



“It was a dark and stormy night...”
Flame, May 11, 2011

Dr. Michelle Michot Foss, CEE/BEG/JSG/UT

The Story...

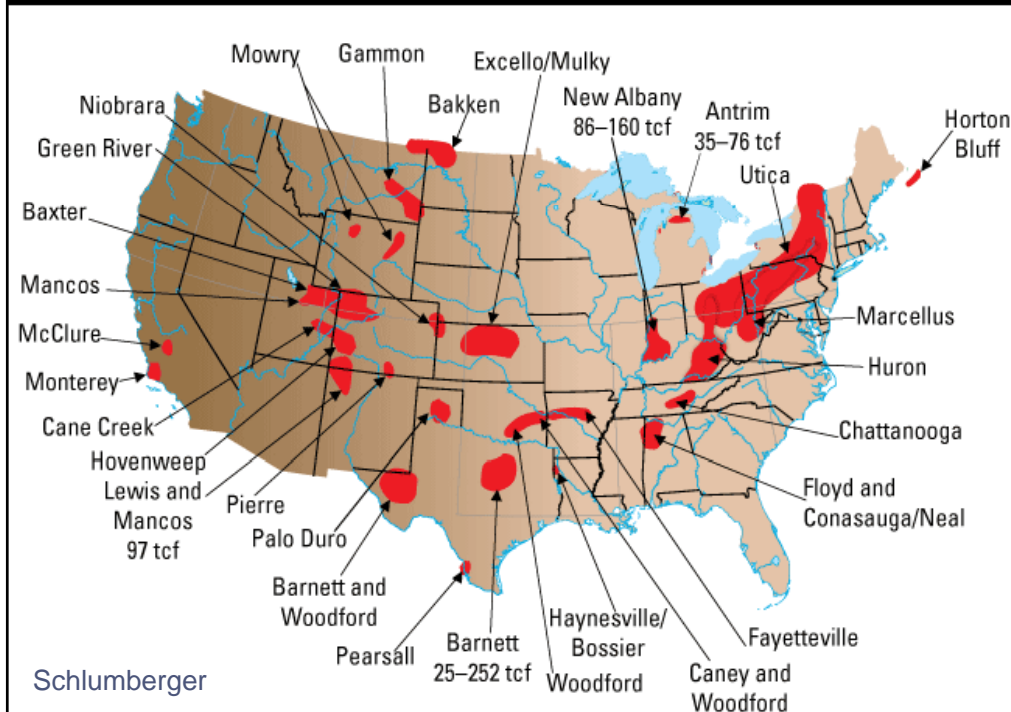
- “It’s a factory business...”
- “Have I got a shale deal to sell you...”
- “We can make money at \$4...”

...and the Back Story

- Private lands event
- Unknown unknowns in technology
- Shifting upstream business models
- Is natural gas price volatility “dead”?

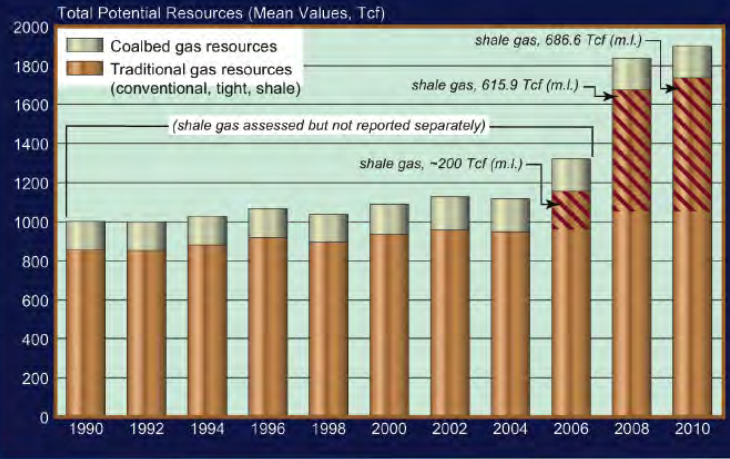
Rocks for Jocks

Major US shale basins.



