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"Gas: Sustaining Future Global Growth"

Brazil: Gas Market – Towards a Liberalisation?

An Overview of the Evolution of the Market, Regulation and the Industry Organization

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EF8.B: PGCC Perspectives For Regional Gas Market Development

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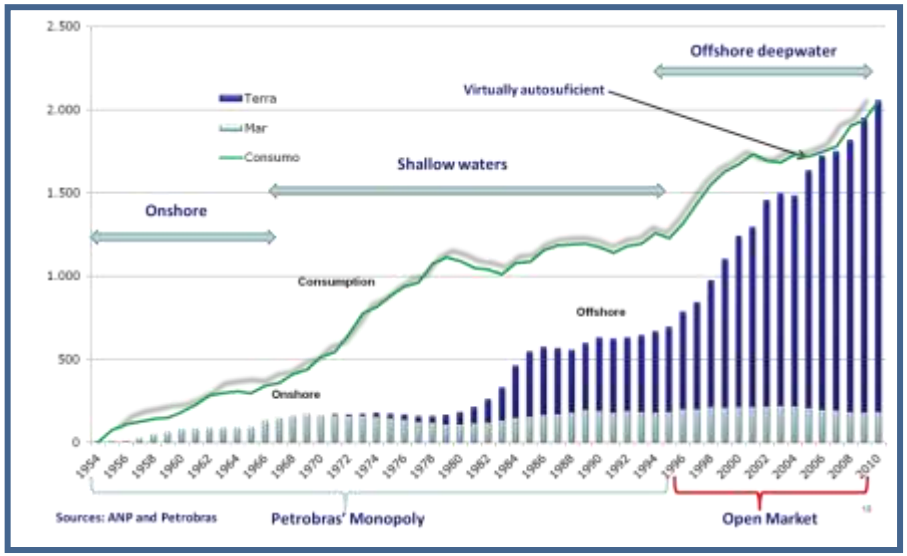
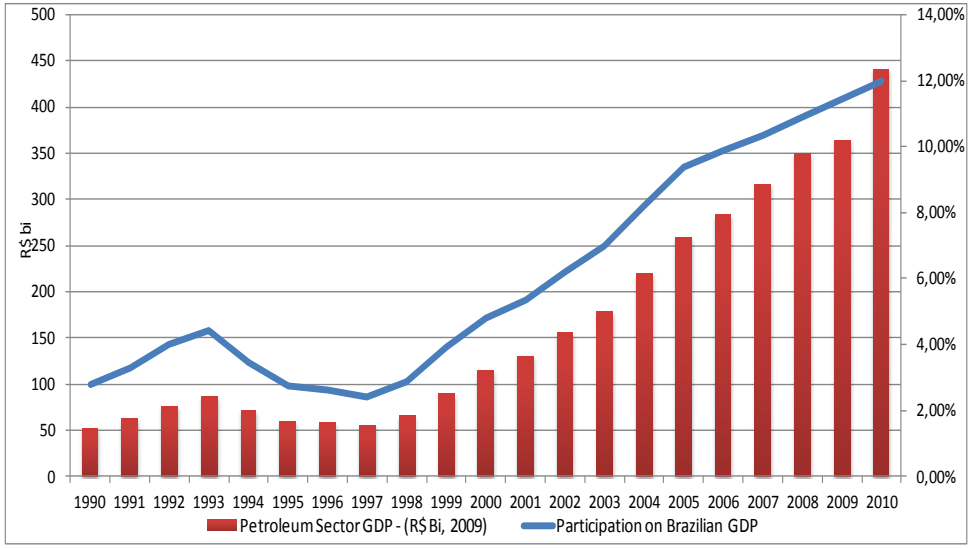
Evolution of the Industry

1954 – 2010 Petroleum Production and Consumption



Sources: ANP and Petrobras

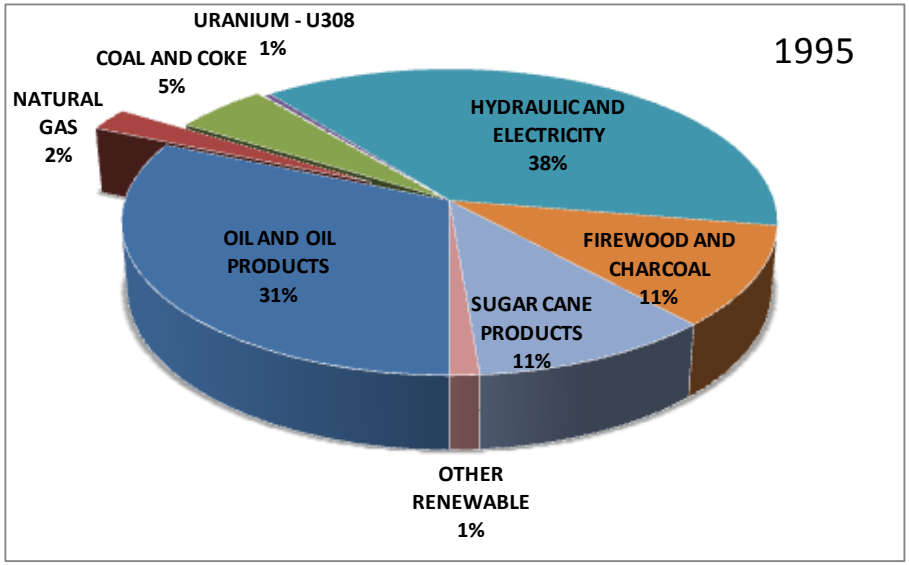
Participation of the Petroleum Sector in GDP

