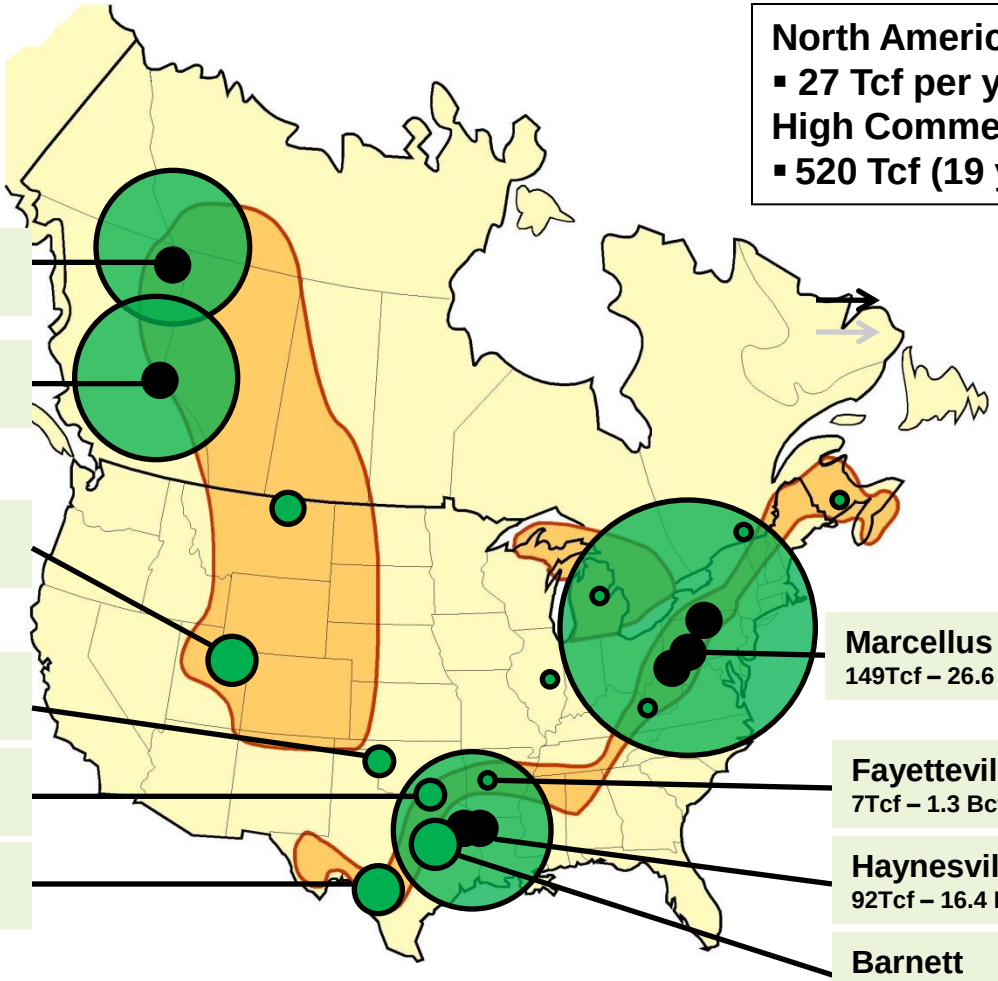
Unlocking Shale Gas Potential in Latin America

IHS CERA

Highly Commercial Resource Estimates

North American Consumption:
- 27 Tcf per year

High Commercial Resource:
- 520 Tcf (19 years)



Horn River
90Tcf – 16.0 Bcfd - $2.74

Montney
96Tcf – 17.1 Bcfd - $3.96

Mancos
20Tcf - 5Bcfd

Granite Wash
10Tcf – 1.6 Bcfd - $2.20

Woodford
9Tcf - 3Bcfd - $3.64

Eagleford
28Tcf – 5.0 Bcfd - $2.07

Marcellus
149Tcf – 26.6 Bcfd - $3.29

Fayetteville
7Tcf – 1.3 Bcfd - $2.57

Haynesville
92Tcf – 16.4 Bcfd - $3.10

Barnett
28Tcf - 5Bcfd
$5.24 FWS & $3.89 SB

Source: IHS CERA.
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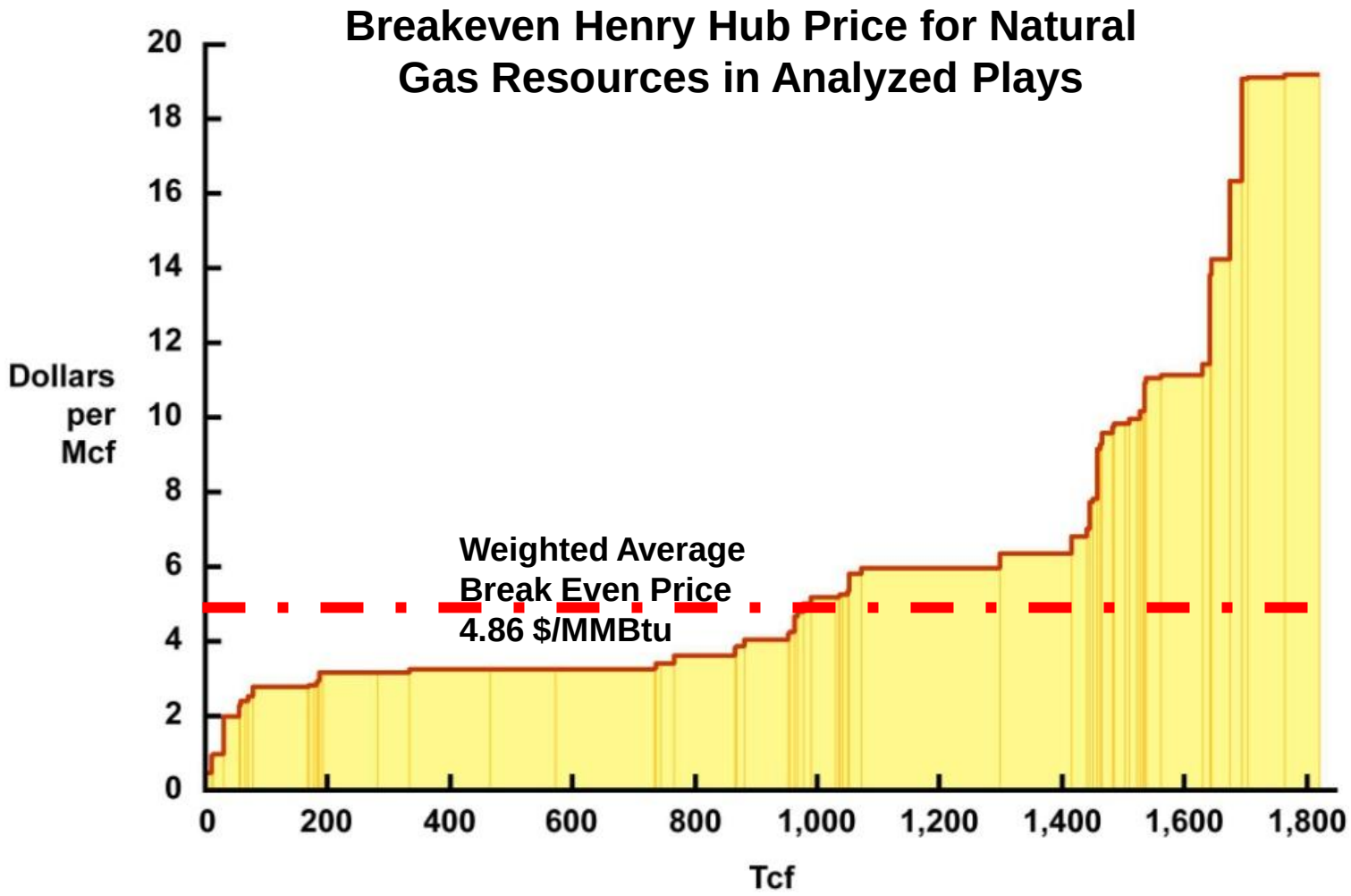
Plentiful and Low-Cost
North American Shale Gas Displaces Any Need for LNG



