

# 26<sup>th</sup> World Gas Conference

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**TS WOC 2 1**

## *The Future of UGS in Brazil*

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# Agenda

## **Background:**

- Domestic Balance of NG
- Exercise: NG Storage vs. GNL Imports

## **Aims:**

- Potential Market

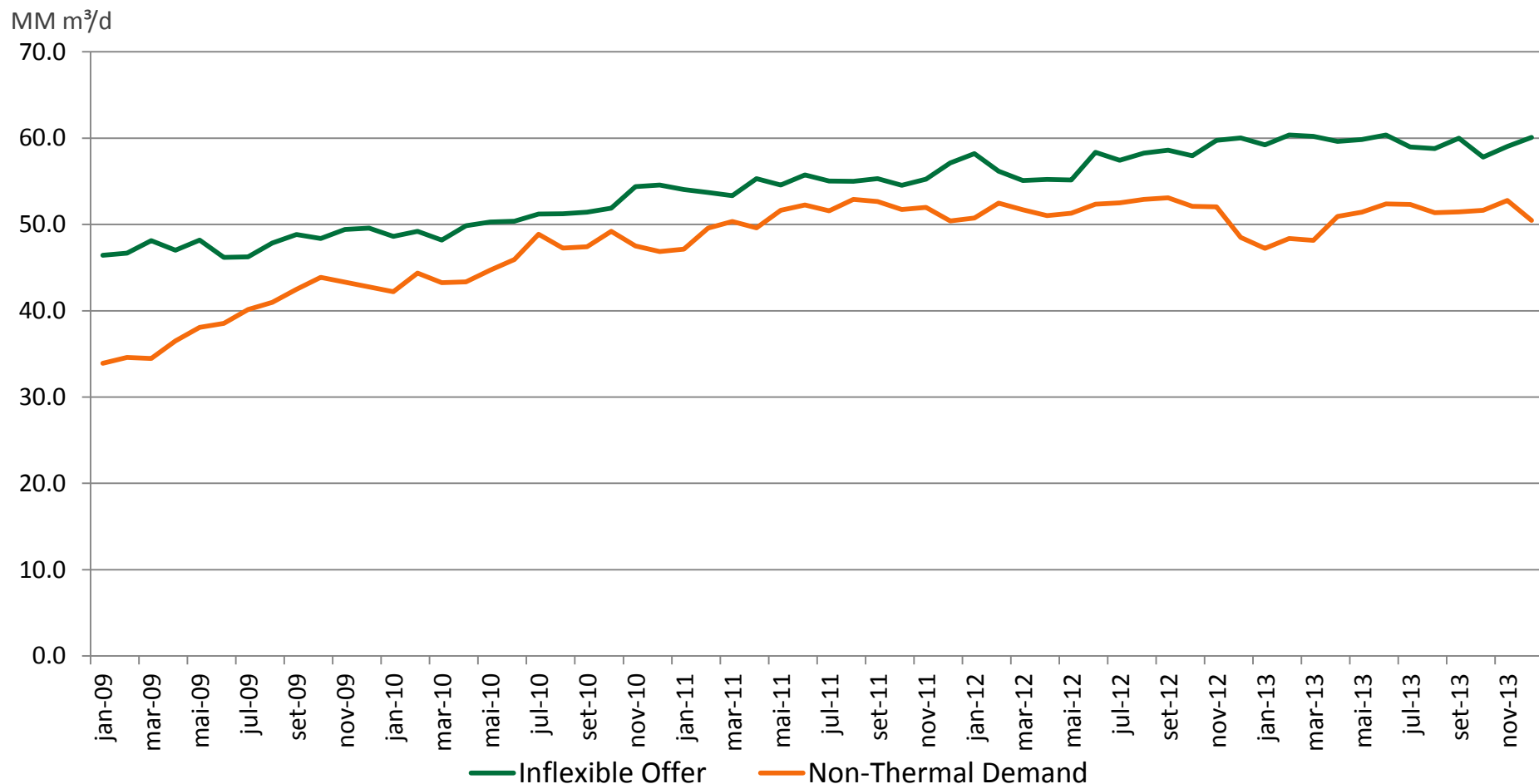
## **Methods & Results:**

- Possible Locations for a UGS in Brazil
- Petrobras Alternatives to UGS

## **Summary / Conclusions:**

- Key Takeaways

# Domestic Balance of NG

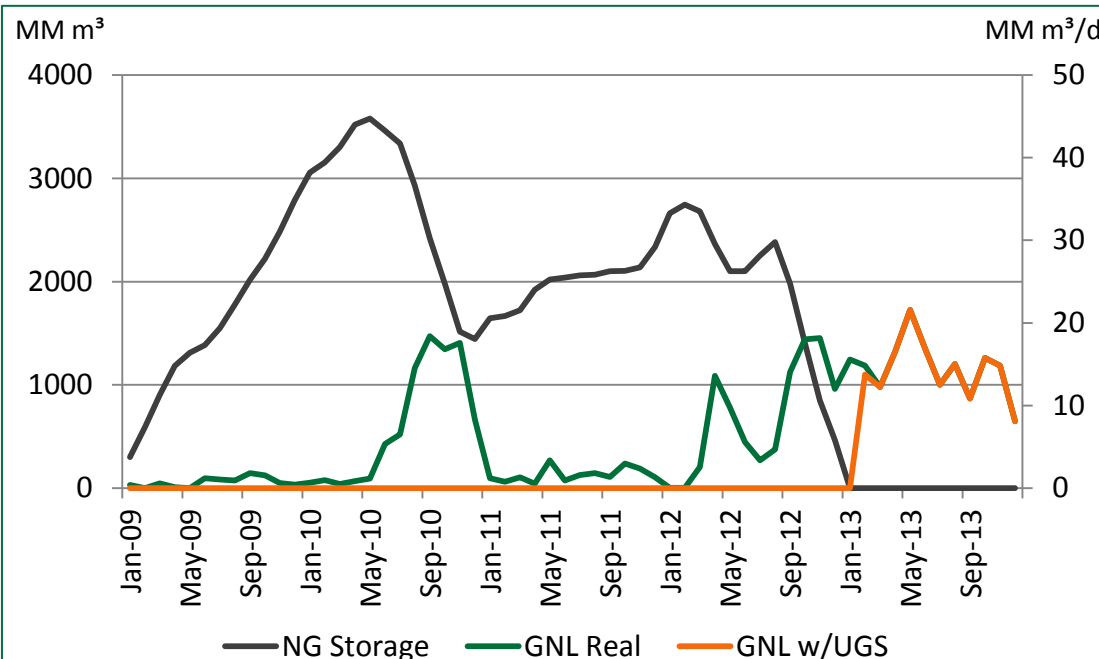


- ▶ The inflexible offer of domestic gas has been historically higher than the non-thermal demand, implying in a pseudo-excess of gas in a low thermal dispatch scenario.

# Exercise: NG Storage vs. GNL Imports

## Assumptions

- ▶ Bolivia imports fixed in 30 MM m<sup>3</sup>/d
  - ▶ Total Offer: Net Domestic Production + Bolivia Imports
  - ▶ Total Offer > Total Demand → Inject the excess
  - ▶ Total Demand > Total Offer → Withdraw from storage
- ▶ Cost of Bolivia gas: 10 US\$/MMBtu
- ▶ Cost of GNL 2014\*:
  - ▶ GNL: 15.4 US\$/MMBtu
  - ▶ Regas: 1.0 US\$/MMBtu