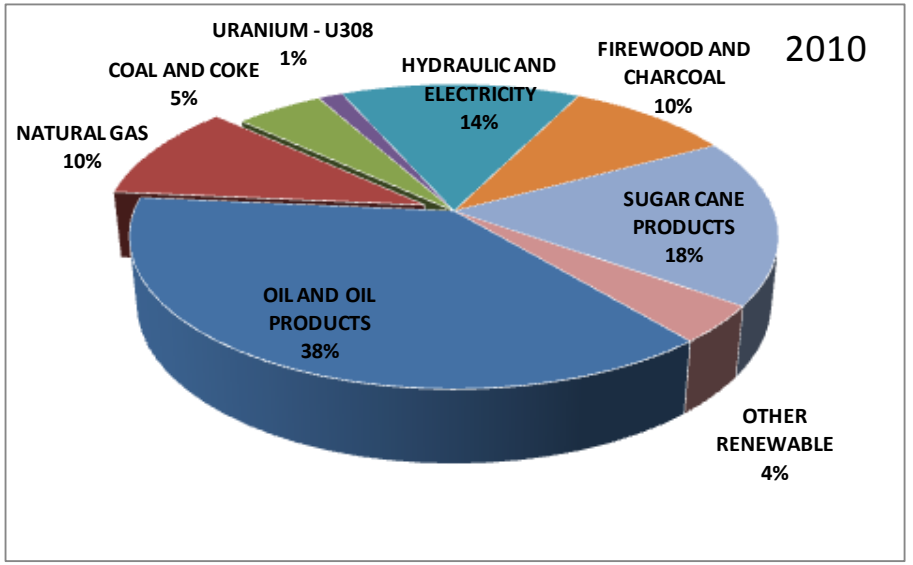


Sources: Andrade Canelas, ANP and IBP

- **Brazil's E&P Evolution**
  - Early 70's: In response to the first oil shock, off-shore activities in the continental shelf began making successive discoveries;
  - 1978: Brazilian reserves reached 622 M Boe-proven;
  - 90's: Fields in deep and ultra deep waters started to be explored;
  - 1998: Publication of Law 9.478. Opening of the sector to both domestic and foreign private companies;
  - 2006: Brazil has virtually reached self-sufficiency.
  - Today reserves amount around 14000 M Boe-proven.

Brazilian Energy Matrix 1995 -2010





Source: MME

- **Natural Gas and the Brazilian Energy Matrix**
  - 1995: Gas represented less than 2% of the Brazilian energy matrix;
  - In 2001, around 80% of all power generation in Brazil was produced by hydroelectric plants;
  - 2000's: A series of blackouts and droughts make the government reconsider its dependence on climate-dependant energy sources, provoking the creation of an emergency thermo generation program;
  - Today the country has 32 844 MW of installed natural gas thermoelectric capacity, representing about 26.7% of Brazil's entire power-generation capacity.

Bolivia-Brazil Gas Pipeline – a *"game changer"*

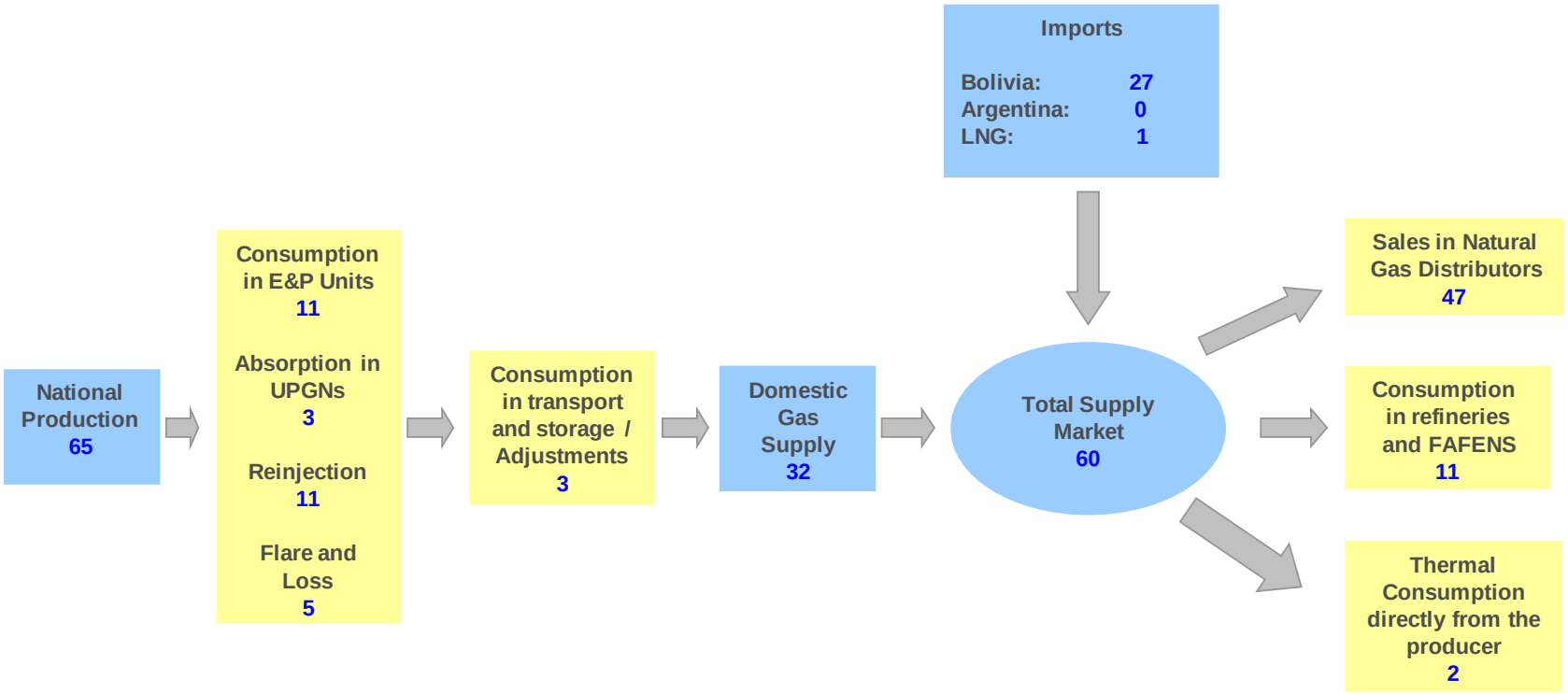
Source: TBG

- **The Brazil-Bolivia pipeline**
  - In the mid 90's the Brazilian Government decided to import natural gas from Bolivia, aiming to expand its supply.
  - In July 1999 Gasbol began commercial operations with 3,150 km (557 km in Bolivia and 2593 km in Brazil).
  - It crosses five states and its area of influence extends through about 80% of Brazilian GDP;
  - Current expanded delivery capacity: about 45 Mm ^{3} / d (receiving 30 Mm^3/d from Bolivia).

- **Impact of the pipeline**
  - The security of gas supply promoted an unexpected growth in demand with the *ramp up* of the Bolivia Brazil pipeline.
  - Bolivian gas contributes with about 47% to 50% of the gas offered to the Brazilian consumer.

