

LOS EXPERTOS EN MERCADOS



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COLOMBIA'S FIRM ENERGY OBLIGATION AUCTIONS

Gerencia Operaciones Financieras

World Bank – Lima, Perú – October 29th, 2008



2018-2019

Firm Energy
65,804 GWh/y



90,419 GWh/y

Installed Capacity
13,251 MW



17,501 MW

Investments



USD 6 billion

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Bid excess in energy auction

The energy auction moves \$ 800 million
The energy auction has three winners

Six Hydro Plants will be built in Colombia
2009 energy auction: a task in the agenda

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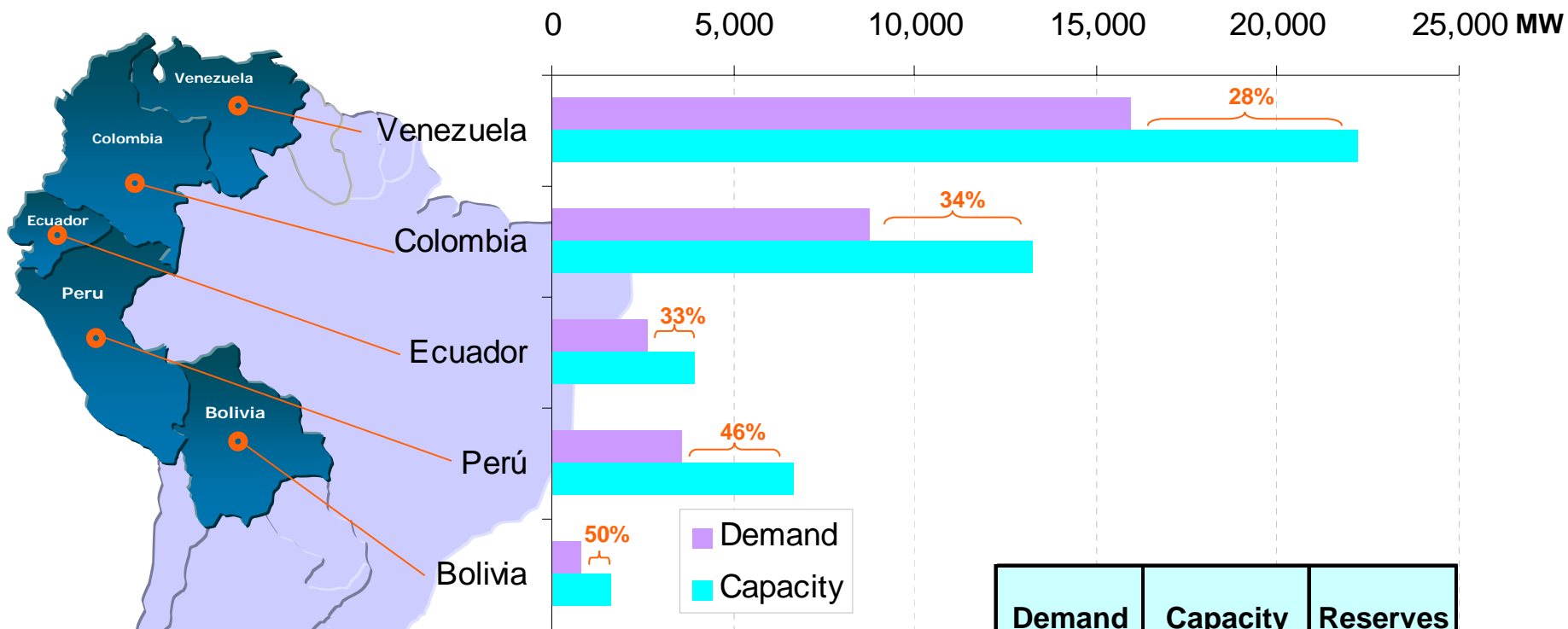


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Colombian Power Market Overview

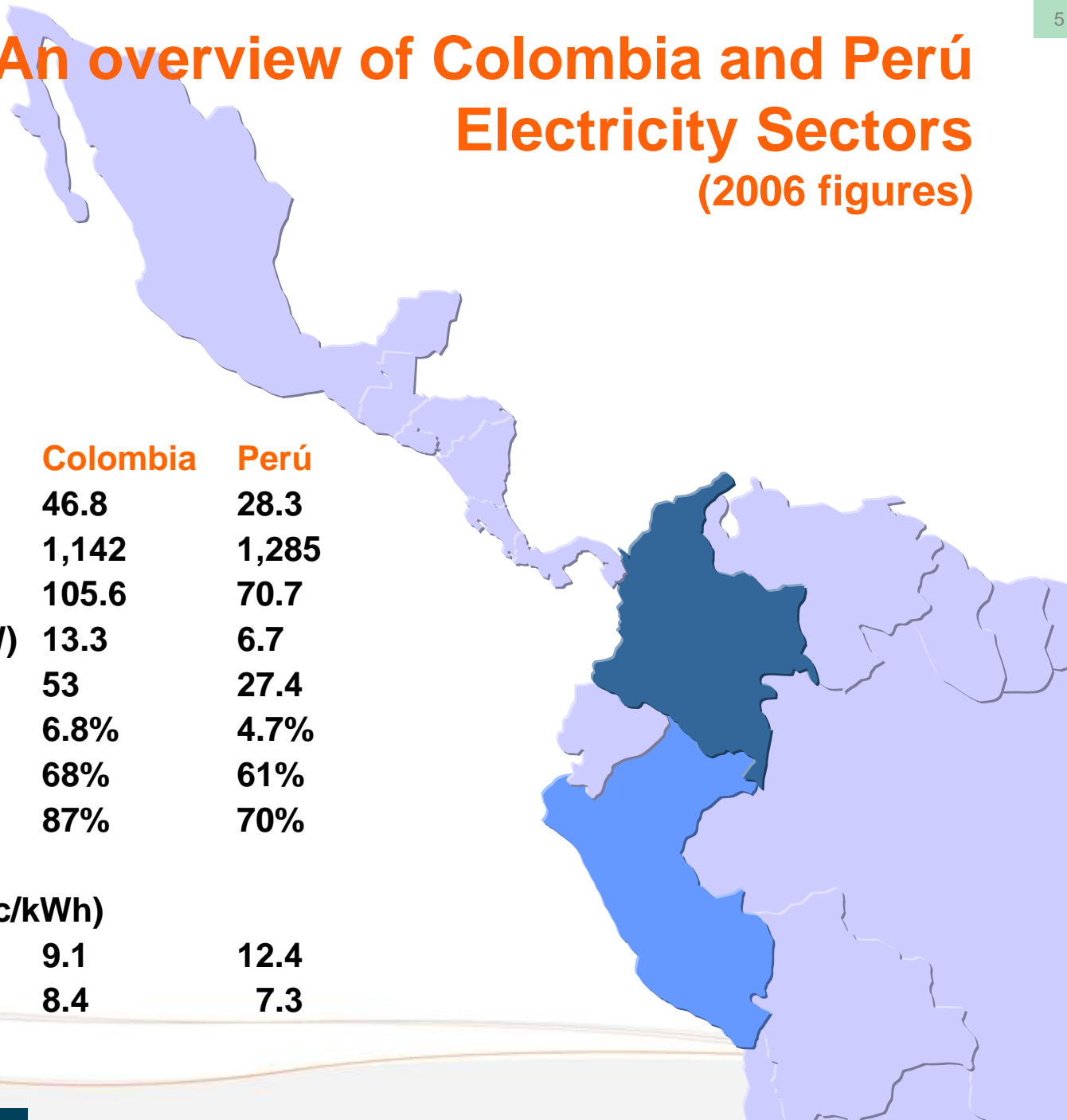
South American Power Systems Venezuela and the Andean Community of Nations (CAN)

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	Demand MW	Capacity MW	Reserves %
Venezuela	15,945	22,216	28%
Colombia	8,762	13,277	34%
Ecuador	2,653	3,956	33%
Perú	3,580	6,659	46%
Bolivia	822	1,645	50%
Total	31,762	47,753	33%

An overview of Colombia and Perú Electricity Sectors (2006 figures)



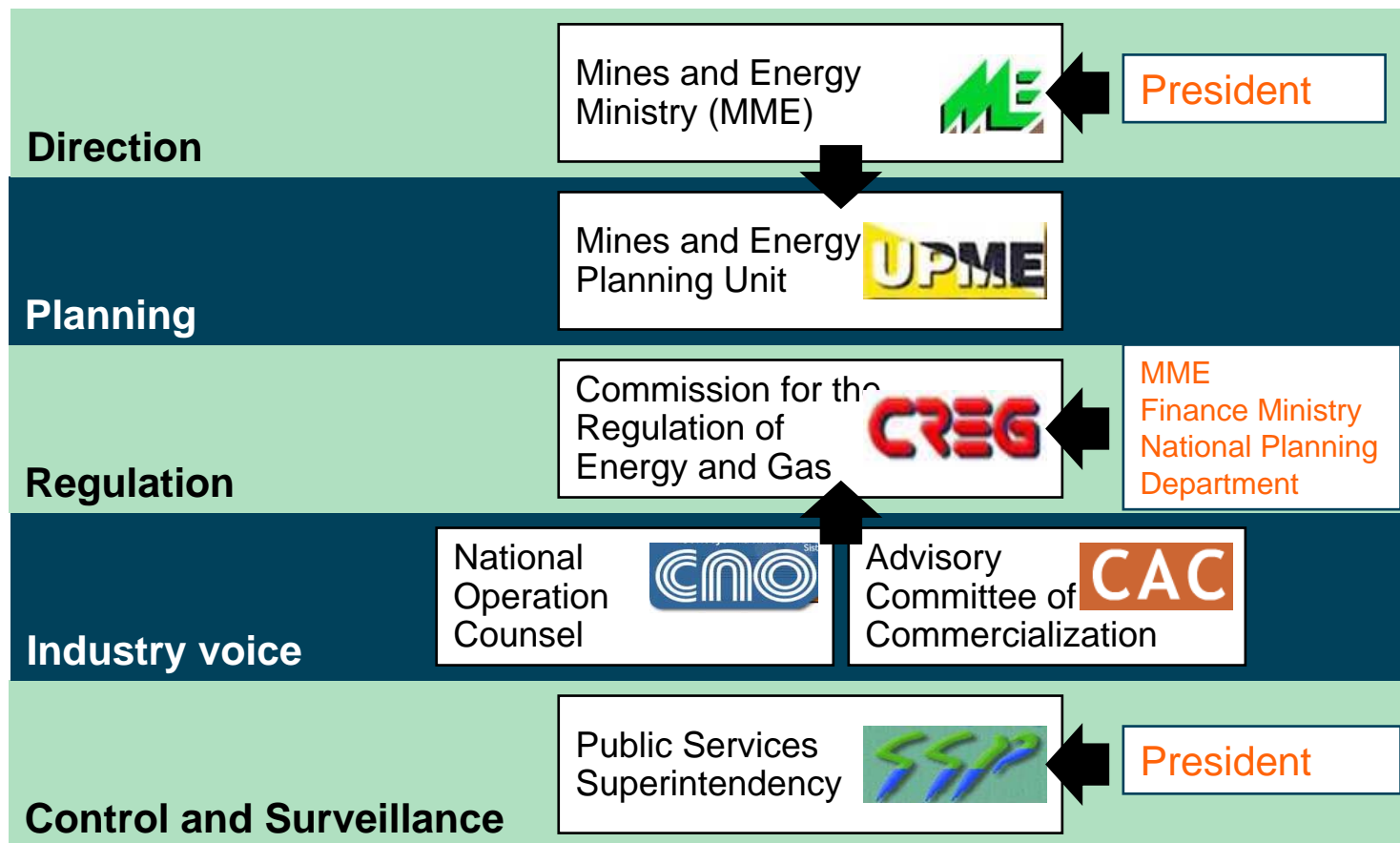
A map of South America with Colombia and Peru highlighted in dark blue. Colombia is on the left, and Peru is on the right. The rest of the continent is shown in light blue.