PGC Resource Assessments, 1990-2010

Total Potential Gas Resources (Mean Values)

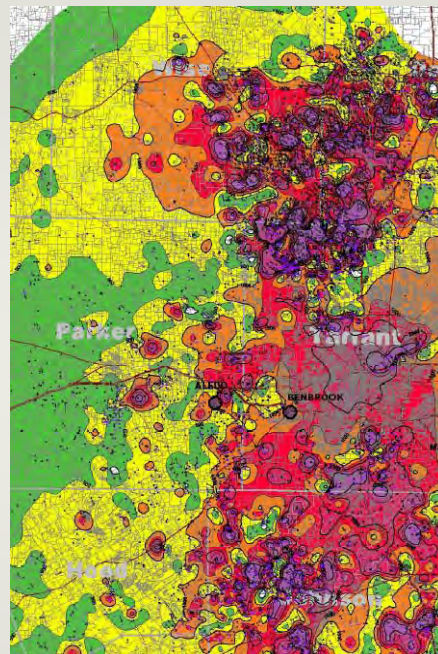


Data source: Potential Gas Committee (2011)

All Shale is Not the Same

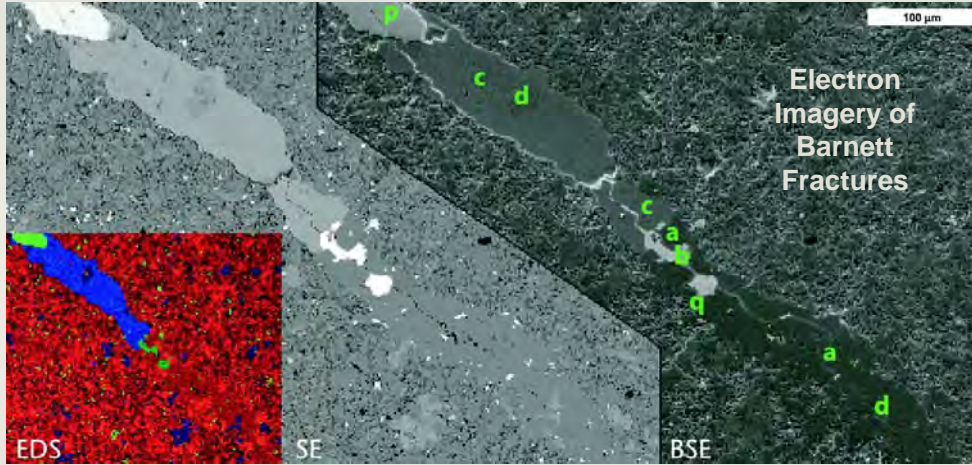
Estimated ultimate recoveries per well (Barnett):

Isoach	BCF
"Sweet Spot"	3.0+
Second	2.5-3.0
Third	1.75 - 2.5
Fourth	1.25 - 1.5
Fifth	0.5 - 1.25
Sixth	<0.5



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The Frontier – FLAME 2009



Gale, J. F. W., Reed, R. M., and Holder, Jon, 2007, *Natural fractures in the Barnett Shale and their importance for hydraulic fracture treatments*: AAPG Bulletin, v. 91, no. 4, p. 603–622.

