



THE FUTURE OF GAS TURBINE TECHNOLOGY

8TH INTERNATIONAL GAS TURBINE CONFERENCE

12-13 October 2016, Hotel Le Plaza, Brussels, Belgium

ETN

Business Opportunities for Gas Turbines Stakeholders in Latin America



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- **ETM MISSION:** Provide services that add value to the entire production chain of energy and turbomachinery industries.
- **ETM VISION:** To be a company recognized for its innovation and creativity, that provide solutions to face the challenges during the transitional phase from the oil and gas era to the low carbon society.



Marcelo Accorsi Miranda
Senior Consultant

- 38 years of experience in oil and gas industry.
- Emeritus Member of The Advisory Committee of the Turbomachinery Symposium, Texas A&M University
- Member of ETN Emeritus Club
- Founder of ETM Energy & Turbomachinery



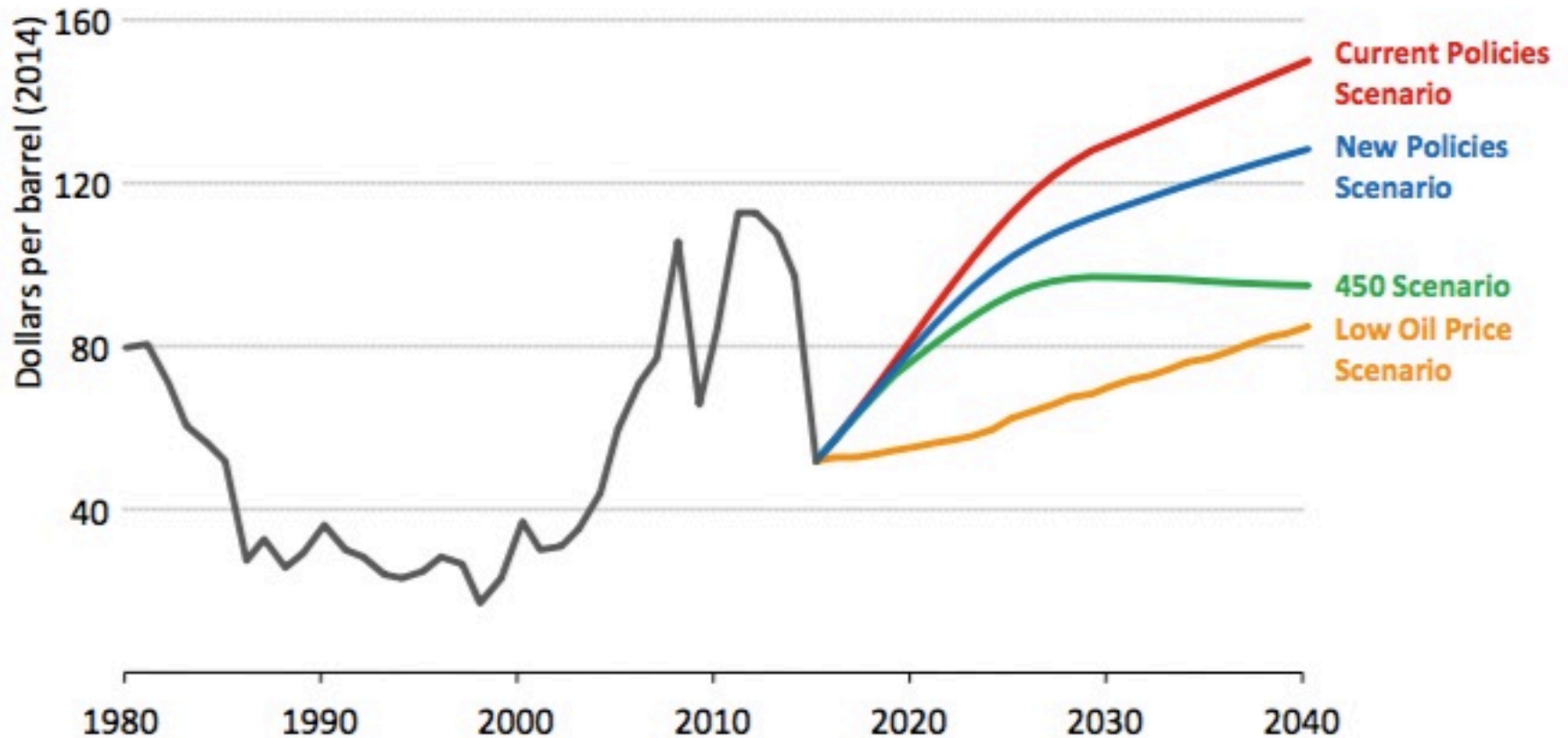
Business Opportunities for Gas Turbines Stakeholders in Latin America