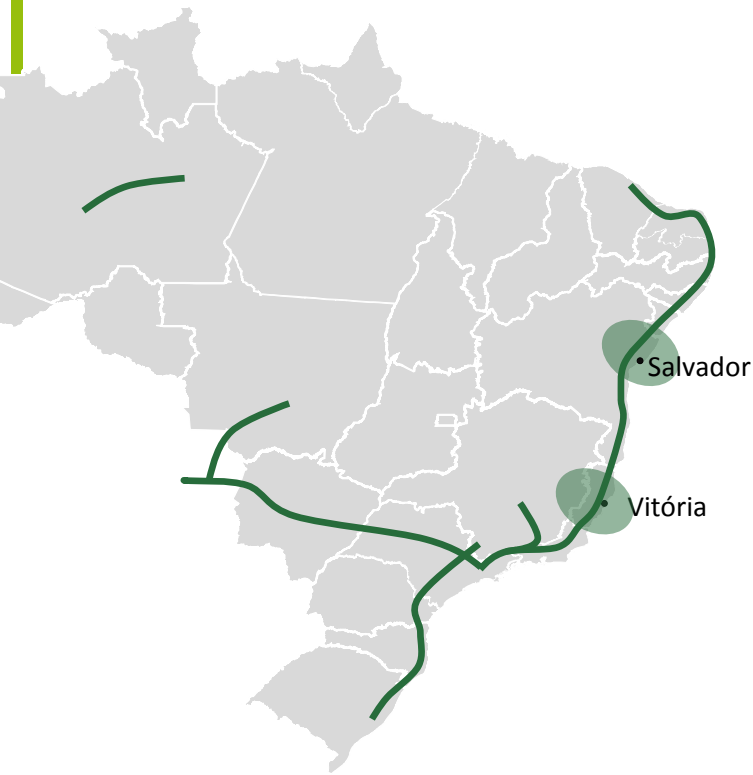


## Conclusions

- ▶ GNL Imports Real: **12.1 bi m<sup>3</sup>**
- ▶ GNL Imports w/ UGS: **4.9 bi m<sup>3</sup>**
- ▶ Possible reduction of GNL: **7.2 bi m<sup>3</sup>**
  - ▶ Relative Cost of GNL: **R\$ 4.4 bi**
  - ▶ Bolivia Gas Cost: **R\$ 2.7 bi**

**Total Savings : R\$ 1.7 bi**

# Potential Market



Withdrawal Rate (M m<sup>3</sup>/d field) | # fields

Working Gas M m <sup>3</sup>	Withdraw / Working Gas				
	1%	2%	3%	4%	5%
200	2   10	4   5	6   3	8   3	10   2
300	3   6	6   3	9   2	12   2	15   2
400	4   5	8   3	12   2	16   2	20   1
500	5   4	10   2	15   2	20   1	25   1