	Colombia	Perú
Population (million)	46.8	28.3
Area (thousand km2)	1,142	1,285
GDP (USD billion)	105.6	70.7
Installed Capacity (GW)	13.3	6.7
Yearly Demand (TWh)	53	27.4
GDP growth	6.8%	4.7%
Hidroelectric share	68%	61%
Coverage	87%	70%
End User Tariffs (USDc/kWh)		
• Residential	9.1	12.4
• Industrial	8.4	7.3

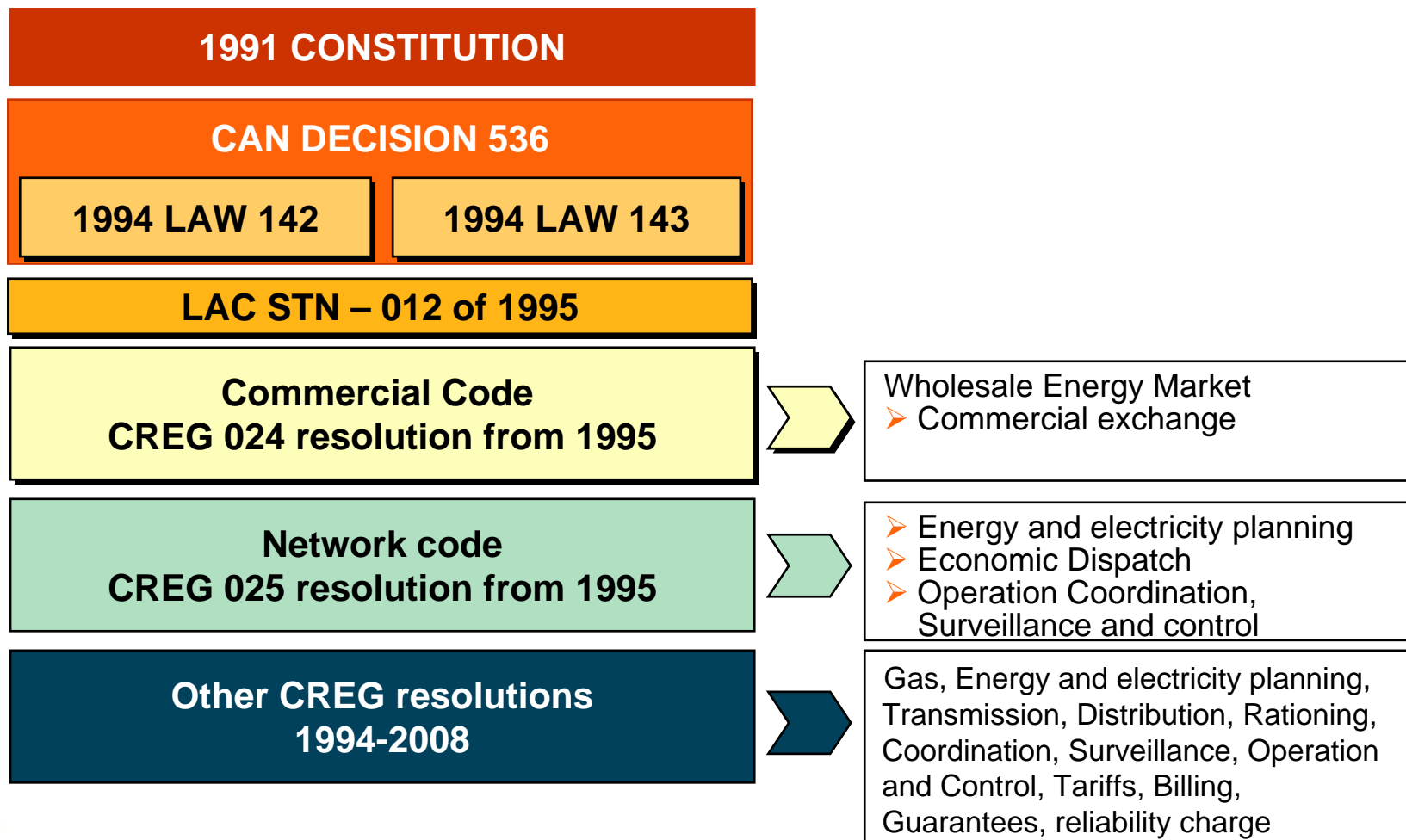
Basic Objectives of the 1994 Electricity Sector Reform

BASIC OBJECTIVES	
<p style="text-align: center;">July 1994</p> <ul style="list-style-type: none"> ➤ Law 142 Public Services ➤ Law 143 Electricity 	<p style="text-align: center;">Change the role of the state</p>
	<p style="text-align: center;">Enhance Efficiency</p>
	<p style="text-align: center;">Create Competition</p>
	<p style="text-align: center;">Private investment</p>
	<ul style="list-style-type: none"> ➤ Direction ➤ Regulation ➤ Control and surveillance
	<ul style="list-style-type: none"> ➤ Competitive tariffs ➤ Reliability ➤ Quality ➤ Coverage

Institutional framework

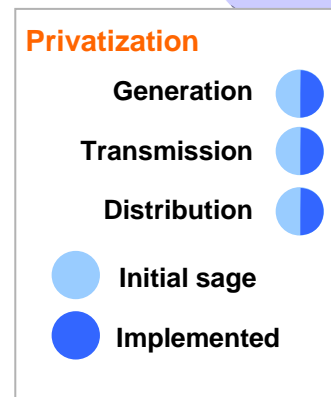
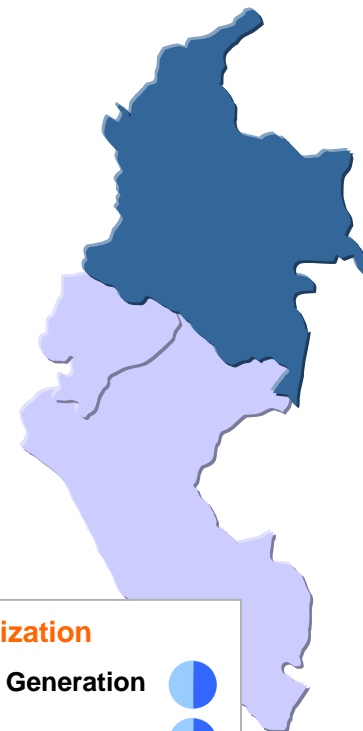


Legal and Regulation Framework

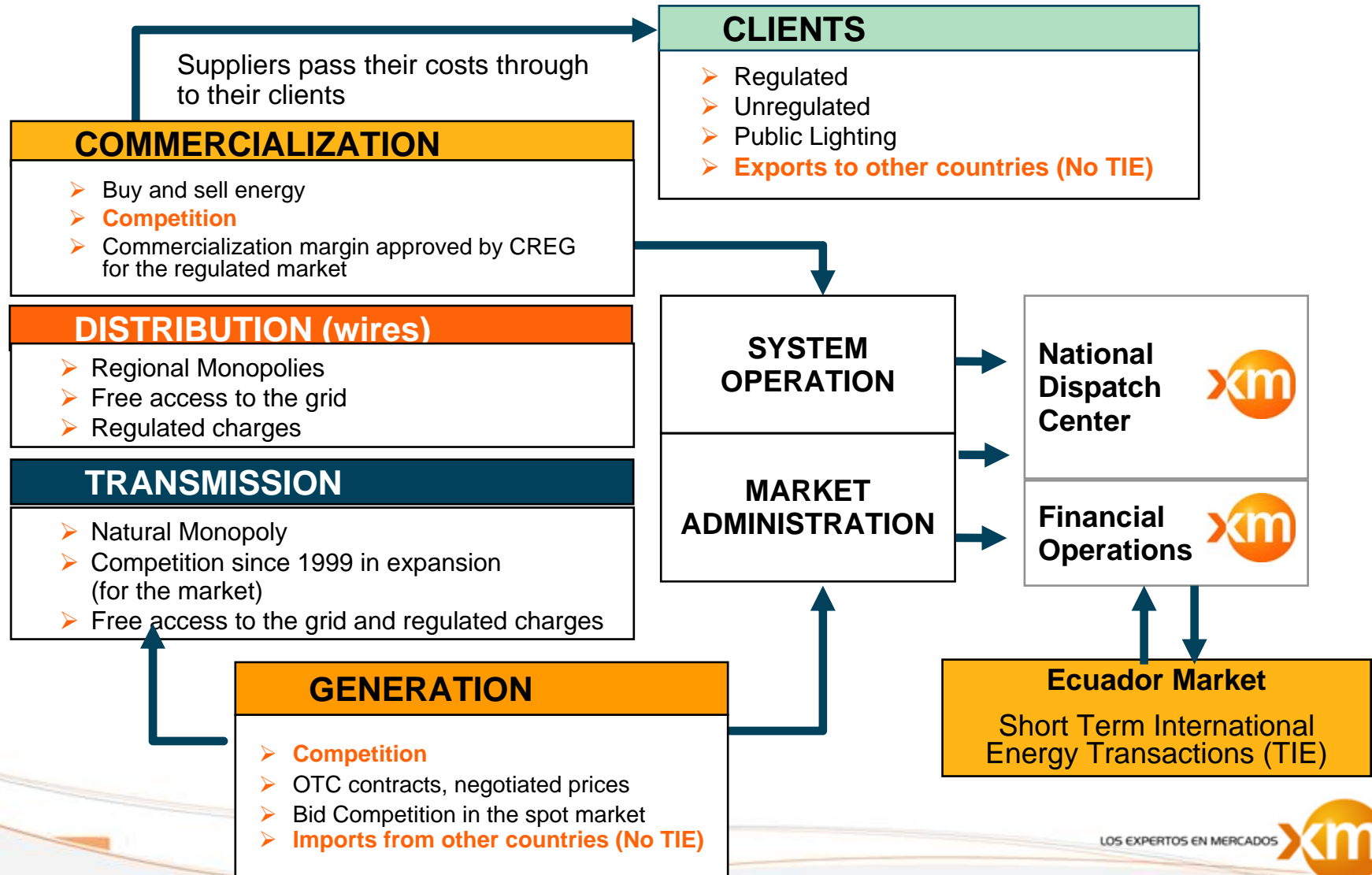


An overview of Colombia's Wholesale Electricity Market

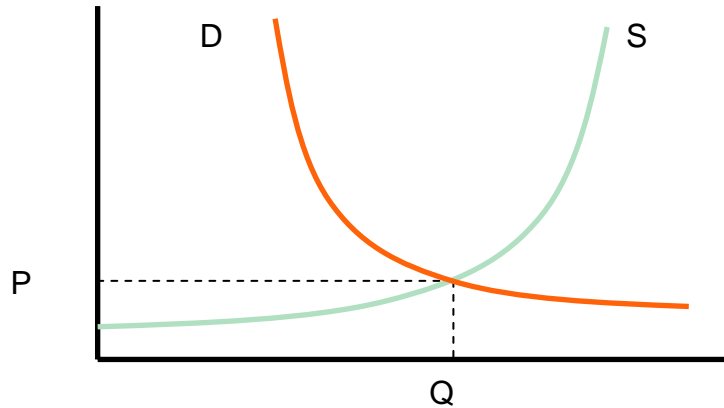
- Fully operational Wholesale Market with **Gross Pool** since 1995 resembling that of England and Wales (pre-reform), with **price bids** by generators in an uninodal spot market and **financial OTC contracts** to hedge price risk.
- Vertical disintegration since 1994. However, utilities created before 1994 are only required to keep separate accounting, and limitations on concentration have been established.
- Open Access and Price Cap for Distribution and Transmission (auctions for new investments).
- Retail competition accounts for 32% of the market.
- Replacing 1996-2006 Capacity Charge, **Firm Energy Obligation Auctions** should ensure supply in the middle and long term, allowing investors to finance fixed costs.