Agenda

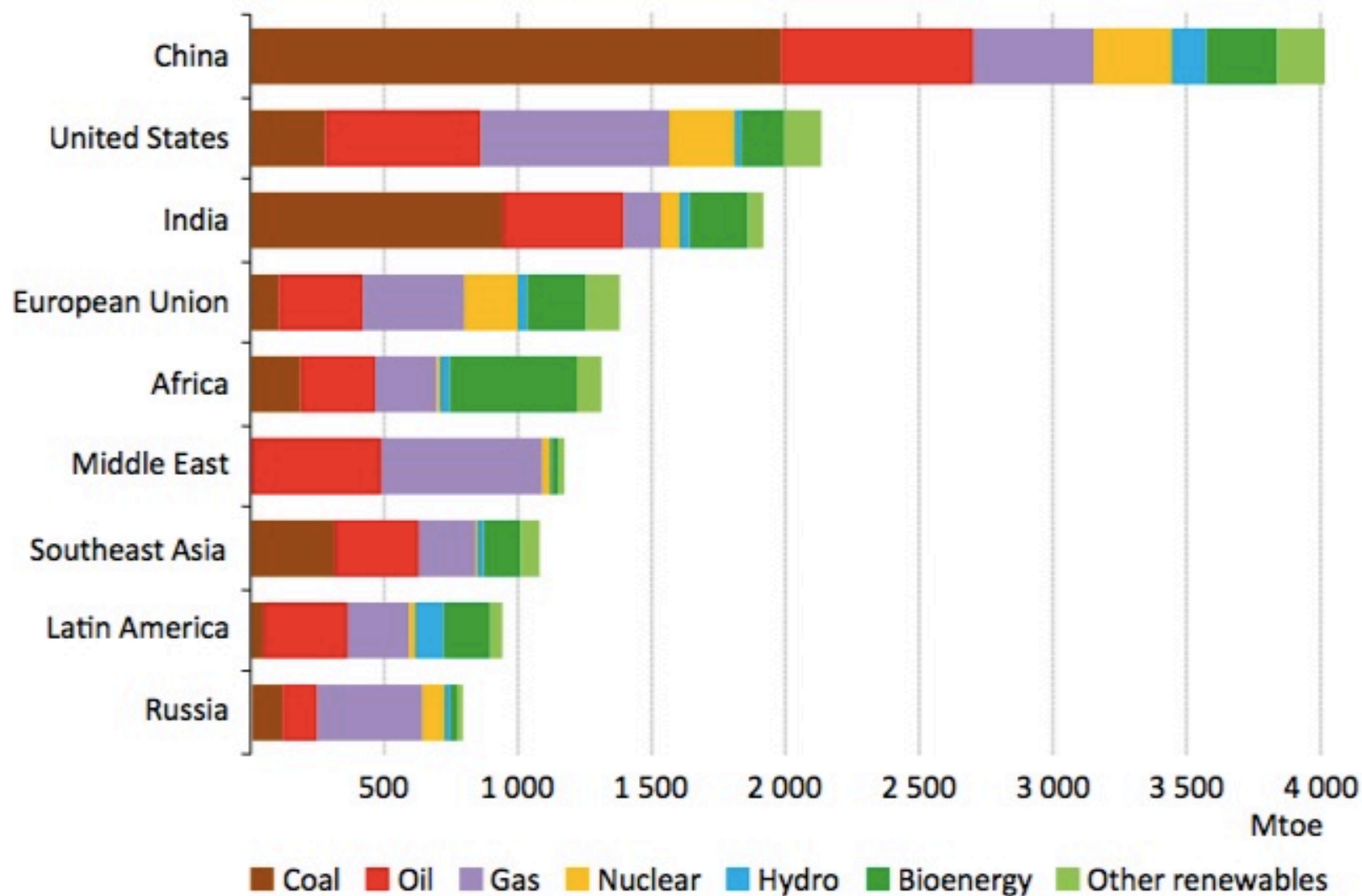
- Latin America Energy Outlook
- Mexico Outlook
- Brazilian Economy Outlook
- Gas Turbines in Brazil & LA
- Conclusion

