

Prospects for North American Petroleum Product Exports

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The North American Petroleum Renaissance Take Aways (part 1)

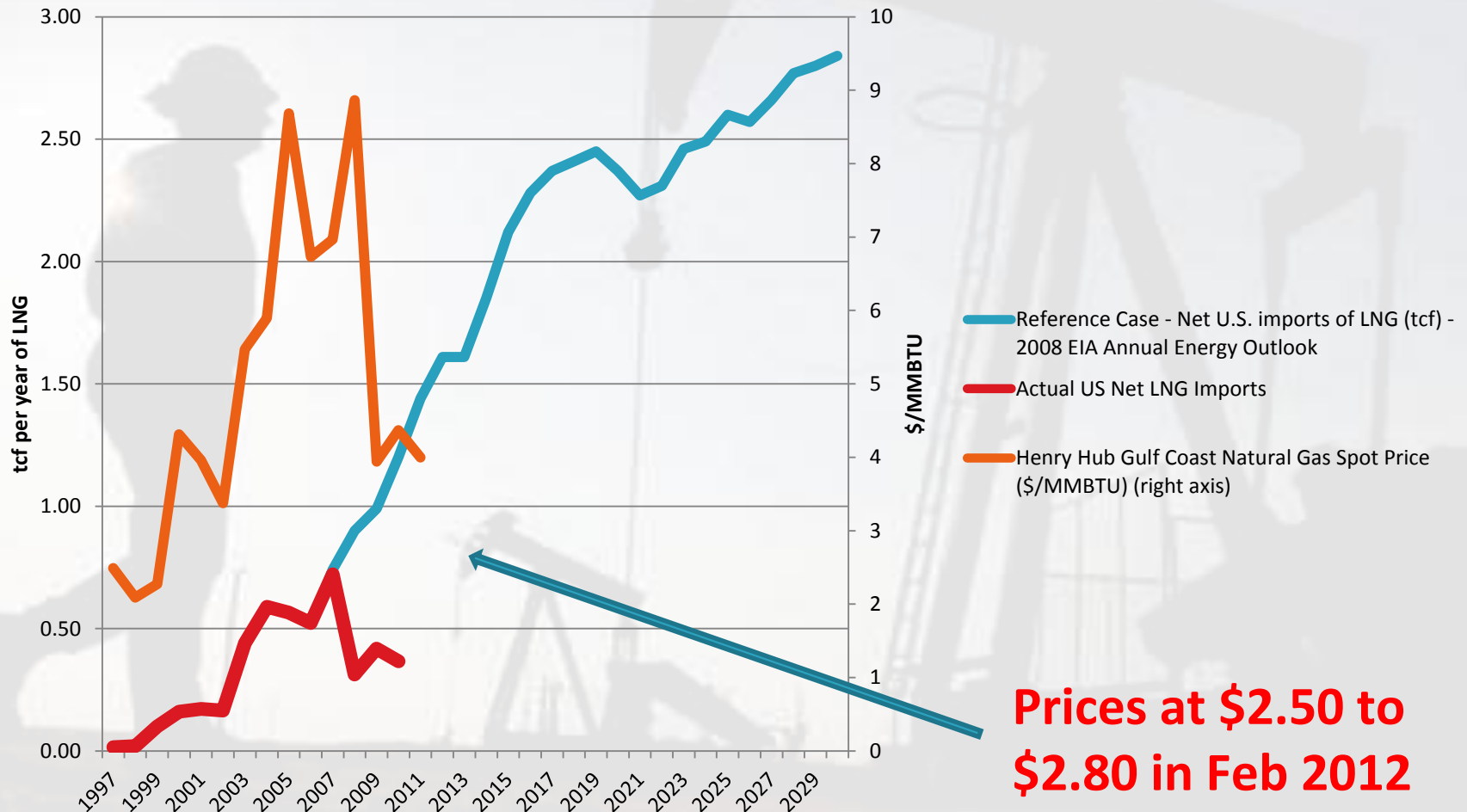
- North America is at the early stages of a “game changing” surge in liquids output which will radically alter product trade in the Atlantic Basin (& beyond).
- Infrastructure requirements to move upstream output to downstream centers in U.S. are massive. Execution risk in infrastructure and political interference will yield extreme volatility in WCS-WTI-Brent-LLS spreads & Atlantic Basin products trade.
- Shale oil, like shale gas, is now benefitting from the same technology (horizontal drilling and HF) that delivered the shale gas boom. North America to expand at 400-500k bbls/d of liquids per annum.

The North American Petroleum Renaissance Take Aways (part 2)

- This transformation is leading to large scale opportunities for value added upstream and downstream operations (crude oil, NGLs, refining, petrochemicals, LNG, etc.). + higher U.S. economic growth.
- There is now a real potential for the U.S. to separate from the world oil market (not necessarily a good thing), as has been the case with nat gas.
- U.S. regulatory programs/political resistance is largest risk to the renaissance.
- Presenter is not taking any special medications!!!!

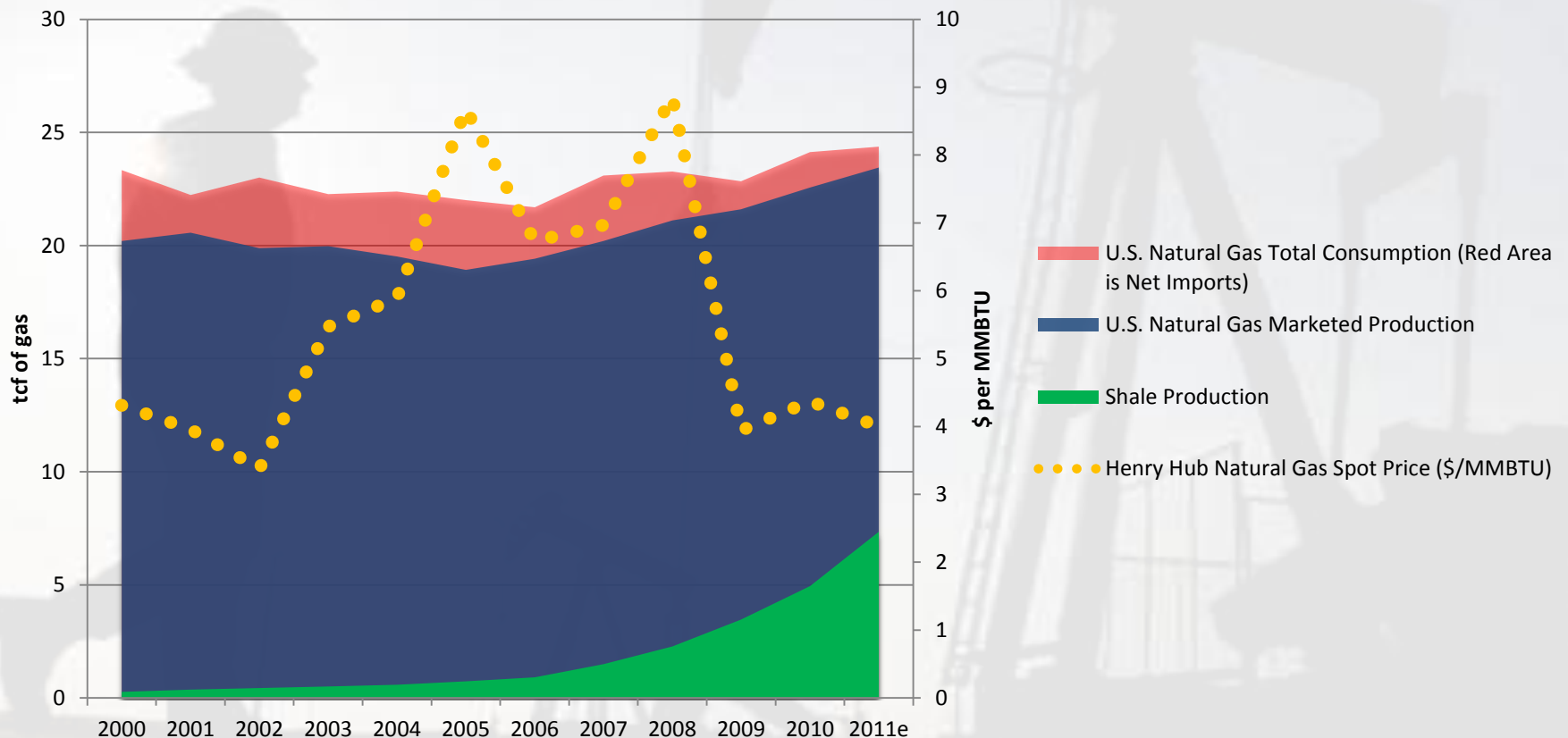
Projected Imports of LNG vs. Actual

(or why forecasters should have humility)



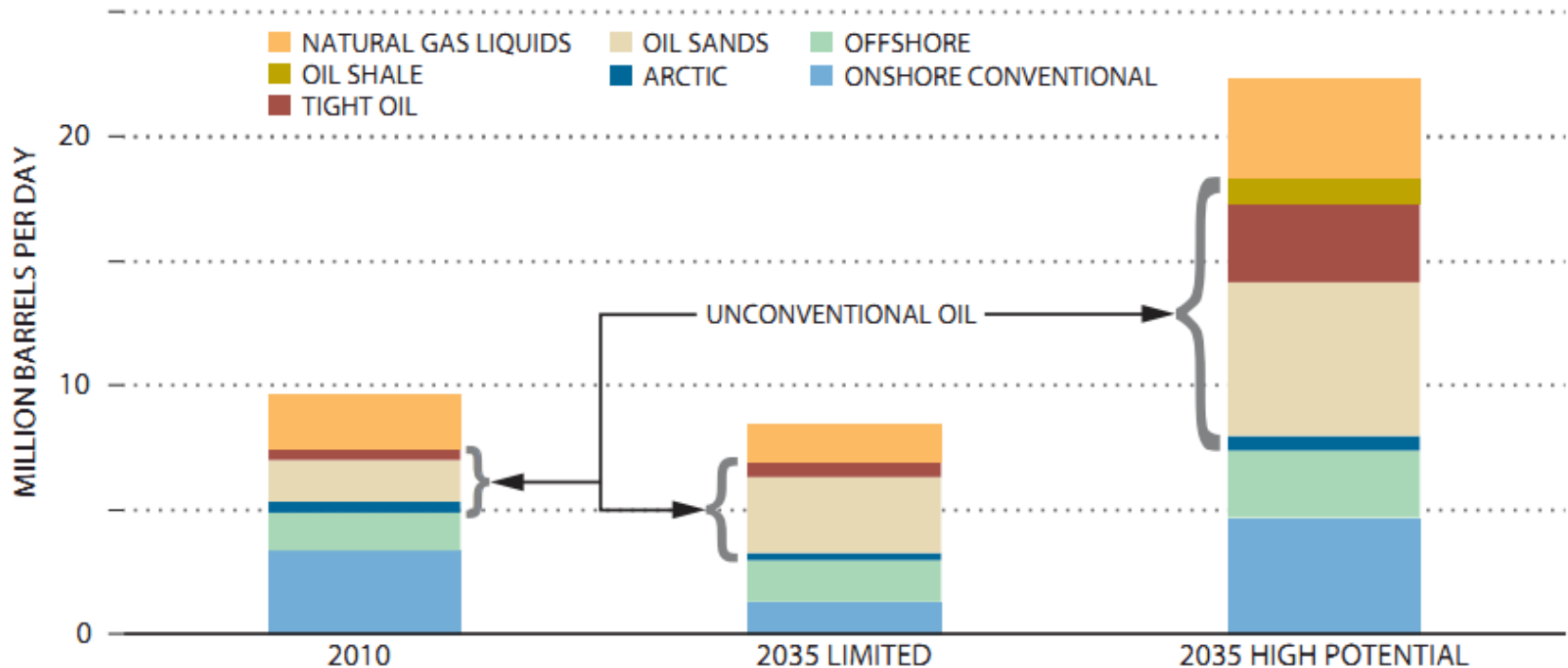
Source : EIA data and forecasts

Disposition of US Natural Gas



Source: EIA data, Navigant data, EPRINC calculations

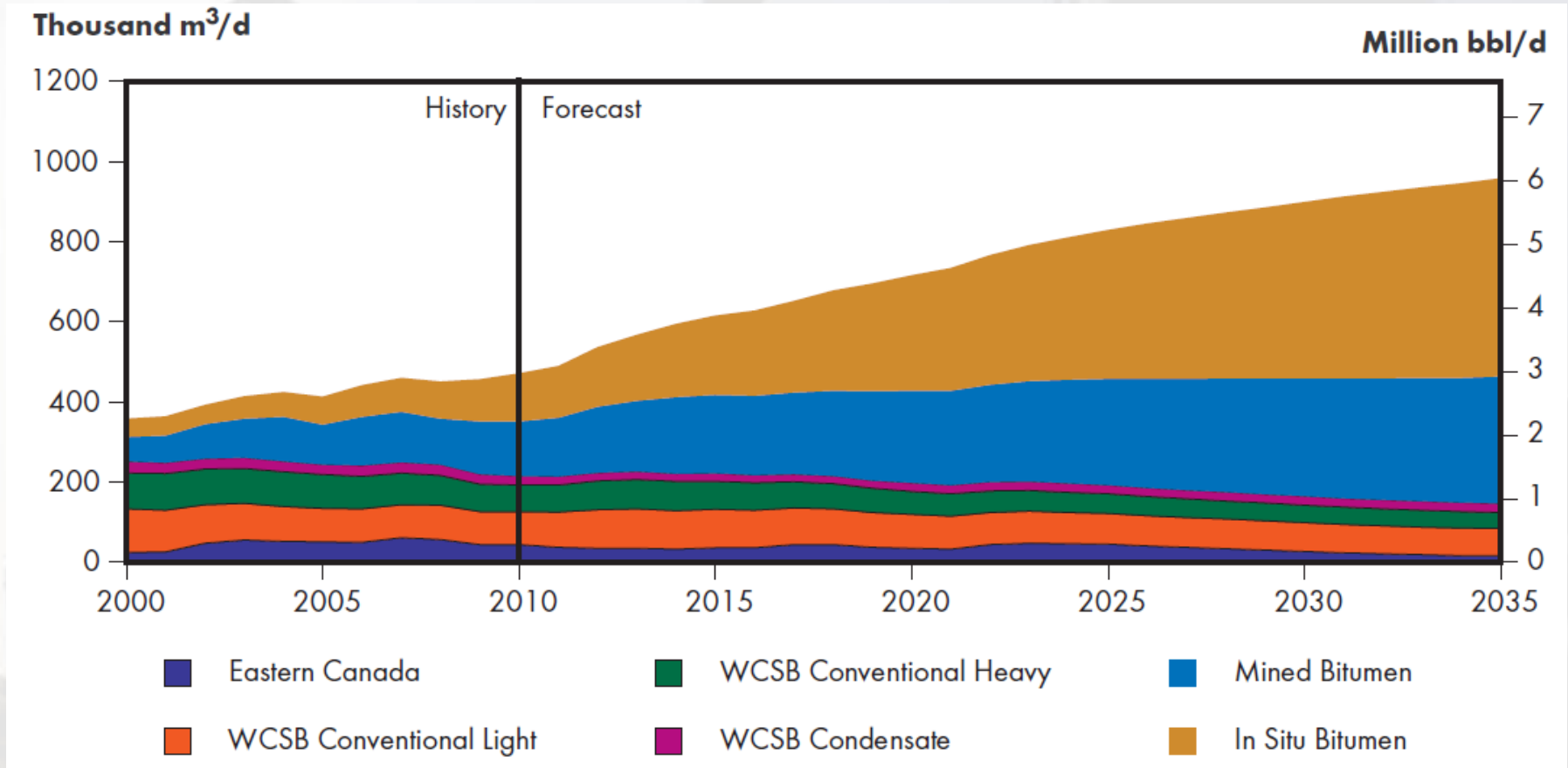
North American Production Potential



Note: The oil supply bars for 2035 represent the range of potential supply from each of the individual supply sources and types considered in this study. The specific factors that may constrain or enable development and production can be different for each supply type, but include such factors as whether access is enabled, infrastructure is developed, appropriate technology research and development is sustained, an appropriate regulatory framework is in place, and environmental performance is maintained.

Source: Historical data from Energy Information Administration and National Energy Board of Canada.

Total Canadian Oil Production (NEB Reference Case)



Source: "Canada's Energy Future: Energy Supply and Demand Projections to 2035." Nov 2011. NEB

Cost of Oil Sands Production

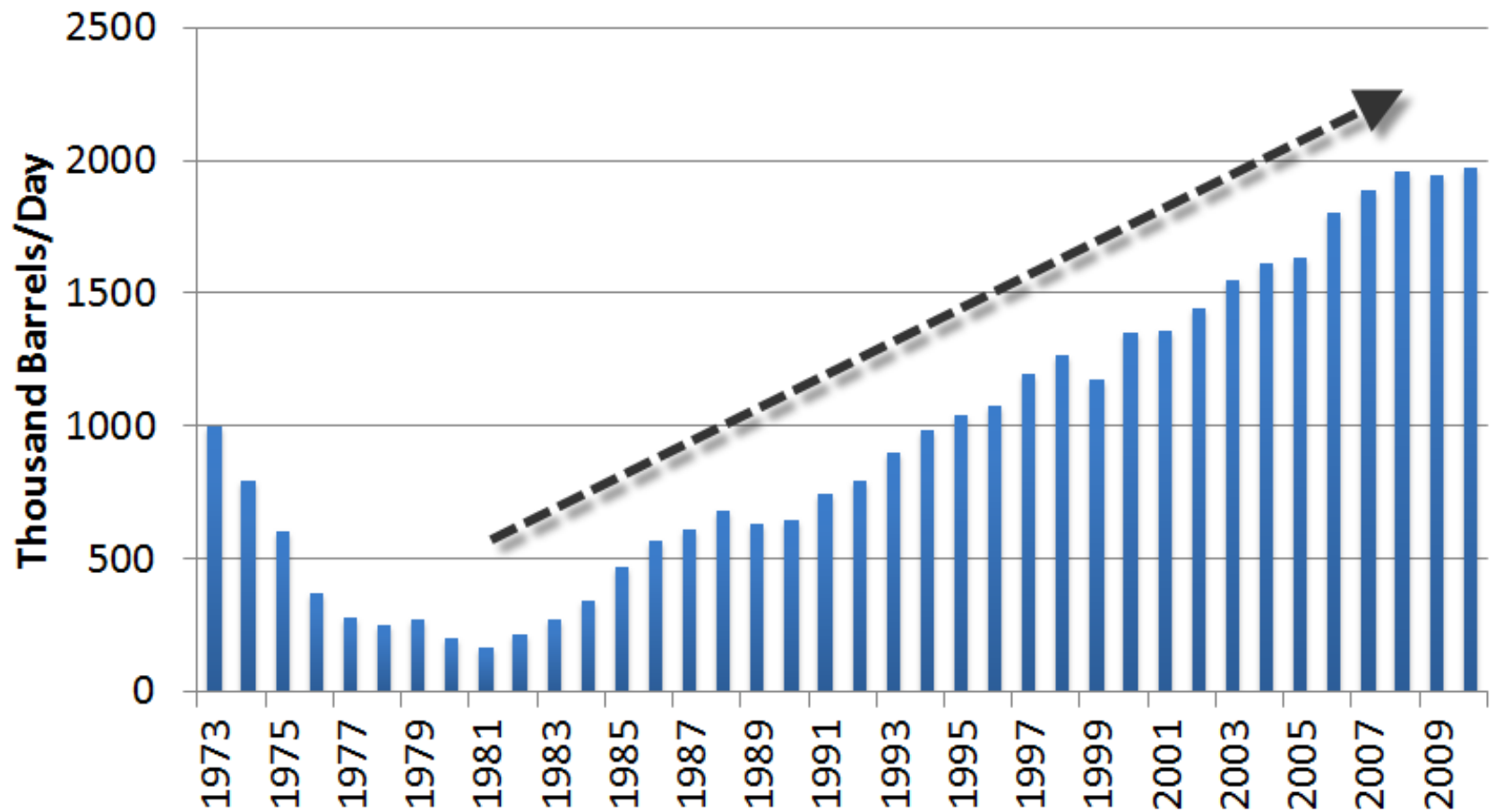
Estimated Initial Capital Expenditure (CAPEX) and Threshold^(a) Prices for New Oil Sands Projects

	CAPEX (\$Cdn / bbl of capacity, Cdn\$2010)	Economic Threshold (WTI US\$ equivalent / bbl, US\$2010)
Mining, Extraction and Upgrading	\$85,000-\$105,000	\$85-\$95
Mining and Extraction Only (No upgrading)	\$60,000-\$75,000	\$65-\$75
Steam-assisted Gravity Drainage (SAGD)/Cyclic Steam Stimulation (CSS)	\$25,000-\$40,000	\$50-\$60

(a) Includes a realistic after-tax rate of return, commonly in the order of 10 to 15%.