Natural Gas Balance in Brazil - 2011

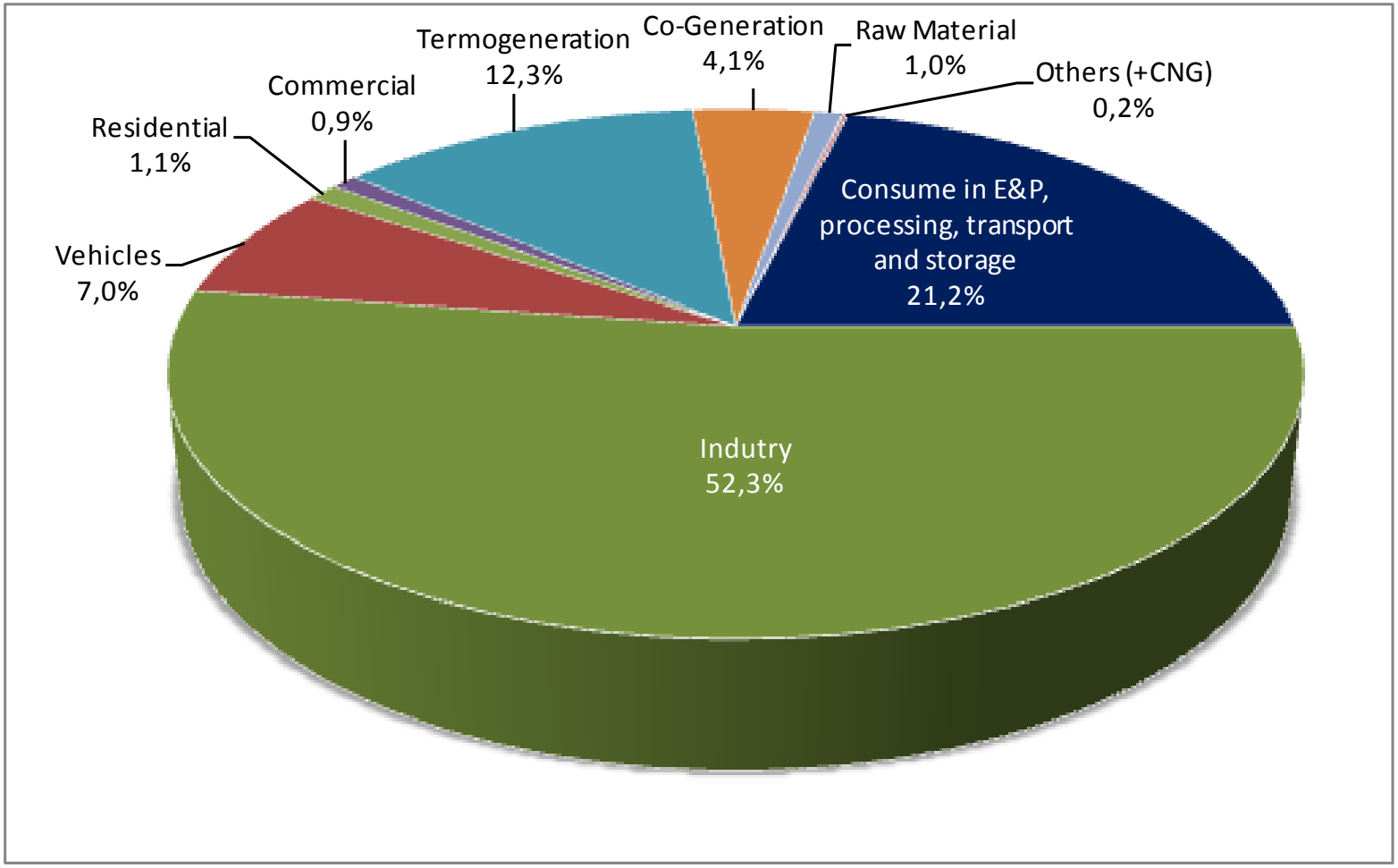
Natural Gas Balance in Brazil – Average 2011 (Mm³/d)



Source: MME

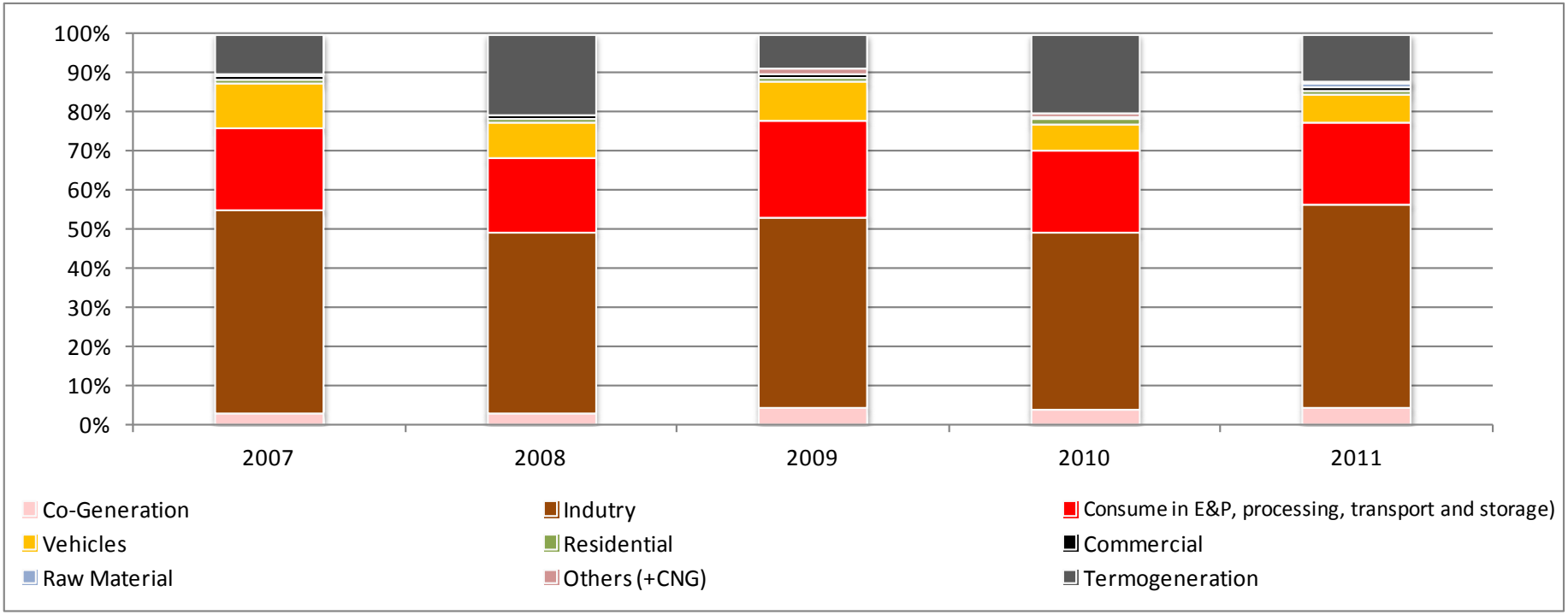
- **Natural Gas Demand**
  - 2011: 46% of the demand was supplied by Bolivian Gas, 2.6% by LNG and 51.4% by domestic gas production.
  - Only half of domestic gas production becomes available to the market due to gas' use in reinjection and E&P consumption.
  - The Gas market in Brazil has always had the industrial demand as an anchor for its development.
  - It was only with the steady supply of Bolivian gas that the market was able to develop itself.