Latin America Outlook

Average IEA crude oil import price by scenario

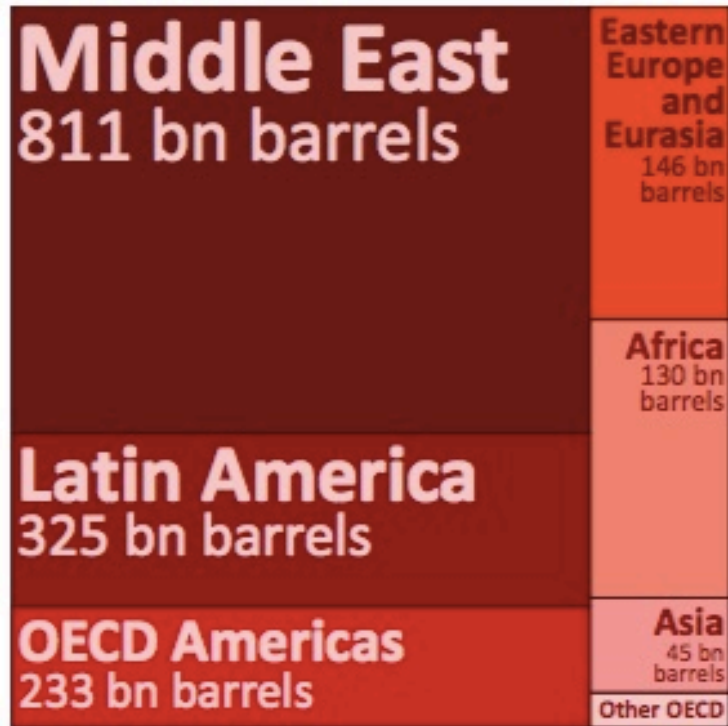


Primary energy demand by selected region in the New Policies Scenario, 2040

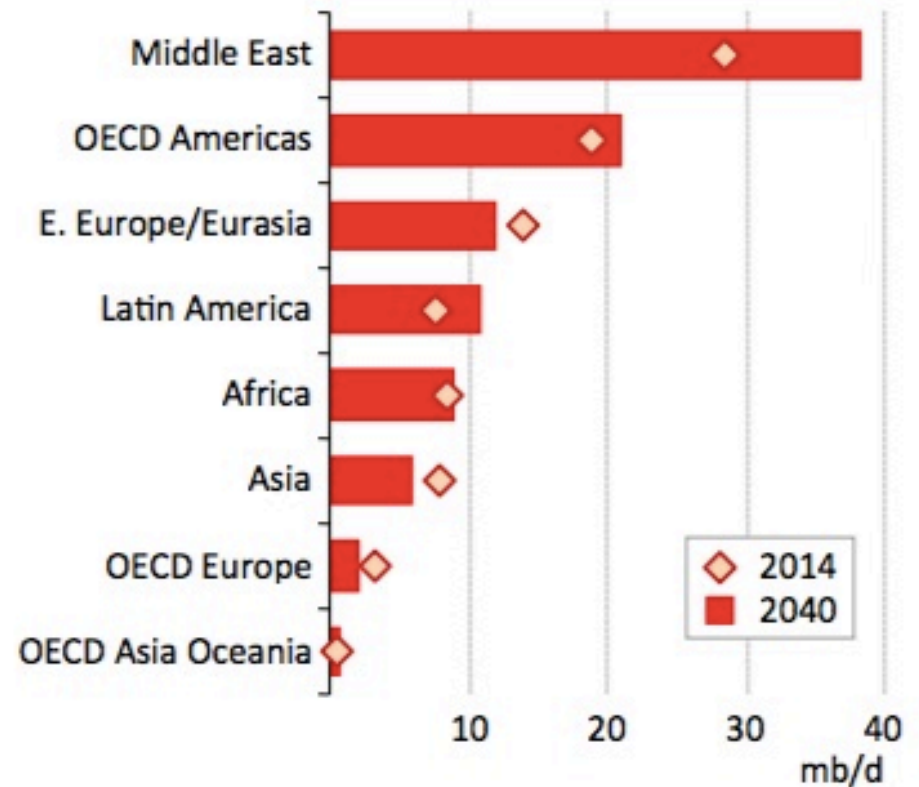


