Gas Energy

Understanding the Brazilian Natural Gas Market

"Mercado de Gas y Energía más allá de 2019"

August 19th, 2015

Brazilian Natural Gas Market Drivers

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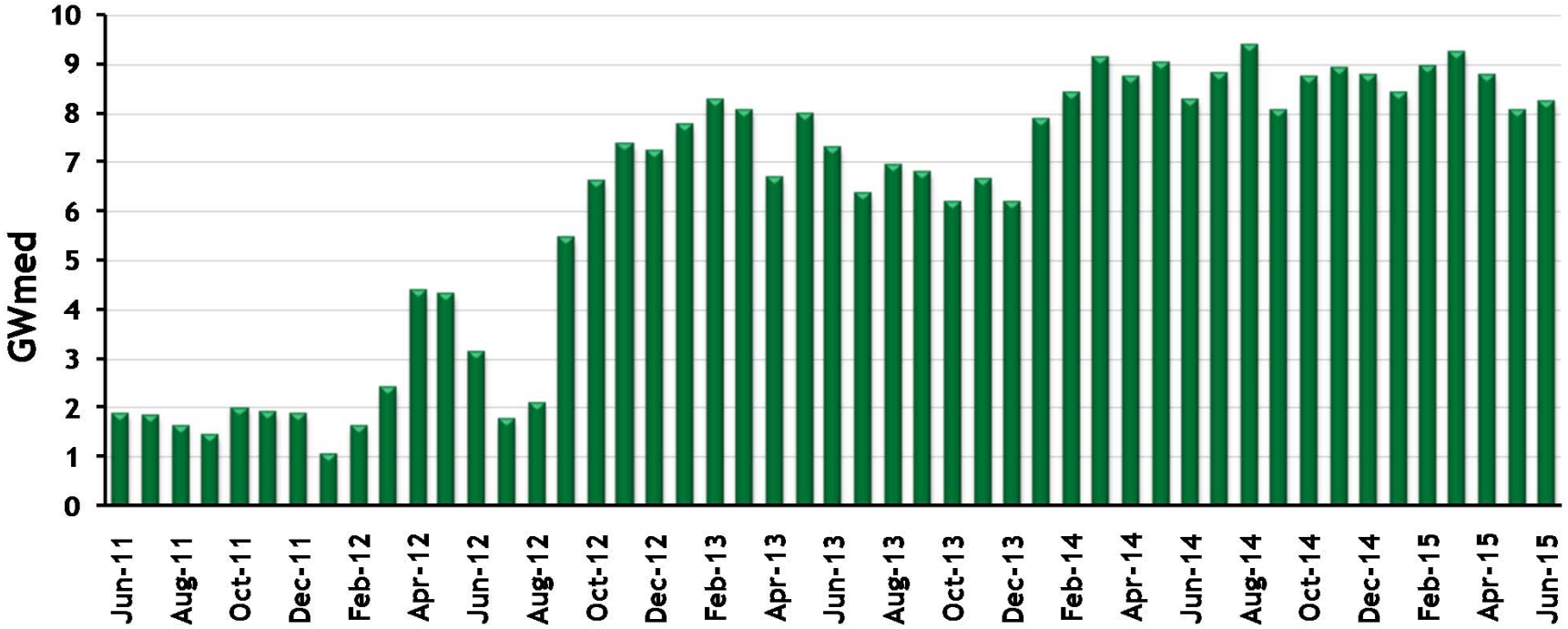
Power Market Crisis ➔ ▫ New NG Thermal Capacity

Power Crisis means High NG Power Plant Dispatch



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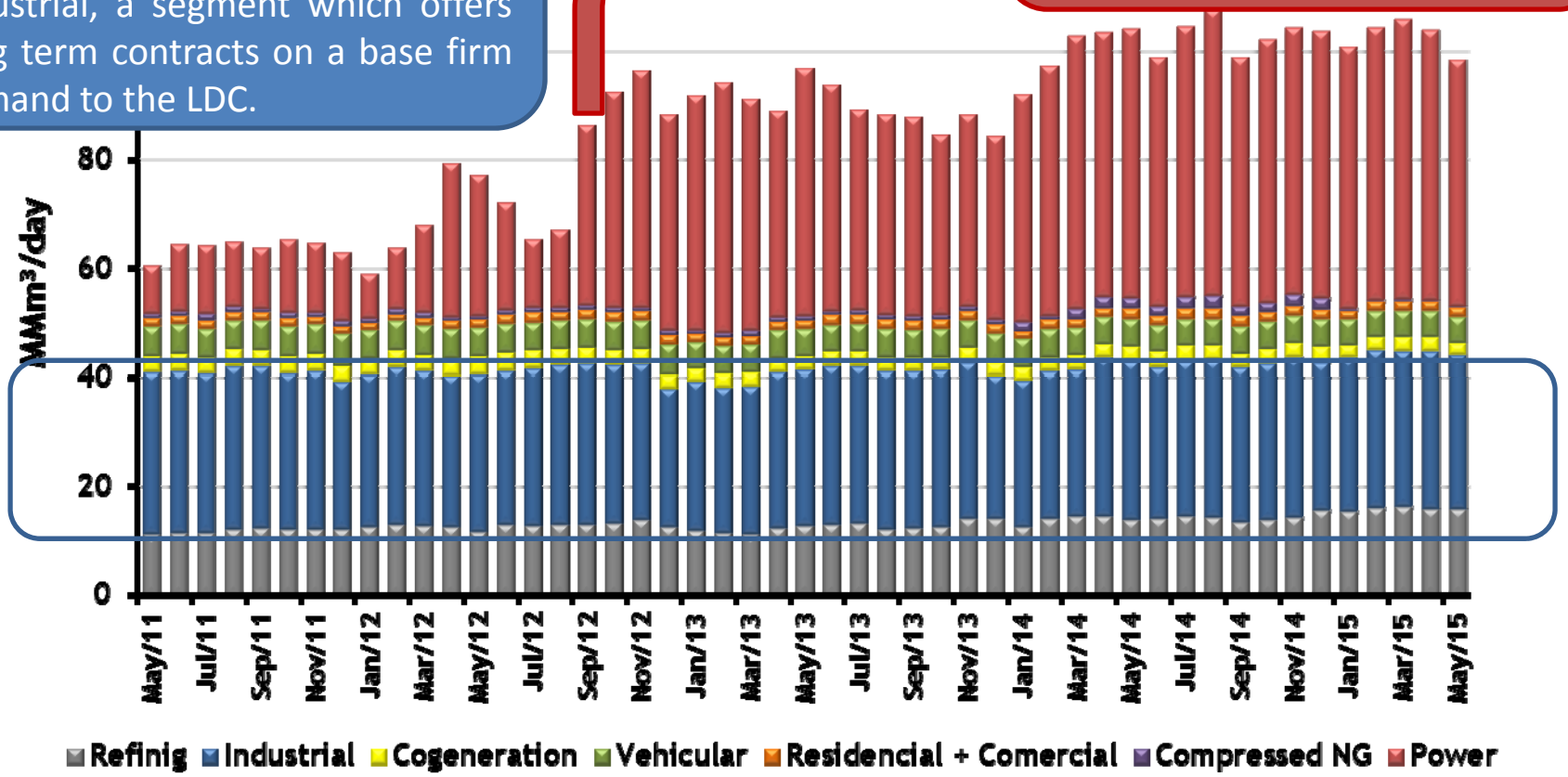
Natural Gas Historical Demand

Lack of new supply and competitive prices has limit the expansion of the market, especially the industrial, a segment which offers long term contracts on a base firm demand to the LDC.

On the other hand, thermal consumption has been increasing in response of the hydroelectric crisis.



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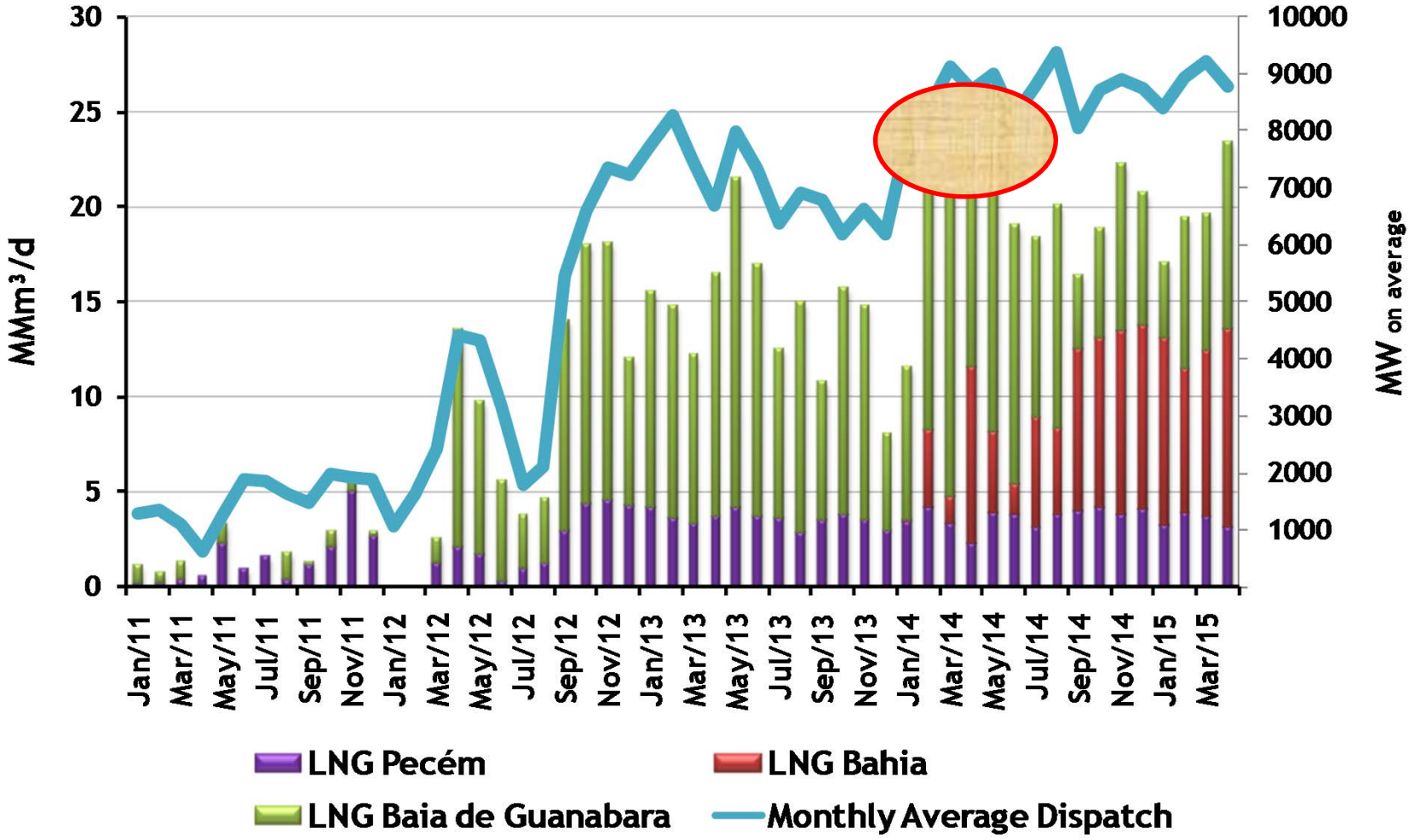
Existing Regasification Plants for LNG imports in Brazil

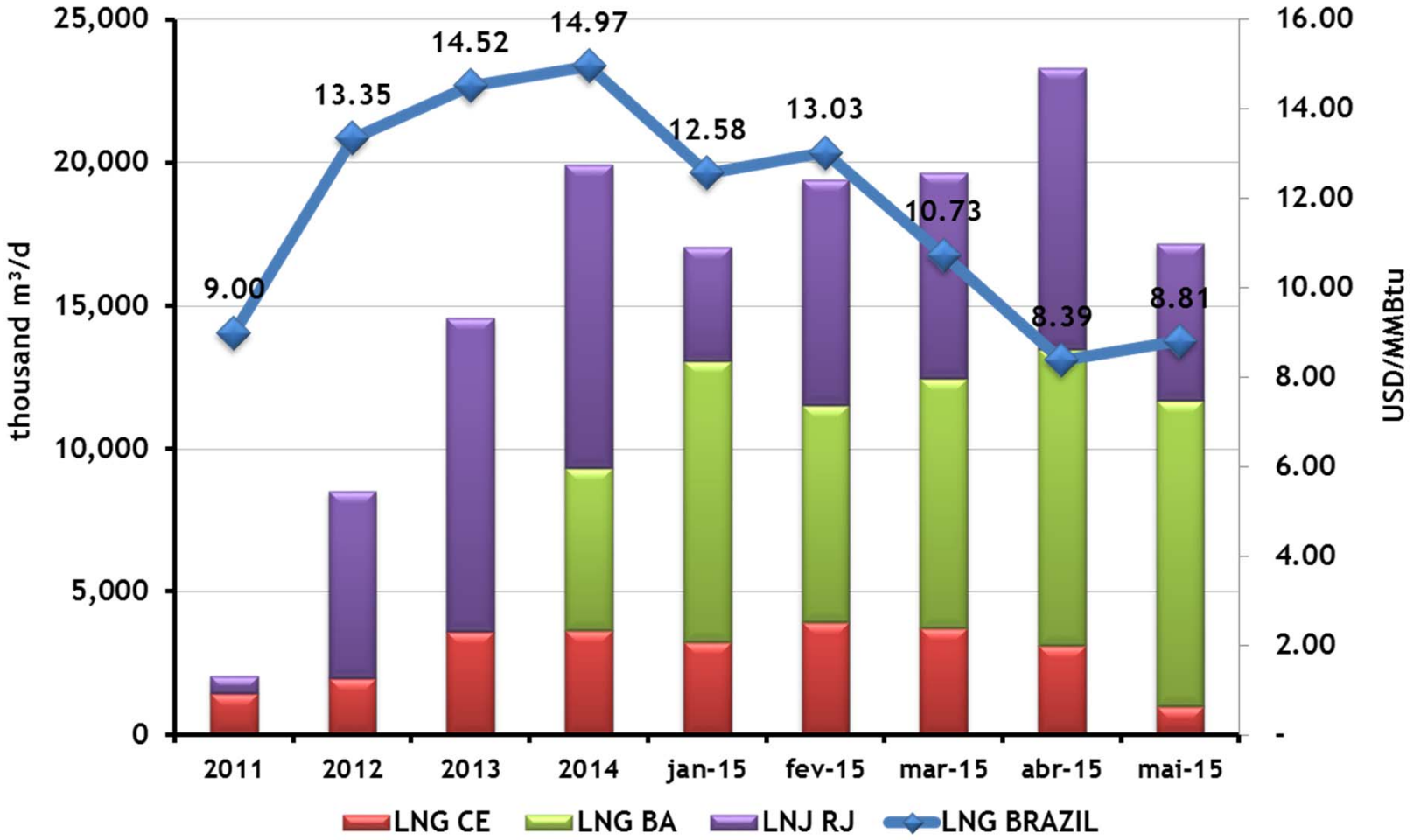
Source: Gasnet. ANP.