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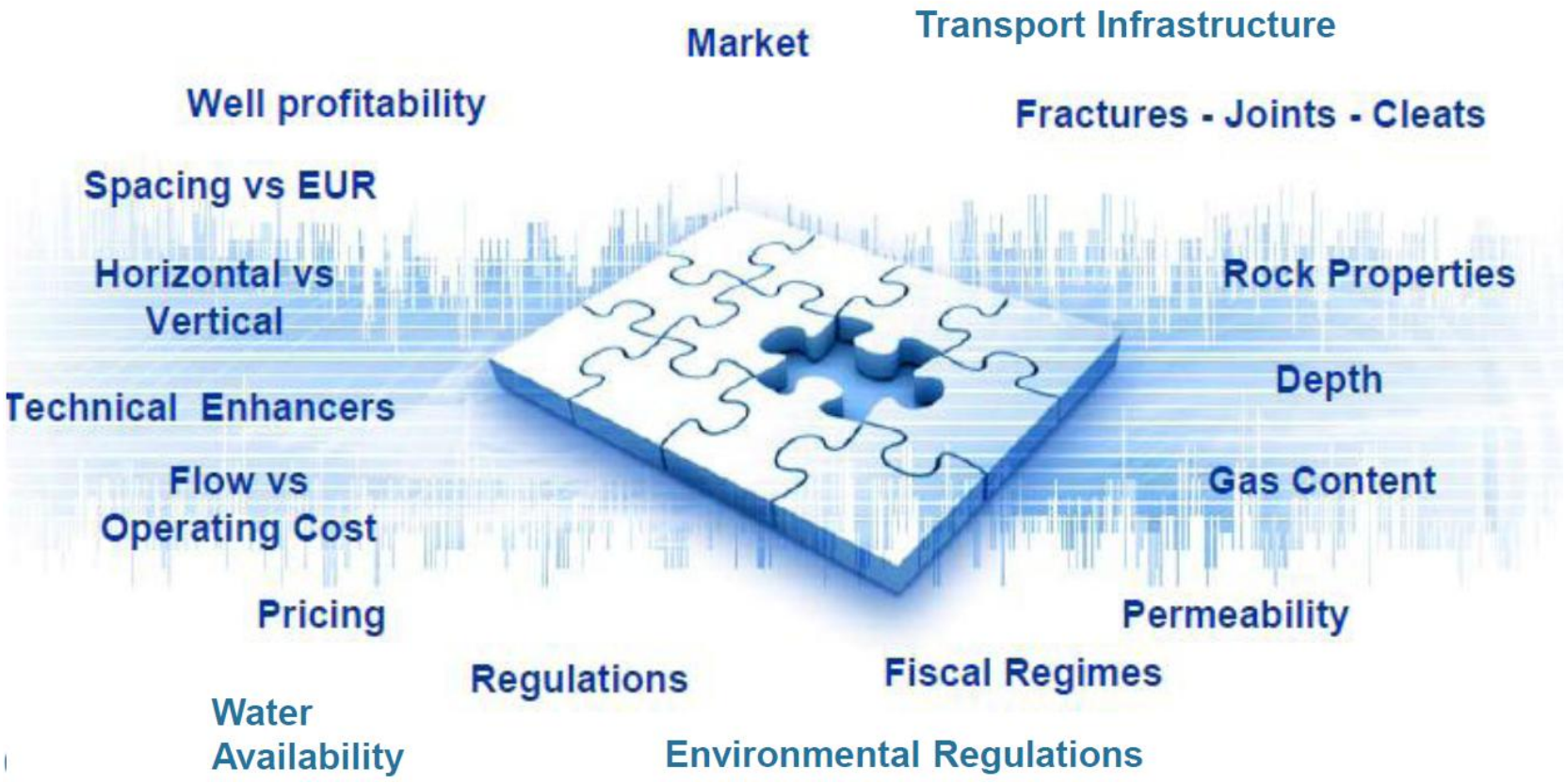
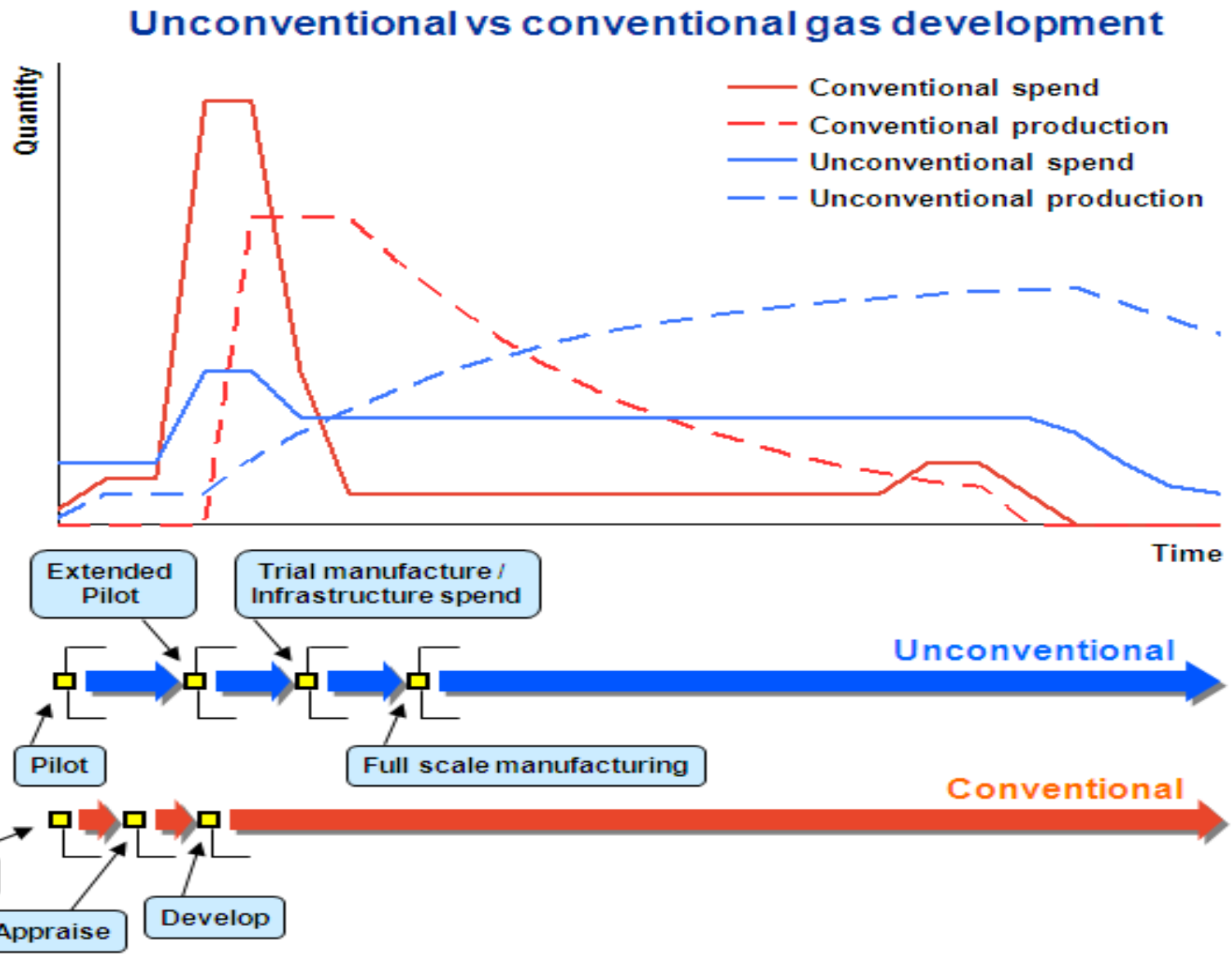
…….Is There a Formula for Success?

……Is the Shale Gas Business Model Replicable Outside North America?



Changing Our Thinking !



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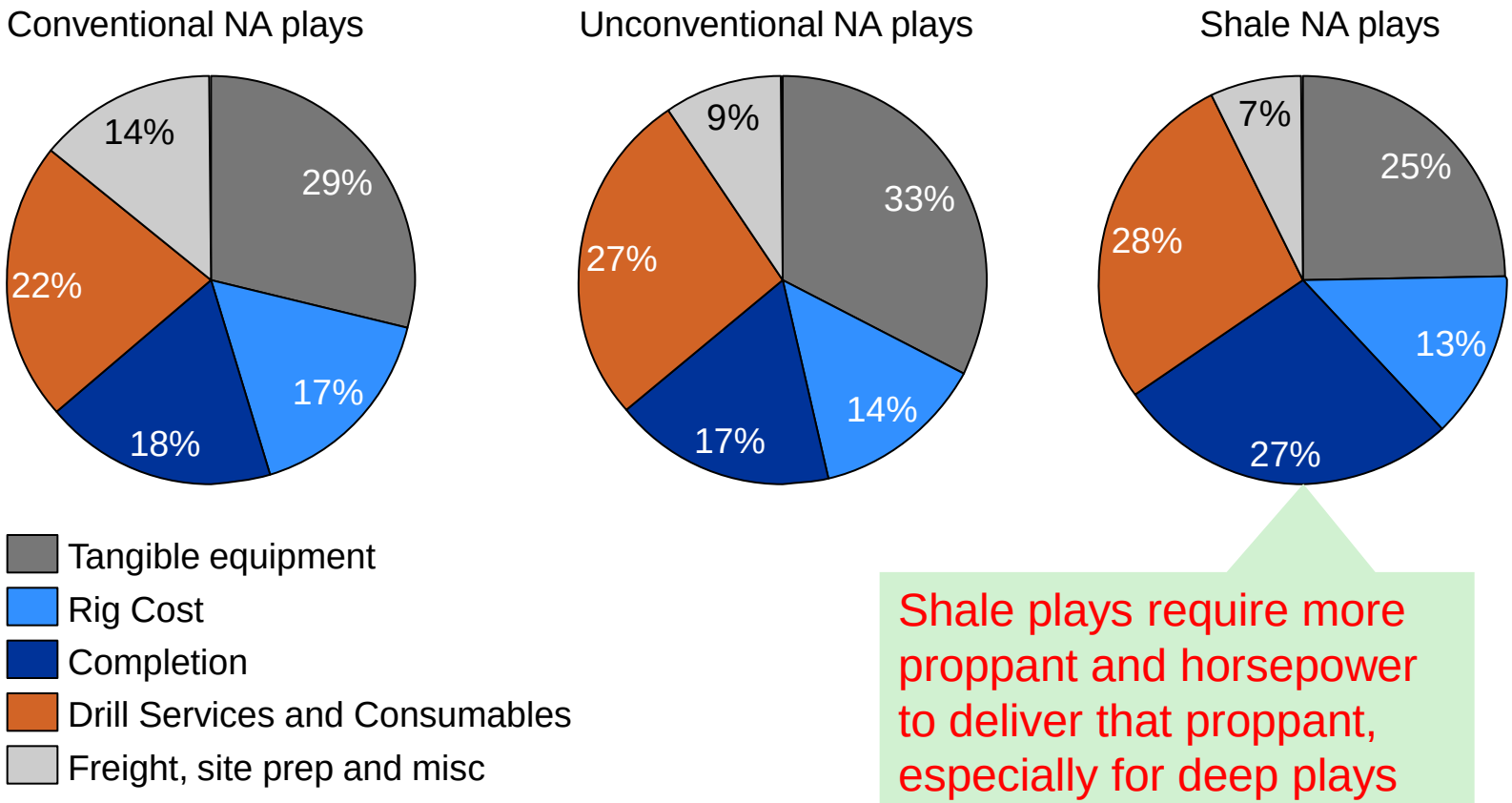
Completion Costs Dominant

Breakdown of 2009 Well Costs for Unconventional NA plays



Shale plays require more proppant and horsepower to deliver that proppant, especially for deep plays

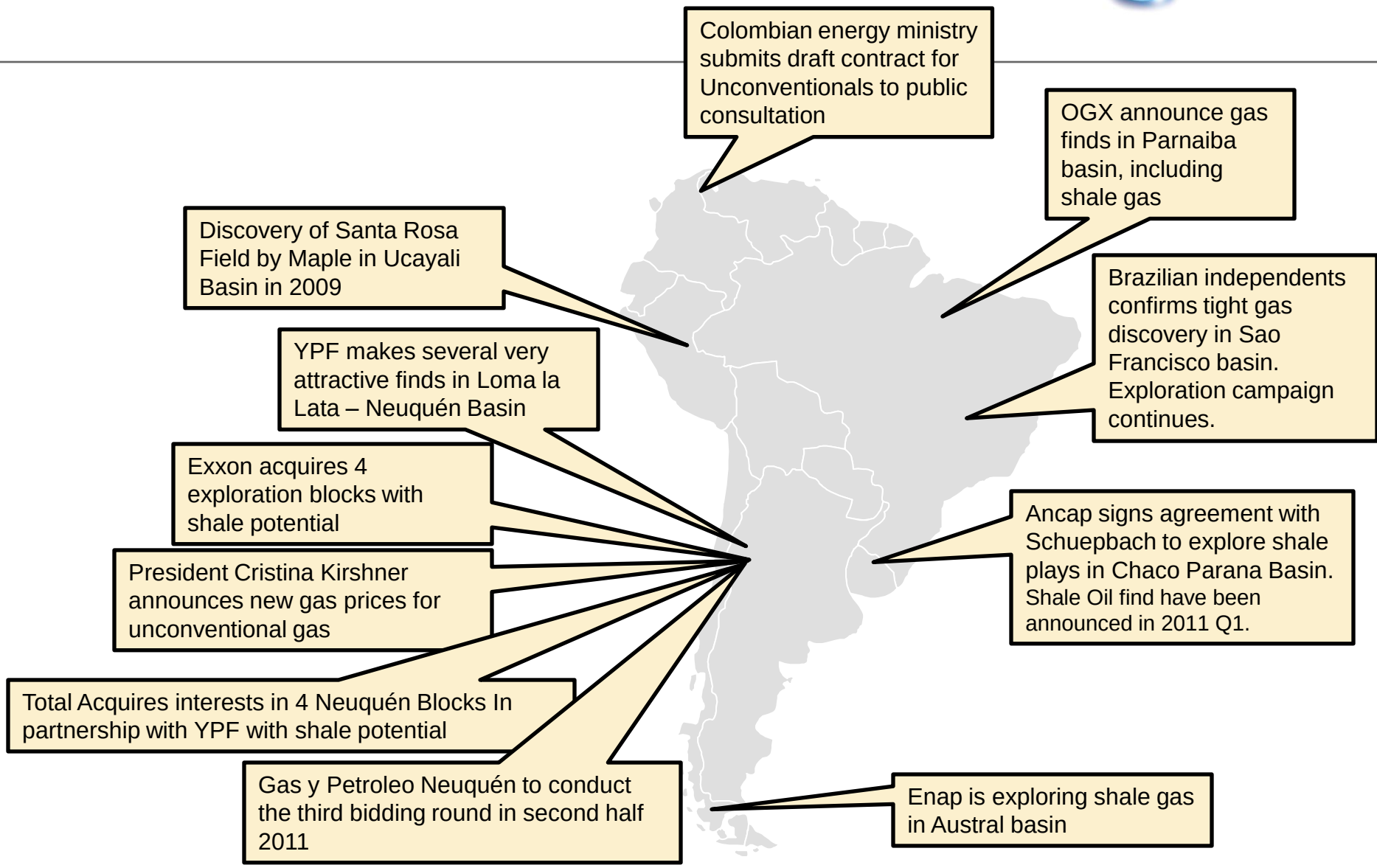
Source: IHS Consulting

Not all Locations are Suitable for a Drilling Intensive and Environmentally Sensitive Operation…….