Source: IEA

World proven oil reserves: 1 706 billion barrels

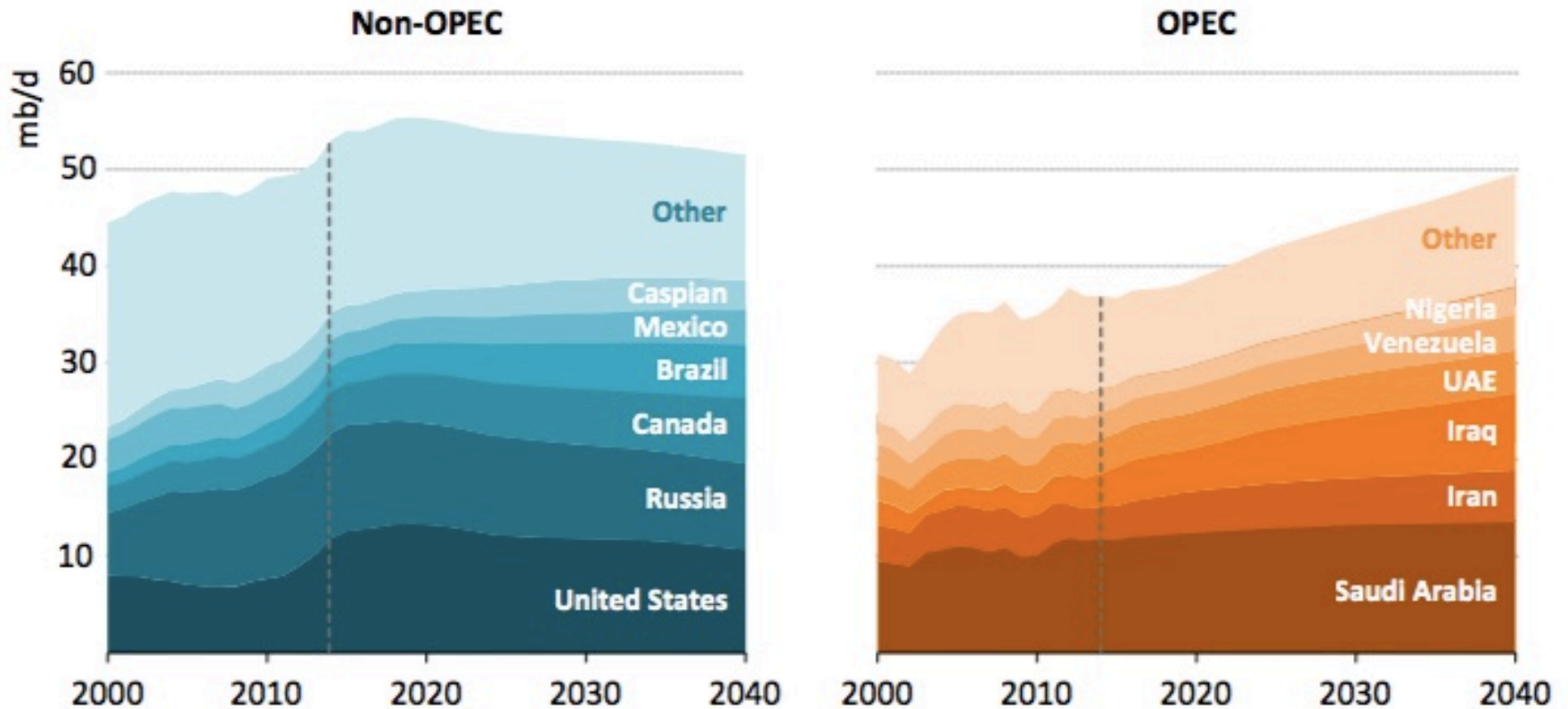


Oil production by region



Source: IEA

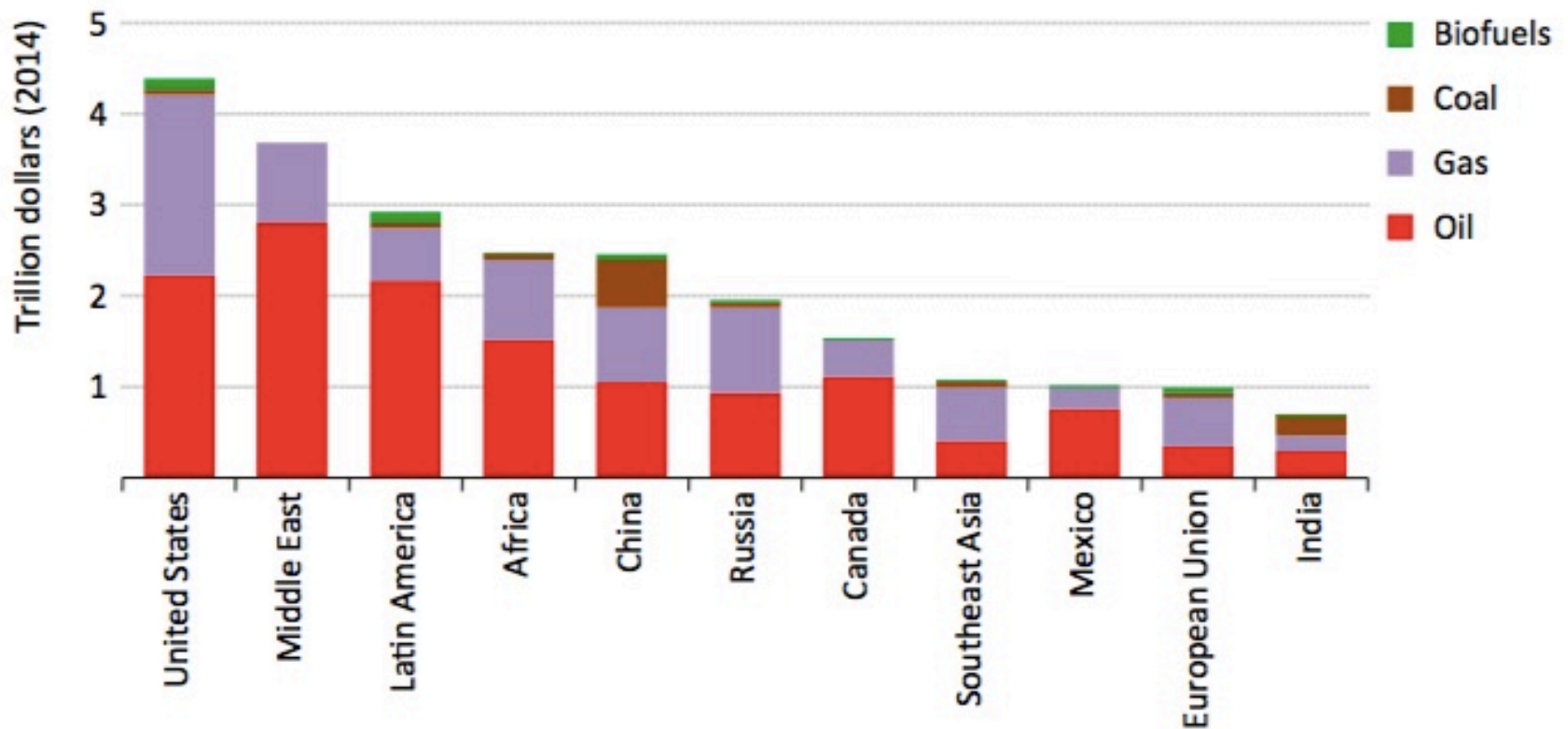
Oil production by region in the New Policies Scenario