Gas Consumption by Sector - 2011



Source: MME

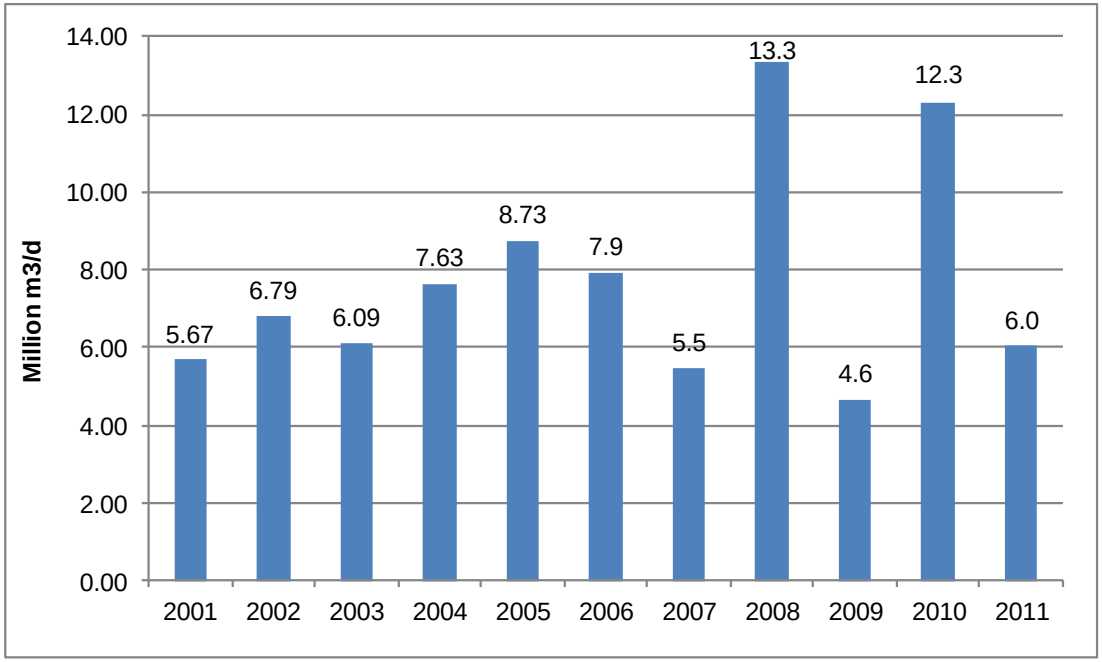
Gas Consumption Evolution



Source: MME

- **Post- Emergency Thermo Generation Program Scenario**
  - Gas thermoelectric power plants have become the fundamental element of energy security and reliability of the Brazilian electric system.
  - IBP's studies expect an increasing use of this source in the supply of the country's electricity, justified by:
    I. Non-dependence on the hydrological regime
    II. Plants are located close to consumption centers, optimizing the transmission system.

Gas Consumption for Thermal Generation



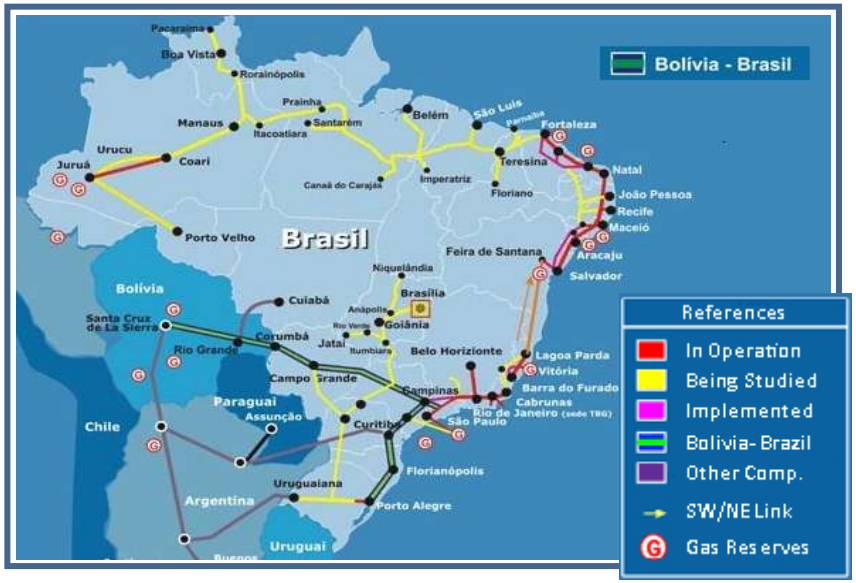
Source: MME and Abegás

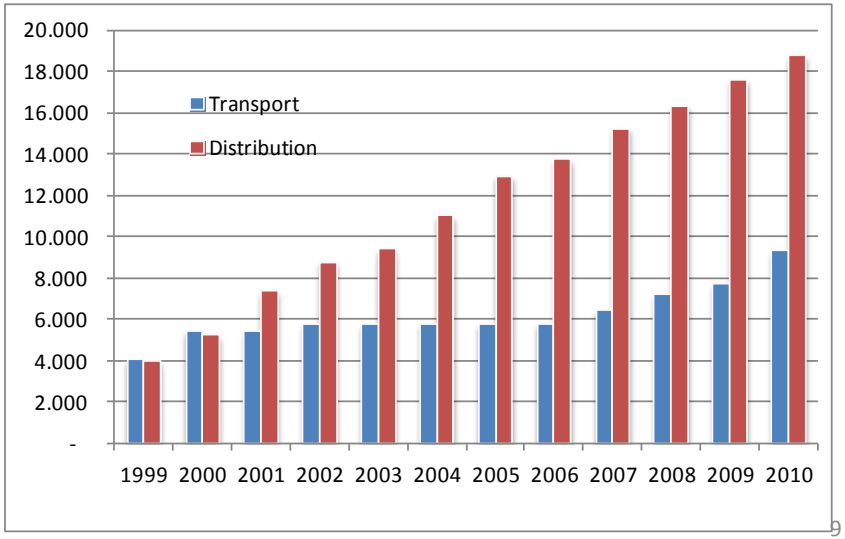
- **The Nature of Complementary Energy Supply**
  - Adds tremendous volatility to the natural gas market;
  - During very dry years, all thermoelectric plants will have to be employed simultaneously for a few consecutive months.

- **Gas Surplus and Solutions**
  - Lack of secondary market to absorb large volumes of natural gas when thermoelectric plants are not generating;
  - Petrobras developed LNG terminals, supplied with short-term contracts;
  - Petrobras has included in its 2011-2015 investment plan the construction of three fertilizers (ammonia and urea) production units.