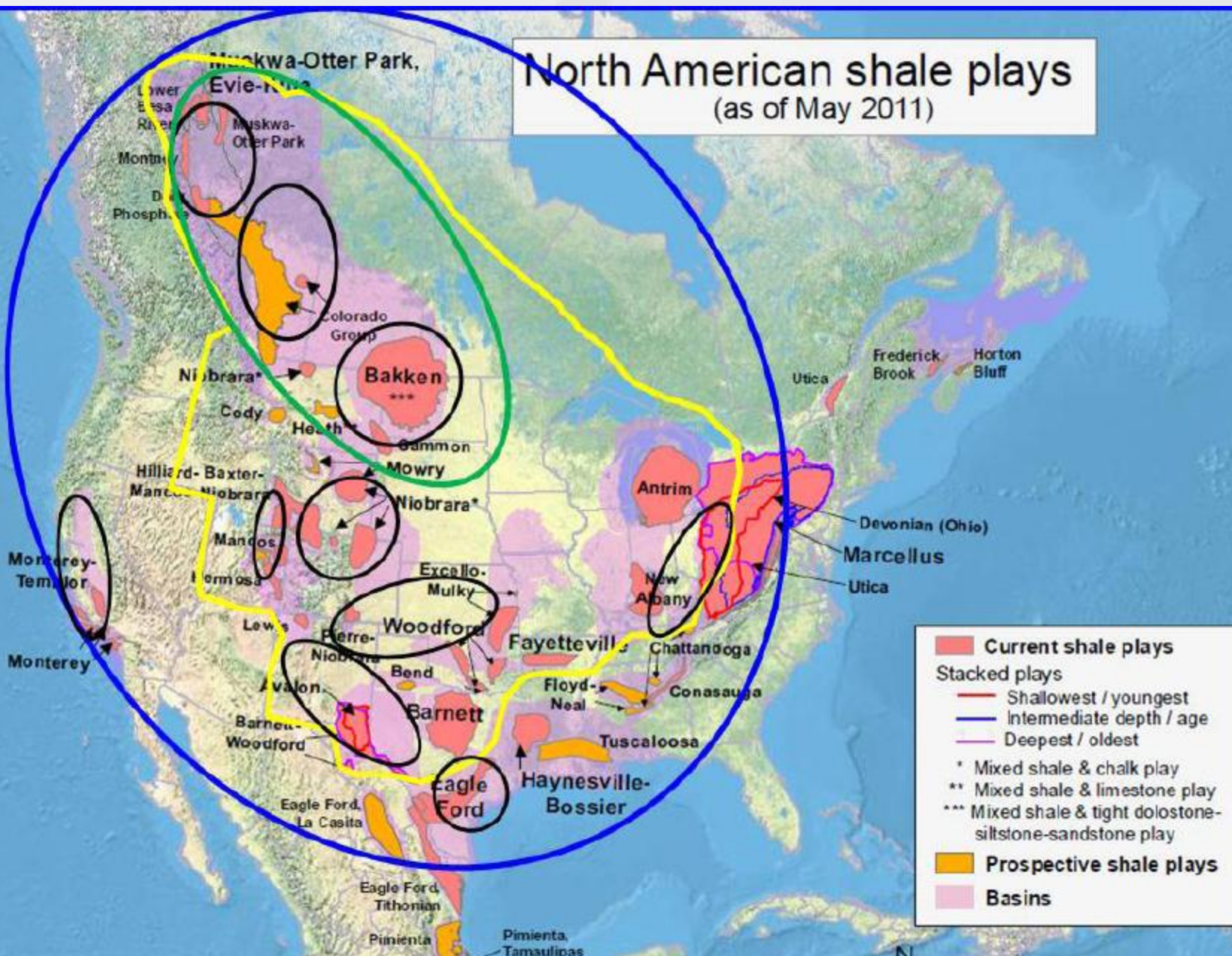
Source: "Canada's Energy Future: Energy Supply and Demand Projections to 2035." Nov 2011. NEB

Canadian Imports



Source: EIA

North American shale plays (as of May 2011)

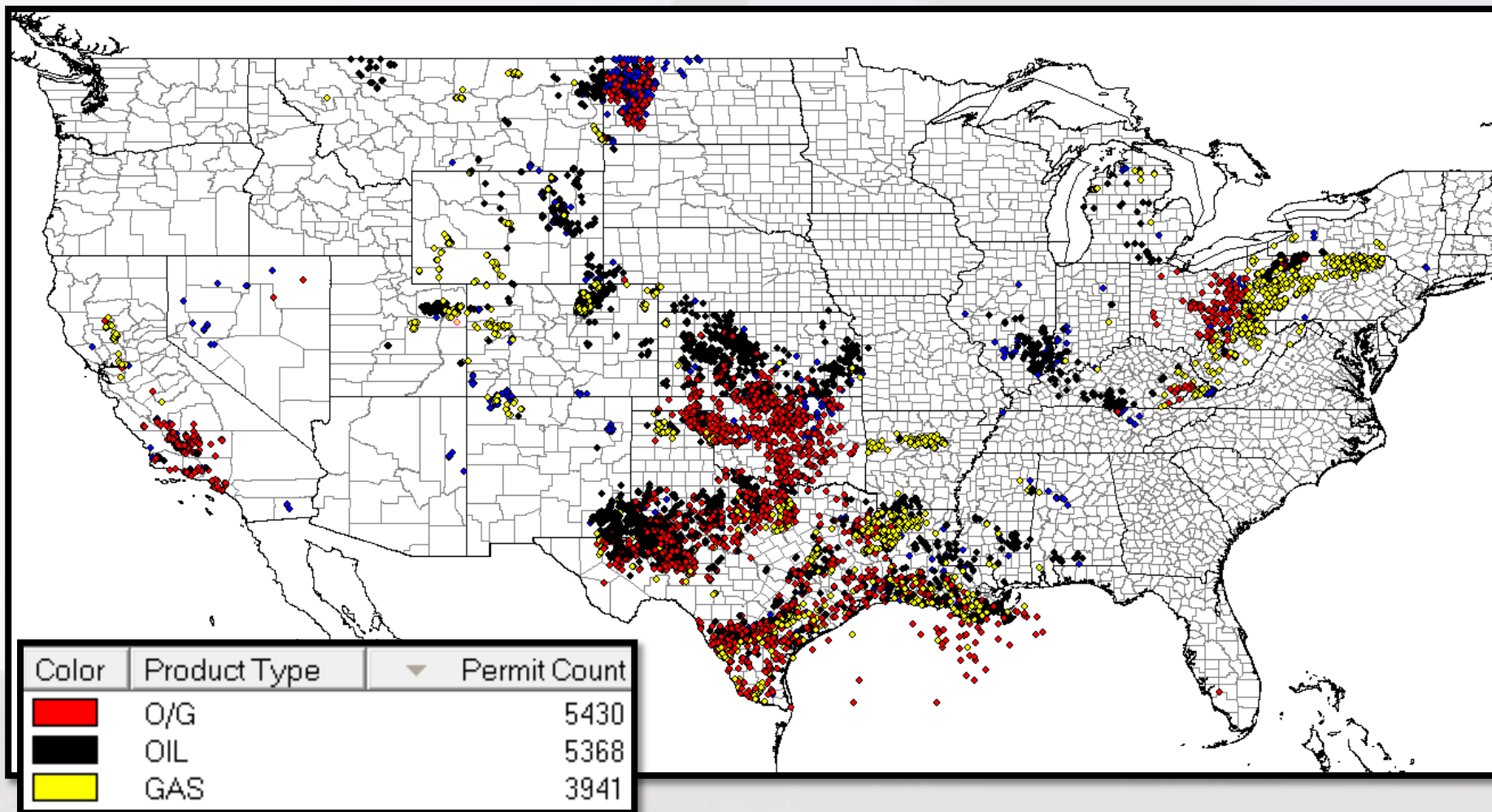


Rig Count and Permits



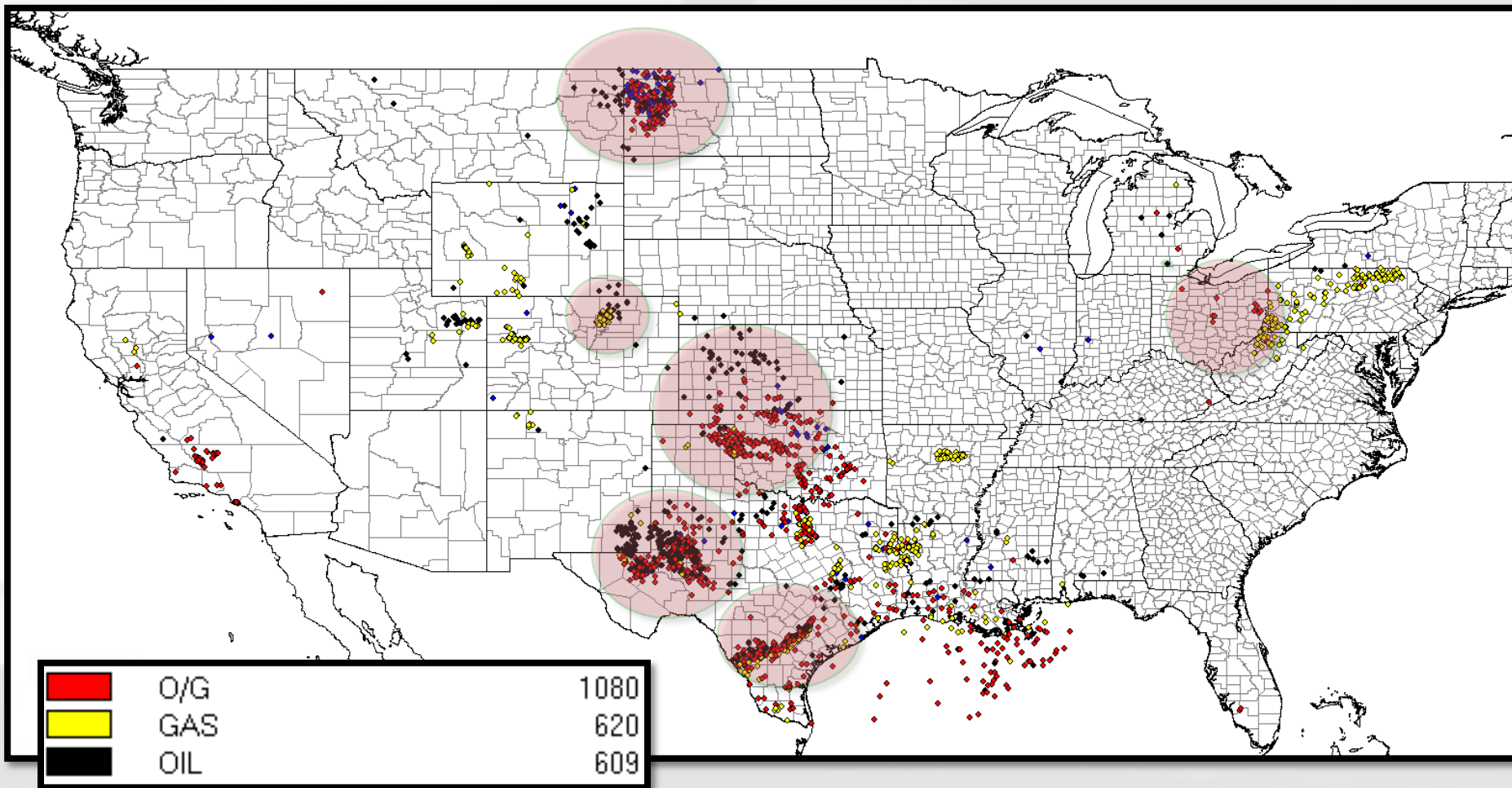
Source: Photo Baker Hughes Interactive Rig Count Jan 25, 2012

