distribution facilities which operate in the so-called Wholesale Power Market. In 2009, the total power generation reached 5,632.7 GWh of which approximately 40 per cent was produced by hydro plants and 59 per cent was generated from thermo-generation units. The hydro-generating cluster mainly consists of run-off-river stations in Zongo, Taquesi, Yura, and Quehata [518] as well as dam-based power stations in Corani and Miguillas.[519] In contrast, thermo-generation facilities based on vapour-driven turbines, natural gas, and diesel-fired units are mainly located towards the east of the country.[520] Bolivia has the second largest reserves of natural gas in South America and it is the main regional exporter thereof, currently delivering gas to Brazil and Argentina.[521] For political reasons, however, natural gas is not exported to Chile.

The *Sistema Troncal de Interconexión* or Main Interconnecting System is an essential part of the Bolivian National Interconnected System and it is made up of high-voltage transmission lines. Even though the interconnection with Chile's northern transmission network is technically

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[518] Ministerio de Minería, Hidrocarburos y Energía, *Memoria Anual del Comité Nacional de Despacho de Carga. Resultados de Operación del Sistema Interconectado Nacional* (Ministerio de Minería, 2009) [Load Dispatch National Committee Annual Report. National Interconnected System 2009 Operational Results].

[519] Ibid.

[520] Ibid.

[521] The natural-gas pipeline to Brazil (GASBOL) entered into operation on 1999. Since then, natural gas exports have experienced continuous growth (in 2009, economic downturn led Brazil to cut imports, but heavy rains allow it to substitute them with greater hydro-generation). In turn, as of 2010 Bolivia exports 7.7 million cubic meters a day to Argentine, but a deal signed in March 2010 expanded that quantity to 16 million cubic meters a day by 2013 and 27.7 million cubic meters a day by 2021. See Diego Ore, *Natgas exports to quadruple by 2021 under new deal* (26 March 2010) Reuters <www.reuters.com>. Exports of natural-gas to Chile have been projected for a long time; however, political concerns have hindered the materialization of such projects even though Chile's power deficit represents a trade opportunity for both countries.

feasible, political opposition to any such interconnection seems to be insurmountable.

At the transnational level, Bolivia is State Member of the Andean Community of Nations, thus, abiding by the Cartagena Agreement.[522] On the other hand, the political and regulatory framework for the electricity sector in Chile is dramatically different to Bolivia. Moreover, Chile is not part of the Andean Community of Nations. In turn, Chile ratified and is a Party of the *UNFCCC* and the *Kyoto Protocol*. It is also a Party of the *Agreement on Training to meet UNFCCC's Obligations*, administered by the United Nations Development Program (UNDP). In this context, Chile's first environmental statute is the *Act 19300 on Fundamentals of the Environment*, which incorporates the notion of sustainable development and sets standards for several air and water emissions, directing interested parties to conduct environmental impact assessments on projects of relevant significance.

Chile's[523] power production relies heavily on conventional energy sources (97.4 per cent). In 2008, the energy supply mix consisted of 36.4 per cent dam and run-of-river hydro,[524] 36.1 per cent natural gas, 15.6 per cent coal,

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[522] *Andean Subregional Integration Agreement* (*Cartagena Agreement, Andean Community of Nations, CAN)*, opened for signature 26 May 1969 (entered into force 16 October 1969). Some of the principle objective of the Cartagena Agreement is achieve a Customs Union, a Free-Trade Zone, Origin Denominations, uniformity in technical rules, sanitary measures, as well as transfer pricing regulation, rules for the automotive sector, and the liberalization of the services market among many others.

[523] However, the Act 19300 does not straightforwardly set standards for energy efficiency. The Comisión Nacional del Medio Ambiente (CONAMA) [National Committee for the Environment] is the agency in charge to develop and implement the environmental policy as well as to supervise its compliance. Under the *Kyoto Protocol*, it is also the DNA for CDM purposes. The *Act 19,300*, on Fundamentals of Environment, of 9 March 1994, resembles the U.S. National Environmental Policy Act (NEPA). *Ley 19.300 sobre Bases del Medio Ambiente, modificada (Diario Oficial de 9 de Marzo de 1994)* [Act 19,300 on Environment Fundamentals, amended (Official Gazette of 9 March 1994)].

[524] See Comisión Nacional de Energía [National Energy Committee] <http://www.cne.cl>.

9.3 per cent diesel and fossil fuels,[525] and only 2.6 per cent non-conventional renewable energies in the form of biomass,[526] small-hydro and wind power.[527] The rise in international oil prices as well as increasing power demand, instability of supply,[528] and pollution concerns have compelled the revision and diversification of the energy mix with renovated interest in renewable energy technologies, as well as changes in the energy legal framework.[529]

This case study shows that an electrical grid interconnection between Chile and Bolivia, without regard to other kinds of energy integration, would require a radical change in the current political environment. Although commercial relationships are steady, Chile and Bolivia do not have top-level diplomatic relationships with each other even though both countries would gain significant economic advantages from power trading. A potential trading scheme may involve interconnecting domestic

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[525] Ibid. Chile obtains a significant part of its electricity production (48.5 per cent) from imported fossil fuels.

[526] Biogas and biofuels (bioethanol and biodiesel).

[527] Comisión Nacional de Energía, *Energías Renovables: Capacidad instalada de Generación Eléctrica* (2010) Comisión Nacional de Energía [National Energy Commission]. <http://www.cne.cl > [Renewable Energies: Electric Generation Installed Capacity]. In 2007, hydro electricity amounted for 39.7 per cent of the total generation (22223.5GWh), closely followed by natural gas and coal-based thermo generation with 36.7 per cent (20535.3GWh), fossil fuel-fired plants reached 22.2 per cent (12408.7GWh). Up to May 2011, the combined SIC-SING power generation scenario in Chile was composed of natural gas 20%, oil 12%, coal 30%, hydro 35%, wind 1%, biomass 1%, and non conventional hydro 1%, see Ministerio de Energía, *Antecedentes sobre la matríz energética en Chile y sus desafíos para el futuro* (May 2011). Ministerio de Energía <http://www.cchen.cl/mediateca/PDF/antecedentes_matriz_energetica.pdf>, 6.

[528] Particularly of natural gas from Argentina.

[529] The Chilean Constitution guarantees the right to undertake any economic activity, see art 19(21). The access to the generation market, thus, is open to any developers, who must comply with the relevant legal framework, which is composed mainly by the *Ley General de Servicios Eléctricos, modificada por Ley 19940 (Diario Oficial de 13 de Febrero de 2004)* [General Act on Electric Services, as amended by Act 19940 (Official Gazette of 13 February 2004)]*; Ley 20018 (Diario Oficial de 19 de Mayo de 2005)* [Act 20018 (Official Gazette of 19 May 2005)] and appurtenant *Regulations*; *Ley 20057 (Diario Oficial de 1 de Abril de 2008)* [Act 20057 (Official Gazette of 1 April 2008)]. For the *General Act on Electric Services* see Ministry of Mining, *Decreto Ley Nº 4 (Ministerio de Minería) de 12 de Mayo de 2006 consolida Decreto Ley Nº 1 (Ministerio de Minería) de 1982* [Law-Decree Nr 4 (Ministry of Mining), of 12 May 2006, restates Delegated Law-Decree Nr 1 (Ministry of Mining), of 1982].

transmission systems thereby taking advantage of Bolivia's energy surplus to alleviate Chile's power generation deficit.

When it comes to energy integration and international cooperation to achieve sustainable development in such hostile political environments, three factors present an outstanding opportunity to overcome these entrenched conflicts. These include: domestic energy matrix configurations, promotion, investment in, and use of transnational power networks, and natural resources share-management. All these policy options are consistent with development programs, climate change abatement targets, and the need to alleviate security threats posed by power shortages. The options are considered below through the analysis of a case study.

Energy Integration

The exploitation of bordering natural resources does not always lead to conflicts between countries in South America. Sometimes transnational measures can help to solve problems faced by individual nations. Here, a case study will be analysed to illustrate how transnational power-generation and transmission undertakings can themselves constitute cooperative drivers of economic growth, shared-management, natural resource preservation, and peaceful resolution of conflicts.

Case Study: Brazil and Paraguay - The Itaipú dam

Historical territorial conflicts between Brazil and Paraguay over the Salto Grande de Sete Quedas, home to the Itaipú dam, date back to 1750. While the 1872 Peace Treaty failed to resolve the boundary claims to each country,[530] in 1966 Brazil and Paraguay agreed to jointly explore the feasibility to exploit the hydroelectric potential of De la Plata basin as part of the Iguazú Declaration.[531] A year later, the Brazil-Paraguay Mixed Technical Commission was created to conduct feasibility studies for the proposed facility; and an international tender process was initiated to choose the contractors for building the 14GW Itaipú hydro-electrical dam on the Paraná River.

Late in 1973, the Parties entered into the Itaipú Treaty.[532] Despite much criticism of this instrument, the Treaty is interesting for several reasons. One of them is the treatment in the Treaty of sovereignty-sensitive resources (water) and territorial issues. Firstly, the Treaty fully acknowledged the bi-national nature and co-ownership regime over hydro resources in the relevant track of the Paraná River.[533] Secondly, it contains a sovereignty-safeguard clause whereby the construction of the electricity facilities shall neither alter the *status quo ante* in regard to national border

[530] The *1872 Peace Treaty* put an end to the so-called 'War of Paraguay'.
[531] *Declaração de Assunção sobre o aproveitamento de rios internacionais,* signed on 3 June 1971, art 5, 6 [Assunção Declaration on exploitation of international watercourses].
[532] *Tratado entre a República Federativa do Brasil e a República do Paraguai para o aproveitamento hidroelétrico dos Recursos Hídricos do Rio Paraná, pertencentes em condomínio aos dois países, desde e inclusive o Salto Grande de Sete Quedas ou Salto de Guairá até a Foz do Rio Iguaçú* [Treaty between the Federative Republic of Brazil and the Republic of Paraguay for the hydroelectric exploitation of water resources of the Paraná River, belonging in a condominium to both countries, from and including the Salto Grande Seven Falls or Guairá Falls to Foz do Iguaçú River], opened for signature 26 April 1973, UNTS 13164 (entered into force 26 April 1973), art XXIII.
[533] In other words, from and including Salto Grande de Sete Quedas [Salto Grande Seven Falls] (also known as Guairá Falls) to Foz do Rio Iguaçú [Foz do Iguaçú River].

delimitation nor confer on any Party jurisdiction or property rights over any part of the other nation's territory.[534] However, the Itaipú Treaty finally overcame a long-standing territorial dispute, by, literally, flooding the area in dispute. It is interesting too, that it created a bi-national entity: Itaipú, to which both nation-state Parties granted a concession to exploit the hydro potential of the Paraná River[535] in return for royalties flowing to each nation.[536] However, the central point for consideration in respect of the present thesis is the power distribution agreement enshrined in Art. XIII. According thereto, the entire Itaipú power output shall be divided equally between Brazil and Paraguay, the Treaty recognizes that each Party has the right to acquire the excess power not domestically consumed by the other. The Parties also agreed to acquire the entire production of the installed capacity.[537] Finally, Art. XV paragraph 3 establishes as an element of the cost of the service provided by Itaipú a certain amount which is set aside to remunerate the Party assigning power surpluses.[538]

In 1984, the Itaipú hydro plant commenced operation but new problems began to emerge. Argentina feared Brazil's control over the floodgates for the dam was regarded as a security threat posed to Buenos Aires in the event that the floodgates were opened. These external security issues were resolved through a tripartite agreement.[539] Paraguay claimed that a strict interpretation of the Treaty as to the exclusive nature of the power-

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[534] Above n 532, art VII.
[535] Ibid arts III, V.
[536] Ibid art XV (1).
[537] Ibid art XIV. In the manner set forth therein.
[538] Ibid art XIV (3), Annex C.
[539] *Acordo Tripartite entre Brasil, Paraguai e Argentina para aproveitamento dos recursos hidráulicos no trecho do Rio Parana desde as Sete Quedas até a foz do Rio da Prata* [Tripartite Agreement between Brazil, Paraguay and Argentina to the use of water resources in the stretch of the Parana River from the Seven Falls to the mouth of the River Plate] opened for signature 19 October 1979, 2216 UNTS I-39389 (entered into force 5 December 1979).

surpluses acquisition right[540] adversely affects its commercial options. Paraguay as well cast doubts upon the 'fairness' of the amount payable to the power-assigning Party.[541] This is of the utmost commercial importance because, although Paraguay enjoys enormous power-surpluses, it is not allowed, under the terms of the Treaty, to sell it to third parties even if they are willing to pay higher prices than those provided in the Agreement. Under the Itaipú Treaty Paraguay can only assign surpluses to Eletrobrás (Centrais Elétricas Brasileiras S.A.) the publicly-owned Brazilian energy company. As a result of diplomatic negotiations held over the past few years, as of 2023, Paraguay's State-owned national electricity utility, Administración Nacional de Electricidad (ANDE), will be authorize to sell power-surpluses to Brazilian companies other than Eletrobrás and to third party countries as well.[542] This will result in a more widely distributed transnational power sharing process.

Relationships between Brazil and Paraguay may continue to improve with the realisation of the 500kV Villa Hayes transmission line, a project valued at USD$ 400 million which is intended to be carried out by Brazil, Paraguay, Argentina, and Uruguay once funding has been agreed upon.[543] It is remarkable that, despite its formal multinational character, the project will provide an improvement to Paraguay's poor power-transmission

[540] Differences in the interpretation of this point go back to a Treaty's antecedent: the *Foz do Iguaçú Statement*, according to which both countries shall have a 'preferential right' to buy each other's power surpluses, which shall also be acquired for a 'fair price'. However, this wording was not transferred into the current *Itaipú Treaty*, leading to the construction of an exclusive power-surplus acquisition right.

[541]See ABC Digital, *Lugo deja renegociación de Itaipú en manos de voluntad del Brasil* (2010) ABC Digital <http://www.abc.com.py>.

[542] *Declaração de Assunção sobre o aproveitamento de rios internacionais*, signed on 3 June 1971, art 5, 6 [Assunção Declaration on exploitation of international watercourses]. In fact, it has been informed that the then current payment of USD 120 mills for that concept would increase up to USD360 mills.

[543] Through contributions to MERCOSUR's Convergence Structural Fund. MERCOSUR Fondo de Convergencia Estructural (FOCEM) <www.mercosur.int/focem>.

infrastructure. Paraguay's transmission network is made up of only seven 220kV lines totalling approximately 3566 kms. Its scarce and unsophisticated transmission infrastructure sharply contrasts with its huge generation capacity. The reason why the network in Paraguay remains to date so simple is, basically, because the most important lines belong to the bi-national stations. These lines mostly convey power towards Brazil and Argentina, while the remainder goes to feed the distribution system focused mainly on the east part of the country. In fact, the Paraguayan transmission capacity[544] lies far behind that of Uruguay which, though having much less power capacity, enjoys a widespread power transport network.[545] Apart from the transport coverage issue, the Paraguay network is well-known for having serious efficiency and reliability weaknesses.

Therefore, in the context of the bilateral relationships between Brazil and Paraguay in which the Itaipú transnational power distribution issues are central, it is quite understandable why Brazil is willing to promote the Villa Hayes' transmission line project which will assist in improving Paraguay's inadequate electricity transmission infrastructure, even funding it either in whole or part. The Itaipú hydro-electrical dam thus represents not only an example of cross-border interconnection, but also the cooperative approach towards energy integration in the transmission area and a working example of transnational grid interconnection in South America.

[544] Paraguay has only 9 km of high-voltage lines per 1000 km^2, totalling 3566 kms. Centro de Estudios Económicos, *La energía eléctrica Paraguaya en un marco regional* (Unión Industrial Paraguaya, 2009) [Centre for Economic Studies, Paraguayan electricity within a regional framework].

[545] Even though totalling just 4330 kms, Uruguay has 25 kms of high-voltage lines per 1000 km^2, thus, leading with this ratio the regional transmission coverage ranking. Comisión de Integración Energética Regional (CIER), *Regional Statistics* (2007) CIER <www.cier.org> [Regional Commission for Energy Integration].

