



Geopolitics of Unconventional Oil & Gas

New Markets, New Risks, New Policies



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Outline of Presentation

- **Context: O&G's role in the economy and foreign affairs**
- **What is different about Unconventional O&G?**
- **The North American Experience**
- **Implications for Major producers and consumers**
- **Some cases: Russia, Iran, China, Saudi Arabia,**
- **Uncertainties**



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Old View

- O&G global resources concentrated in Middle East and a few major resource holders.
- Large economies hopelessly dependent on oil and increasingly gas imports.
- The real price of O&G will inevitably increase.
- Natural Gas Markets inevitably regional – Europe, Asia, North America.

New View

- Unconventional O&G (shales, tight sands, coal bed CH₄) widely available around the world.
- Previously dependent economies will stop being import dependent, e.g. U.S.
- Increased supply may lead to lower real prices for several decades.
- Global Natural Gas market possible, but not soon.



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Implications of the changes

- Energy, especially O&G, will continue to be key to economic performance and geopolitical affairs.
- Consumers will benefit from lower prices, e.g. lower cost for home heating with natural gas.
- There will greater demand for O&G due to lower prices.
- The shift in relative prices (O&G, coal, nuclear, renewables) will cause shift in energy use, e.g. natural gas for electric power generation.
- Winner & Loser among traditional major resource holders.



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What is different about Unconventional O&G?