Apache Horn River 10-frac: 2.4 million kg sand; 32 million Lts water……..

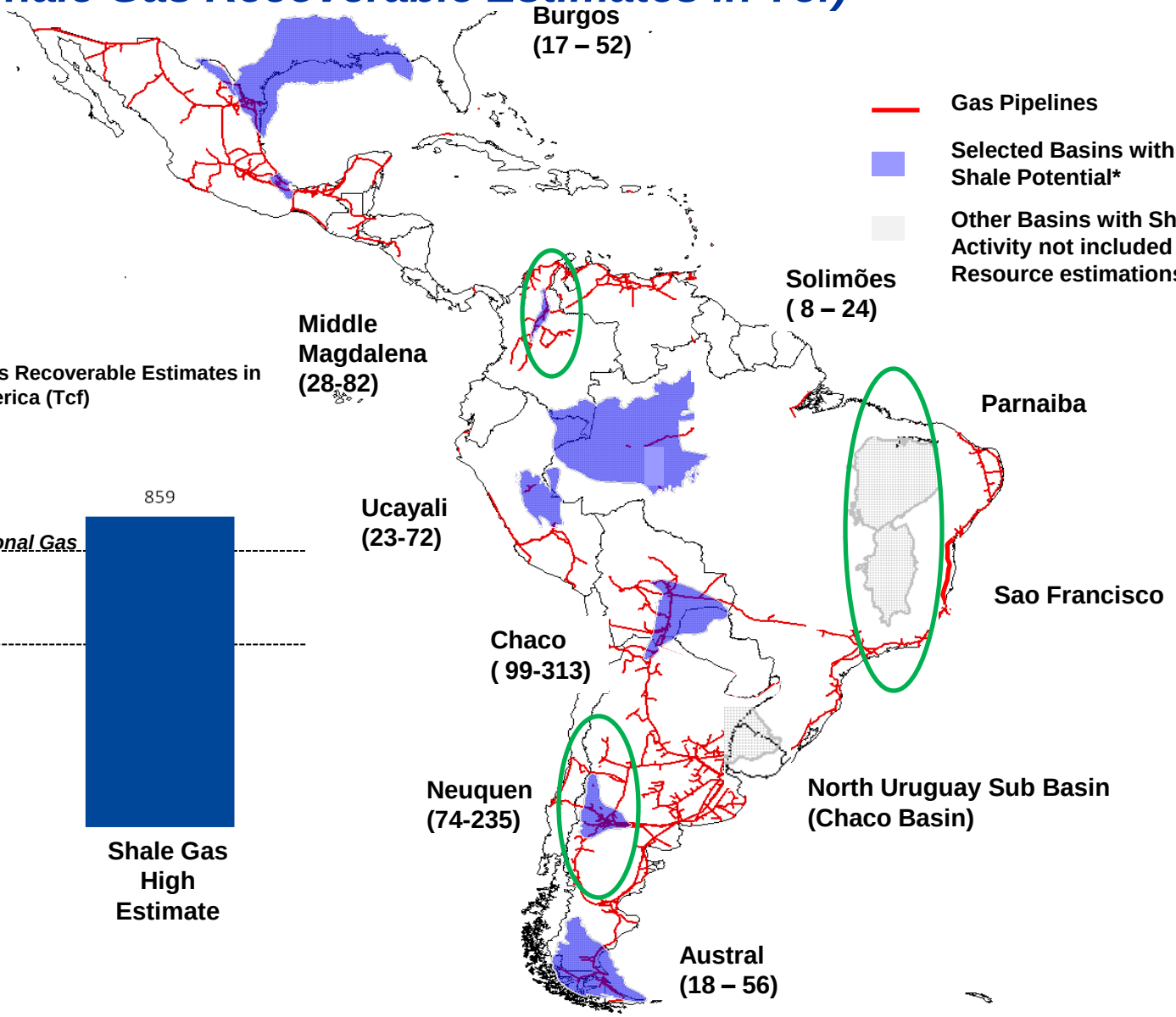
Is The Shale Gas Revolution Replicable in South America?

Unconventional Gas Activity is Gaining Momentum

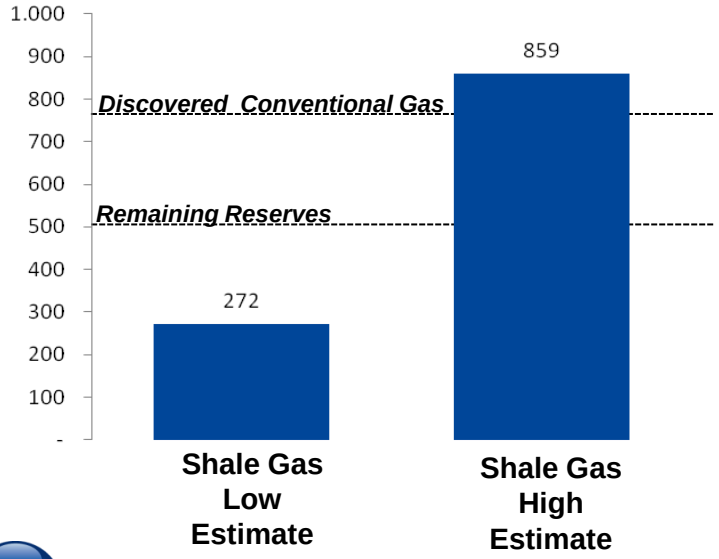


Shale Gas Potential in Latin America

(Low and High Shale Gas Recoverable Estimates In Tcf)



Conventional and Shale Gas Recoverable Estimates in Latin America (Tcf)



*Selection of the basins followed the criteria developed in the IHS CERA private report *Gas from Shale: Potential outside North America*.

A Premium Opportunity that Compares Against The Best……

	Haynesville	Barnett	Marcellus	Woodford	Eagle Ford	Vaca Muerta	Los Molles	La Luna	Sao Francisco
Average TOC (%)	3–5	4.5	<2–8	3–8	4–8	3–5	0.3–5	3–4	1-15
Net Thickness (meter)	60-75	120	40	40-55	37-85	>200	150-200	100	20-180
Thermal Maturity (Percent Ro)	0.6–1.6	1.3–2.1	1-3–2.4	0.5–3	0.7–1.8	0.4–1.5	0.25–2.9	0.8–1.2	2
Permeability (Nanodarcy)	100–500	50–200	100–200	40–70	100–1,500	50–200			5-300
Average Well IP (Mscfd)	5,071	2,875	2,500	1,498	2,624	2,666	2,666	2,207	
Average Vertical Formation Depth (meter)	3,500	2,200	2,500	3,000	3,400	2,750	3,500	2,000	2,000

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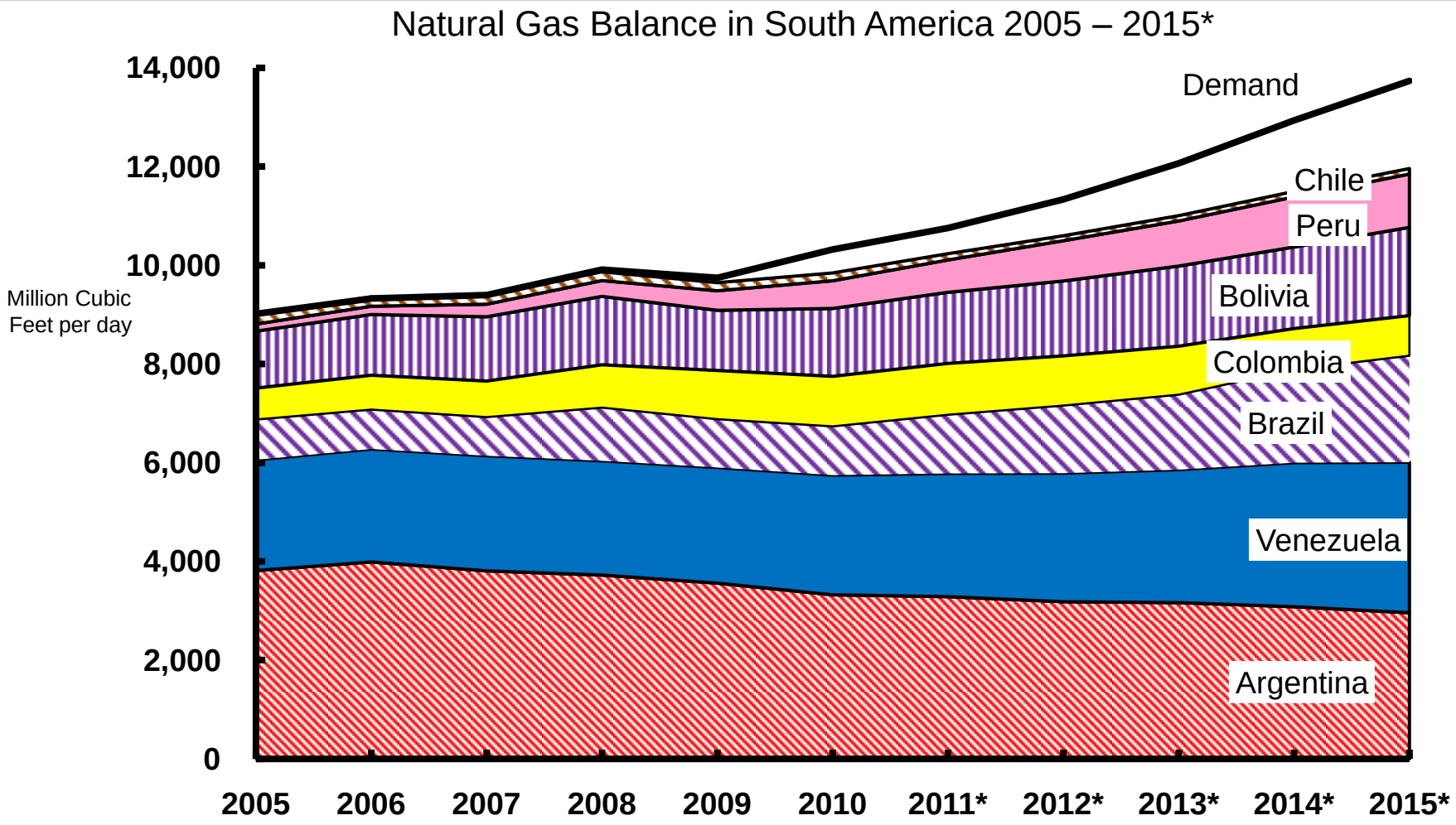
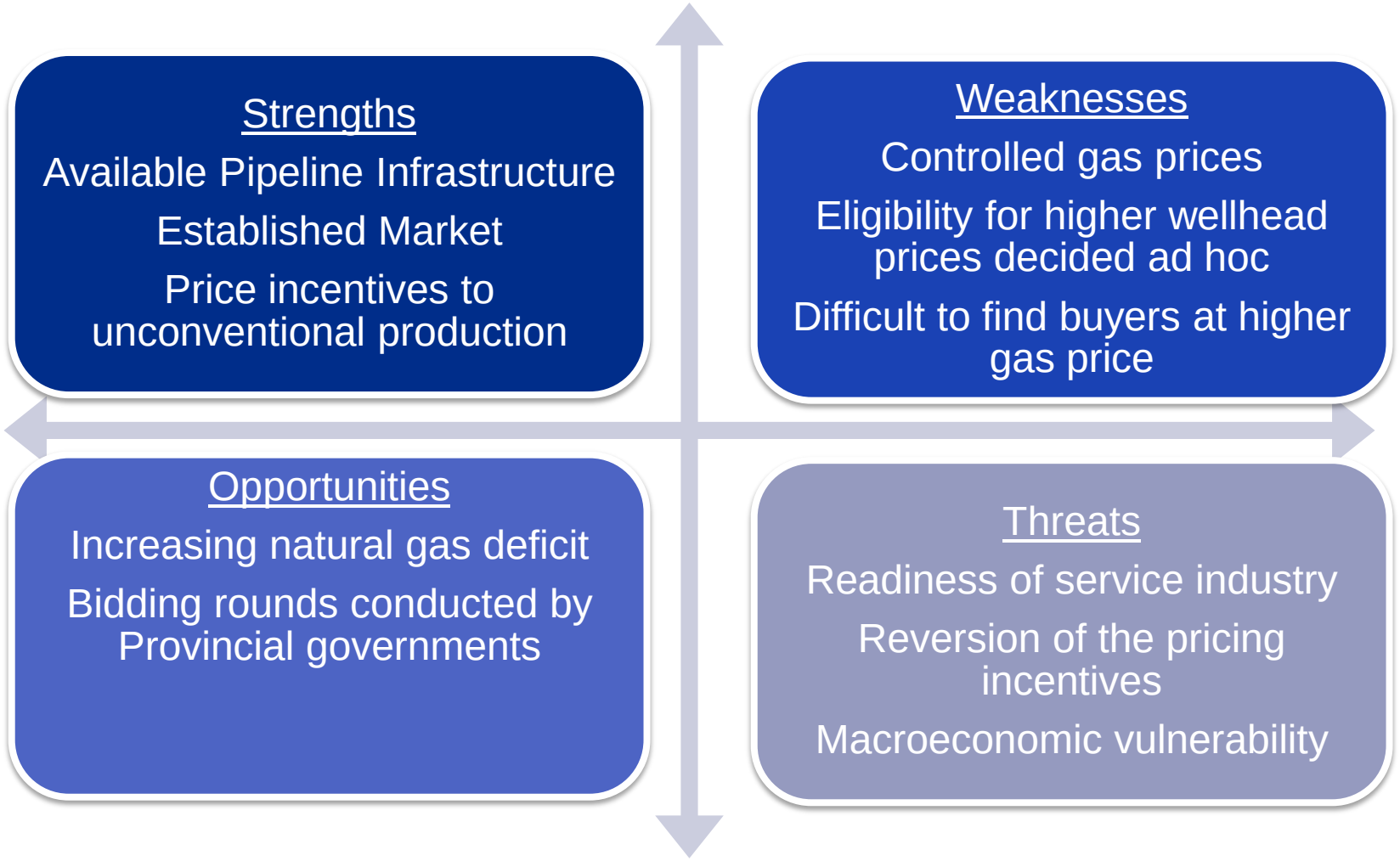
The Regional Gas Deficit Will Continue to Grow Very Rapidly…..