Gas demand profile attended by Petrobras LNG imports terminals – Almost the same of Bolivian Imports



Source: MME. ONS.

Existing Regas Terminals: Evolution Prices and Volume Historical



Source: Aliceweb

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New Power Planning Propositions

- High wind power capacity starting and lower water reservoirs at new big Hydro means urgent thermal plant complementation
- Lack of peak hours supply is increasing minimum natural gas dispatch to 30 % minimum after 2018 / 19
- Next 4 A-5 Auctions (2016 to 2019) need to contract Thermal Plants (Biomass, Coal and Natural Gas) ➔ 1,5 to 2 GW each year
- Potential 6 to 8 GW new market to natural gas ➔ 28 to 38 Mm3/d new capacity (trends to be 50% firm and 50% flex)
- Government moves to more friendly to natural gas power auctions (new formula permitted – mix of indexation references, pre dispatch advice and revolving reservoirs time guarantee from supply)

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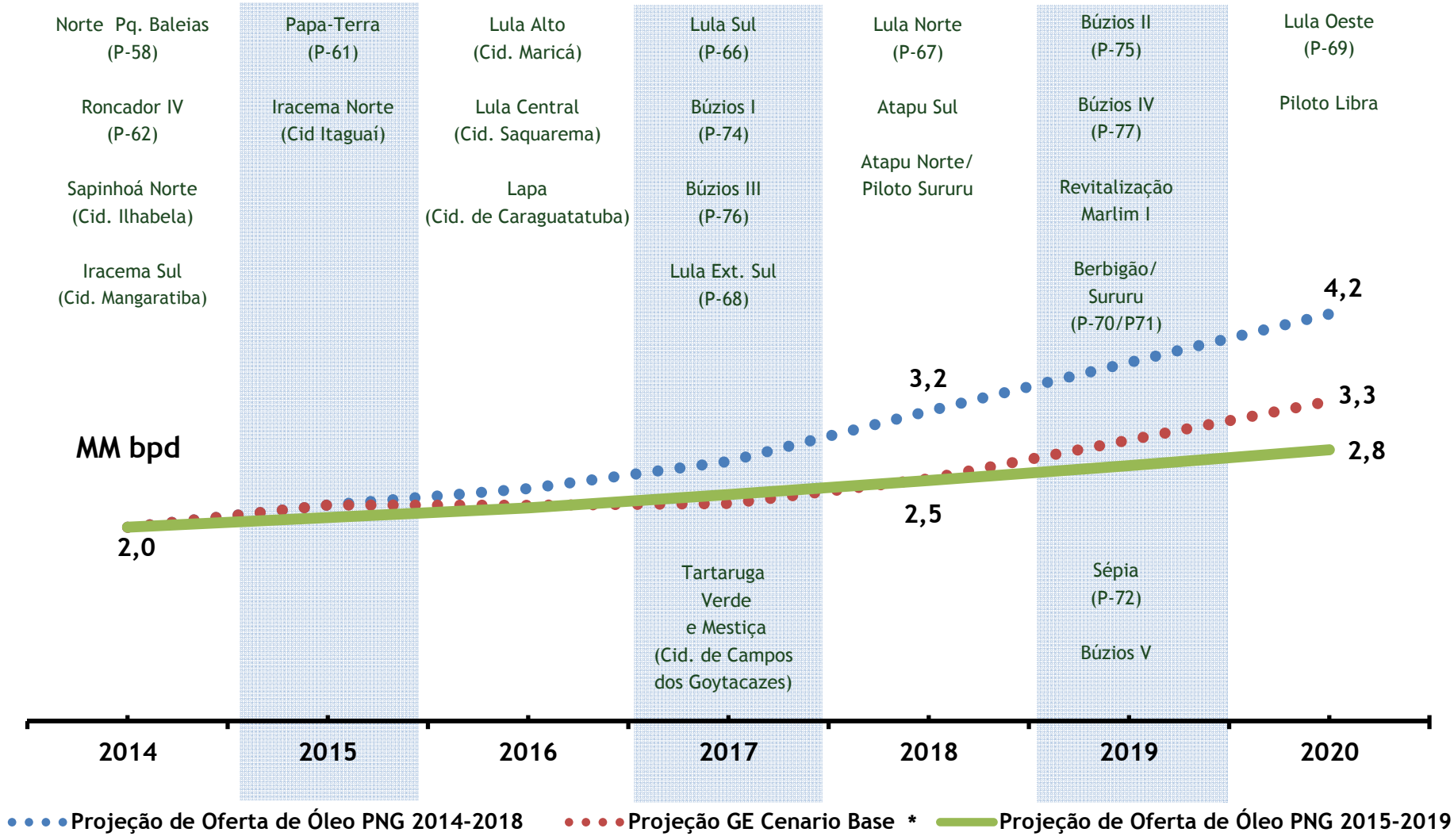
Petrobras Investment Constrains ➔▫ Delay NG from Pre Salt and sell Assets

Projeção de Oferta de Óleo - GE / PNG 2015-2019



* Projeção GE anterior ao PNG 2015-2019

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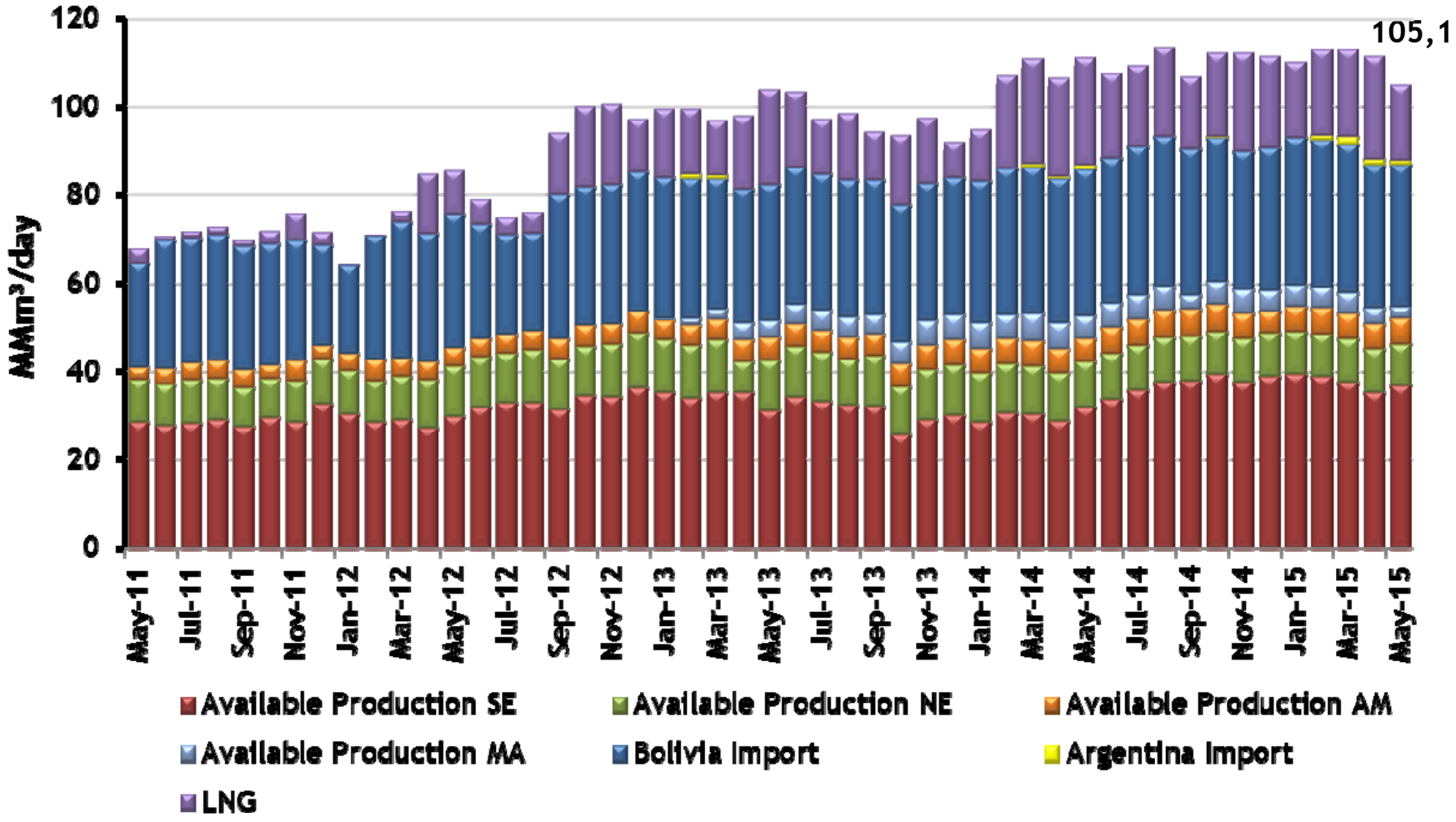
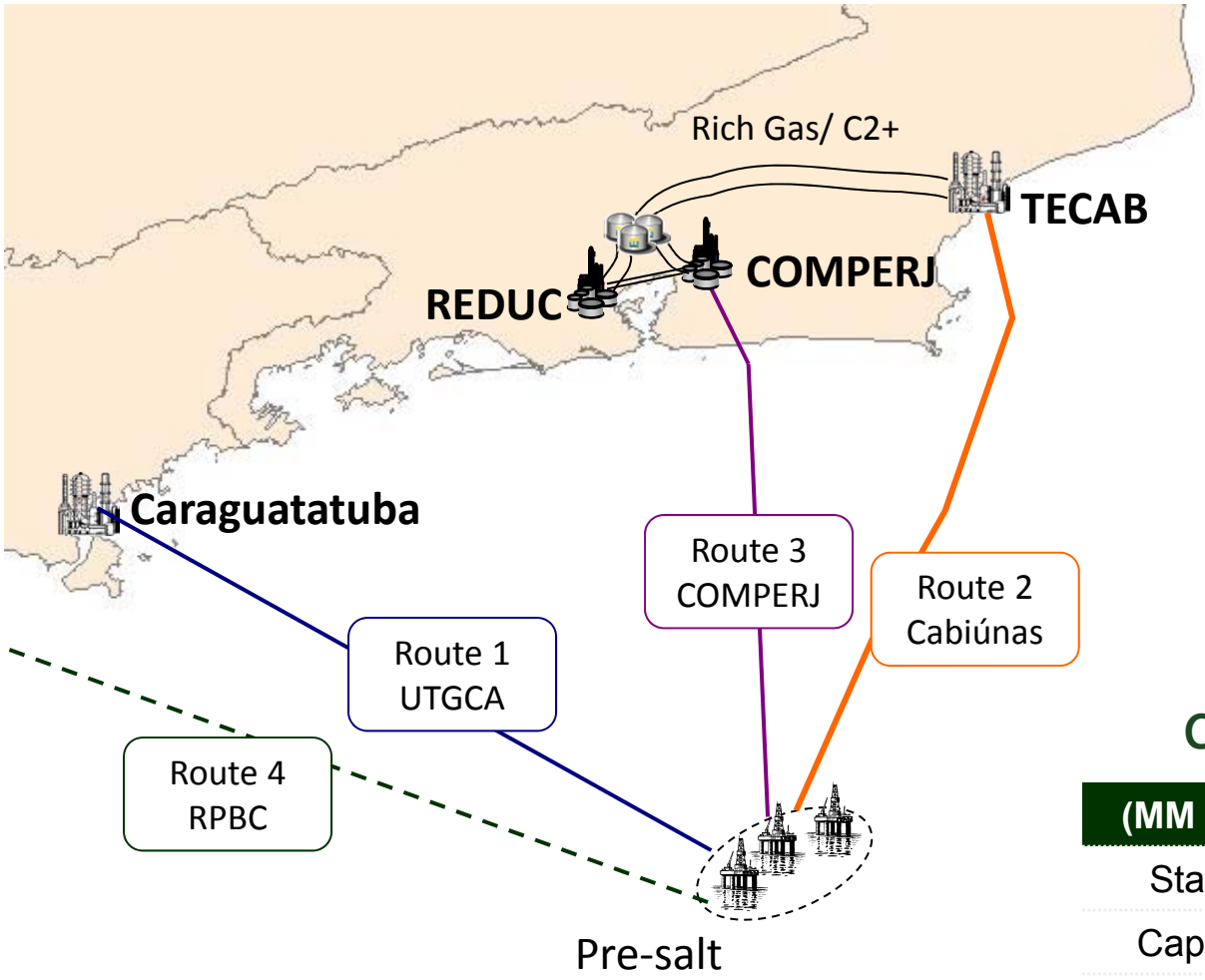
Brazilian Historical Evolution Natural Gas Supplying



Source: ANP. MME.