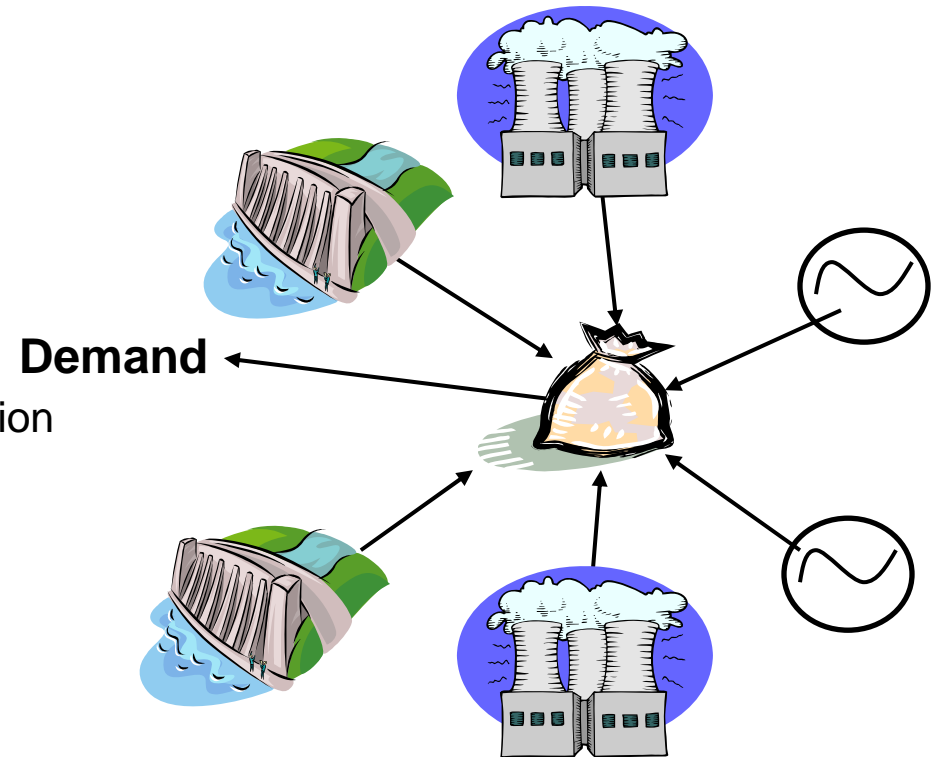
Market Organization



The Daily Spot Market

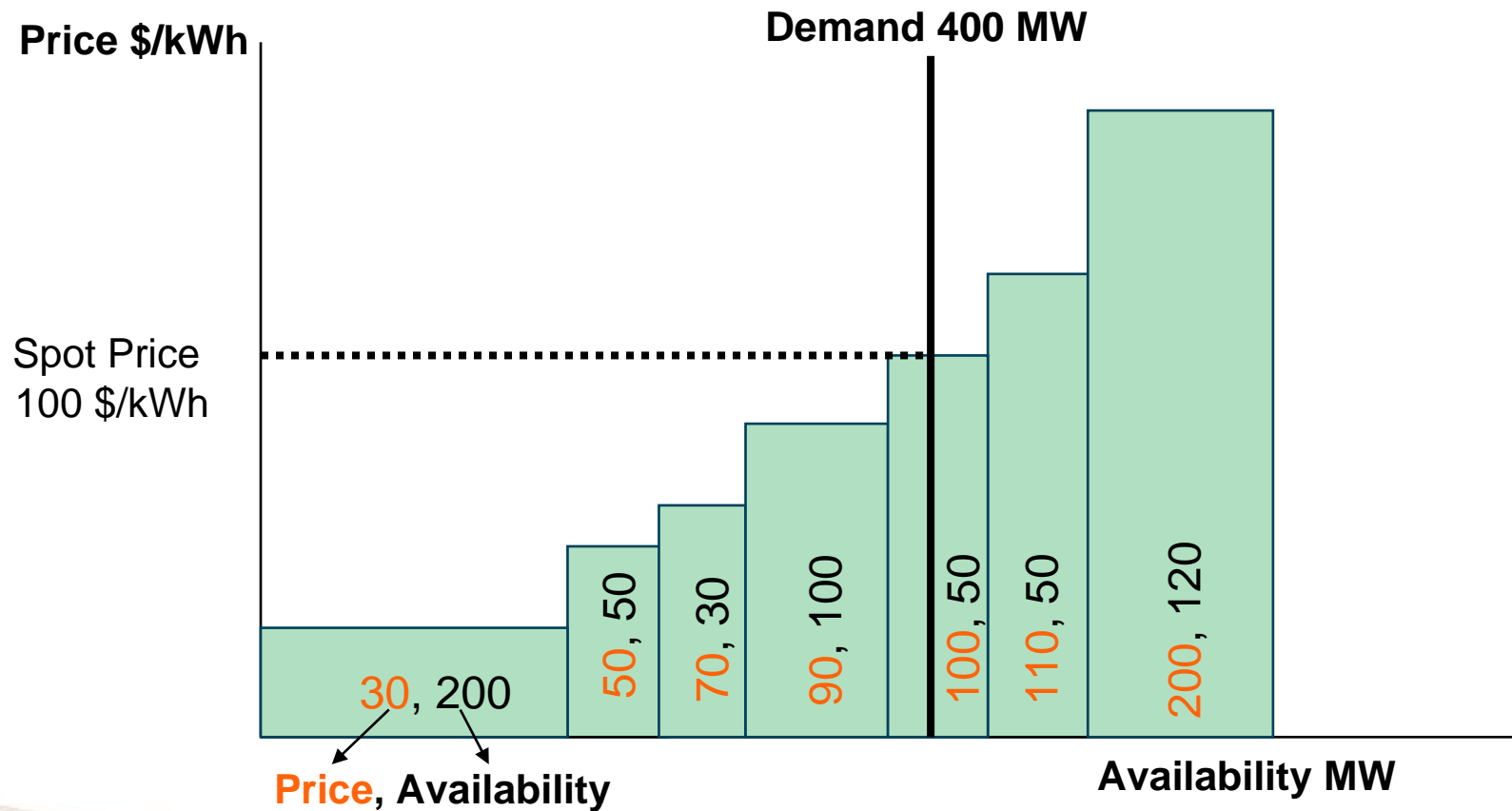


- Day ahead closed envelope price auction
- Mandatory supply side participation
- Partial allocation in the marginal
- Spot price \geq offer price
- No demand contestability (inelasticity)
- Goal: discovery efficient hourly prices

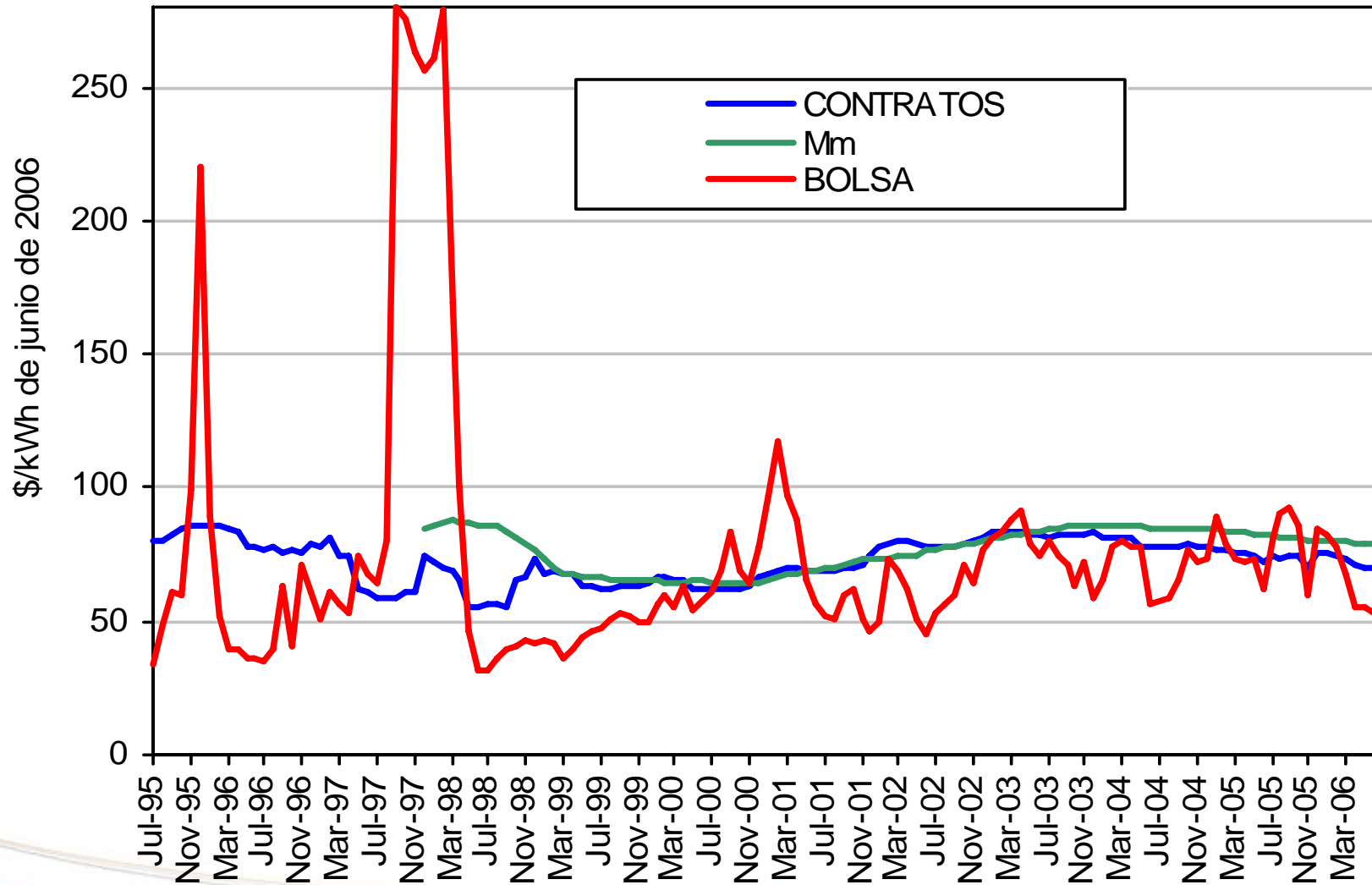


Spot price discovery

Supply bids are sorted in an hourly basis according (lowest prices first) and generation of each plant is decided



Average Spot, OTC Contracts and Regulated Consumer prices (market data, since 1995)



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Reliability Payments Firm Energy Auctions

Dealing with market imperfections

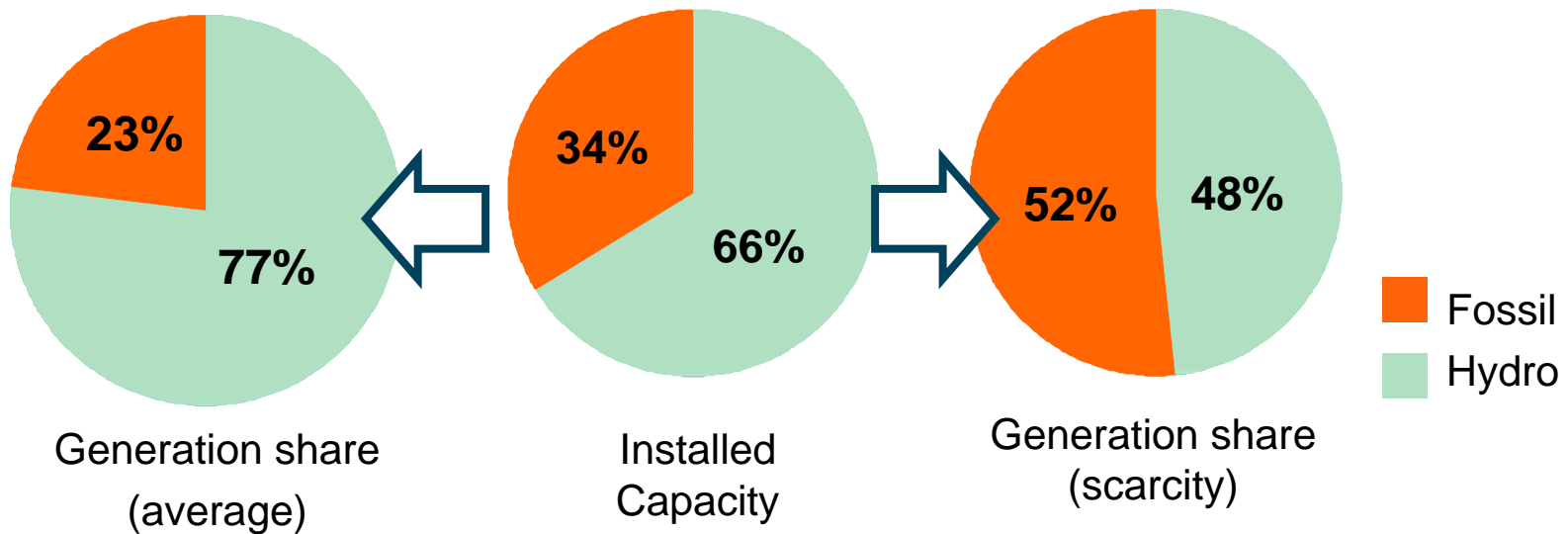
- Spot market price should be the underlying economic index
- Financial OTC forward contracts had been used for hedging spot price risk
- Resource Adequacy by partial fixed cost recovery, collected through the spot market



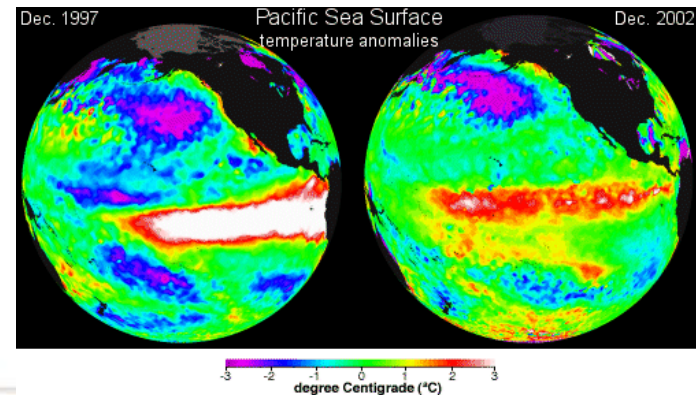
Why Reliability Payments instead of *Capacity Payments*?