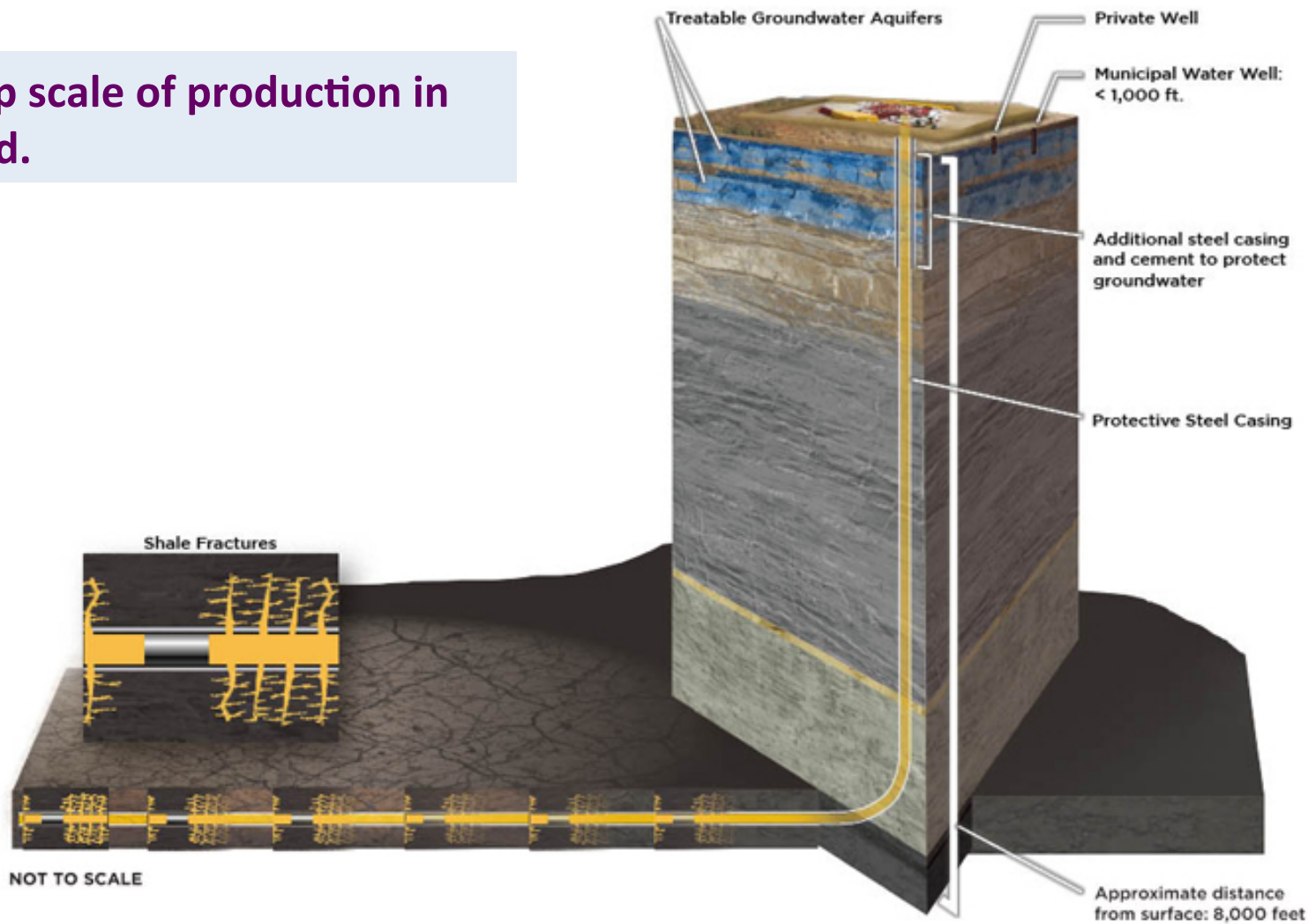


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Keep scale of production in mind.





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Enormous surface operations



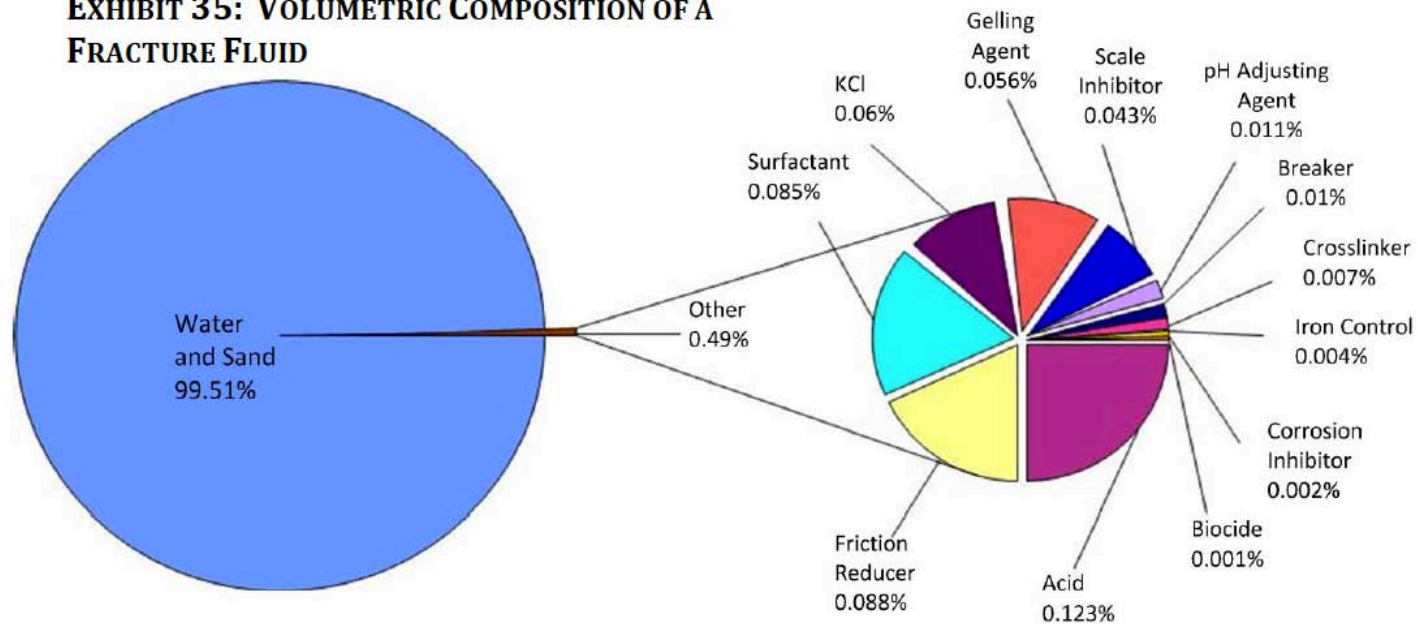


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Initial Environmental Concern - Hydraulic fracturing fluid contaminating drinking water – not the major environmental issue