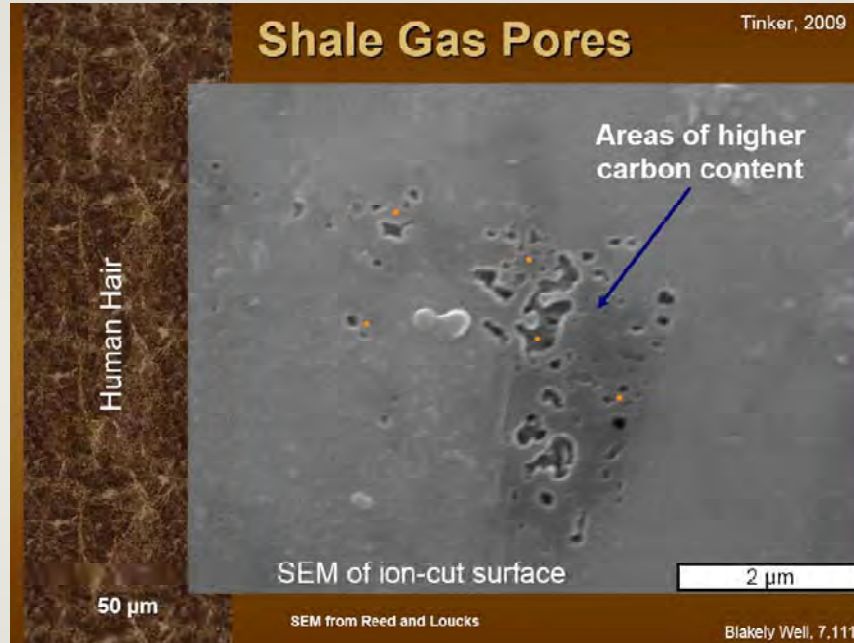


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Shale Gas Pores

Tinker, 2009



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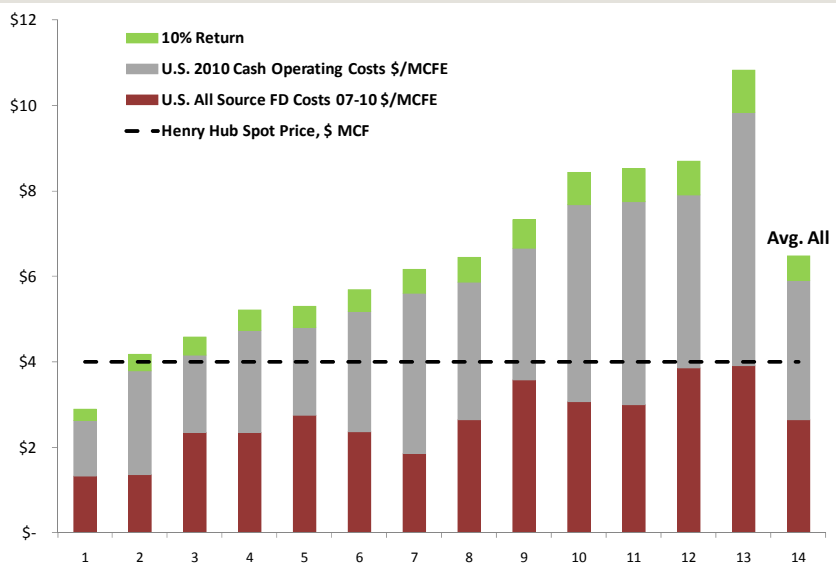
The New “Nanodarcy Nirvana” Universe of Technology

- Detection and advanced stimulation
 - Slow decline curves
 - Reduce drilling (fewer rigs, lower costs, smaller footprint)
 - Manage water disposal and other production issues
- Enhanced recovery
 - Extend field life

A Tough Business, Anyway

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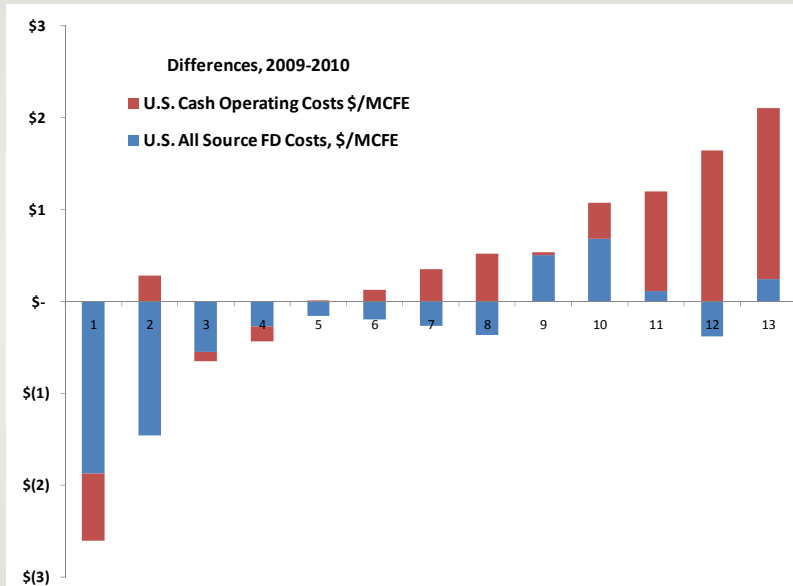
Not All Producers are the Same