Oil and Gas Permits



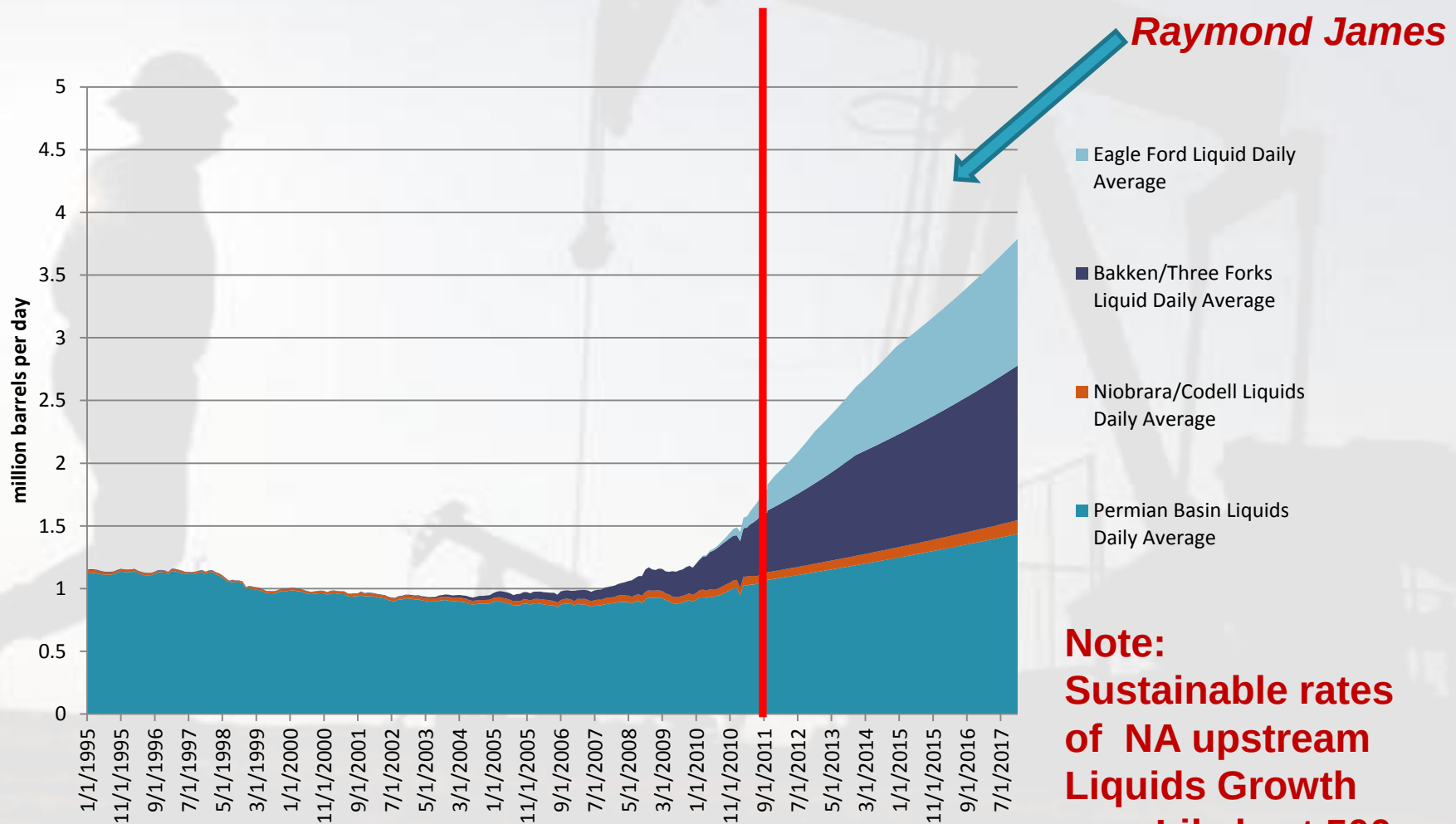
Source: HPDI Feb 13, 2012

Rigs by Product Type

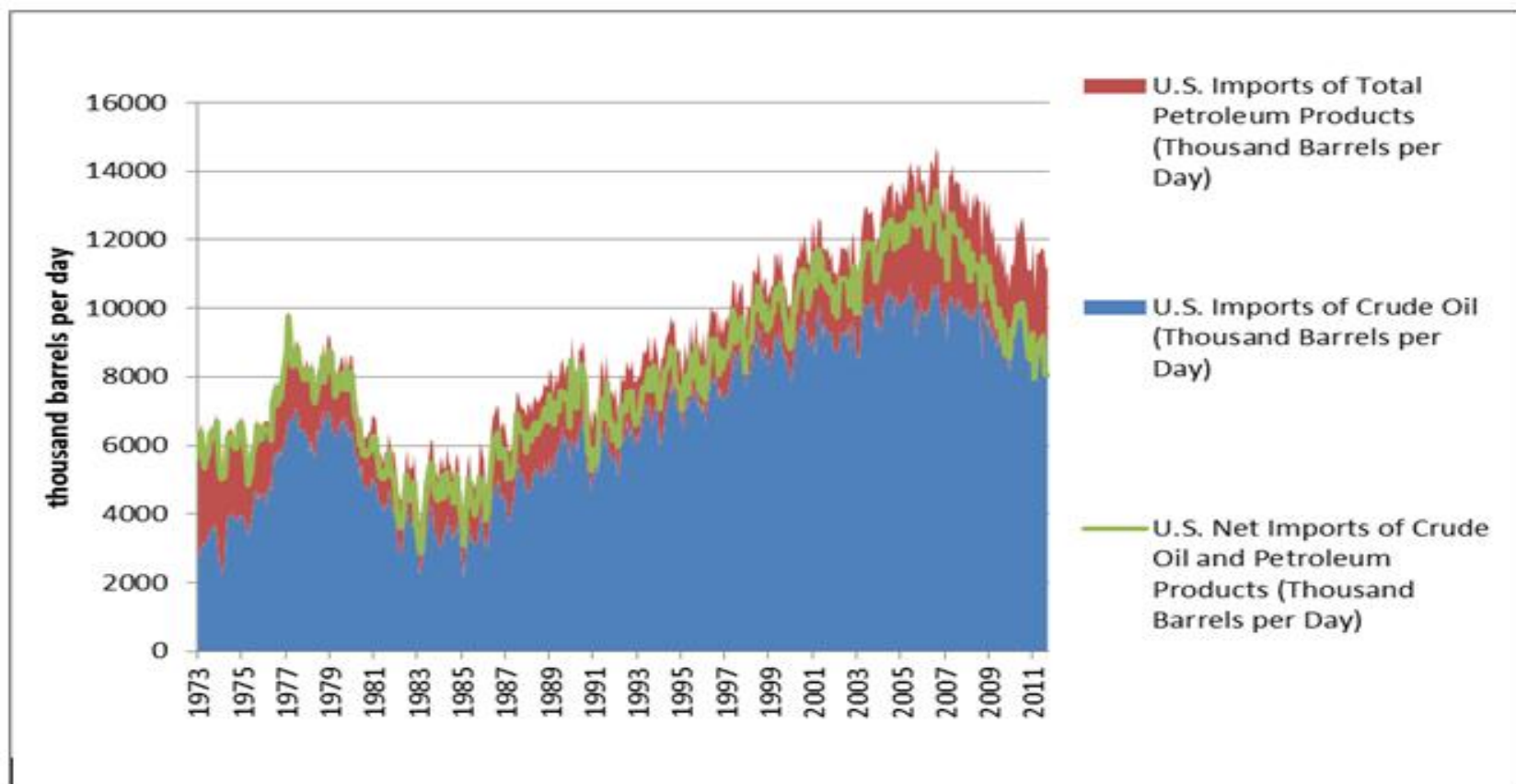


Source: HPDI Feb 13, 2012

Unconventional Liquids 2011 to 2017

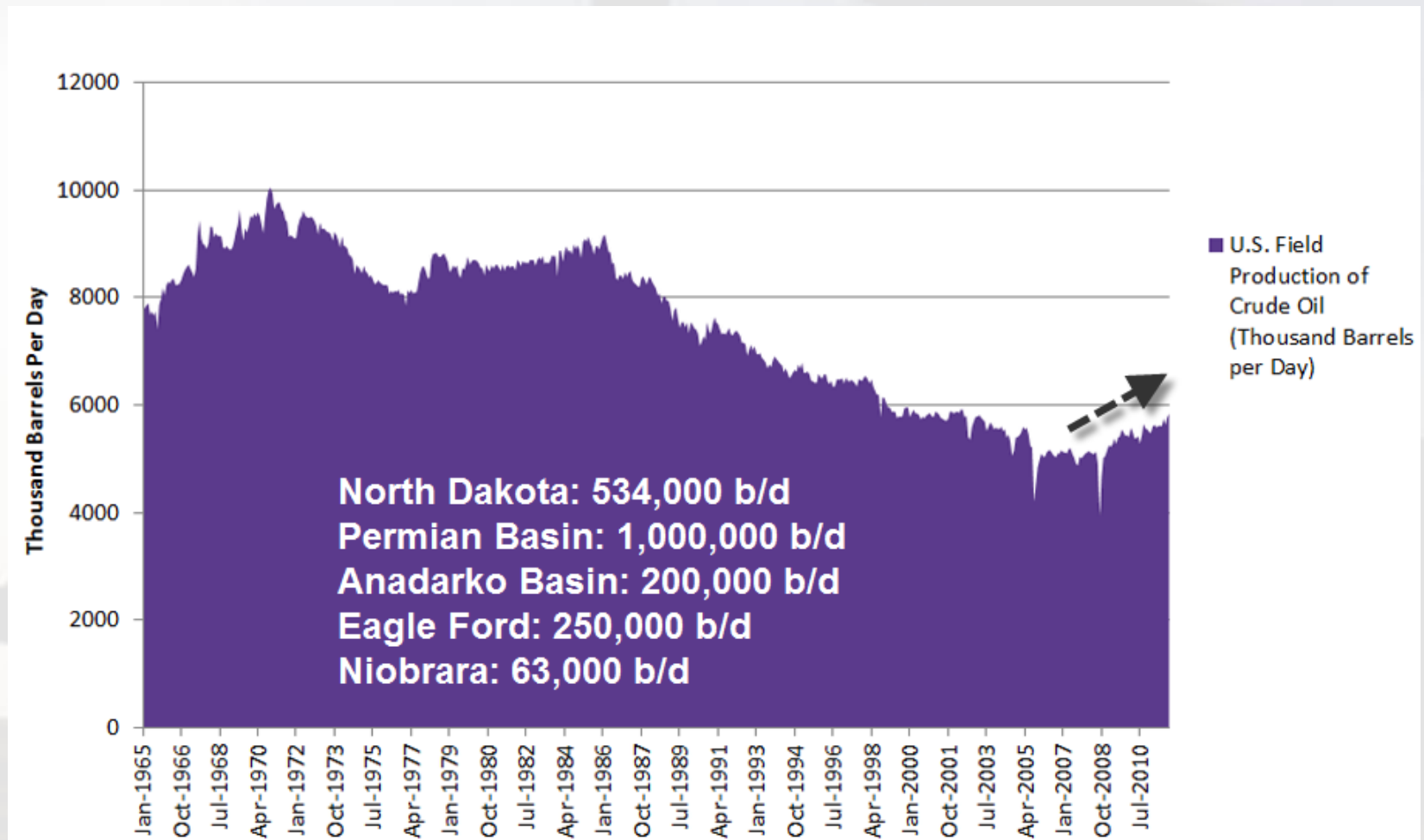


U.S. Imports of Crude Oil and Petroleum Products and Net Imports



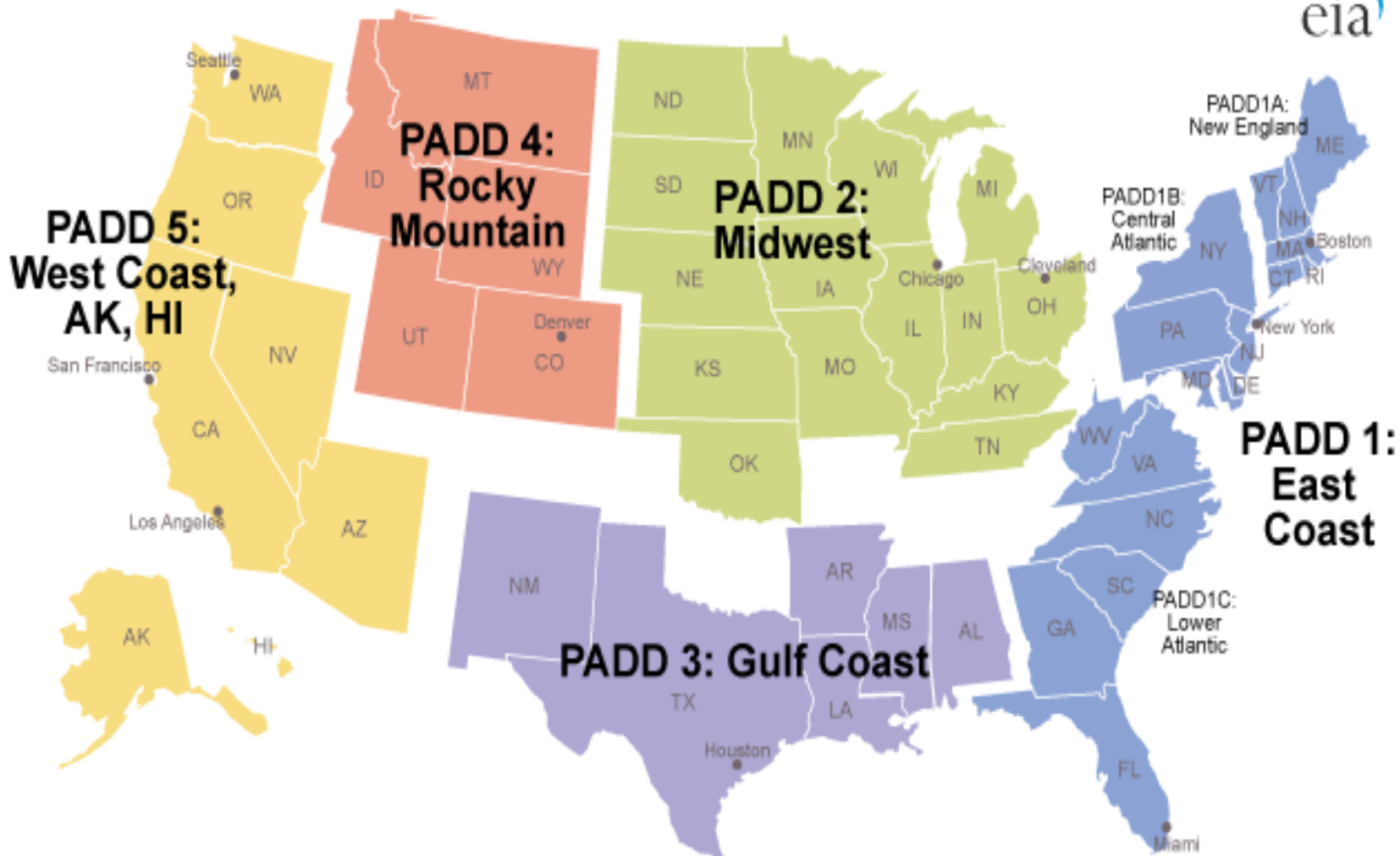
Source: EIA

U.S. Production Increases



Source: EIA and EPRINC estimates from NDPA and HPDI

Petroleum Administration for Defense Districts

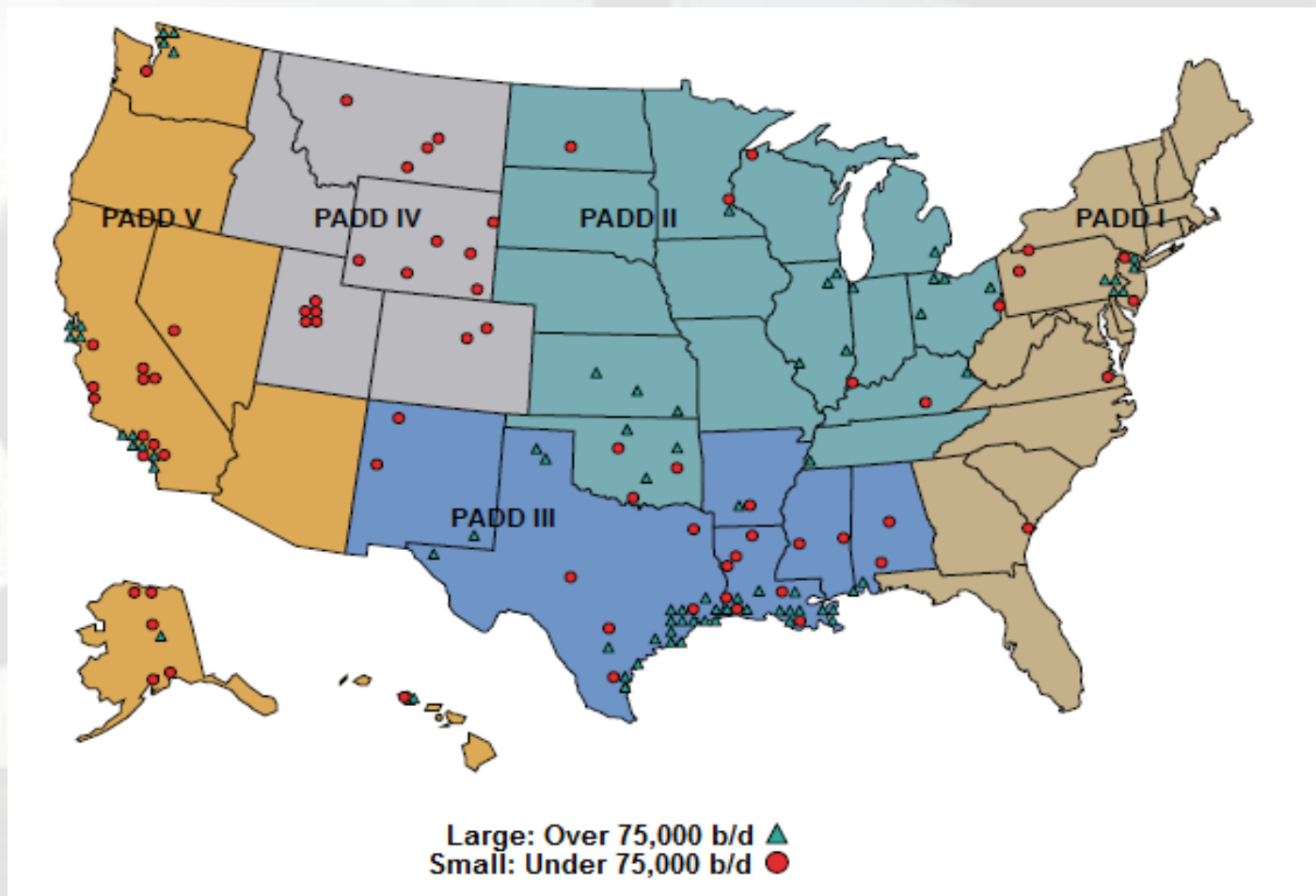


Source: U.S. Energy Information Administration.

The Route

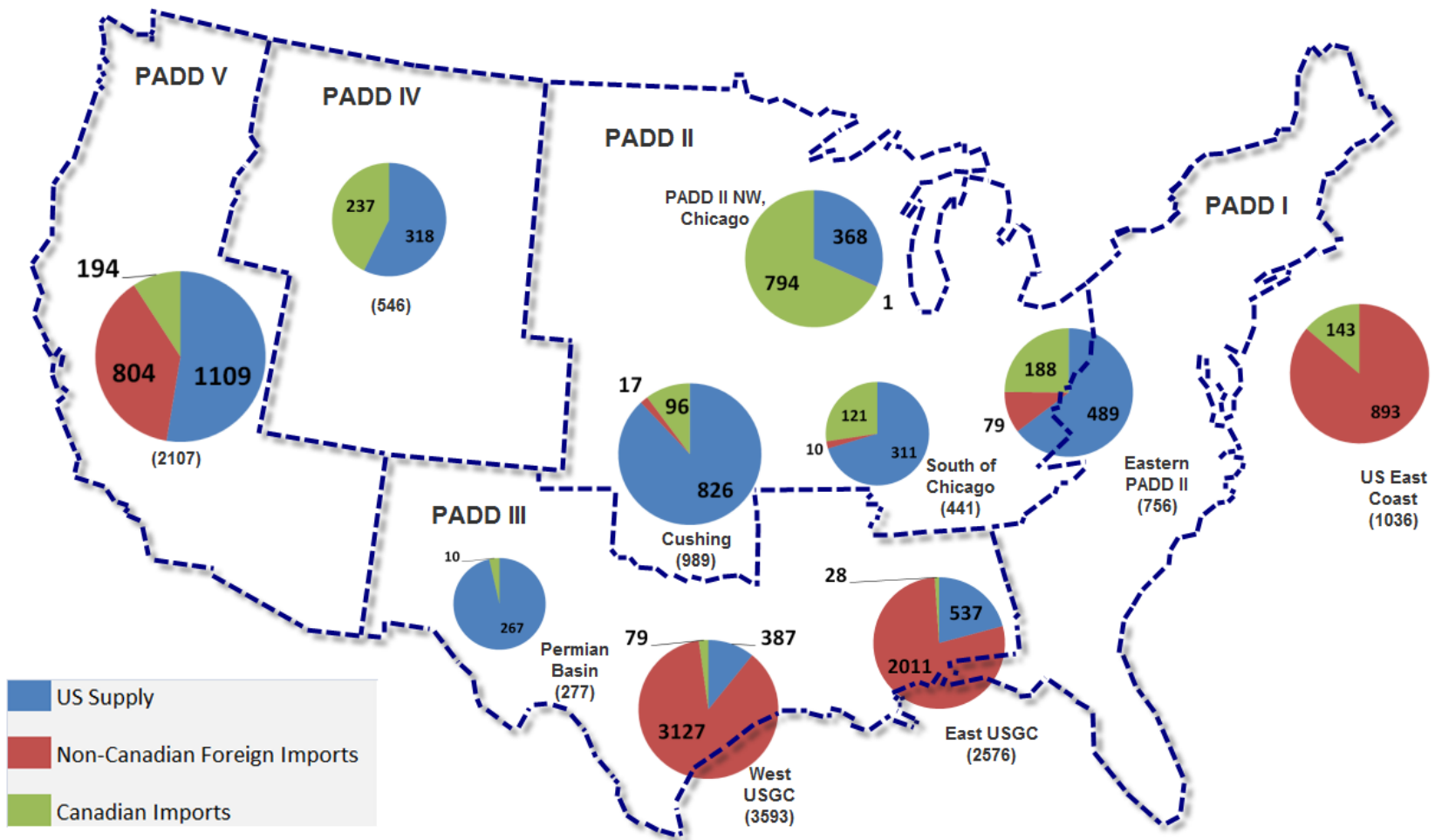


PAD Districts and Refinery Locations



Source: NPRA

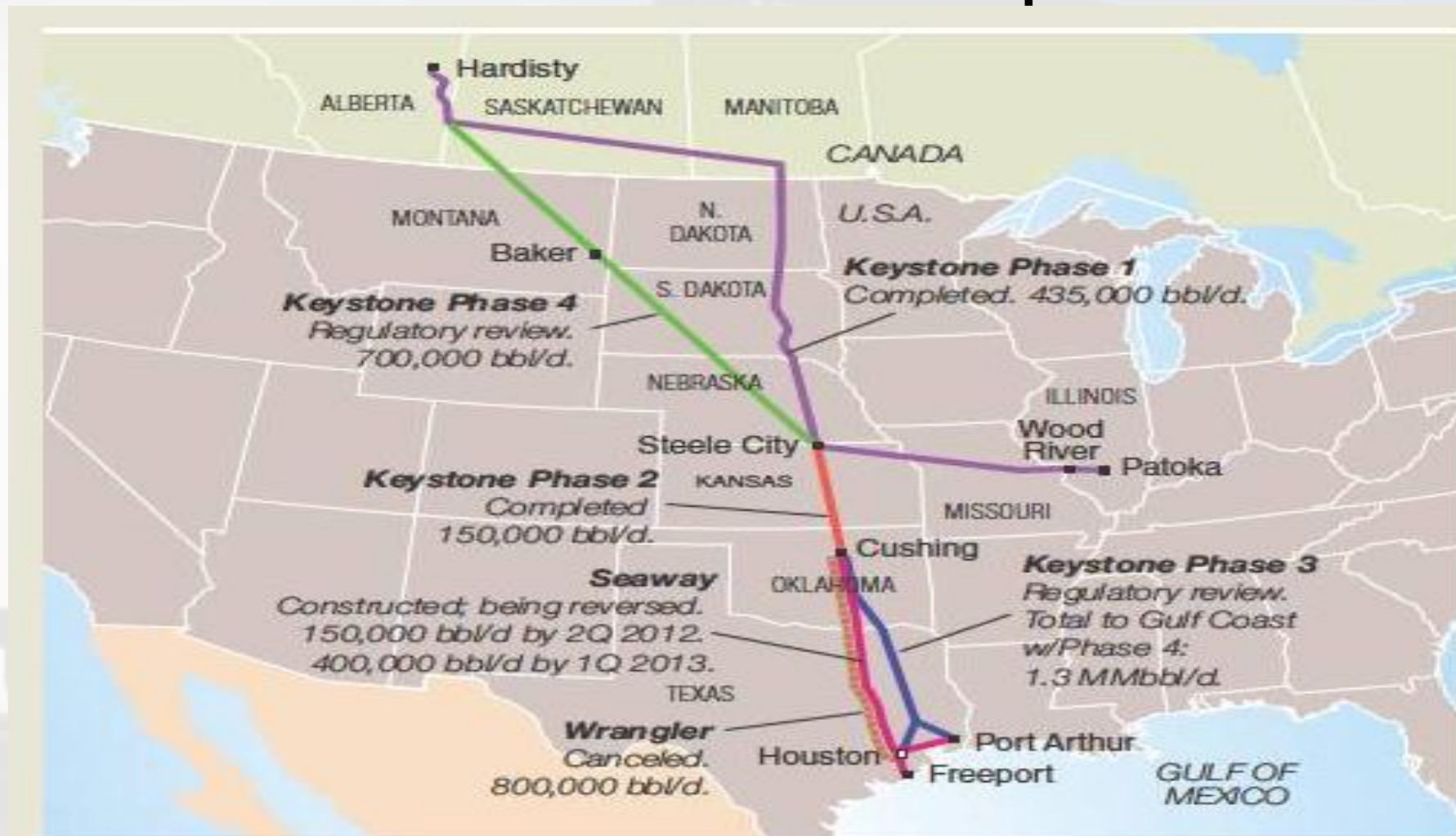
Canadian Imports and Potential Markets



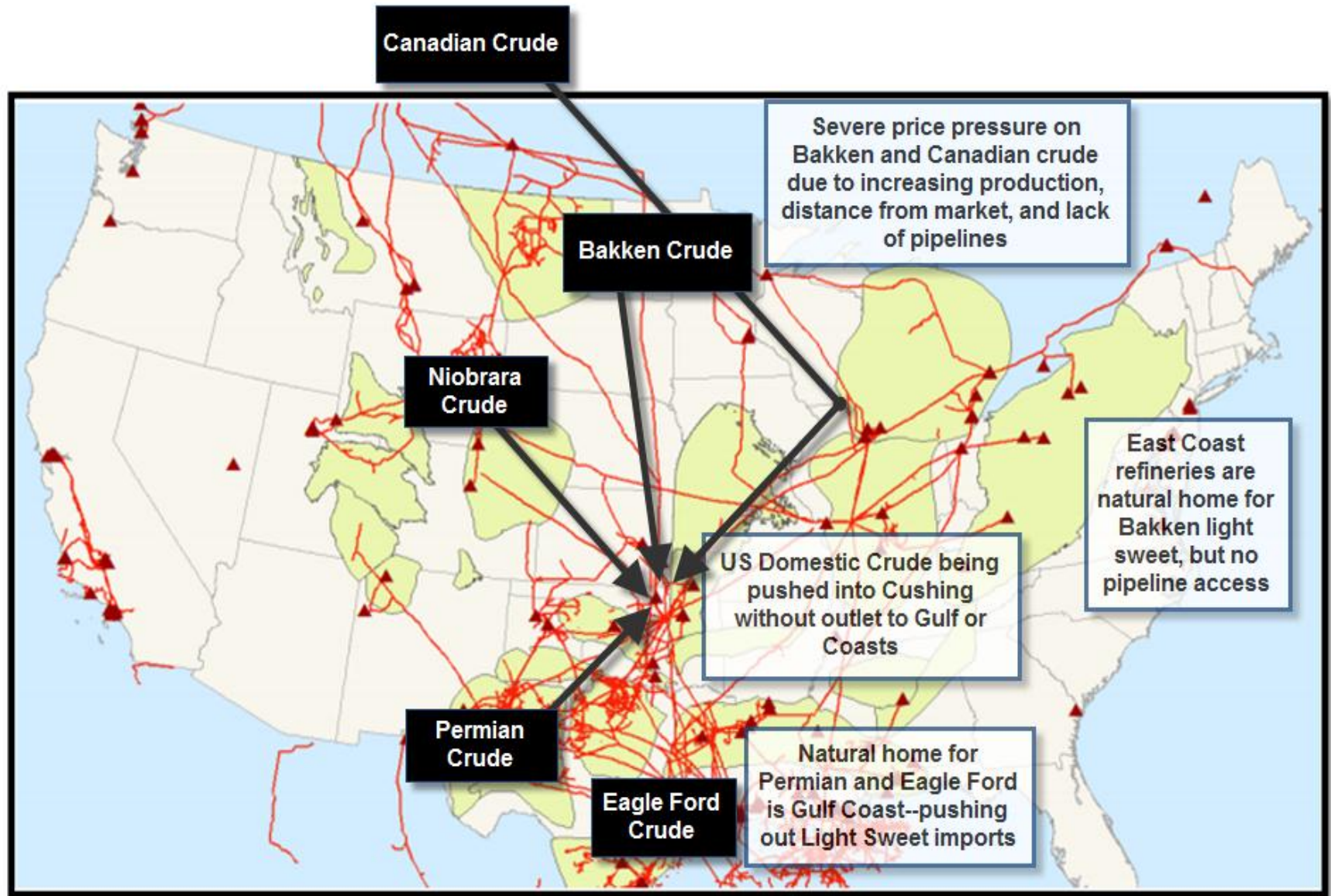
Source: EPRINC rendition from Enbridge. Enbridge; Enbridge used EIA and NEB Data and Enbridge Estimates (with some averages)

Crude Disposition by Region 2010 (MB/D)

North American Pipes

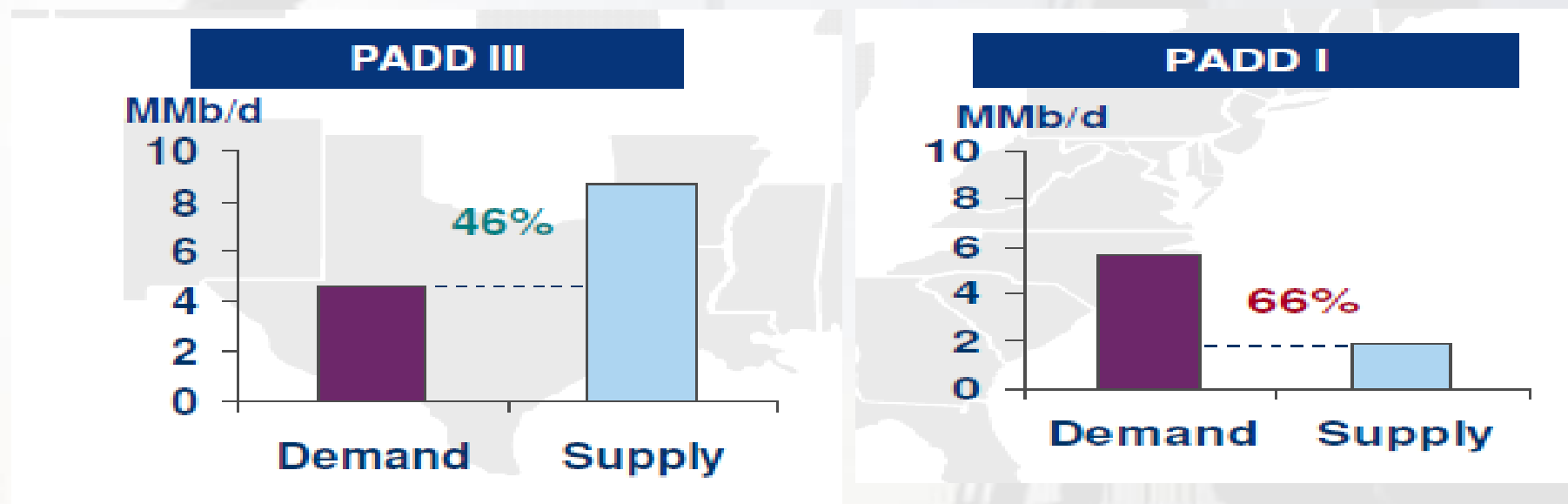


Choke Points



Source: Savage, Presentation Bakken Product Markets and Take-Away Denver Jan 31-Feb 1 2012 *with EPRINC Additions*

State of the Industry: A Tale of Two PADDs



Atlantic Basin Refinery Closures

PADD I closures, 2009 – 2012 estimated at over 700,000 b/d

Main causes include:

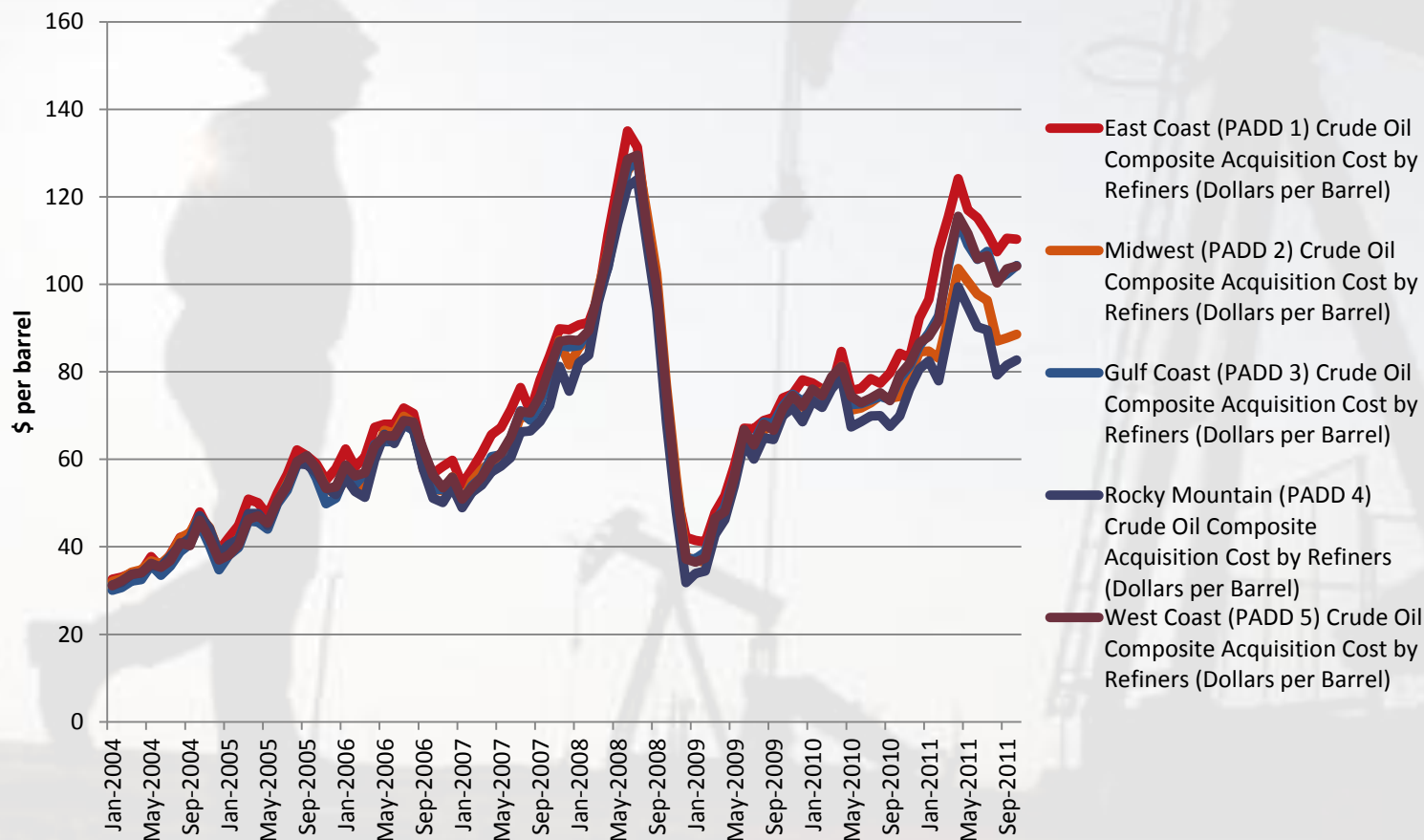
Rising federal and state regulatory costs (and uncertainties on future regs)

High refiner acquisition cost for feedstock

Limited infrastructure for accessing rising volumes of lower cost domestic feedstock

Low cost gasoline imports from European refiners as U.S. Gulf Coast refiners face obstacles for moving volumes by ocean tanker

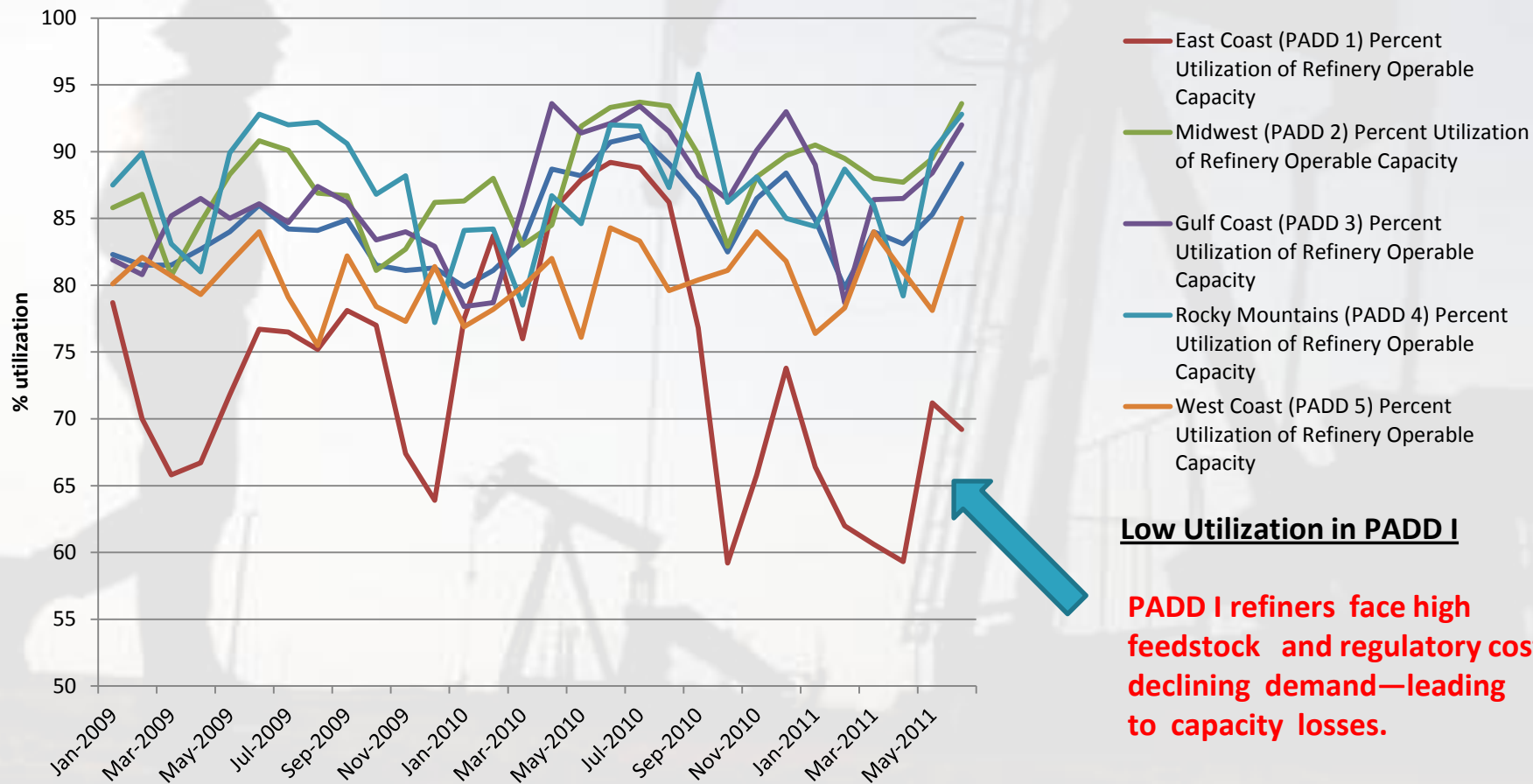
Refinery Acquisition Cost of Crude



PADD 1 has the highest RAC in the U.S. – and the least heavy crude processing capability

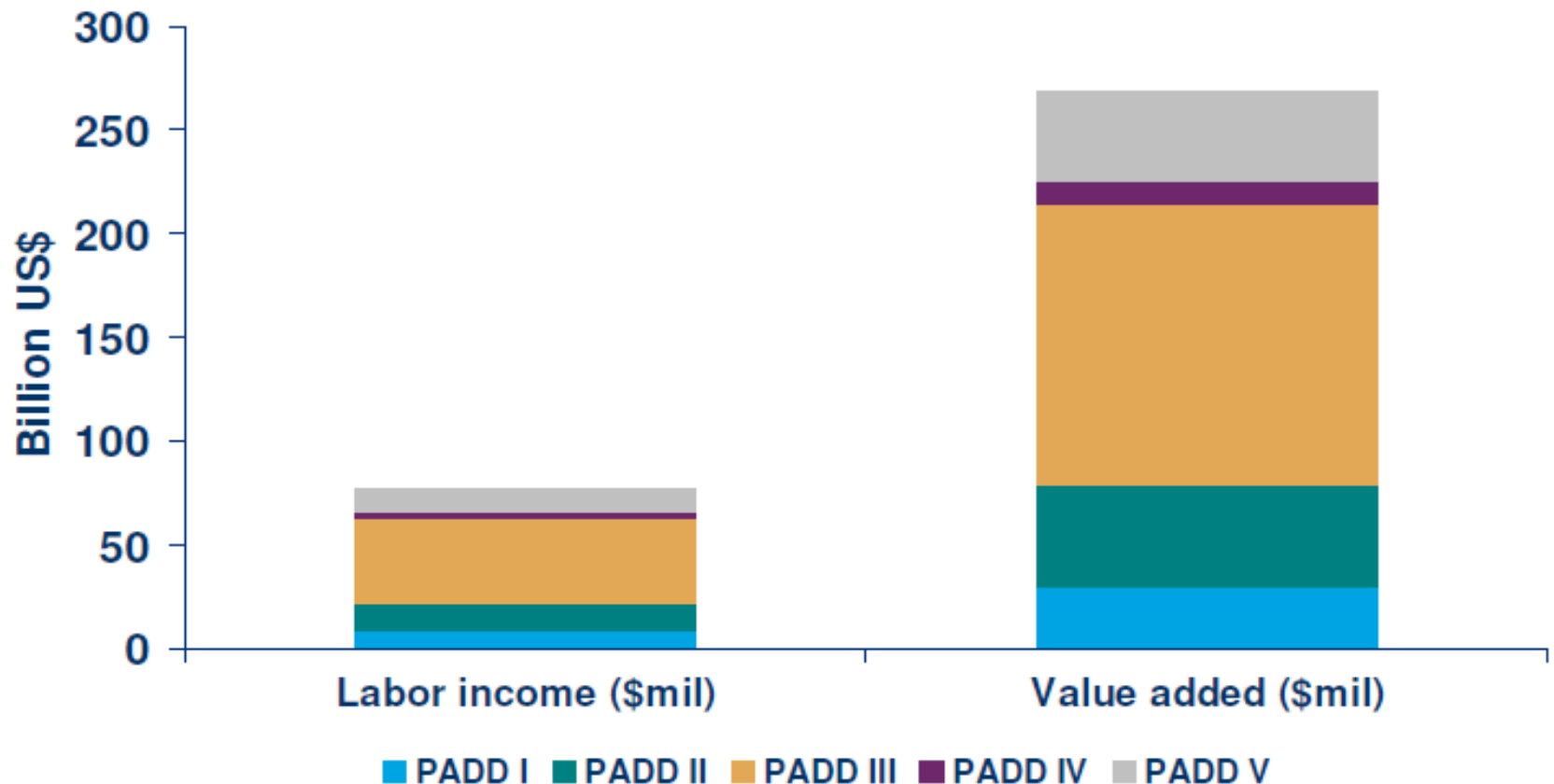
Source: EIA Data

Refinery Utilization by PADD



Source: EIA Data

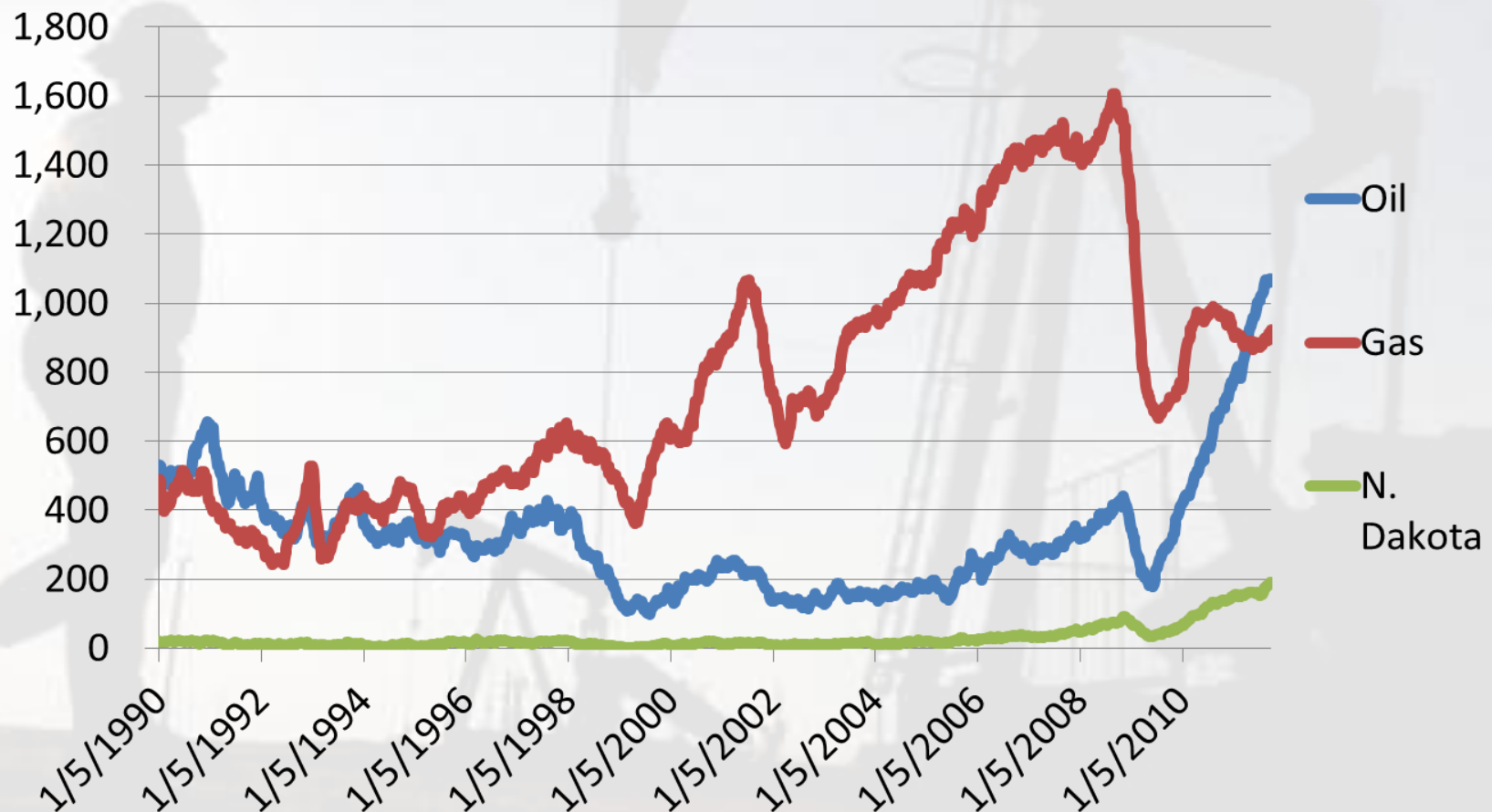
Refining Labor Income and Value Added by PADD (2009)



Source: PwC Economic Impact & Employment Report 2011; Wood Mackenzie analysis

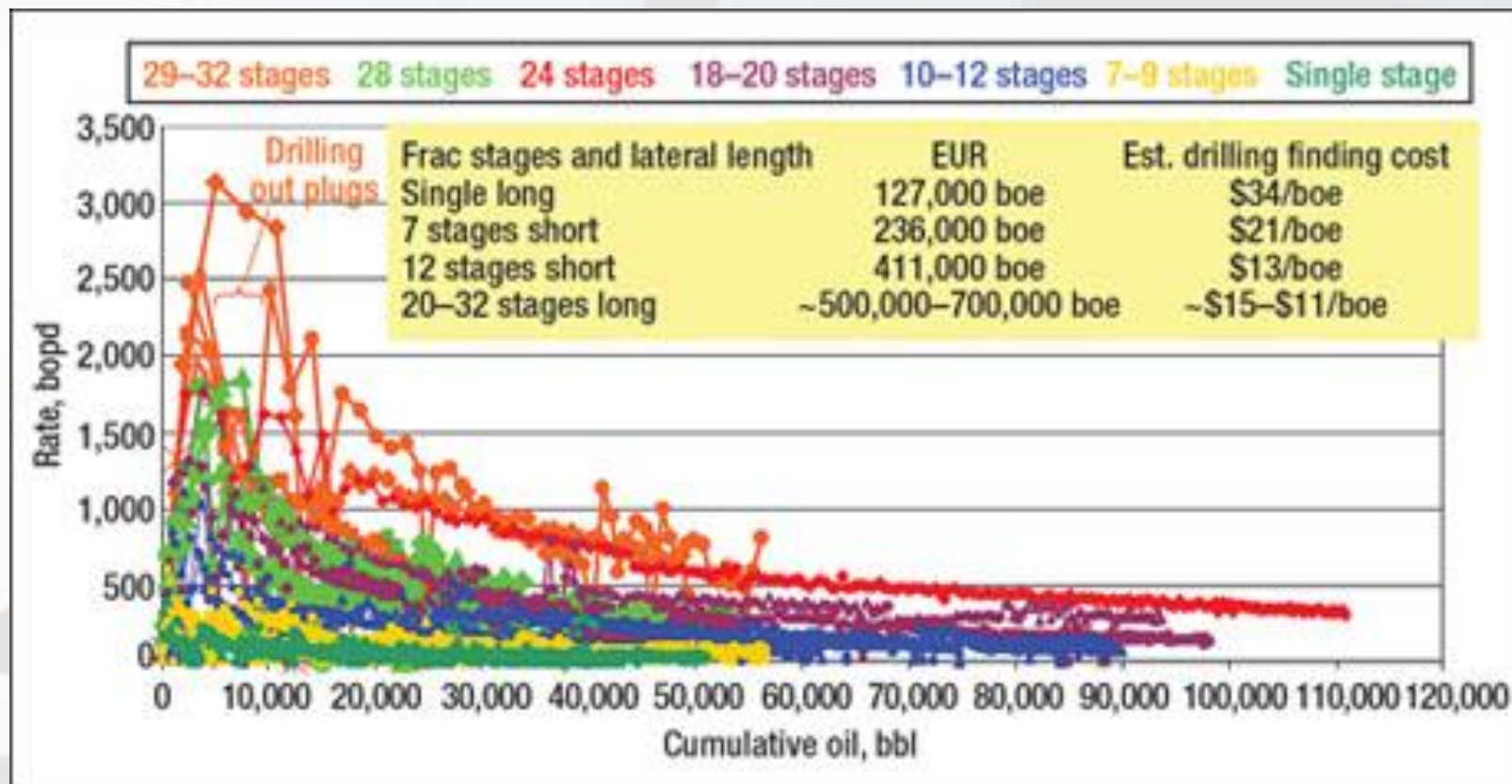
Upstream Will Drive the Downstream

U.S. and North Dakota Rig Count



Source: Baker Hughes Oct 4 2011. All but 50 rigs nationwide are onshore.

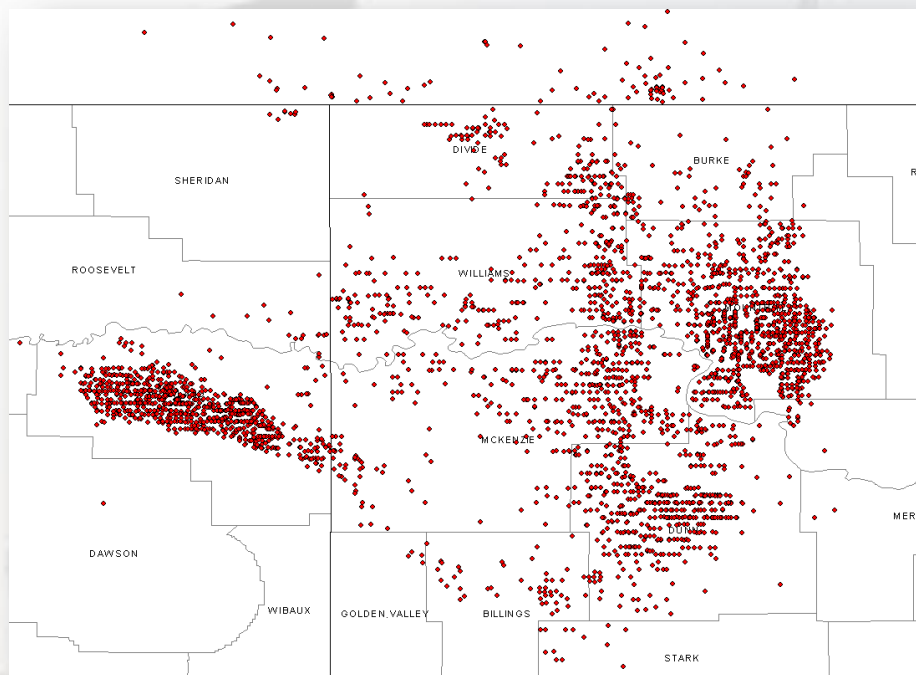
Estimated Ultimate Recovery



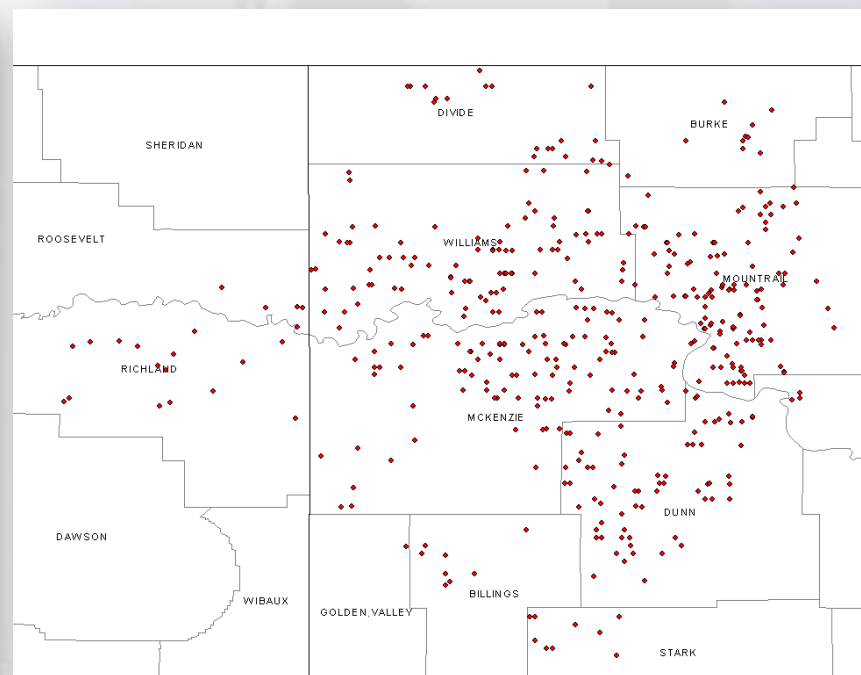
Source: Brigham Exploration via *World Oil*