EXHIBIT 35: VOLUMETRIC COMPOSITION OF A FRACTURE FLUID



Full disclosure of all additives – type and quantity



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Principal Environmental impacts:

- ① Water quality
- ② Air quality
- ③ Community impacts
- ④ Land-use impacts
- ⑤ Induced Seismicity

Key points:

- Not just hydraulic fracturing
- All environmental impacts of production should be included
- Different than conventional production
- Expect great diversity



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Global Markets

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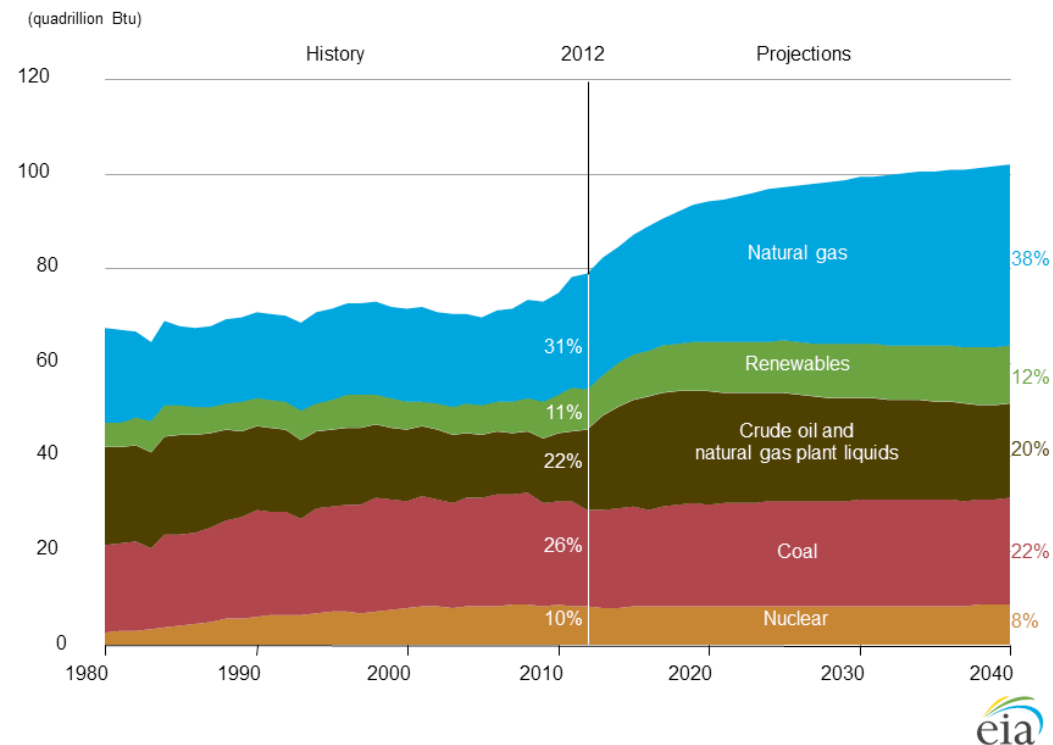
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Rapid growth of Unconventional O&G production in US