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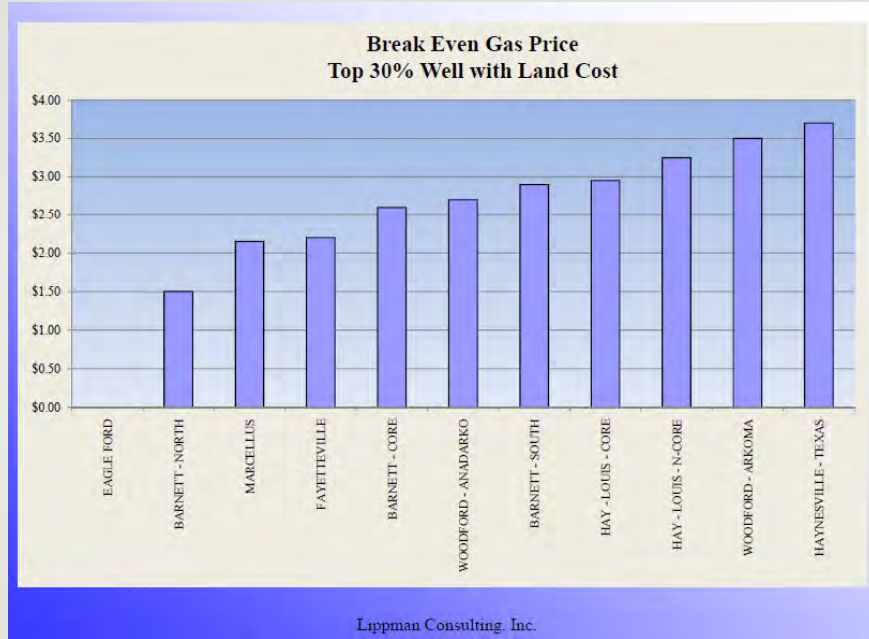
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Gainers, Losers



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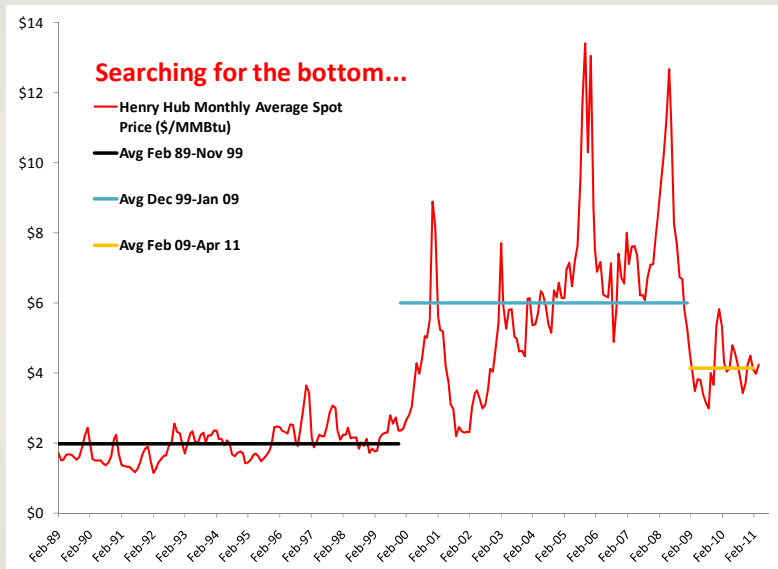