Colombia's high dependence of hydro generation makes it necessary to count on enough firm energy to attend demand even in scarcity situations.

The usual "Capacity Payments" was NOT the answer



When "El Niño" appears in the Pacific Ocean, Colombia experienced extreme droughts affecting of hydro reserves



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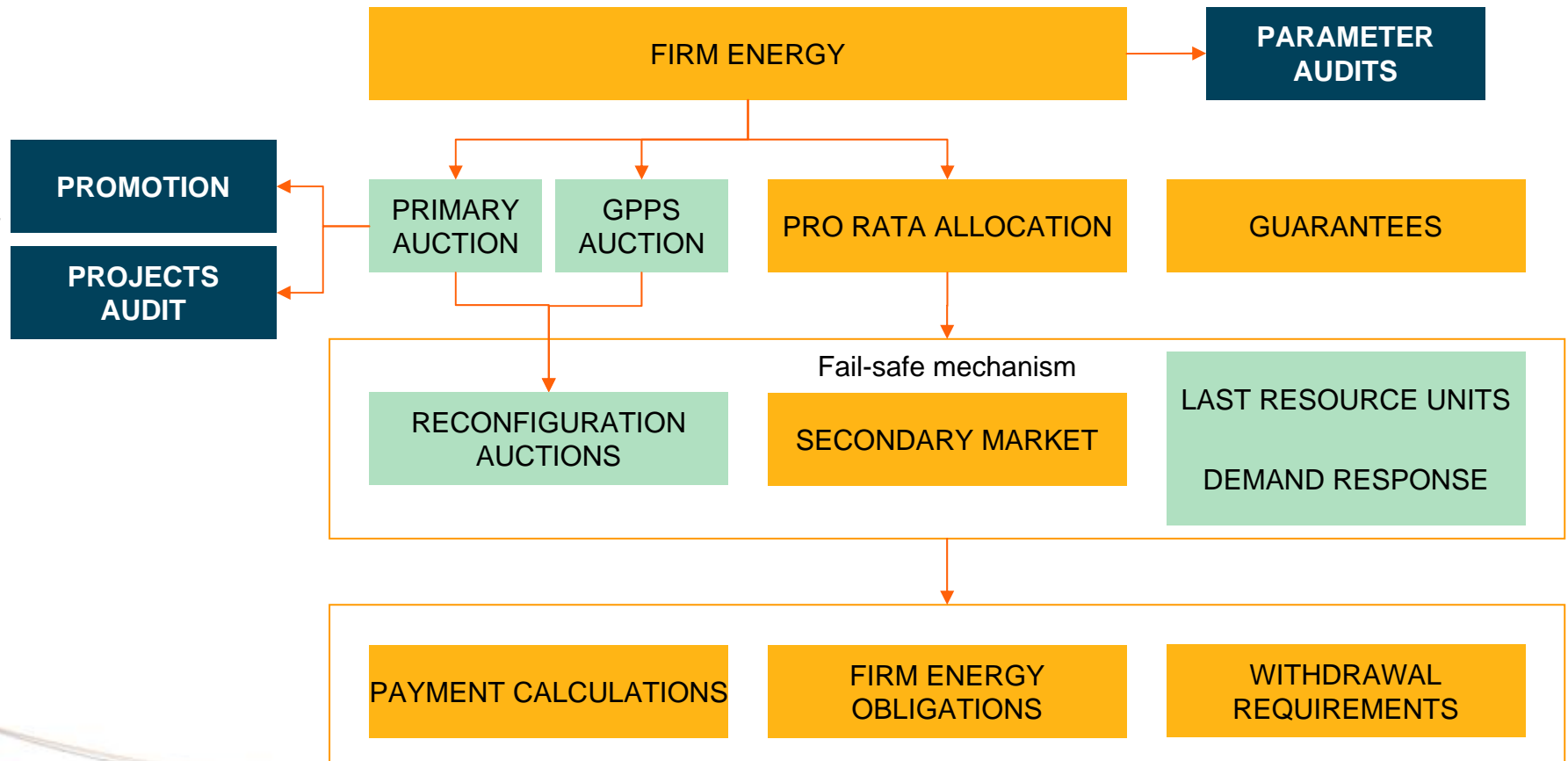


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Questions to be addressed...

1. General Framework of Auctions
2. What is auctioned?
3. Type of auction procedure
4. How are winners selected?
5. Who signs the contracts?

The new Reliability Payments Model



Then, Firm Energy is required. ¿What is Firm Energy?

Energía Firme para el Cargo por Confiabilidad –ENFICC- (Firm Energy for the Reliability Payments)

Is the maximum electrical energy a given generation plant is able to produce in a permanent basis, under extreme hydrological conditions (drought) during a period of time (In Colombia, a year)”

For a Thermal plant

- Historic shortages
- Fuel availability

For a Hydro plant

- Dryest years
- Capacity to store

The new Reliability Payments Mechanism was designed to give incentives to investors in the long term in order to guarantee an efficient supply adequacy for scarcity events

PRODUCT

Firm Energy
Obligations
(MWh)

ALLOCATION

Market
mechanism
Up to 20 year
allocation for
greenfield
projects

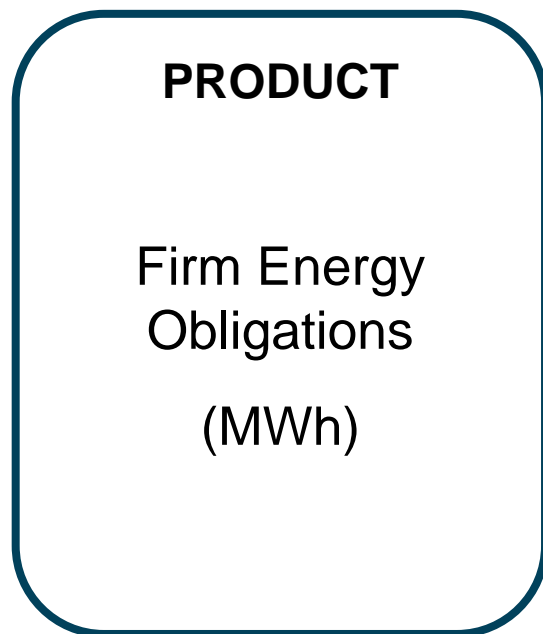
PRICE

Price discovered
using a
descending clock
Dutch auction

Firm Energy Obligations with ballast (generation assets and fuel contracts)

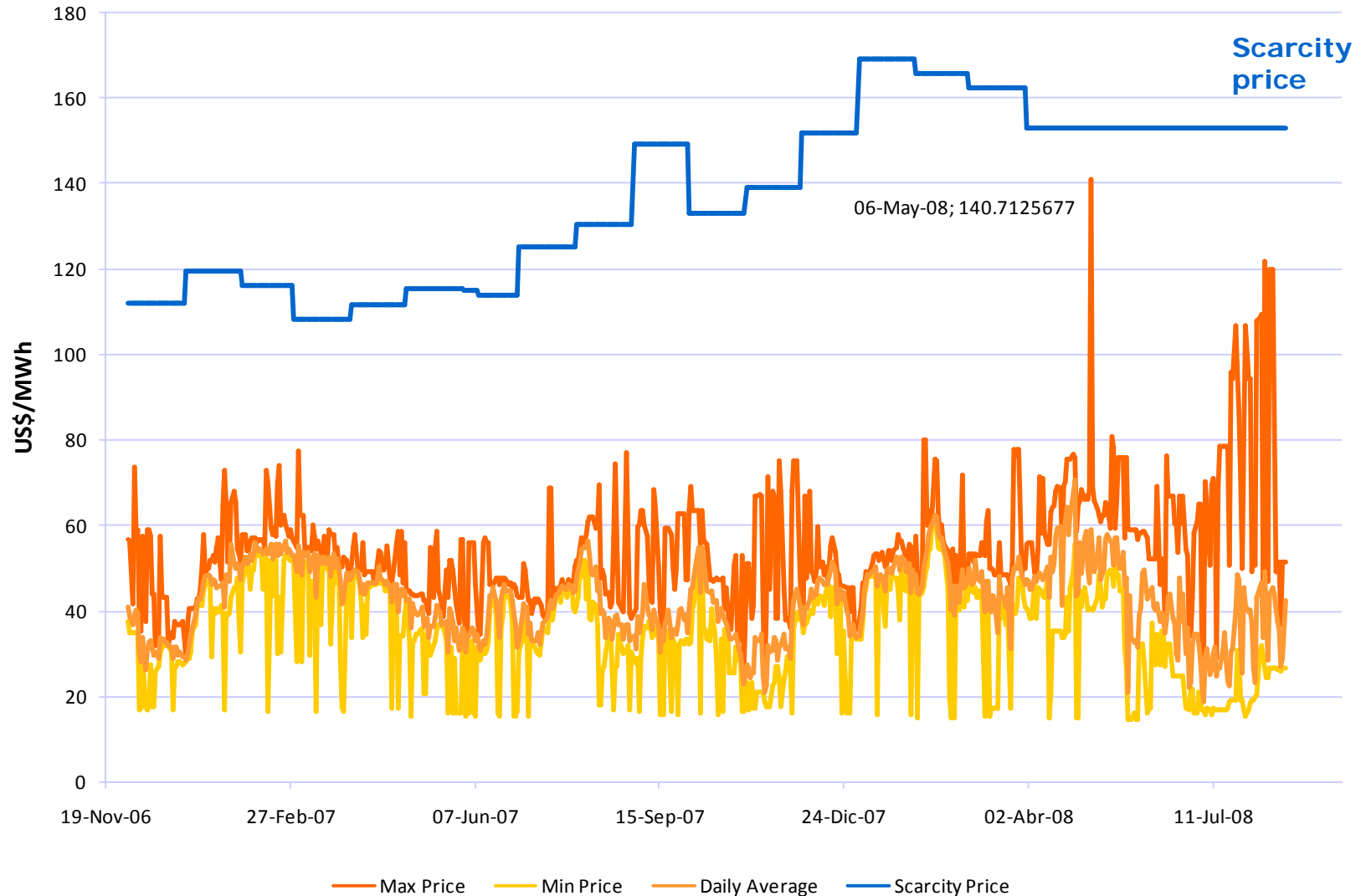
Obligations honored by the generators through the spot market (non constrained ideal dispatch) when scarcity conditions arise.

The scarcity condition for the Firm Energy obligation is defined in economic terms: “...when the spot prices reaches the scarcity price”



- The generator assumes the obligation to be dispatched in the spot market for a daily quota when scarcity arises.
- Firm energy will always be sold in the spot market at the scarcity price
- The scheme resembles a financial call option (scarcity price=strike price).

Any hour the option could be exercised : “... when the spot price is higher than the scarcity price”



Promotion for the auction looked for new investors



A world map with several orange circles placed over North America, South America, and Europe. Blue arrows originate from these circles and point towards the 'Multidisciplinary team' section on the right.