Figure 11. U.S. energy production by fuel, 1980-2040



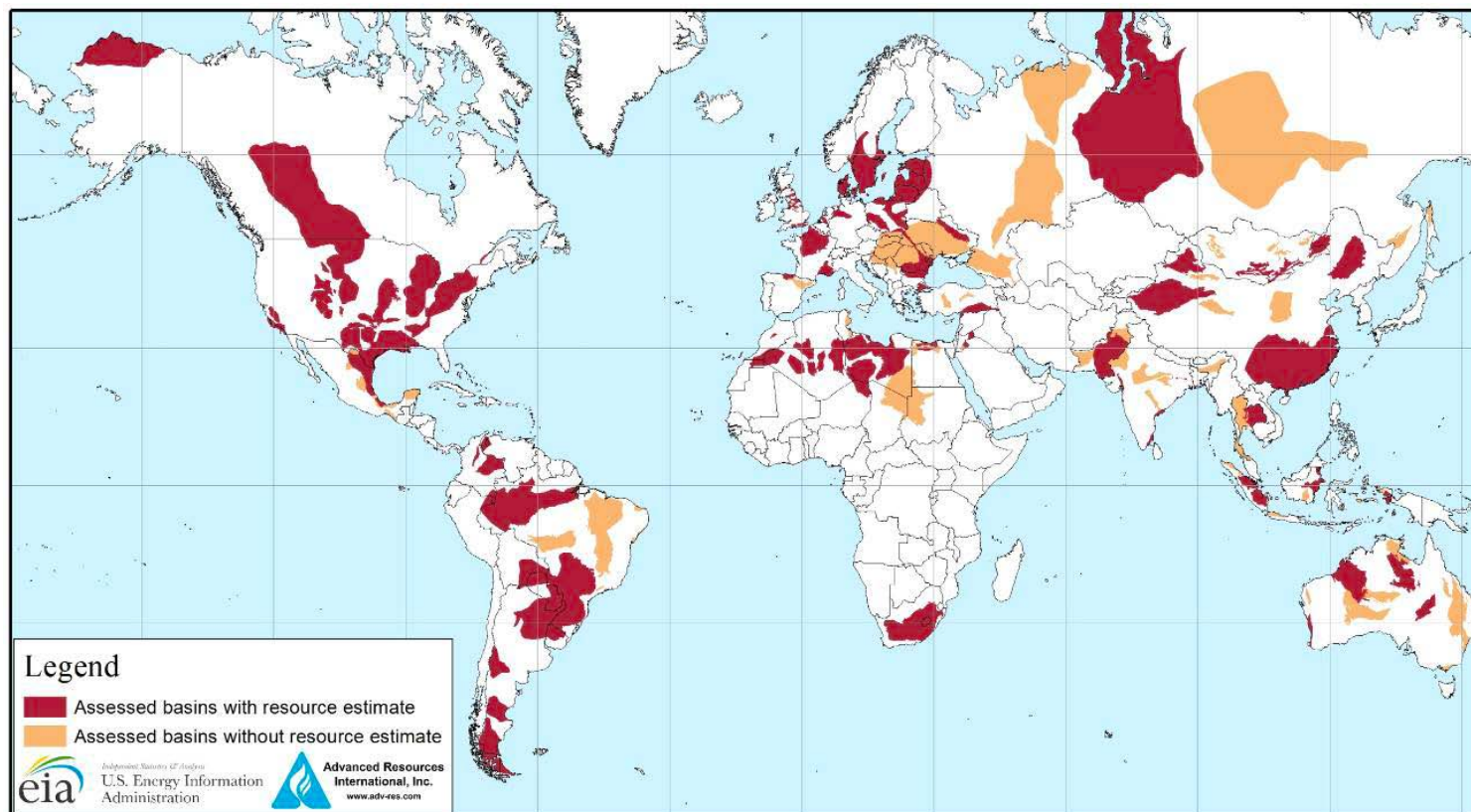


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Explosion of Shale gas resource is world-wide





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Table 2. Top 10 countries with technically recoverable shale oil resources

Rank	Country	Shale oil (billion barrels)	
1	Russia	75	
2	U.S. ¹	58	(48)
3	China	32	
4	Argentina	27	
5	Libya	26	
6	Venezuela	13	
7	Mexico	13	
8	Pakistan	9	
9	Canada	9	
10	Indonesia	8	
World Total		345	(335)

¹ EIA estimates used for ranking order. ARI estimates in parentheses.