Pre-Salt Gathering Routes



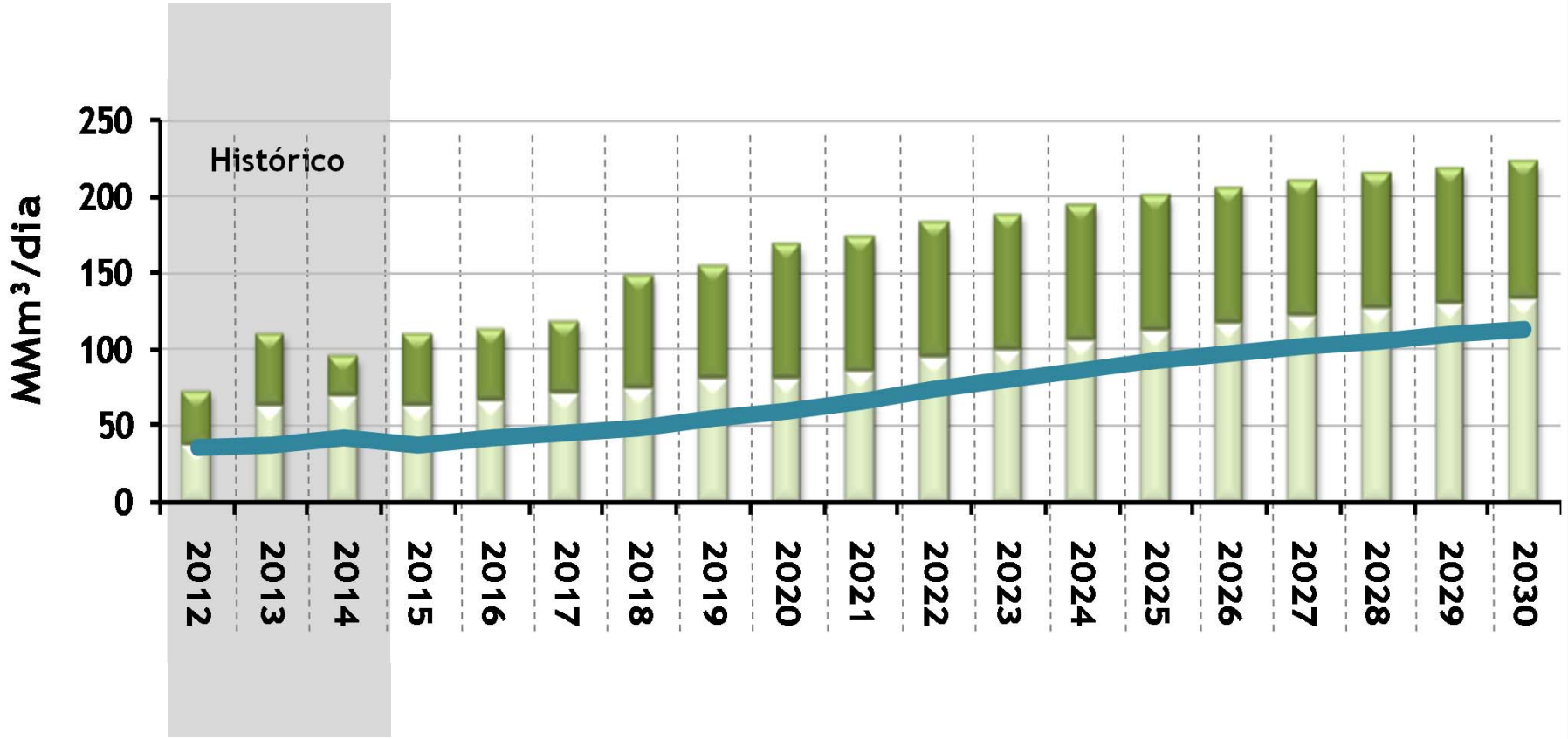
Rote 4 is also being studied by Cosan and Shell. Its planned capacity is 15 MMm³/d and It will connect Pre-salt to Cubatão (SP).

COMPERJ was recently delayed to October 2017 by Petrobras.

Current Gathering: 2,271 km

(MM m³/d)	Route 1	Route 2	Route 3
Startup	Sep/11	1st Q/16	Oct/18
Capacity	10	16	18
Processing	10	13	21

Gas Energy ➔ Supply Projection Model Results



Flex Sypply: LNG plus Bolivia Flex Bolivia (after ToP)

Firm Supply: Net Domestic Gas production plus Bolivia ToP

Net Domestic Gas Production = Natural Gas bring to coast - LGN's - Transport Consumption - Loss

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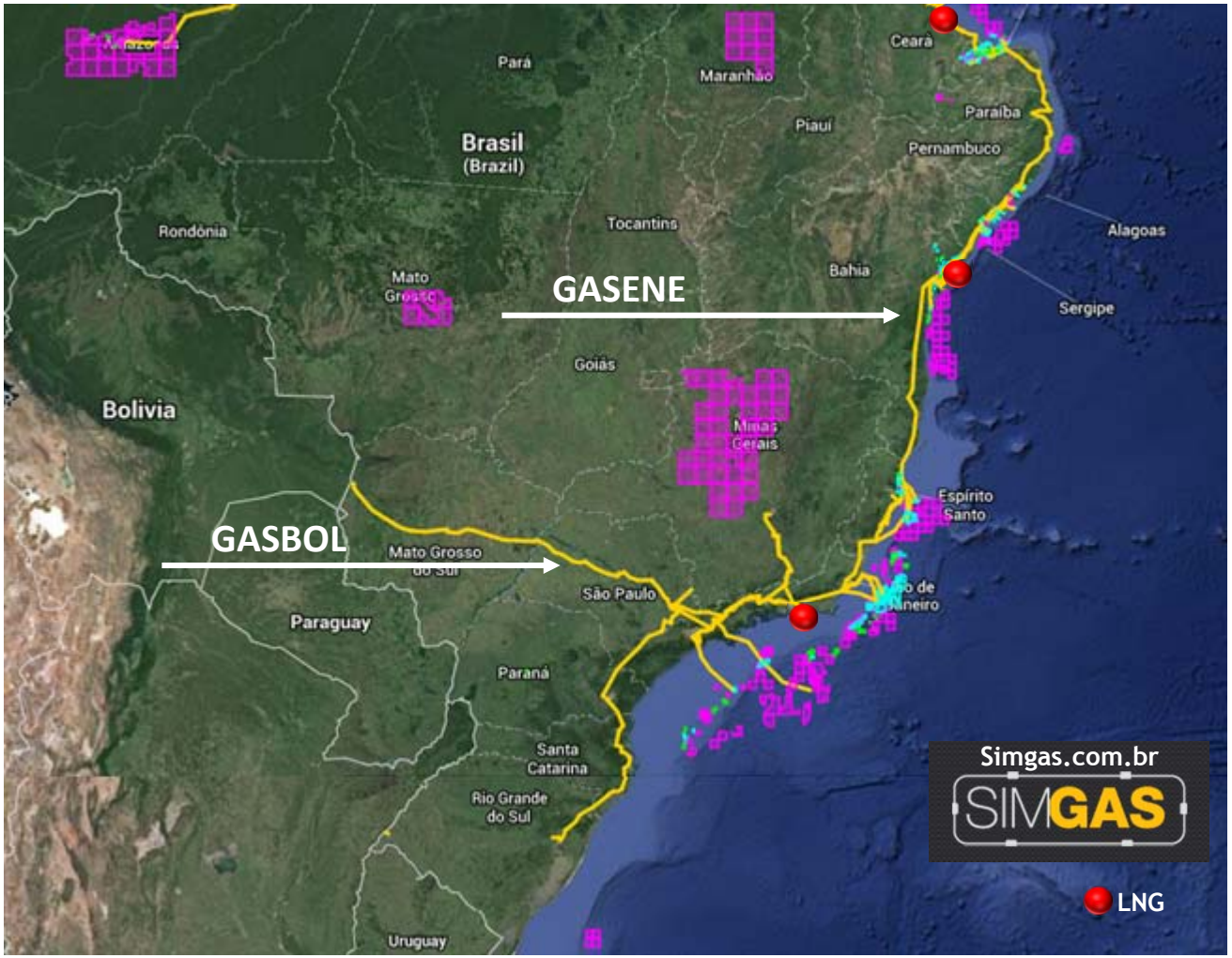
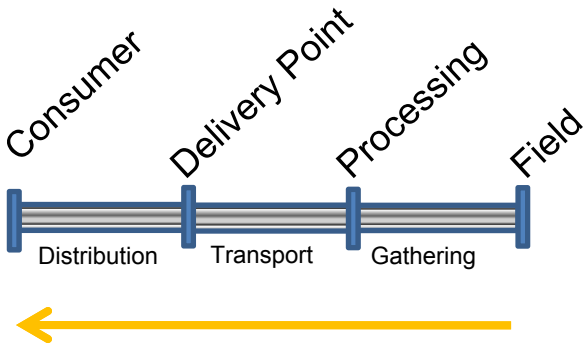
Brazil Natural Gas Network Transport Map – PB propose to sell transport pipelines and Distco's participation



Pipelines:

- Gathering: 2,271 km
- Transport: 9,410 km
- Distribution: 28,750 km



Source: Simgás

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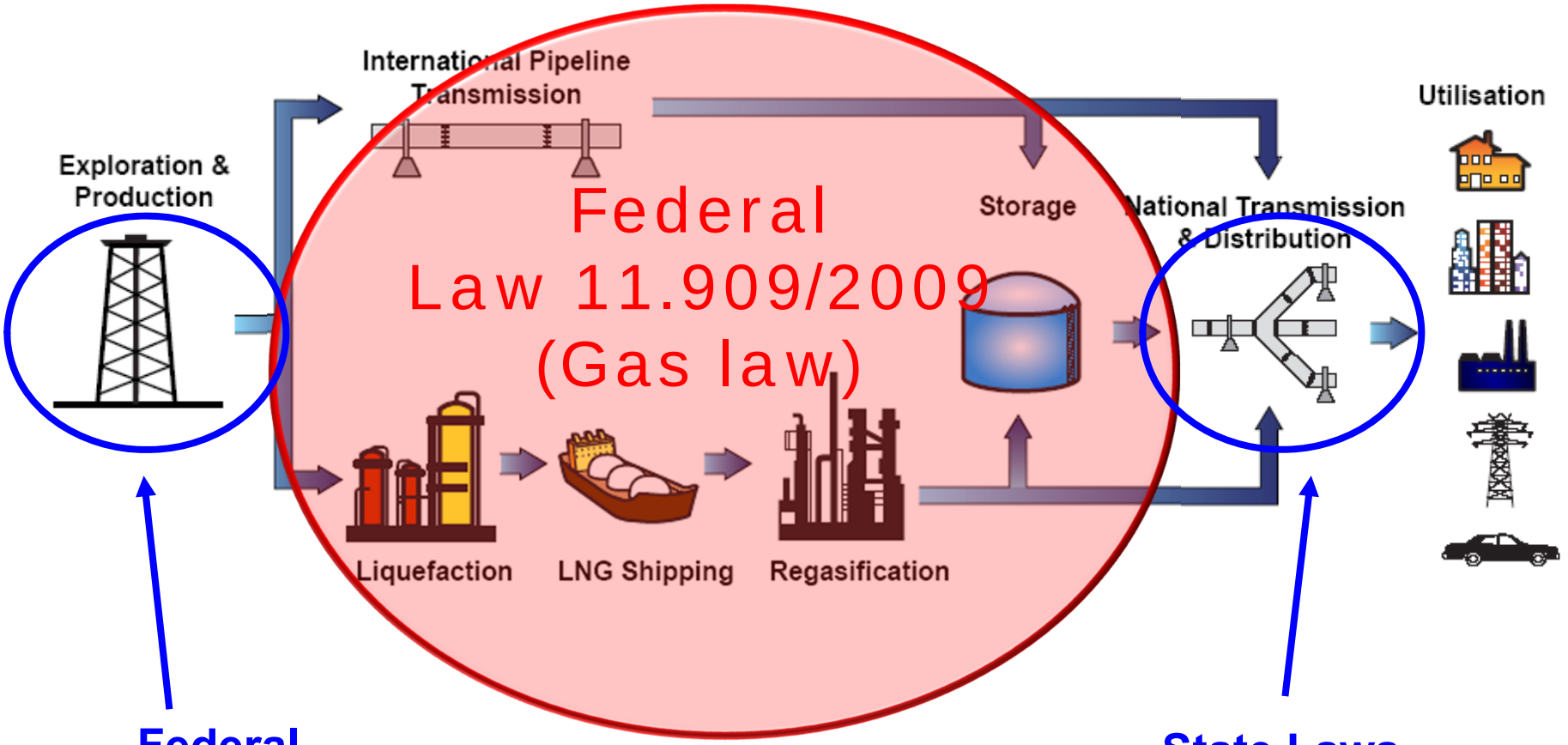
NG Law Detail Rules Finalizing 2015 ▫ First Movements to Liberalization

The 2009 Gas Law - Focusing on Midstream



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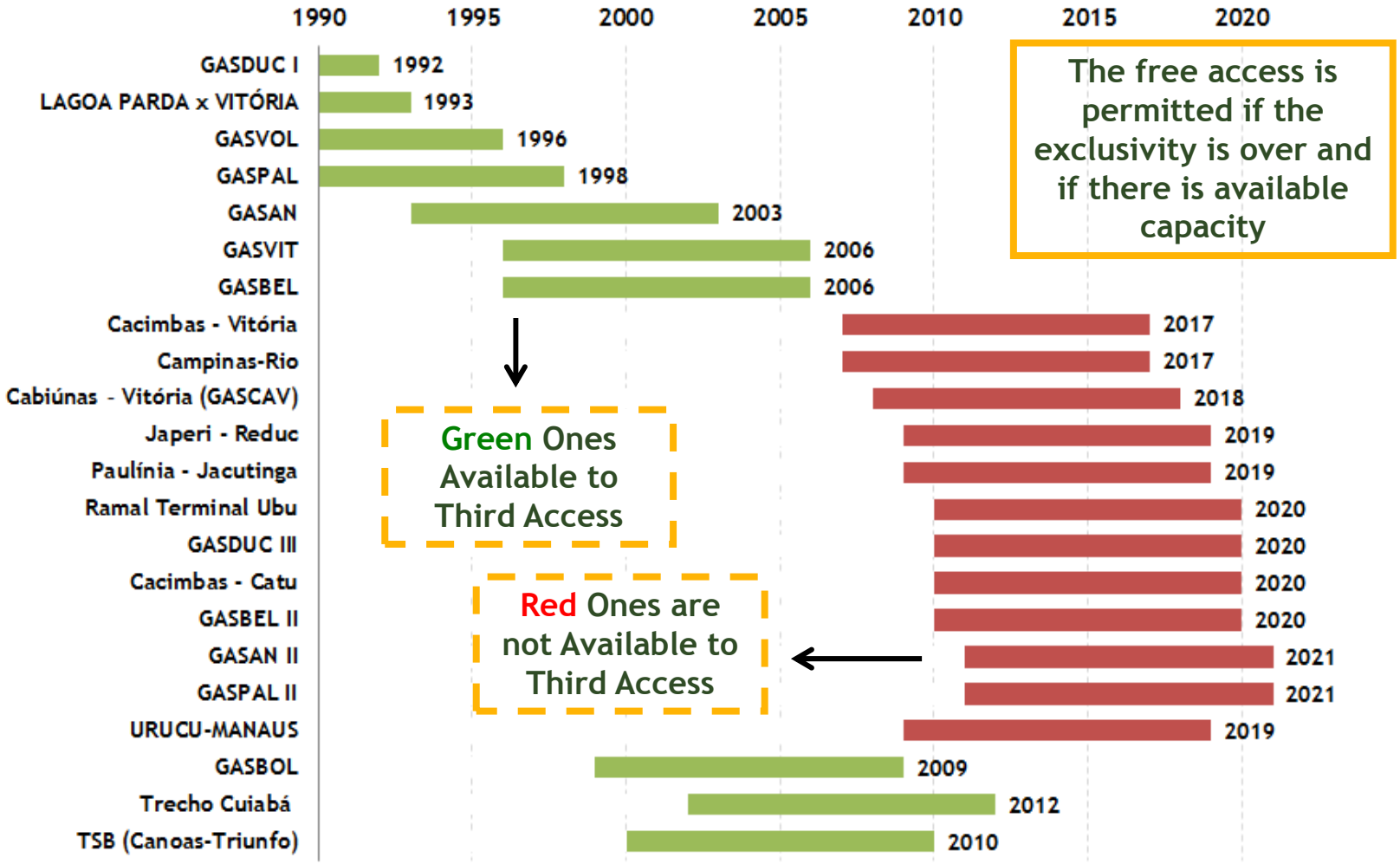
Transport Pipelines Access Possibilities - Southeast/South Regions