IV.4.3. Opportunities provided by Transnational Power Transmission

In a world in which the human population is approximately 7 billion, 396 million of whom are living in South America, the law of conservation of energy seems inescapable. Resources are finite and it is essential that the remaining non-renewable resources are efficiently employed. Although electric power is a commodity, under the present technological state of affairs,[546] meeting its demand depends on limited natural resources, whose value varies according to location,[547] purpose,[548] and circumstances.[549] In dealing with these factors, transmission networks are called upon to play a decisive role.

Two main expressions of such a role will be analysed here. Firstly, the opportunity for transmission networks to assist in achieving sustainable development and to serve as a climate change abatement mechanism. Secondly, transnational power transmission has the potential for enhancing

546 Here, the book sets aside the consideration of renewable energy sources with, although promising potentiality for the future and high natural availability, still very low technical availability, high cost, or no having no real expectations to provide, even in the medium term, wide-scale power supply, like solar photovoltaic (PV) cells using solar continental irradiation (Desertec project) or tidal energy. Source: DLR, *Renewable Energy and the Clean Development Mechanism. Potential barriers and ways forward. A guide for policy-makers* (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)-Germany, 2007).

547 Geographically, natural resources are unevenly distributed.

548 Water is the paradigm of a multiple - purpose though scarce natural resource. It can be used to quench the thirst of indigenous communities, to irrigate agricultural fields, to run into a water stream and then to activate a turbine of a hydro-electrical plant.

549 Once again, water serves to exemplify the 'circumstance' factor, particularly when facing the threatening effects of Climate Change: from global water resources, 97.5 per cent are in the oceans (salty water not readily usable) and only 2.5 per cent constitutes fresh water. Of this latter figure, 69.5 per cent is frozen in glaciers, ice caps, and permafrost; 30.1 per cent corresponds to groundwater; and only 0.4 per cent is water present on surface (falling as rain, flowing in rivers, and sitting in lakes and reservoirs) and the atmosphere. Furthermore, over 60 per cent thereof hitting the ground as rain and/or snowfalls cannot be captured due to evapotranspiration (ET) or because it runs into the sea or other saline underground aquifer. Out of the 30.5 per cent of surface, atmosphere, and groundwater resources, 67 per cent goes to agricultural irrigation, 20 per cent to domestic and other industrial uses, 3 per cent evaporates from reservoirs, and 10 per cent is directly used in power generation. See World Bank, *World Development Report* 2010 (World Bank, 2011).

market access and configuring a single transnational electricity market which may bring economic and social benefits.

Sustainable Development and climate change

Interconnecting power grids is economically desirable for it results in significant decreases in operational costs. This is particularly true for States choosing to design their energy matrices around renewable energy sources, because it allows interconnected countries to export excess power thus generating income for their developing economies. Further, in reference to the 'flexibility mechanisms' of Article 12 of the Kyoto Protocol, Annex I countries were able to invest in emission reduction projects in non-Annex I countries, thus, contributing to achieve or enhance sustainable development. Furthermore, under Article 6 of the Protocol, transmission projects could also qualify for Joint Implementation i.e. emission reduction projects in other Annex I countries.

A highly controversial case is found in the Master Plan for Electrification 2007-2016 of Ecuador which, under a scheme of compulsory planning, contains projects to be carried out for overcoming the country's seasonal power deficits and lack of investment in energy infrastructure.[550] The new

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[550] The year of 2006 marked a clear-cut change in Ecuadorian energy policy. The then newly elected government left behind neo-liberal indicative policies and resolutely embraced a scheme of compulsory planning. The *Plan Maestro de Electrificacion 2007-2016* [Master Plan for Electrification 2007-2016] pledges for further 3800 MW of installed capacity to be added to the system, of which 80 per cent (3040 MW) must come from renewable sources. The plan is, in the short-term, aimed to expand the hydro share through developing its generating potential in the Pacific's side of the country. As a result thereof, the plan also demands the reinforcement of the National Transmission System (SNT), including three main transmission expansion projects: a 500kV line from Quito to Guayaquil, a 230kV one for linking Totoras and Quevedo, a 230kV system comprising Milagro, Las Esclusas, and Trinitaria, as well as the 230kV system Milagro-Machala, which funding is indexed to the government-regulated transport tariff through a specific factor. The SNT is regulated by R.O. 134 of 23 February 1999 on load dispatch and operation; and controlled by a single, state-owned company: Transelectric. The

policy approach seeks not only energy independence from fossil fuels and consequent import-related savings but the possibility to export power to neighbor countries (Colombia, Perú, and even Venezuela this latter with which has no frontier) as well as greater and intensive use of renewable energies. In Ecuador, the energy mix is currently made up of hydro sources (17 per cent) mainly sited in the Amazonian region and natural gas-fired thermoelectric stations (3 per cent). The share of the hydropower generation in the mix is expected to be 95 per cent by 2017, according to the plan. In this manner, the use of the country's hydro resources would go up to 21 per cent in 2016. The challenge is big, for Ecuador's energy mix is still largely dependent upon oil. The participation of other non-conventional renewable technologies is still negligible. Despite the fact that the plan relies on the use of renewable energy sources, particularly

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basic regulatory framework is made of the Power Sector Framework Act, which organizes the structure and functioning of the power market *R.O.S. 43 Ley de Régimen del Sector Eléctrico de 10 Octubre de 1996* [R.O.S. 43 Electric Sector Regime Act of 10 October 1996] and its by-law rules, which deal with specific general proceedings *R.O. Nº 41 Reglamento General de la Ley de Régimen del Sector Eléctrico de 21 Noviembre de 2006)* [R.O. Nr 41 General Regulation of the Electric Sector Regime Act, of 21 November 2006] applicable thereto. The financial transactions derived from the operation of the system by the load dispatch body: the Centro Nacional de Control de Energía (CENACE) [National Centre for Energy Control] <www.cenace.org.ec>, are also regulated. In turn, international power trade is subject of the *Andean Subregional Integration Agreement* (*Cartagena Agreement, Andean Community of Nations, CAN)*, opened for signature 26 May 1969 (entered into force 16 October 1969). The Agreement is complemented with CAN's Rulings 536 of 19 December 2002 and 720 of 5 November 2009, specific by-laws: the *R.O. Nº 735 Reglamento para Transacciones Internacionales de Electricidad de 31 Diciembre de 2002* [R.O. Nr 735 Regulation for International Power Transactions of 31 December 2002] setting technical and commercial requirements for international power transactions; *R.O. Nº 2 Reglamento para Transacciones Internacionales de Electricidad de 3 de Agosto de 2004* [R.O. Nr 2 Regulation for International Power Transactions of 3 August 2004]; Consejo Nacional de Electricidad (CONELEC), *Ruling 002/04* of 3 August 2004 on power international transactions. Documents available at Consejo Nacional de Electricidad (CONELEC) [National Council of Power] <www.conelec.gob.ec>. The latter Ruling sets the proceedings to be followed by the national operator (CENACE) to coordinate the load dispatch, operation, and the transaction financial set-off with other country's system administrator. Likewise, proceedings and measures applicable to power undertakings with regard to the protection and control, or the abatement of negative impacts thereof in the environment are the subject of *R.O. Nº 396 Reglamento Ambiental para Actividades Eléctricas de 23 de Agosto de 2001* [R.O. Nr 396 Environmental Regulation for Electric Activities of 23 August 2001]. See U.S. Energy Information Administration, *Country Analysis Briefs, Ecuador* (September, 2010) EIA <http://www.eia.doe.gov/cabs/Ecuador/Background.html>.

hydro, wind, and biomass, as a long-term energy supply solution,[551] with a CO_2 abatement potential of 6.13 tons per year. Further, the plan advocates for a more active participation of the State in carrying out the projects.[552] However, it has been widely criticized for its failure to appropriately juggle both of the following requirements. On the one hand, part of the funds allocated to the project must be used for improving the global management of river basins, in terms of specific programs for reforestation, and in establishing mechanisms for the preservation and enhancement of the biodiversity and for co-benefits for the local communities.[553] On the other hand, the funding for such undertakings comes from the share that the Ecuadorian State obtains from contracts in the oil industry[554]and from the exploitation of sectors of the Ecuadorian Amazonia.[555]

Surprisingly, while Latin America and the Caribbean has the second lowest regional greenhouse gas emissions, it is suffering the effects of climate change more than any other region.[556] As such, there is an urgent need for technological innovation and financial support from developed

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[551] The *Plan Maestro de Electrificacion 2007-2016* [Master Plan for Electrification 2007-2016] pledges for further 3800MW of installed capacity to be added to the system, of which 80 per cent (3040 MW) must come from renewable sources.

[552] Either in the generation, transmission, or distribution sectors. For instance, in the former one, the plan projects the construction of five hydro-electric dams: Mazar, Sopladora, Toachi Pilatón, Ocaña, and Coca Codo Sinclair. The environmental protection and the projects for rural electrification are also areas in which the planning conceives determined State's participation.

[553] Above n 551.

[554] All revenues originally going to the Fondo Ecuatoriano de Inversión en los Sectores Energético e Hidrocarburífero- FEISEH [Ecuadorian Investment Fund in Energy and Hydrocarbon Sectors - FEISEH]. See *Ley Orgánica para la Recuperación del Uso de los Recursos Petroleros del Estado y Racionalización Administrativa de los Procesos de Endeudamiento* [Constitutional Act for Recovering the Use of State's Oil Resources and for the Administrative Razionalization of Debt Processes].

[555] The so-called Block 15: the joint fields Edén-Yuturi and Limoncocha.

[556] Economic Commission for Latin America and the Caribbean (ECLAC), *Economics of Climate Change in Latin America and the Caribbean. Summary 2010* (ECLAC, 2010) 101. ECLAC <http://www.eclac.org>.

countries to help bolster the region's adaptation, mitigation, and sustainable economic recovery programs. The region needs to maintain strong growth rates over time turning onto a path of energy decoupling via decarbonisation and energy intensity structure rates (like those of developed countries, like USA or the EU) whilst maintaining low carbon dioxide emissions, increasing the share of renewable sources into energy matrixes, and promoting transnational transmission networks.

Transnational power transmission projects clearly represent the way to converge and make multi-renewable source integration work in its full generating potential since interconnected networks enable power to be transferred from one region to another balancing load between time-zones and regional variations,[557] thereby enhancing energy efficiency[558] with minimal overall impact to the environment.[559]

However, the efficiency of an interregional policy depends upon its ability to generate GHG emission reductions at source and, preferably, through long term large-scale use of renewable energy technologies. The proposition of this research is that a way to achieve this effect is through interconnecting networks internationally. The contribution of expanding transnational interconnected grids to the abatement of the effects of climate change can be justified not only through acknowledging that the integration of renewable sources allows dispatching the most efficient

[557] Even at hemispheric seasonal variation scale.
[558] Operation at high-transmission level voltages (110kV and above) in long distances reduces load losses. It also increases the power system reliability and improves load management power transmission with existing viable technology (ultra-high voltage – UHV - transmission) means several energy efficiencies. Electricity Forum <http://www.electricityforum.com>.
[559] Whilst reducing demand for fossil fuels (coal, oil, gas) and the resulting contamination, transmission networks also contribute to reduce deforestation, topsoil and rainforest loss, as well as the spreading of deserts. Greenpeace, *[R]evolution scenario on global transitioning to renewable energy and energy efficiency by 2050* (20 January 2011) Greenpeace <http://www.greenpeace.org/international/en/campaigns/climate-change/energyrevolution/>.

generating units according to marginal cost considerations, but also because it enables the use of existing power plants as a back-up,[560] and makes existing inefficient units obsolete.[561]

In summary, as long as they can be integrated to an existing power grid on a wide-scale, renewable energies contribute to *slowing climate change* by providing power generation with none or only marginal direct and indirect GHGs emissions.

Natural resources share management and integration of renewable sources into transnational networks

At present, renewable energy sources for power only work efficiently on a large scale. Many countries have realized that they can have renewable sources of energy in operation, but, if they are not integrated into an existing network, the bigger the better, it is hard to achieve full efficiency and economic competitiveness. This acknowledgement is, therefore, one of the major drivers which make countries enter into talks on network interconnection and energy integration. And it is particularly true for those countries relying on renewable sources to achieve a relevant share of their energy mixes.

Disappointingly, at a multilateral level the effect of all this in South America has largely resulted in mere talks about international cooperation among governments and the occasional promotion of studies on electrical

[560] Contributing in this way to a massive overall reduction in expensive spinning reserve and standby of conventional oil-fired generating units.
[561] This is an explanation why, in general, there is no great support from the traditional big agents, particularly generators, because a massive and faster integration of renewable generation sources into the grid it would strand many of their assets and make it unnecessary to build new fossil fuel-fired plants already with secured financing or in project stage.

interconnections. By contrast, attempts to introduce shared management and energy integration have been more productive and faster at bilateral level. This is so because, normally, these arrangements involve the use of bordering natural resources, such as hydropower. The need to exploit such natural resources, as well as the need for sharing the benefits derived from such exploitation has typically found its way through bilateral political understanding. So it has been the case with Brazil and Paraguay as to the utilization of the river Paraná in the Itaipú dam, as well as that of Argentina and Uruguay using the river Uruguay to serve the bi-national 1,890MW hydro plant Salto Grande, where the power production is distributed evenly between both countries. Salto Grande also comprises an associated transmission system on 500kV operated by a bi-national body: the Mixed Technical Commission depending on the Foreign Affairs Ministries of Argentina and Uruguay.

Since in a physical sense natural resources are randomly allocated across the nations of the South American continent and, hence, either exclusively or jointly appropriated and managed; this does not prevent distant and non-locals users from benefiting from them (particularly in situations of power-generation surpluses). Transmission facilities associated with the exploitation of common natural resources the management and preservation of which are regulated by international instruments - like a treaty on bi-national frontiers - are normally subject of international bilateral agreements.[562]

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[562] See generally, Alan Boyle, 'International Law and the Protection of the Global Atmosphere: Concepts, Categories and Principles' in Robin Churchill and David Freestone (eds), *International Law and Global Climate Change* (Nihoff, 1991). See also *Agreement Relating to the Implementation of Part XI of the UN Convention on the Law of the Sea of 10 December 1982*, opened for signature 28 July 1994, 33 ILM 1309 (entered into force 28 July 1996) part XI.

As to the integration of renewable energy sources into transmission networks, it is argued that the advantages will ultimately outweigh obvious shortcomings. Indeed, apart from allowing renewable sources achieve their full efficiency by operating at a large integrated scale, the fact that these power sources are able to connect into a network contributes to the gradual reduction of the still relatively high costs for renewable technology. Wind-power costs, for instance, are already competitive in many countries. In these issues of renewable power connection and comparative costs, the role to be played by the State should be to ensure that entry-requirements are equal and non-discriminatory for any source of power.[563]

Moreover, the integration of renewable energy sources might also act as a sort of an insurance against rising prices of other energy sources as well as an incentive for domestic industrial growth. Once renewable power sources are interconnected to a grid, the zero (or extremely low) operating costs of renewable sources means that they start to compete with those of conventional sources. Theoretically possible outcomes are two: either conventional power sources will be displaced out of the market or their pricing will go down to match that of renewable sources.

Enhancement of market accessibility and potential for a single transnational electricity market in South America

In terms of market accessibility, the idea of a transnational transmission grid is appealing for many reasons. Primarily, it may facilitate the situation where new energy sources might access and become interconnected to the

[563] P. Favre-Perrod, T. Krause, 'Multi-energy transmission – an option for system development?' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C1-106-2010.

grid, thus, allowing more competition between generators as well as cross-border power trading (free movement of goods). Secondly, in developing a single market, this must not necessarily be a matter of large power companies only. In theory, a common, widespread smart grid also should be prepared to integrate a multitude of small or even very small energy sources. Even an individual might become a producer, having access and enabled to interact with the network when installing a solar panel and becoming a co-generator. Thirdly, a single electricity market could assist in balancing supply and meeting demand at regional level, thus, securing power supply that is needed not only for driving regular economic activities, but also contributing to enhancing the stability and reliability of domestic grids. Fourthly, if a smart grid was to be developed allowing widespread access it would also provide power storage capacity to offset low generation. Finally, multilateral energy interdependence (particularly between non-neighbouring countries) and the technical advantages of interconnection make this market interdependence politically desirable in an international context.