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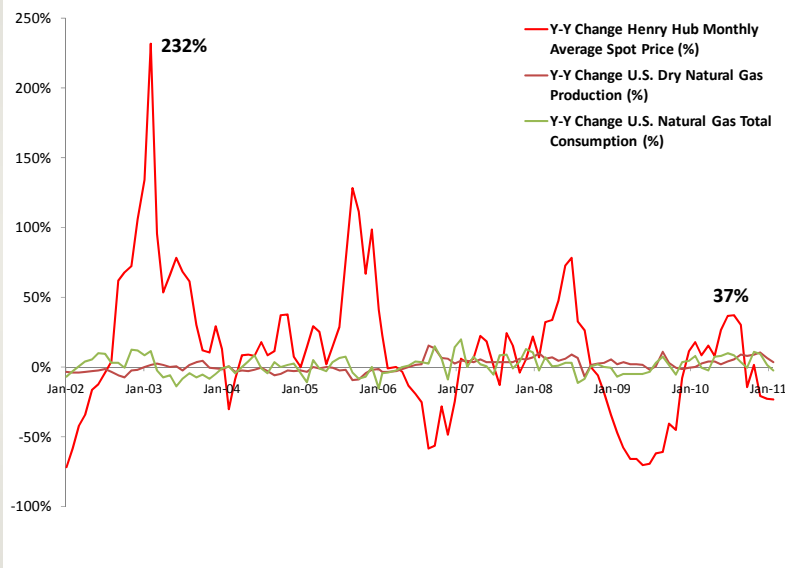
“Glubbausage”



CEE based on U.S. EIA

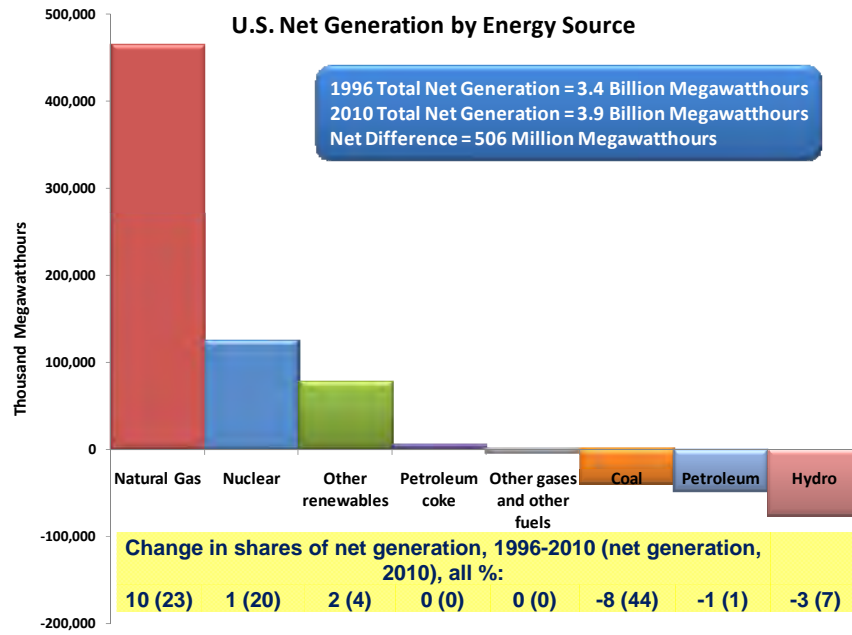
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Price Change & Volatility Matter



“Why Can’t We Be Friends”

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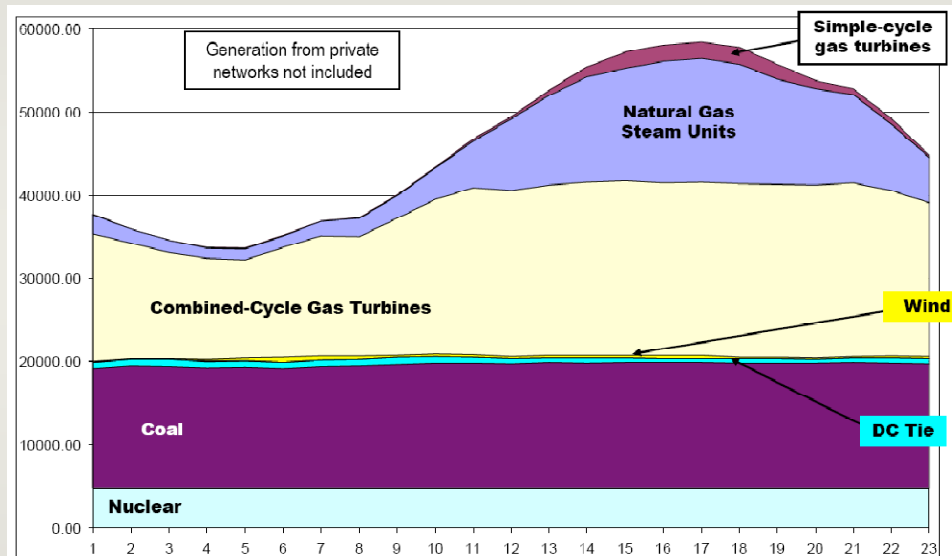