Source: MME

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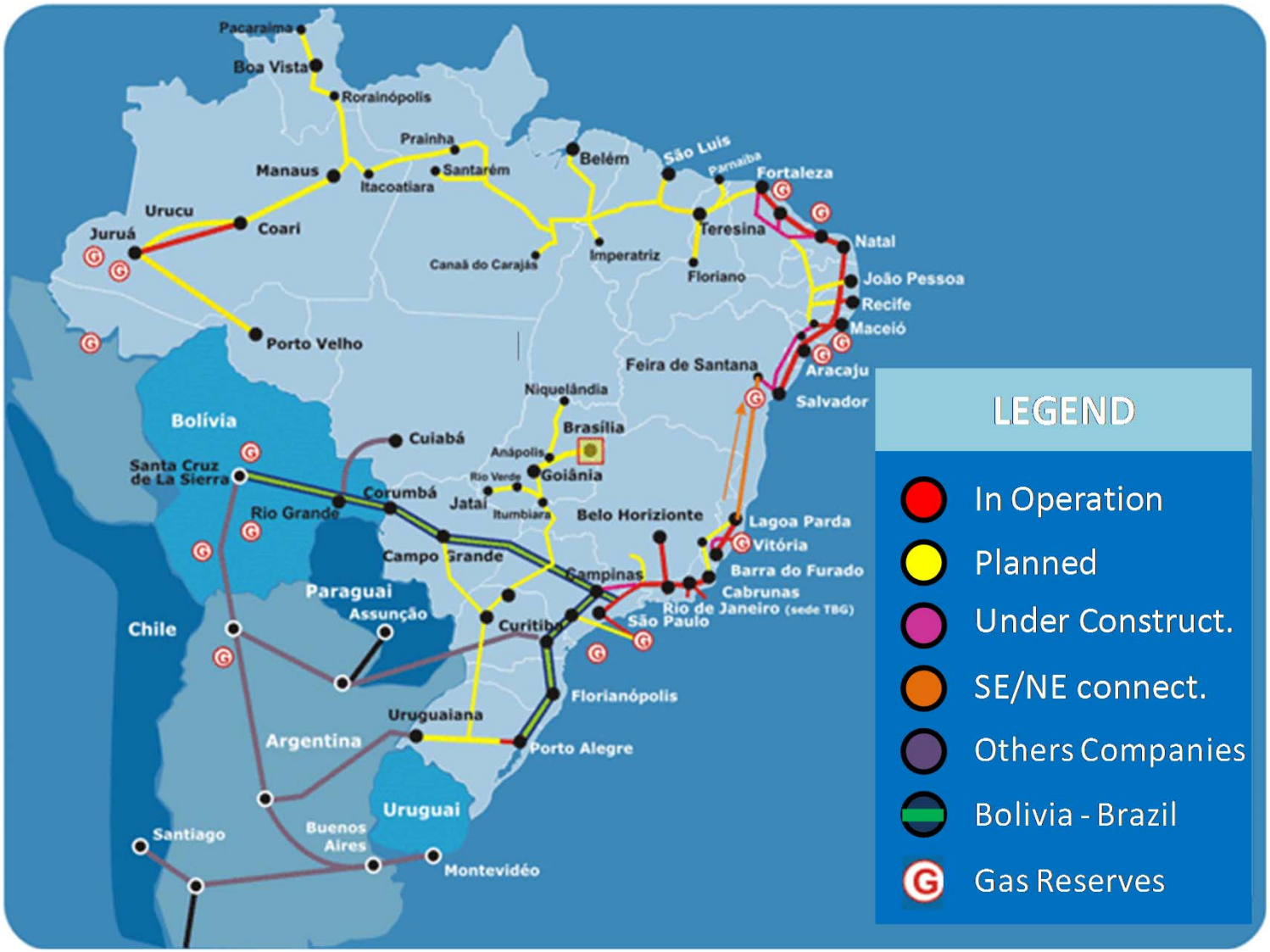
Natural Gas Network Map in Brazil (South America) ➔ need to increment gas pipeline network



Source: Abegas

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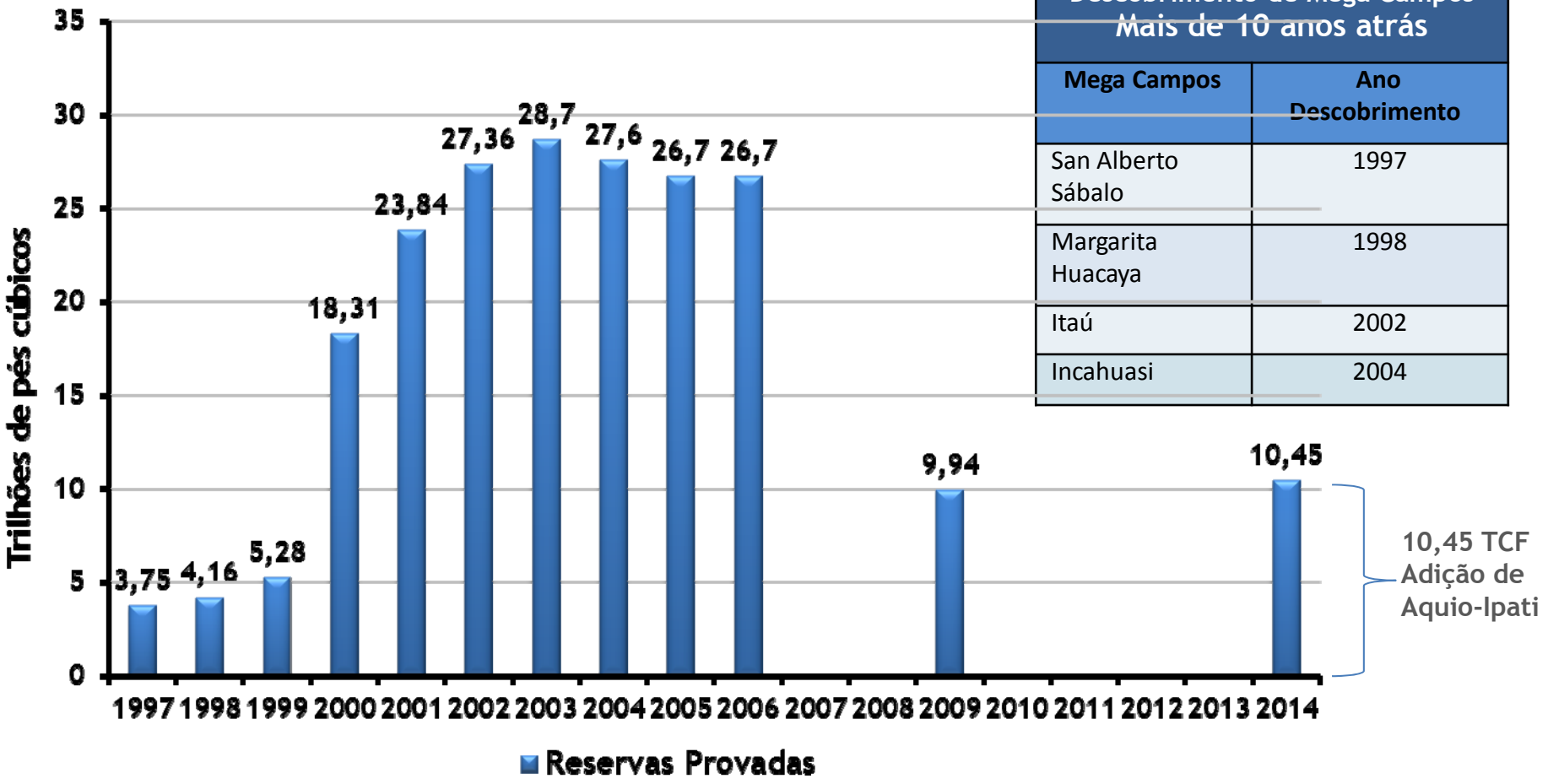
Bolivian Gas Behavior Uncertainty ➔ Brazil goes to reduce this dependency

Proved Reserves Evolution



Descobrimento de Mega Campos Mais de 10 anos atrás	
Mega Campos	**Ano Descobrimento**
San Alberto Sábalo	1997
Margarita Huacaya	1998
Itaú	2002
Incahuasi	2004

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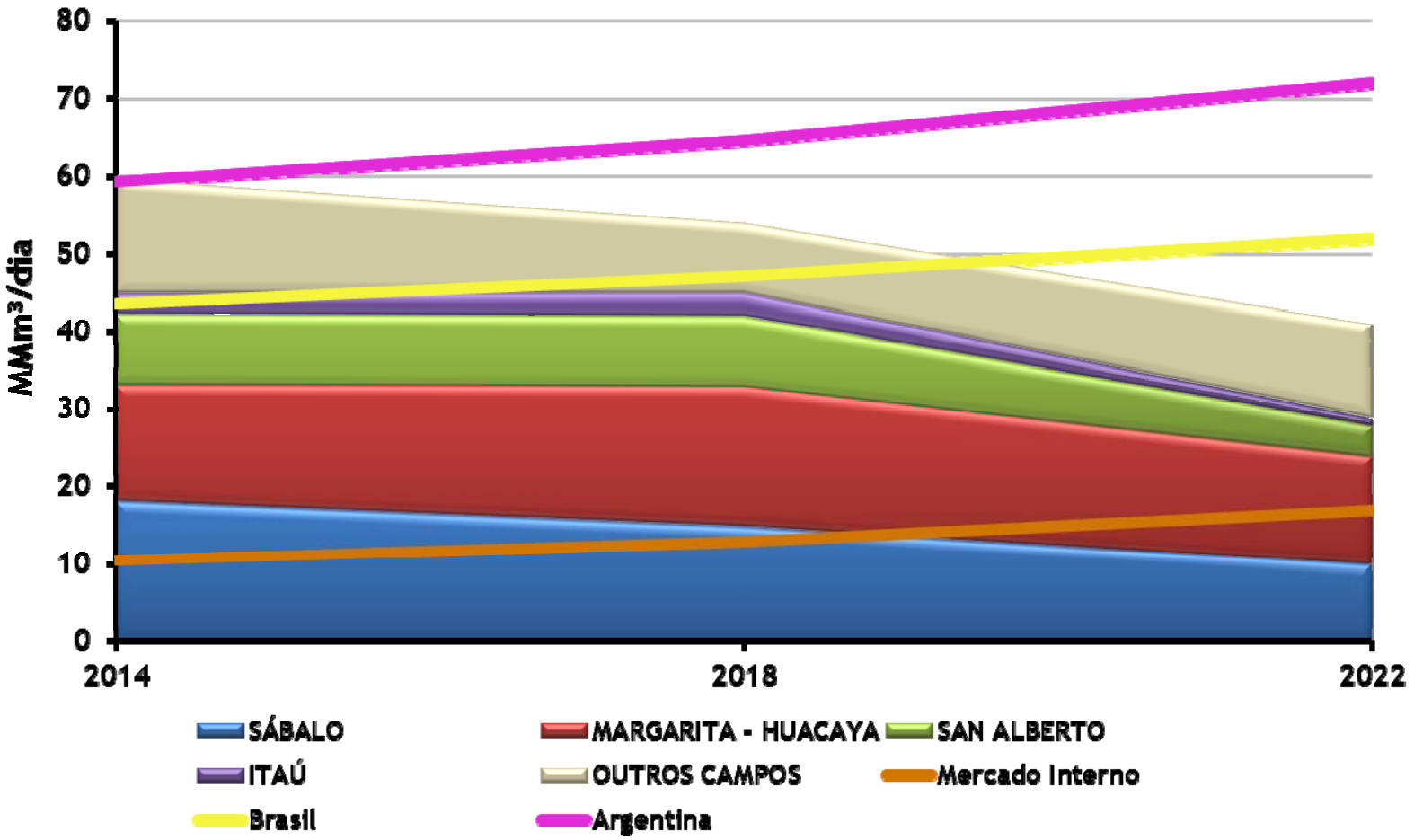
Expected Bolivian Gas Production Availability