A single transnational power network also assists in the development of enforcement mechanisms to ensure energy supply, since it plays a stabilising role helping to remove the threatened use of the cessation of power supply as a political bargaining chip during any political conflict in the region. In this context, transboundary transmission constitutes a good ground for the development of internationally enforceable legal mechanisms to facilitate transnational power transmission as well as for securing unstable regions.[564]

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[564] See above ch III.3, 73.

However, as monopolistic markets, the creation and operation of power grids calls for detailed regulation ensuring fair and non-discriminatory access to its infrastructure. Up to the present time, however, attempts to make a truly common electricity market a reality, like the proposed European Union's Internal Energy Market,[565] have still not been fully realised. In a regional context in South America, despite many features of a common heritage, such task appears to be even more difficult for the South American nations.

IV.4.4. Conclusion

This section advanced the proposition that, in South America, transnational power networks could represent a step forward towards achieving sustainable development as a regional common policy goal.

In testing such proposition, the analysis discussed the reason for the many different countries in South America to have such a common policy goal. The conclusion is that in the energy context in South America, rather than needing to be specific and highly prescriptive in character, the sustainable development concept is of a general non-prescriptive nature. This allows disparate sectoral policies be a fairly regular outcome. However, two options stand out as main ways to, on the one hand, favour sustainable development and, on the other, decarbonise economies: adopting energy efficiency measures in the short run;[566] and fostering renewable energy technologies, in the medium and long term.

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[565] See European Commission, 'Completing the Internal Market' (White Paper to the European Council No 310 final, European Commission, June 1985) COM[85]. See also European Commission, 'The Internal Energy Market' (Working Document Nr 238 final, European Commission, 2 May 1988) COM[88].

[566] The detailed consideration and effects of implementing energy efficiency (EE) measures are outside of the scope of this book, which instead focuses on that of renewable energy sources

For a proper assessment of the book proposal and the opportunities for sustainable development presented in this section it was necessary to provide, at least, a glimpse of the technical, economic, and regulatory obstacles on the way to make transnational transmission networks a reality. Firstly, grids should become larger and preferably 'smart' to allow instantaneous consumption-data transfer and electronic device interaction in order to give feedback to the grid so to increase energy-efficient responses. In addition, precise operation software is required to better strike the balance between power surplus and scarcity in a grid that is to be to be characterized by the integration of renewable sources, especially given that the output of such sources is extremely difficult to predict.

Secondly, transnational transmission networks in South America face big economic challenges. Apart from the inherent costs of research, testing, and developing new technologies; and the externalities of dealing with either monopolistic or oligopolistic features of the transmission sector, a new grid would also require more flexibility in its economic operation. At the level of users, for instance, the traditional pattern of supply based on consumption would need to evolve to adjust demand to an increasingly fluctuating load on the grid. Economically, this situation manifests itself through variable pricing models for electricity (instead of uniform prices), premium convenience schemes for consumption, freedom to change power providers, and even prepaid power rates. At the level of private developers, in turn, the cost of building this kind of network demands large capital investments. Similarly, for States engaged in centralized planning the funding of 'smart' transmission infrastructure expansion plans could

(RE) when integrated into energy mixes, as well as considering the suitability of transnational network interconnection to the furtherance of sustainable development. Furthermore, both EE and RE are mechanisms viable and available for climate change mitigation.

represent a significant burden for domestic budgets. More broadly, renewable-based energy mixes must bear the cost of de-carbonizing existing economies, largely, by phasing out fossil fuels-related subsidies and promoting clean energy sources.

Finally, particularly in developing countries, legal, institutional, and political barriers stand in the way of transnational energy integration. At present, while South American multilateral energy integration efforts are in embryonic state, bilateral agreements in line with national concerns on security of power supply, have been moderately successful.

Clearly, the interconnection of transmission networks throughout South America would represent several opportunities for achieving sustainable development. Not only could the establishment of such a system create the conditions for a common electricity market, it would also assist in meeting the power needs of high-demand countries by making possible cross-border power transmission from generating units to consumer centres. This aspect is of particular relevance not only because of the growing rate of total power demand in South America, but also most importantly though not surprisingly, because of the three power-deficit countries: Brazil, Argentina, and Chile have the highest concentration of industrial-related power demand.

Transnational power integration also would optimize the use of natural resources and, thus, work as a suitable climate change abatement mechanism, like those which were operative under the term of the Kyoto Protocol.[567] Indeed, network integration allows the interconnection of different power sources - particularly, renewable sources - as well as

[567] The Kyoto Protocol was in force until 2012.

taking advantage of the interaction of geographical regions with dissimilar energy potentials due to particular morphological features and/or timing in power generation. All these factors can combine to make countries attain the most from their resources and comparative advantages in producing goods and services for international trading. Ultimately this can lead to economic growth and development whilst preserving the environment.

In addition, cross-border power transmission integration resembles the shared-management of resources. As seen, some large bi-national or multinational power agreements/undertakings would not have been executed, if participating countries had not agreed on how to use common resources, how the facilities involved would be operated, and how to transport the resulting power that is produced. Power generation does not make sense if it is unable to be delivered where needed - the main problem of Paraguay, for instance. In fact, during the operation phase, the longest and much-awaited period of any power project, the issue of transportation is critical. It can fairly be said that once the power is produced, the entity that controls the access to the transmission lines also controls the power sources. If, on top of that, cross-border interconnections are involved, the matter becomes even more sensitive. Key issues raised for examination include the identification of the transmission facilities involved in interconnection processes, the control of and access to them, the choosing amongst public, private or mixed property regimes at domestic level, or their straightforward characterization as assets under international status, thus, having characteristics above and beyond mere national interests. Transposing such characteristics of power transmission to the legal field results in the reasonable need for consciously avoiding property-based mindsets at international level and, progressively, doing the same with others ideology-filled concepts and language denoting exclusive use and absolute control of an object, namely, the new transnational transmission facilities. In addition, it is necessary to find a clear though non-exclusive model of management over a common resource: the *functionality* of an interconnected power grid.

This explains why, whether in regard to relatively simple operational issues or more complex outcome distribution factors, legal and practical arrangements between countries on the shared-management of transmission systems can facilitate the joint management of a power source.[568]

International interconnections normally serve as a guarantee for a country's own network stability through the integration and interplay between the various components of the corresponding electric systems. The same configuration also improves the reliability of national domestic networks, for example, in terms of uninterrupted supply. On the one hand, either conventionally produced (Venezuela being an example) or coming from renewable sources (Uruguay, for instance) countries enjoying power-surpluses should fear nothing. On the other, deficit or non-energy producing countries, should welcome a reliable and steady supply and be prompted to develop and integrate renewable energy-producing units into the common grid.

In most countries, particularly in those facing the pressing sustainable development dilemma, all these barriers to transnational power transmission pose a considerable challenge. The lack of technical, funding, and institutional capacity makes it harder. In South America particularly,

[568] This being the case of Brazil and Paraguay in regard to the Itaipú hydro-electric station and the use of the river Paraná, and also that of Brazil and Argentina in respect to the Garabí hydro-electric station and the use of the rivers Uruguay and Pepirí-Guazú.

the promotion of new renewable energy sources is relatively recent, still limited, and not always consistent. Although these sources have been progressively making their way into the energy mixes of many countries, as one of the envisaged solution to the dilemma, South American States still need to realize that for renewable energy sources to succeed as the key for sustainable development in terms of energy production, rather than confining them to domestic realms, their best chance is to have them integrated into a single regional smart grid with harmonized energy portfolios.

In summary, energy policies are a crucial factor for the attainment of South America's regional common goal of sustainable development. In turn, inherent to the nature of renewable technologies, their integration into a regional grid is a central part of their development. Thus, the target for developing renewable technologies and sustainable energy production ends up being inextricably linked with the availability of a technically feasible means that is able to make the best use of renewable sources having them work efficiently, with an acceptable risk, and at a competitive cost level. Does the transnational interconnection of South-American power transmission networks represent such a technical, risk-acceptable, and cost-competitive means? The opportunities analysed in relation to South America allows this research to answer affirmatively. However, it also highlights the occurrence of both political and legal barriers which might hinder its implementation. Individually, and with different emphasis and pace, the generation schemes of South American nations seem to have internalized an urgent need for decarbonising their respective economies and to integrate renewable energy sources. Brazil, Colombia, Ecuador, and Paraguay lead the trend allocating to renewable power a substantial share in national energy mixes followed by Argentina, Chile, Uruguay, and Venezuela, and to a lesser extent Perú and Bolivia.

Given the analysis above, this section finally concludes that transnational interconnection of transmission networks could function as a cooperative mechanism for energy integration and climate change abatement, in order to assist solving the dilemma of sustainable development. By simultaneously focusing on energy matrix configuration at the national domestic level and through interregional power transmission networks within South America, transnational power grids are viable and promising.

CHAPTER V. CONCLUSIONS

V.1. OBJECTIVES

The general aims of the research were promoting renewable energy integration at a large scale by means of international legal cooperation,[569] as well as advancing energy supply through legally securing unrestrained power transit across-national borders. It argued for creating a single power market[570] as a base for regional economic integration, sharing of natural resources, and sustainable development.[571]

Specifically, the analysis aimed at explaining the paradox of international power grid isolation[572] as a phenomenon opposed to the most sensible energy-efficient behaviour: interconnecting transmission facilities. It did so through exploring - from a legal point of view - opportunities for energy efficiency[573] derived from cooperative energy matrix configurations (energy selection),[574] as well as legal mechanisms for creating a transnational power market (energy security).[575] This shaped the research question: despite the consideration of its potential benefits, and not constituting either a technical or insurmountable economic problem, why do countries not interconnect their power grids transnationally?

The question was seen as relevant and timely and the thesis advocated that promoting a system for transboundary power transmission might induce

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569 See ch IV.4 on the role of international cooperation, 145.
570 See ch IV.3.5 on economic challenges, 137.
571 Above n 556.
572 See ch I.
573 See ch IV.4.3 on opportunities of transnational power transmission, 161.
574 See ch II, IV.4.2, particularly, on energy integration and the Itaipú dam case study, 156.
575 Above n 556.

the rise of non-conventional power generation projects and the harmonization of energy portfolios. And this, in turn, can produce diversification in energy matrices,[576] economies of scale, variable and marginal costs reduction,[577] production synergies,[578] and an array of positive externalities.[579] The research also sought to identify legal barriers hindering cross-border power grid interconnections and to provide recommendations - expressed in practical legal documents - designed to meet said goals i.e. integrating renewable energies at large-scale and securing energy supply in transnational contexts.

V.2. LEGAL ARGUMENT

V.2.1. Central contention

It is herein advanced the proposition that a specialized legal framework dealing only with international obligations to interconnect power grids and secure unrestrained transnational transit of power flow[580] would assist processes of progressive harmonisation of energy matrices across countries.[581] The justification for entering into such a framework stemming from the acknowledgement of market economy interdependency; the worldwide need for securing reliable and economic energy supply and, ultimately, the nation's own pursuit of productivity and subsistence.

The proposition was based on there being a single transmission line - a transnational wholly interconnected power grid - the most efficient way to

[576] See ch II.
[577] See ch IV.
[578] See ch III, IV.
[579] See ch IV.
[580] Ibid.
[581] See ch II.

have as many renewable sources integrated, thus, dramatically contributing to reduce power generation costs whilst solving the output variability/reliability issue normally associated with renewable sources. Such a grid would contribute to integrate productive markets globally and to share natural resources worldwide in a cost-efficient manner. It might also contribute to reducing the risk of economic disturbances and even political tensions between countries, for a single power grid crossing multiple national boundaries adds a dimension of geopolitical negotiation and offers to the countries placed along the grid, opportunities for negotiation, peace and mutual sustainable prosperity.

The research proposition was, therefore, that international legal instruments - designed to encourage cross-border power grid interconnections and unrestrained power transit - promote the harmonisation of domestic energy portfolios thus contributing to the large-scale integration of renewable energy sources. An advantage of the proposition is that the combined effect of the interconnection and energy mixes harmonisation process would naturally make renewable power generation cheaper and thus get integrated to energy mixes and power networks faster. This integration will promote and secure unrestrained power-flow and trade across borders securing worldwide 'green' energy supply whilst assisting, for instance, the reduction of climate change-associated atmospheric emissions. The proposition also includes the view that the security of power supply under Energy Agreements between interconnected transmission systems would improve if the grid operation were granted independent status subject to International Law. The research also advanced the proposition that the lack of such independence is one of the legal factors which might explain the isolated operation of transmission systems at international level. Also and more importantly, that such a condition entails economic inefficiencies, as well as serious threats of environment damage and political instability worldwide.

As a result, the research proposed an international legal framework governing interconnected renewable energy-based transmission grids in a regional context and on a transnational basis, allowing unrestrained circulation of power. In addition, the framework would allow producers injecting and taking out energy along the grid, produced at the minimum possible cost and delivered (according to a tariff scheme) through independent operation and subject to international standards (of environment sustainability, safety, and reliability), aimed at securing enforceable supply under specific realigned principles of International Law.

The Legal Argument: Sovereignty and International Law

The legal argument of the book rests upon a critique of traditional views on sovereignty which prevent external restrictions imposed upon States. The thesis proposed a new more flexible understanding of the concept. It argued that the legal capacity of a subject of International Law to act independently in an international context - like that of States' *per se* or that of international organisations in derivative form – and even if subject to limitations from the regulatory framework of an specific substantive context - can be applied to sustain the independent operation of a transnational power grid. Such restriction of capacities, namely, the possibility of nation states being limited in terms of their capacity to act in relation to an international power grid, legally embodied in an agreement on interconnection and transit, would enable not only the management of territories serving the transmission facilities, but also unbiased and independent operation of the cross-border energy network.

For a more flexible understanding of sovereignty to be achieved, a process of realignment of some International Law principles is required. As seen, with few exceptions current International Law presents itself as a developing normative system which substantially lack material content. International Law does provide a framework of minimal rules to reduce levels of uncertainty among nation states and other agents in carrying out their activities. At its best, such procedural frameworks have the potential to encourage cooperation in achieving common mutually beneficial goals. The book takes advantage of such potential for promoting a way in which nations' individual energy insecurity can be lowered whilst contributing to achieve common and mutually beneficial targets of energy efficiency and sustainable development, at least, in regional contexts. International Law clearly requires rules going beyond calling in States to adopt unspecified measures to address a problem. Procedural rules can foster cooperation; but the character of challenges such as climate change and environmental protection calls for more.

In that sense, rather than relying on mere formalities, the legal argument of the book advanced the need for International Law to achieve substantiality in two specific and clearly-defined aspects. The book acknowledges that this process, however, must be approached progressively and, thus, it considers that technical issues represent a suitable starting point, for consensus among nations is more likely to be reached in like matters, and technical interconnection of power grids is one of them. It directly appeals to countries for several reasons, the most important aspects being securing energy supply, the expected benefits derived from power trading, and the chance to make their own power grids more reliable. In the medium and long-term, interconnecting is even more appealing for countries, due to it promotes costs reductions, cheaper generation, new energy sources getting integrated faster, and ultimately the synchronisation/harmonisation of energy matrices and appurtenant positive externalities. Since many countries might be interested in interconnecting their power grids on a permanent basis, each would arguably become mutually responsible for, and guarantor of, keeping not only the 'interconnectedness' status, but also the continuance of the power flow uninterrupted: the *functionality* of the grid. In this manner, the countries would adopt as far as possible the criterion that the direct or indirect costs attributable to interrupting the transit shall make the perpetrator internationally responsible to the rest of stakeholders of the project.

Through this legal argument, the research breaks fertile ground for developing material International Law rules capable of luring States into having their power grids interconnected. Further, according to the argument, more than its physicality, it is the *functionality* of an interconnected power transmission grid that must be construed as an *international common resource* thus capable to be accessed and shared by many States. It must operate under a regulatory framework built upon the fundamental pillar that the transit of power though the grid must be safeguarded and kept uninterrupted under international State responsibility.