Bakken Producing Wells and Activity

2001 to 2011



2011



Source: HPDI Production Data

Technology Matters

- Overtime companies in the Bakken have improved their techniques
- Only a few years ago frac stages were minimal, but now they are 30 plus with some trying to go as high as 60
- Typically, more fracturing means more production, but this also increases cost, usually more than paid for by the increased production
- Horizontal laterals now common in the Bakken and across the country were once around 4,000 ft and are now as long as 10-15,000 ft
- “...40 fracture stimulations are now pushing ultimate recovery figures to well over 600,000 and 700,000 barrels of oil.” (Oil Patch Hotline)

Wells, Rigs, and Jobs

- 1,100 to 2,700 wells/year = 2,000 expected
- 100-225 rigs = 12,000 – 27,000 jobs = 20,000 expected
- 225 rigs can drill the 5,000 wells needed to secure leases in 2.5 years
- 225 rigs can drill the 28,000 wells needed to develop spacing units in 14 years
- 33,000 new wells = thousands of long term jobs

Source: North Dakota Industrial Commission

Value of an Oil Well in North Dakota

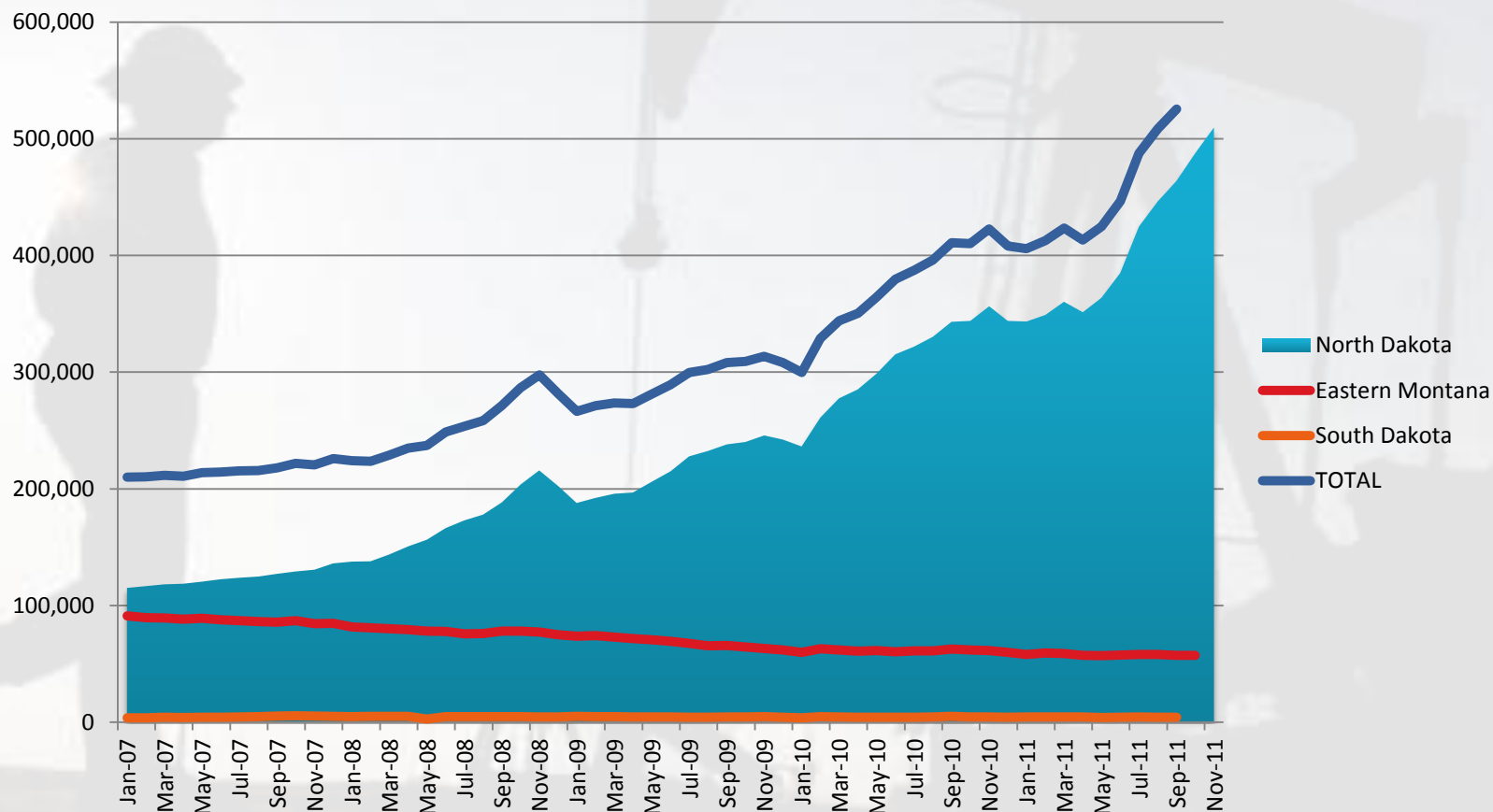
Typical 2011 North Dakota Bakken well will produce for 28 years
(enhanced oil recovery efforts could extend the life of well)

During those 28 years the average Bakken well will...

- Produce approximately 550,000 barrels of oil
- Generate over \$20 million net profit
- Pay approximately \$4,360,000 in taxes, \$2,100,000 gross production taxes, \$1,900,000 extraction tax, \$360,000 sales tax
- Pay royalties of \$7,600,000 to mineral owners
- Pay salaries and wages of \$1,600,000
- Pay operating expenses of \$2,300,000
- Cost \$7,300,000 to drill and complete

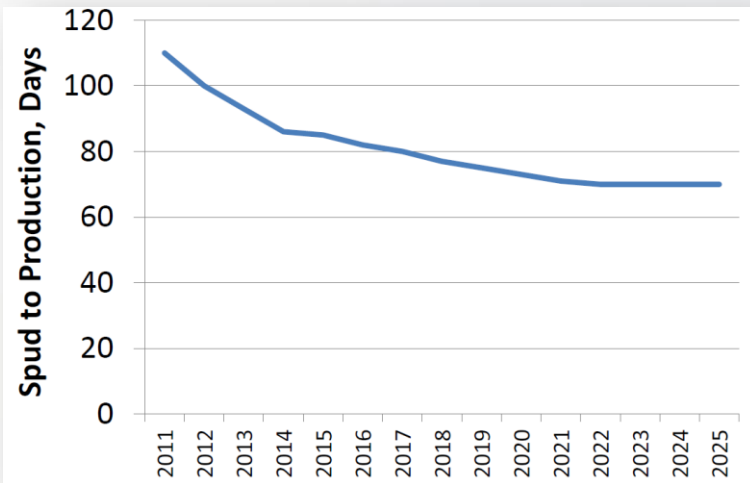
Source: North Dakota Industrial Commission

Williston Basin Production

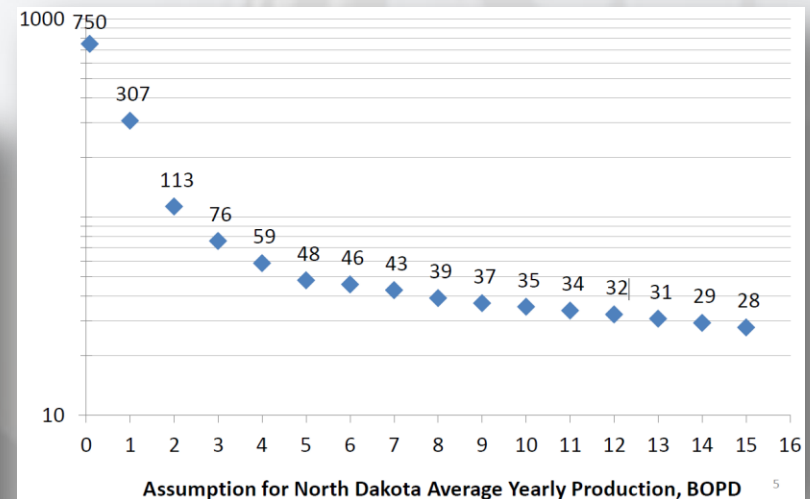
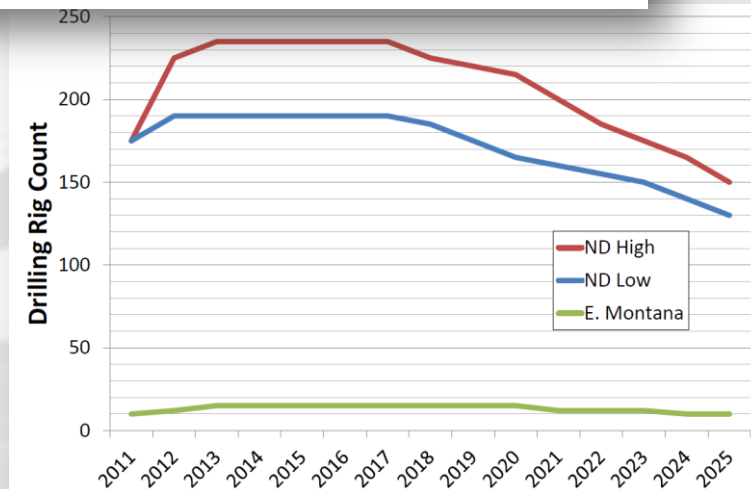


North Dakota Now Accounts for 8% of US Production!!!!