Source: IEA

Cumulative investment in energy supply by selected region in the New Policies Scenario, 2015-2040

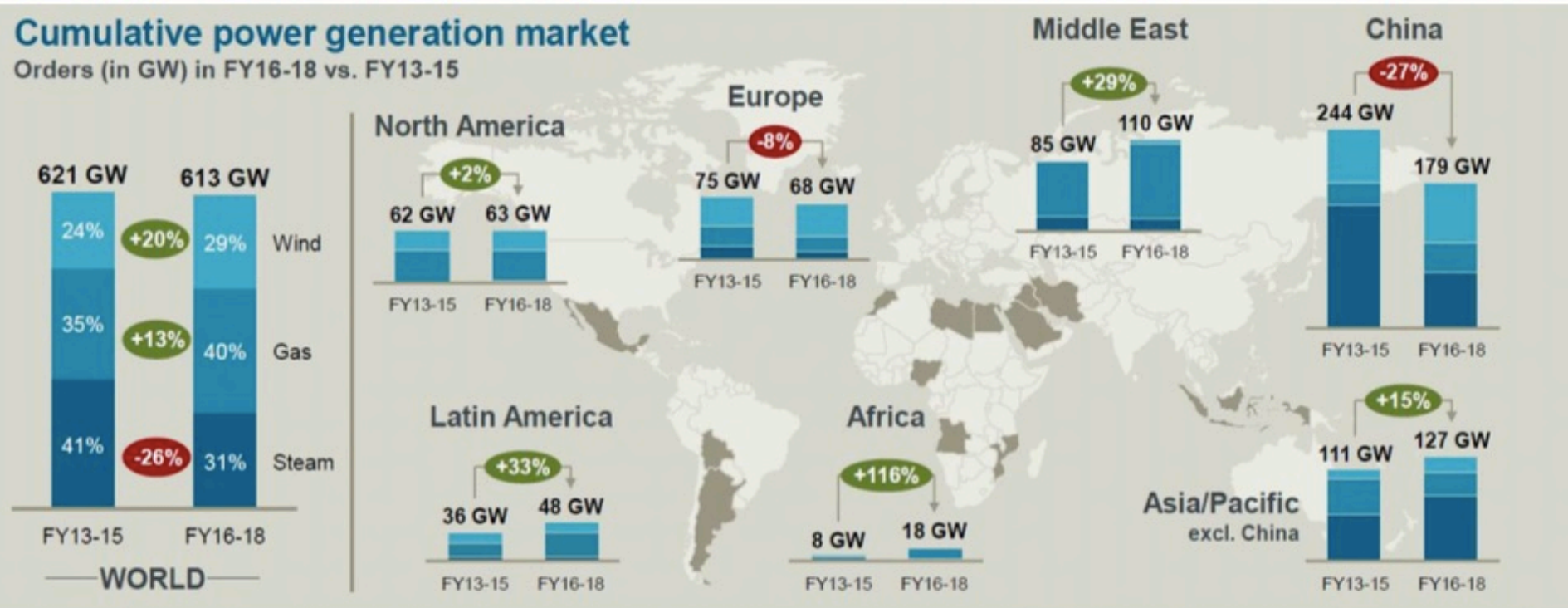
a) Primary energy supply by fuel



Source: IEA

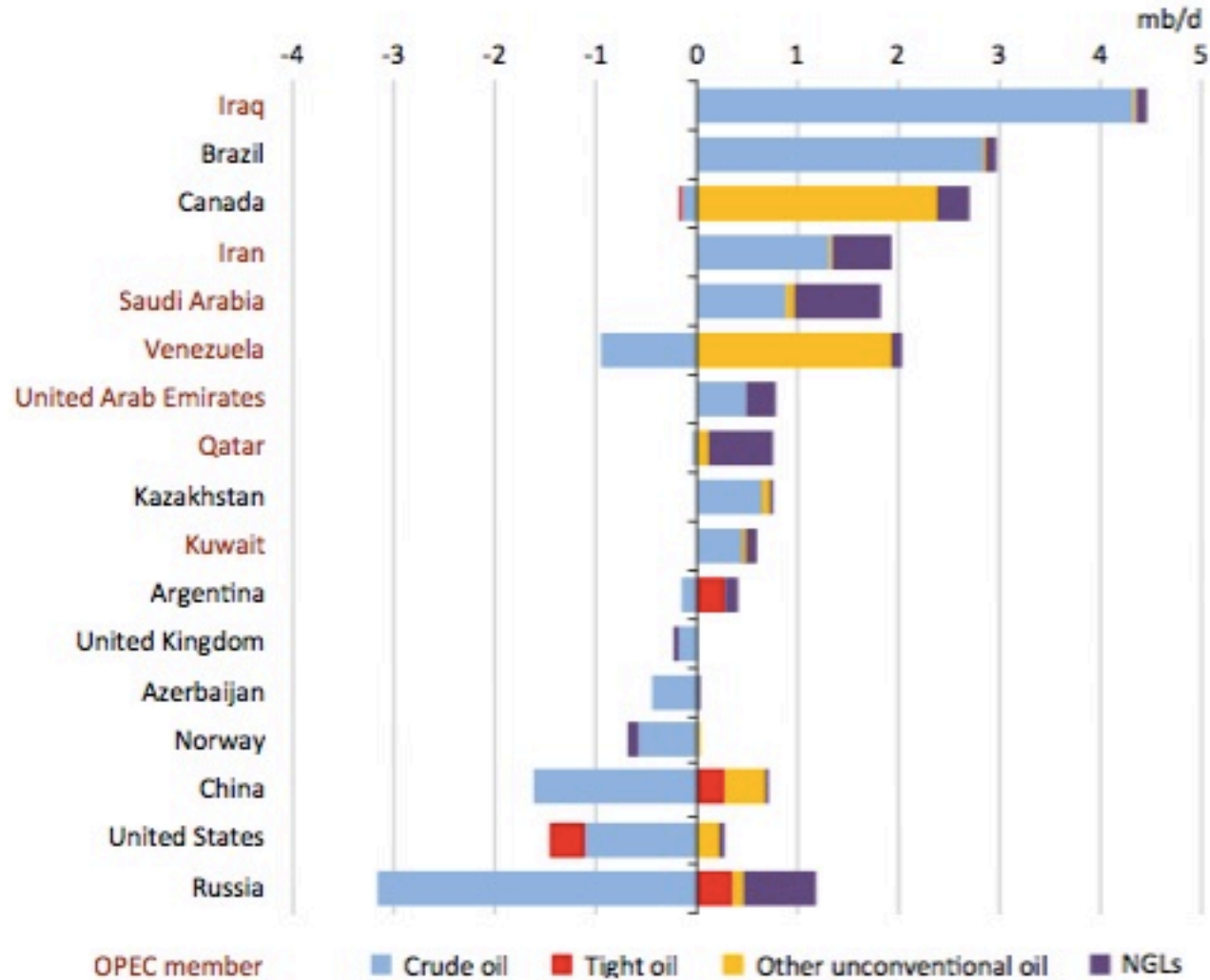
Cumulative power generation market

Orders (in GW) in FY16-18 vs. FY13-15



Source: Siemens; J.P.
Morgan

Change in oil production in selected countries in the New Policies Scenario, 2014-2040



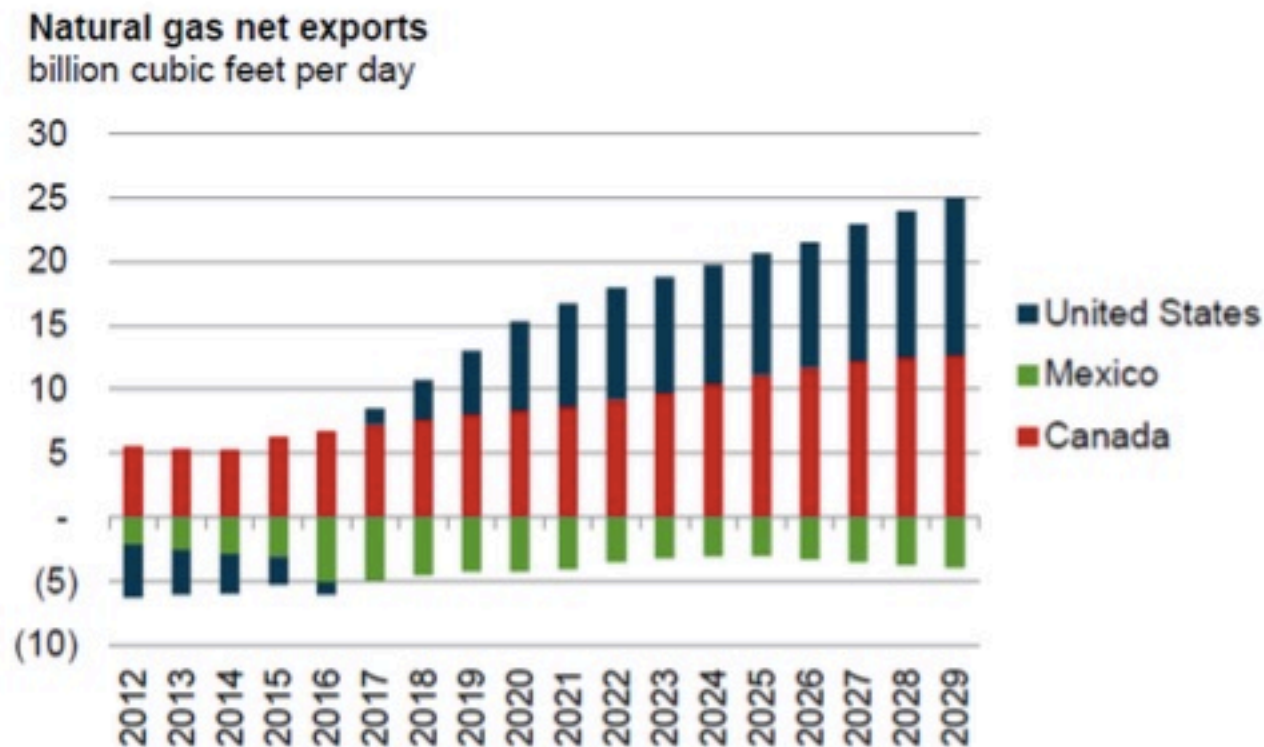
Source: IEA

Mexico's New Energy Industry

Current expected investments

- **Hydrocarbons**
 - 1st Bid: 2.7 Billion USD
 - 2nd Bid: 3.1 Billion USD
 - 3rd Bid: 1.1 Billion USD
- **Natural Gas Transportation**
 - Pipeline network expansion: 13 Billion USD
- **Power Sector**
 - Generation: 24 Billion USD
 - Transmission: 4.5 Billion USD