V.3. IMPLEMENTING CHANGES

This research concludes that for achieving a flexible understanding on sovereignty and advancing the process of reinterpretation of International Law principles, an appropriate legal technique to further the development of substantial contents of international rules in the field of energy transmission must be limited to the basic contructs. It comprises an international obligation to interconnect grids and to allow electricity en route to Third Parties to flow through local segments of the grid and across corresponding territories without restraint, interruption or appropriation. In this fashion, the chance to obtain wide consensus on the legal instrument increases and so do energy-related interests of participating States, equally eager to keep the level of international liability down on the one hand, though still meaningful and enforceable on the other. In this latter aspect, to surmount current limitations of International Law, all participants should guarantee to abide by the rules and comply with the non-interference obligation. In order for this to be practical, along with provisions regarding transparency of information and communication duties among relevant parties, the legal framework should contain expedited mechanisms for accessing the grid, settlement of disputes and to enforce or ensure State liability effective in case of breach.

A purposive interpretation approach to energy agreements on grid interconnections as covered in this research leads to the conclusion that, unless otherwise expressed, they are intended to carry on transactions indefinitely, on a continuing basis. Such an intention can be easily constructed from the mere fact of arranging an international interconnection. In this kind of setting, a combined transnational market like that of Canada and the U.S. is feasible, since it implies – at least – an understanding on information sharing and transparency to make synchronised grid operation possible. At its best, it is capable of sustaining a deeper intentional commitment to synchronise energy policies, i.e. in regard to what specific sources of energy are going to be used to keep the power flowing across-borders.

The logic underlying the legal argument is that both, power deficit and power surplus-countries, will be keen to voluntarily agree on coordinating their national energy policies so the energy produced in one country may be used in the other. It is, at the same time, a strategic and economic logic, since it works out security of supply and power trading issues simultaneously. This is similar in the EU joint support schemes which are aimed to facilitate the achievement of national overall targets of renewable energy production, allowing a certain amount of renewable energy to count towards another participating Member State's national target. Here, the priority is to further an external dimension of the transmission energy market through interconnection as a first technical, scope-limited step.[582]

Transboundary transmission constitutes a good ground for developing International Law enforceable mechanisms, for it is technical, simple, and commonly advantageous. The uniqueness of the power transmission market is apparent both in domestic settings and from an international perspective. As demonstrated, its monopolistic structure turns out to be naturally beneficial for attaining an international single power market. Indeed, being considered as monopolistic imperfect markets, the operation of power grids calls for detailed regulation ensuring fair and not discriminatory access and use of its infrastructure. In turn, multilateral energy interdependence (particularly between non-neighbouring countries)

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[582] *Council Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directive 2001/77/EC and 2003/30/EC* [2009] OJ L 140/16, *Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market* [2001] OJ L 283/33, *European Commission Decision 2006/770/EC of 9 November 2006 amending the Annex to Regulation (EC) No 1228/2003 on conditions for access to the network for cross-border exchanges in electricity (guidelines on the management and allocation of available transfer capacity of interconnections)* [2006] OJ L 312/59.

and technical advantages of interconnection makes this latter option politically desirable in international contexts, and helps the push towards enforcement mechanisms to ensure energy supply.

There is still a long way to go towards attaining a single power market integrating renewable sources on a large-scale and for power markets to be receptive to feedback from the demand side as required by a SmartGrid. However, attempts like market coupling are certainly a step forward, at least, in coordinating physical power transactions and corresponding financial effects in two separate distant markets. The single market envisaged in this book though would require a system oversight body capable of determining which, at what time, and for how long generators are required to meet demand in a process that could be described as a coordinating/scheduling multiple market coupling.

V.4. REINTERPRETATION OF INTERNATIONAL PRINCIPLES

V.4.1. International Cooperation

Clean energy generation to abate climate change and to secure energy supply to drive sustainable development are challenges that transcend national borders and require nations working together to sort them out. These goals call for unity and cooperation.

Since the general wellbeing of the international community relies upon basic power needs which large-scale energy generation helps to meet. A large-scale grid interconnecting several countries requires a qualitative approach towards what international cooperation really means when involving transnational energy generation and sustainable development, far beyond mere ‘good-neighbourliness’ as stated in Article 74 of the United Nations Charter.[583]

Instrumental to a regional power grid, the International Law principle of cooperation should be specified in two ways: firstly, its legal interpretation should entail international legal obligations for achieving common humankind-related targets, such as species survival, global environmental protection, and energy efficiency. Secondly, cooperation should be understood both in an active and a passive way. The former refers to actions and measures consciously taken by nation states to promote grid interconnections and power projects’ environmental neutrality. Whilst the latter should detail what should not be done in terms of hindering the electricity flow through the territories of States involved in a project, particularly, that of transit States.

Extraterritoriality (Unobstructed power transit)

Extraterritoriality concerns the use of international spaces or areas supporting transmission facilities needed for the operation of an interconnected power network. The research advanced the idea of constructing the principle in regard to territories used by transmission facilities as a *functional commonality*. This expression avoids confrontation between dissimilar understandings of property or ownership between countries to emphasize that what is relevant is not physical objects, namely facilities, equipment and/or spaces though a network does certainly comprise them – but a *function*: the power flow connectivity.

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[583] *United Nations Charter*, art 74.

In that fashion, it is unnecessary to review the limits placed on the exercise of sovereign rights. Instead, in an interdependent world, it is the connectivity required to make power generation flow (either global or regionally) what is deemed as a 'commonality' worth keeping. In this particular sense, States should be considered as having a shared obligation towards the protection of the grid's *functionality*, irrespective of the characteristics and nature, physical location, ownership status, and/or historic usage of any given transmission facility associated with it. It means also that no territorial sovereign claim (nor award thereupon) should interfere with the common goal of assuring permanent and reliable power supply among States. In view of global energy efficiency, therefore, interconnected power transmission grid's functionality could be considered as an *international common resource*.

Non discrimination (equal treatment)

Unfair discrimination directly undermines the core aim of an interconnected power grid: sharing a common resource. Where the benefits derived from using the grid do not bear fair proportionality with the duties associated with keeping its functionality, the whole project is jeopardised. The research analysed that there is still room for improvements in grid access requirements, fair treatment on common contribution to grid functioning and power transmission fees.[584]

Most-Favoured-Nation treatment (MFN)

The current WTO framework has no specific rules to deal with international power-trading, let alone with cross-border power transit. It is

[584] See ch IV.3.3 on common features of the transmission market, 127.

also of very limited use for dealing with national energy policies and, therefore, with potential harmonisation of energy matrices. Grid interconnections, third-party access to grids and power transit still have no solution in the ECT/WTO sphere of influence. Even conventional WTO-like issues such as binding tariffs regimes for electricity have not succeeded.[585]

The research explored the shortcomings of the WTO system as to energy trading/transit from the point of view of the Most-Favoured-Nation clause, as well as WTO commitments on tariff reduction and bans on trade barriers. In regard to the former, the MFN - which works well in conventional multilateral trading contexts - should become specific as to cross-border power-trading and become standard in energy integration agreements. Its potential to extend rights and/or preferences to third parties in a widened electricity transmission market cannot be missed. However, multilateral energy cooperation agreements, unfortunately, are rare. Due to this, the research advanced the MFN, preeminently, as a mechanism for 'automatic' accession to interconnection agreements, rather than only as a tool for allowing the dissemination of rights among actual Parties of a multilateral treaty.

In turn, the research concludes that the scope of Article XX GATT 1994[586] should be amended in order to restrict or at least to specify excluding electricity trading from it. Since securing power supply is vital for production and essential services delivery; global power generation must enjoy the most widespread and open market possible. Further, with

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[585] See ch IV.3.4 on International power trade and the WTO, 130.

[586] *General Agreement on Tariffs and Trade (GATT) 1994. Marrakesh Agreement establishing the World Trade Organization* (*WTO*), opened for signature 15 April 1994, 1867 UNTS I-31874 (entered into force 1 January 1995) Annex 1A.

environmental protection a 'legitimate objective' under Article 2.2 of the Agreement on Technical Barriers to Trade,[587] thus, power trading should be crossed out as an exception to the ban on import restrictions, levy taxes and other internal charges on imported products.[588]

Finally, outside general integration processes, International Law would be required to have specific tools to achieve the grid interconnection target. The specific use of the MFN treatment to make possible for third parties to access interconnection agreements - entered into under the auspices of a multilateral framework - is seen as a way to promote the enjoyment of equal rights whilst allowing differentiated obligations depending on the particulars of a given transmission project and/or the costs of expanding it to reach the new interested Third Party. Such a construction, which deems the MFN treatment applicable, though optional in the energy field, represents neither a disadvantage for original Parties nor an imposition to a State whose policy might reject to become dependent upon others in such a sensitive matter as power supply. From a different perspective, this 'automatic option' to accede to energy agreements in multilateral trading frameworks only, and materially limited to power grid interconnections offers a more likely chance to attract financing and/or technological assistance from potential, though politically unapproachable, neighbouring stakeholders. This interpretation of the MFN, thus, enables power transmission operation to cast aside ideological bias and political differences from the decision-making processes on energy-related matters. It also contributes to the use of the MFN-option as an incentive for states which lack funding to put forward infrastructure projects which might be

[587] World Trade Organisation, *Agreement on Technical Barriers to Trade* (2013) WTO <http://wto.org/english/docs_e/legal_e/17-tbt.pdf>, art 2.2, p 17.
[588] See ch IV.2.2 on the MFN treatment, 114.

of interest to other States, including non-political allies, but which would bring about mutual benefits.

Property regime over transmission facilities

The bulk of domestic law and regulations on property regimes continue dealing with energy infrastructure in terms of traditional understandings of national sovereignty, which puts at risk attaining interconnection and unrestrained power transit targets.

The legal idea of a nation state dominion that emphasizes excludability[589] over things, spaces and resources is one of the biggest obstacles. In contrast, sovereign rights over specific transmission facilities allocated to form a transnational grid should yield to international obligations concerning grid operational issues. This book recognised the strength of national 'ownership' over resources. Further, it has indicated that under a proposed functional view of power grid interconnection there should be no need to review or alter this long-kept understanding. However, the legal argument of the book takes advantage of the cases in international contexts in which there has been cooperation on shared common use of territorial areas for transit – international air space and high seas being common examples. Of course a cross-border power grid could be internationalised and, then, the property regime would be totally different. It is a legal option, though not entirely realistic, as a grid operator is likely to lack the power to control the areas potentially concerned. The legal emphasis of this inquiry is, therefore, different.

[589] Kevin Gray, 'Property in Thin Air' [1991] *Cambridge Law Journal* 252, 306-7.

Instead of focusing on the ownership issue, which may be subject to domestic regulations; the book aims to attract State responsibility to secure the international functionality of power grids transnationally connected. And so, once power is uploaded to a network and in connection with any threat to limit the power transit, participating States should not be allowed to invoke exclusive sovereign property rights over injected power nor any segment of the interconnected grid in their respective territories.

V.5. IDENTIFICATION OF BARRIERS HINDERING CROSS-BORDER INTERCONNECTIONS AND TRANSIT

The inquiry identified a number of barriers - both internal and external - which limit the process of power grid transnational interconnection.

The most relevant internal barriers hindering cross-border interconnections and power transit are presented here, in descending order, from general to specific ones.

The first and most comprehensive internal barrier to power grid cross-border interconnections consists of geopolitical factors. The geographic component is largely related to location, size, and character of natural resources, particularly, sources of energy and it proceeds from the uneven distribution of resources. But - along with this natural component – there is also a component pertinent and exclusive to human life, such as legal, economic, social and cultural factors which determine the way in which politically organized communities purport to meet their own needs. This inquiry assumed that technical problems associated with interconnecting networks of different countries can be adequately sorted out, if the geopolitical assessment of the project is positive.

From the legal point of view, some configurations of domestic energy mixes have the potential to obstruct and/or delay the development of transmission projects. In general, the capability of fossil fuels to be delivered and stocked up close to consumer centres favours the installation of fuel-fired generating units nearby; but, by the same token, may pose a disincentive for green power projects which might require transmission lines to reach the relevant markets. In these cases, either the law does not provide for enough fairness in terms of equalitarian treatment to potential investors or it decidedly takes part on the design and continuance of carbon-prone matrices, most commonly via subsidies or preferential tax treatments.

A different internal barrier is the impact on the concepts of sovereignty and sovereign rights when they are seen as rights of absolute ownership over natural resources. A consequence of such a strict view can be contrasted with the tragedy of the global commons:[590] areas, resources or facilities not subject to property rights or national appropriation, both because of an ecosystem understanding of the natural resources and the interlinking and cross-border effects of exploitation systems of resources at domestic level. A striking example of this was the Pulp Mills on the River Uruguay.[591] Additionally, sometimes, the configuration of licence systems either for prospecting or exploiting natural resources also arises as a hindrance for subsequent developments of transmission lines projects e.g. as to conditions for negotiated tender on concessions for power generation.

[590] Garrett Hardin, 'The Tragedy of the Commons' (1968) 162 *Science* 3859, 1243-1248.
[591] *Pulp Mills on the River Uruguay* (*Argentina v Uruguay*) (*Judgment*) [2010] ICJ Reports 14, 14.

The research identified the property regime of prospective transmission facilities as a potential internal barrier to transnational power networks development. This is because, in general, under International Law, property rights and the conditions precedent to create them are a matter of domestic law. International Law, more often, deals with 'property' in the realm of States liability, compensation for damages and deprivation of property rights i.e. nationalization which can be deemed enough to protect foreign investments in transmission in a given country. However, once again, the emphasis of the book's legal argument rests upon understanding the power flow and the cross-border connectivity as an *international common functionality* and, therefore, less focused on who owns what at domestic level, as long as the purpose and functionality of the overarching international grid is guaranteed.

There are different approaches towards energy regulation in the domestic realm which can – depending upon the circumstances - also represent obstacles for a transnational power transmission enterprise. Indeed, in countries like Paraguay for instance, the approach embraced by the legislation is based more on structure rather than on regulatory models, mostly due to the serious infrastructure deficit experienced by the country. At first sight, this approach might seem appropriate, but for a long time it was carried on along with a centralized approach which prioritized power reliability over power trading. In the medium and long term the consequences were disastrous both for domestic and international contexts. The trunk transmission system ended up being configured with a collection of medium transmission capacity lines of short and medium range distance capacity. This not only makes it costlier to upgrade the lines, but it also has seriously impaired the power export capability of Paraguay once its generation capacity grew exponentially when the Itaipú dam entered into operation.

The antitrust regulation also has an important role to play. Transmission systems are normally characterized as natural monopolies/oligopolies. As opposed to most economic activities, in transporting electricity, efficiency has commonly been understood as better achieved by the existence of only one provider - instead of many - within a given area. The access to provide the service through informed, transparent and participative procurement processes is what domestic law are in charge of delivering. The focus of this inquiry is, however, international and the capacity of international law to deliver similar schemes for first, accessing the procurement of the interconnection service and then, providing non-discriminative access to those interested in using the interconnection; whether for injecting or withdrawing power the rules are currently very limited. Building upon the regular capacity of sovereign States to enter into international agreements, this inquiry makes a case for power grid interconnection but, at the same time, advances a new use and understanding of a well-know International Trade Law mechanism: the Most Favoured Nation clause (MFN) to achieve a specific reinterpretation of the International Law principle of non-discrimination. The purpose of this is twofold: firstly, to develop an specific use for power-trading of the MFN aimed at facilitating consensus as to grid interconnection; and, secondly, to serve as mechanism to non-discriminating access to take part in interconnecting projects intended to be carried out by two or more States who are parties of a common international trading framework, such as the WTO or the ECT.

A further internal obstacle to cross-border energy transmission is the existence of subsidies to conventional energy sources. This is, of course, a legal mechanism of domestic effects which intervenes internal pricing mechanism of renewable energies available or potentially available, thus, affecting their economic competitiveness. Conventional energies tend to keep the markets local and isolated while green energy markets further the opposite. Unjustified or discriminatory regulations applicable to the renewable sector e.g. interconnection requirements, tariffs, subsidies, etc, might phase out cooperative efforts between them, particularly, if they differ amongst countries, which is the norm.