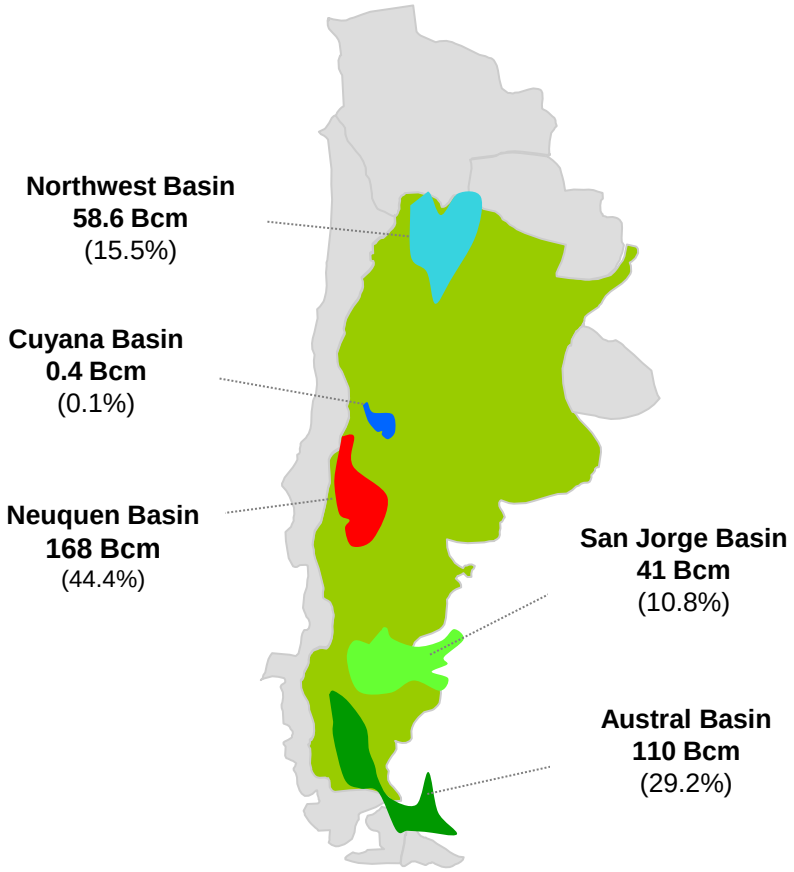


* Estimated values

Argentina Has a Mature Gas Market and High Priority for Growing Energy Needs



Proven Reserves and Most Important Basins



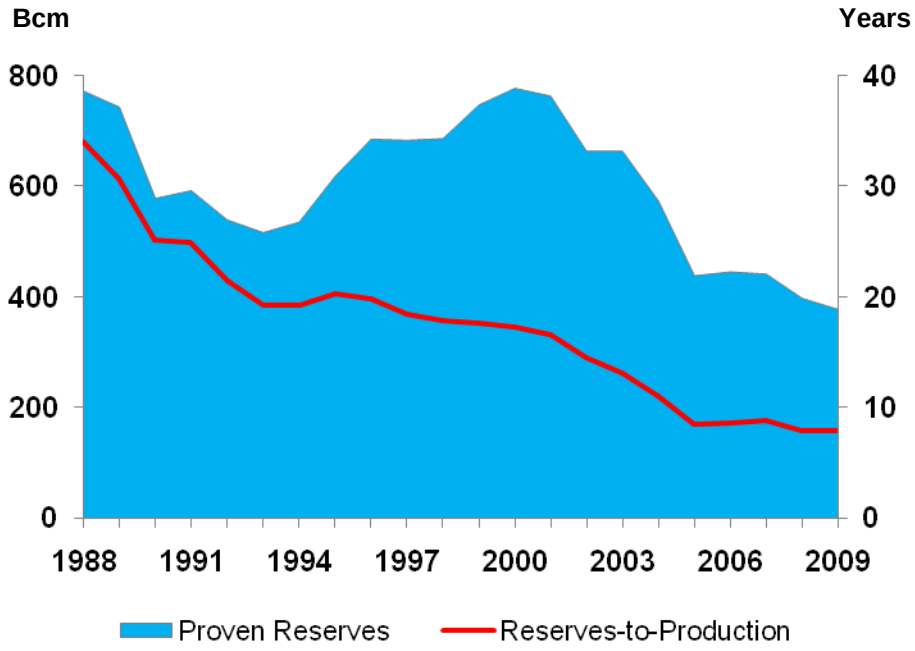
Natural Gas Proven Reserves, 2010

378 billion cubic meters (Bcm)

(14 Trillion cubic feet)

- Reserves-to-production ratio is declining. Gas imports are expected to become essential to secure gas supply in the short and medium term.

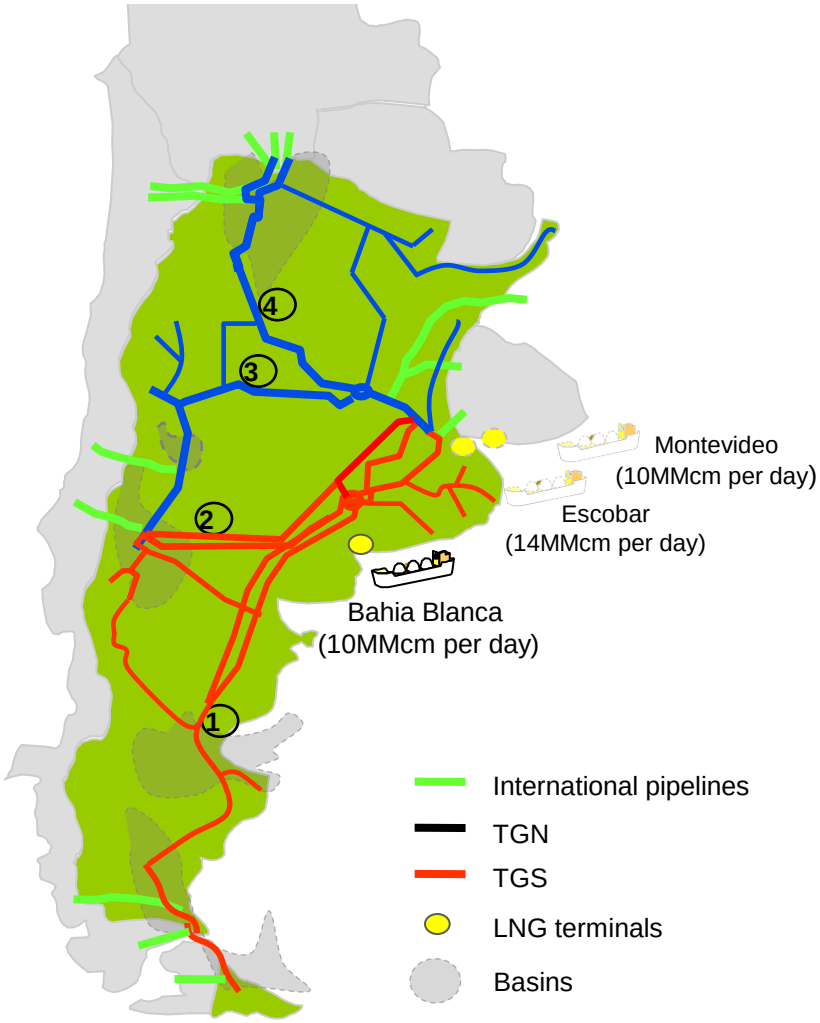
Reserves Evolution and R/P Ratio*



* Reserves-to-production is a ratio commonly used to estimate reserves life expectancy maintaining current production.

Source: IHS CERA. Data Source: Secretaria de Energia.

Natural Gas Transportation and Distribution Infrastructure



Major Trunklines Capacity

1. San Martin Pipeline (35 MMcm per day)
2. Neuba I and Neuba II (14 MMcm and 30 MMcm per day)
3. Midwest Pipeline (34 MMcm per day)
4. Northern Pipeline (25 MMcm per day)

GNEA (Gasoducto del Noroeste Argentino)

— The GNEA pipeline will increase current import capacity from Bolivia from 7MMcm to almost 30MMcm per day. The project was accepted by both countries in 2004, but construction is yet to start.

LNG Regasification Terminals

Besides the existing terminal of Bahia Blanca, there are currently two new liquefied natural gas (LNG) projects under way:

— Escobar terminal, just north of Buenos Aires, recently brought online with regassification capacity of 14 MMcm per day.

— Montevideo LNG facility is planned to go online after 2013, with a capacity around 10 MMcm per day to supply both Argentine and Uruguay gas markets.

Source: IHS CERA. Data source: ENARGAS.

