LNG from USA in Brazil and Americas

U.S. - Americas LNG Forum
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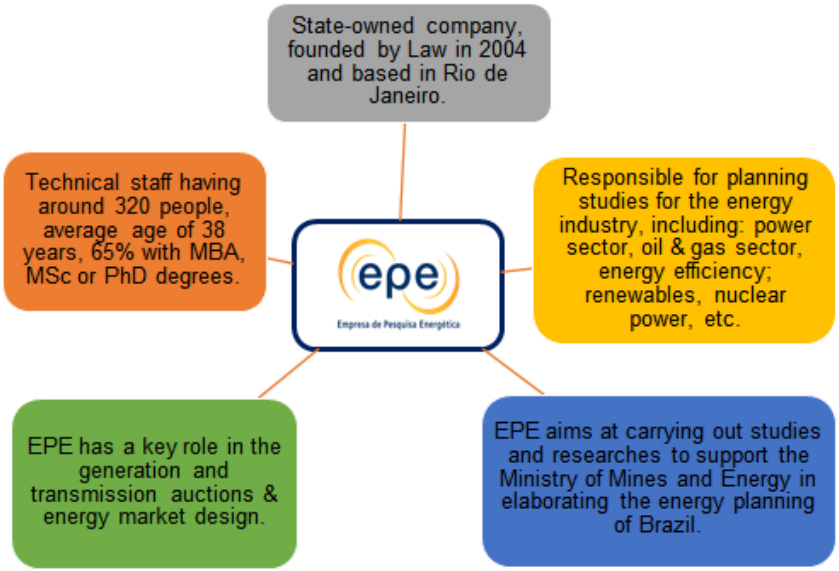
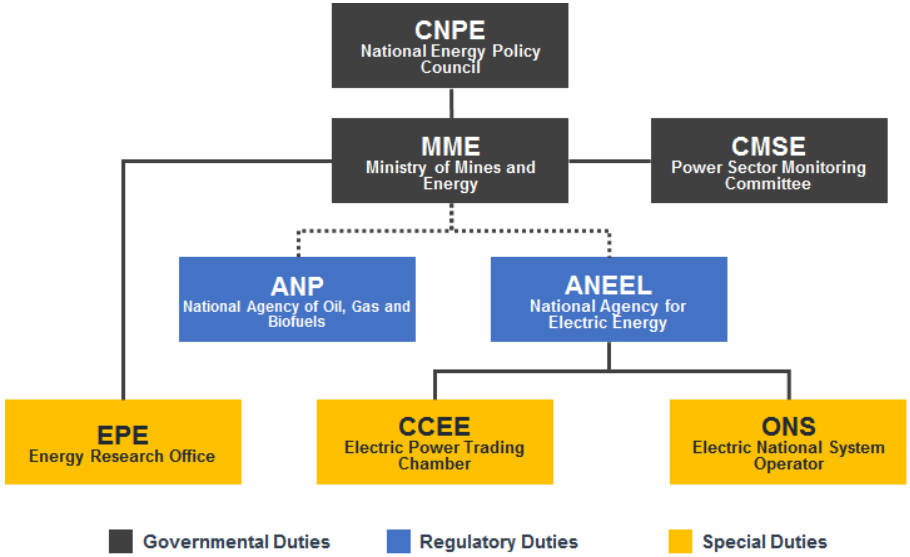
Ministry of Mines and Energy

ABOUT EPE


State-owned company, founded by Law in 2004 and based in Rio de Janeiro.
Technical staff having around 320 people, average age of 38 years, 65% with MBA, MSc or PhD degrees.
epe
Empresa de Pesquisa Energética
Responsible for planning studies for the energy industry, including: power sector, oil & gas sector, energy efficiency; renewables, nuclear power, etc.
EPE has a key role in the generation and transmission auctions & energy market design.
EPE aims at carrying out studies and researches to support the Ministry of Mines and Energy in elaborating the energy planning of Brazil.


CNPE
National Energy Policy Council
MME
Ministry of Mines and Energy
CMSE
Power Sector Monitoring Committee
ANP
National Agency of Oil, Gas and Biofuels
ANEEL
National Agency for Electric Energy
EPE
Energy Research Office
CCEE
Electric Power Trading Chamber
ONS
Electric National System Operator
Governmental Duties
Regulatory Duties
Special Duties