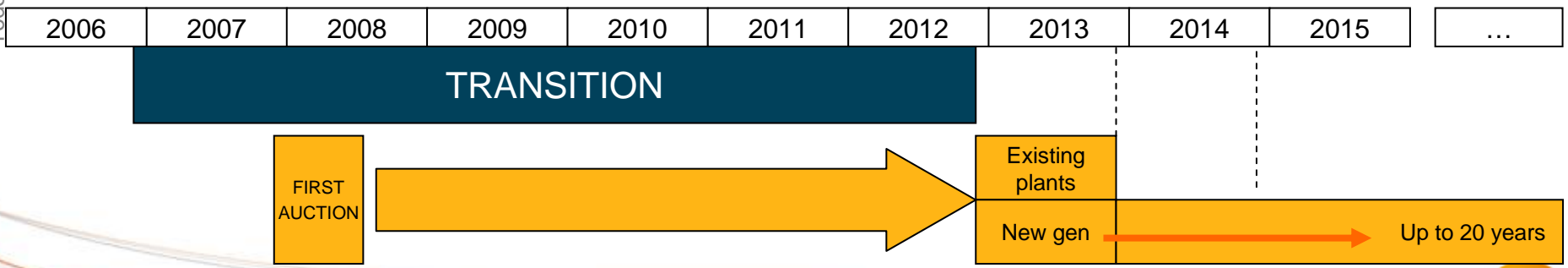
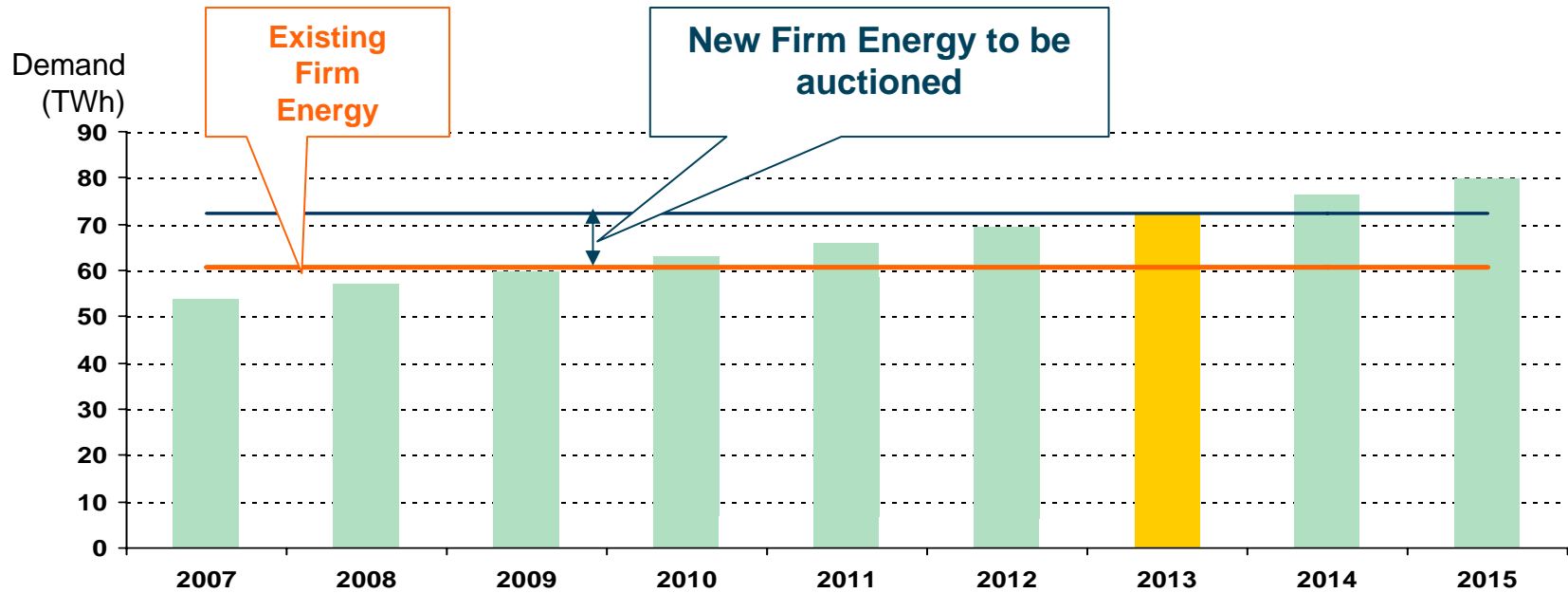
Multidisciplinary team

- Energy Ministry & Energy Planning Unit
- Regulator (CREG)
- Promoters
- Embassies support
- XM (market operator)

Investors Profile

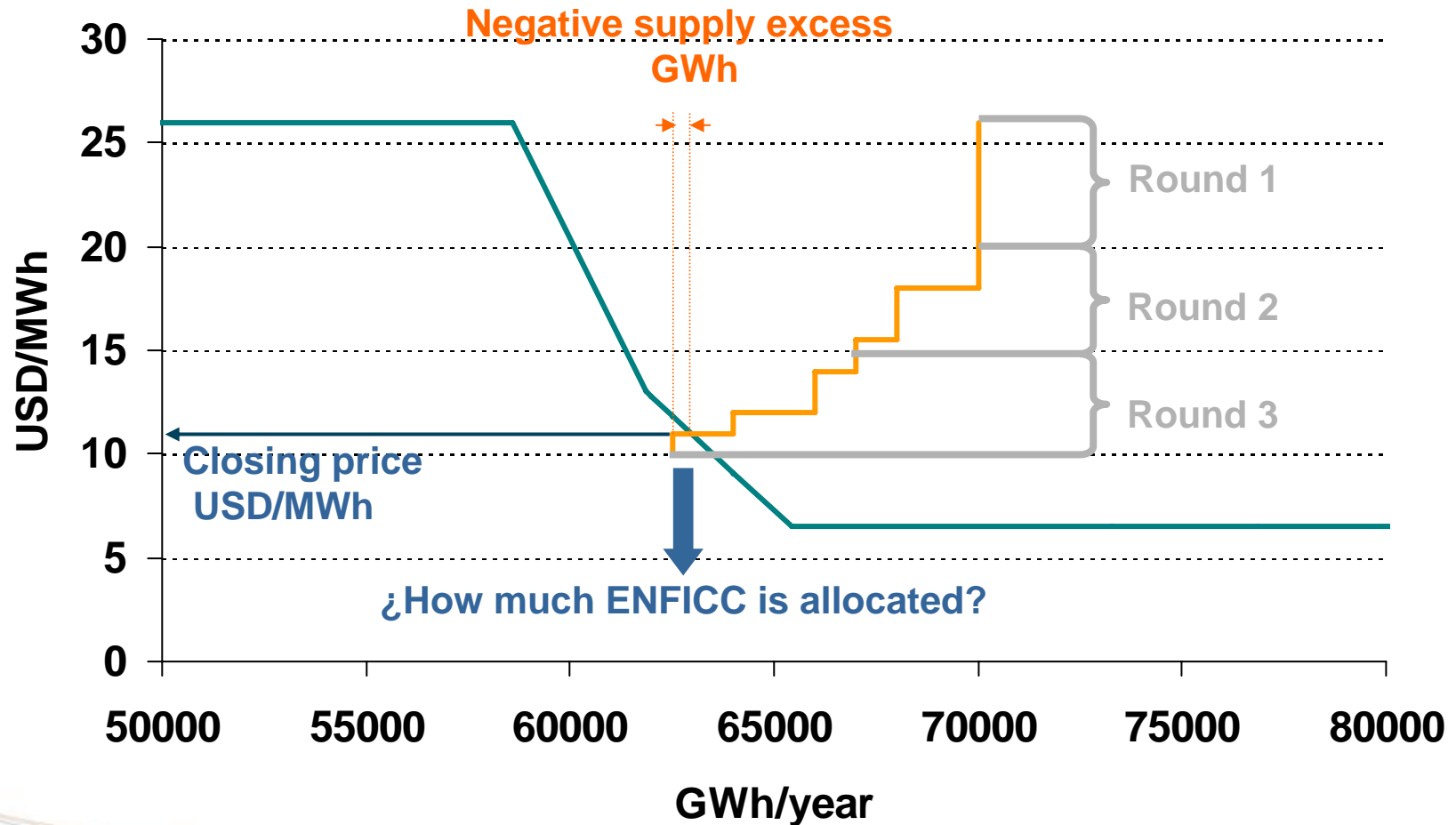
- Investment funds
- Electricity and gas utilities
- Infrastructure investors

The first auction took place May 6th 2008 to allocate firm energy obligations from December 2012 to November 2013, so that greenfield projects could participate