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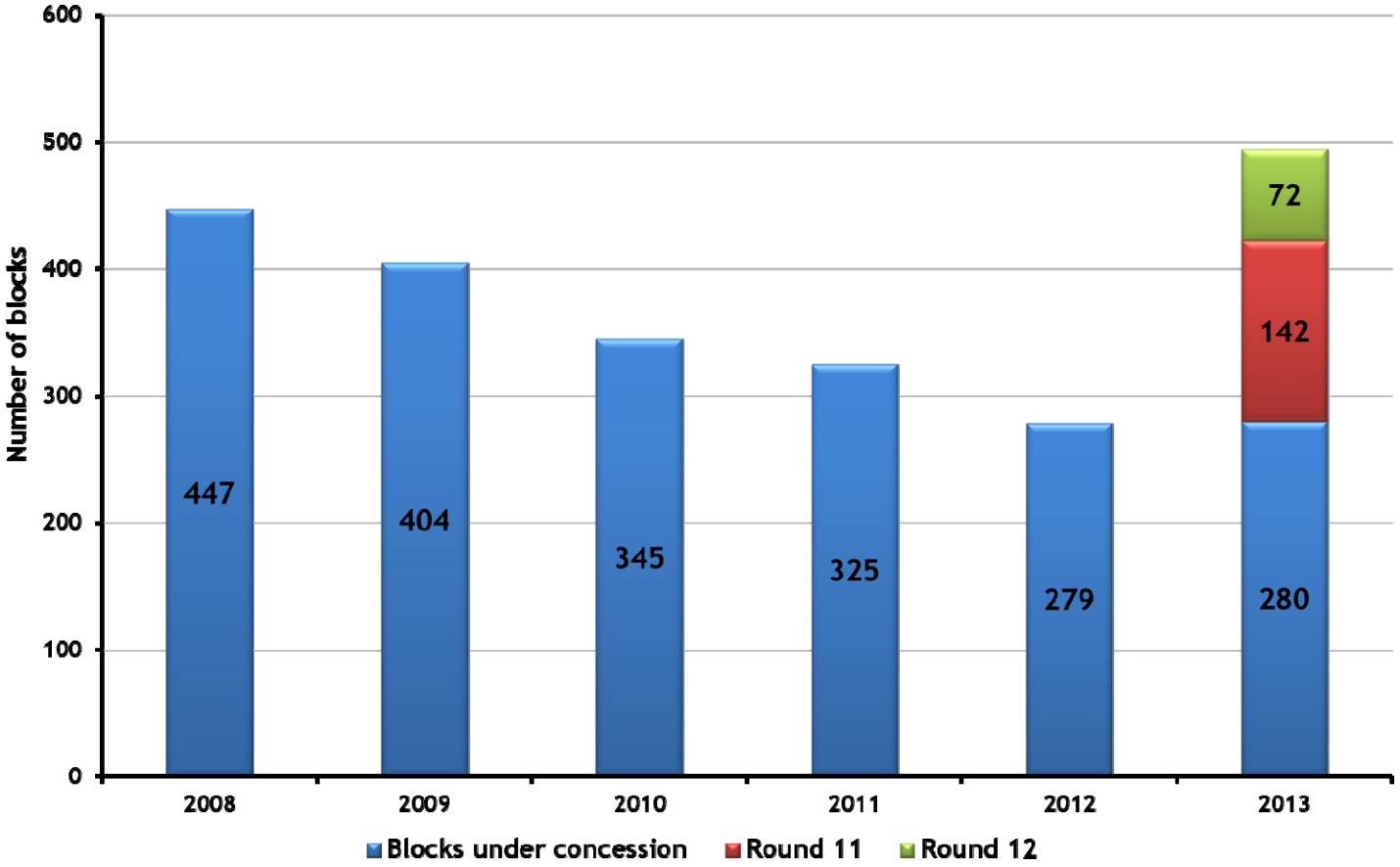
New Players Response ➔ Pre Salt and New Regas Capacity

Blocks under Concession - Historic



During the period between 2008 and 2013 there was no biding rounds → The absence of further rounds may compromise the expansion of production.

Source: ANP

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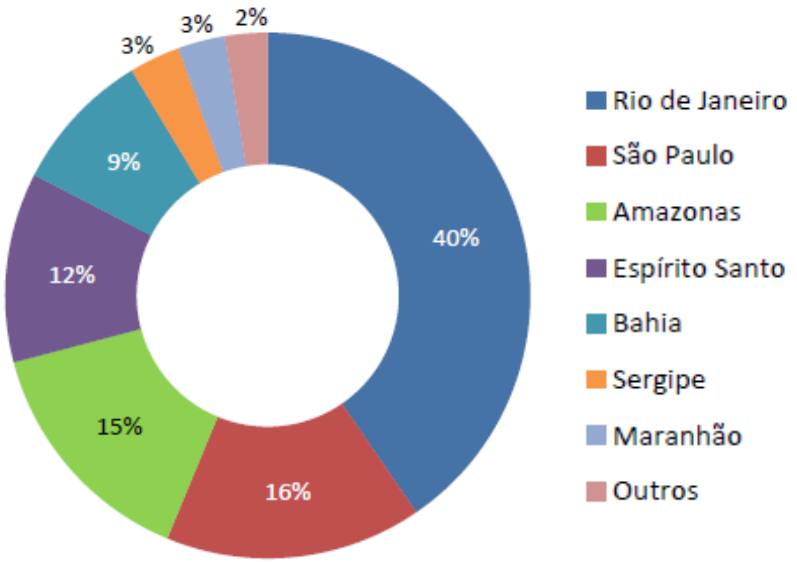
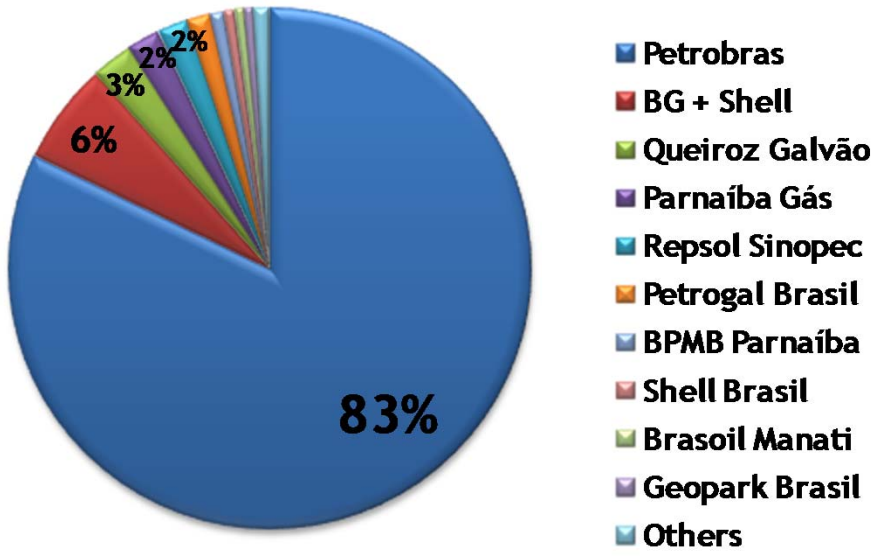
Brazil's Upstream - Briefing

- *Production:
  - Offshore fields are responsible for 93.3% of oil production and for 77.4% of natural gas production;
  - Petrobras is responsible for 93.0% of oil and natural gas production;
  - The national gross natural production in May/15 was 93.1 MMm³/day , which 74.4% were from associated fields;
  - E&P, Flare and Reinjection were 12.1, 3.2 and 23.2 MMm³/day, respectively, which resulted in a net gas natural production of 54,7MMm³/day.





* Data from May/2015. Sources: ANP, MME.

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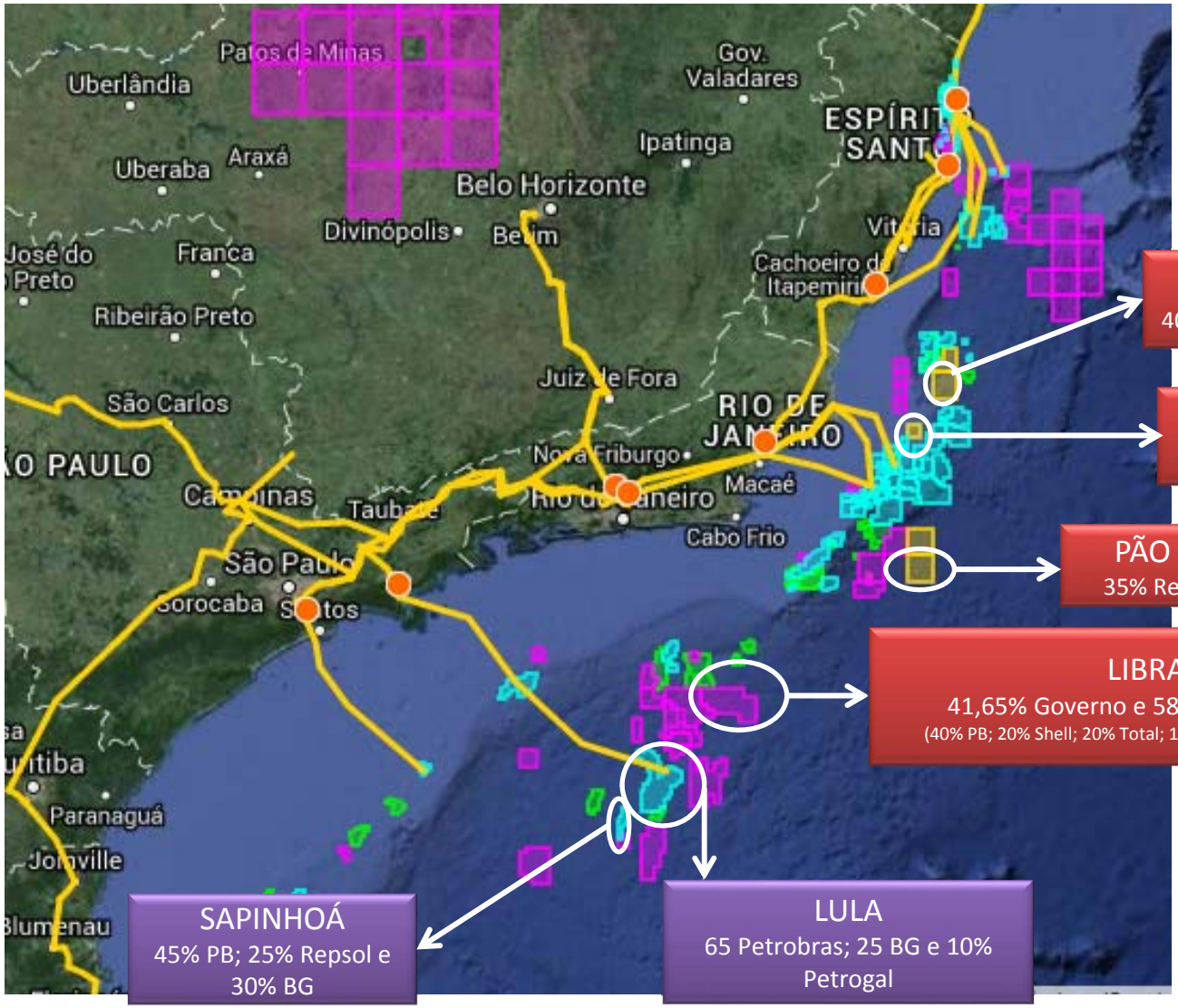
Overview – Main New Players and Potential Blocks



ITAIPU (BM-C-32)
40% BP; Anadarko 33% e Maersk 27%

BM-C-29
50% Anadarko e 50% Ecopetrol

PÃO DE ACÚCAR (BM-C-33)
35% Repsol (op); 35% Statoil e 30% PB

LIBRA
41,65% Governo e 58,35% Consórcio
(40% PB; 20% Shell; 20% Total; 10% CNPC e 10% CNOOC)

SAPINHOÁ
45% PB; 25% Repsol e 30% BG

LULA
65 Petrobras; 25 BG e 10% Petrogal

Under Production

Blocks (under exploration)

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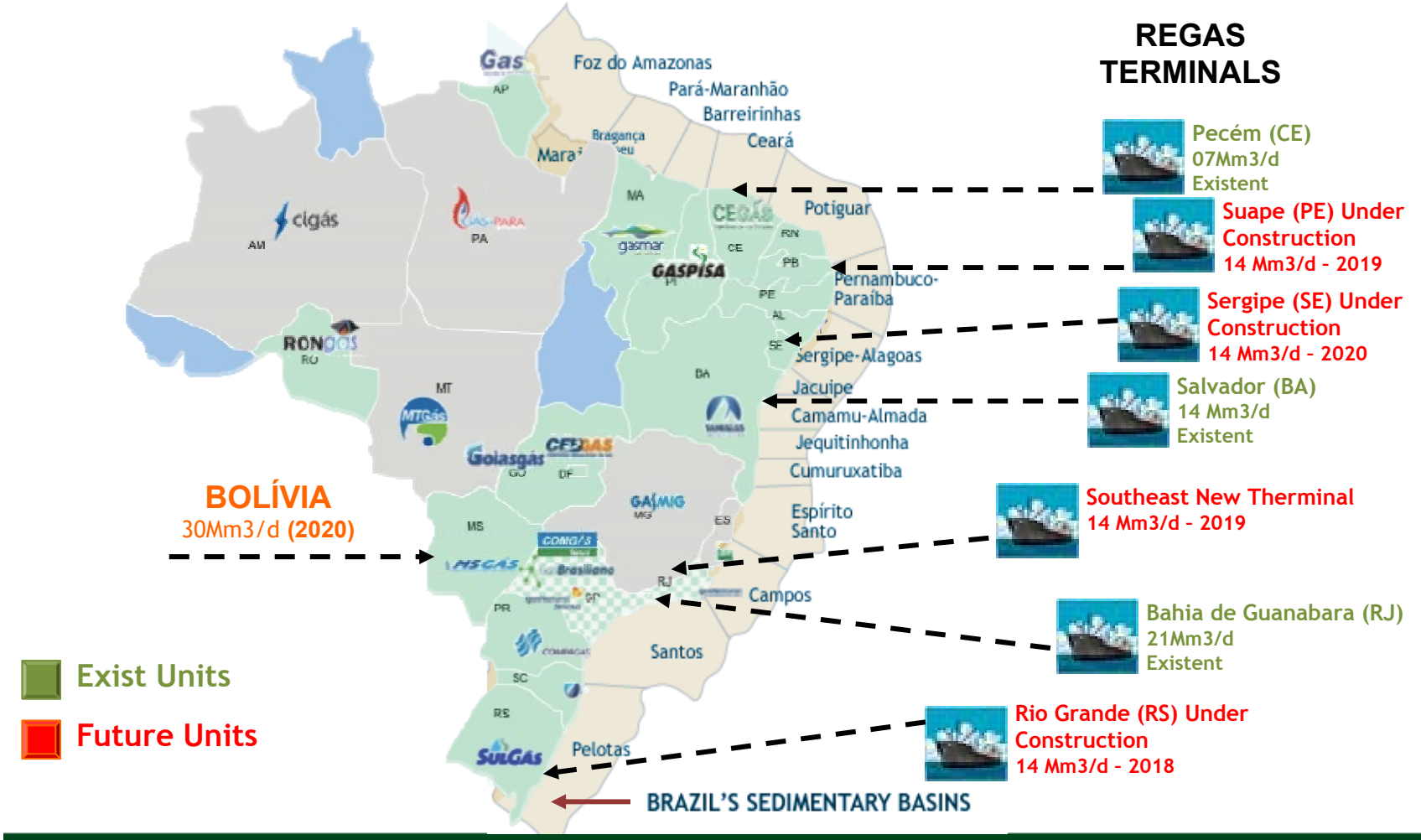
Natural Gas Sources of Supplying

Sedimentary Basins; Main import Pipeline (Bolívia) and Regasification Import Terminals