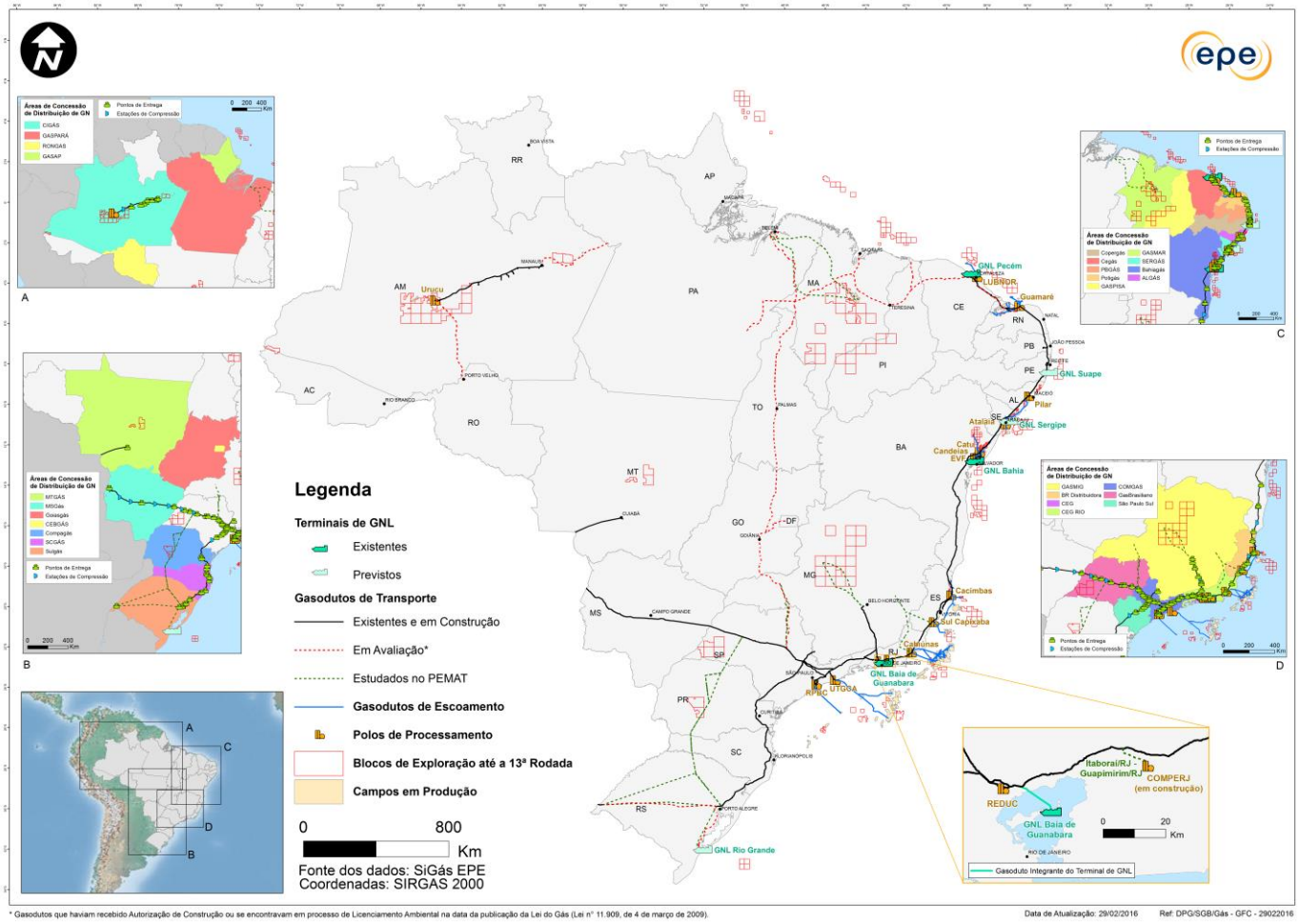
Overview of the Brazilian Natural Gas Industry

Energy Research Office
Ministry of Mines and Energy

NATURAL GAS INFRASTRUCTURE

Supply – Demand (Total Brazil, 2017 average)	Million m^3/d
Total Supply	**89.83**
National Supply	60.46
Pipelines Imports	24.33
LNG Imports	5.05
Total Demand	**89.83**
Non-thermoelectric	48.66
Thermoelectric	36.90
Pipeline Own Use/Adjusts	4.27

Source: Based on MME

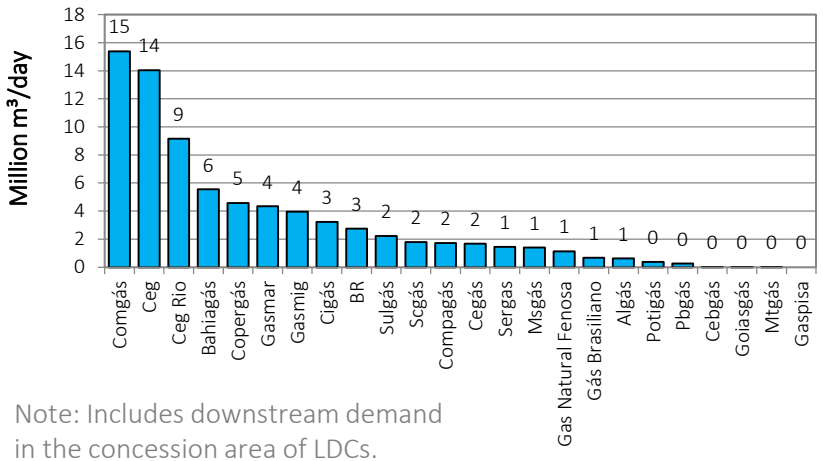


- **15 Processing Zones (95 MMm³/d)**
- **3 Existing LNG terminals (41 MMm³/d)**
- **9.409 km Transmission pipelines**
- **179 Operating citygates**