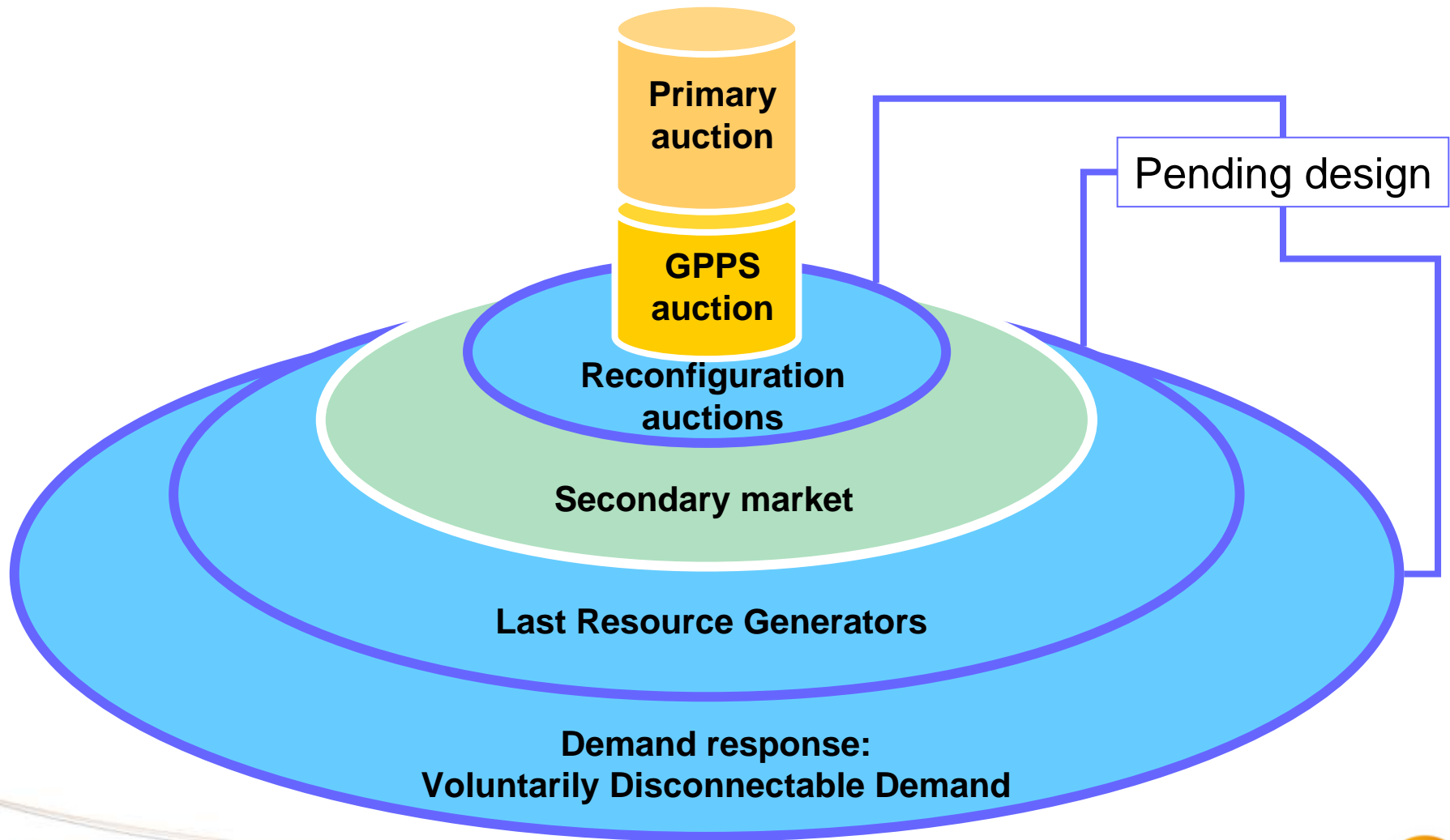


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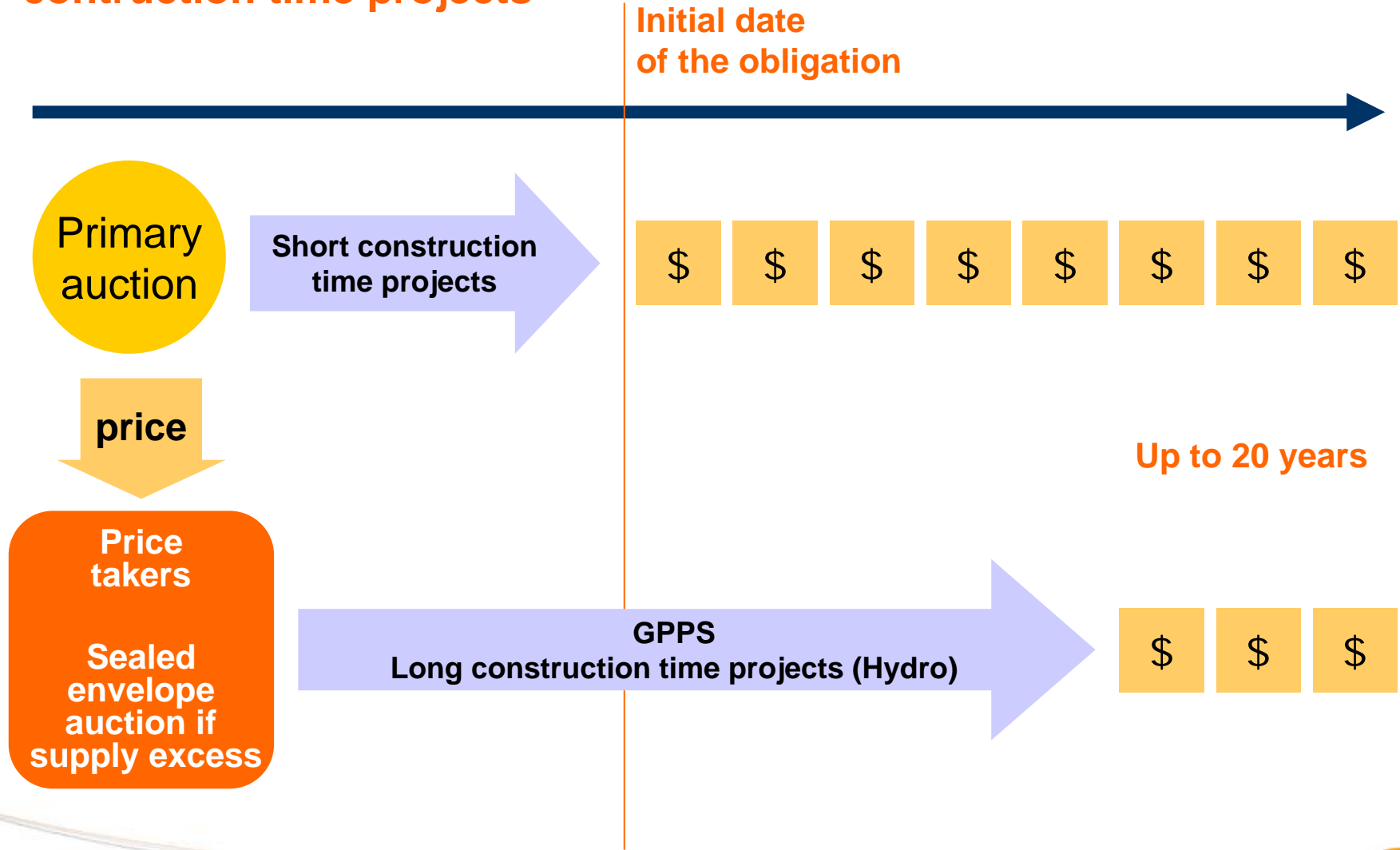
A descending clock auction with intra-round bids was used to discover the price of the Firm Energy Obligations



Some fail-safe measures were foreseen to manage mechanism risks



A secondary Auction (GPPS) was also implemented for longer construction time projects



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May 6th 2008 Primary Auction June 21th 2008 GPPS Auction RESULTS

New generation projects are required to fulfill some requirements

Requirements for the Inscription

- ✓ Feasibility studies
- ✓ Financial and management scheme
- ✓ Approval of Environmental Alternatives Diagnosis
- ✓ Information about land acquisition options
- ✓ Request of connection to the transmission network
- ✓ Fuel acquisition scheme
- ✓ Designs under execution
- ✓ Presentation of environmental alternatives Studies

Information about power generation projects in Colombia

REPUBLICA DE COLOMBIA
MINISTERIO DE MINAS Y ENERGIA

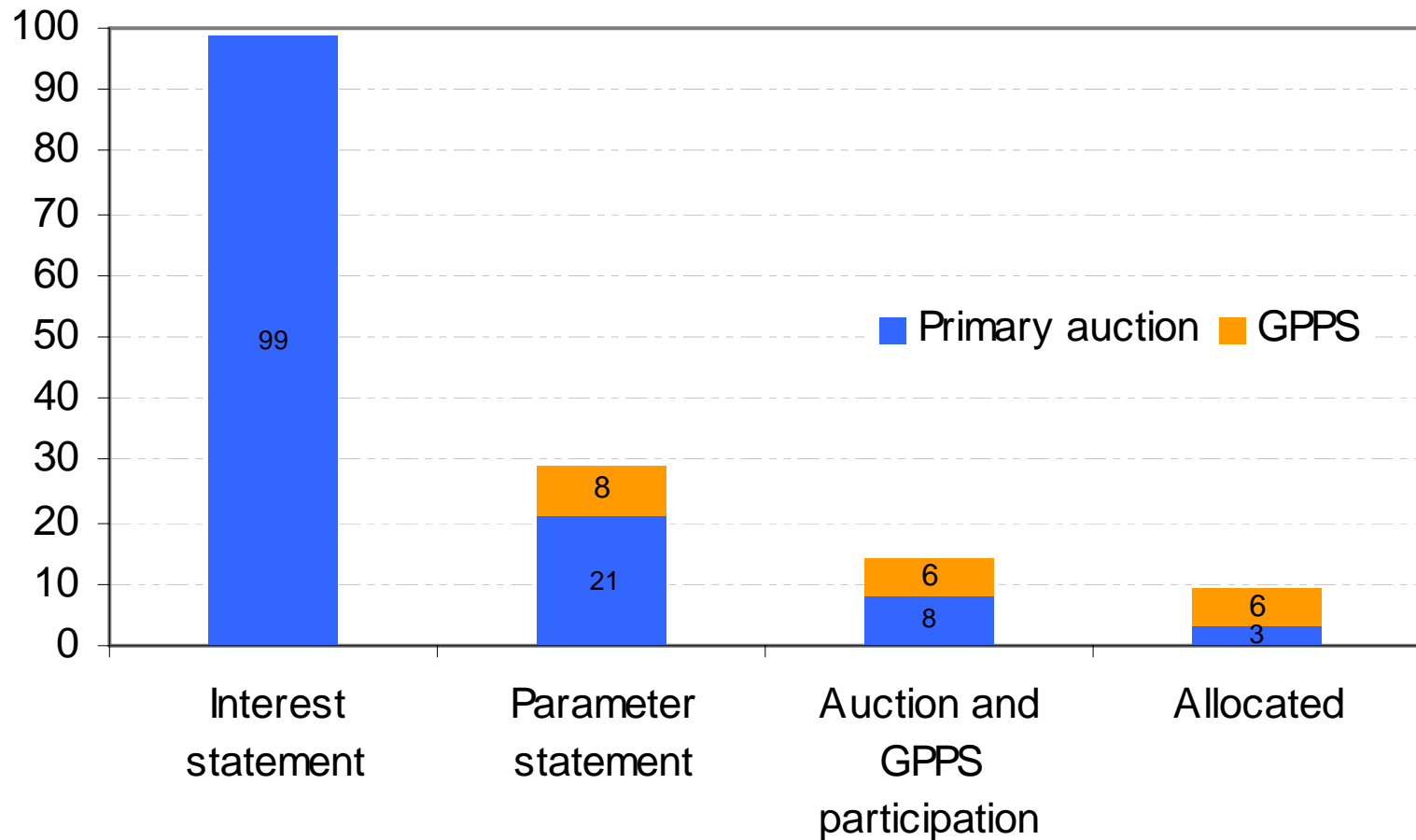
UNIDAD DE PLANEACION MINERO-ENERGETICA



www.upme.gov.co

Stages in the scheme filtered mature projects to be developed

Projects in each stage



INITIAL AUCTION SCHEDULE (actual web screenshot)



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PROGRAMA TENTATIVO DE LA SUBASTA

El Subastador preparó un programa tentativo de la Subasta para cada una de las rondas que se transcribe a continuación.

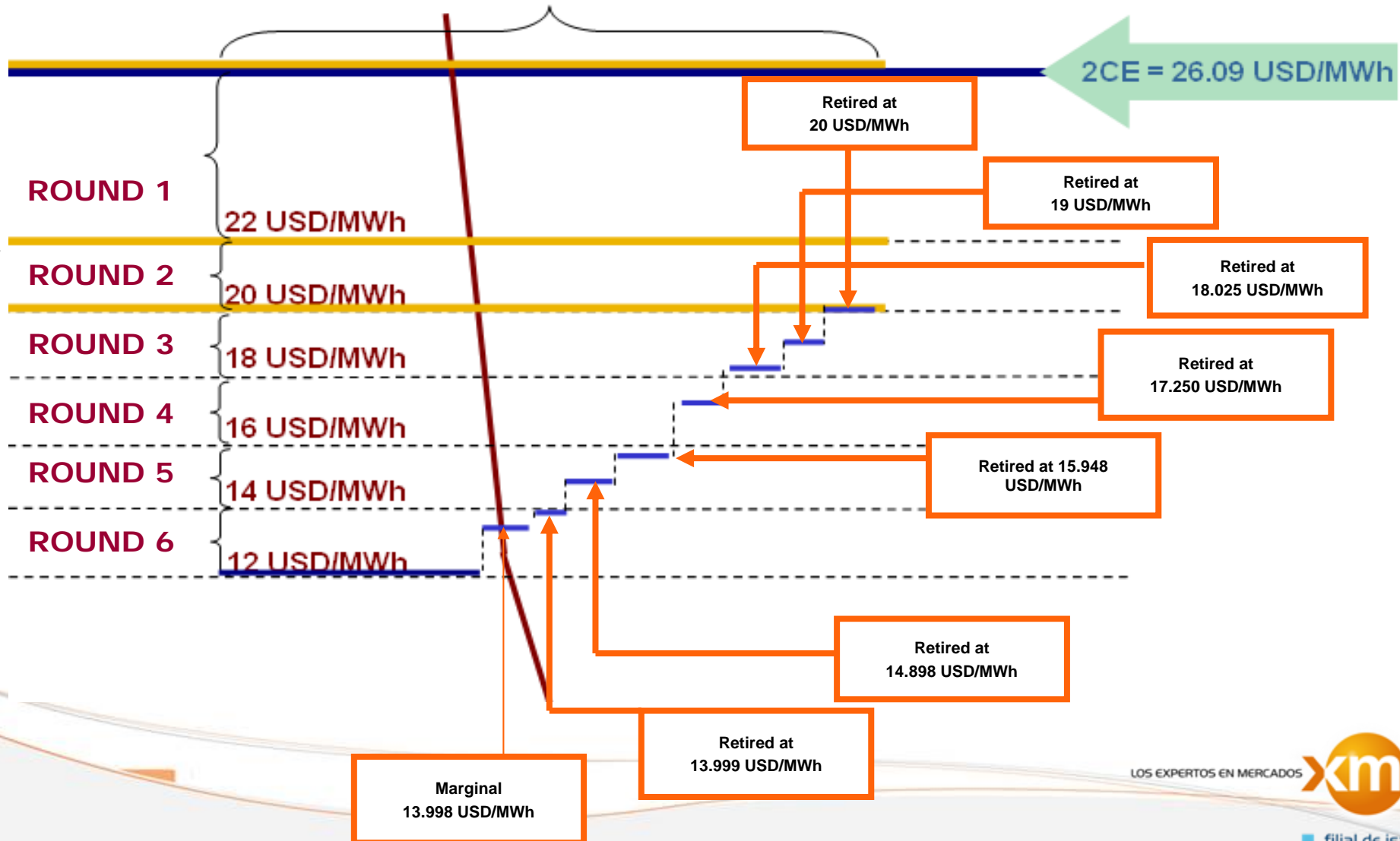
Fecha Hora	Mayo 6	Mayo 7	Mayo 8
09:00	Ronda 1	Ronda 5	Ronda 8
10:00	*26.09-22.00	*13.00-11.00	*08.00-07.00
11:00	Ronda 2		
12:00	*22.00-19.00	Ronda 6	
13:00	Ronda 3	*11.00-09.00	Ronda 9
14:00	*19.00-\$16.00		*07.00-06.23
15:00	Ronda 4	Ronda 7	
16:00	*16.00-13.00	*09.00-08.00	

*Precio de Apertura y Cierre (US\$/MWh) Fuente: CREG "Circular No. 34"

Exceso de oferta al inicio de la Subasta. Una vez verificado las ENFICC declaradas, procedimiento que finalizó el 28 de abril de 2008, se encontró que el exceso de oferta al inicio de la Subasta es un valor que se aproxima a los 9 Twh.