As explained in Chapter IV when dealing with the scope of Article XX WTO,[592] taxation involving high export withholding taxes or export duties levied upon electricity exports is also a hurdle to the furtherance of cross-border interconnection. Further, since some countries have constitutional and/or legislative limitations as to the configuration of their energy matrices, the State energy-supply policy might also suffer from this sort of legal constraints. Furthermore, some power facilities operation regimes may also constitute an obstacle. Basically, isolated trans-boundary operation or deficient regulation of congestion management systems - designed to cope with the risk of voltage instability or reactive power-flow mitigation mechanisms – might make sections of the grid particularly unstable, thus unsuitable for reliable international power supply. Finally, the lack of technical standardization at by-law level may result, for instance, in deficient interconnections causing bottlenecks which, in turn, carry the risk of power failures.

External barriers, in turn, are those imposed by international conditions which hinder cross-border interconnection and unrestrained power transit. Politics and historical issues such as in the relationship between North and

[592] See ch IV.

South Korea, weak bureaucracy and corruption as in several countries in Africa, cultural misunderstandings as in between Western and Asian societies, war threats as in the Middle East, and ignorance and prejudices are part of a wide palette of general factors underlying policy and legal obstacles to widespread natural resources sharing and, specifically, network international interconnection.

The current status of International Law of State liability might also be deemed an obstacle. Without a concept of *grid common functionality* to counterbalance that of sovereign ownership over natural resources, International Law does not have adequate mechanisms to address the consequences of unilateral acts of States who may want to intervene or interrupt the regular transnational transport of electricity (or other form of energy) while it is in their respective territories. Furthermore, for grids to become internationally operated would require a closer look at the rules governing the attribution of responsibility for States' acts. The issue turns to be crucial in considering multi-national operation systems and, even more, given that the research advanced the proposition about entrusting that function to an independent body enjoying international status.

International Law and particularly that of the treaties can adequately provide for these undesirable situations, such as power supply interruption, obstacles to transit, domestic power rationing and others. The Parties' agreement can set forth rules for compensation, guarantees, enforcement, and dispute settlement mechanisms, but all this is no novelty. Instead, what it needed is to have International Law instruments capable of dealing with situations like these. Situations in which a third country to an agreement could take advantage thereof without compromising the status and rights of the original Parties; or be deemed liable of international acts contrary to an objective situation concerning to the Parties of such treaty or even unrelated third parties with a common interest in a given *function* sought by that treaty.

A further obstacle to cross-border grid interconnections is the lack of an effective dispute settlement mechanism at International Law to assist in conflict resolution over transnational power transmission. For overcoming the objection of lack of enforcement mechanisms for international obligations,[593] the international community should keep on gaining legal substance. The book advocates that this process gets momentum when the scope of potential obligations is narrowed down to basics, this means as to the inquiry's field, emphasizing the need for interconnection of power networks either bilateral or multilaterally and using to that effect modified legal instruments such as the MFN clause. But, then, without interference with current understandings of sovereignty it is necessary to foster the idea of a progressive cross-border power grids common functionality.

Furthermore, the idea of a successful transnational grid calls for enforcement mechanisms, both to secure continuous interconnection, transport and energy delivery. These could be achieved if the common functionality idea engenders, in turn, the acceptance of common independent operation of a transnational grid entitled to international status.

International economic concerns and the limited affordability of new technologies threaten developing countries' political will and capacity to introduce changes to their economic development schemes. A scheme of sustainable development comprising both a harmonised multilateral energy

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[593] See ch III, IV.2, 88.

matrix and a regional network of interconnected transmission grids might well serve countries such as those in Africa to dramatically reduce costs, take advantage of well-known transmission technology (even standard), integrate vast and different sources of green energy into the system and, even, achieve greater negotiation power vis a vis, for example, in the carrying out of projects aimed at supplying Europe with energy produced in Africa.

Finally, State policy on external defence is also a hurdle to transnational power grids. Here, nationalistic views and perceptions of external insecurity directly impact much of the characterization process of many natural resources; generating power units, transmission facilities and other facilities as strategic, which naturally constraints their free exploitation and/or legal disposition. This is so, mainly, because of a widespread but commonly misplaced political feeling that a neighbouring State's advantage represents one's own disadvantage.

V.6. LEGAL RECOMMENDATIONS FOR A HARMONISED MULTILATERAL INTEGRATION OF RENEWABLE SOURCES-BASED ENERGY POLICIES

International Law requires specific tools to achieve the target of grid interconnection. The flexibility of International Law has advantages over secluded supranational systems of Law, as the EU's resort to the ECT/WTO framework clearly indicates. For this reason, an innovative specific use of the MFN is proposed here in order to allow third-party countries to accede to interconnection agreements entered into under a multilateral trading framework. It is also possible for transmission projects to be compatible with, and to be carried out under any of Kyoto Protocol's 'flexibility mechanisms' under Art 12.[594]

In the context of general integration processes, achieving a single transnational electricity market, like EU's Internal Energy Market (IEM), highlights the need for a more manageable, narrower approach to the sector, rather than a comprehensive one. In this sense, lessons on specificity about energy issues drawn from the European Communities and EURATOM[595] justify the choice of solution proposed by this book. It is sensible to identify the market target clearly, as the transnational transmission sector, and approach it with adequate and specific regulatory tools designed to unify it. As to the international transmission market, the starting point is getting networks interconnected. A supranational legal order is instrumental, but neither is it the only option nor is it an infallible one as the European case study demonstrated.[596] It would be of significant interest to explore the effect of new legal devices based on the cooperative idea for meeting renewable energy targets underlying provisions such as Art 11 of Directive 2009/28/EC on Joint Support Schemes,[597] if applied to power transmission expanding/interconnecting projects.

However, in any transnational power transmission scenario, the worldwide trading framework: the WTO has a significant role to play. The MFN should undergo changes in terms of becoming power-specific and a standard inclusion in all energy integration agreements. Indeed, it is a

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[594] *Kyoto Protocol to the Framework Convention on Climate Change*, opened for signature 11 December 1997, 37 ILM 22 (1998) (entered into force 16th February 2005), art 12.
[595] *Treaty establishing the European Atomic Energy Community (EAEC or EURATOM Treaty)*, opened for signature 25 March 1957, 298 UNTS 167 (entered into force 1 January 1958).
[596] See ch III.
[597] *Council Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directive 2001/77/EC and 2003/30/EC* [2009] OJ L 140/16, art 11.

clause that has served well the objectives of liberalising general trade, but it has not reaped similar effects in the power-trading area. The functioning of the clause is well known and its potential to extend the rights and/or preferences to third parties in a given market cannot be missed when applied to widespread electricity transmission. Notwithstanding these issues, the research envisions using the MFN more as a mechanism for accession to interconnection agreements entered into Parties, rather than as a tool for allowing the dissemination of rights among those who are actually Parties of a multilateral treaty.

International legal obligations arising from an international framework on power transmission should also provide mechanisms for the protection of the common interest embedded in the notion and functionality of a transnational grid. For instance, a treaty establishing an International Power Transmission Network (IPTN) should have as its principal goal guaranteeing the security of energy supply within the framework formed by its Member States. It should also promote the coordination of the Contracting States' energy programmes and provide for the cooperative and synchronised use of energy output by pooling power infrastructure. In this context, the treaty should create and empower an independent body in charge of operating the newly created grid. Finally, such a treaty should also provide for funding schemes to encourage research and development of new technologies and operating models.

On the national domestic front, it is advisable that vertically integrated utilities be divided into several companies. Market restructuring enables each of the newly unbundled sectors to manage its own businesses separately and to allow new actors enter into power generation, transmission, and distribution markets, thus, furthering more competition amongst them.[598] In the transmission sector, in particular, open and non-discriminatory access to the power lines should be encouraged, since this has a direct effect on the number and variety of stakeholders willing to invest in power generation, a crucial element in the design of an energy matrix based on renewable energy sources. In turn, end-consumers of electricity are better off, since power supply becomes wider, more diversified, and cheaper than the situation if transmission lines remained closed and/or exclusive.

For meeting the challenge of achieving external coordination of energy policies based on renewable sources, it is necessary - as a first step - to reach wide consensus on transnational grid interconnection. The following step is that, at domestic level, the regulation should guarantee all generators clear access to the trunk power grid. In this sense, national legal systems should provide for sanctions to those who unduly obstruct access to third parties. This may also serve as a powerful economic signal for agents to enter the market in response to increasing power demand thus enhancing the transmission infrastructure, lowering power rates, and becoming a competitive advantage capable of attracting international trading interest.

Therefore, this work advances the need for establishing basic treaty substantive rules on grid interconnection and unrestrained power transit obligations. It also recommends, in line with its practical outcomes, that some basic legal concepts should be introduced, developed and used consistently at the international realm. Amongst these concepts are: ‘international power transmission’, ‘power transit’, and ‘international

[598] See ch IV.3.3, 123.

power transmission network (IPTN)'.[599] Last but not least, our thesis promotes the creation of the latter as an organization with international status, whilst envisaging independent operation of the interconnected transmission facilities associated to the IPTN.[600]

V.7. PRACTICAL OUTCOMES: INTERNATIONAL DECLARATION AND MODEL TREATY

As a contribution to making transnational transmission feasible and internationally enforceable, the book developed two model legal documents: an International Declaration and an Agreement on grid interconnection and power transit. Both are designed as the backbone of an international legal framework for governing interconnected renewable energy-based transmission grids, at least, on a transnational regional basis.

The International Declaration draws on the growing scope and significance of international cooperation for furthering sustainable development,[601] as well as other peaceful purposes. It relies on the principles of International Law to call for international cooperation to fund and implement common international power transmission facilities for mutual benefit and in the interest of all participant States, while taking into particular account the needs of developing countries.[602]

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[599] See appendices B and C.

[600] See ch I, II.

[601] Sustainable development as defined by the Brundtland Commission Report. World Commission on Environment and Development, above n 141. In regard to Latin America, for example, see Lila K. Barrera-Hernández, 'Sustainable Energy development in Latin America and Donor driven Reform: What will the World Bank do?' in Barton et al (eds), *Regulating Energy and Natural Resources* (Oxford University Press, 2006). The model declaration is based on the *Declaration on International Cooperation in the Exploration and Use of Outer Space for the benefit and in the interest of All States, taking into particular account the needs of Developing Countries*, UNGA RES 51/122 (13 December 1996).

[602] The idea of common but differentiated responsibility at International Environmental Law.

In turn, the Model Treaty is conceived as a specialized international legal instrument for establishing and implementing an International Power Transmission Network (IPTN) through interconnections, as well as for securing unrestrained energy transit. The Model Treaty contains vital definitions of 'international power transmission', 'IPTN', and 'transit' (Art.1) amongst others; organizational provisions such as that creating the IPTN as an international organization (Art. 13); along with setting forth basics substantive treaty rules on grid interconnection obligation (Art. 11), and unrestrained power transit (Art. 8). The model is generally based upon the ECT framework, but focused specifically on power grid interconnection and transit issues.

Both models can assist in providing transparency regarding current practices in the areas of cross-border power grid interconnections and operation, as well as in facilitating project-specific negotiations, thus, reducing transaction-costs. The Model Agreement offers operational value as a set of provisions neutrally drafted to be used by stakeholders to facilitate the realization of prospective cross-border interconnections for transmission projects or exploring renewable energy-based mix harmonisation. It is, therefore, intended to assist interconnections between each of the countries over whose territories the transmission lines are to be placed upon.

V.8. RELEVANCE OF THE RESEARCH

The relevance of the research rests upon the following considerations.

V.8.1. Global Energy Efficiency, Market Expansion and Renewable Energy Sources Integration through International Law Instruments

In a broad context, the research aims at promoting international energy cooperation through legal instruments. In a narrow sense, it aims at fostering power grid interconnections at regional level through bilateral or multilateral International Law instruments.

The importance of the research and its proposal is that interconnecting energy supply systems not only reduces overall energy generating costs, but also enhances the expansion of energy markets encouraging greater competition between their participants. The legal implications of interconnecting power grids across-borders may contribute to International Law specifically and progressively build substance and, therefore, achieve greater enforceability in a field long considered strategic and closely related to the sovereign capacities of States. The advantage of this legal approach is that it does not necessarily sit in opposition to current views on State prerogatives and the scope of national sovereignty, nor does it requires a revision of property regimes over natural resources.

The research aimed at extending the positive effects of expanding energy markets beyond the boundaries of individual States. At the same time, it attempted to do so in connection with emerging markets of renewable energy sources; or even in long consolidated energy markets though residual in the global energy matrix, such as nuclear energy, in which it could also be applicable. The research, therefore, contributes - from a legal perspective - to the furtherance of international cooperative mechanisms for achieving greater energy efficiency rates at a global/regional scale through transnational interconnection of transmission networks and the promotion of harmonized renewable energy sources integration.

V.8.2. International Trade-based instrument for Economic Growth and Sustainable Development

The research is also relevant for international trade. Apart from what was explained in Chapter IV with regard to the WTO multilateral trading system, conclusions can be drawn in terms that trade-inhibiting border taxes and other border restrictions or trade measures do affect the flow of power across borders. Such restrictions, for instance, between non-neighbouring power-excess and power-deficit countries represent significant economic inefficiencies. These are counterproductive to economic development and to the efforts of minimising the global financial system volatility and to stimulate economic growth.

The research's aim of promoting international interconnections of power grids represents a direct contribution to facilitate and increase international power trading. Indirectly, it assists to the achievement of broader economic goals. In this context, the outcomes of the inquiry would greatly benefit developing and emerging countries to identify legal instruments for international cooperation, developing joint negotiation capacity, as well as detecting regional market and economic sustainable development opportunities.

Finally, the research has a practical direct use: it may serve as a guide for law development and policy-makers to address some identified legal obstacles to international trade and cooperation as well as in designing a framework for power market unification.

V.8.3. Ground-breaking GHG abatement potential and infrastructure management regime

Depletion of natural resources and rising international prices of carbon-based fuels threaten conventional economies. Further, the global implications of climate change pose a number of obligations on the international community, one of them being that of collectively reducing GHG.

The research is pertinent to those challenges, when it comes to the efforts made by the EU to attain a limited single power market based on transnational supply although the EU still relies mainly on carbon-based sources of energy. The inquiry went further in trying to identify the basis for a transnational common power market in which cross border interconnections could boost electricity generation based on renewable sources.

Simultaneously, the search for new technologies based on non-traditional energy sources and the efforts to make them economically viable have reoriented political interests in the setting-up of many countries' energy matrices. However, whilst renewable generating potential may not be the main problem in most cases, the readily availability of such energy certainly is, because the renewable power technologies are not capable yet of completely substituting carbon-based energy mixes. Wind-power, for instance, is not cost-efficient unless it is used at a very large-scale. This is coupled with energy storage mechanisms still unable of efficiently ameliorate load fluctuations; the isolation of outdated transmission systems, and other structural inefficiencies of conventional grids.[603] The argument being that transnational power transmission might assist the development of renewable energies in energy matrices. But, if all these efficiency issues could be successfully surmounted, there is still the problem of managing power facilities sited in diverse state territories and with power lines crossing multiple sovereign States. In this area, the book advances the idea of an independent operator with international status.

There are many issues that lie ahead to be politically and legally addressed by multiple States in regard to energy supply including: the utilisation of common natural resources, the property regime to be applicable (as to resources, installations, power outcome, etc), the international trading of electricity produced by them, the possibility of creating an integrated single power market, and the shared and independent operation of generating and transmission facilities. The research is original in this regard in attempting to explore and reinterpret some International Law principles concerning a new *common functionality* to make the legal models suitable to jointly develop transnational transmission facilities ultimately designed to be operated independently.

V.8.4. Innovative approach to Renewable Energy and Transmission

The research offers an approach focused on integrating renewable source-based power generation into energy matrices at the expense of fossil-fuels but it is original because its focal point is the long-neglected regulatory

[603] See ch III.2 on power networks, 72.

aspect of transnational interconnections, instead of concentrating only on those less controversial areas that are of a technical or economic nature. Moreover, it approaches transnational interconnection as a global means to raise renewable energy competitiveness and offers a means for achieving it faster. It looks at the potential of the power transmission sector at a large scale. Further, the research takes great care to isolate its analysis from the examination of the policy aspects that are to be modified. Instead, it looks to specific regulatory models in the primary legislation of the selected cases studies.