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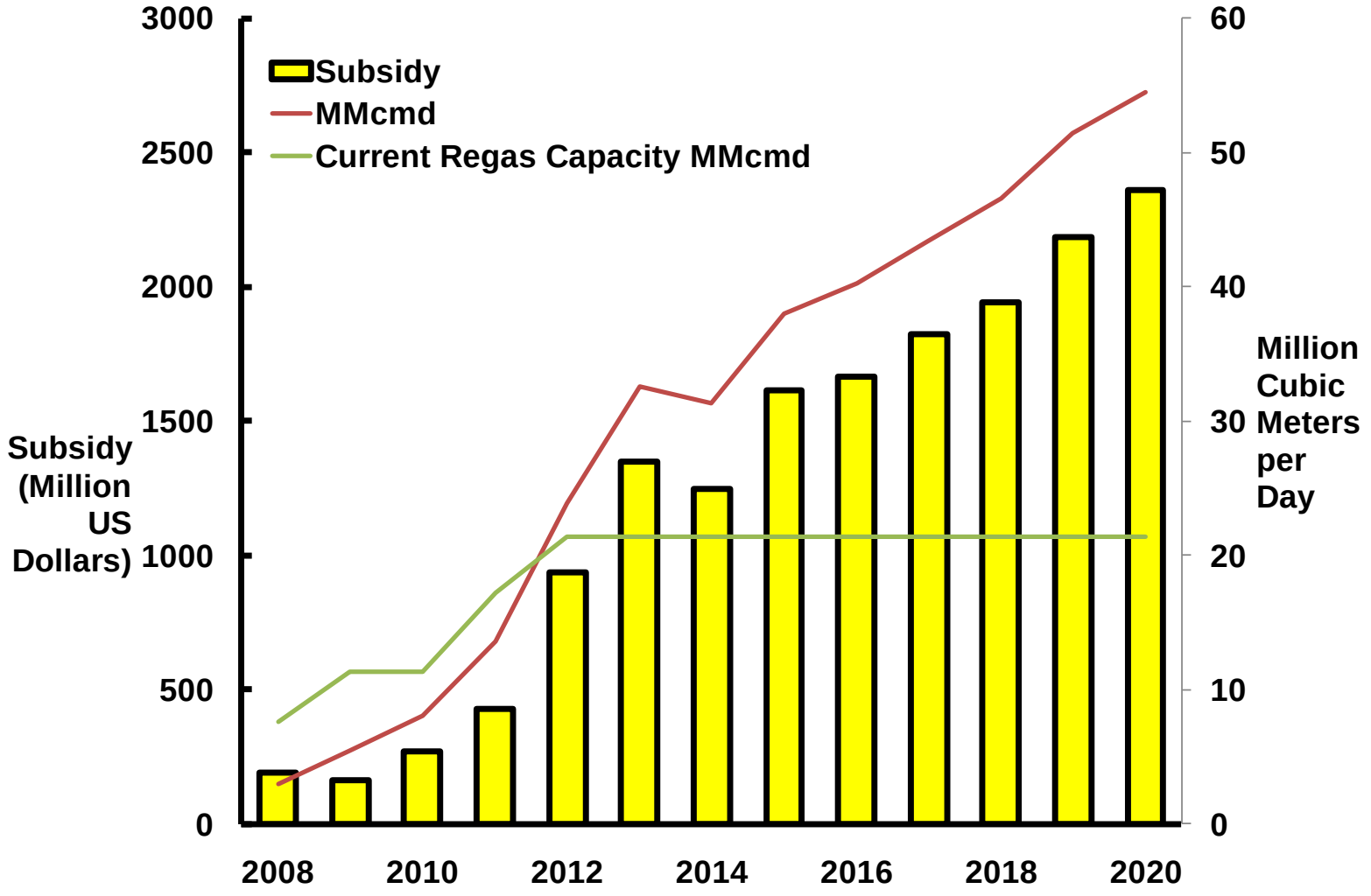
Argentina: Growing Very Rapidly into a Large Net Natural Gas Importer…..

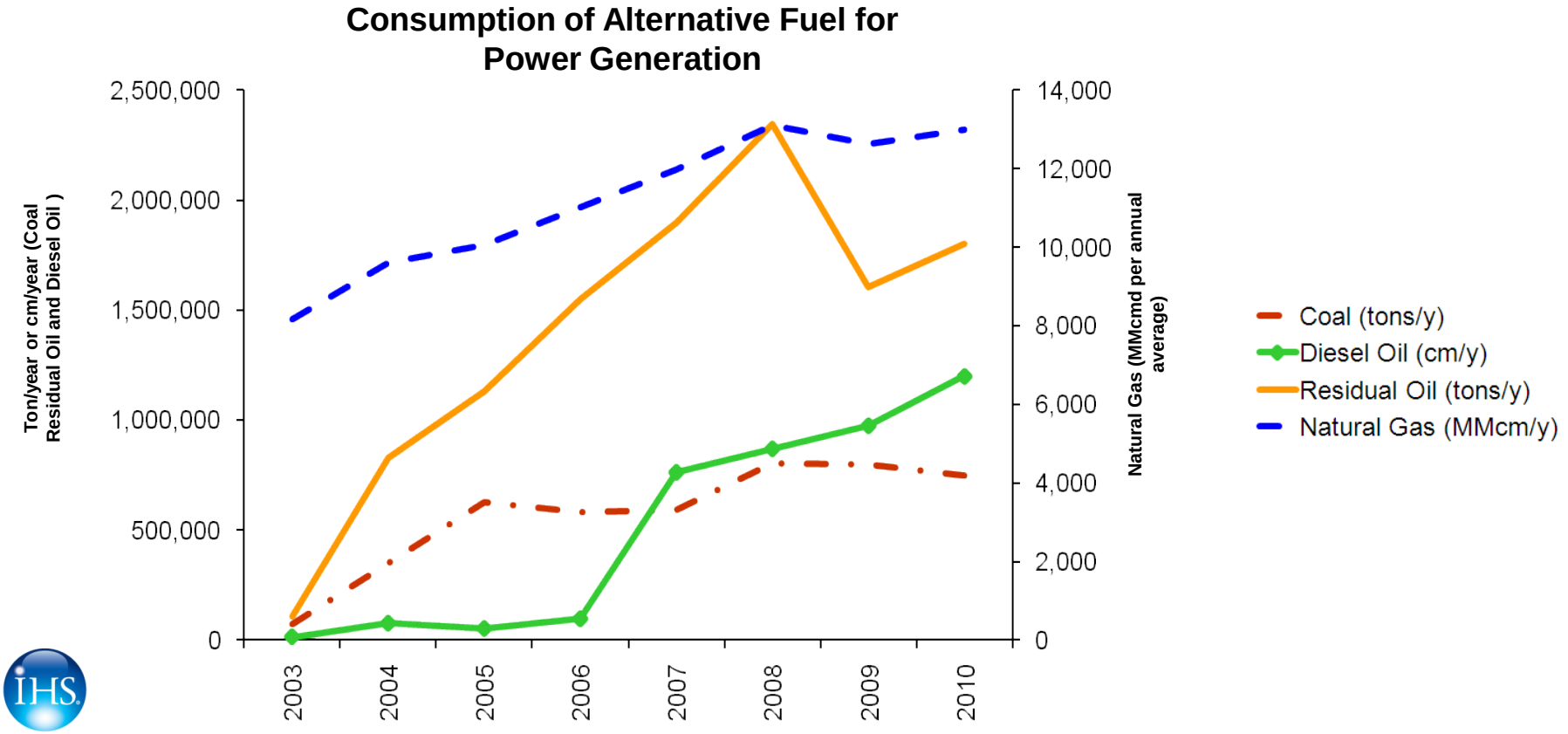


If sold at an assumed power price of $1.50 per MMBtu for power production

Source: IHS CERA, ENARGAS.

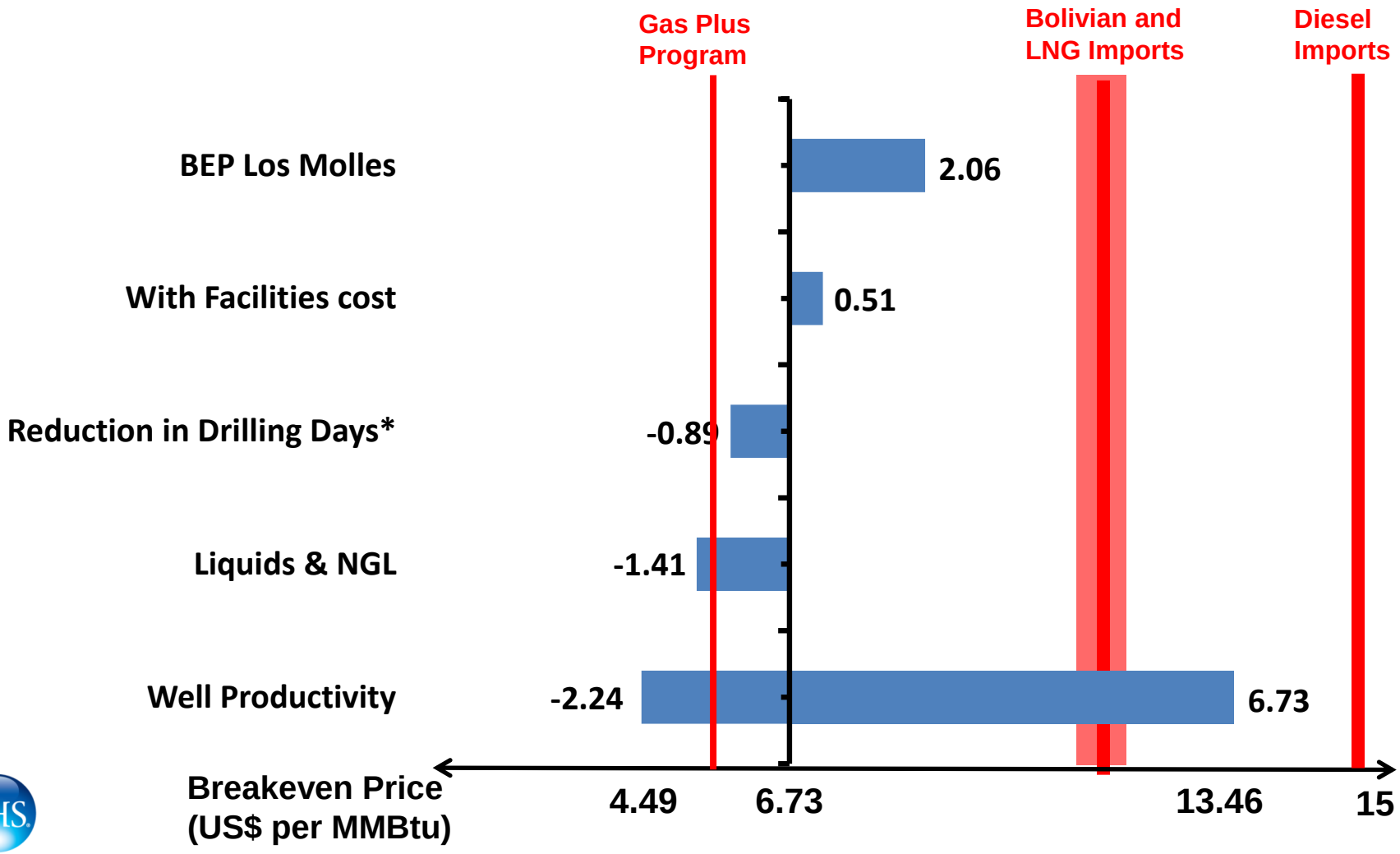
Alternative Fuel Consumption for Power Generation on the Rise…

- **Power generation increasingly requires substantial quantities of diesel oil/heating oil and residual oil–both imported in winter–to offset natural gas restrictions**



Source: IHS CERA, CAMMESA.