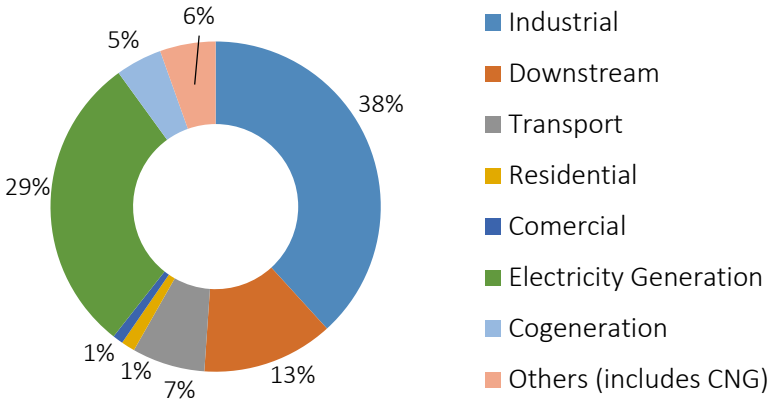
WEBMAP epe

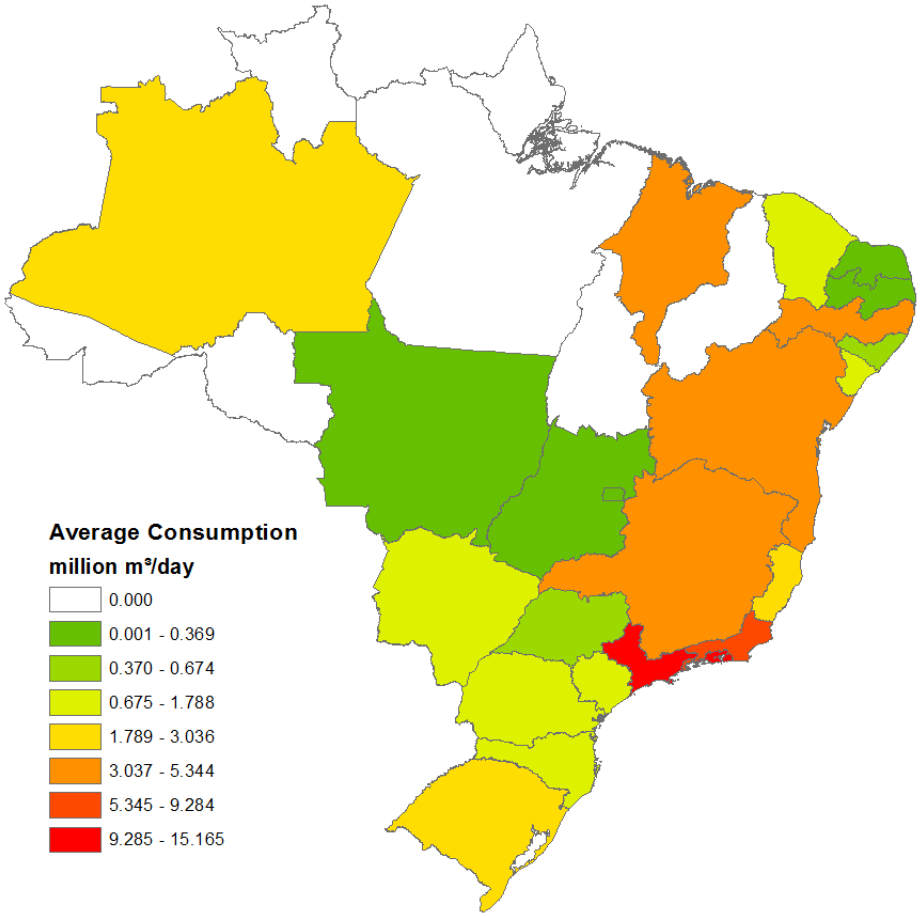
https://gisepe.epe.gov.br/WebMapEPE/

Natural Gas Demand – Total Brazil



Note: Includes downstream demand in the concession area of LDCs.