To sum up, the research has the potential to contribute to furthering international cooperative mechanisms for improving energy efficiency rates, at least, at a regional scale through transnational interconnection of transmission grids and the promotion of harmonized renewable energy source integration. This aims at providing reliable 'green' energy supply. It is innovative, since the book approaches transnational interconnection as a global means to raise renewable energy efficiency and competitiveness. Further, it places emphasis on the legal obstacles – external or internal - to international cooperation in achieving interconnections, power market unification, and energy efficiency, all three long-neglected aspects by scholars and policy-makers. Lastly, the research aimed at having a straightforward practical use: to serve as a model guide for regulation.

V.9. SUMMARY OF FINDINGS

A global outlook of energy issues reveals that, along with continuing efforts to discover new sources of energy, issues such as climate change, sustainable use of resources, and energy efficiency have become critical. While climate change is giving emphasis to Environmental Law measures;

the uniqueness of the power market which makes it the cornerstone of many other economic activities at a global scale seems to demand - in the aftermath of pressing energy security concerns - the internationalisation of Energy Law. However, depending upon the current unreliable power supply the worldwide market interdependency poses dauntingly complex challenges for a globalised power regulatory framework. In such a context, the central focus of this research was to determine how and by what means Law can contribute to promote power generation from renewable sources, harmonised energy portfolios, and coordinated operation of power grids in a regional framework. It endeavoured to present the fundamentals of power markets and grids as powerful energy-efficiency tools, explaining its nature and particulars, as well as demonstrating by case studies how international power trade works in practice, particularly, under the WTO, ECT, and EU legal frameworks. It is a modern paradox that, while the world becomes more globalised, particularly in trade, the fear of insecure energy supply might drive policy-makers towards protectionism and economically inefficient self-supply energy approaches. However, as seen, securing power network interconnection is just the first part of the challenge.

Uniform standards of international investment protection and enforcement are vital for the proposed transnational power infrastructure. These are best served under a multilateral approach to international relationships, since the normal contents of bilateral investment treaties appears insufficient to provide the level of security that international energy supply demands. Most of the time, the existence of a clear binding procedural rule to settle disputes is preferable to an appropriate substantive, though normally vague and unenforceable provision of an international instrument. In this sense, the framework provided by the WTO is both multilateral and procedural and its general principles of equity, transparency, non-discrimination, and trading liberalization suit power trading fairly well. Unfortunately, however, it does not deal with some specifics of power trading, such as power transit and energy security when the delivery involves more than two countries and with associated enforcement of agreed electricity supply. Notwithstanding, the WTO rules contribute to remove trade-inhibiting border taxes and other border restrictions or trade measures affecting the flow of power - for instance, between non-neighbouring power-excess and power-deficit countries - all economic inefficiencies thus counterproductive to economic development; whilst assisting to minimise power price volatility and stimulate investments. The Energy Charter Treaty framework, in turn, is genuinely more specific as to investment protection, but in terms of power trading it simply refers to WTO rules. Again, power transit and energy security issues associated with it remain unsolved.

The research found that energy mix configurations (energy selection) are dependent upon two considerations: firstly, rising international oil prices; and, secondly, the impact of renewable energy technologies, which progressively are making renewable sources more competitive. This latter process, in turn, is furthered by the opportunity to access distant markets through transnational power transmission.

The research also found that, while some cases studies exemplify the need for a shift towards renewable power generation in strategic sectors as a way to secure power supply (in a modern - though naive - ideal for energy autonomy); others, instead, highlight the need for both external coordination of energy policies (international cooperation) and the promotion of mechanisms to enforce international energy agreements (in other words, the legal aspects clashing with the doctrine of absolute sovereignty). Ideally, for efficiency purposes, the States should firstly try to coordinate their energy programmes before attempting to create a single power market; but this might be asking too much from traditional views on sovereignty. In fact, efforts in the latter direction – though still limited, such as market coupling – have simply set aside such traditional views about absolute nation-state sovereignty. In so doing, public-private undertakings for implementing power transmission projects using flexible procedures have taken the lead.[604]

One of the most powerful economic reasons to encourage international interconnection of power grids is that long-distance transmission of electricity is cheaper and efficient, and allows remote renewable energy resources to be used to displace fossil fuel consumption. This might also represent a new and more lasting legal development than 'flexible' CO_2 emissions reduction instruments under the Kyoto Protocol, beyond that of Joint Implementation (JI), Clean Development Mechanisms (CDM), and Emission Trading Schemes (ETS).[605]

The book concludes that having a single transmission line, a transnational wholly interconnected power grid is the most efficient way to: 1. Integrate renewable sources into power supply faster, thus, helping to dramatically

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[604] See generally, P.G.H. Jacobs, M.A.M.M. Van Der Meuden, F.J.C.M. Spaan, I. J. Tigschelaar, 'Long-term grid planning in the Netherlands' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C1-303-2010.

[605] *Kyoto Protocol to the Framework Convention on Climate Change*, opened for signature 11 December 1997, 37 ILM 22 (1998) (entered into force 16th February 2005). See also E.M. Carlini, P.P. Pericolo, F. Vedovelli, B. Cova, A. Venturini, S. Lepy, E. Momot, 'Impact of CO2 reduction targets on transmission capacity expansion dictated by the power market clearing: application to the Italian and French systems' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-302-2010.

reduce its cost whilst solving the output variability/reliability issue normally associated with them. 2. Even more importantly, it will assist in the sharing of natural resources worldwide in a cost-efficient manner; and 3. It will also assist in integrating productive markets globally, therefore, reducing the risk of economic disturbances and political tensions between countries. A single power grid crossing multiple national boundaries fosters processes of negotiation and offer countries placed along the grid opportunities for mutual sustainable prosperity and peace. Grid interconnection policies favour the reassessment of national domestic energy mixes towards renewable sources, promoting both its market integration and the development of enforceable international mechanisms to secure its continuance.

Drawing from the analysis of the case studies on energy selection (Brazil, Canada/USA) and energy security (EU), the research concludes that harmonised energy portfolios, when coupled with cross-border power grid interconnections contribute to the large-scale integration of renewable energy sources and work to promote and secure unrestrained power-flow and trade across-borders. This assists the pursuit of sustainable development, whilst reducing climate change-associated effects and securing worldwide 'green' energy supply.

As explained in the methodology section in Chapter I,[606] the use of three different case-studies did not extensively examine the overall context of the relevant country (Brazil) and the two regions (European Union and South America) with two distinctive legal systems (Civil and Common Law systems). In each case the research interest was limited to specific subject matters. Indeed, the use of each case-study was subjected to a

[606] See ch I.4, 31.

thematic approach, though jointly considered all three contribute towards the analysis and the legal argument of the book. In this sense, studying the case of Brazil was relevant because, over decades, this country has committed itself to set-up and maintains an energy mix mainly based on renewable sources. However, Brazil is currently threatened by increasing power demand and lack of transmission infrastructure, notably, of international interconnections.[607] As a single country, however, its regulatory experience is not entirely suitable for replication, particularly in multilateral settings. In contrast, the EU case-study stands for extensive regulatory experience on multilateral integration processes for power transmission. But, despite efforts deployed in the energy field, the EU has failed in fully transitioning to a non carbon-based economy and securing energy supply.

The case-studies of Brazil, the EU and South America considered as a whole encompass all key aspects of the research question. Indeed, first, the regulatory aspects for promoting transnational interconnections and legal instruments to secure cross-border energy transmission are represented through the analysis of the EU case. Secondly, energy efficiency opportunities arising out of renewable sources integration were at the core when examining Brazil's energy mix policy and appurtenant regulation. Thirdly, the potential for achieving sustainable development through international cooperation on power grid interconnection and harmonisation

[607] Empresa de Pesquisa Energética (EPE), *Programa de Expansão da Transmissão – PET 2010-2014. Estudos para licitação da expansão da transmissão. Consolidação das análises e pareceres técnicos* (Ministério de Minas e Energia, Secretaria de Planejamento e Desenvolvimento Energético, 2009) [Transmission Expansion Plan – PET 2010-2014. Studies for the procurement of the Transmission Expansion Procurement Studies. Consolidated analysis and technical opinions]. See also J.C. Mello, M.R. Souza, F.V. Moreira, T.M. Prandini, S. Areco, 'The Brazilian market-based expansion and low carbon energy future - issues and solutions' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C1-107-2010.

of energy matrices was examined using South America as an example. From the case studies, the research drew lessons on managing renewable source-based energy mixes (Brazil), integrating different regulatory frameworks for interconnecting grids across-borders, securing power trade and transit, and coordinating renewable sources-based energy mixes in multilateral settings (EU). All provide examples of legal mechanisms that are well capable of serving the purpose of allowing nations to agree on the basics of a transnational cooperation project on power interconnection, especially in developing regions such as South America, South-East Asia, or Africa.

In sum, the three selected case studies have shown what the ideal would be (Brazil),[608] how to achieve it by avoiding past errors (EU),[609] and how such legal mechanisms would work in an interactive global/regional trading scenario (South America).[610]

The research focus emphasized - using an approach based on minimal legal intervention – that the legal mechanisms required for achieving a single integrated power market must address two main obstacles: market accessibility and electricity reference pricing.[611] In regard to market access, much has been done domestically due to liberalization and unbundling processes,[612] but when thinking about accessing an international power grid or even an international power interconnector, which it may impact

[608] See ch II. See also E. Mesquita, 'Socio environmental transmission costs in Brazil'(Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C3-201-2010.
[609] See ch III.
[610] See ch IV.
[611] R. Beune, J. Van Putten, K. A. Barmsnes, O. Gjerde, 'Interregional market coupling - a challenge for the NorNed cable' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-103-2010.
[612] See ch IV.3 on the role of international trade and economics, 120.

the competitiveness of potential energy sources pricing, it is truly an issue to be addressed by regulatory schemes, preferably, multilaterally. In regard to electricity pricing and regardless of the type of transmission system operator, this latter has to dispatch generating instructions - normally based on previous bidding process - for each relevant dispatch-period and thus prices are normally reached.

The quest for a price for electricity at international level is, however, vital for attaining a reference market. An initial limited attempt to do this has been market coupling, as tested in the European Union. This is a method that relies on a close coordination between transmission system operators as controllers of the power volume calculation and power exchanges as pricing authorities.[613] The auction-based mechanism has worked relatively well in matching prices for different European regions via interconnectors as to the extent of a day-ahead electricity trading. Further, it has allowed a more efficient use of cross-border capacities, as well as the principal aim of price harmonisation. In the author's opinion, the current scheme of market coupling could withstand being used more widely, mostly because normally local-based power exchanges are in a better position to assess the impact of economic factors contributing to the variations of the electricity price for local supply in different regions. In conducting such assessment, factors like distance travelled, transmission losses, restrictions to interconnectors' transmission capacity, nomination of preferred carrier, and alternate local generating source costs, amongst others, must be considered in setting an electricity reference price specific to the regions (sub-markets) concerned.

[613] R.A.C. Van Der Veen, G.L. Doorman, O.S. Grande, A. Abbasy, R.A. Hakvoort, F.A. Nobel, D.A.M. Klaar, 'Harmonization and integration of national balancing markets in Europe – regulatory challenges' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C5-104-2010.

However, a coordinated power output and transmission capacity calculation – which is the flip side of pricing – seems more complex to achieve by multiple local operators;[614] particularly in order to meet power demand, supply must became multilateral. This is when the power is delivered via multiple interconnectors or when it involves the crossing of several national borders. In these truly transnational scenarios in which more than two system operators are called upon to synchronise and coordinate actions and instructions, the need for a responsible overseeing body at international level is justified.

In meeting these challenges, distinguishing between international and domestic power transmission markets is a must. Cooperation in transnational bulk power transmission should be sought using *de minimis* specific legal instruments designed to facilitate and secure access to the available interconnected transmission capacity by the renewable energy generators.

The solution to these challenges – as envisaged by this inquiry - rests upon taking advantage at international level of the fact that transmission networks are natural monopolies. This condition may facilitate reaching consensus by nations on transnational interconnections. Domestically, this goal is mainly supported through legally guaranteeing access to the national trunk grids through transparent procurement processes. Lower power rates resulting from growing domestic markets with improved transmission facilities represents a competitive advantage as well, which

[614] M.A. Rabinovich, Ju.I. Morjn, S.P. Potapenko, 'Digital model power systems of real time for information support of dispatcher power systems' (Paper presented at the 43rd Conseil International des Grands Reseaux Electriques (CIGRE) [43rd International Council of Large Electric Resources], Paris, France, 2010) C2-111-2010.

promotes trading and, ultimately, turns out into an incentive for markets unification. Here, the legal solution would be for nations to reach a technically-framed agreement of the kind and scope of the model contained in appendix C to this book and whose features are described further below.

The investigation confirmed the contention that the sought-after objectives of energy efficiency and security of energy supply would be achieved more effectively had countries agreed on renewable-sourced energy policy synchronisation on the one hand; and, on the other, specific International Law instruments were used. These instruments ideally should comprise: the reinterpretation of International Law principles as discussed in Chapter II and IV and the use of flexible model rules and dedicated international agreements addressing two straightforward and very limited subject matters: cross-border power grid interconnection and unrestrained power transit.

In regard to power transit, the inquiry concludes that the security of supply under Energy Agreements between already interconnected transmission systems would improve if the operation that oversees such transit were granted independent status under International Law. It is suggested that such status should comprise an international organization having international personality, legal capacity, and *ius postulandi*, as well as an Operator capable of exerting control over designated territorial areas and/or facilities. The research shows that the lack of independency in operating transmission facilities plays a significant role in explaining the long-standing isolated operation of transmission systems in the international realm. Further, the lack of independent operation also brings about serious environmental and economic inefficiencies, as well as threats of political instability worldwide.

Accordingly, the research identified several opportunities for energy efficiency and the legal barriers hindering the achievement of such objectives. The most relevant of the latter being an outdated legal notion of territorial sovereignty and dominion over natural resources which hinders efforts to develop legal models for grid interconnection. In seeking to overcome these barriers, the research advanced a process of reinterpretation of certain international legal principles: international cooperation and free transit among others, in terms of giving substance to these principles.[615] It also provided legal recommendations for advancing a harmonised multilateral integration of renewable sources via network interconnections.

Finally, as practical outcomes, for making transnational transmission (cross-border power transit) not only possible, but also internationally enforceable (energy security), the research develops two model legal documents on grid interconnection and power transit.[616] In this manner, the system would allow producers to inject and take out energy along the grid, generated and delivered at the minimum possible cost, and subject to international standards aimed at securing enforceable supply under the principles of International Law.

[615] See ch I, V.

[616] See Appendices B and C.

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2. CBC-Canada <http://www.cbc.ca>.
3. World Wild Fund for Nature International –WWF <http://wwf.ca>.
4. National Energy Board - Canada <http://www.neb-one.gc.ca>.

Chile

Comisión Nacional de Energía [National Energy Commission] (Chile) <http://www.cne.cl>.

Ecuador

1. Consejo Nacional de Electricidad (CONELEC) [National Council of Power] (Ecuador) <www.conelec.gob.ec>.
2. Centro Nacional de Control de Energía (CENACE) [National Centre for Energy Control] (Ecuador) <www.cenace.org.ec>.

Japan

Japanese Agency for Natural Resources and Energy <www.enecho.meti.go.jp>.

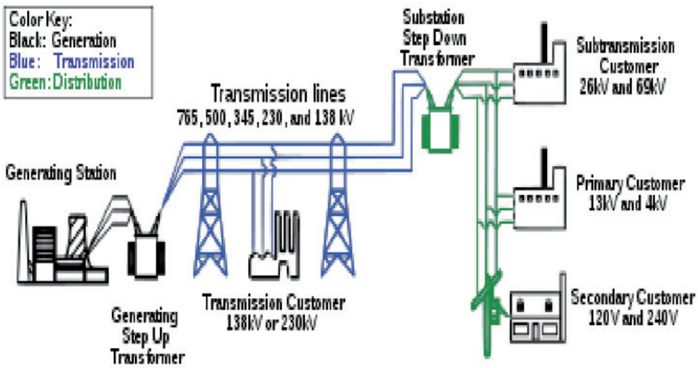
Press Agencies & Magazines

1. BNamericas <www.bnamericas.com>.
2. CNN <http://cnn.com>.
3. Reuters <www.reuters.com>.
4. ABC Digital <http://www.abc.com.>.
5. UTNE Reader <www.utne.com>.