The Primary Auction lasted six rounds

Initial ENFICC BID: 72045 GWh/year



Primary Firm Energy auction rounds (actual web screenshot)

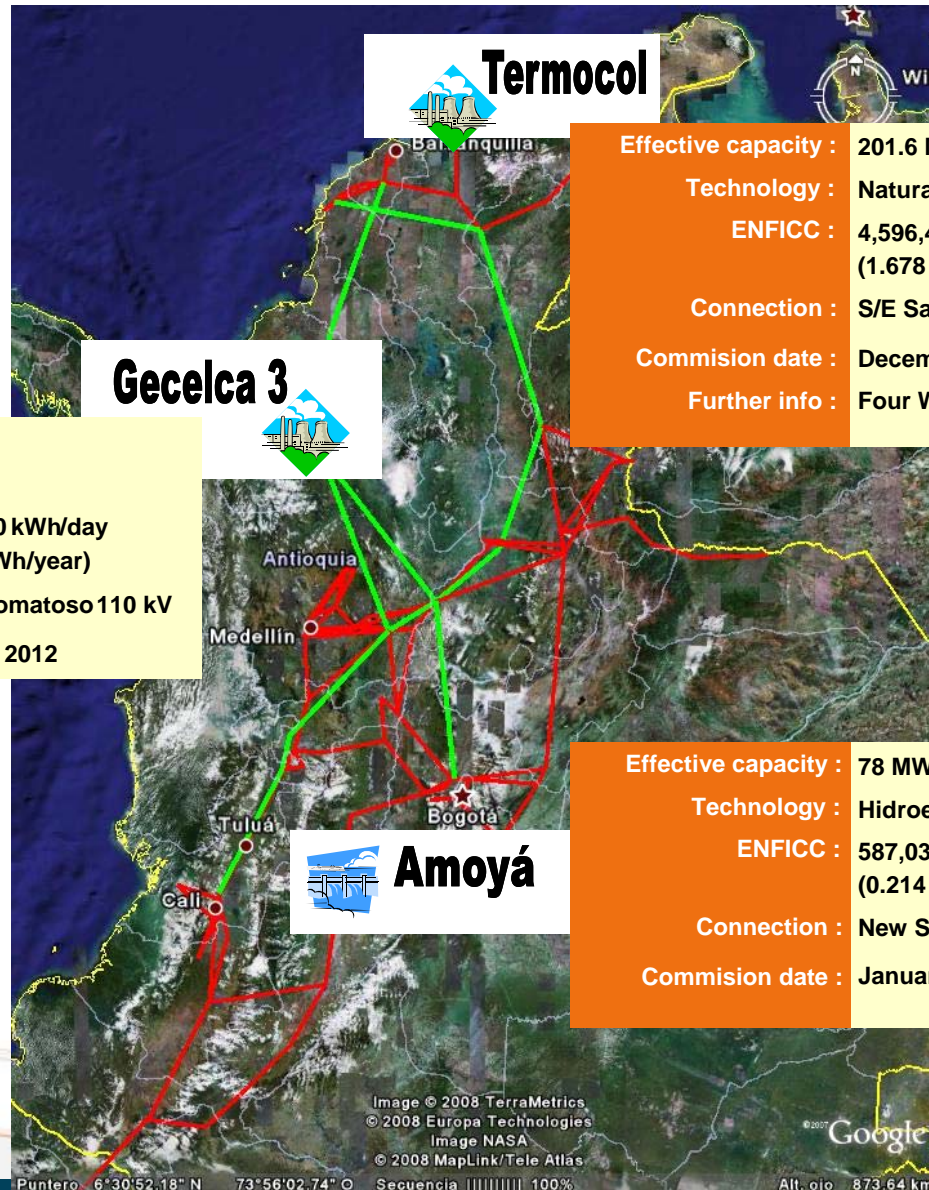


RESUMEN SUBASTA DE ENERGÍA FIRME 2013

Mayo 6	Mayo 7
Ronda 1 *26.09 - 22.00 Exceso de Oferta (KWh-día): 22,890,276.686 Exceso de Oferta (GWh-año): 8.355	Ronda 5 *16.00 - 14.00 Exceso de Oferta (KWh-día): 2,486,184.103 Exceso de Oferta (GWh-año): 907
Ronda 2 *22.00 - 20.00 Exceso de Oferta (KWh-día): 21,509,177.540 Exceso de Oferta (GWh-año): 7.851	Ronda 6 *14.00 - 12.00 Exceso de Oferta (KWh-día): -4,834,615.343 Exceso de Oferta (GWh-año): -1765
Ronda 3 *20.00 - 18.00 Exceso de Oferta (KWh-día): 12,528,358.394 Exceso de Oferta (GWh-año): 4.573	Precio de cierre (US\$/MWh) 13,998
Ronda 4 *18.00 - 16.00 Exceso de Oferta (KWh-día): 9,498,877.249 Exceso de Oferta (GWh-año): 3.467	

*Precio de Apertura y Cierre (US\$/MWh)

Firm Energy was allocated to 42 existing plants and to 3 greenfield projects (one of them owned by a new market participant)



Effective capacity : 201.6 MW
Technology : Natural Gas / Diesel (Fuel Oil 2)
ENFICC : 4,596,475 kWh/day
 (1.678 TWh/year)
Connection : S/E Santa Marta 220 kV / 110 kV
Commision date : December 1st 2012
Further info : Four Westinghouse 501 turbines

Effective capacity : 150 MW
Technology : Coal
ENFICC : 3,060,000 kWh/day
 (1.116 TWh/year)
Connection : S/E Cerromatoso 110 kV
Commision date : June 1st 2012

Effective capacity : 78 MW
Technology : Hidroelectric
ENFICC : 587,031 kWh/day
 (0.214 TWh/year)
Connection : New S/E 230 kV (pending)
Commision date : January 30th 2011



Pescadero-Ituango



Quimbo



Sogamoso



Cucuana



Porce IV



Miel II

Effective capacity : 1200 MW
Technology : Hydroelectric
ENFICC : 8563 GWh/year

Effective capacity : 396 MW
Technology : Hydroelectric
ENFICC : 1750 GWh/year

Effective capacity : 800 MW
Technology : Hydroelectric
ENFICC : 3791 GWh/year

Effective capacity : 60 MW
Technology : Hydroelectric
ENFICC : 50 GWh/year

Effective capacity : 400 MW
Technology : Hydroelectric
ENFICC : 1923 GWh/year

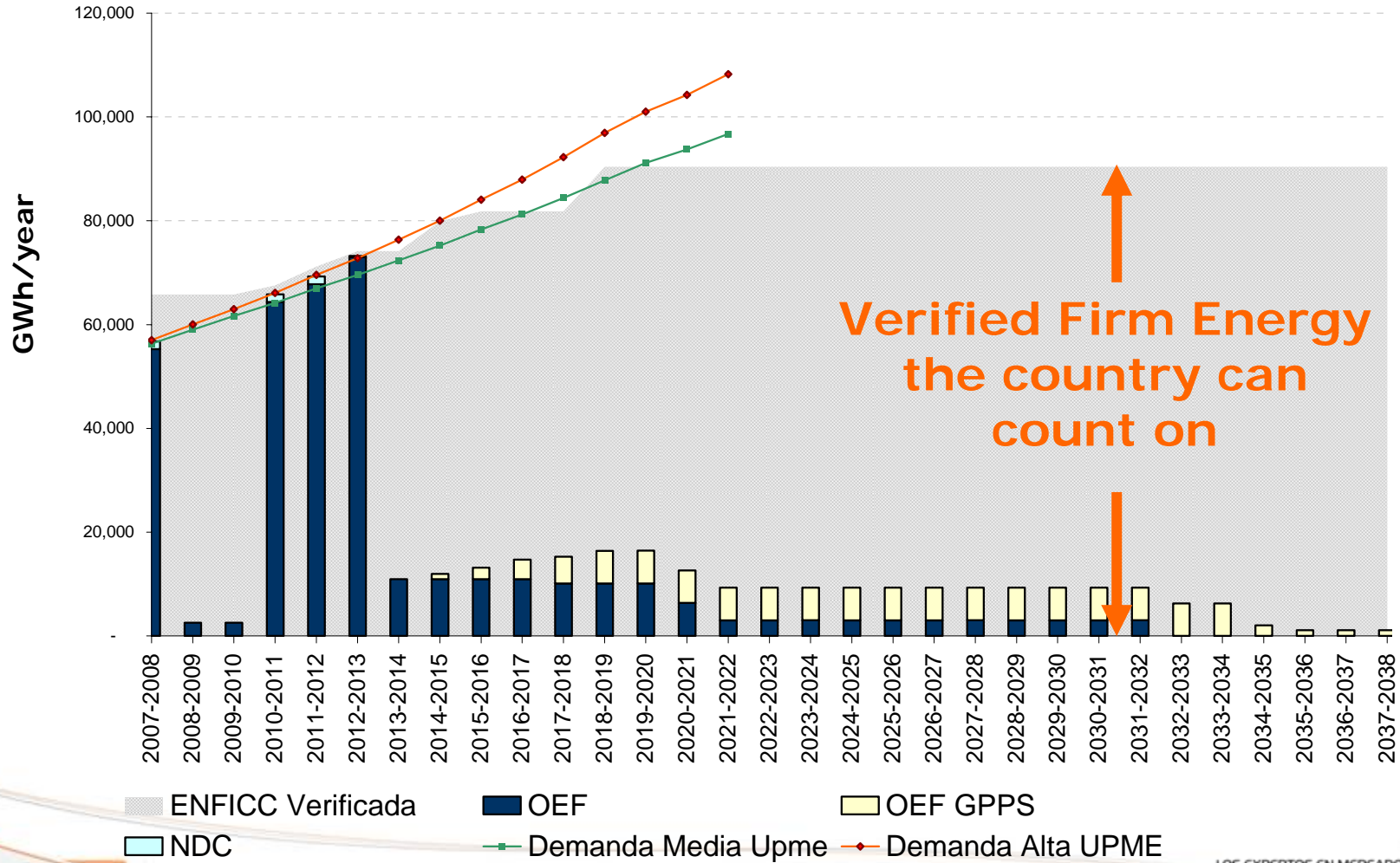
Effective capacity : 135.2 MW
Technology : Hydroelectric
ENFICC : 184 GWh/year

TOTAL Effective capacity : 2991.2 MW
Technology : Hydroelectric
TOTAL verified ENFICC : 16261 GWh/year
TOTAL allocated ENFICC : 6281 GWh/year



The verified Firm Energy covers demand forecasts up to 2019 However, allocations were granted up to 2038