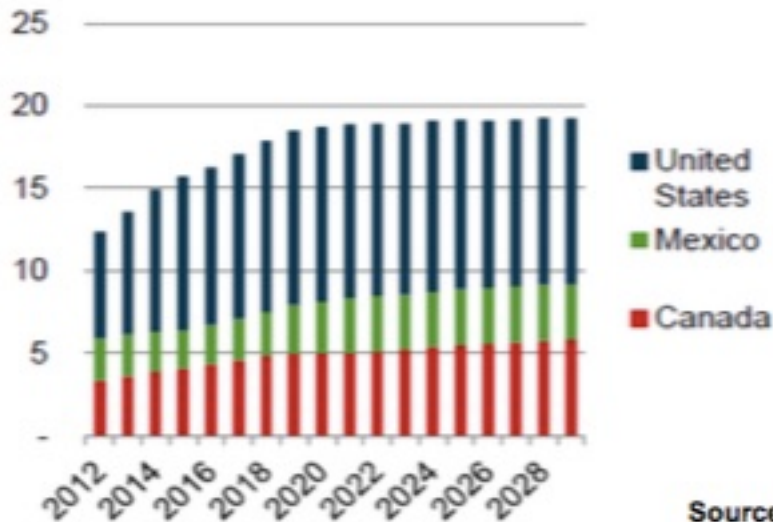
Natural Gas Exports: Outlook



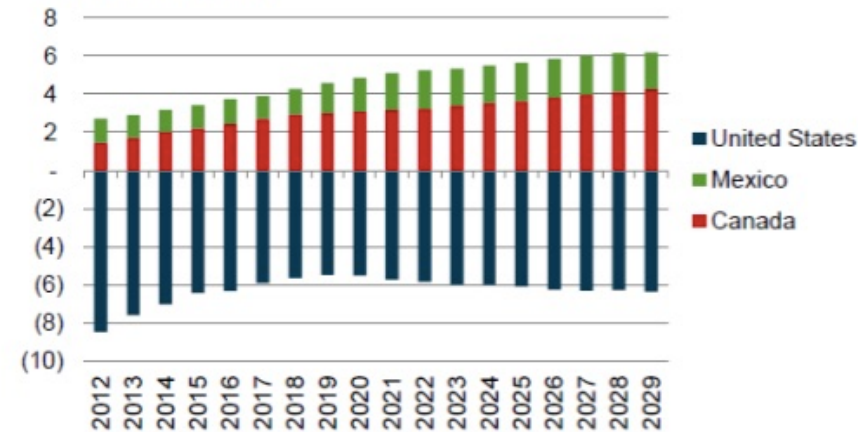
Source: SENER

North America Outlook

Crude oil production
million barrels per day



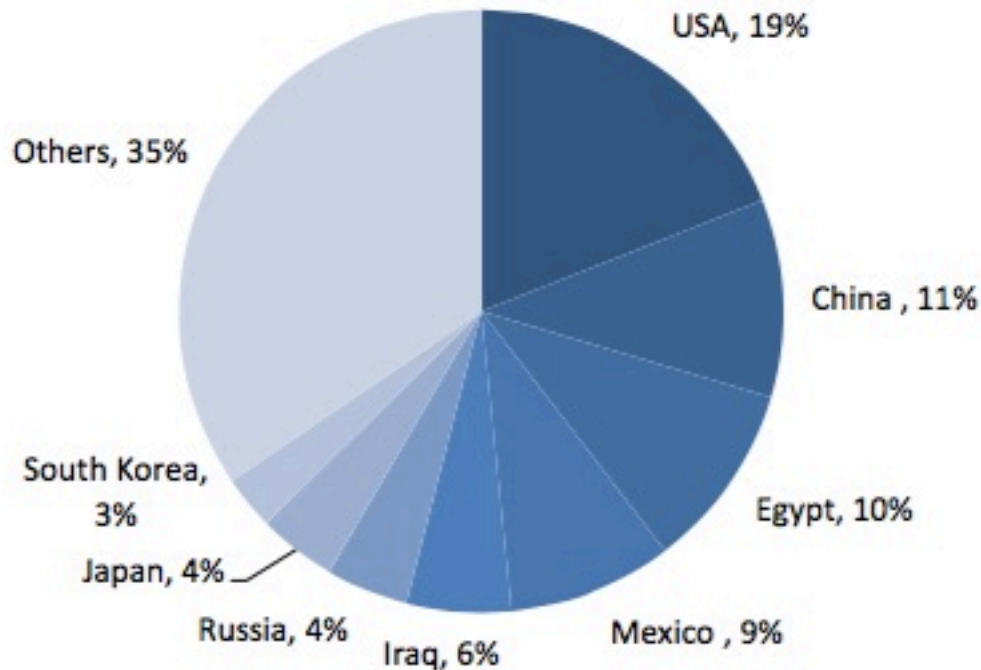
Crude oil net exports
million barrels per day