Project Economics for Shale Gas in Neuquen Basin, Argentina ($/MMBtu)



Source: IHS CERA.

A Horsepower Intensive and Environmentally Sensitive Undertaking.....

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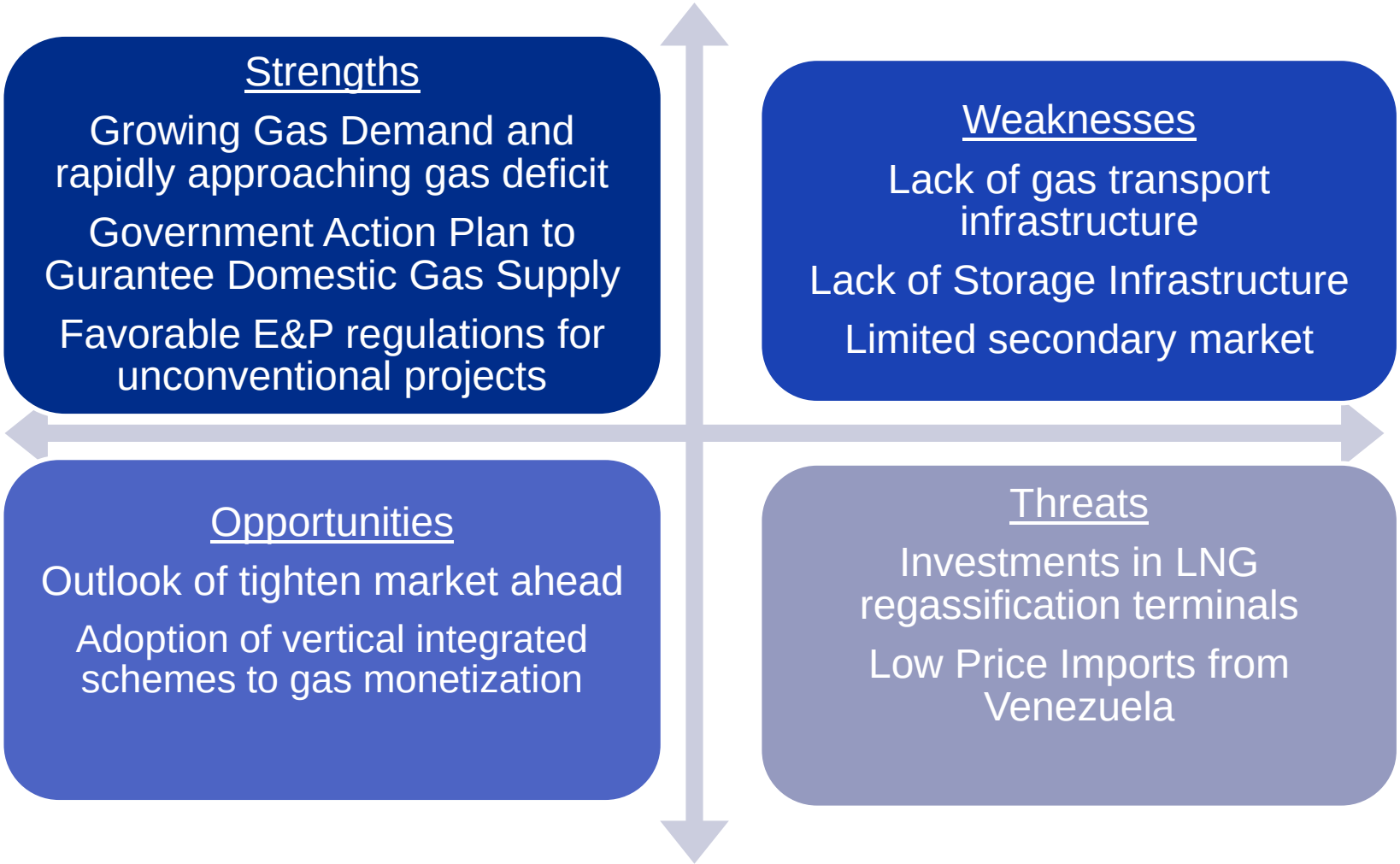
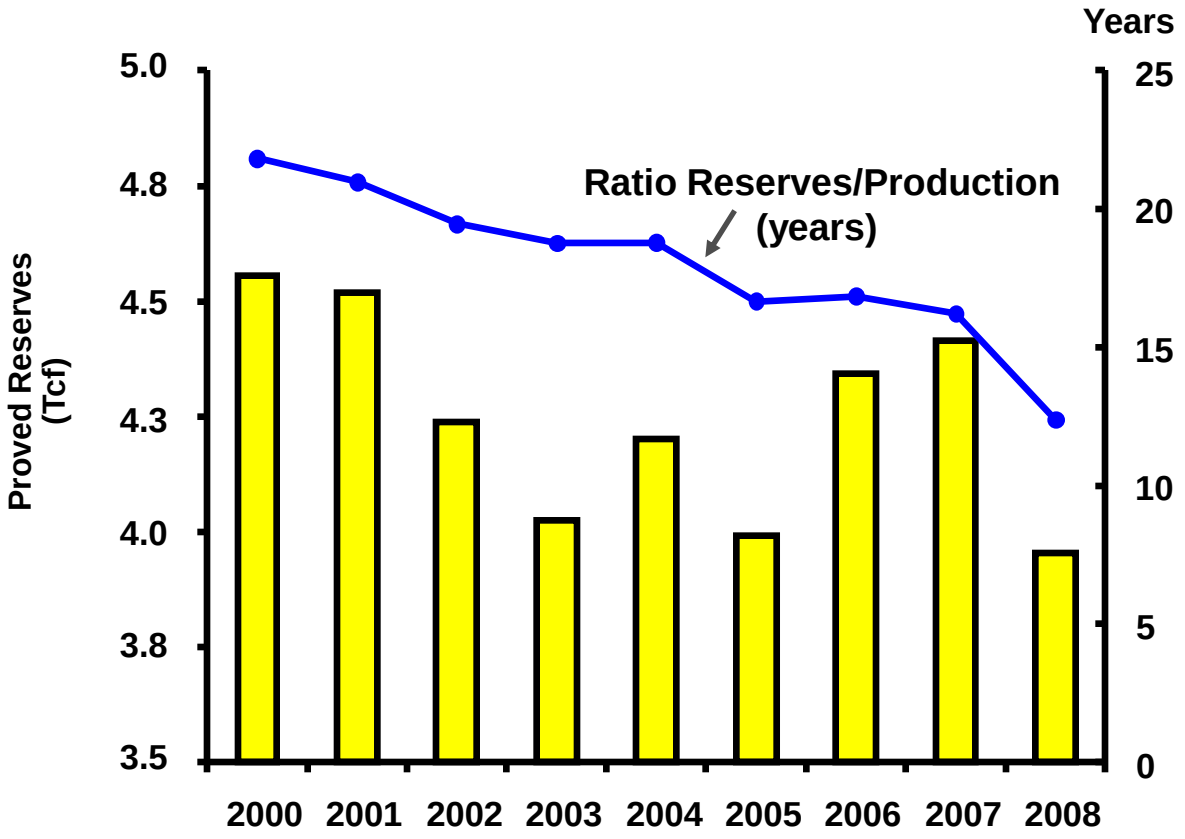
Colombia Implements New Regulations to Stimulate Unconventional Activity



Natural Gas Proved Reserves



- Ecopetrol announced that proven natural gas reserves rose to 1.88 billion barrels of oil equivalent at the end of 2009 (of which 1.34 billion barrels was oil), according to US Securities and Exchange Commission (SEC) criteria.
- Yet such additions result in a still tight natural gas balance in the short term—slightly above 12 years using the 2008 ratio of reserve to production.

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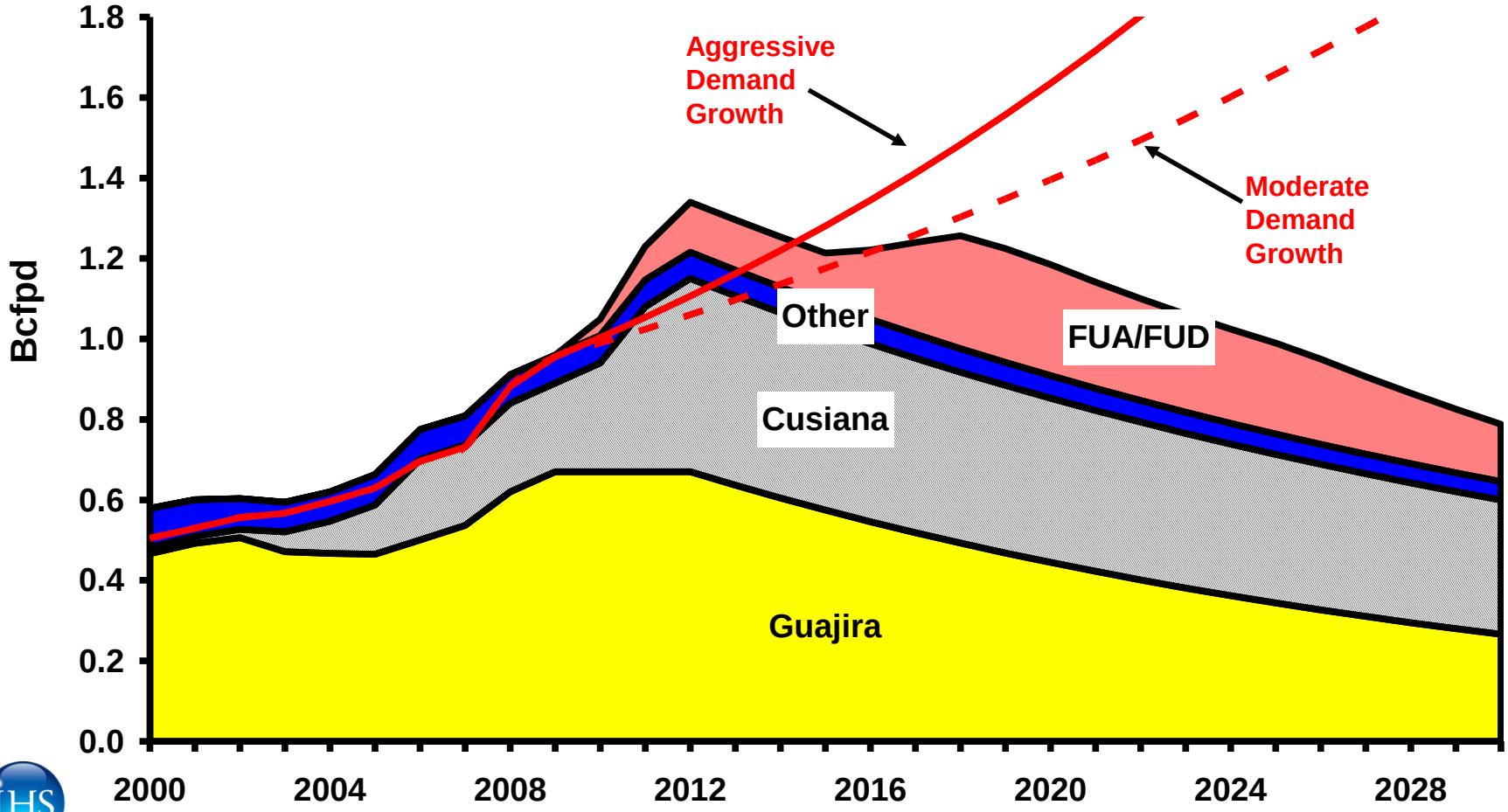
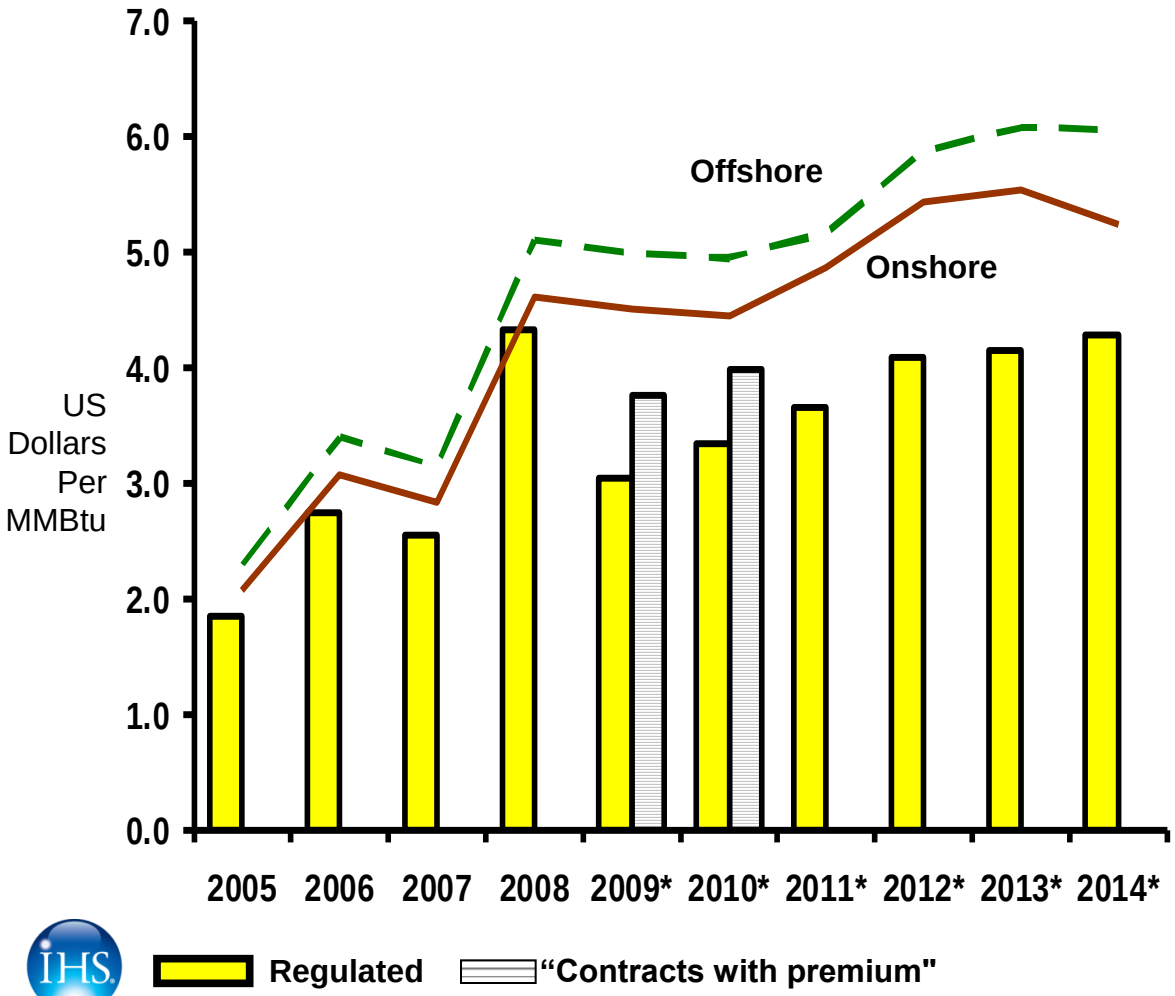
At Current Consumption Rates Colombia Will Become a Net Importer (Bcfpd)