Table 3. Top 10 countries with technically recoverable shale gas resources

Rank	Country	Shale gas (trillion cubic feet)	
1	China	1,115	
2	Argentina	802	
3	Algeria	707	
4	U.S. ¹	665	(1,161)
5	Canada	573	
6	Mexico	545	
7	Australia	437	
8	South Africa	390	
9	Russia	285	
10	Brazil	245	
World Total		7,299	(7,795)

¹ EIA estimates used for ranking order. ARI estimates in parentheses.

EIA June 2013 estimates



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- *Global Resource Base Potential Huge*
- *Uncertainties Large*
 - Large variation within resource play – Oil/Gas/Water.
 - Environmental impacts and production cost.
 - Oil/Gas price uncertain both in local economy and globally.
 - Economics of global LNG trade uncertain.
 - O&G infrastructure is huge and expensive so pace of commercial development will be slow.
 - Drilling and stimulation technology mostly in North America.
 - Hard to predict relative economic value of oil/gas for domestic use compared to export.



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Implications for global oil & gas markets

- The North American Supply shock has not and will not, by it self, result in a cratering of the the world oil price.
- The relatively high levels of global spare production capacity, NA production growth, and slower global demand growth points to potential oil price drop to the range of \$70 - \$90 per barrel.
- Global spare capacity has dampened “minor” supply disruptions: Syria, Nigeria, Libya, Yemen.
- MRHs such as Iran, Venezuela, Russia have suffered negative wealth effect – the value of their conventional O&G resources have gone down.
- Expensive conventional O&G projects are now underwater: Australian CBM, Gulf of Mexico deep off shore, and Artic oil.



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Major economic questions

- Will natural gas prices maintain regional difference ?
NA \$4/MCF Europe \$10/MCF Asia \$16/MCF
- Will the energy equivalent difference between oil and gas continue ?
Oil \$100/b = \$15/MMBTU NA natural gas \$4/MMTU
- Tremendous economic incentive for technology change that will increase natural gas demand:
 - Natural gas in power generation (displacing nuclear, renewables, coal)
 - Natural gas in transportation sector: CNGVs or bi-fuel vehicles?
 - Gas to Liquids (GTL) transform CH_4 to CH_3OH .



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Geopolitical Implications



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How quickly will new Unconventional Oil & Gas production come on line?

- In U.S. resource belongs to land owner – not the government.
Tremendous financial incentive to exploit resource.
- North American has much greater intensity of drill rigs and pumping equipment and stimulation technology.
- National oil companies do not have technical know-how of investor owned E&P companies.
- Large over hang of conventional O&G production capacity.



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Changes in U.S. Energy Policy

- U.S. (and N.A.) will have the potential to export oil, gas (and coal) so U.S. will be more influential in balancing world markets.
- North America will become “effectively independent of oil imports” but this does not mean “energy independent.”
- The change in the U.S. energy posture significantly increases foreign policy leverage and will advance its interests.
- Changes best understood by considering country examples



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Six country examples

- Iran
- Russia
- Saudi Arabia
- China
- Venezuela
- Mozambique

Points to remember

- Energy is always an important part of foreign policy
- First priority – avoid conflict
- Oil & Gas is only one aspect of energy
- Increased supply favors consumers.
- Bilateral & Multilateral action



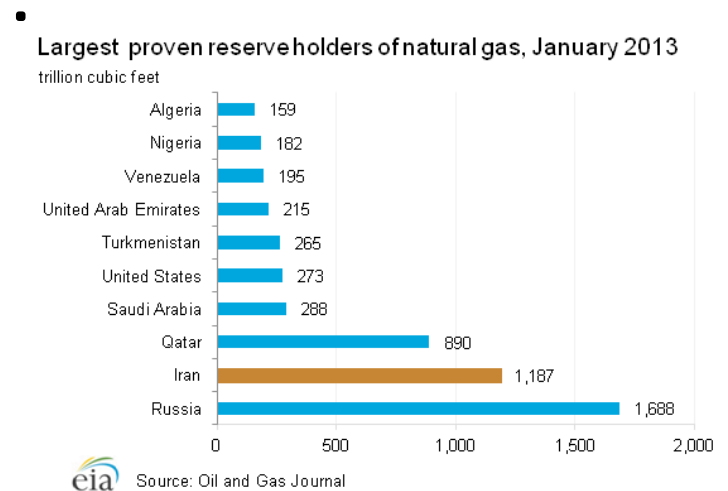
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Iran