Transportation and Distribution Evolution

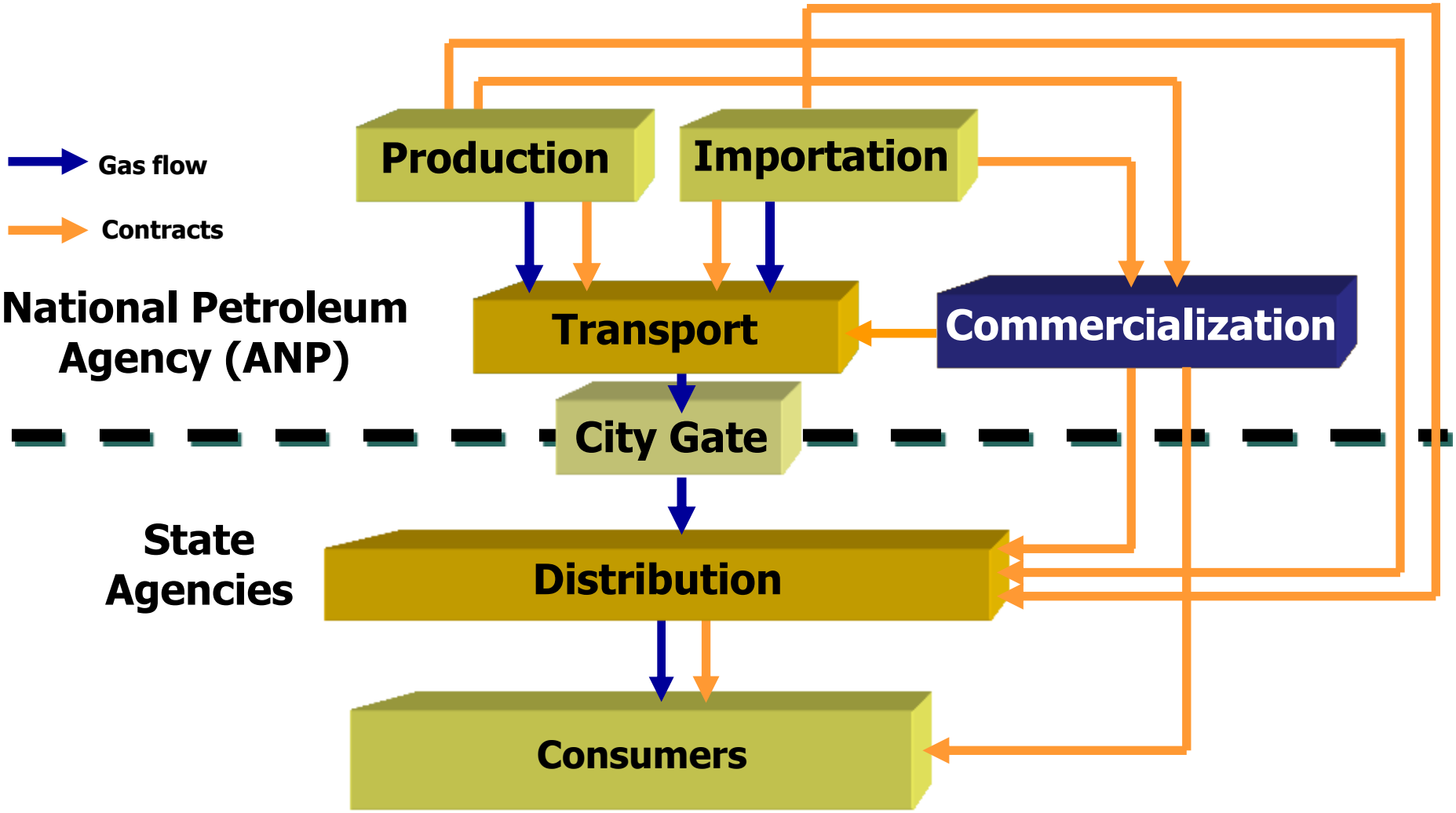
- **Transportation Sector**
  - Increased from 4,000 km in 1999, to approximately 9,300 km in 2010.
  - Several projects to interiorize gas still on “paper”.
- **Distribution Network**
  - Evolved in the same period from less than 4,000 km to about 20,300 km.
- **External Factors**
  - The absence of a law to regulate the gas sector, and of major non-associated gas discoveries, limited the interest of private companies in infrastructure.
  - The Bolivia-Brazil pipeline contributions:
    - Enabled a steady supply of gas;
    - Attracted private companies with international experience to the sector.
  - Gas market still young, and currently still concentrated in the southeast and along the coastline.
  - Some of the initiatives to bring this gas to less-populated areas have been promoted by the transport of LNG and CNG using trucks.