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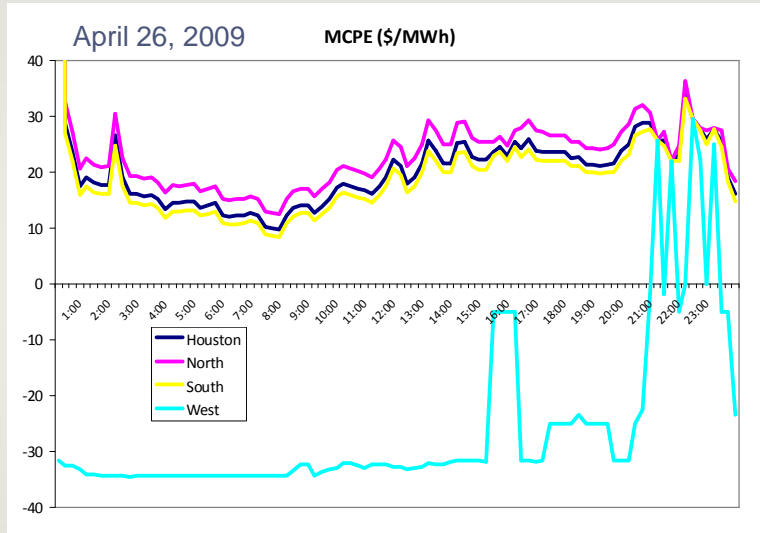
ERCOT Peak Day by Fuel Type



Electric Reliability Council of Texas (ERCOT)

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Does Renewable Energy Create Volatility?



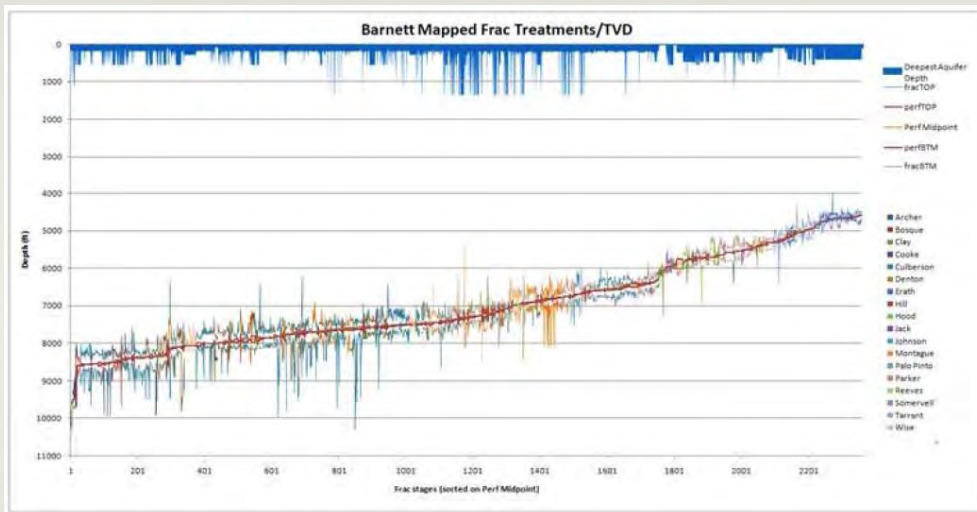
Negative price intervals (15 min)

2006	76
2007	338
2008	4,894
2009	3,069
2010	4,445 (Nov)

