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NOMENCLATURE

GLOSSARY

ToP	Take-or-Pay
Take-or-Pay Generator	Generator with LNG supply with Take-or-Pay contracts
M$	Million US Dollar
mmBtu	Million British Thermal Units
SIC	Sistema Interconectado Central (Central Interconnected System)
SING	Sistema Interconectado del Norte Grande (Great North Interconnected System)

SETS	
Ω_G	Set of Generators
$\Omega_{G(gnl)}$	Set of Generators with LNG supply
$\Omega_{G(n)}$	Set of Generators connected to the electrical node n
Ω_{ToP}	Set of Take-or-Pay Contracts
$\Omega_{ToP(gt)}$	Set of Take-or-Pay Contracts with delivery point in the Gas Tank gt
Ω_{Spot}	Set of Spot Contracts
Ω_{Tank}	Set of Gas Tanks (regasification terminal)
Ω_N	Set of Gas Nodes
Ω_{GC}	Set of Gas Connections (Pipelines)
$\Omega_{GC(gt)}$	Set of Gas Connections with initial node in Gas Tank gt
$\Omega_{GC(n^+)}$	Set of Gas Connections with initial node in Gas Node n
$\Omega_{GC(n^-)}$	Set of Gas Connections with terminal node in Gas Node n
$\Omega_{GC(g)}$	Set of Gas Connections with terminal node in Generator g
Ω_S	Set of Scenarios (Hydrological)
Ω_T	Set of Stages (Time period)
$\Omega_{B(t)}$	Set of Blocks of Stage t
Ω_D	Set of Dams
Ω_L	Set of Transmission Lines
Ω_N	Set of Electrical Nodes
$\Omega_{L(n^+)}$	Set of Transmission Lines with initial node in Electrical Node n
$\Omega_{L(n^-)}$	Set of Transmission Lines with terminal node in Electrical Node n
$\Omega_{HC(g/d^+)}$	Set of Hydro Connections that end at Hydro generator g or Dam d
$\Omega_{HC(g/d^-)}$	Set of Hydro Connections that start at Hydro generator g or Dam d

ELEMENTS	
g	Generator
c	Gas Contract (Take-or-Pay or Spot)
gt	Gas Tank
n	Gas Node
gc	Gas Connection
s	Scenario
t	Stage
b	Block
n	Electrical Node
l	Transmission line
$n^+(l)$	Initial node of line l
$n^-(l)$	Terminal node of line l
d	Dam
hc	Hydro connection
$hc^+(g/d)$	Hydro connection with ending point at generator g or dam d
$hc^-(g/d)$	Hydro connection with starting point at generator g or dam d

PARAMETERS	
h_g	Heat Rate of Generator g [m^3/MWh]
$pmax_g$	Max Power of Generator g [MW]
β_g	Variable Cost of Generator g [US$/MW]
γ_c^{ToP}	Price of Take-or-Pay Contract c [US$/m^3]
β_c^{ToP}	Equivalent price of Take-or-Pay Contract c [US$/MWh]
γ_c^{Spot}	Price of Spot Contract c [US$/m^3]
β_c^{Spot}	Equivalent Price of Spot Contract c [US$/MWh]
$vmin_{gt/d}$	Minimum Volume of Gas Tank gt or Dam d
$vmax_{gt/d}$	Maximum Volume of Gas Tank gt or Dam d
$vini_{gt/d}$	Initial Volume of Gas Tank gt or Dam d
$vfin_{gt/d}$	Final Volume of Gas Tank gt or Dam d
Y_c	Minimum Volume fraction of Take-or-Pay Contract c [0 to 1]
X_c	Penalization fraction of Take-or-Pay Contract c [0 to 1]
ρ_s	Probability of Scenario s
Δ_t	Duration of Stage (time period) t [h]
$\Delta_{t,b}$	Duration of Block b, of Stage t [h]
E_c	Contracted Energy [MWh]
α	C-VaR confidence level [0 to 1]
ω	Risk Aversion of System Operator [0 a 1]
r_l	Resistance of Transmission Line l [Ohm]
x_l	Reactance of Transmission Line l [Ohm]
$pfmax_l$	Maximum transfer capacity of Transmission Line l [MW]
$Dem_{n,s,t,b}$	Load at node n [MW]
$Af_{hc,s,t,b}$	Affluent of hydro connection hc, at Scenario s, Stage t, Block b [m^3/s]
η_g	Efficiency of Hydro generator g [MW/(m^3/s)]
$K_d, K1_d$	Polinomial factors for filtrated flow approximation of dam d [m^3/s], [1/s]

η_g	Efficiency of Hydro generator g [MW/(m^3/s)]
VARIABLES	
$P_{g,s,t,b}$	Generated Power by Generator g, at Scenario s, Stage t, Block b [MW]
V_c^{ToP}	LNG Contracted Volume with Take-or-Pay Contract c [m^3]
$V_{c,s,t}^{Spot}$	LNG Contracted Volume at Spot Market c, at Scenario s, Stage t [m^3]
$D_{c,s,t}$	LNG Delivered Volume of Take-or-Pay Contract c, at Scenario s, Stage t [m^3]
$V_{gt,s,t,b}$	Volume of Gas Tank gt at Scenario s, Stage t, Block b [m^3]
$F_{gc,t,b,s}$	Gas Flow through Gas Connection gc, at Scenario s, Stage t, Block b [m^3/h]
V^+	Auxiliary variable for Minimum Volume Take-or-Pay Contract formulation
C_s	System cost (operational + LNG supply) at Scenario s
VaR	Auxiliary Variable (Value at Risk) for C-VaR formulation
$CVaR$	Auxiliary Variable (C-VaR) for C-VaR formulation
Z_s	Auxiliary Variable (associated to Scenario s) for C-VaR formulation
$pf_{l,s,t,b}$	Power flow through Transmission Line l [MW]
$Loss_{l,s,t,b}$	Transmission Losses in Transmission Line l [MW]
$\theta_{n,s,t,b}$	Angle of electrical node n [rad]
$QT_{hc^-(g),s,t,b}$	Turbined flow at generator g [m^3/s]
$QS_{hc^-(g),s,t,b}$	Spilled flow at generator g [m^3/s]
$QR_{hc^-(d),s,t,b}$	Released flow of dam d [m^3/s]
$QF_{hc^-(d),s,t,b}$	Filtrated flow of dam d [m^3/s]
$QOvf_{hc^-(d),s,t,b}$	Overflow of dam d [m^3/s]
$QE_{hc,s,tb}$	Extracted flow of dam d [m^3/s]
$Vol_{d,s,t}$	Stored volume at dam d [m^3]