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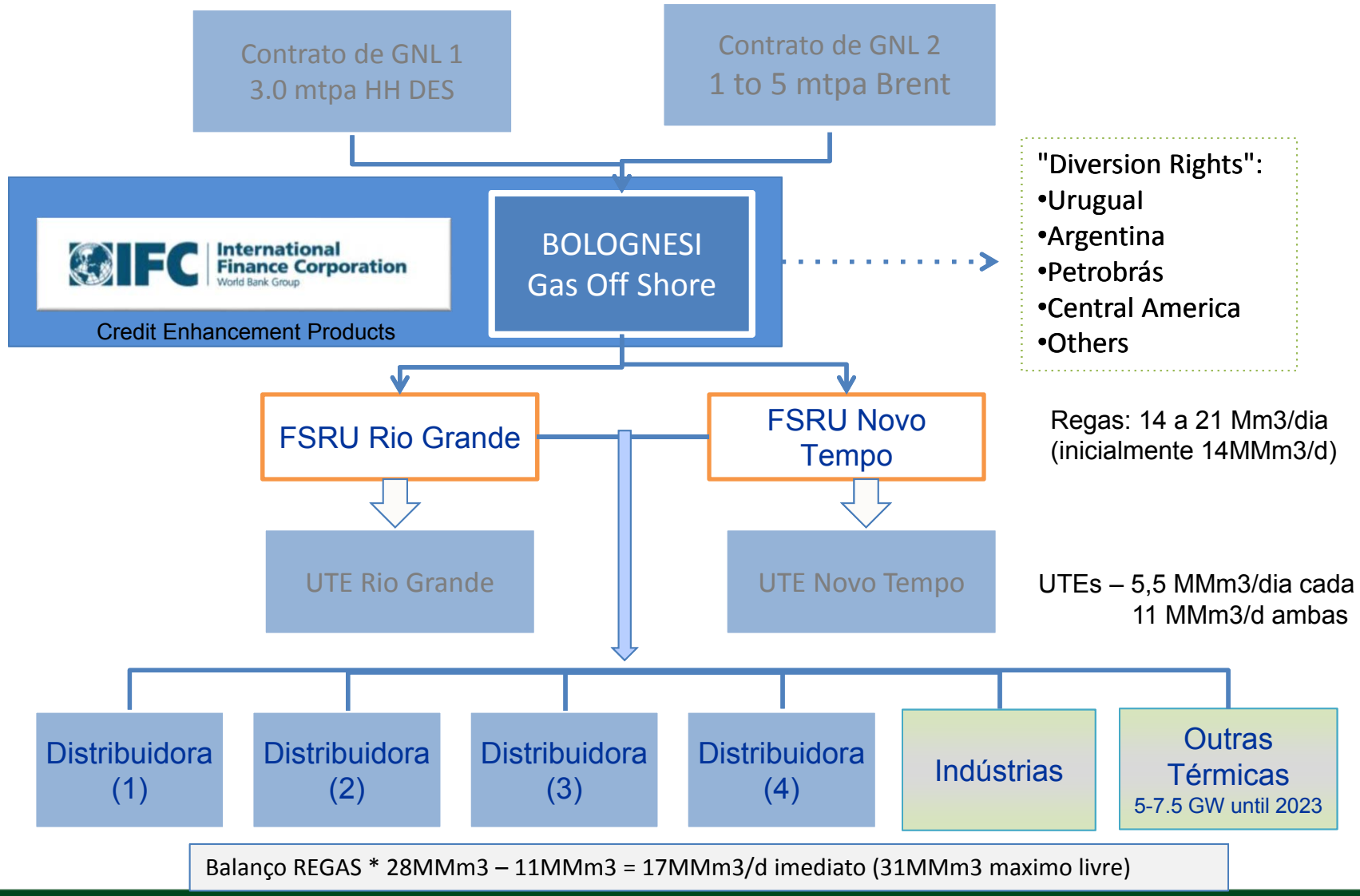
Bolognesi LNG Partnership



Balanço REGAS * 28MMm3 – 11MMm3 = 17MMm3/d imediato (31MMm3 maximo livre)

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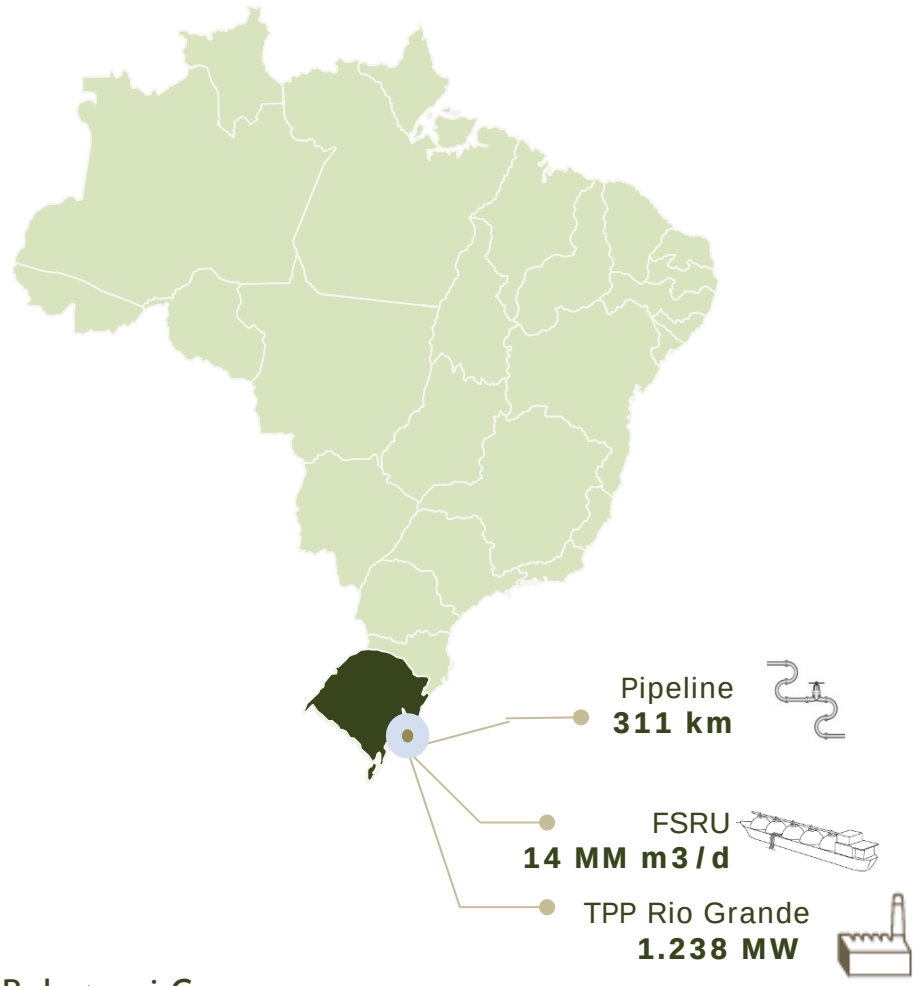
Integrated Project Gas & Energy at Rio Grande

Rio Grande Project Location



Bolognesi Group

Rio Grande Project Description

- Integrated project to provide power and natural gas supply solution for the southern region of Brazil, composed of:
  - **Thermal Power Plant Rio Grande:**

    Type: Combined Cycle, with high efficiency

    Fuel: Natural Gas

    Consumption: 5.5 MM m^3 / day

    Power: 1,238 MW

    Energy Sales Agreements in the Regulated Market effective for 25 years, from Jan / 2019

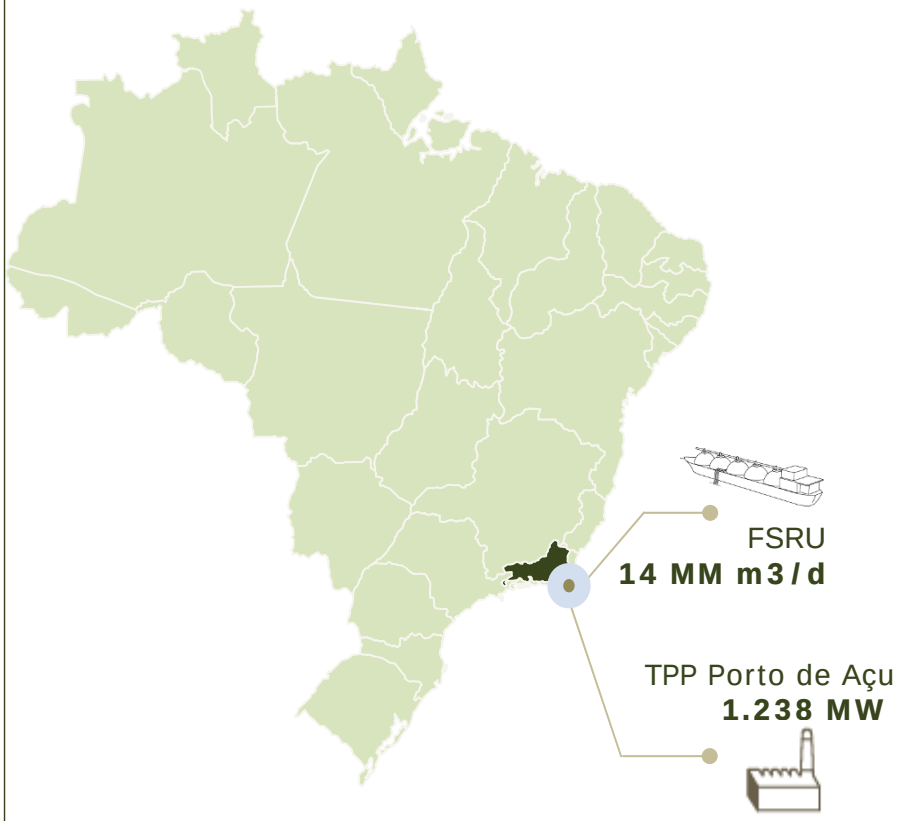
    It will be the anchor client of Rio Grande Regas Terminal
  - **Regas Terminal Rio Grande:**

    Terminal with FSRU 14 MM m3 / day to supply the UTE Rio Grande, as well as gas distribution, thermal and other industrial customers, with operation beginning in 2018.
  - **Pipeline Rio Grande-Triunfo:**

    Gas pipeline of 311 km and 24 " linking Rio Grande in Brazil gas pipeline network in Triunfo, which is being developed in parallel through gas transportation bid

Integrated Project Gas & Energy at Southeast

Porto de Açu Project Location



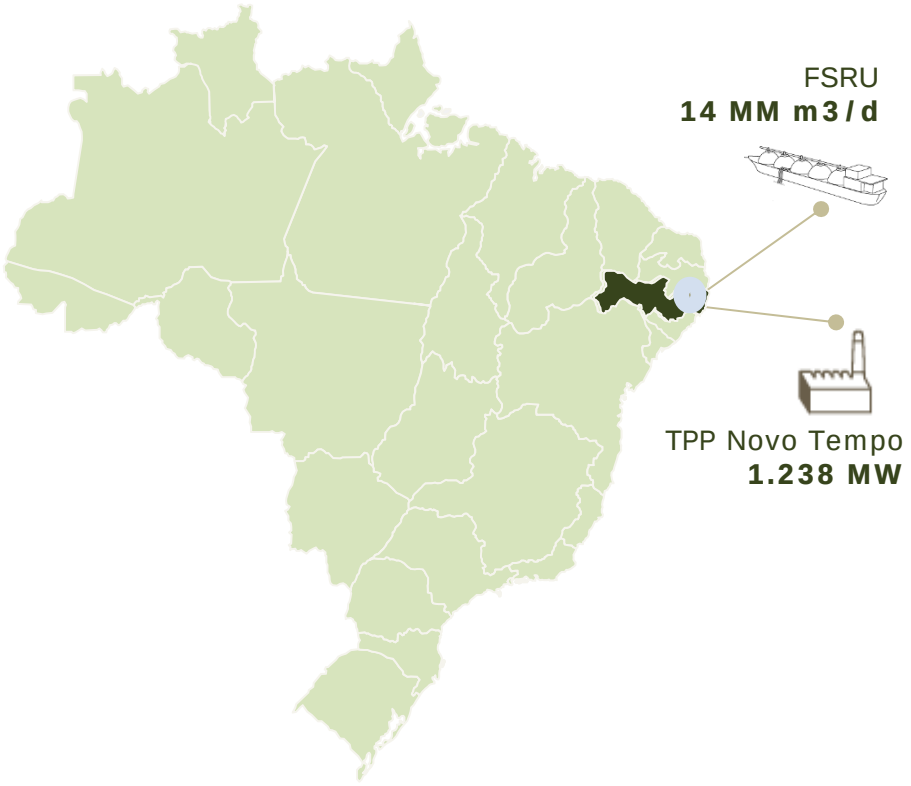
Bolognesi Group

Porto de Açu Project Description

- The main project consists of the construction of a thermoelectric gas and the installation of an FSRU.
- According to the terms of trade, the Bolognesi will rent an area of up to 400,000 m^2 in the port of Açu for a period of 25 years with possibility of renewal for another 25 years. The Bolognesi will be responsible for the construction of all necessary infrastructure for the implementation of thermal gas, including power substation, transmission line and the LNG terminal.
- With capacity to produce 14 MMm^3/d. The project should receive the natural gas that will be produced in the Santos and Campos basins.

Integrated Project Gas & Energy at Suape

Suape Project Location



Bolognesi Group

Novo Tempo Project Description

- Integrated project to provide power and natural gas supply solution for the northeast region of Brazil, composed of:

– Thermal Power Plant Novo Tempo:

Type: Combined Cycle, with high efficiency

Fuel: Natural Gas

Consumption: 5.5 MM m^3 / day

Power: 1,238 MW

Energy Sales Agreements in the Regulated Market effective for 25 years, from Jan / 2019

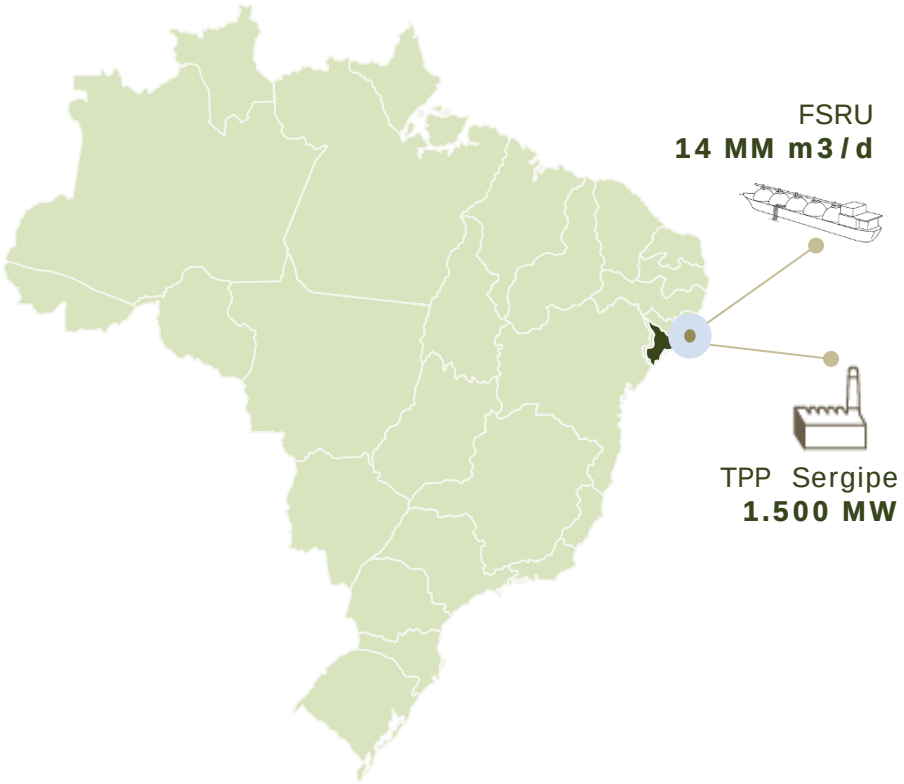
It will be the anchor client of Suape Regas Terminal

– Regas Terminal Rio Grande:

FSRU terminal with 14 MM m3 / day to supply the TPP Novo Tempo, as well as gas distribution, thermal and other industrial customers, with operation beginning in 2018. The terminal will be located at the Port of Suape, 11km distant mesh transportation pipeline in Ipojuca.