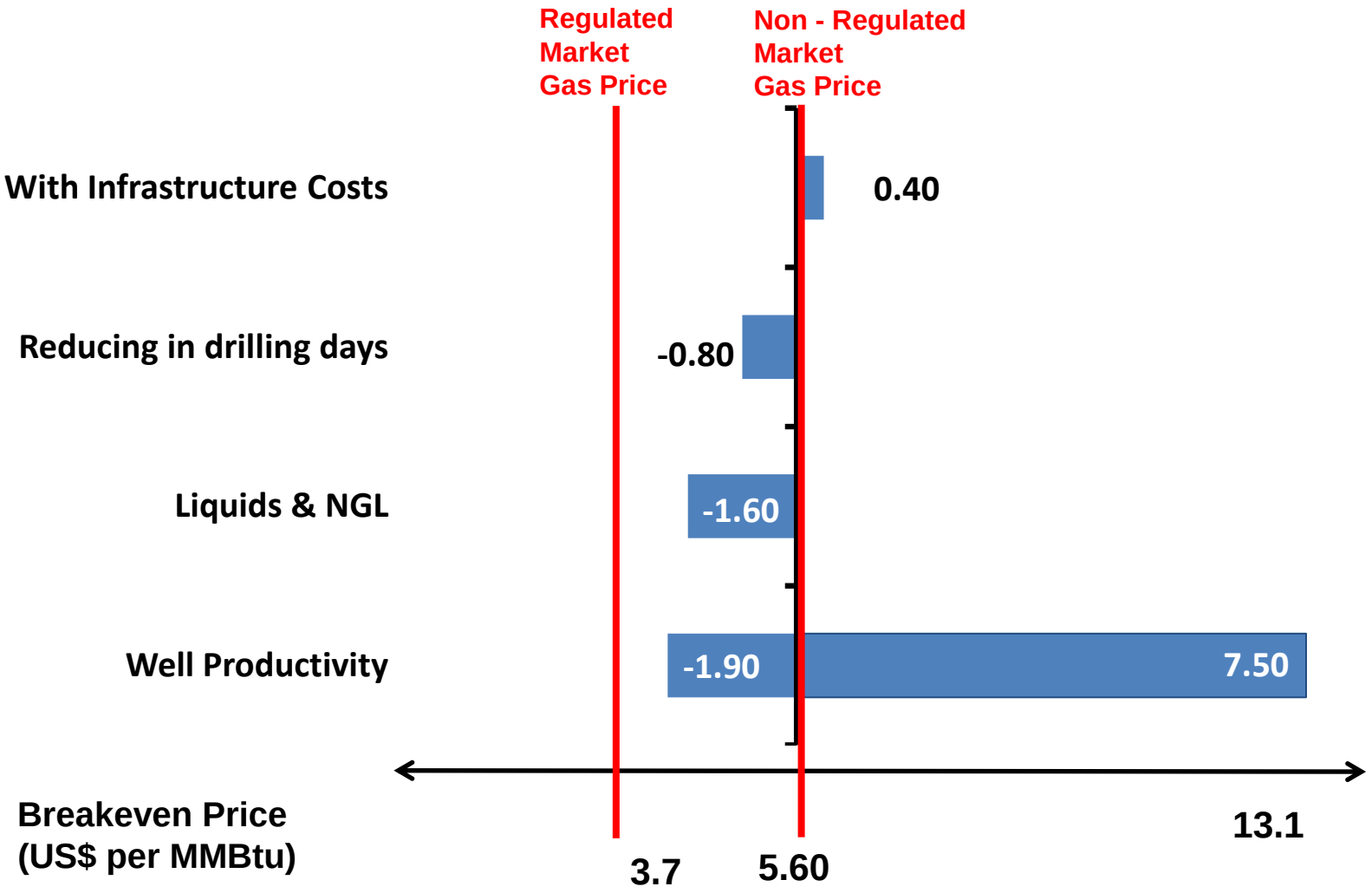
Natural Gas Prices



- Gas prices are negotiated among producers and main consumer groups with predetermined price escalators.
- There are two main pricing schemes: regulated gas prices (RGP) and more flexible schemes (public auctions for fixed prices and prices with premiums to RGP).

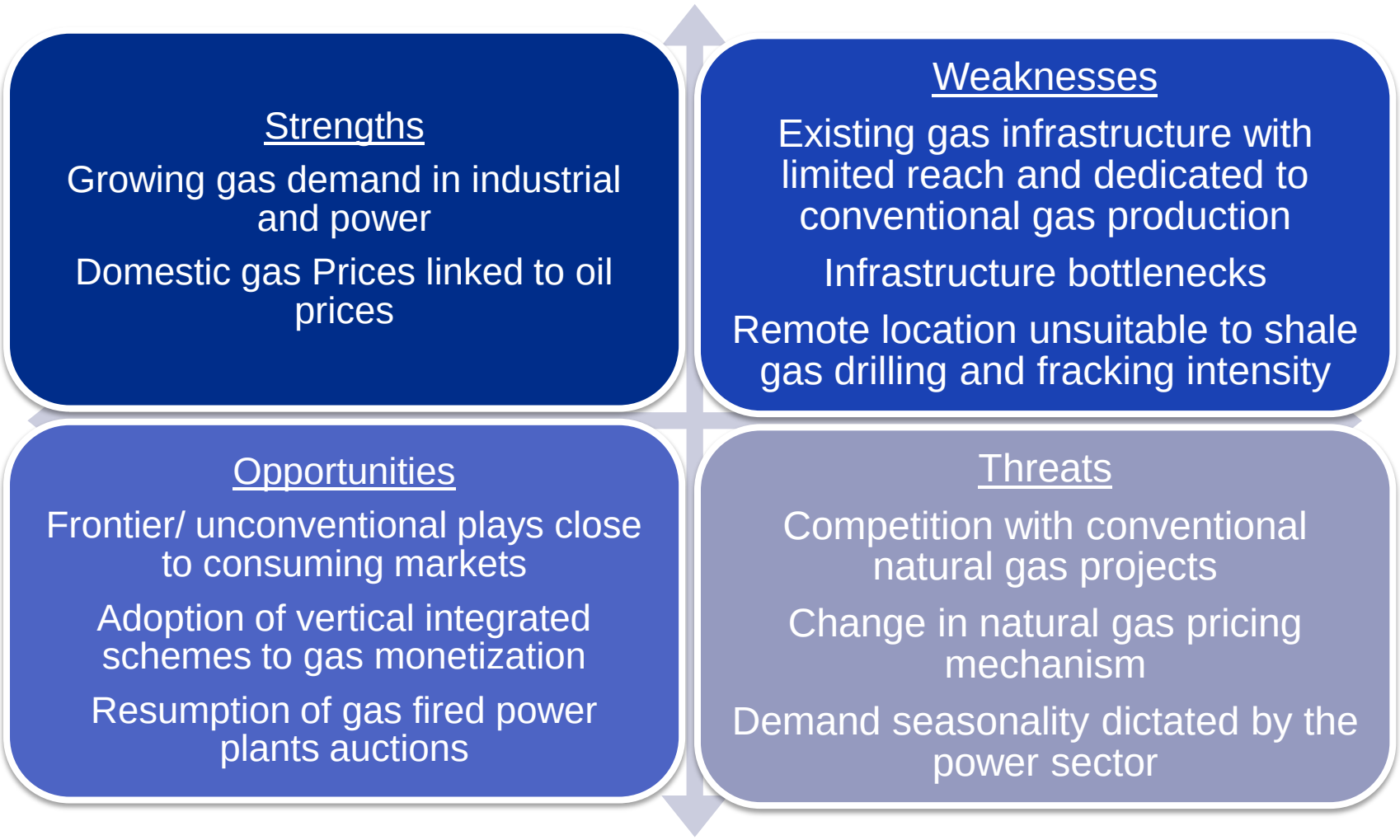
Source: IHS CERA.