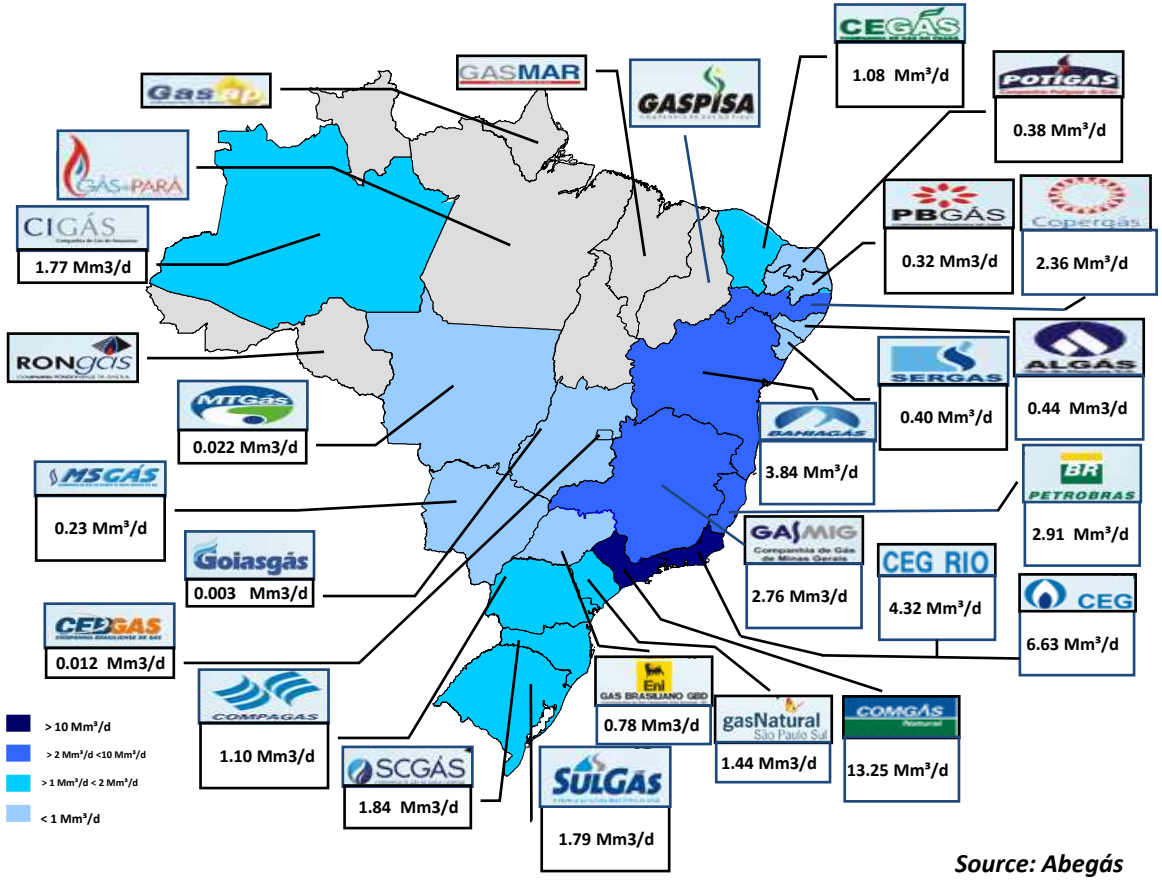
Source: MME

Regulation Responsibilities



Source: ANP

Local Distribution Companies in Brazil



Source: Abegás

- ***Today The country has 27 gas distributors, of which 7 are still in their early stages due to the lack of a natural gas supply***

- **Distribution (Until 1988)**
  - Petrobras' oil and gas production monopoly;
  - The distribution activity had no specific regulation;
  - Distribution was historically performed by two state-owned companies in the states of Rio de Janeiro and Sao Paulo, or directly by Petrobras in the other states.

- **Post-1988 Period**
  - Brazilian Constitution revised: "each state had the right to explore directly, or through concession, the local piped gas services...".
  - 6 North eastern, and 3 Southern states created companies following a state-private owned model.
  - 1997/1999: CEG and COMGAS were privatized.
  - The concession of the gas distribution services anticipated a future opening of the market

Opening of the Market

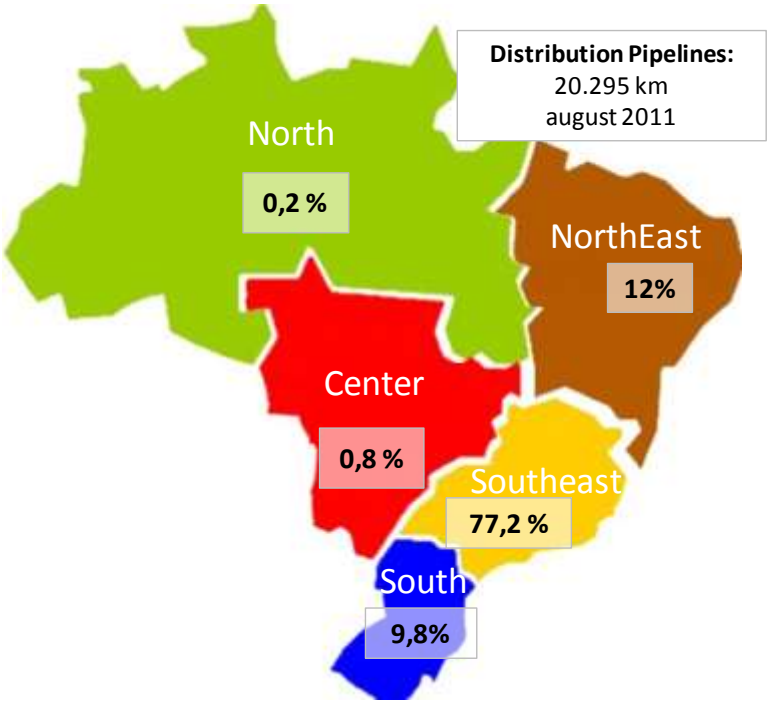
I. Petroleum Law (1997)

- Opened the exploration and production sector for private investment;
- The gas sector began being regulated at two levels:
  - Activities developed from the production/import of gas up to the city gate;
  - State distribution.
- A superficial treatment to gas transportation due to the low maturity of the gas industry;
- Brazil, did not have at that time a regulatory framework that would ensure the stability to attract investments in this segment.

II. Gas Law (2009)

- Focused its efforts in regulating the transportation of gas, and added other points such as the storage of natural gas.
- New gas pipelines and gas storage facilities will operate under a concession regime.
- Created several new agents, such as *self-producer*, *self-importer* and ***free consumer***. (RJ and SP concession contracts, signed before the Law was published, had foreseen the creation of this last figure)
- Allows the operational exchange of gas, called *swap.*

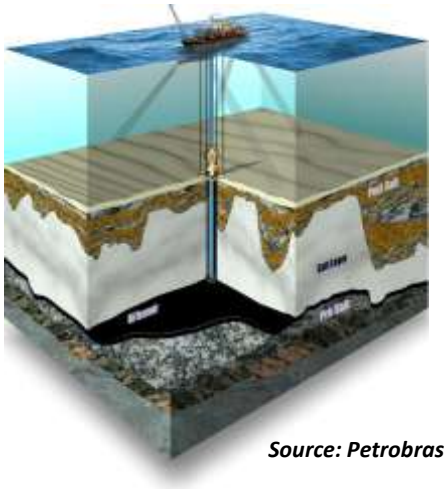
Figure 13: Distribution Pipelines



Source: Abegás

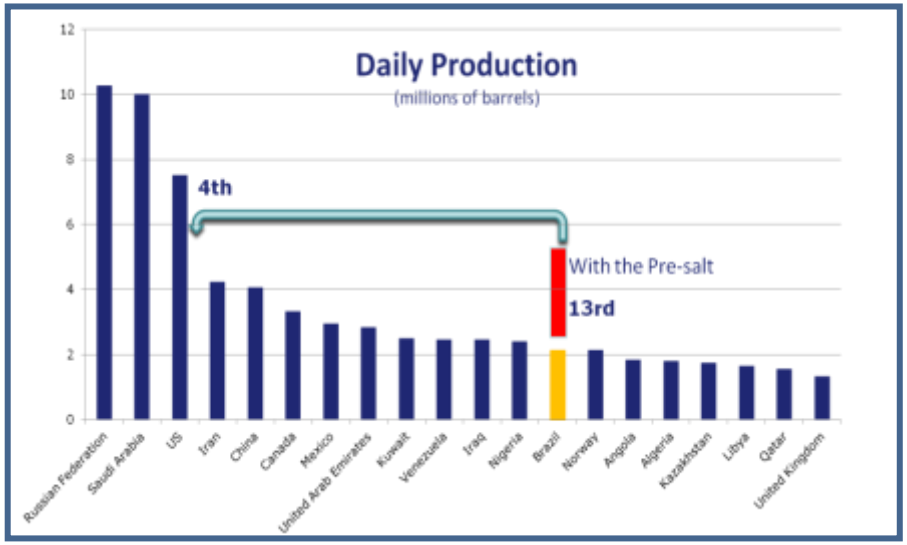
- ***Considering that the level of maturity of the gas markets in each Brazilian region varies greatly, the issues established in a broad sense by the gas law, are being treated quite differently in each state.***