NDPA Forecast Drivers

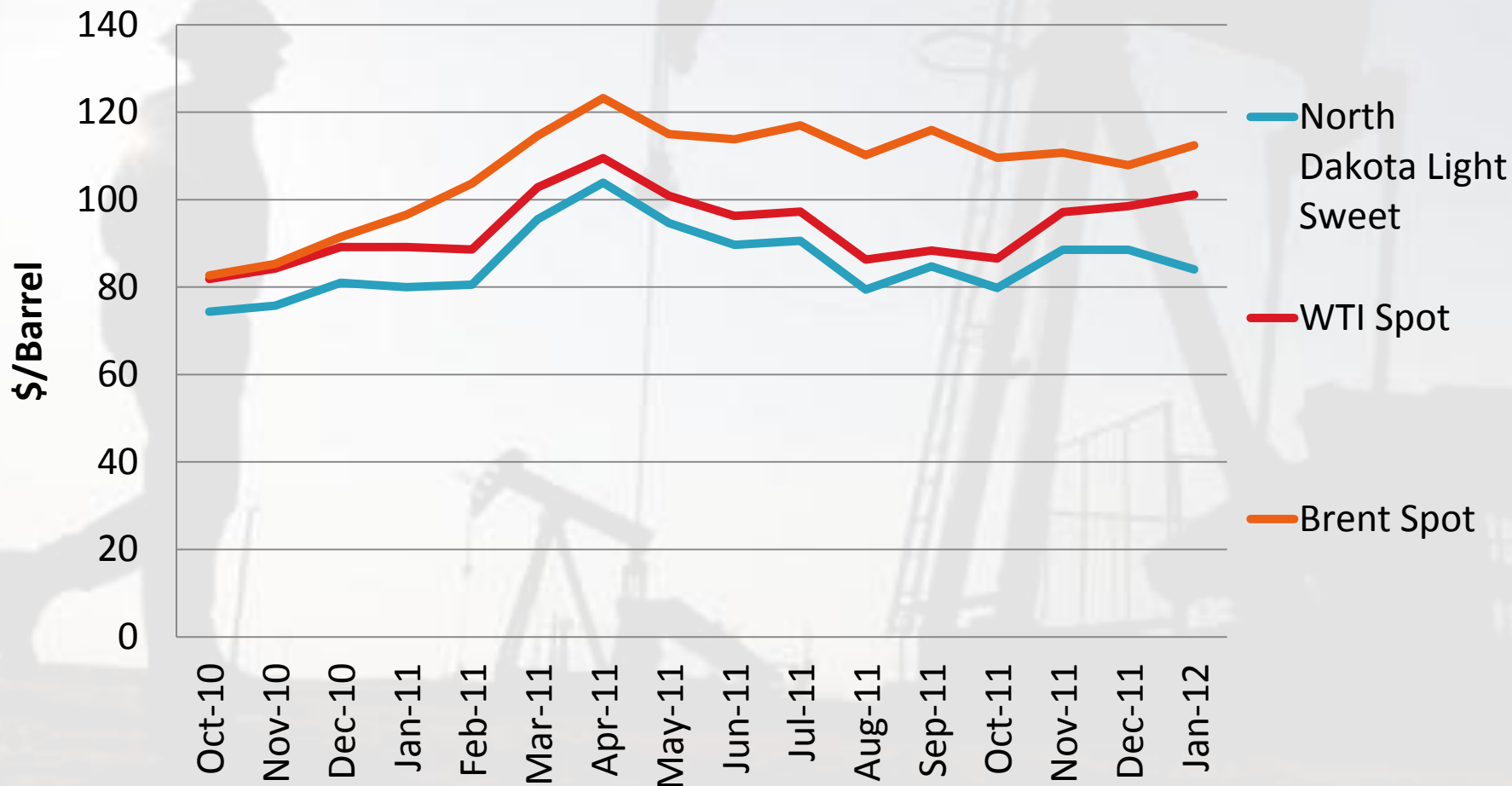


- 1) Completion Time
- 2) Rig Count
- 3) Decline Rates



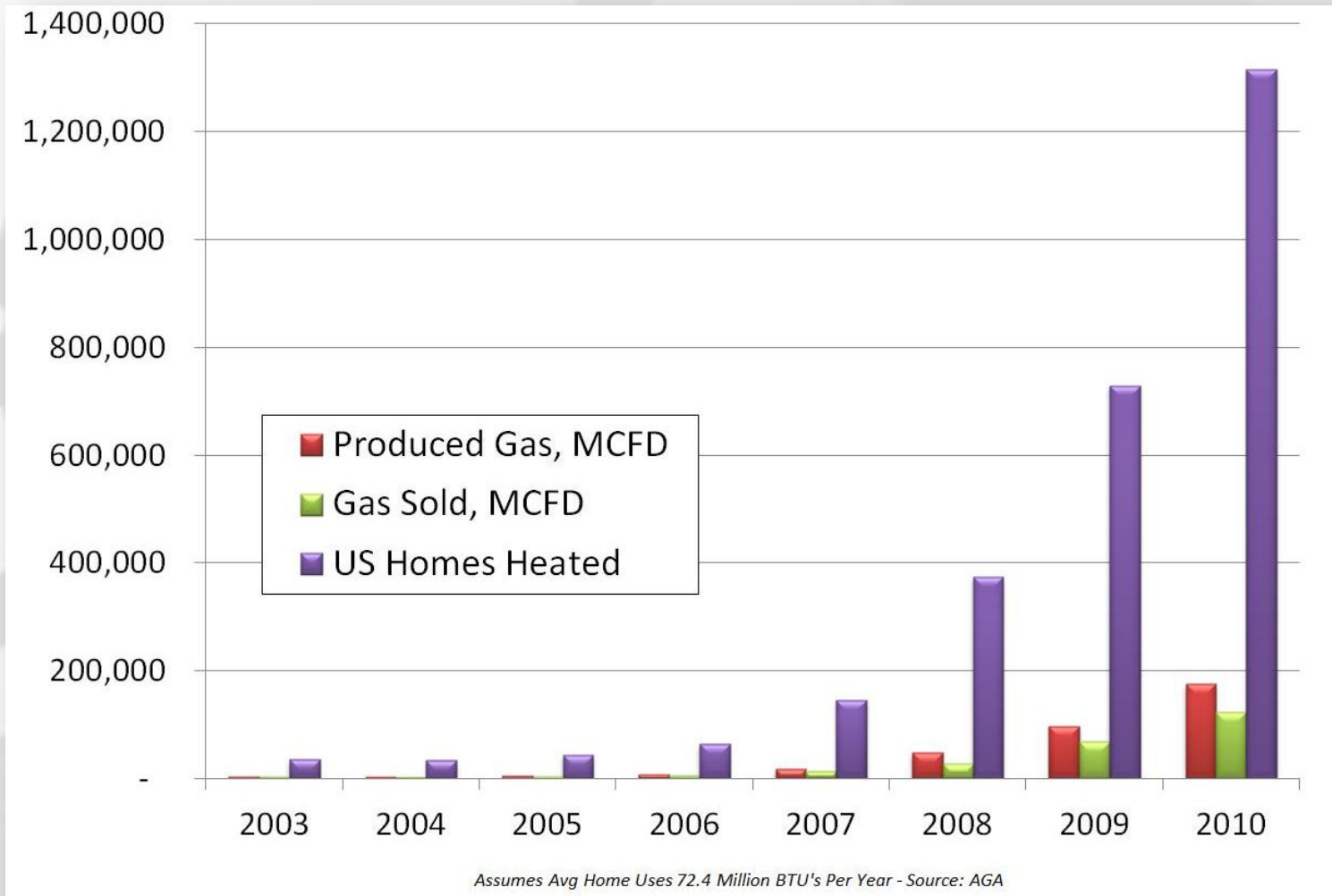
Source: North Dakota Pipeline Authority

North Dakota Discounts

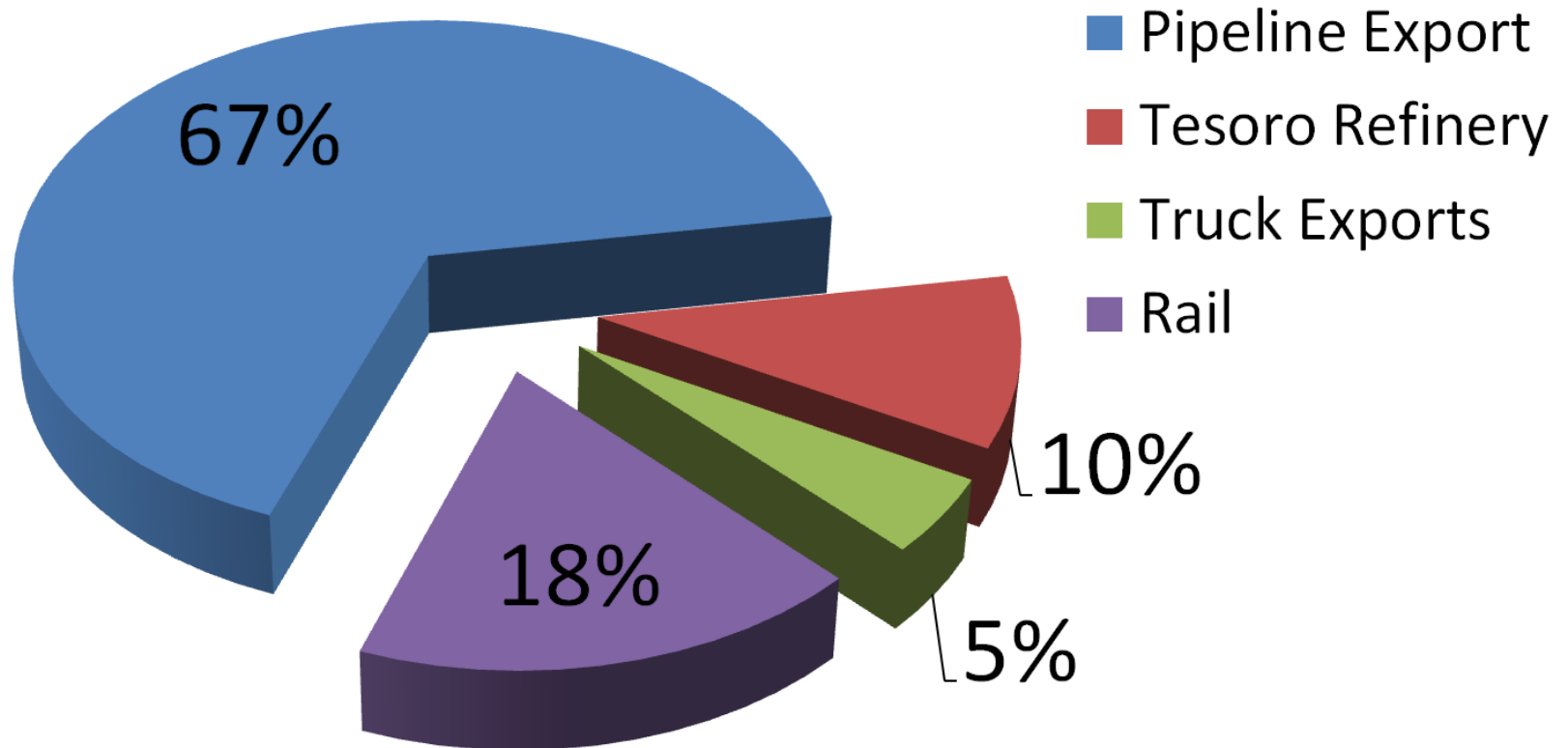


Source: Flint Hills, EIA, and estimates

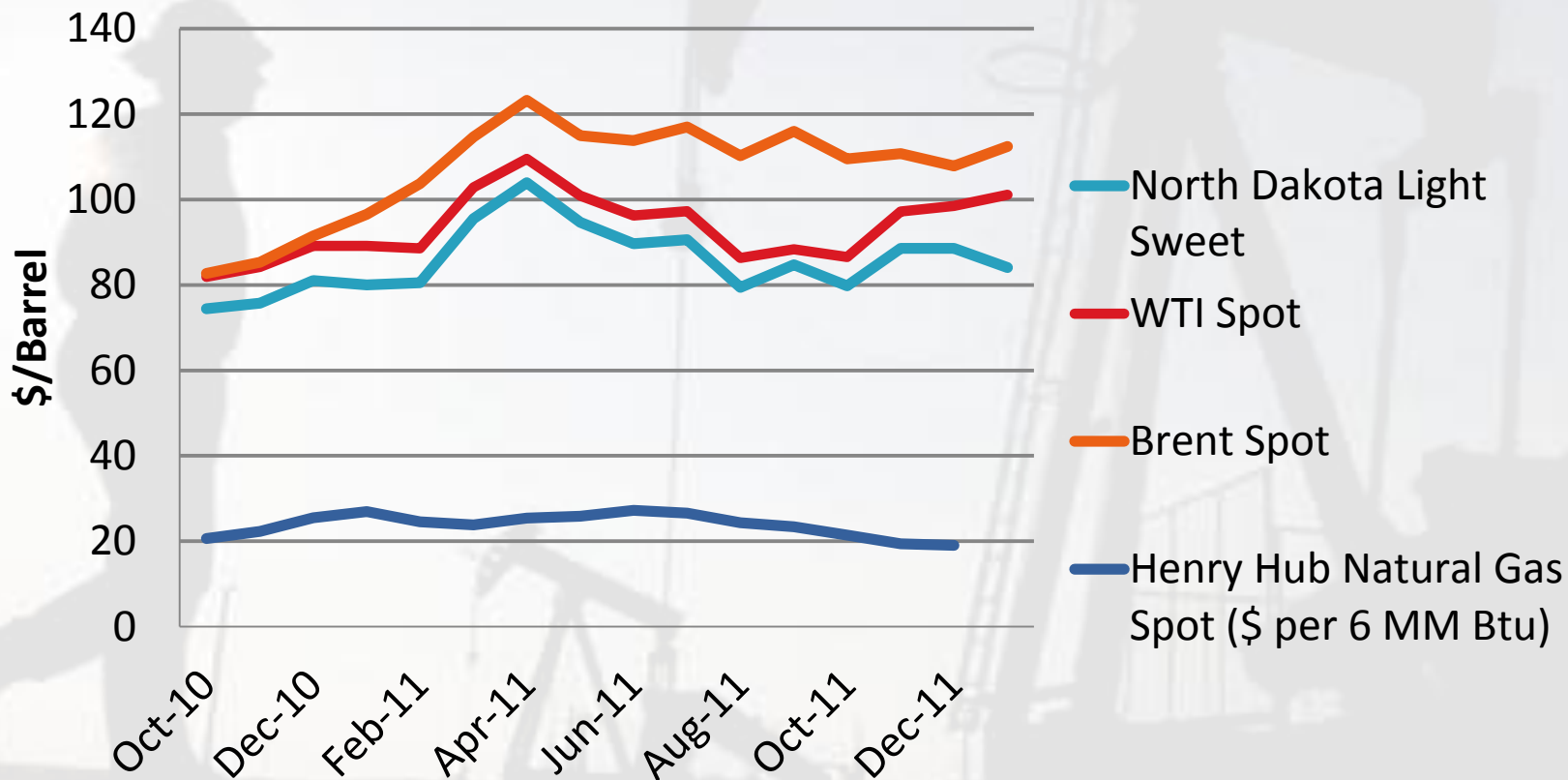
Bakken and Three Forks Natural Gas



North Dakota Crude Oil Transportation

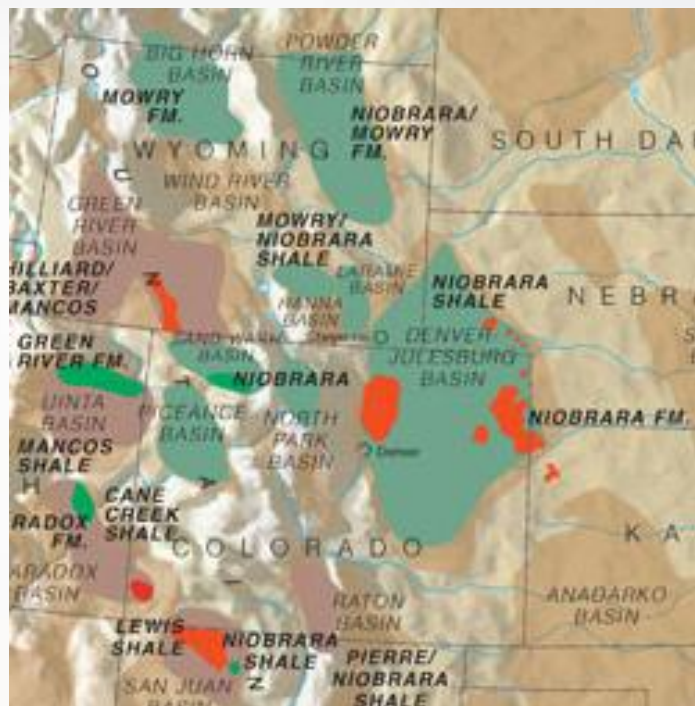


Various Crude and NG Prices



Source : EIA data, Flint Hills data, EPRINC Calculations

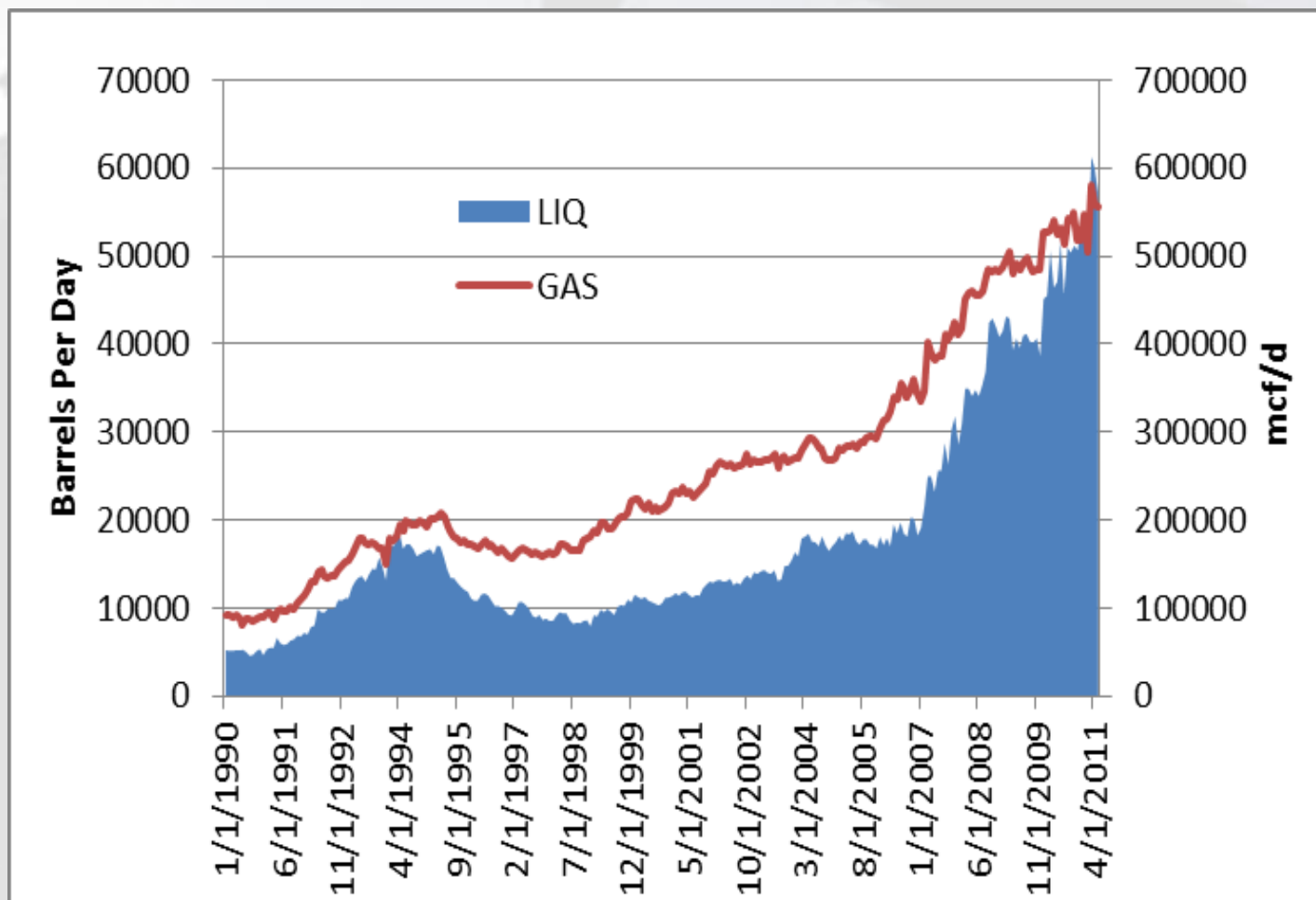
Niobrara



- Upper Cretaceous, interbedded marine chalk, limestone, organic rich shale
- Self-sourced hydrocarbon system
- Total Organic Carbon Content (TOC) between 1-7%
- **Deep** portions of the play are thermally mature
- Type II marine oil-prone kerogen
- **Low permeability, low porosity**
- **Low pressure** system
- Interbedded chalk helps with brittleness and natural fractures, enhanced with structural features (anticlines, faults, etc...)

Source: Hart Energy and Others

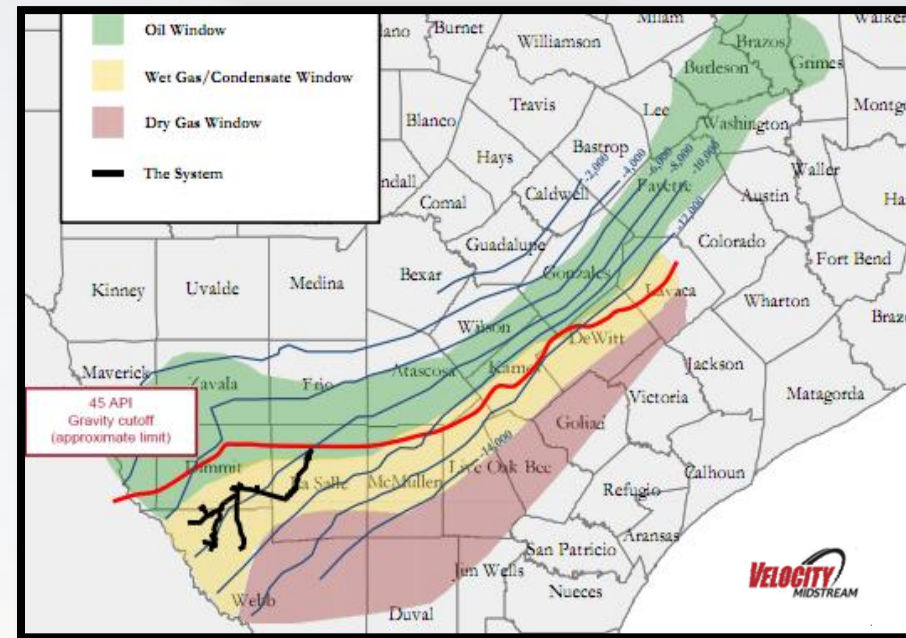
Niobrara Production



Source: HPDI

The Basics

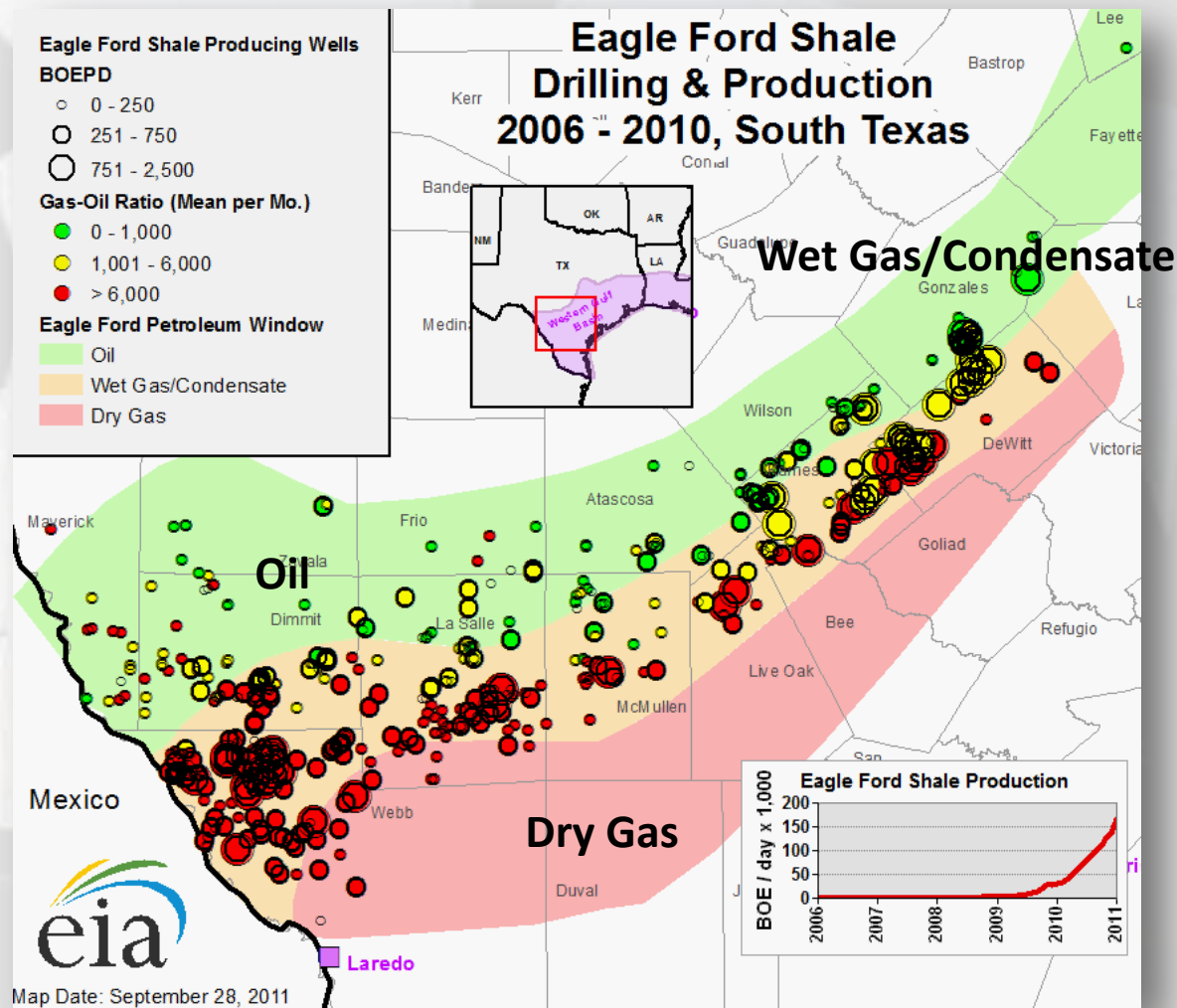
- The Eagle Ford stretches across south Texas more than 180 miles. It is a shale oil, condensate/NGL, and dry gas play that increases in depth and maturity as you move south and slightly to the west.
- Estimates of recoverable liquids range from three to seven billion barrels
- The play produces low sulfur (low in oil window and only minimal in condensate window) high API gravity oil and condensate ranging from 45 degrees to 65 degrees and increases in gravity as you move south from oil to gas
- Current production is nearly 200,000 boe/d and set to continue in the coming months and years, especially as the necessary take-away capacity comes in mid to late 2012



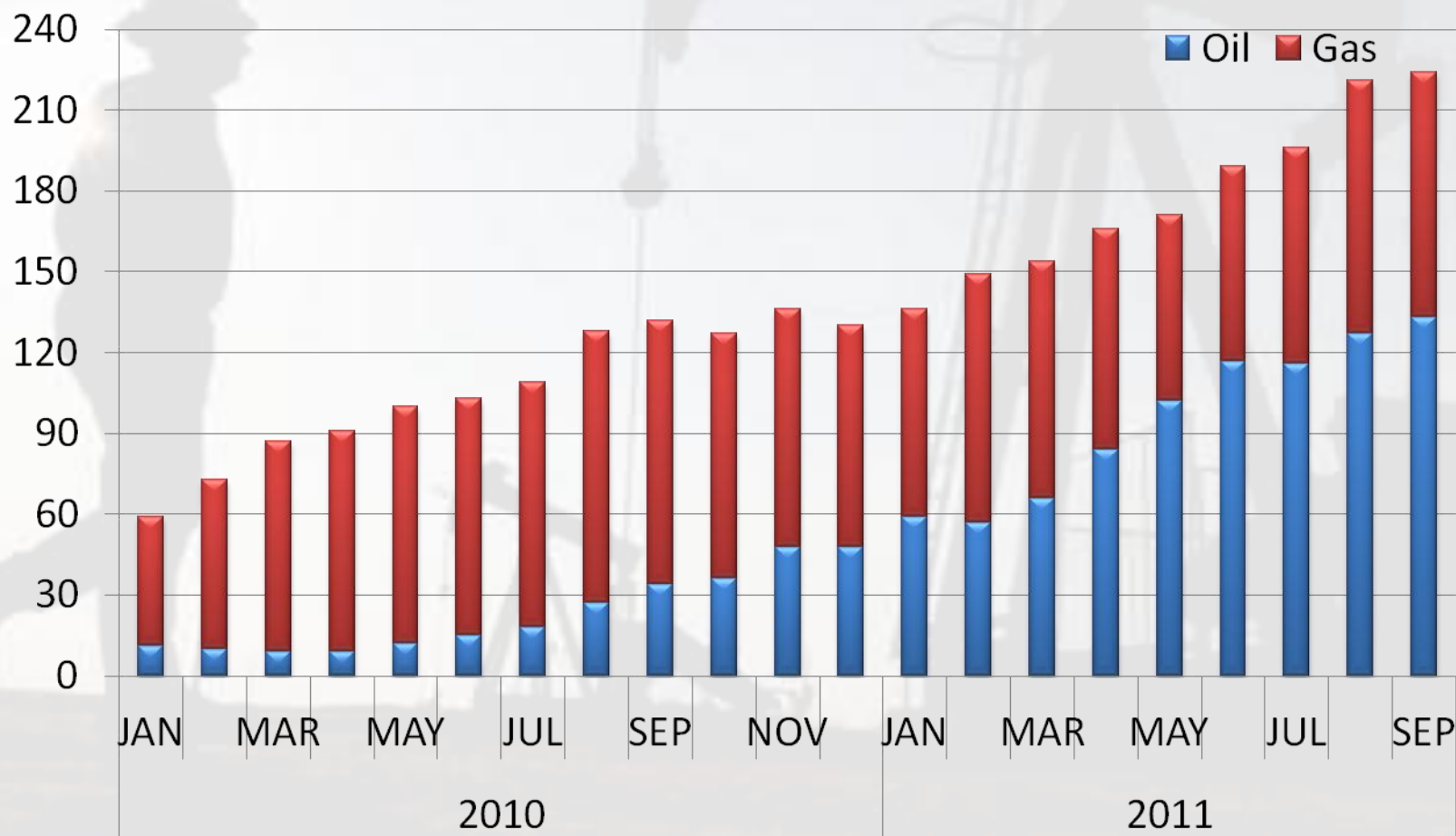
What is Happening Now...?

- **Most activity is in the condensate window (located in the middle between the oil and gas, corresponding to depth and thermal maturity). Condensate is receiving prices similar to oil.**
- **With low natural gas prices, the gas window is not exceptionally hot, but is still being targeted by some companies due to its richer content enabling it to fetch higher than Henry Hub prices.**
- **EOG is the largest liquids producer in the Eagle Ford, dominating oil production and oil acreage in the Eagle Ford.**
- **Many companies have yet to fully push the oil portion of the play give lack of necessary take-away infrastructure and therefore we may see this increase mid 2012 with significant infrastructure projects set to begin operation**