## Rationale

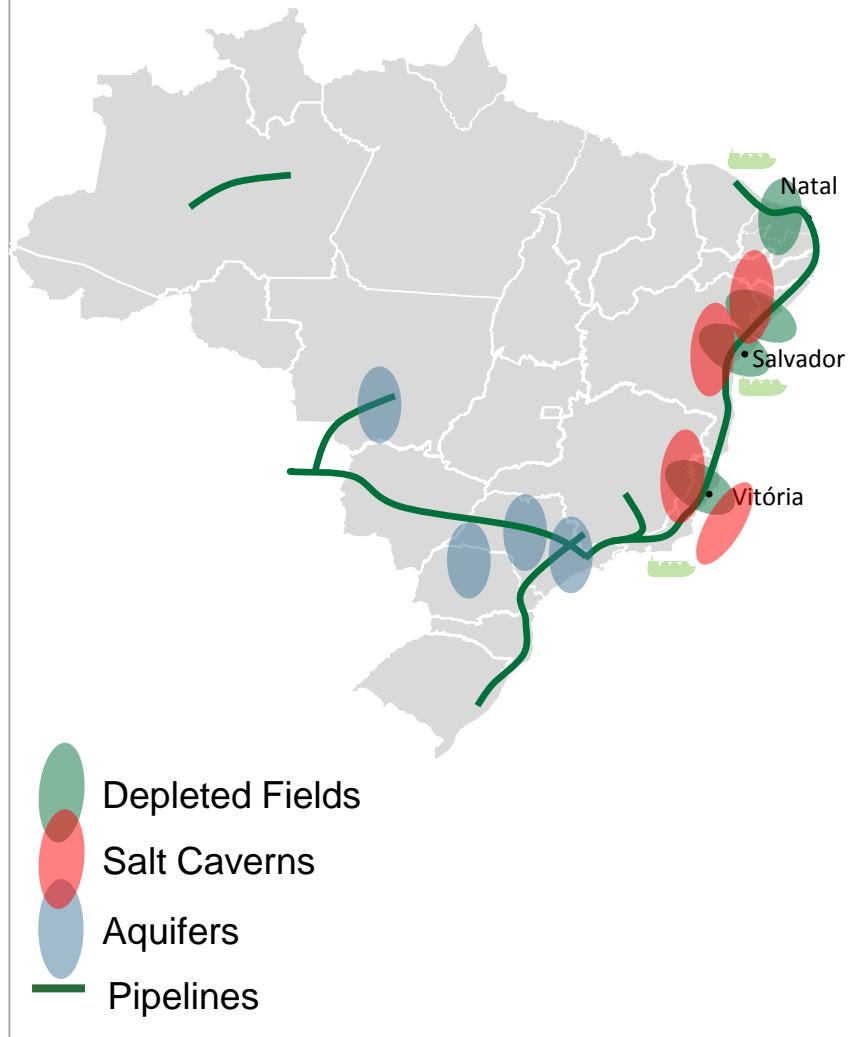
- ▶ Quick response for the volatility of energy demand
- ▶ Assuming the need of UGS is equivalent to a withdrawal rate similar to the local regasification capacity :
  - **20 - 25 M m<sup>3</sup>/d**
- ▶ Need for a working gas storage volume of 30 to 90 days
  - **0,6 - 2 bi m<sup>3</sup>**
- ▶ States that have idle capacity in their existing pipelines
  - **Bahia and Espírito Santo**

## Typical schedule for start-up



# Possible Locations for a UGS Facility in Brazil

## Locations Screened



## Milestones Achieved:

- 1) Negotiate with client an MOU;
- 2) Based on internal analysis and consultants opinions, 30 onshore fields from independent producers were identified;
- 3) A second round of analysis were carried out and 7 (out of the 30) mature fields were prioritized;
- 4) Geotechnical consultancy was hired in order to evaluate these 7 prospects
- 5) 3 Fields proved some viable conditions to implement a UGS facility

# Petrobras Alternatives to UGS

	UGS	FSRU Storage	Storage in LNG Carriers
Cost to Petrobras (MM US\$)	Up to 50	Freight <b>43.3<sup>1</sup></b> Regas <b>6.8</b> Depreciation <b>30.3</b> Total <b>80.4</b>	Freight <b>18.0<sup>2</sup></b> Regas <b>6.8</b> Depreciation <b>30.3</b> Total <b>55.2</b>
Storage Capacity (MM m <sup>3</sup> )	100.00	104.04	96.00

## Comparison:

US\$ / m <sup>3</sup>	Up to 0.50	0.77	0.57
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1. Daily rate: US\$ 118.6 k
2. Daily rate: US\$ 50.0 k

# Key Takeaways

- I. As the country becomes more dependent on Gas Fired Power Plants to supply energy, gas storage becomes more necessary to handle supply x demand fluctuations
- II. Today, the alternatives to gas storage are not enough nor the most efficient way to meet the expected demand for gas fired energy
- III. The “de facto” monopoly of gas infrastructure allied to the regulatory landscape poses relevant challenges to anyone trying to venture in this field, but there are some signs of change coming from ANP
- IV. However, there are still some room for entrepreneurs trying to seize, now, local and specific opportunities either by offering a predictable source of energy to the GFPPs bidding projects or by creating a strategic reserve of fuel for industries powered by NG