- FP Issues: Nuclear weapons program, terrorism, Iraq, Israel/Palestine
- Oil production: 3 million b/d export reduced by sanctions. Burden for importing countries such as Japan, Germany, China.
- Increase in global supply imposes tremendous “wealth loss” of Iran’s gas resource base (due to anticipated fall in natural gas and oil prices).
- Increase in global supply encourages greater firmness by international community on Iran to reverse course on their nuclear program.





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Russia

- Russian economy highly dependent on O&G exports.
- Eastern Europe, especially Germany, dependent on Russian natural gas exports with pricing indexed to oil. This dependence influences the foreign policy position of Germany and other countries.
- Diversity of supply leverages Europe's bargaining position.
- Lower prices means: lower revenue, lower investment in O&G sector. Major economic risk for Russia and contributes to political instability.



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Saudi Arabia

- Great risk from lower oil and gas prices.
- Fiscal breakeven for Kingdom said to be \$90 per barrel (IMF estimate).
- Prolonger drop in oil price will make it difficult to maintain social safety next at a time when expectations rising among the younger generation. (Saudi citizen unemployment rate is about 10%).
- Some risk this will destabilize monarchy – with successor government less inclined to stabilize the global oil market.
- However any successor regime will continue to be oil exporter.
- Other MRH have similar risk: Algeria, Iraq, Libya, and Yemen.



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China

- China's economic growth requires increasing consumption of O&G. (+40% O&G imports 2012 to 2035).
- New opportunities for needed O&G supply:
 - o Unconventional O&G production (but water is a constraint).
 - o Greater imports from Russia and Central Asia.
- Natural Gas import prices linkage to oil weakened – Index to oil reduced. Future supplies from Australia cheaper.
- Eases Chinese interest in “going out” for oil and gas reserves.



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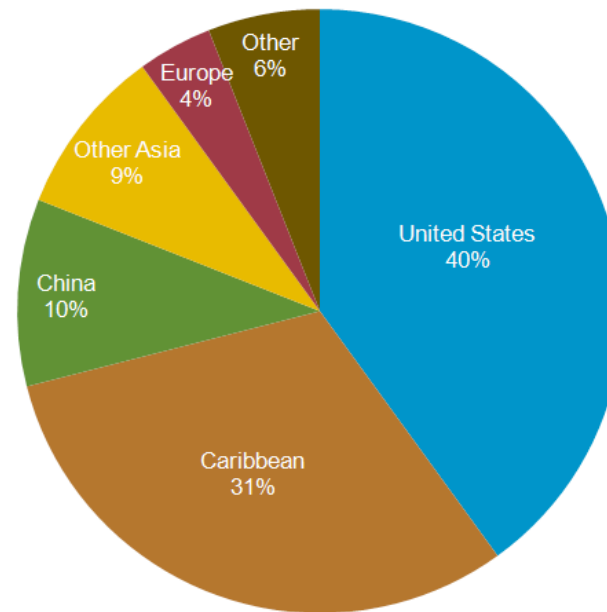
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Venezuela

- Venezuela has been a thorn in the U.S. side for a long time.
- Venezuela has provided oil to Caribbean and Central American countries gaining influence in the region.
- Prospects that VZ exports to region will be decline in next several years.

- Venezuelan crude oil exports by destination (2011)



Source: U.S. Energy Information Administration, APEX, FACTS Global Energy, Global Trade Information Services



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Mozambique

- Interesting example ENI and Anadarko considering large LNG projects.
- Planned on assumption that LNG price indexed to oil. No longer true.
- Major increase in regional supply impacts regional market, in this case Iran.