Three Window Map of Eagle Ford

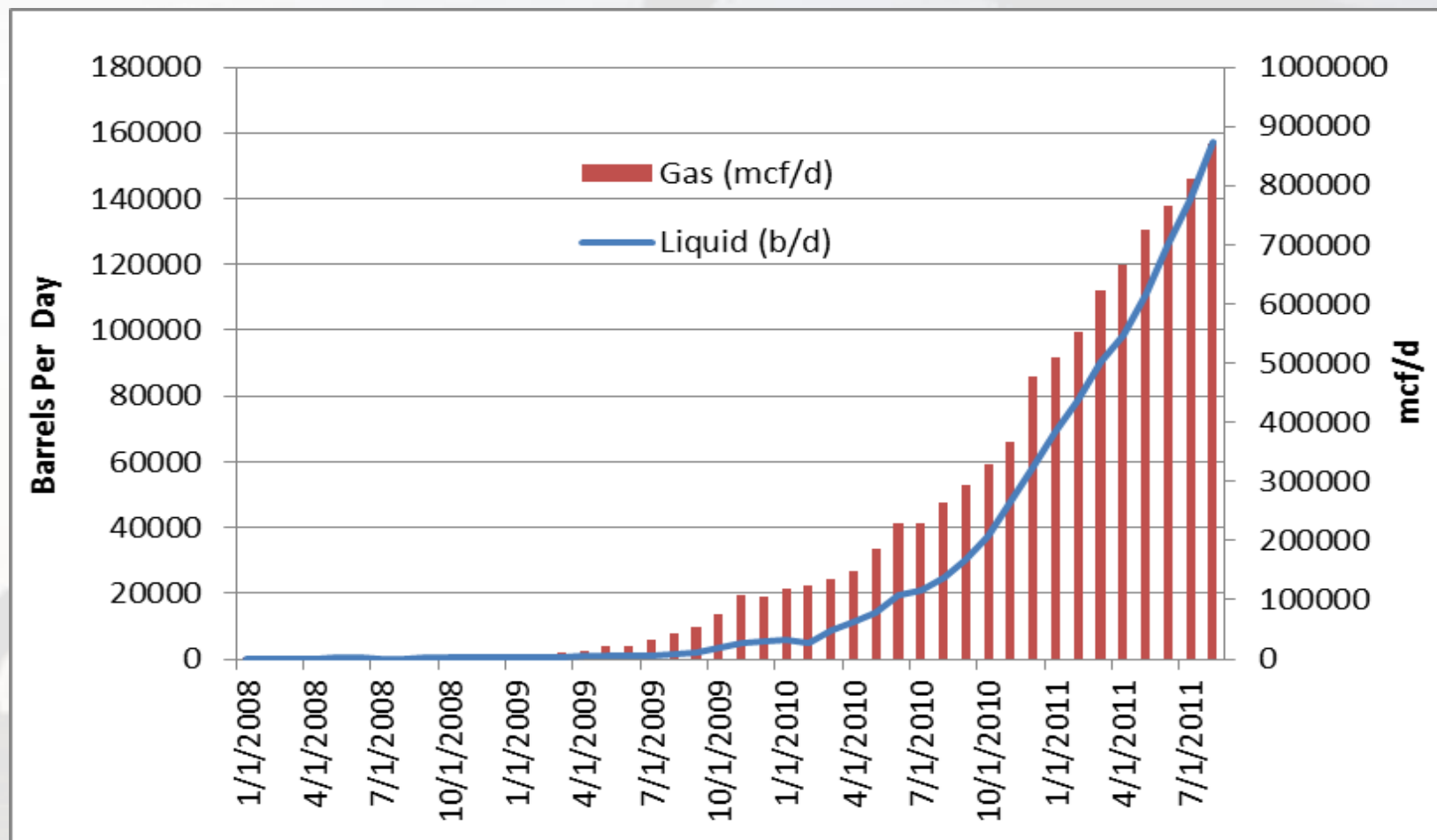


Eagle Ford Rig Count



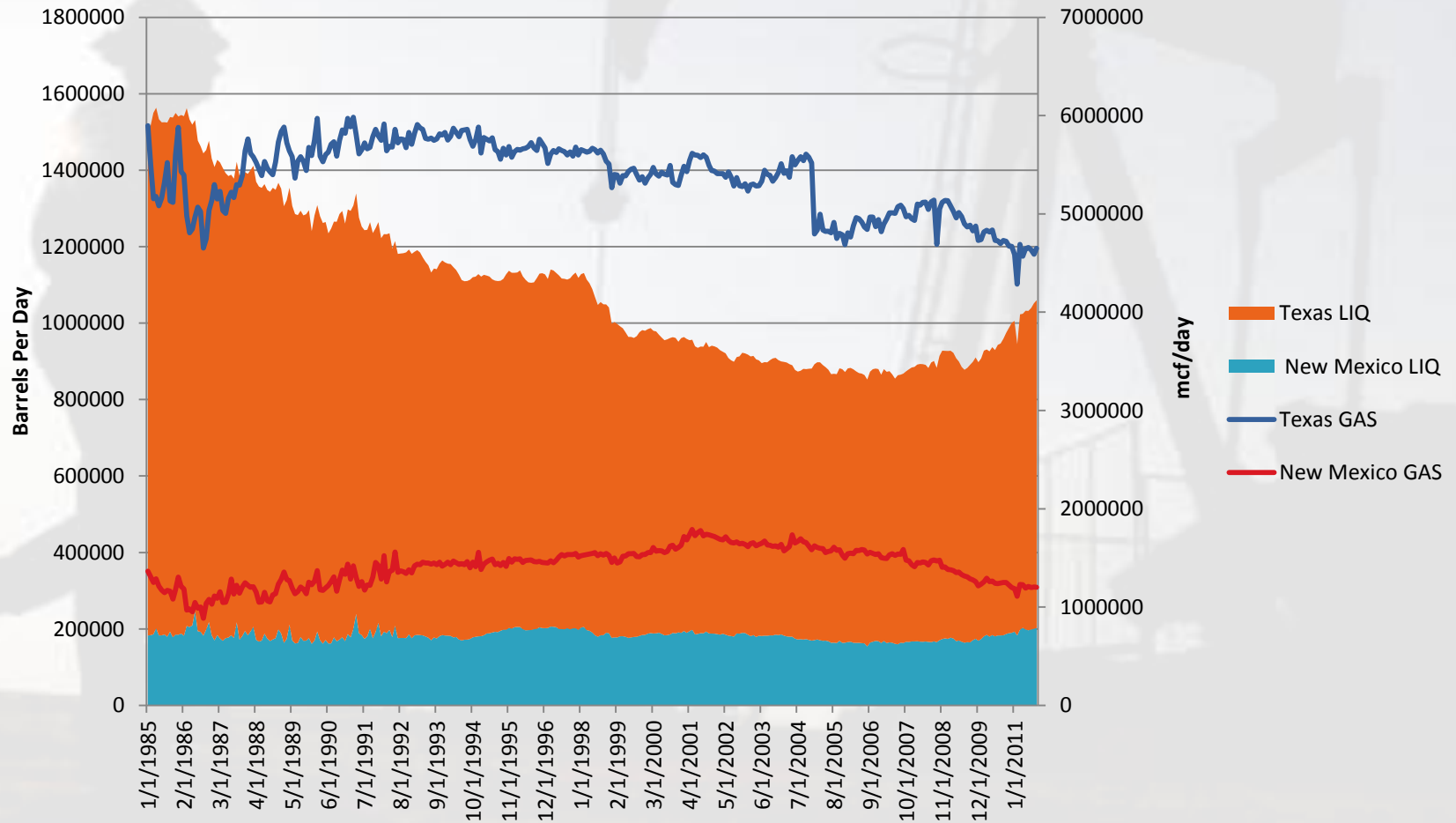
Source: Baker Hughes provide by Hart Energy

Eagle Ford Production



Source: HPDI

Permian Basin Oil and Gas Production

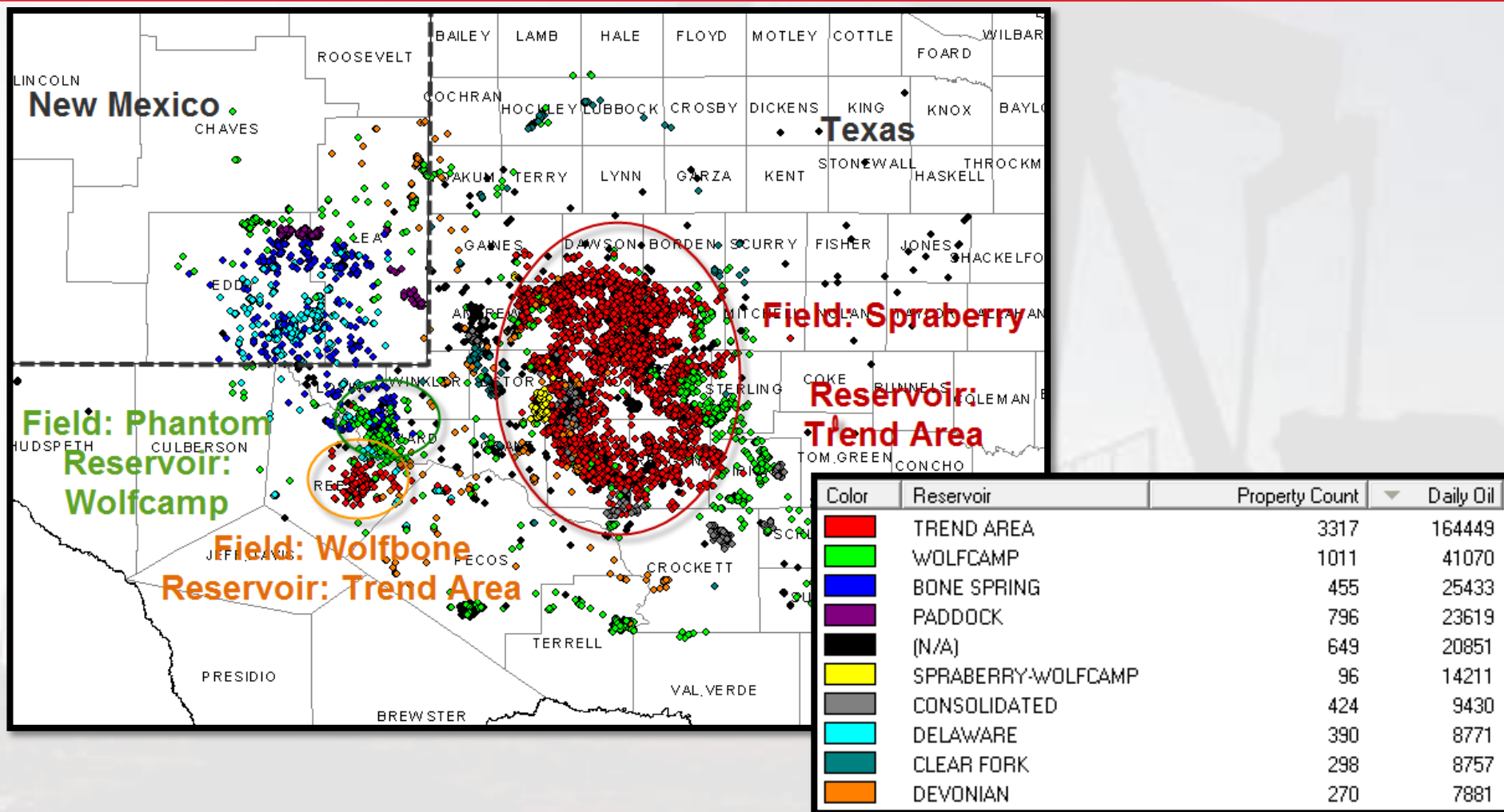


Source: HPDI

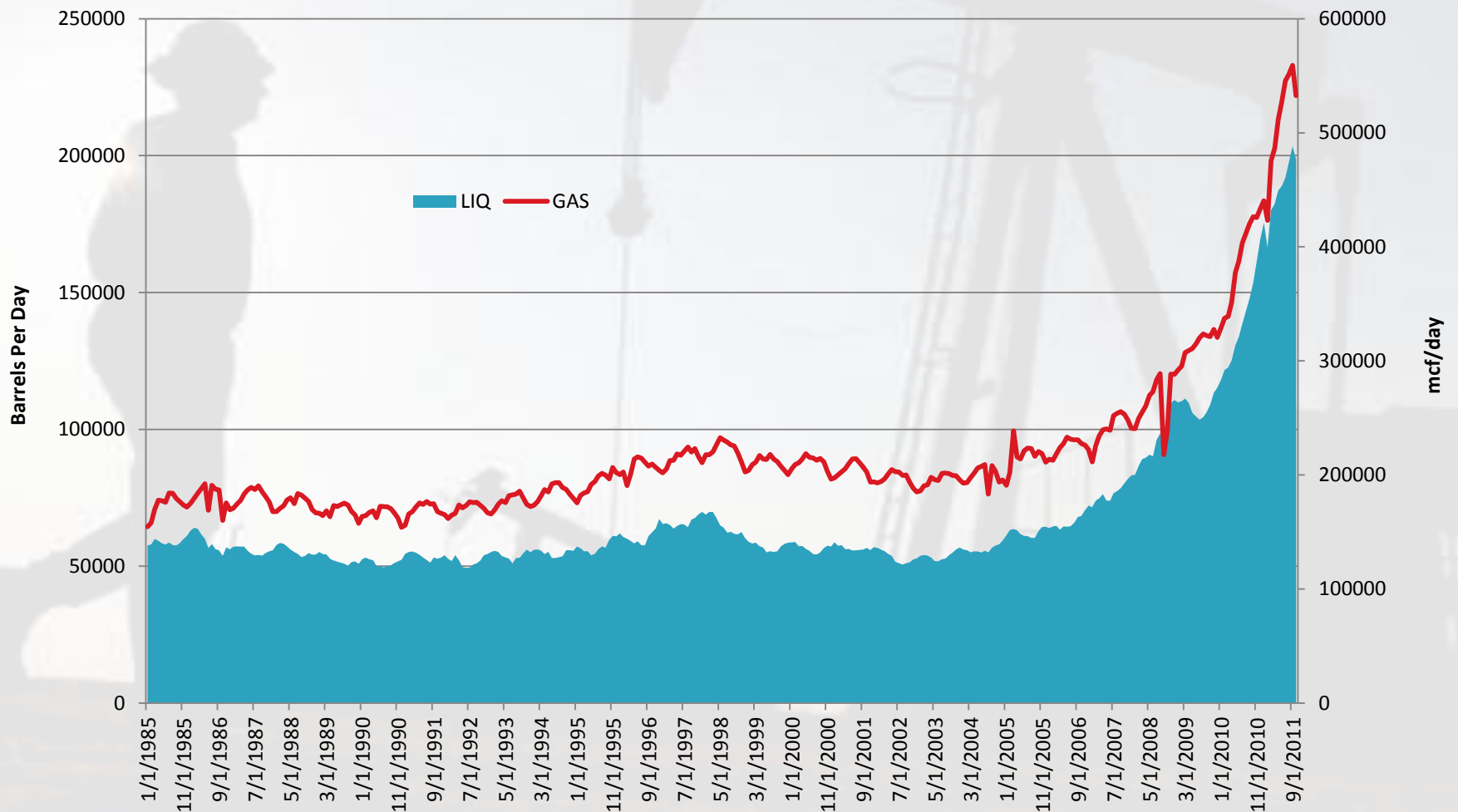
The Permian Basin

- The Permian Basin province is a gift that keeps on giving. The Basin has been producing oil for 90 years and is currently in the heart of both a vertical and horizontal boom. Nearly 500 rigs are running in the Permian Basin and over the past few years production has risen around 200,000 b/d putting Basin production over 1,000,000 b/d and accounting for about a fifth of U.S. production
- The historical province includes multiple geologic shelves and basins, reservoirs, and producing fields. Recent activity is somewhat confusing given the use of both field and reservoirs being used interchangeably referring to production
- What is unique about this Basin is the significant vertical drilling activity targeting what is termed by many as the “Wolfberry” or Spraberry field. This presentation breaks down this area of activity through the “Trend Area” reservoir and the “Strawn” reservoir in the Midland Basin of the Permian Basin Province
- The notable horizontal drilling is being done in the Bone Spring and the Wolfcamp which encompass both New Mexico and Texas

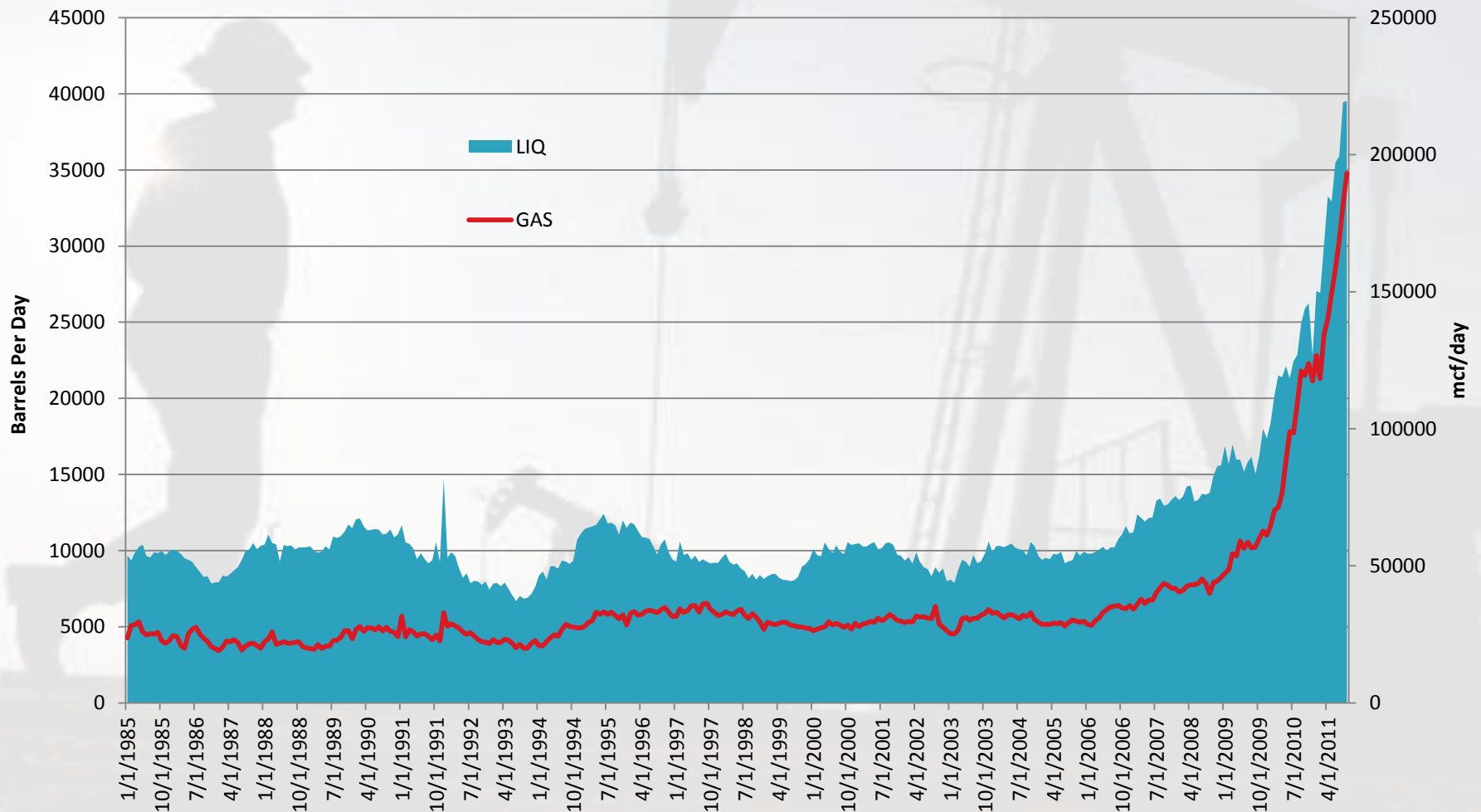
Permian Basin Prominent Reservoirs and Fields



Trend Area Daily Average Production



Bone Spring Daily Average Production



The older, deeper, and
more liquid rich
brother of the
Marcellus....?

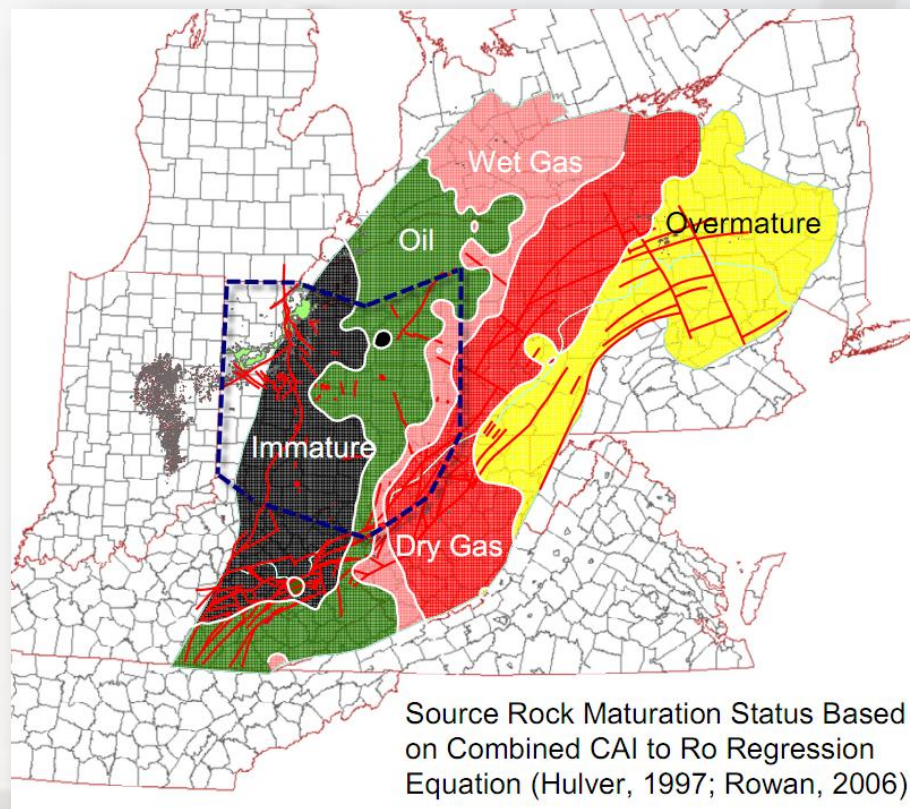
...The Utica



The Utica sits below and exceeds the extent of the geologically younger and highly productive Devonian-age Marcellus shale.

Source: Oil and Gas Investor July 2011

Utica Oil and Gas Potential in Ohio



Source: Ohio Government Department of Natural Resources
<http://www.dnr.state.oh.us/geosurvey/tabid/23014/Default.aspx>



Source: Baker Hughes Interactive Rig Count, Ipad, Dec 2, 2011

Utica Oil and Gas Potential in Ohio

Utica/Point Pleasant Recoverable Reserve Potential Estimate for Ohio

The Ohio Geological Survey, conservatively estimates:

IF we assume $\frac{1}{3}$ of volume will be gas and $\frac{2}{3}$ is oil, then...