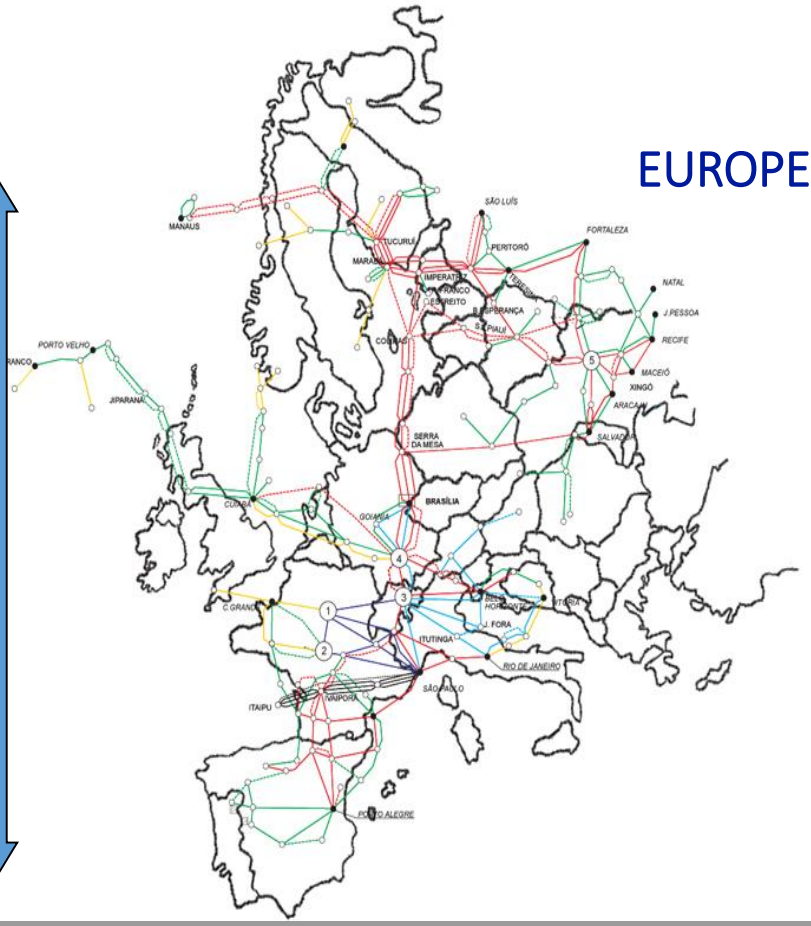




Source: Based on ABEGAS, MME
Average Consumption – January to December 2017

BRAZILIAN POWER SYSTEM

4,000 km



2018

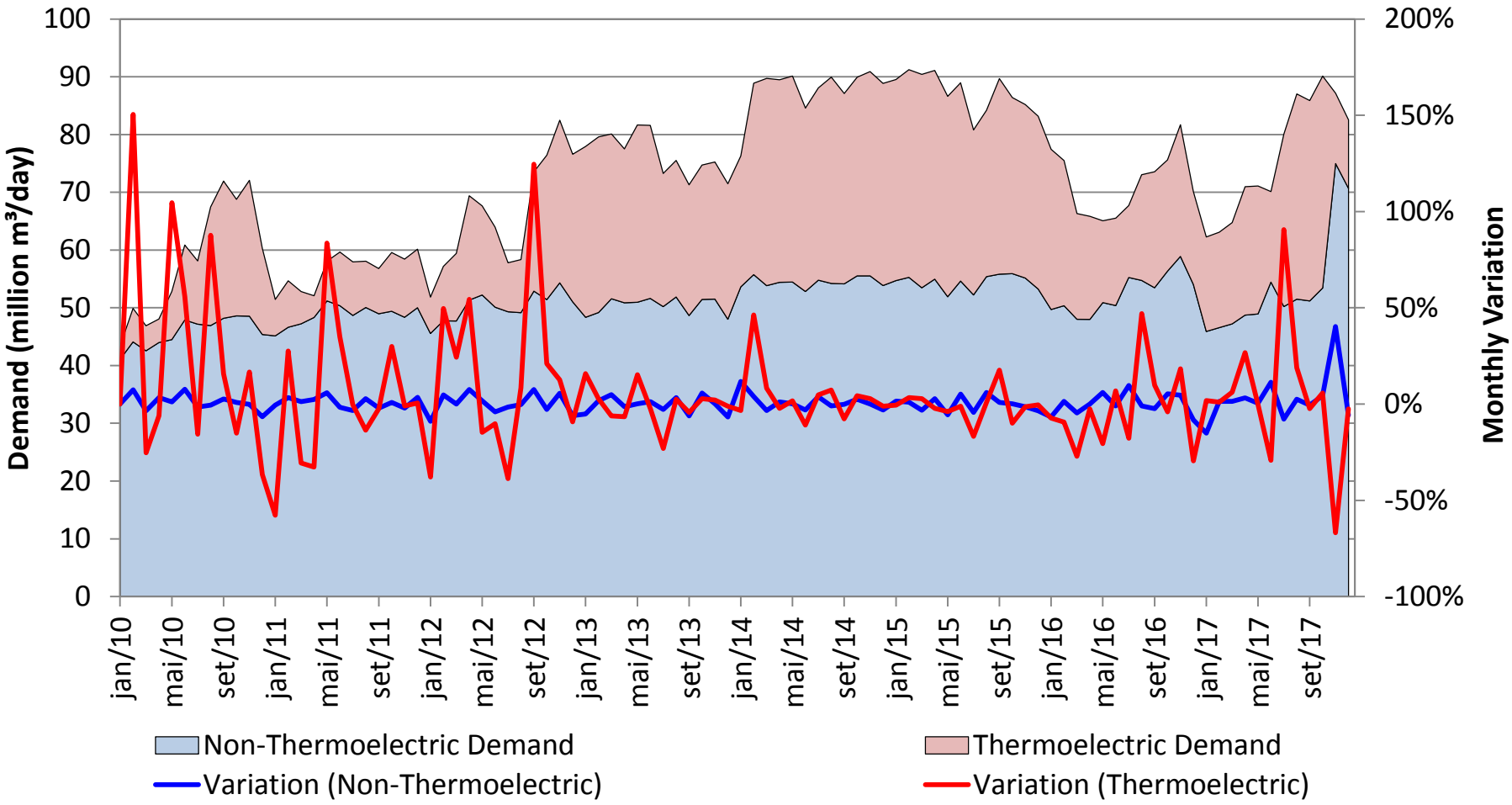
Installed Capacity	167 GW
Electricity Consumption	575 TWh/year (2017 average)
Peak Demand	85.7 GW (05/02/2014)
Consumer Units	82.5 x 10^6 (December 2017)

- ❑ **Hydro 63 %**
- ❑ **Thermal 26 %**
- ❑ **Nuclear 1 %**
- ❑ **Wind 8 %**

Source: ONS, ANEEL

Natural Gas Demand – Total Brazil

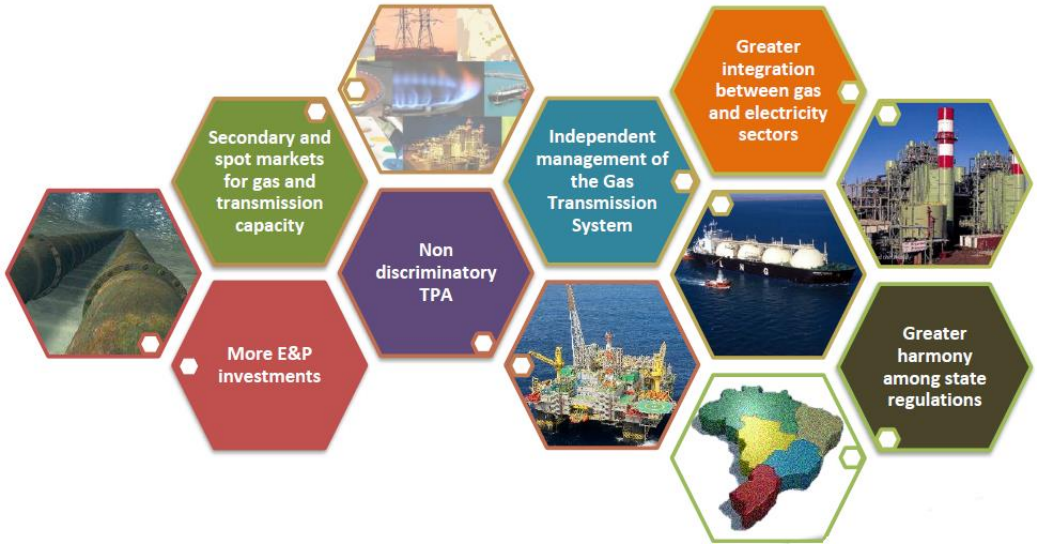
Variations in Non-Thermoelectric and Thermoelectric Demands



Source: Based on ABEGAS, MME

GAS TO GROW INITIATIVE : Market Opening Process

A natural gas market with diversification of agents, liquidity, competitiveness, transparency of information and best practices, which contributes to economic growth of the country.



CNPE Committee for Natural Gas Development

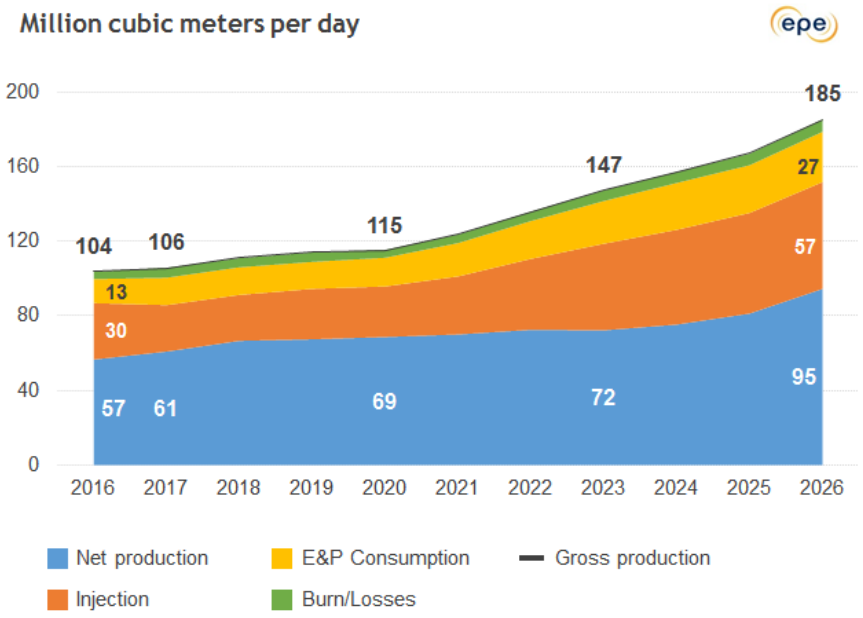
SC1	Third Party Access to Essential Facilities: Gathering pipelines, Gas Processing Plants and LNG Terminals
SC2	Transmission and Storage
SC3	Distribution
SC4	Commercialization
SC5	Improvement of taxes structure
SC6	Natural gas as feedstock
SC7	Natural gas of the Union (mainly Production Sharing Agreements)
SC8	Integration of Natural Gas and Power Industries