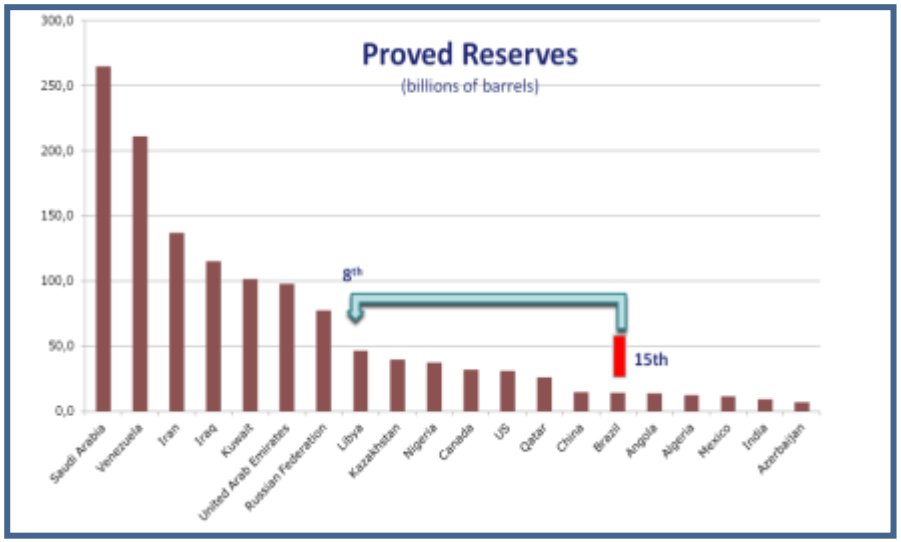
The Pre Salt Reserves - Simplified Description



Source: Petrobras

- **The "Pre-Salt"**
  - Reserves with enormous potential for hydrocarbon production in the pre-salt layers of its offshore basins.
  - Production sharing regime.
  - Creation of PPSA - Présal Petróleo S.A. to represent the interests of the state.
  - Brazilian Congress is currently debating how royalties will be distributed.
- **Future NG Challenges**
  - Gas is associated with oil, with uncertainties about reinjection volumes
  - Deep water off-shore production brings transportation and logistical challenges.





Source: BP – Statistical Review – 2011 and IBP

Assumptions for a Gas Balance Scenarios

NG Supply -Assumptions for Each Scenario

SUPPLY	CONSERVATIVE SCENARIO	AGRESSIVE SCENARIO
NATIONAL PRODUCTION (excl. Pré-sal Santos Cluster)		
Traditional Basins	Decline rates per basin for fields in production Production curves for new fields	
Southeast (Ex-Presalt)	Some delay for the fields that should go into production in 2014	
Isolated Systems	For the Solimoes and Parnaíba basins: forecasts of net production related to demand expectations	
New Discoveries / Unproven Reserves	Prod. 5 Mm³/d in 2020	Prod. 6 Mm³/d in 2020
IMPORTS FROM BOLIVIA:	Maintaining current capacity (does not consider Gasbol's expansion)	
LNG IMPORTS:	RJ -expansion of 7 Mm³/d (2015) BA – new terminal 14 Mm³/d (2015) Another non-petrobras 6 Mm³/d terminal (2016)	RJ -expansion of 7 Mm³/d (2014) BA – new 14 Mm³/d terminal (2014) Another 6 Mm³/d new non-petrobras terminal (2015)

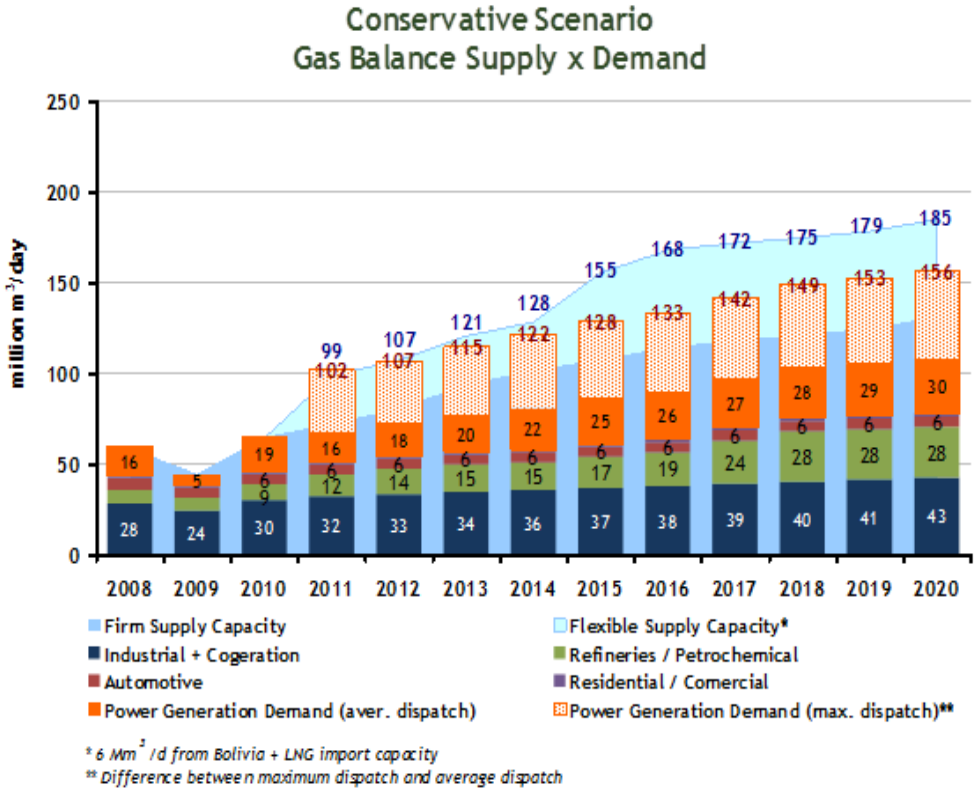
*These are recent findings during the initial stage of exploration or evaluation, or unproven reserves in areas already granted or to be granted.