Integrated Project Gas & Energy at Sergipe

Porto de Sergipe I Project Location



Genpower Energy (49%) e Ebrasil (51%)

Porto de Sergipe I Project Description

- Integrated project to provide power and natural gas supply solution for the northeast region of Brazil, composed of:
  - **The project will have to deliver power from January 2020.**
  - **It will be supplied by a regasification terminal to be installed in Sergipe.**

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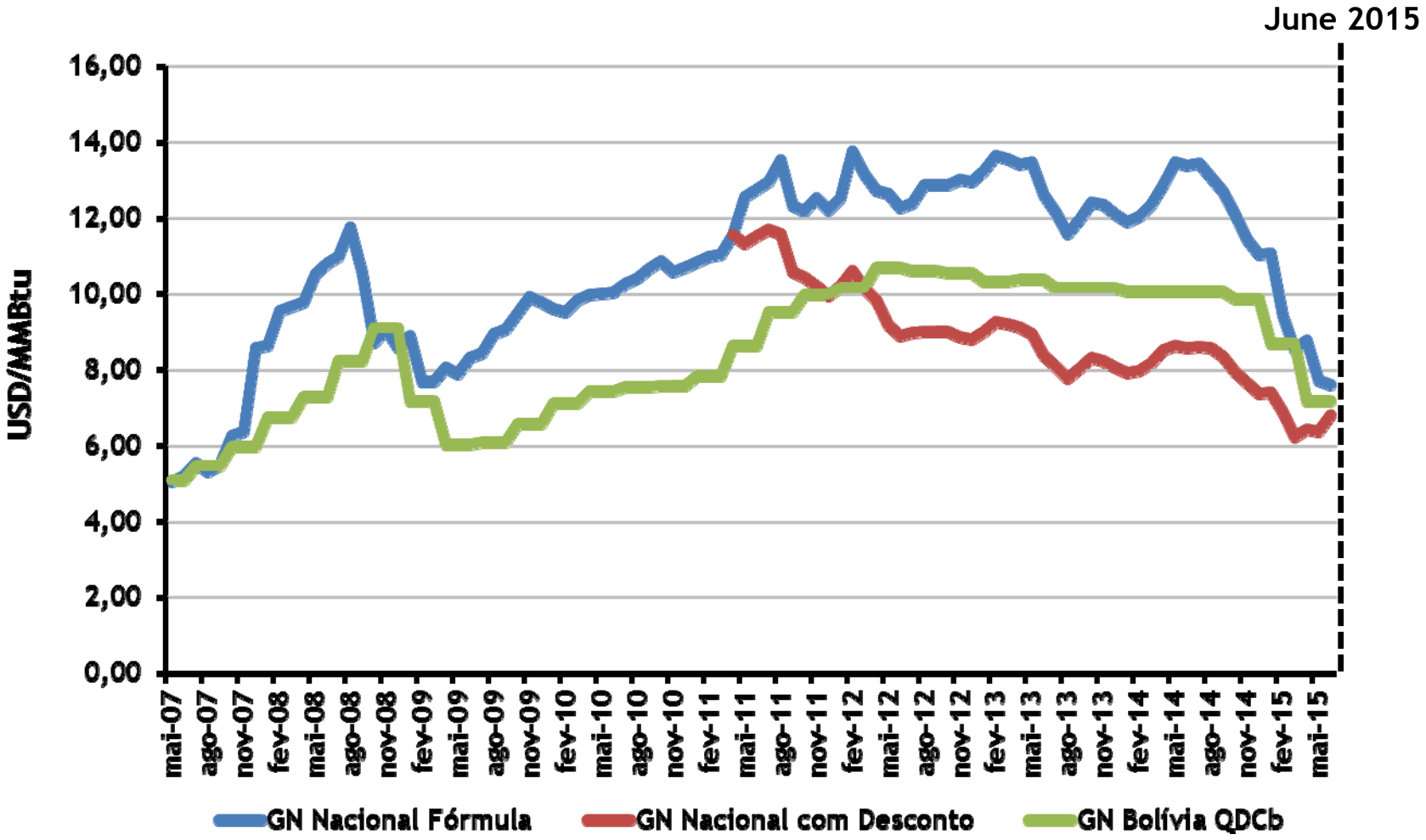
LNG Competitiveness, Flexibility and Availability ➔ Answer to Brazil bridge Pre Salt Delay

Price Historical Evolution



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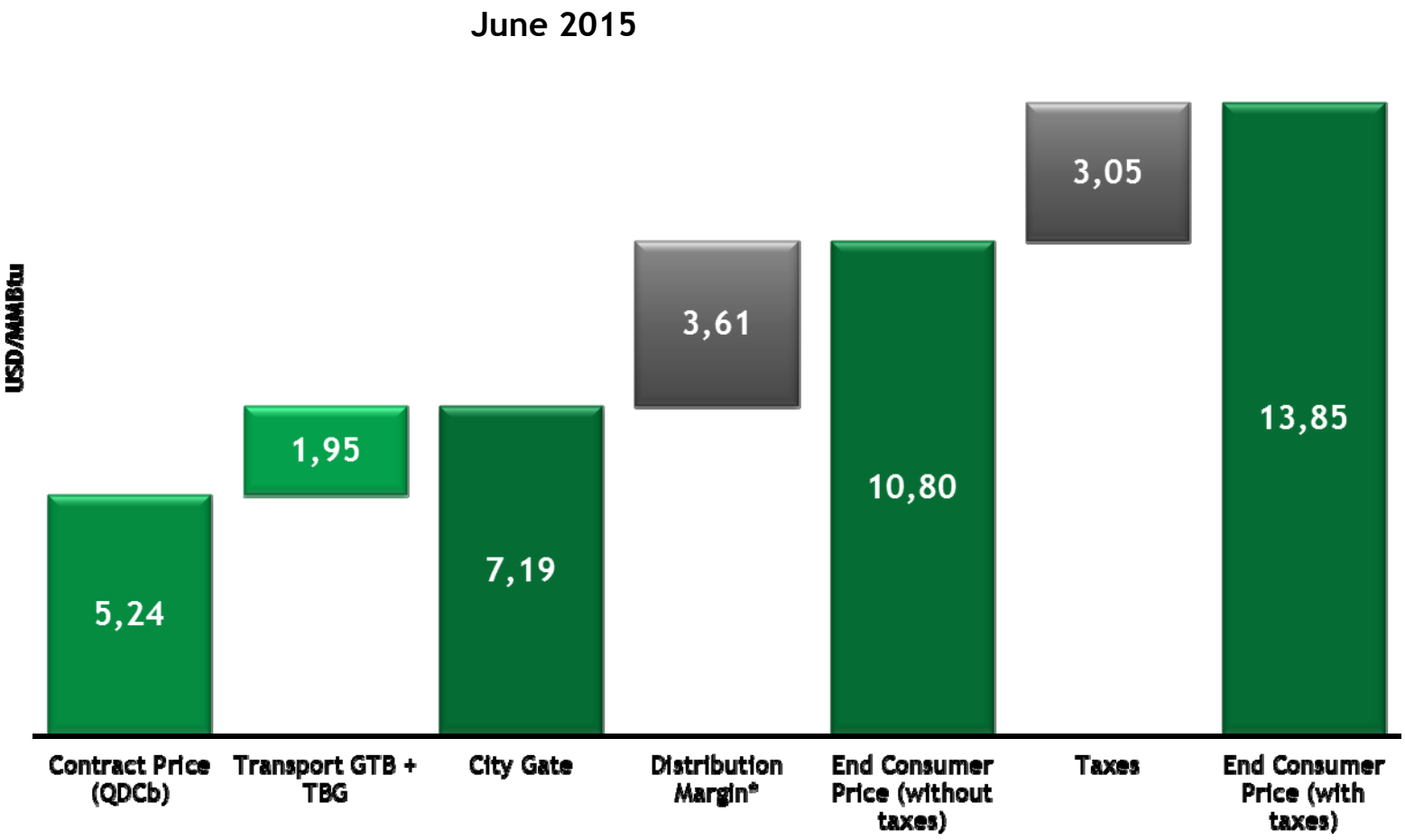
Current Bolivian Natural Gas Price Formation



*Margin for a 50.000 m³/day consumer in São Paulo (COMGAS)

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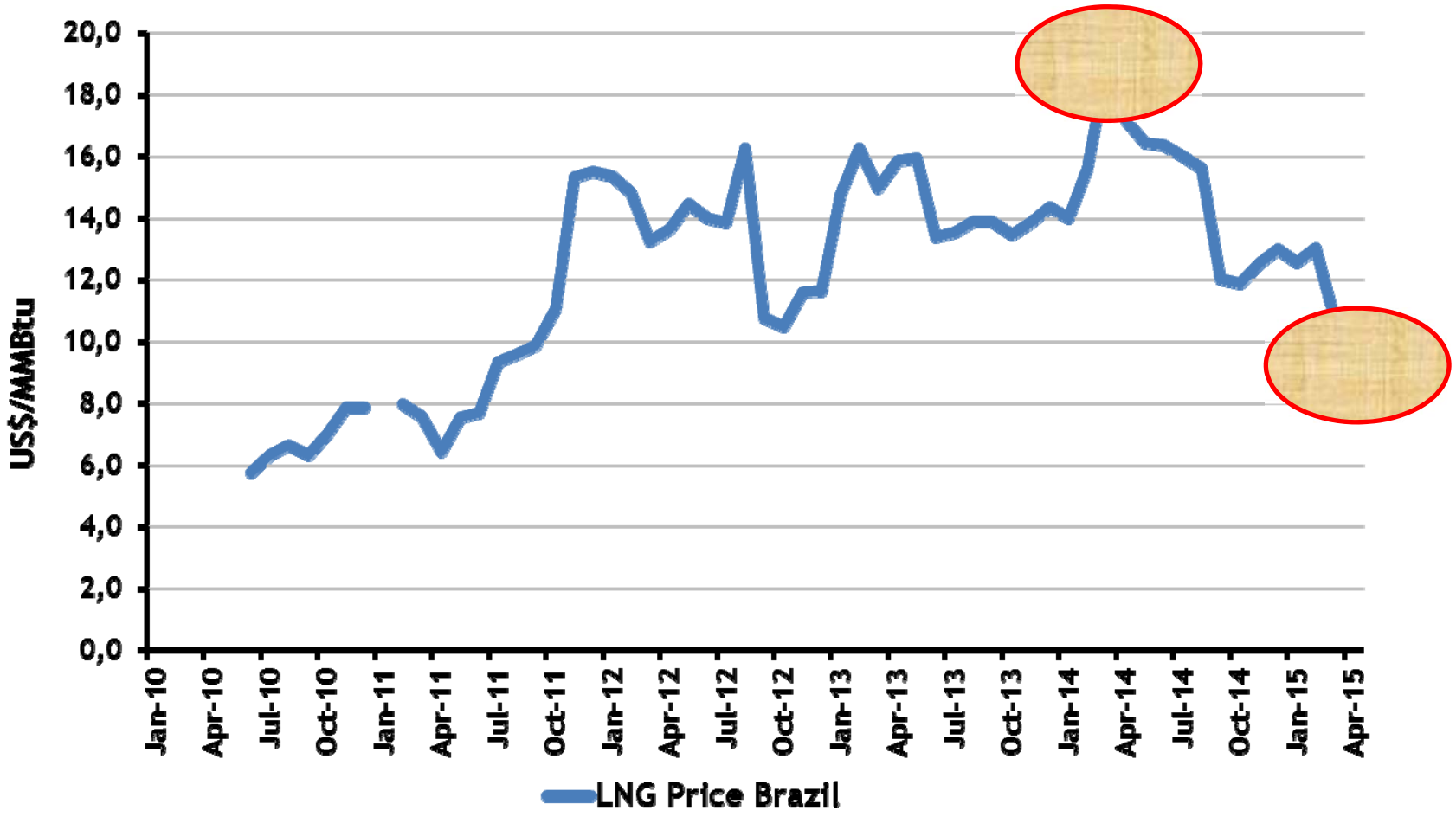
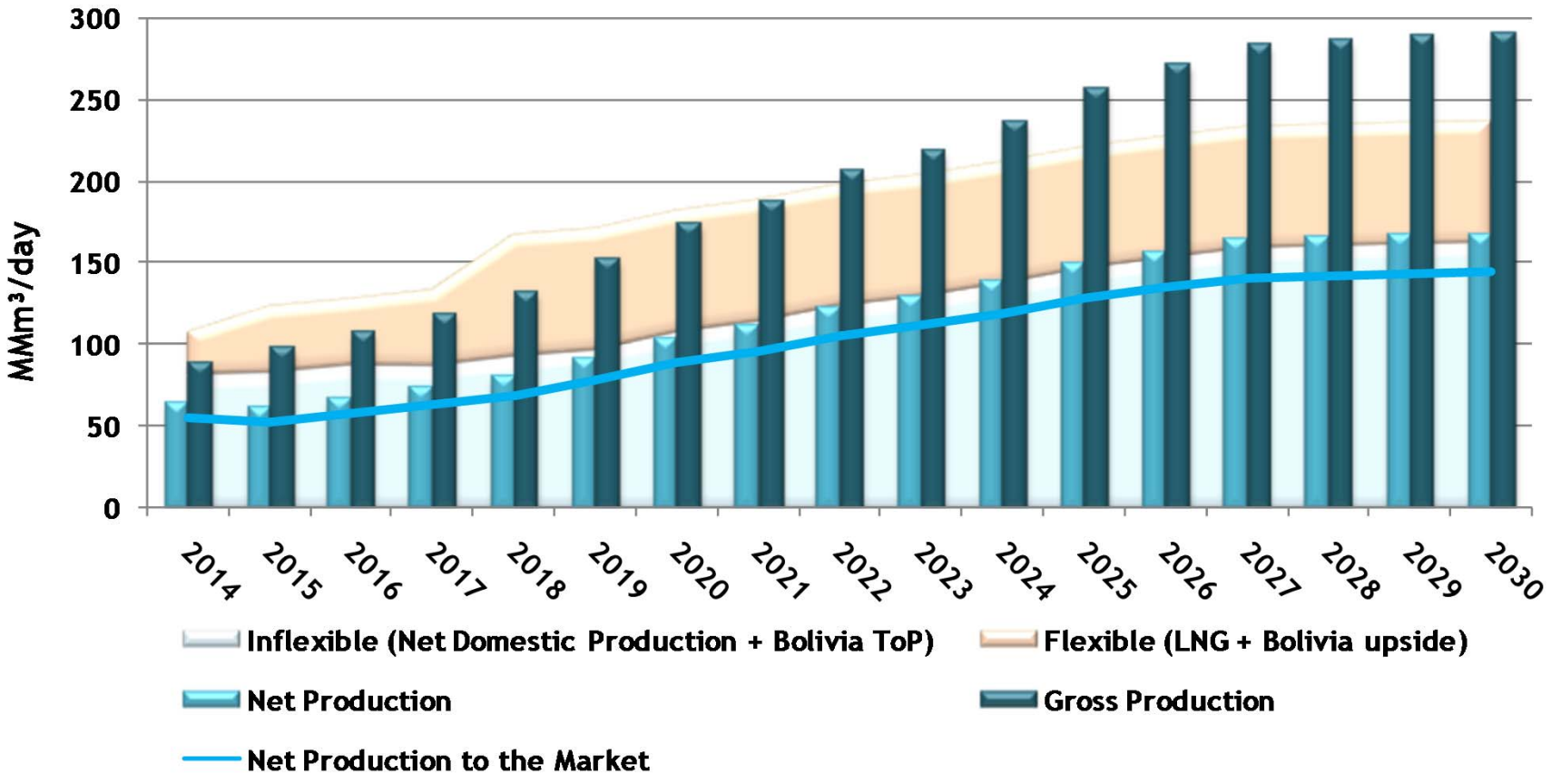
Petrobras historical range of LNG Import prices*