Source: MME

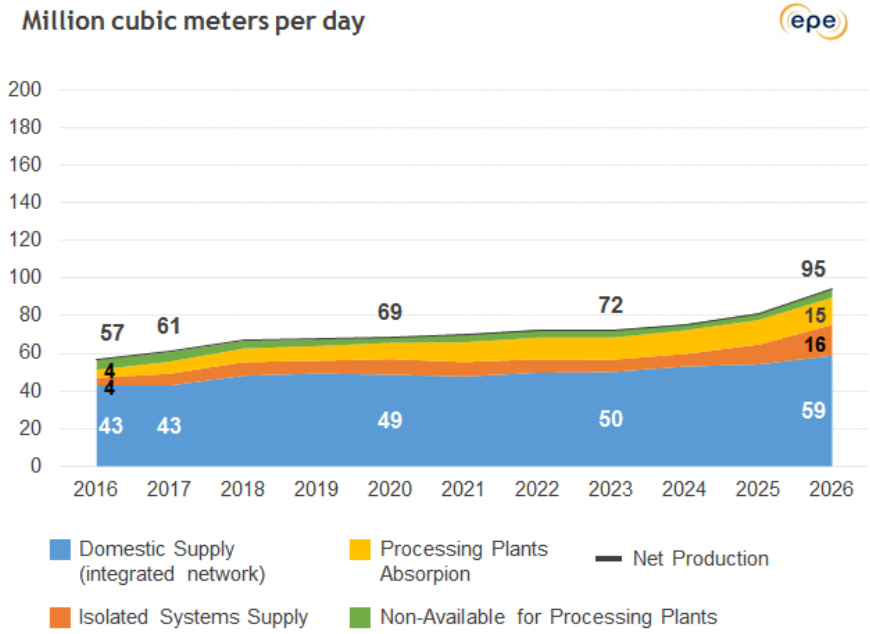
FORECAST OF NATURAL GAS SUPPLY AND BALANCE