APPENDICES

APPENDIX A

Diagram: A simple electricity grid[617]



[617] U.S. Secretary of Energy – Minister of Natural Resources Canada, *Final Report on the August 14, 2003 Blackout in the United States and Canada. Causes and Recommendations* (April 2004) U.S. – Canada Power Outage Task Force <http://www.ferc.gov/industries/electric/indus-act/reliability/blackout/ch1-3.pdf>, 5.

APPENDIX B

International Declaration and Annex[618]

A/RES/XX/XX

XXrd Plenary Meeting

XX March 2013

RES XX/XX. Declaration on International Cooperation in the Implementation and Use of International Power Transmission Facilities for the benefit and in the interest of all States, taking into particular account the needs of Developing Countries.

The General Assembly,

Having considered the report of the Committee on the Implementation and Use of International Power Transmission Facilities on the work of its XX session and the text of the Declaration on International Cooperation in the Implementation and Use of International Power Transmission Facilities for the Benefit and in the Interest of All States, Taking into particular account

[618] This model of international declaration is based on the *Declaration on International Cooperation in the Exploration and Use of Outer Space for the benefit and in the interest of All States, taking into particular account the needs of Developing Countries*, UNGA RES 51/122 (13 December 1996).

the needs of Developing Countries, as approved by the Committee and annexed to its report,

Bearing in mind the relevant provisions of the Charter of the United Nations,

Recalling notably the provisions of the Treaty on Principles Governing the Activities of States in the Implementation and Use of International Power Transmission Facilities, including International Interconnections (international nodes), International Substations and Other International Transmission devices,

Recalling also its relevant resolutions relating to activities in International Sites,

Bearing in mind the recommendations of the XX United Nations Conference and of other international conferences relevant in this field,

Recognizing the growing scope and significance of international cooperation among States and between States and international organisations in the Implementation and Use of (International) Power Transmission Facilities for peaceful and sustainable development purposes,

Considering experiences gained in international cooperative ventures,

Convinced of the necessity and the significance of further strengthening international cooperation in order to reach broad and efficient collaboration in this field of international power transmission for the mutual benefit and in the interest of all parties involved,

Desirous of facilitating the application of the principle that Implementation and Use of International Power Transmission Facilities, including International Interconnections, International Substations and Other Transmission Devices, shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all humankind,

Adopts the 'Declaration on International Cooperation in the Implementation and Use of International Power Transmission Facilities for the benefit and in the interest of all States, taking into particular account the needs of Developing Countries', set forth in the Annex to the present resolution

ANNEX

Declaration on International Cooperation in the Implementation and Use of International Power Transmission Facilities for the benefit and in the interest of all States, taking into particular account the needs of Developing Countries

1. International cooperation in the Implementation and Use of International Power Transmission Facilities for peaceful and sustainable development purposes (hereinafter 'international cooperation') shall be conducted in accordance with the provisions of international law, including the Charter of the United Nations and the Treaty on Principles Governing the

Activities of States in the Implementation and Use of International Power Transmission Facilities, including International Interconnections (international nodes), International Substations and Other Transmission Devices. It shall be carried out for the benefit and in the interest of all States, irrespective of their degree of economic, social or scientific and technological development, and shall be the province of all mankind. Particular account should be taken of the needs of developing countries.

2. States are free to determine all aspects of their participation in international cooperation in the Implementation and Use of (International) Power Transmission Facilities on an equitable and mutually acceptable basis. Contractual terms in such cooperative ventures should be fair and reasonable and they should be in full compliance with the legitimate rights and interests of the parties concerned.

3. All States, particularly those with relevant technological capabilities and with expertise in the Implementation and Use of Power Transmission Facilities, should contribute to promoting and fostering international cooperation on an equitable and mutually acceptable basis. In this context, particular attention should be given to the benefit and the interests of developing countries and countries with incipient expertise stemming from such international cooperation conducted with countries with more advanced technological capabilities.

4. International cooperation should be conducted in the modes that are considered most effective and appropriate by the countries concerned, including, inter alia, governmental and non-governmental; commercial and non-commercial; global, multilateral, regional or bilateral; and international cooperation among countries at all levels of development; as

long as they conform to the rules and principles set forth in the Treaty on Principles Governing the Activities of States in the Implementation and Use of (International) Power Transmission Facilities, including International Interconnections (international nodes), International Substations and Other Transmission Devices, in particular, to the rules on Uniform Standards and the principle of unrestricted power-flow.

5. International cooperation, while taking into particular account the needs of developing countries, should aim, inter alia, at the following goals, considering their need for technical assistance and the rational and efficient allocation of financial and technical resources:

(a) Promoting the development of a transnational Smart-Grid and technology and of its applications;

(b) Fostering the development of relevant and appropriate power transmission capabilities in interested States;

(c) Facilitating the exchange of expertise and technology among States on a mutually acceptable basis.

6. National and international agencies, research institutions, organisations for development aid, and developed and developing countries alike should consider the appropriate use of international power transmission facilities and the potential of international cooperation for reaching their development goals in a sustainable manner.

7. The International Load Dispatch Centre on the [Peaceful] Use/Operation of International Transmission Facilities should be strengthened in its role,

among others, as an independent specialized technical forum for the exchange of information on national and international activities in the field of international cooperation in power generation, and Use/Operation of Power Transmission Facilities.

8. All States should contribute to the financing of the implementation of International Transmission Expansion programmes and of the establishment and operational costs of the International Load Dispatch Centre for the [Peaceful] Use/Operation of International Transmission Facilities as well as to those of other initiatives in the field of international cooperation in power transmission in accordance with their Industrial-related GDP capabilities and their average power-demand [participation/consumption] in the use of international transmission facilities.

APPENDIX C

MODEL TREATY

between

[*Insert Name Of States*]

ESTABLISHING

a

REGIONAL POWER-TRANSMISSION NETWORK

and on

TRANSNATIONAL POWER TRANSIT[619]

TABLE OF CONTENTS

[619] Some provisions in this model treaty are based on the *Energy Charter Treaty* (*ECT*) *and Energy Charter Protocol on Energy Efficiency and related Environmental Aspects* (*PEEREA*) (Lisbon), opened for signature 17 December 1994, 33 ILM 360 (entered into force 16 April 1998) as well as on Energy Charter Secretariat, *The Energy Charter Treaty and related documents. A legal framework for International Energy Cooperation* (ECT, 2010).

PART II

THE INTERNATIONAL POWER-TRANSMISSION NETWORK

PART III

TRANSNATIONAL POWER TRANSIT

PART IV

TAXATION

PART V

FINAL PROVISIONS

PREAMBLE

The States of [*insert State name*], [*insert State name*] and [*insert State name*], Contracting Parties to this Agreement,

WHEREAS, that the States acknowledge the relevance of soundly based social and economic stability in regions of energy production and transit as well as the importance of international cooperation towards the development of commercially viable international energy transmission networks;

WHEREAS, that the States recognise the value of multilateral rules providing a balanced and efficient framework for international mutually beneficial cooperation in the energy sector.

WHEREAS, that the States acknowledge the importance of open energy markets, access to power transmission facilities as well as security of energy supply;

WHEREAS, the States wish to co-operate in facilitating the transnational power transit through the establishment and implementation of an International Network for the transmission of electricity in and across their Territories;

WHEREAS, the States wish to enter into this Agreement in order to promote and protect investment in the International Power Transmission Network and safeguard the efficient and secure implementation, ownership, and operation thereof within their Territories;

The Contracting Parties hereto HAVE AGREED as follows:

PART I

DEFINITIONS, SCOPE AND INTERPRETATION OF THE TREATY

ARTICLE 1

DEFINITIONS

Capitalised terms used in this Agreement and not otherwise defined herein, shall have the following meaning:

"Area" shall mean, with respect to any State, the land territory of such State, its territorial sea and the air space above each of them, as well as the maritime areas over which such State has jurisdiction or exercises sovereign rights in accordance with International Law.

"Available Capacity" means the total physical operating capacity of the Power Transmission Facilities, less the physical operating capacity:

(a) necessary for the fulfilment of obligations by the owner or operator of the Power Transmission Facilities under any valid and legally binding agreements relating to the transportation of Energy;

(b) necessary for the fulfilment of any other binding obligations pursuant to laws and regulations to the extent those laws and regulations are intended to ensure the supply of Energy within the territory of a Contracting Party; and

(d) necessary for the efficient operation of the Energy Transport Facilities, including any operating margin necessary to ensure the security and reliability of the system.

"Contracting Party" shall mean a State or Regional Economic Integration Organisation which has consented to be bound by this Treaty and for which this is in force.

"Energy Charter Treaty" shall mean the Energy Charter Treaty as opened for signature in Lisbon on 17 December 1994 and in force as of 16 April 1998.

"Environmental Impact" means any effect caused by a given activity on the environment, including human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interactions among these factors; it also includes effects on cultural heritage or socio-economic conditions resulting from alterations to those factors.

“International Power Transmission” shall mean carriage of power [Electricity] from one Contracting Party’s Area to another, including Transit, passing through at least two national boundaries of States or two different International Nodes of States carries out via any technical means and/or legal arrangement whatsoever subjected to this Treaty’s Scope and using the International Power Transmission Network.

"Land Rights" shall mean all those rights of examination, testing, evaluation, analysis, inspection, construction, use, possession, occupancy, control, [ownership], assignment and enjoyment with respect to land in any Territory as are required to carry out the International Power Transmission Network.

“International Load Dispatch Centre (ILDC)” or **“Operator”** shall mean the Person or Persons responsible for carrying out the activities set forth in Article 9 in pursuance of the objectives established in Article 8.

“International Power Transmission Network”, the **“Network”**, or **“IPTN”** shall mean the High Voltage [Alternate/Direct Current] Power Transmission Network created by this instrument and enjoying both international status and independent operation, formed by means of physically interconnecting all Contracting Parties’ [suitable] domestic bulk-power grids and intended to allow unrestrained energy flow throughout Contracting Parties’ Areas as long as Available Capacity does exist. , as described in Appendix […].

“International Interconnection” or **“International Node”** shall mean the point in which at least two different domestic power grids technically compatible converge and get physically interconnected and functional in terms of enabling both injection and taking out of power as well as its transit from the Area of one Contracting Party to another. The Contracting Parties acknowledge these points as the building blocks of the International Power Transmission Network and they are referred to in Annex XX.

"International Transmission Facilities" shall mean the Transmission Facilities being part of the International Power Transmission Network as listed in Annex XX.

"Network Activities" shall mean the activities conducted by the Contracting Parties and/or the International Load Dispatch Centre in connection with the implementation, operation, and expansion of the International Power Transmission Network.

"Project" shall mean the evaluation, development, design, construction, installation, financing, insuring, [ownership], operation, including the Transport by any or all of the network Parties of Power through the International Power Transmission Network, as well as the repair, replacement, refurbishment, maintenance, expansion, and extension (including laterals) of the International Power Transmission Network.

"Project Agreement" shall mean any agreement, contract, licence, concession or other document, other than this Agreement, to which, on the one hand, any State or State Authority or State Entity and, on the other hand, any Project Participant are or later become a party relating to Network Activities, as any such agreement, contract or other document may be extended, renewed, replaced, amended or otherwise modified from time to time in accordance with its terms.

“**States**” shall mean each of the Contracting Parties to this Agreement and any State invoking the rights under paragraph 2 of Article 13 of this Treaty. “**State**” shall mean any of them.

“State Authority” shall mean any organ of a State at any level of authority, which exercises any legislative, executive, judicial or any other state functions, and including, without limitation, all central, regional, municipal, local and judicial organs or any consistent element of such organs having the power to govern, adjudicate, regulate, levy or collect taxes, duties, fines or other charges, grant licences or permits or approvals or otherwise affect the rights and obligations of any Network Party, Project Participants, their successors or permitted assignees, in respect of Project Activities.

“Transmitter” shall mean any Person which has a legal entitlement (whether arising by virtue of any contract or otherwise) to Transport Power through all or any portion of the International Power Transmission Network.

“Transit” shall mean, with respect to any contracting Party or State:

(a) The carriage through the Area of a Contracting Party, or to or from an International Node in its Area for injecting or taking out Power [Energy Materials and Products] originating in the Area of another State and destined for the Area of a third State, so long as the other State or the third State is a Contracting Party; or

(b) The carriage through the Area of a Contracting Party of Power originating in the Area of another Contracting party and destined for the Area of that other Contracting party, unless the two Contracting Parties concerned decide otherwise and record their decision by a joint entry in Annex XX. Such listing may be deleted by delivering joint written notification to the International Dispatch Load Centre.

“Transit Tariffs” means the payments required by the owner or operator of the Energy Transport Facilities for the Transit of Energy Materials and Products.

“Treaty” shall mean this Treaty, including any Appendices attached hereto, as amended, supplemented or otherwise modified from time to time.

ARTICLE 2

INTERPRETATION

1. The division of this Treaty into articles, sections and other portions and the insertion of headings are for convenience of reference only and shall not affect the construction or interpretation hereof.

2. Unless otherwise indicated, all references to an "Article" or "Section" followed by a number or a letter refer to the specified Article or Section of this Agreement.

3. No provision of this Treaty should be construed to constitute a precedent in the context of international economic activities other than those pertaining to its specific scope.

4. Nothing in this Treaty shall derogate from a contracting Party's rights and obligations under International Law.

ARTICLE 3

SCOPE

1. Unless otherwise provided for in this Treaty, it shall apply to power in transit through the International Power Transmission Network, and the Power Transmission Facilities in the territory of a Contracting Party used for such Transit.

2. The provisions of this Treaty relating to access to Available Capacity shall apply for Transit purposes only.

3. This Treaty shall apply only to activities conducted through or by means of the International Power Transmission Network. The following are illustrative of activities falling thereinto:

(i) International or Transnational Interconnection of Power Transmission Facilities;
(ii) construction and operation of International Power Transmission Facilities, whether those suited for conveying power generated by conventional or renewable energy technologies;
(iii) design, implementation and operation of power transmission devices aimed at increasing the total physical operating capacity of International Power Transmission Facilities;

(iv) construction, expansion, extension, reconstruction, and/or upgrading of International Power Transmission Facilities;

(v) Load-Balancing between interconnected Power Transmission Facilities

(vi) Transit, as defined in Article 1

ARTICLE 4

NO CONFLICT WITH THIS AGREEMENT

1. Each Contracting Party confirms and warrants that it is not a party to any domestic or international agreement or commitment, or bound to observe or enforce any domestic or international law, regulation, or agreement that conflicts with, violates, impairs, interferes with, limits, abridges or adversely affects the ability of such Contracting Party to implement this Treaty or to enter into or implement the International Power Transmission Network.

2. No State shall enact, amend, make, change or enter into any incompatible law, regulation or agreement subsequently to the signature of this Agreement.

ARTICLE 5

OBJECTIVES

The objectives of this Treaty are:

1. To establish an International Power Transmission Network, as a means of advancing security of energy supply, economic growth, and sustainable development to each and all the Contracting Parties;

2. To facilitate International Interconnections of present and future Power Transmission Facilities used for International Power Transmission;

3. To establish an international framework of rules to secure long-term, reliable, efficient, and uninterrupted Power Transit for the benefit of all Contracting Parties concerned;

4. To facilitate the construction, configuration, redirection, expansion, reconstruction, and efficient operation of Power Transmission Facilities being part of the International Power Transmission Network and used for power transit;

5. To minimise harmful Environmental Impacts of the International Power Transmission Network whether derived from its construction or operation;

6. To promote the prompt and effective settlement of disputes relating to International Power Transmission and those concerning the interpretation or application of the Treaty;

7. To develop a set of commonly accepted operative principles for the International Power Transmission Network dealing with unrestrained transit flow of energy resources and online information system on Available Capacity;

8. To facilitate International Energy Agreements among the Contracting Parties.

PART II

THE INTERNATIONAL POWER TRANSMISSION NETWORK

ARTICLE 6

ESTABLISHMENT

1. The Contracting Parties hereby create an International Organization to be known as the International Power Transmission Network or IPTN.