*FOB – average price considering all regasification terminals in Brazil

Source: AliceWeb

Forecast of Brazil Supply



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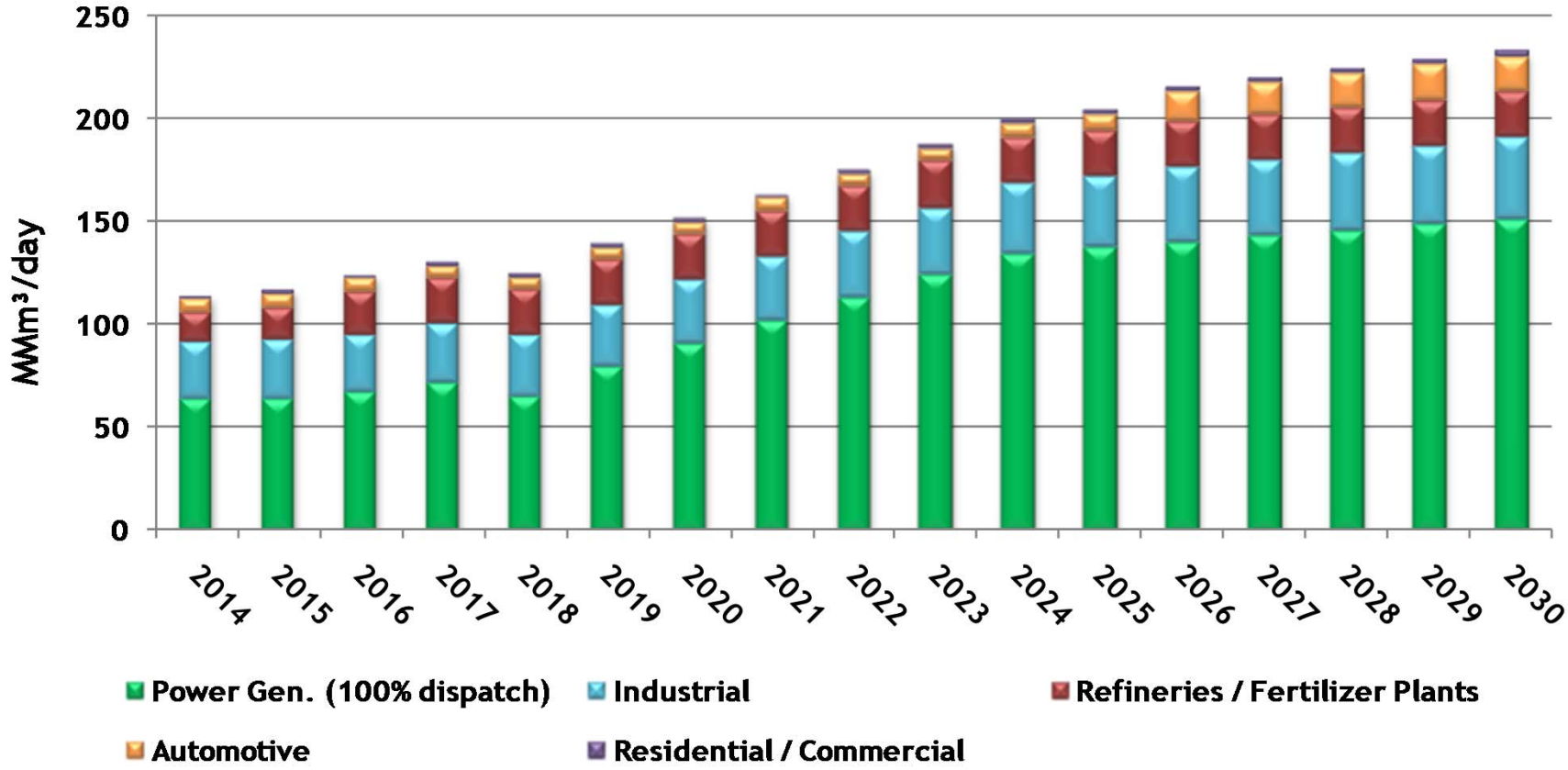
Forecast of Brazil Demand



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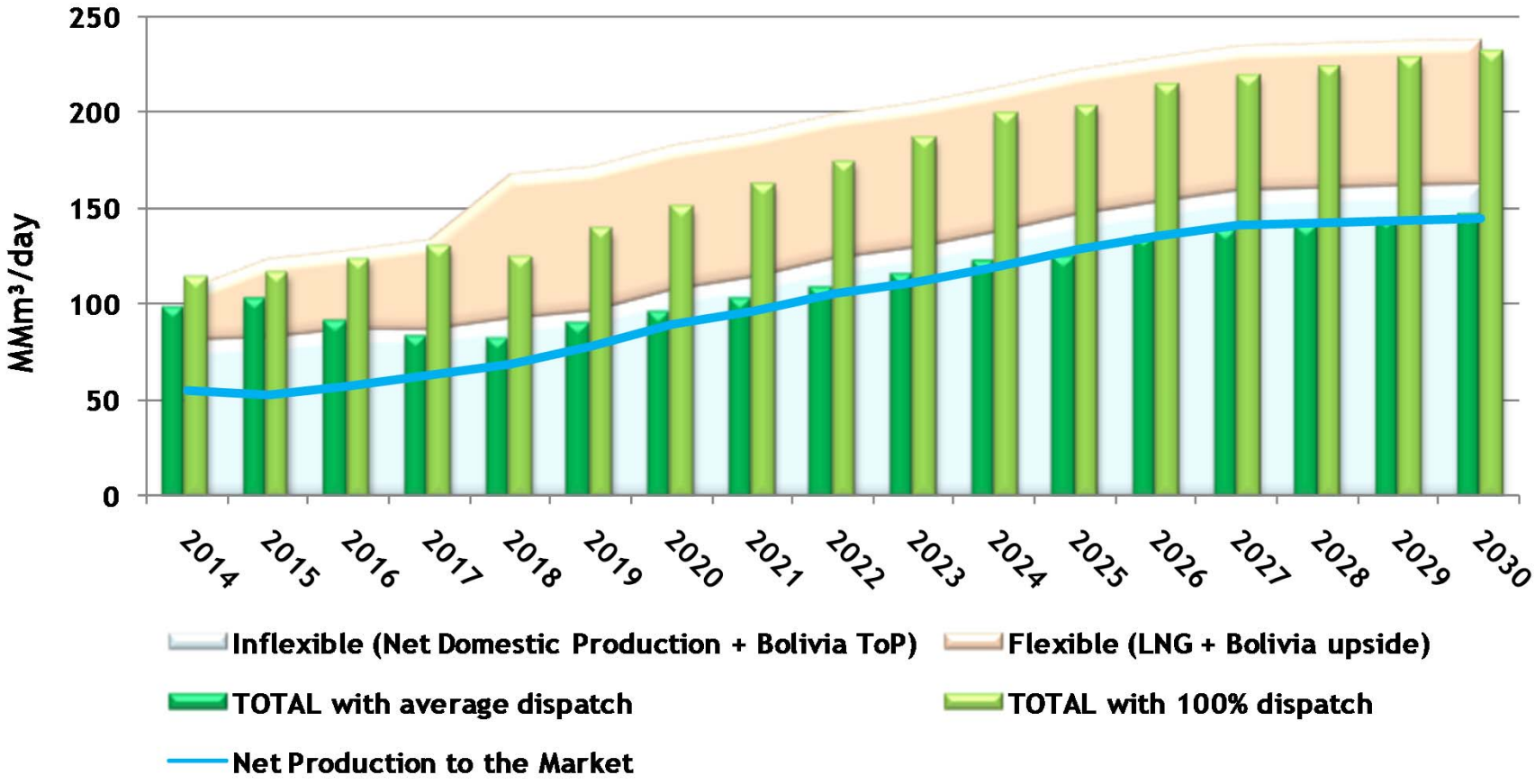
Forecast of Brazil Balance

- The Supplying and Demand Balance shows a future of possible needed for natural gas importation



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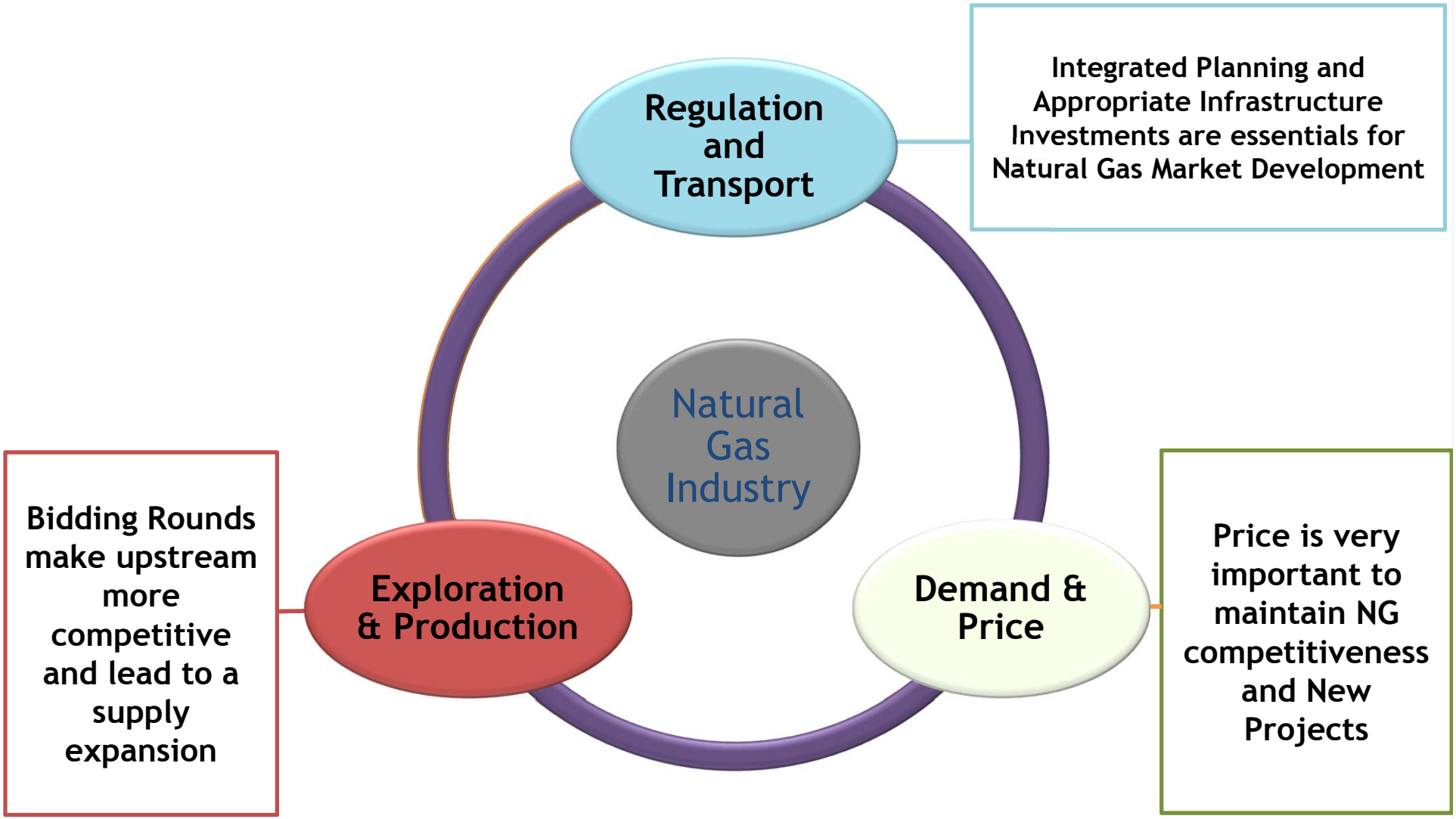
Pillars for the Natural Gas Market Development



THANK YOU!

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