Mexico Gas Turbines Market

12M15 Ordered Capacity by Geography

%, unless otherwise stated



Source: McCoy Data

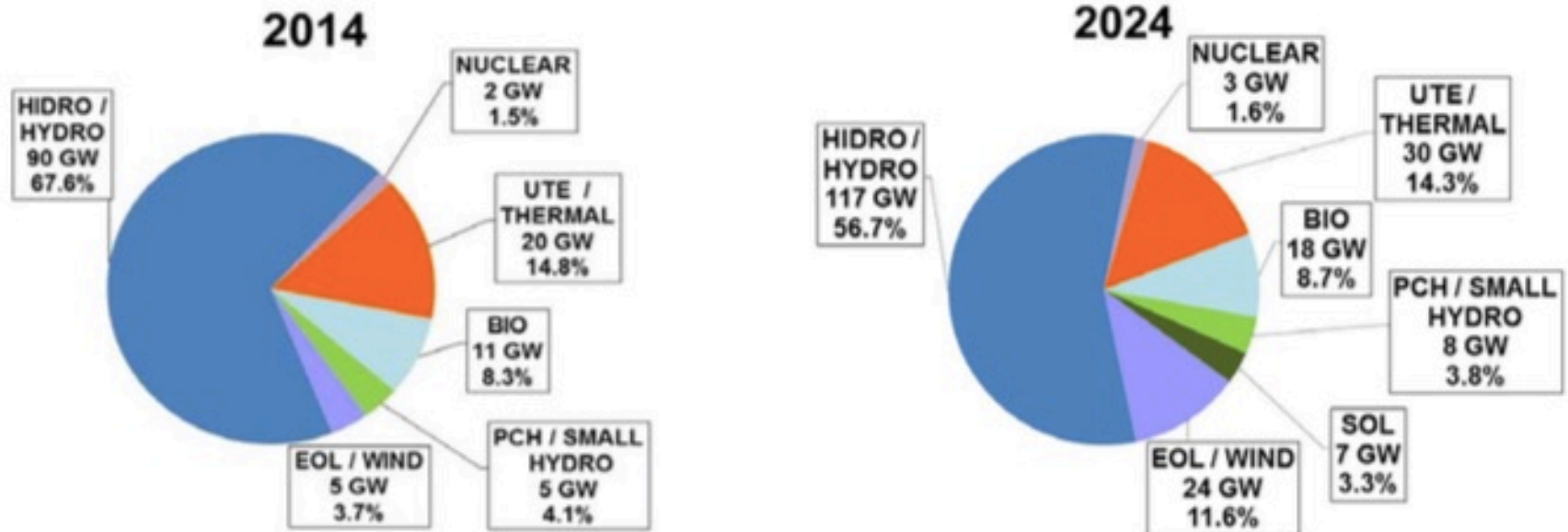
Brazilian Economy Outlook

Brazil Outlook

- **Strong Rebound in Confidence**
- **Growth expected to turn to positive in 2017**
- **Inflation on the way to target 4.5%**
- **Gradual improvement the medium term after a strong recession.**
- **Oil Sector is continuously increasing production as investments in Pre-salt matures.**

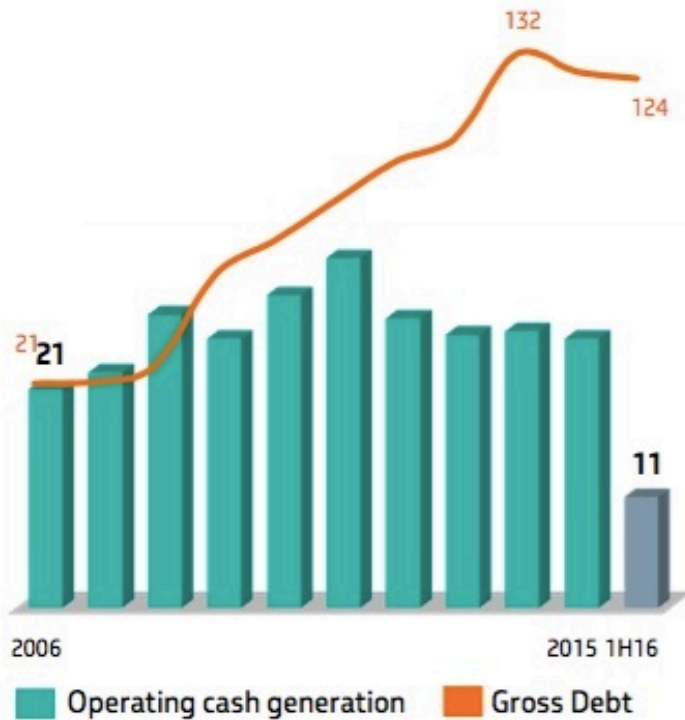
Brazil Power Evolution

Power capacity evolution by energy source

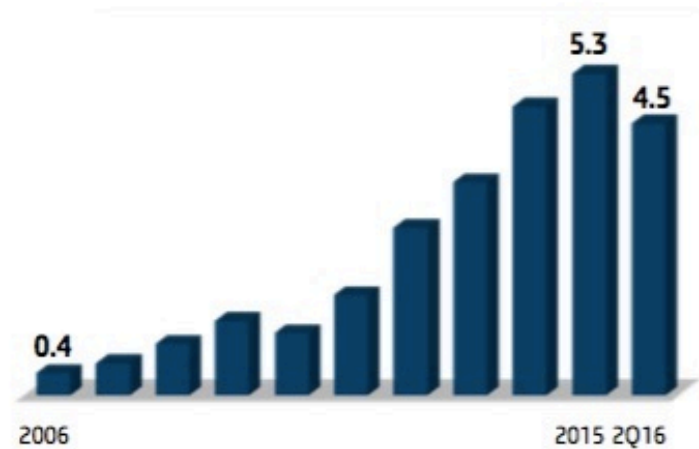


Petrobras Financial Situation

**Growing Debt relative to Cash Generation
(US\$ billion)**



Net Debt / EBITDA



Petrobras Outlook



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Main Metrics of Strategic Plan (SP) and Business and Management Plan (BMP)



SAFETY

Reduction of
36%

In the Total Recordable Injury
Frequency Rate (TRIFR*)