GROSS AND NET PRODUCTION OF NATURAL GAS

GROSS AND NET PRODUCTION OF GAS

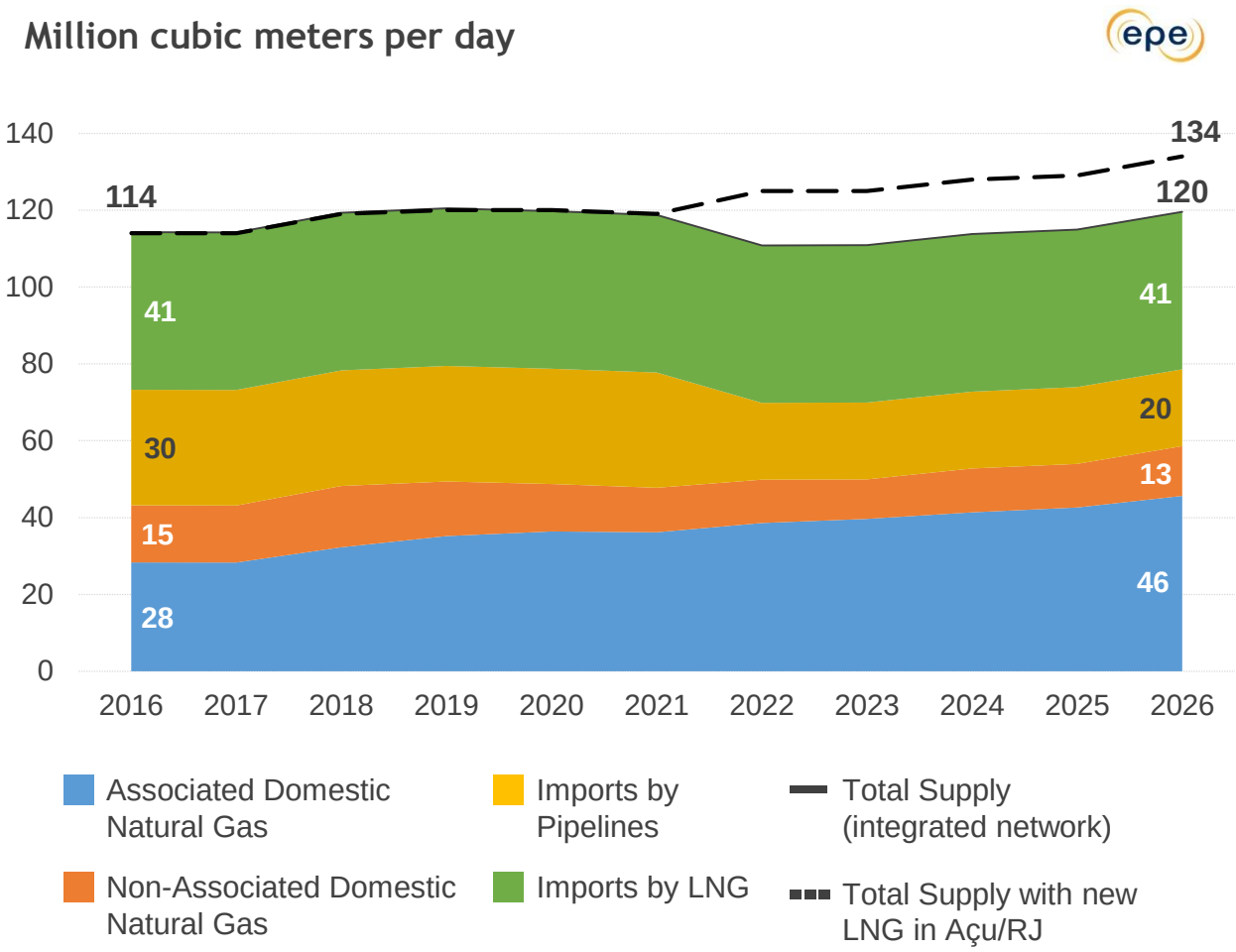


NET PRODUCTION AND DOMESTIC SUPPLY OF GAS



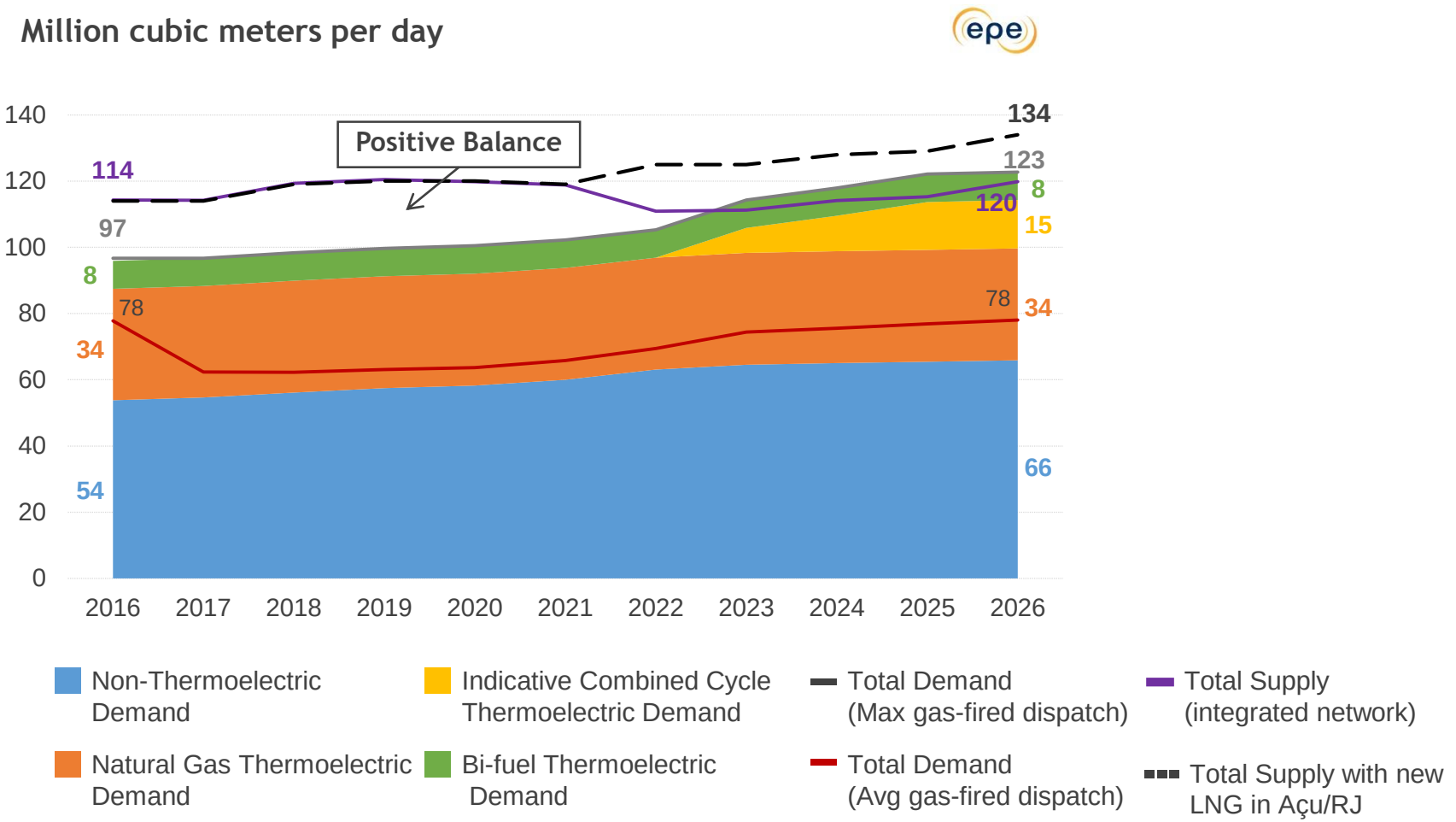
Fonte: EPE

NATURAL GAS SUPPLY (INTEGRATED NETWORK)



Fonte: EPE

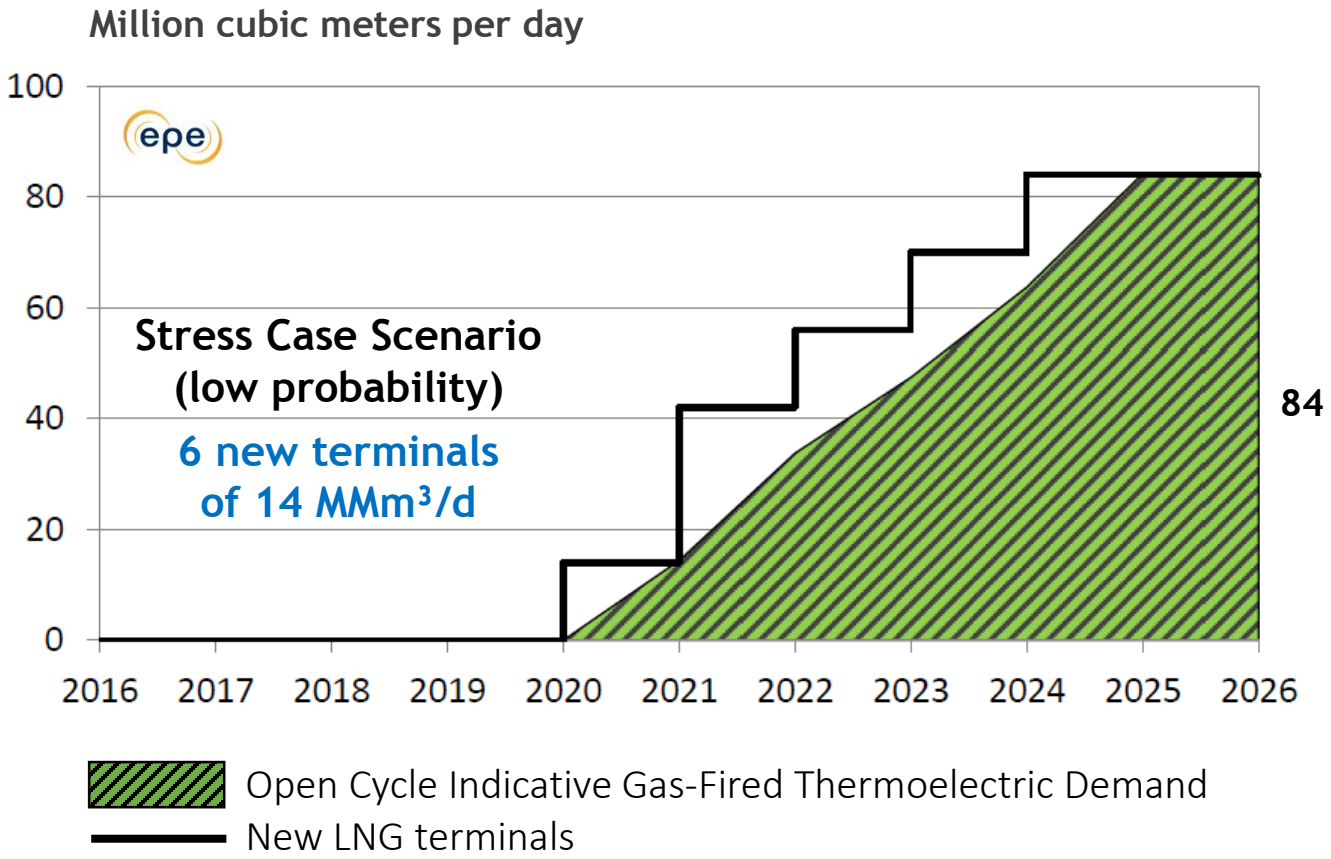
NATURAL GAS BALANCE – INTEGRATED NETWORK