Environment Discontent

- Hydraulic fracturing
 - Water use, disposal, contamination (chemicals and methane)
 - Seismicity
- Air emissions
 - Drilling operations
 - Fugitive methane
- Fugitive emissions from value chain

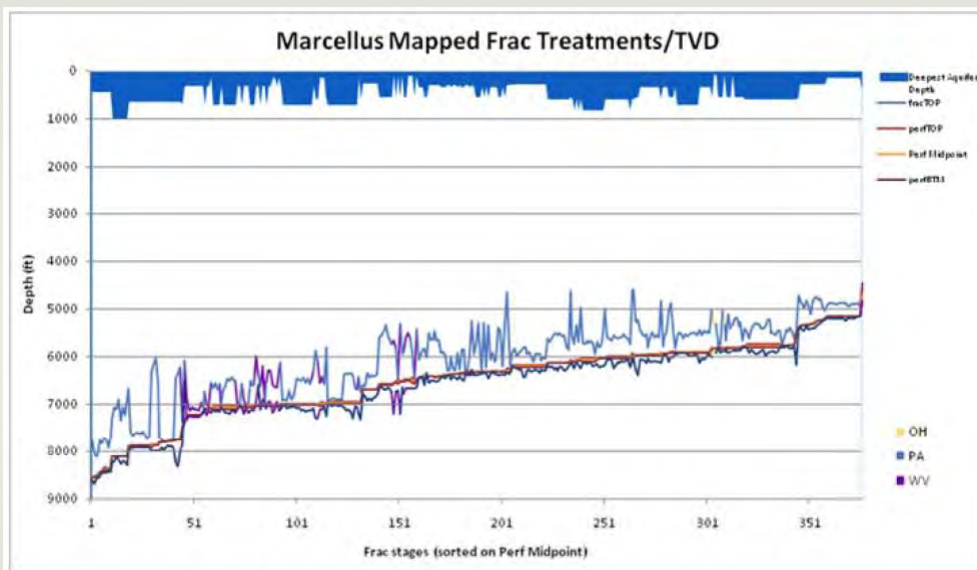
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Pinnacle Technologies/Energy in Depth

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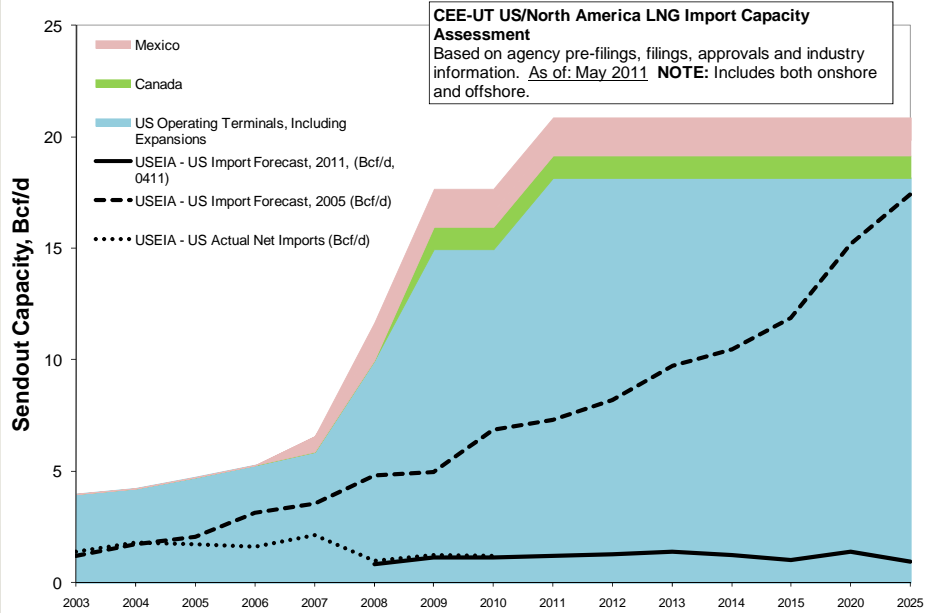
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Pinnacle Technologies/Energy in Depth

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