FROM	TO
2.2	1.4
in 2015	in 2018

* TRIFR = number of reportable injuries per million man-hours



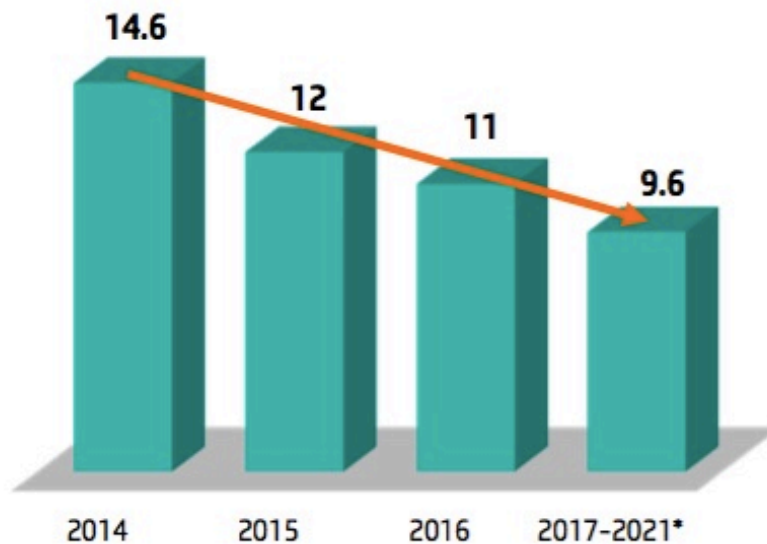
FINANCIAL

Reduction in
LEVERAGE
Net Debt/EBITDA

FROM	TO
5.3	2.5
in 2015	by 2018

Reduction in operating costs

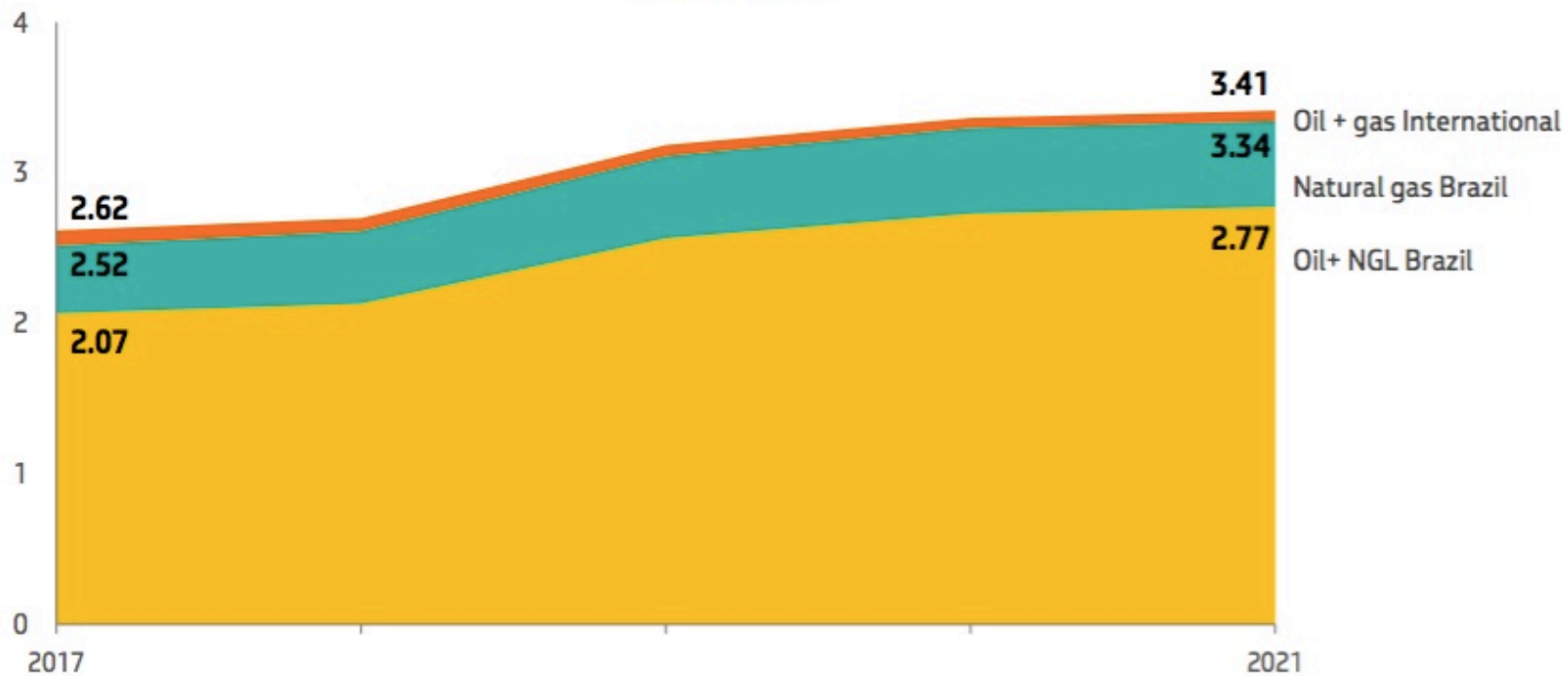
Lifting Cost (US\$/boe)



- Increased share of pre-salt in the portfolio, with lower lifting costs
- Gains from contractual renegotiations
- Management of drilling rig idleness
- Optimization of support vessel logistics
- Reduction in labor costs

Production profile

Oil , NGL* and Gas production
(million boed)



* Natural Gas Liquids

What about Gas Turbines?

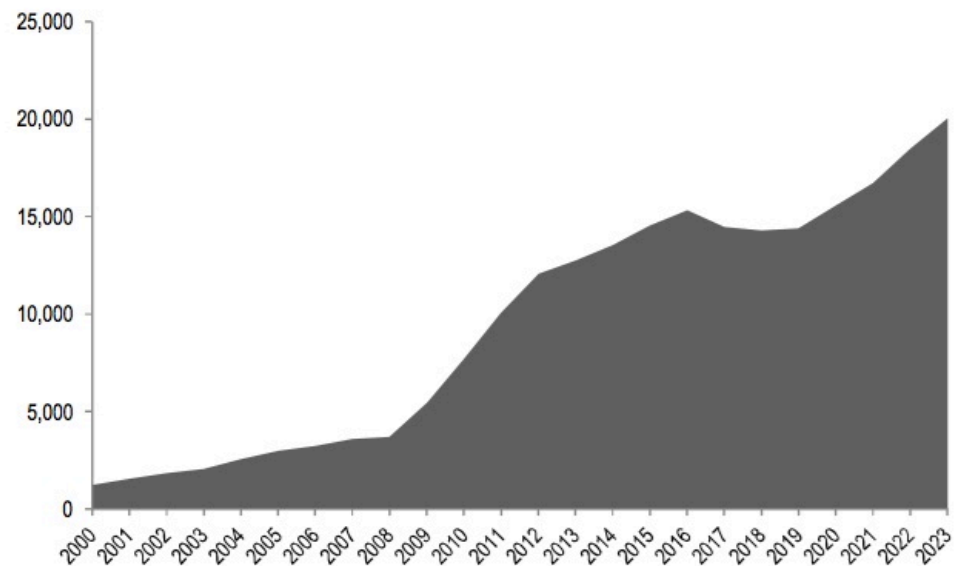
- **Oil & Gas Sector offer better opportunities in Brazil**
- **Mostly in the range of 30 MW due to standardisation, emission policy and electric system constraints.**
- **Some opportunities in Power Gen sector still in place**
- **Excellent perspectives in both O&G and Power Gen in Mexico**

Services opportunities

- According to J.P. Morgan, lifetime services revenue per turbine can reach 4x the original cost of the equipment, with a 30% margin.

Figure 136: Annual market potential for major overhauls

MW, assuming average overall occurs 10-16 years after first installation, all turbines



Source: J.P. Morgan estimates.

Closing Remarks

- **Latin America does have excellent opportunities**
- **Most of the countries are experiencing a steady economic environment.**
- **Mexico Oil & Gas market deregulation offers excellent opportunities for private investment**
- **Brazilian Pre-salt deregulation is likely to unlock the oil sector.**
- **Emerging Markets remain the primary growth opportunity for power generation.**
- **Gas turbine service is a substantial profit driver**



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Thank you!