2. The States shall co-operate in order to establish and maintain necessary and favourable conditions for the implementation and operation of the International Power Transmission Network.

3. Each State undertakes to meet in good faith at all reasonable times and as often as reasonably required for the purposes of negotiating and entering into such other multilateral or bilateral agreements as may be appropriate between and among the States, or with any other states, international institutions and authorities, in order to authorise, enable and support the implementation of the International Power Transmission Network.

ARTICLE 7

OBJECTIVES

1. To implement International Interconnections of present and future Power Transmission Facilities used for International Power Transmission;
2. To conduct International Power Transmission through the International Load Dispatch Centre (ILDC);
3. To supervise and enforce unrestrained Transit for the benefit and interest of all Contracting Parties and States concerned;
4. To carry out Network activities or Projects or Project Agreements within the scope set forth in Article 3;
5. To accomplish the objectives of this Treaty, its protocols, annexes, and complementary instruments as well as to carry out any activity set pertaining thereto; and
6. To ensure that State Authorities or State Entities take all actions necessary for the implementation and execution of the Treaty, Annexes, and complementary instruments.

ARTICLE 8

INTERNATIONAL LOAD DISPATCH CENTRE - OPERATOR

1. There shall be an International Load Dispatch Centre (ILDC). This is the Person or Persons responsible for implementing, operating, managing, coordinating and/or conducting for or on behalf of the Contracting Parties all or any portion of the day-to-day activities of the International Power Transmission Network, whether as an agent for or

Contractor to the Contracting Parties or otherwise, and any successor or permitted assignee of any such Person.

2. The nominated subrogate Operator shall take charge of office in case of lack, absence, or incapacity of the Operator.

3. The Operator, or the subrogate Operator in case, must be independent and carry out his duties and Network Activities on a strict technical basis for the benefit and interest of all Contracting Parties.

4. The main tasks of the ILDC are power load-balancing and keeping the IPTN's stability and reliability within acceptable parameters of service quality and cost-efficiency.

PART III

TRANSNATIONAL POWER TRANSIT

ARTICLE 9

PRINCIPLES

The principles guiding this Treaty and to which all Contracting Parties and/or States must abide by are:

1. Complete and transparent online information-sharing about Available Capacity in current and future interconnected Power Transmission Facilities.

2. Transparent access to and use of Available Capacity in current interconnected Power Transmission Facilities and the International Power Transmission Network.

3. Non-discriminatory access to and use of Available Capacity in present and future interconnected Power Transmission Facilities.

4. Unrestrained energy flow through the International Power Transmission Network.

5. Prohibition of unauthorised taking or interruption of Energy in Transit.

6. Duly and timely fulfilment of Dedicated Transit Agreements.

7. Protection of the Environment.

8. Promotion of international interconnections.

9. Objective, transparent and non-discriminatory domestic authorisation procedures.

10. Agreement on and use of harmonised international technical standards.

11. Use of appropriate, accurate, and secure power-metering and measuring equipment.

12. Equitable Cost Sharing. The capital costs of setting-up International Power Transmission Facilities shall be met by the Contracting Parties and assessed according to their capacity to pay, Areas involved, Generation

Capacity, and Available Capacity determined as specified in Annex XX, the provisions of which may be amended in accordance with Article XX. In turn, fixed operational costs of the International Power Transmission Network shall be regarded as costs of all Contracting Parties, thus be borne by all of them equally. In turn, variable operational costs arising from the use of the International Power Transmission Network shall be funded through Transit Tariff.

ARTICLE 10

NON-INTERRUPTION OF TRANSIT

1. Each Contracting Party shall allow International Power Transmission to occur in its corresponding Area.

2. Each Contracting Party shall secure non-discriminatory access to and use of Available Capacity in the International Power Transmission Network facilities situated in its Area.

3. Each Contracting Party shall guarantee uninterrupted Power Transit in its Area, regardless of power origin, destination, or ownership.

4. Whilst in its Area, each Contracting Party shall not discriminate against power in transit as to the treatment given to the power generated and/or transmitted domestically.

5. Unless otherwise agreed on by all Contracting Parties concerned, it is prohibited to any Contracting Party and/or Entity subject thereto to take -

either for itself or on behalf of any other Contracting or Third Party - Energy in Transit.

6. No Transit Agreement concluded prior to the entry into force of this Treaty shall be challenged as being in violation of any provision of the Treaty.

7. Each Contracting Party shall ensure that its national law provides effective and non-discriminatory means for the assertion of claims and the enforcement of rights with respect to Transit.

8. If any event occurs or any situation arises upon which there are reasonable grounds to believe threatens to interrupt, curtail or otherwise impede Power Transmission or unrestrained Transit , the Contracting Party in, or in respect of whose Area, the relevant threat, event or situation might or has arisen, shall immediately give notice to the International Load Dispatch Centre and use all lawful and reasonable endeavours to eliminate the threat or to settle the situation; securing or restoring Transmission Capacity as soon as possible.

9. In the event of any threat or interruption event, the International Load Dispatch Centre shall be entitled to request updates of the situation, as well as to recommend measures destined to control the situation, restore Transmission Capacity, and secure the standards of stability and reliability of the International Power Transmission Network, either in whole or in part or of any of its constituents elements or Transmission Power Facilities. However, following the International Load Dispatch Centre's recommendations to settle these events shall not in any case discharge Contracting Party's international liability when this had not fully disclosed

to the International Load Dispatch Centre all information available on a timely manner.

10. No State shall interrupt, curtail, delay or otherwise impede Project Activities, Transit, and International Load Dispatch Centre's operations in its Territory.

11. Where there are reasonable grounds to believe that the continuation of operation in an Area creates or would create an unreasonable danger or hazard to public health and safety, property or unacceptable Environment Impact, the International Load Dispatch Centre may interrupt the transmission but only to the extent and for the length of time necessary to remove such danger or hazard.

ARTICLE 11

COMMON ENERGY POLICY AND ENERGY EFFICIENCY

1. The Contracting Parties shall endeavour to harmonize/synchronize their energy matrices on a continuing basis, formulate clear common policy aims for increasing Transmission Capacity, improving energy efficiency, and reducing negative environmental impact whether in setting-up or in operating the International Power Transmission Network.

2. The Contracting Parties shall regularly entertain policy discussions based on analysis and exchange of information and the experiences between them, the analysis of independent experts invited to present before

them and through seeking technical advice of specialised international organisations.

3. The emphasis shall be on practical implementation of a political commitment to harmonize/synchronize energy matrices, improve energy efficiency paying particular attention to cost reductions, renewable sources of energy integration, taxation, pricing policy in the energy sector, environmentally-related subsidies and other mechanisms for financing common energy efficiency objectives.

4. To such purpose, a Working Group on Common Policy, Energy Efficiency, and Related Environmental Aspects shall be created for the discussion of all matters related thereto.

5. In pursuit of sustainable development and taking into account its obligations under international agreements concerning the environment to which it is party, each Contracting Party shall strive to minimize in an economically efficient manner harmful Environmental Impacts occurring either within or outside its Area from all operations concerning the International Power Transmission Network in its Area, taking proper account of safety. In its policies and actions each Contracting Party shall strive to take precautionary measures to prevent or minimize environmental degradation in a cost-effective manner.

6. The Contracting Parties agree that the polluter in the Areas of Contracting Parties, should, in principle, bear the cost of pollution, including transboundary pollution, with due regard to the public interest and without distorting international trade.

7. At the request of one or more Contracting Parties, disputes concerning the application or interpretation of provisions of this Article shall, to the extent that arrangements for the consideration of such disputes do not exist in other appropriate international fora, be summarily reviewed by the Working Group aiming at a solution.

ARTICLE 12

NON-DISCRIMINATORY TREATMENT

1. With respect to tariffs for power transit and electricity charges of any kind imposed on or in connection with international interconnections; power imports or exports; or imposed on the international transfer of payments for imports, exports and/or tariffs and with respect to the method of levying such tariffs and charges, and with respect to all rules and formalities in connection with import and export of power and/or international interconnection of transmission facilities, and with respect to all matters referred to in Article XX, any advantage, favour, privilege or immunity granted by any Contracting Party to power originating in or destined for any other country shall be accorded immediately and unconditionally to power originating in or destined for the Areas of all other Contracting Parties.

2. The advantages, favours, privileges or immunities granted by paragraph 1 can be invoked by Third Parties within a comprehensive international legal framework on energy trade, such as the Energy Charter Treaty, as to the extent that the such Third Party and at least the two Contracting Parties according non-discriminatory treatment to each other pursuant paragraph 1 were also part of the said general legal framework. In this case, the

invocation of equal treatment under this Treaty shall amount to accede thereto and, therefore, to abide thereby as if a Contracting Party.

ARTICLE 13

OBLIGATIONS

1. Contracting Parties shall interconnect with each other their existing bulk power grids. Such international interconnections shall be effectuated taking particularly into account the principles set forth in Article 9.

2. Investment capital costs required for interconnecting grids situated in non neighbouring Areas shall be equally distributed between all Contracting parties. Same costs required for identical purpose between neighbouring grids should, in principle, be equally distributed between the Contracting Parties whose power grids are directly concerned. In the particular case set forth in paragraph 2 of Article 12, these costs shall be allocated to the Third Party claiming fair treatment irrespective of grid interconnection taking place between neighbouring Areas or not. Start-up costs of newly built interconnected Power Transmission Facilities shall be equally distributed between all Contracting parties.

3. In turn, once the International Power Transmission Network is in operation, operating costs shall be shared proportionately by all Contracting Parties.

4. Contracting Parties shall undertake the construction, expansion, extension, re-construction, and maintenance of the Power Transmission Facilities needed to configure the International Power Transmission

Network. Contracting Parties shall facilitate domestic legal or administrative authorisation for this purpose.

5. In carrying out the aforementioned obligation, Contracting Parties are also obliged to minimise, in a cost-effective fashion, harmful Environmental Impact.

6. When a Contracting Party or its Entity applies for permission to construct, expand, extend, reconstruct Power Transmission Facilities of the International Power Transmission Network in the territory of another Contracting Party, this latter shall reply in writing within a reasonable time and shall ensure that its decision is fair, transparent, based on objective considerations, and does not discriminate on grounds of ownership, origin or destination of the Energy.

7. Each Contracting Party is responsible for keeping the International Load Dispatch Centre fully informed - on an ongoing online basis - on the Available Capacity of the International Transmission Facilities in its corresponding Area.

8. Each Contracting Party shall work to alleviate market distortions and barriers to competition in the domestic Energy Sector.

9. Each State undertakes to fulfil and perform each of its obligations under this Treaty and those deriving from it.

10. Each State shall fully support the implementation of the International Power Transmission Network and the execution of the Networks Activities contemplated by this Treaty, Annexes, and complementary instruments;

and shall ensure that its State Authorities take all actions necessary for such implementation and execution.

11. The Contracting Parties shall nominate the Operator. They shall also nominate a subrogate Operator in all times.

12. Each Contracting Party shall ensure that owners or operators of interconnected Energy Transmission Facilities under its jurisdiction will keep a share of their Transport Capacity dedicated to Networks Operations requesting access to and use of such Transport Capacity.

ARTICLE 14

TITLE TO ELECTRICITY IN THE INTERNATIONAL POWER TRANSMISSION NETWORK

1. The Contracting Parties acknowledge State sovereignty and sovereign rights over national energy resources. They confirm that such rights must be exercised in accord and subject to the rules of International Law.

2. Without affecting the furtherance of access to energy resources, its exploration and development, this Treaty shall in no way affect the Contracting Parties' own regime of property ownership of energy resources.

3. The Contracting Parties acknowledge ownership and original property rights to each Contracting Party in respect of national power energy.

Although, once measured and injected into the International Power Transmission Network, the Contracting Parties reaffirm that such property rights must be exercised in accordance with and subject to the provisions set forth in this Treaty.

4. The Contracting Parties recognise that, save for proportional and technically determined Transmission Losses and once paid or payable Transit Tariffs, quantifiable power energy injections into the International Power Transmission Network in the Area of one Contracting Party give each Contracting Party right to take out from the transmission network an equivalent quantity of energy [of the same type] in the Area of any other Contracting Party.

5. Each Contracting Party shall ensure that its domestic laws provide effective and non-discriminatory means for the assertion of claims and the enforcement of rights with respect to International Power Transmission by other Contracting Parties.

6. No Contracting Party shall impose any requirement with respect to title to or ownership of power in the International Power Transmission Network or any part thereof, other than those set forth by the International Load Dispatch Centre.

PART IV

TAXATION

ARTICLE 15

TARIFFS AND NON - DISCRIMINATION

1. The International Load Dispatch Centre shall ensure that the tariff treatment of Transit through the International Power Transmission Network with respect to any Area or Contracting Party will be no less favourable than that applicable to other Areas and/or Contracting Parties under similar circumstances.

2. Each Contracting Party shall ensure that there will be no taxes whether on imports or exports of power channelled through [Available Capacity of] the International Power Transmission Network. No customs duties or other levies shall be imposed or withheld with respect to Power Transmission Network Activities.

PART V

FINAL PROVISIONS

ARTICLE 16

SIGNATURE

This Treaty shall be open for signature at Melbourne, Australia from 15th February, 2013 to 7th December, 2013 by the States and/or Regional Economic Integration Organisations willing to be part of it.

ARTICLE 17

RATIFICATION, ACCEPTANCE OR APPROVAL

This Treaty shall be subject to ratification, acceptance or approval by signatories, but for the case stated on paragraph 2 of Article 12. Instruments of ratification, acceptance or approval shall be deposited with the Secretary General of the Organisations of the United Nations.

ARTICLE 18

ACCESSION

This Treaty shall be opened for accession from the date on which it is closed for signature, by States and Regional Economic Integration

Organisations, on technical and economic terms to be assessed and approved by the International Load Dispatch Centre. The instruments of accession shall be deposited with both the Secretary General of the Organisations of the United Nations and the International Load Dispatch Centre. In case of paragraph 2 of Article 12 same formalities shall be applicable.

ARTICLE 19

AMENDMENTS

1. Any Contracting Party may propose amendments to this Treaty.

2. Proposed amendments shall be directed to the International Load Dispatch Centre, which shall communicate them to all Contracting Parties for ratification, acceptance or approval. The International Load Dispatch centre might also communicate these proposals to other States potentially concerned.

3. Instruments of ratification, acceptance or approval of amendments to this Treaty shall be deposited with the International Load Dispatch Centre, which shall communicate them to the Secretary General of the Organisations of the United Nations.

ARTICLE 20

ENTRY INTO FORCE

1. The rights and obligations under this Agreement shall enter into force upon the exchange of instruments of ratification by all the States save in respect of Article 3 which shall come into force upon the signing of this Treaty by each of the States.

2. Within 90 days each State shall submit this Agreement for ratification by its relevant duly authorised organ of government.

3. Amendments to this Treaty shall enter into force between Contracting Parties having ratified, accepted or approved them on the thirtieth day after deposit of the corresponding instruments according with Article 36 by at least three-fourths of the Contracting Parties. Thereafter, the amendments shall enter into force for any other Contracting Party on the thirtieth day after that Contracting Party deposits its instrument of ratification, acceptance or approval of the amendments.

4. In case of paragraph 2 of Article 12 being applicable, the rights and obligations under this Agreement shall enter into force between Contracting Parties and States on the thirtieth day of the technical and economic approval of the International Load Dispatch Centre.

ARTICLE 21

RESERVATIONS

No reservation may be made to this Treaty

ARTICLE 22

AUTHENTIC TEXTS

In witness whereof the undersigned, being duly authorized to that effect, have signed this Treaty in Spanish and English, of which every text is equally authentic, in one original, which will be deposited with the Government of the Republic of Chile.

Done at Melbourne on the first day of March in the year two thousand and fourteen.