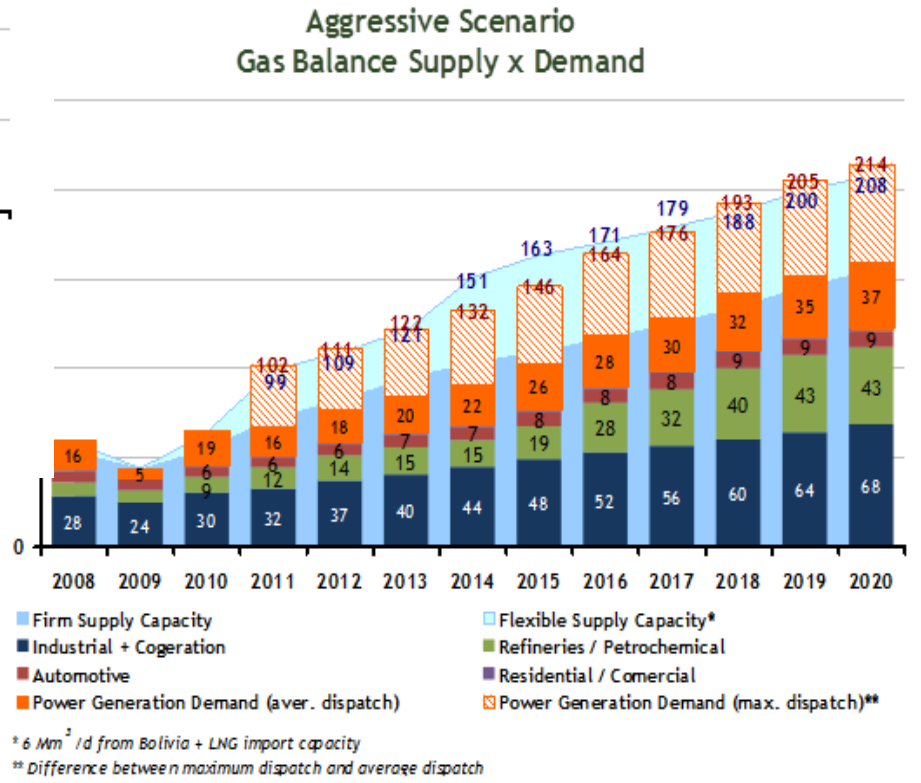
NG Demand Projection Assumptions- Summary

DEMAND	CONSERVATIVE	AGGRESSIVE
INDUSTRIAL / CO-GENERATION:	**MULTIVARIABLE REGRESSION MODEL**	
Industrial GDP	(2011-2020): 4% p.a.	(2011-2015): 5% p.a. (2016-2020): 4% p.a.
Distribution network growth (km)	3% p.a.	(2011-2015): 15% p.a. (2016-2020): 10% p.a.
NG/FO Price Ratio (oil proj. IEA)	Maintaining current ratio (0,8)	More competitive price for gas (0,6)
THERMOELECTRIC:		
2014	Capacity already auctioned (30% average dispatch as for existing)	
2015-2020	+ 0,5 GW/year (50% average dispatch)	+ 1,0 GW/year (50% average dispatch)
REFINARIES / PETROCHEMICAL:	**Based on EPE's Decenal Expansion Plan (PDE)**	
Refinaries	Abreu Lima:2 Mm?/d (2012) + 1 Mm³/d (2013) COMPERJ: 2 Mm?/d (2015) + 2 Mm?/d (2018) COMPERJ Petroqu?mica: 2,8 Mm?/d (2018)	**Conservative + Ref. Premium I: 3,5 Mm?/d** (2016) + 3,5 Mm?/d (2019) + Ref. Premium II: 4 Mm?/d (2017)
Petrochemical	Amonia/Urea: 2 plants (1,5 Mm?/d each) 2017/2018 Methanol: 1 plant (2 Mm?/d) 2018	**Conservative +** 1 Urea and Amonia plant (1,5 Mm?/d) 2018 + Methanol: 1 plant (2 Mm?/d) 2018
CNG for Vehicles	Maintaining the current consumption of Vehicular CNG	Recovery of light vehicle conversions to V. CNG
OTHER SECTORS:	**3% p.a. growth**	

Source: Gas Energy/IBP Gas Advisory Board

The Prospects for the Gas Industry in Brazil





Source: Gas Energy/ IBP – Gas Advisory Board

Brazilian Gas Market - Future Trends/ Challenges

- Gas supply
  - Domestic production: strong increase although uncertainties regarding available volumes and deadlines. Technical limits of reinjection to be better evaluated.
  - Bolivian gas supply after 2019 – Will Bolivian E&P be able to supply Brazil and Argentina?
  - LNG trading market could be "*short*" in a year when Brazil might demand it the most.

- Gas Demand
  - Volatility of the Brazilian electrical sector imposing a high cost for the gas industry.
  - Recognizing the value of gas to the electrical system becomes critical.
  - The need of a Governmental Policy to promote the use of NG in other industrial activities.

- Gas Balance
  - Conservative scenario presenting an excess of supply, gas exports could be an alternative.
  - Aggressive scenario more equilibrated, suggesting that a policy to use gas in other industries and a more competitive price seems to be in a good direction.
  - In both scenarios volatility imposed by the electrical sector creates the opportunity to Brazil to be an active player in global gas trading business.

Brazil's self –sufficiency in gas, and the possibility of becoming an exporter (firm or occasional) will induce a new geopolitical role for the country in the energy business.

Access to Customers

(Self-Importer, Self-Producer and Eligible Customer)

State	AM	ES	MA	RJ	SP
Date for Opening of the Market	06/27/2016	01/01/2013	11/10/2010	After public consultation, 2012	Comgás: 05/31/2011 Gas Natural S.A.: 02/07/2014
Minimum Volumes	500.000 m3/d	35.000 m3/d	500.000 m3/d	100.000 m3/d	10.000 m3/d: Free User; S.P. and S.I.: not required
Previous Contractual Existence- Self Producer Self-Importer	Must have a 5 year-minimum supply contract	No requirements	Must have a 10 year-minimum supply contract	No requirements	No requirements
Minimum distribution network contract	10 years	5 years	5 years	5 years	Free period
Network usage Tariffs	Approved by the Agency	Full Tariff, except for new connections which will have a specific solution	Full Tariff	Full Tariff	Disc. w/o Margin: Comgás - 1,9% and medium discount migrated; Gas Natural S.A. -1,5%
Future Supplying Contract	Does not establish a minimum period	12 month Import Programming	5 years to produce or self-import	5 years(self-importer)	Is not established
Losses	Not determined	1% of volume, except for exclusive duct	Not determined	1% of volume	Its inside the margin, the same for other users, current: 0,5%

Regulation - An Incomplete Puzzle

- Completion of pre-salt regulation and matters involving taxes, royalties and local content. New bidding rounds for exploration blocs are essential to recompose reserves and bring new producers to the industry.

- A review in other State's Regulations to continue the gradual pace for the consumer market liberalization, avoiding the breach of contracts, but still allowing gas producers to access market.

- To complete the supplementary regulation and decrees related to the Gas Law.

- Publication of the Gas Transportation Network Expansion Plan (PEMAT) to increase the transportation infrastructure.

A lot of work is still necessary for a new producer to access the Brazilian Gas Market.

Thank You! Muito Obrigado!

Source: O Globo