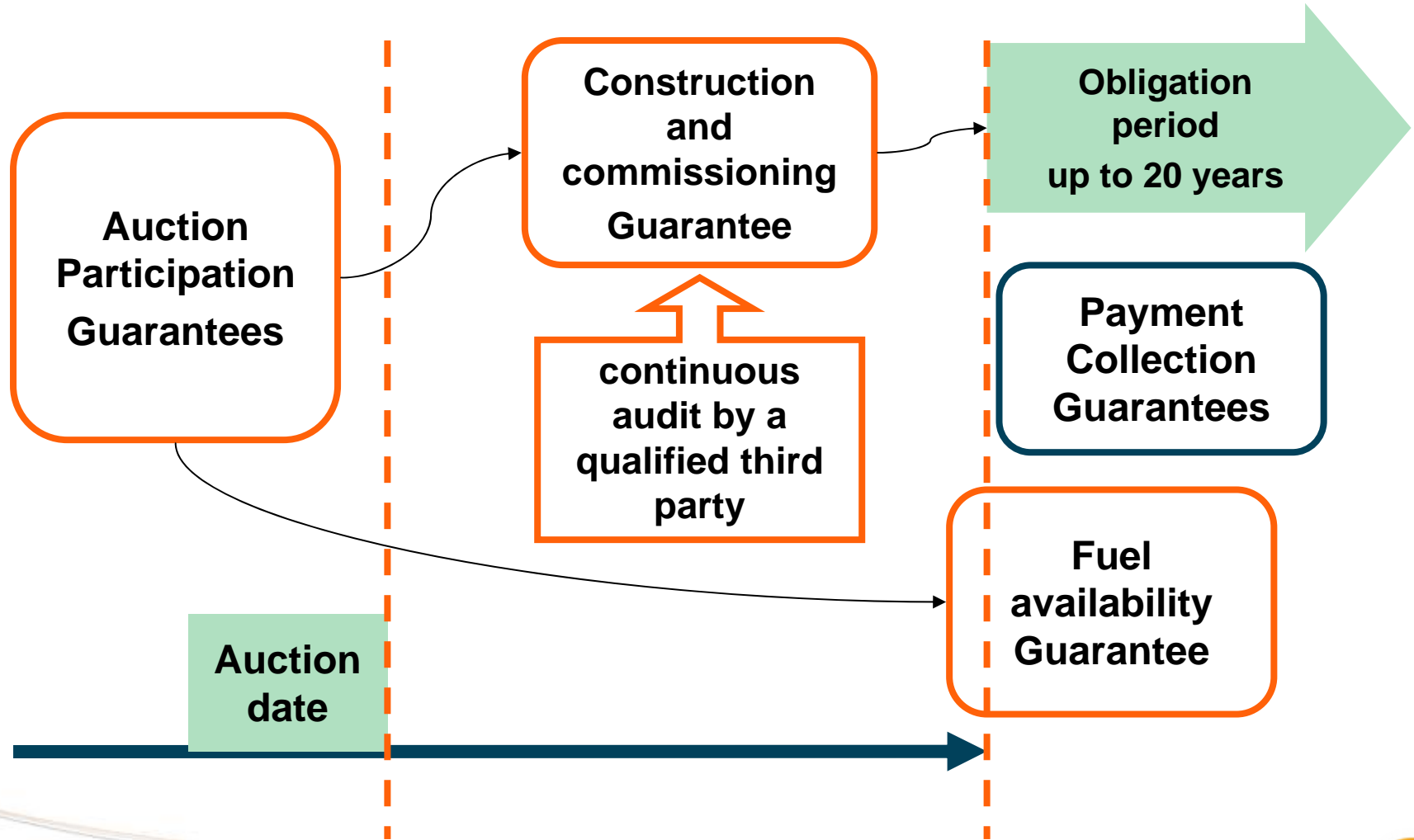
Allocated firm energy obligations



Verified Firm Energy
the country can
count on

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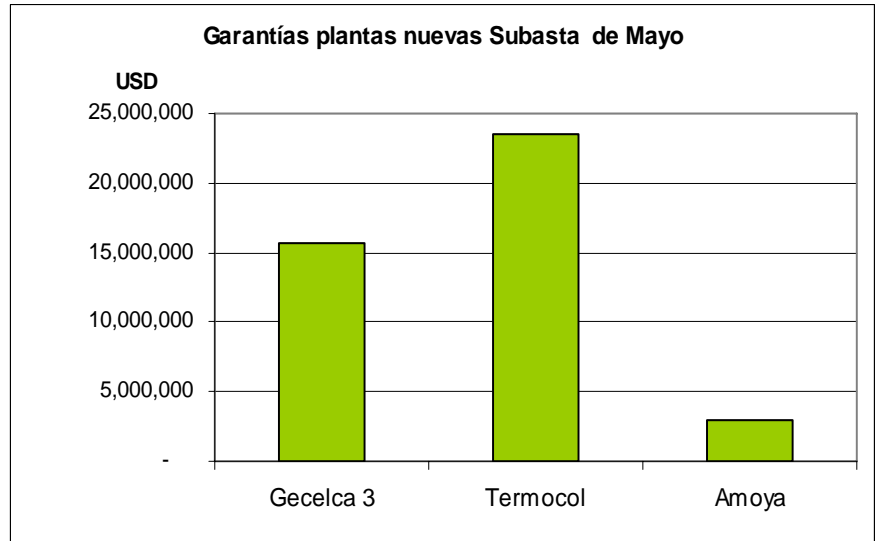
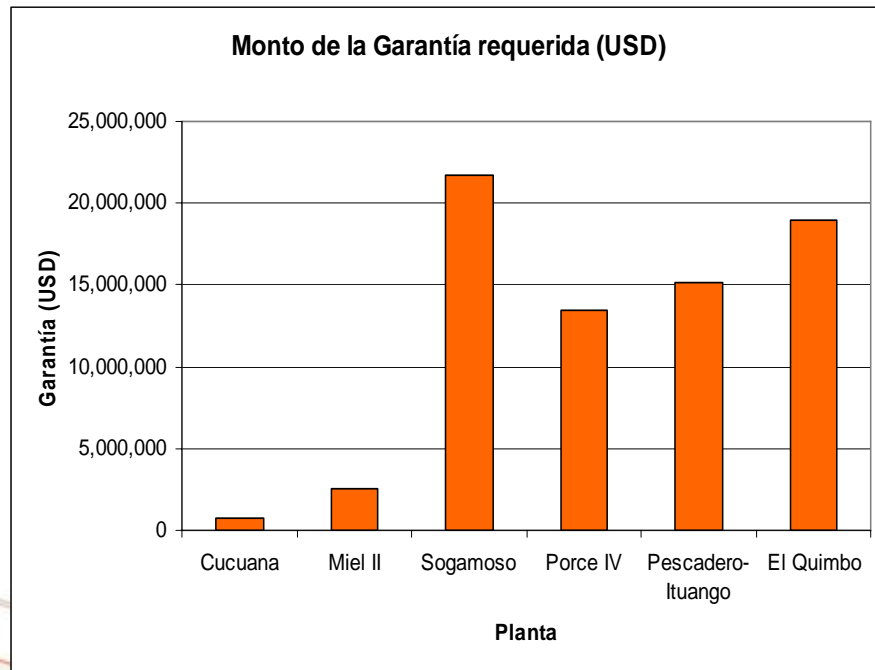
The whole mechanism is backed by a structured scheme of financial guarantees



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1. General Framework of Auctions Guarantees

Project construction and Firm Energy delivery are backed up by liquid guarantees



Any delay in the construction plan triggers guarantee values

Precise responsibilities were defined by the Regulator

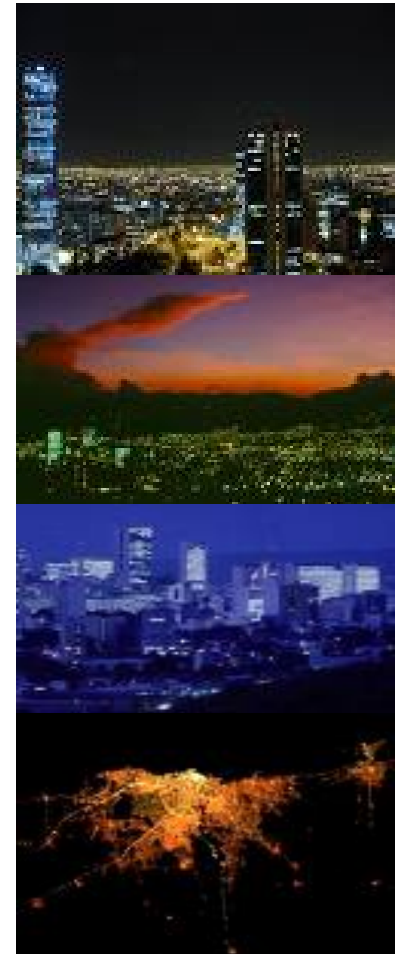
Role	Who was in charge?	When?
Initiator	CREG –The regulator	Once a year, according to demand forecasts
Administrator	XM S.A. E.S.P.	once the process is initiated
Auditor	Independent party contracted by XM S.A. E.S.P	one month before the auction opens
Auctioneer	Experienced person contracted by XM S.A. E.S.P	one month before the auction opens
Promotion	Investment bank contracted by XM S.A. E.S.P	Until June 1st, 2007 for the first auction

Legal and Regulatory framework of the Reliability Payments

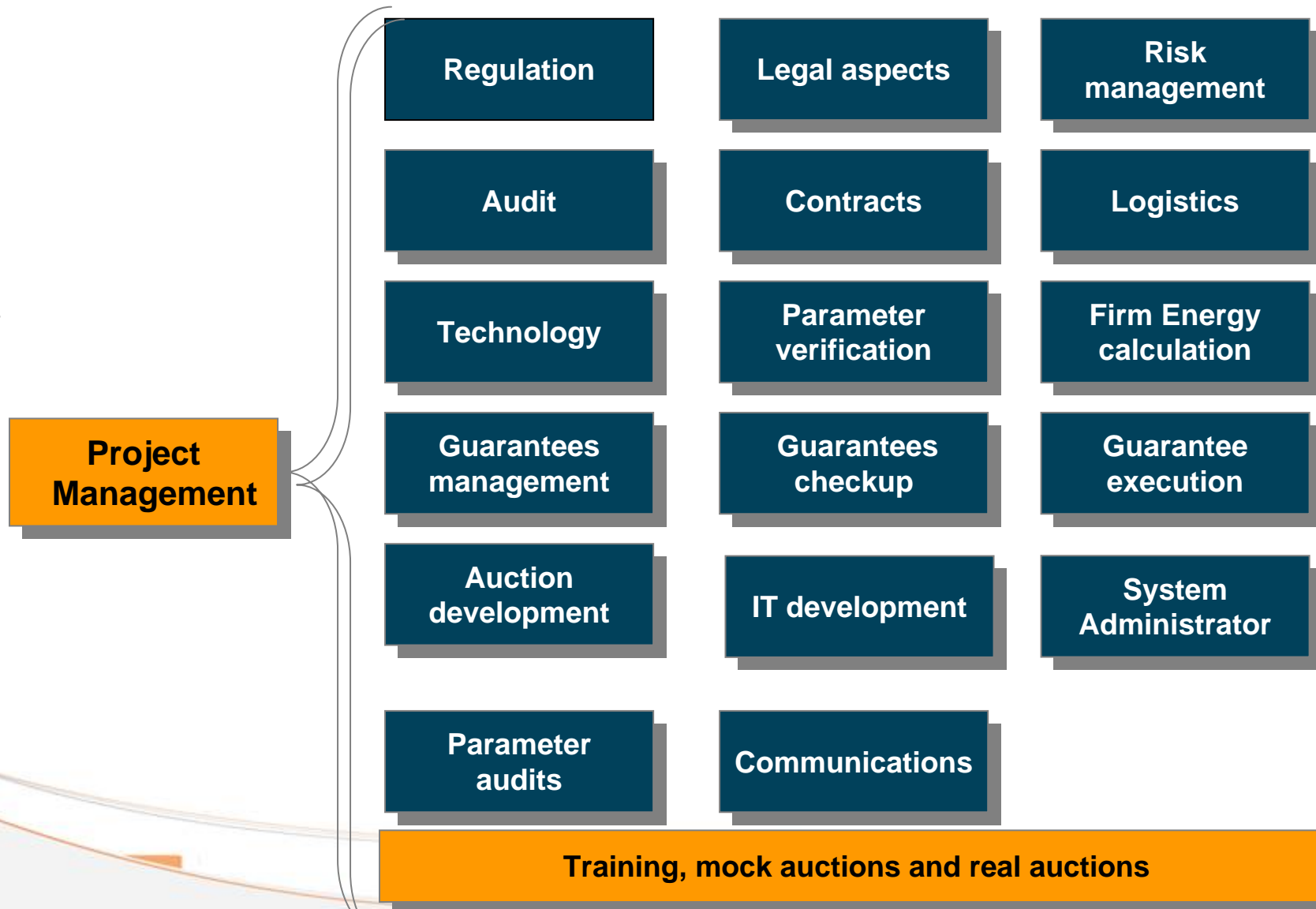
- There is no “contract”
- Electricity Law enforces the evaluation of the reliability each plant contributes to the system
- The Reliability Market is part of the regulation of the Wholesale Electricity Market
- The Firm Energy Commitment (OEF) is then a legal relation resulting from the auction
- Regulator has integrally defined in detail: allocation of obligation, commitment period, responsibility, guarantees, settlement, billing and payments mechanisms.
- Each investor gets a certificate of payments for up to 20 years issued by the Market Administrator (XM)

Some lessons learned

- Innovation & learning: market & expansion
- Legal and financial stability: a crucial issue
- convergence of the electricity sector with the national and international financial sectors
- Completing the market



Dimensions of the Firm Energy Auctions Project



Some new challenges



- Explicit consideration of Social and Environmental constraints immersed in the scheme as well as in the projects
- Demand response: Demand Side Management and Voluntarily Disconnectable Demand
- Effective surveillance to construction to guarantee the Firm Energy real availability or to take the required remedial measures
- The new expansion strengthens Colombian Market as a reliable source of clean electricity at efficient prices

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