Fonte: EPE

NATURAL GAS BALANCE - SENSITIVITY

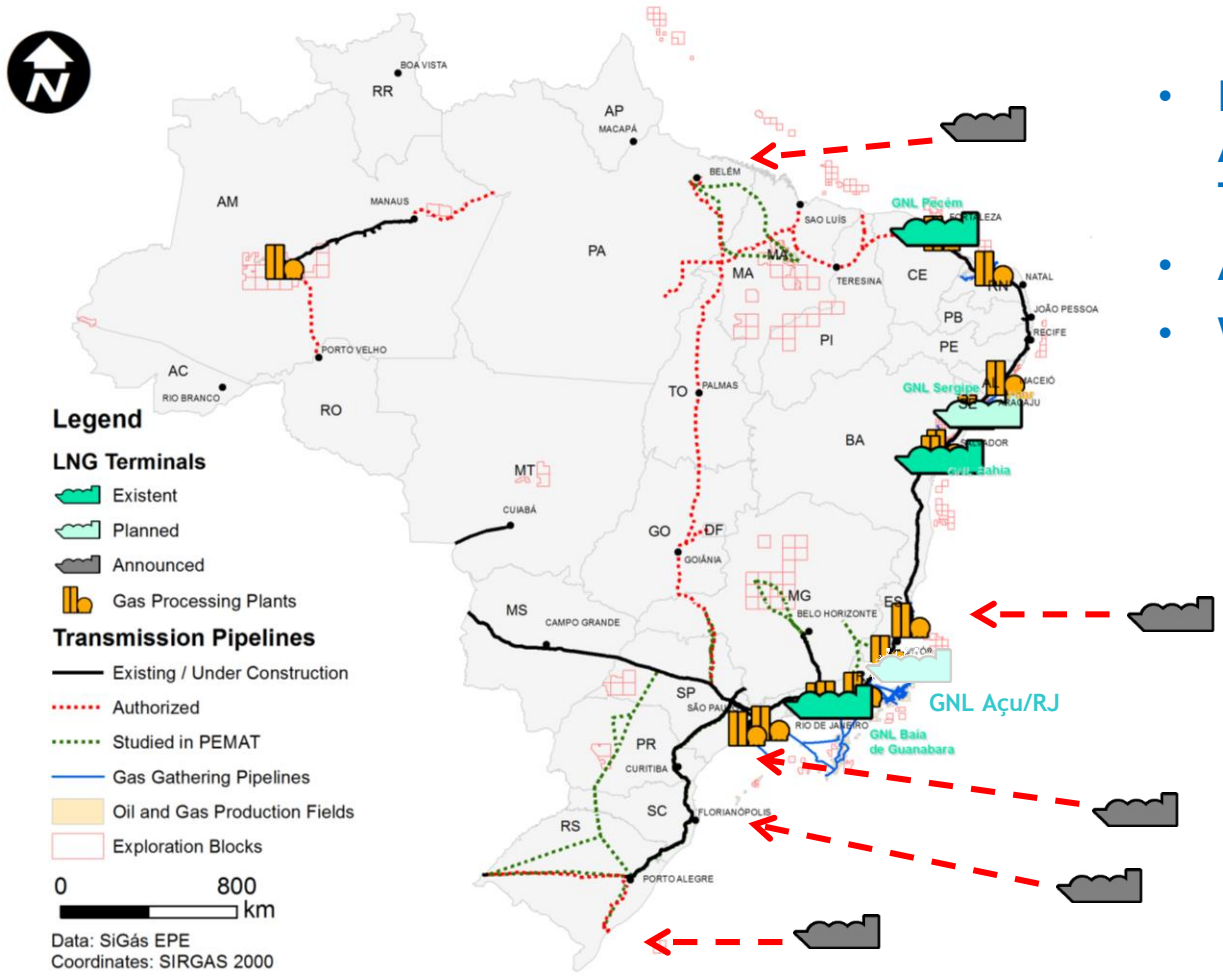
(new open cycle gas-fired thermoelectric plants supplied by new LNG Terminals)