Project Econommics for Shale Gas in Magdalena Medio, Colombia ($/MMBtu)



Source: IHS CERA

Brazil: Fertile Ground for Niche Players



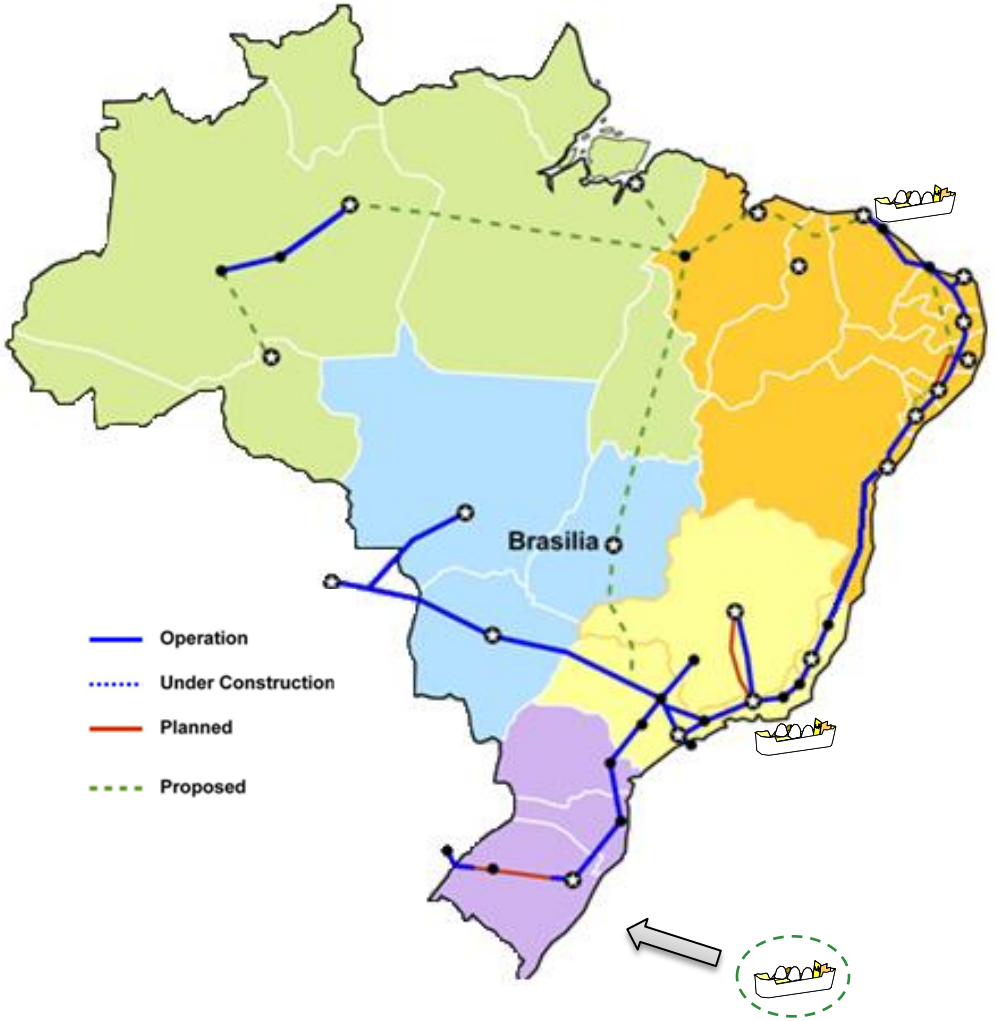
Natural Gas Transportation

Main Infrastructure

Gas transport infrastructure remains very limited compared to the extent of Brazilian territory and is mostly concentrated in the Southeast and along the coast.

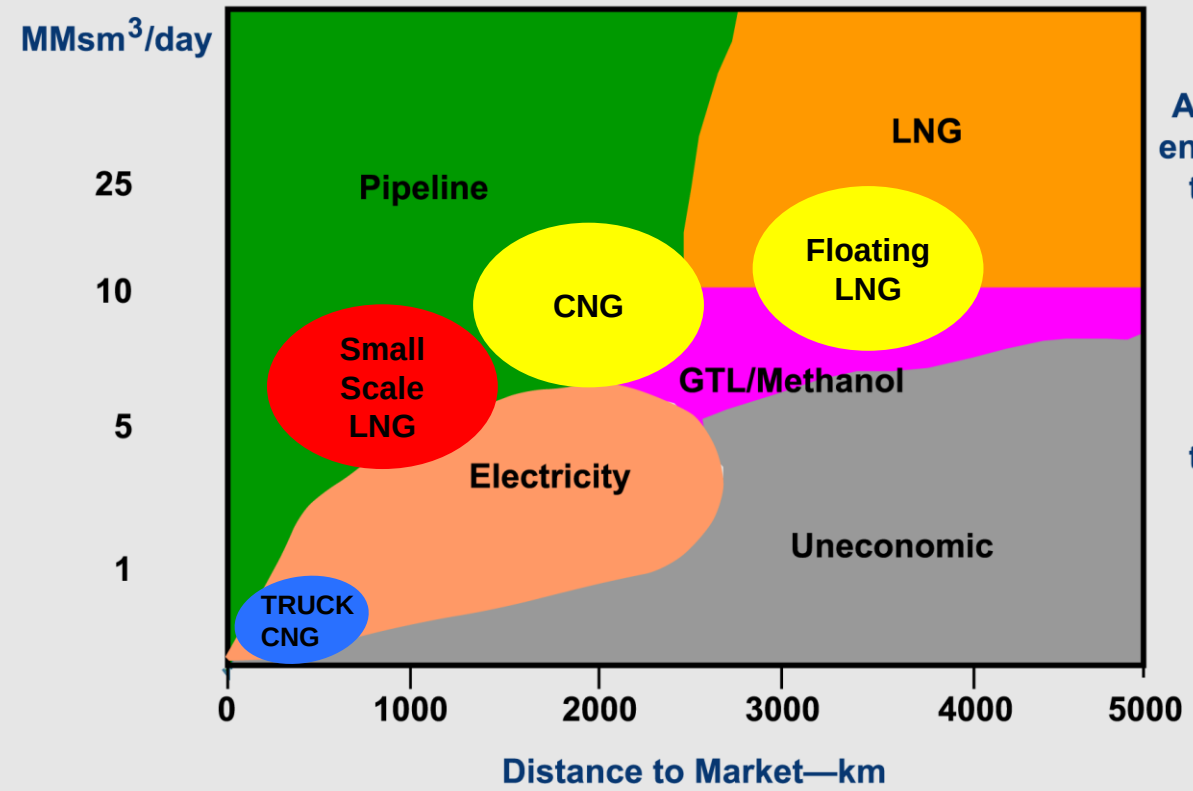
- **Two LNG terminals:**
  - Bahia de Guanabara (RJ - Southeast) with 14 MMcm per day.
  - Pecem (CE - Northeast) with 6 MMcm per day.

- **New investments expected:**
  - Plangas and PAC have financial resources to increase pipeline extensions.
  - A third additional LNG terminal in the southern region with an proposed capacity of 6 MMcm per day is under discussion (exact location and capacity yet to be defined).



Source: IHS CERA.

Concept Map of Natural Gas Based Energy Transport Technologies

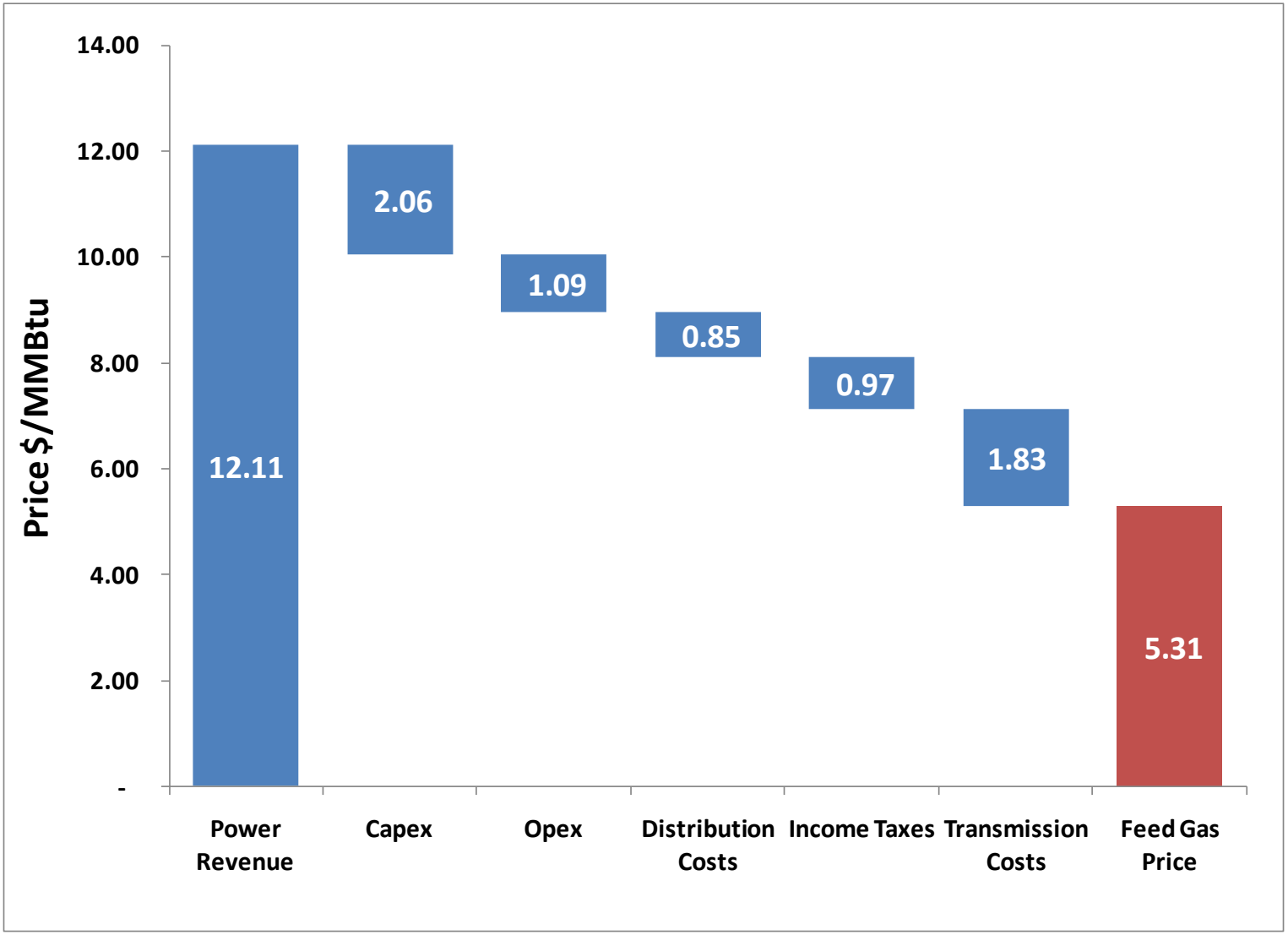


ABBREVIATIONS

LNG:	Liquid Natural Gas
GTL:	Gas to Liquid
CNG:	Compressed Natural Gas
HVDC:	High Voltage Direct Current

Note: km = kilometers.

Gas Price Netback at Wellhead for Gas to Wire (GTW—$/MMBtu)



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Conclusions

- **Huge resource potential: Could become a game changer in some areas.**
- **Best Opportunities in Countries with established conventional resources and high priority energy needs: Argentina and Colombia**
- **Niche Opportunities in many other places like Brazil and Peru.**
- **Access to technology, infrastructure and markets is critical.**
- **Appropriate Fiscal Terms and Regulations Essential.**
- **Access, Geography and Environment are also critical.**
- **Excellent opportunity for independents and majors alike with unconventional technology and project management skills.**

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