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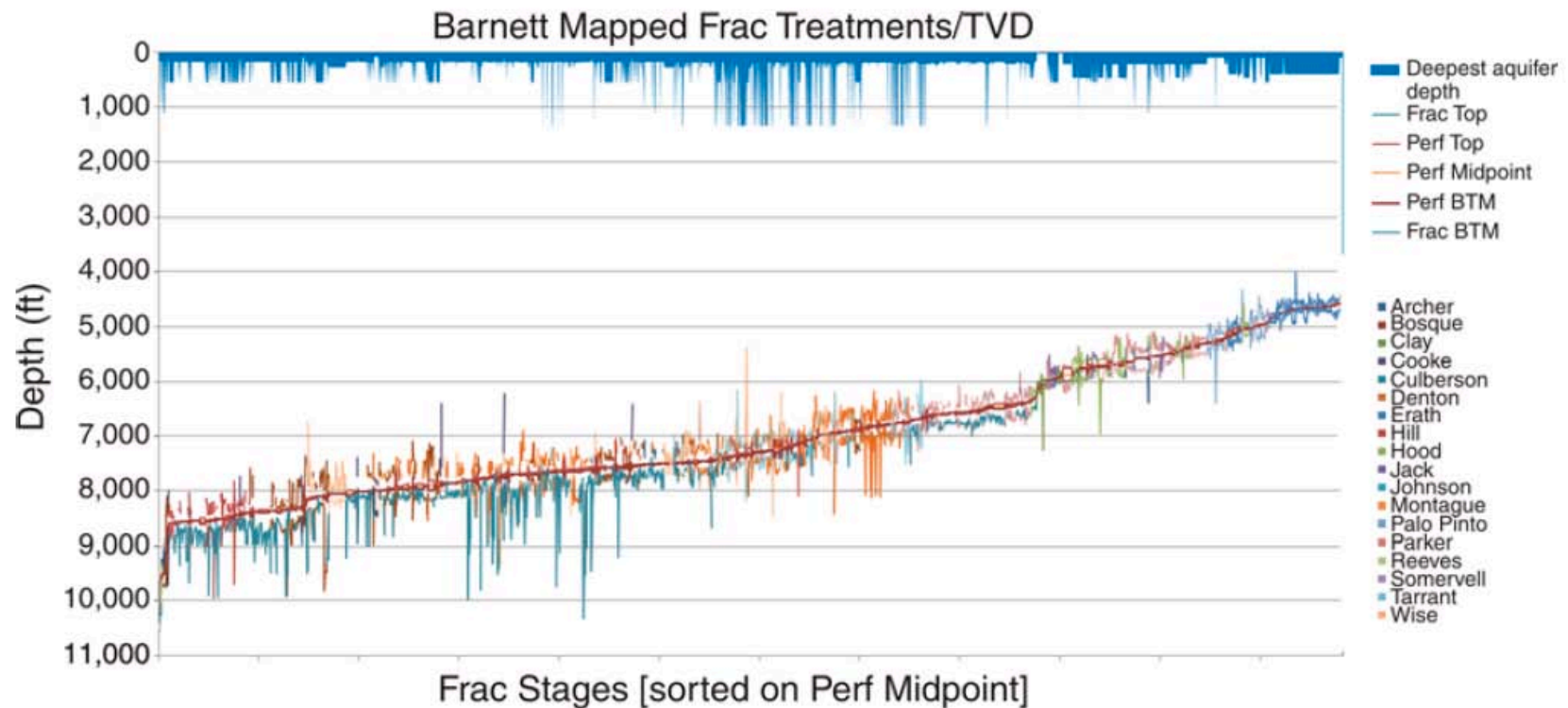


Fig. 2—Barnett shale measured fracture heights sorted by depth and compared to aquifers.

SPE 145949

Hydraulic Fracture-Height Growth: Real Data

Kevin Fisher and Norm Warpinski, SPE, Pinnacle—A Halliburton Service