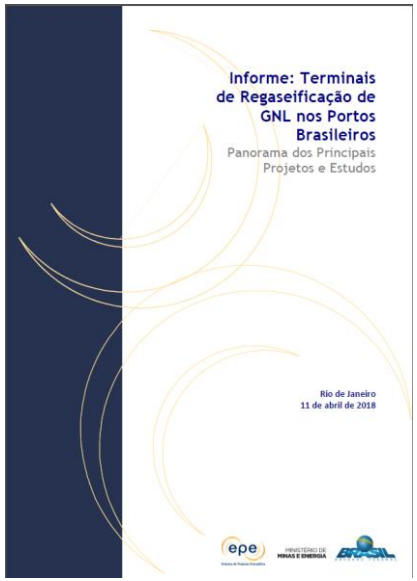
- **How many indicative open cycle gas-fired thermoelectric plants in the integrated network to deal with peak load, intermittences and dry seasons?**

  Open Cycle gas-fired thermoelectric plants will have to compete with other alternatives, such as pump-store hydro, DSM, Biomass

LNG TERMINALS: EXISTING, PLANNED AND ANNOUNCED



- EPE has published a report on Announced Projects for LNG Terminals in Brazil
- Available at www.epe.gov.br
- Will be launched on June 15th



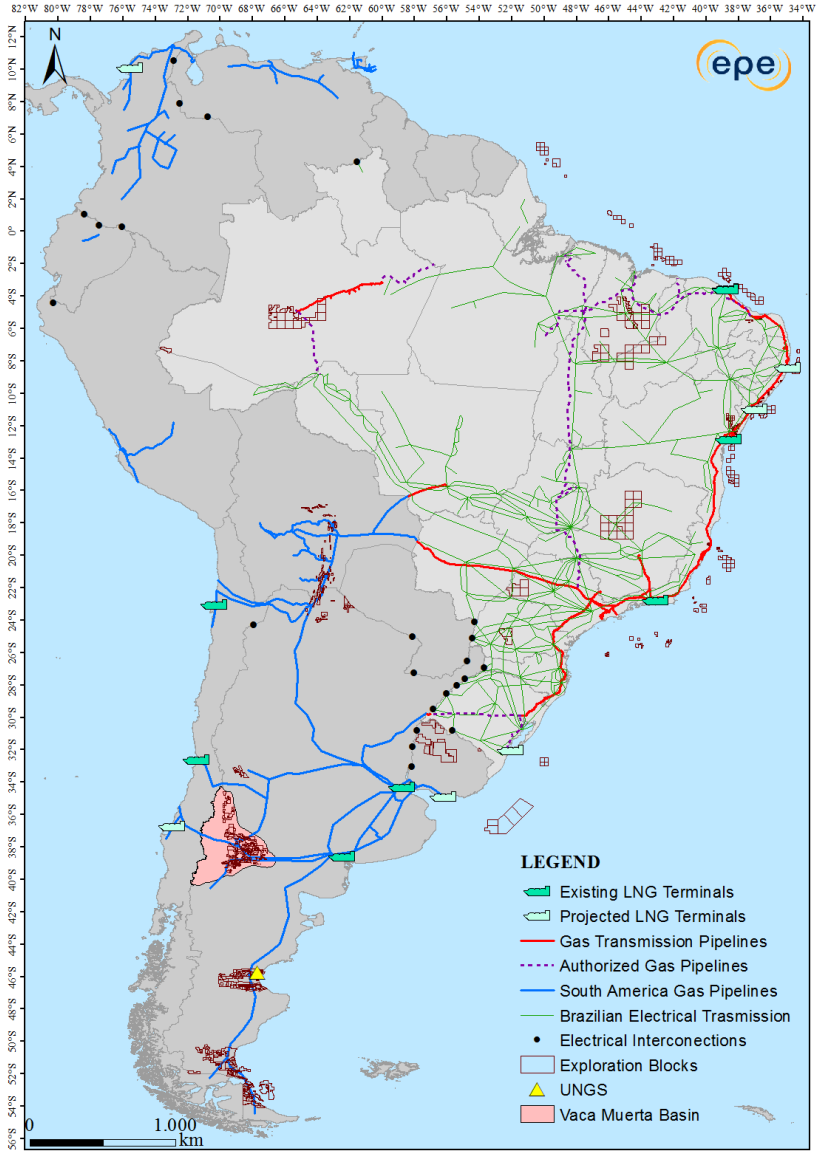
- 3 Existing LNG terminals (41 MMm³/d)
- 3 Planned LNG terminals (42 MMm³/d)
- 5 Announced LNG terminals ("x" MMm³/d)

New LNG terminals:
How many will really be constructed?

Which will be the role of LNG in Brazil?

Could it be new interconnections to South Cone? Gas & Power?

POTENTIAL FOR SOUTH CONE NATURAL GAS SUPPLY INCREASES



Reserves and Yet to Find Resources

Country	Proved Reserves (tcm)	Yet to Find Resources – F50 (tcm)	
		Conventional	Unconventional
Argentina	0.29	0.94	24.06
Bolivia	0.30	0.66	1.08
Paraguay	0.00	0.09	2.25
Peru	0.42	0.14	2.19
Uruguay	0.00	0.03	0.06

Sources: EIA (2013), APEC (2013), CEDIGAZ (2014), USGS (2012).

LNG Capacity in South Cone

Country	Existing Terminals (Million m^3/d)	Planned Terminals (Million m^3/d)
Argentina	31	16*
Brazil	41	42**
Chile	20.5	19.5***
Uruguay	0	10****

Sources: BnAmericas (2017); EPE (2017).

Notes: * Bahia Blanca 16 Millions m^3/d (expansion up to 30 Millions m^3/d); **Sergipe/SE 14 Millions m^3/d + Porto Açu/RJ 14 Millions m^3/d; Rio Grande/RS 14 Millions m^3/d *** Penco 15 Millions m^3/d (under construction) + Mejillones 4.5 Millions m^3/d (expansion up to 10 Milions m^3/d); **** GNL Del Prata 10 MM m^3/d (under construction).

FINAL REMARKS

KEY UNCERTAINTIES IN SUPPLY AND DEMAND

- Path of economic recovery
- Time for the Gas to Grow
- Supply
  - Bolivia
  - Natural gas pre-salt availability
    - CO_2 content, distance from shore, price competitiveness
  - Natural gas onshore resources
    - Potential versus gas discovers
- Gas-fired power plants (base/peak loads, renewable dispatchability, etc.)
  - Some improvements implemented and others under discussion
- LNG regasification capacity expansion and competitiveness
  - Brings additional supply, flexibility and market contestability
  - New terminals on their way

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