%R = 1.2 percent—*recoverable from the interval*

Qt = 1.96 billion barrels equivalent

= 3.75 TCF gas and 1.31 Billion barrels oil

%R = 5 percent—*recoverable from the interval*

Qt = 8.2 billion barrels equivalent

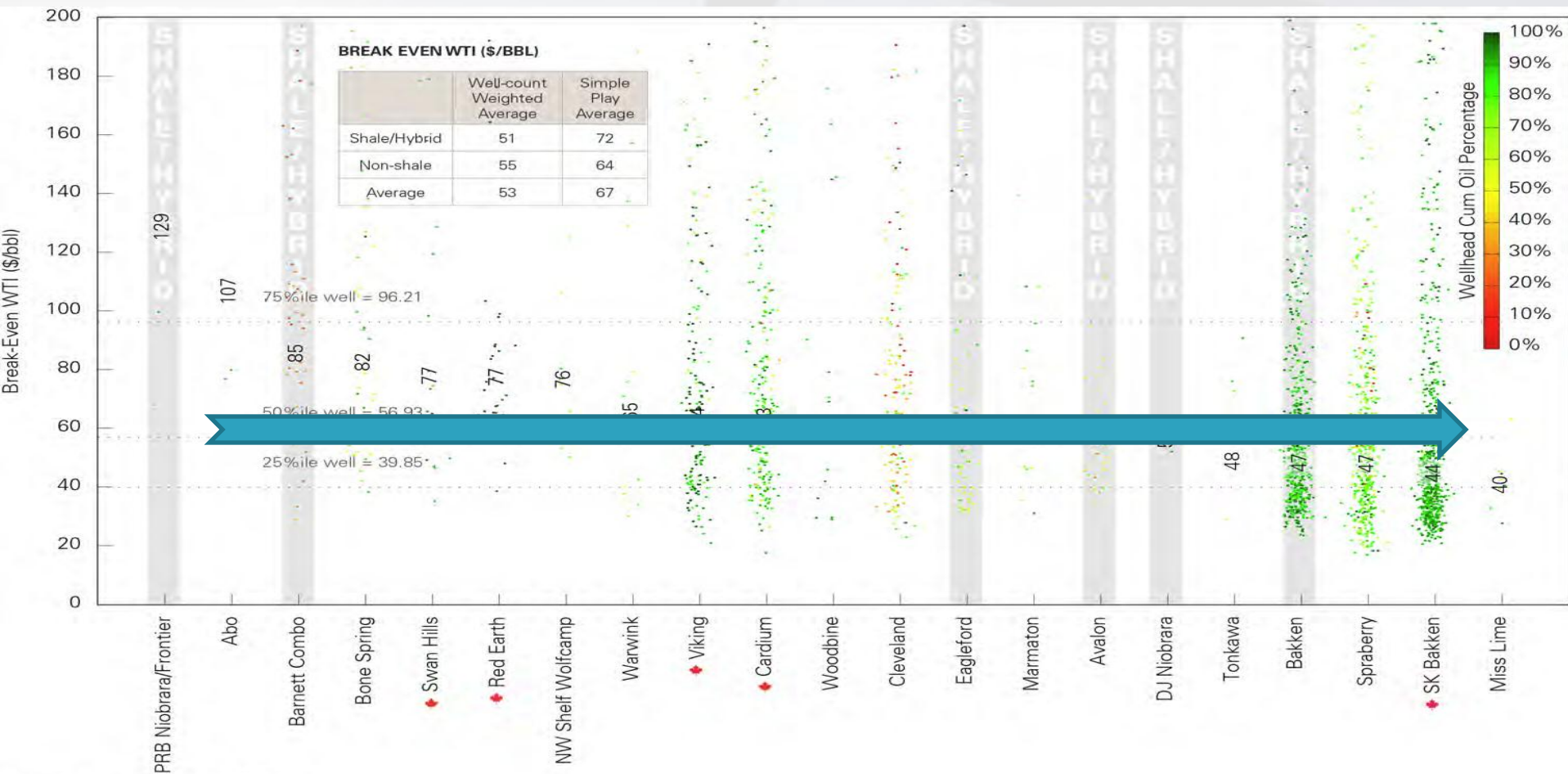
= 15.7 TCF and 5.5 Billion barrels oil



Chesapeake's Positive Outlook on the Utica

- ***Very large leasehold and the only company that has drilled a producing horizontal Utica Shale well in Ohio.***
- ***Utica looks similar, but is likely superior to the Eagle Ford Shale in South Texas. Likely to be economically superior to the Eagle Ford because of the quality of the rock and the location of the asset.***
- ***1.25-million net acres of Chesapeake holdings in the Utica should be worth \$15 billion to \$20 billion***
- ***Utica likely to be key driver in the future growth of U.S. energy supplies, especially in natural gas liquids.***

Break Even Prices - \$50-\$70/bbl



Source: GeoScout, HPDI, RSEG

Source: ITG Investment, formerly Ross Smith

Comparing Shale Oil Plays

	Niobrara	Eagle Ford Oil Window	Bakken
Age	Cretaceous	Cretaceous	Cretaceous
Depth (TVD ft.)	6,000-10,000	5,000-11,000	8,000-11,000
Thickness (ft.)	150-500	80-175	<140
TOC (%)	1-8	3-6	8-10
In-Place (MMBOE/mi²)	20-50	50	5-15
IP (BOE/d)	400+	300-2,000	300-2,000
EUR (MBOE)	200+	200+	200-700
Royalty (%)	17%	25%	15-20%
D & C (\$MM)	3-6	4-7	5-9
F & D (\$/BOE)	15-30	<20	10-25

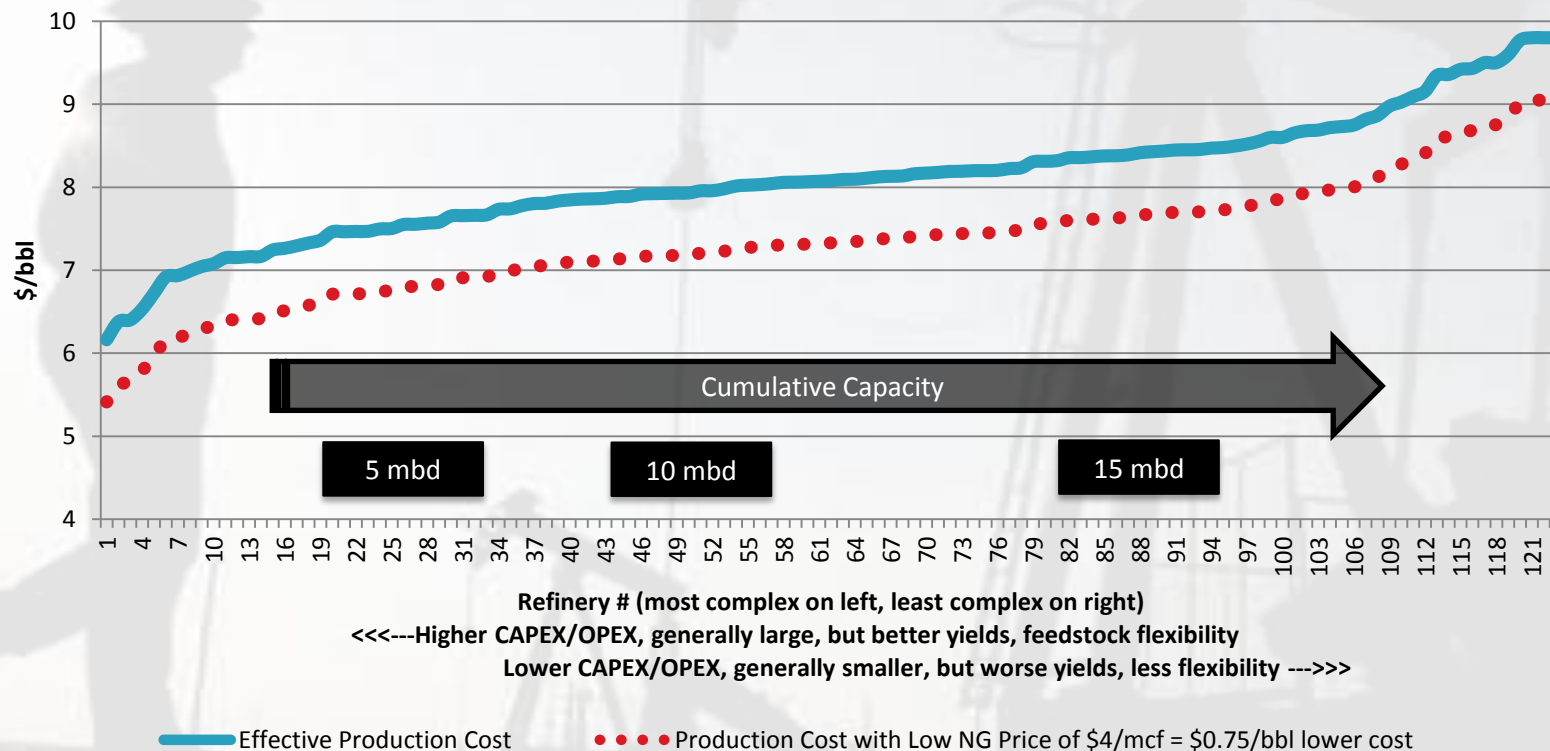
Source: Tudor Pickering Holt and Co. from Hart Energy Oil and Gas Investor

Downstream's Wild Ride

Opportunities and Uncertainties

Low Cost NG Lowers Production Costs

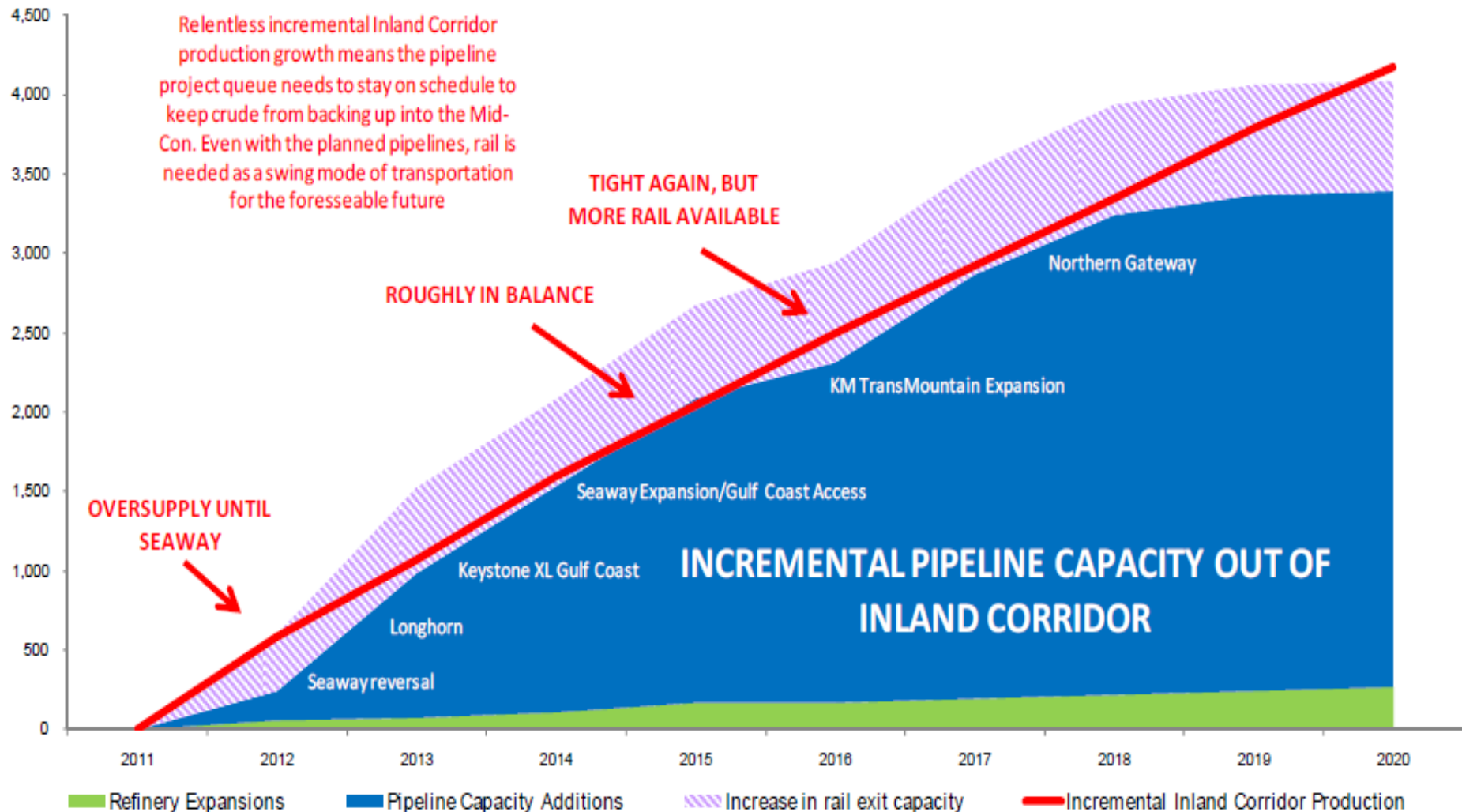
U.S. Refiners' Effective Cost of Production



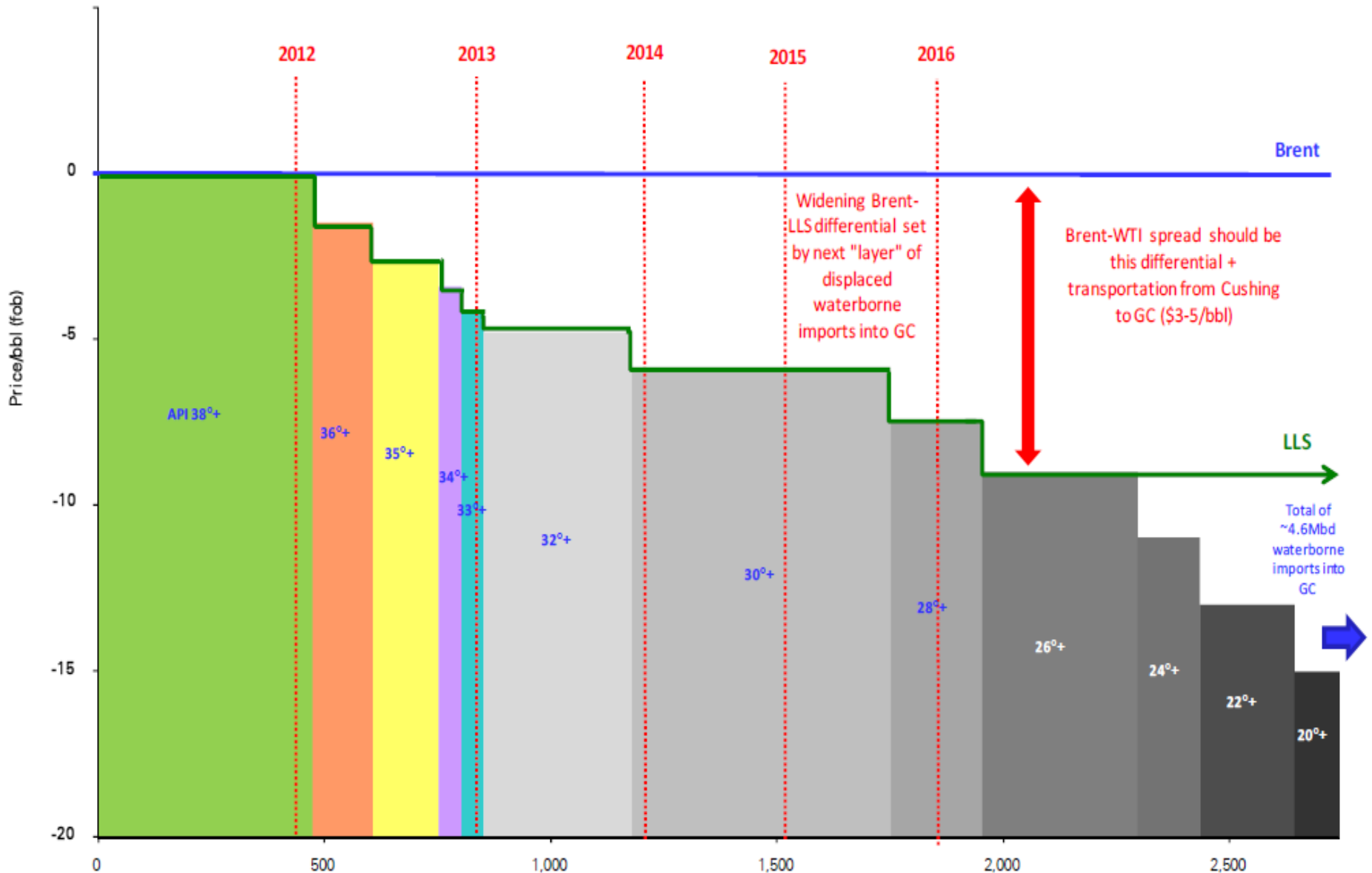
Effective Production Cost takes into account a refinery's ability to use heavy crude feedstocks (complexity), product slate (yields) and operating costs (OPEX).

Source : OGJ Data for 2009, EPRINC Calculations

Building Out the Take Away Capacity is Critical

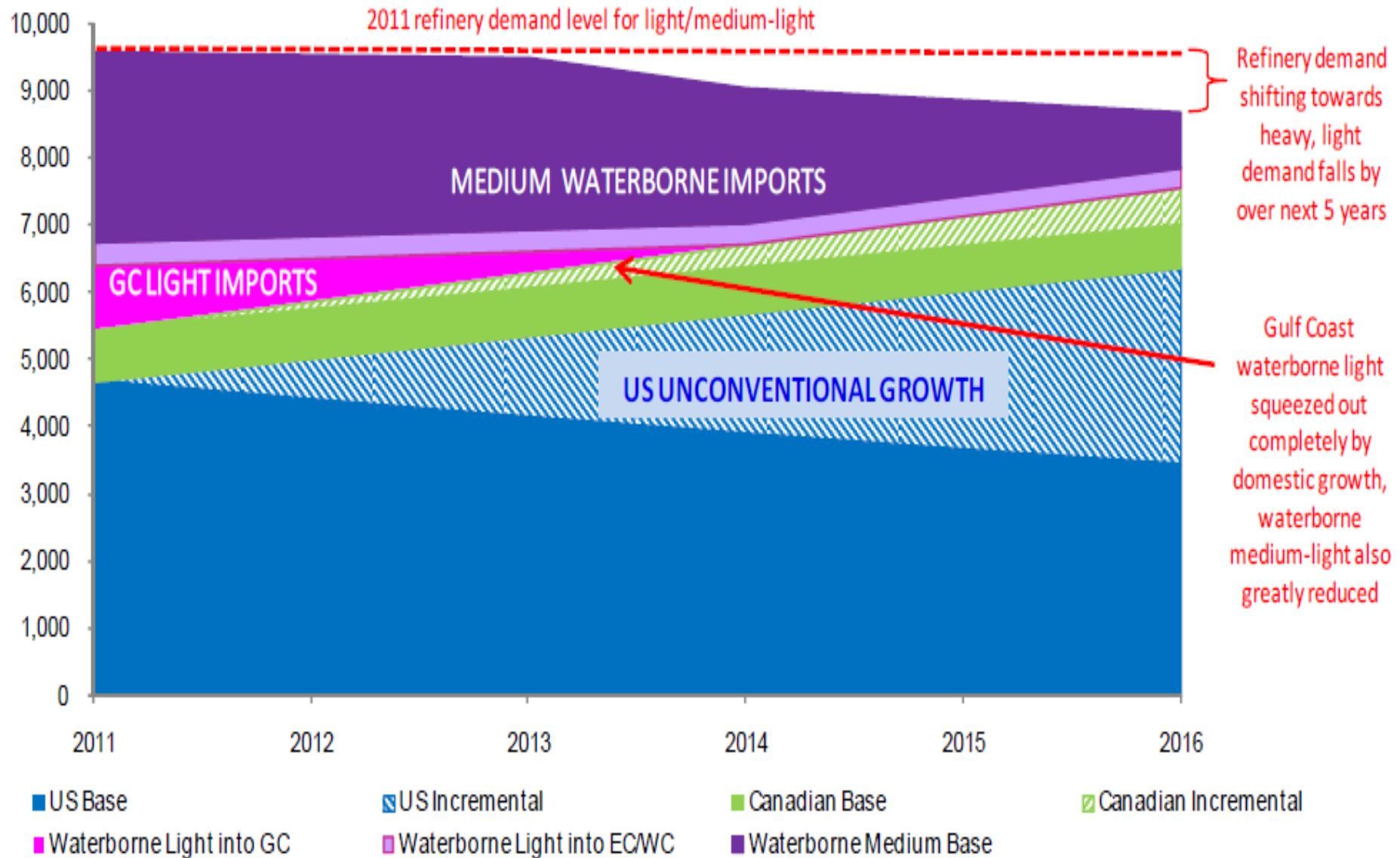


U.S. GC—Send us the Heavy Waterborne Imports, kbd



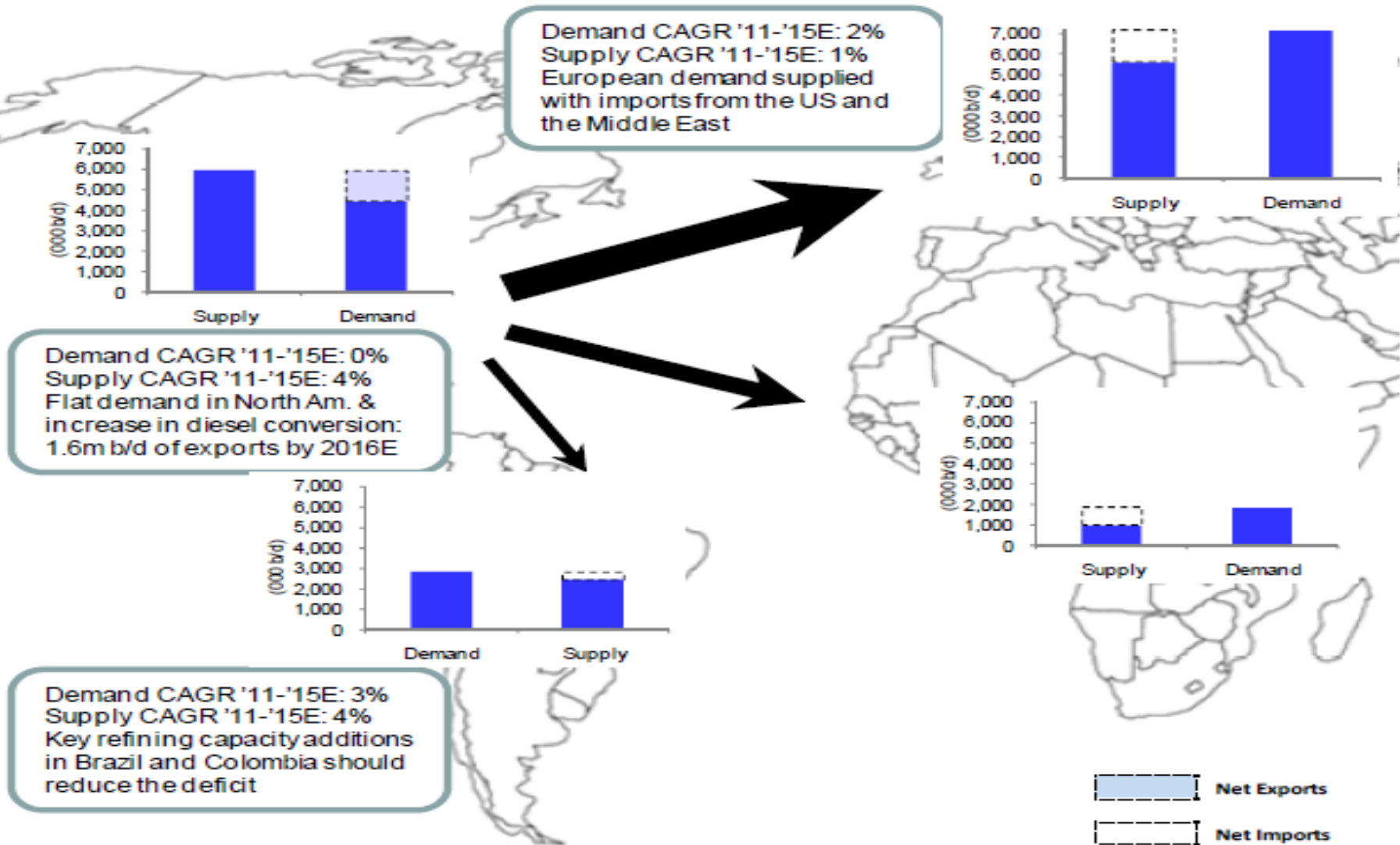
Source: Company data, EIA, Wood Mackenzie, Bloomberg Finance LP, Deutsche Bank estimates

U.S. Refineries Heavy Reliance



Source: EIA, CAPP, Wood Mackenzie, Company data, Deutsche Bank estimates

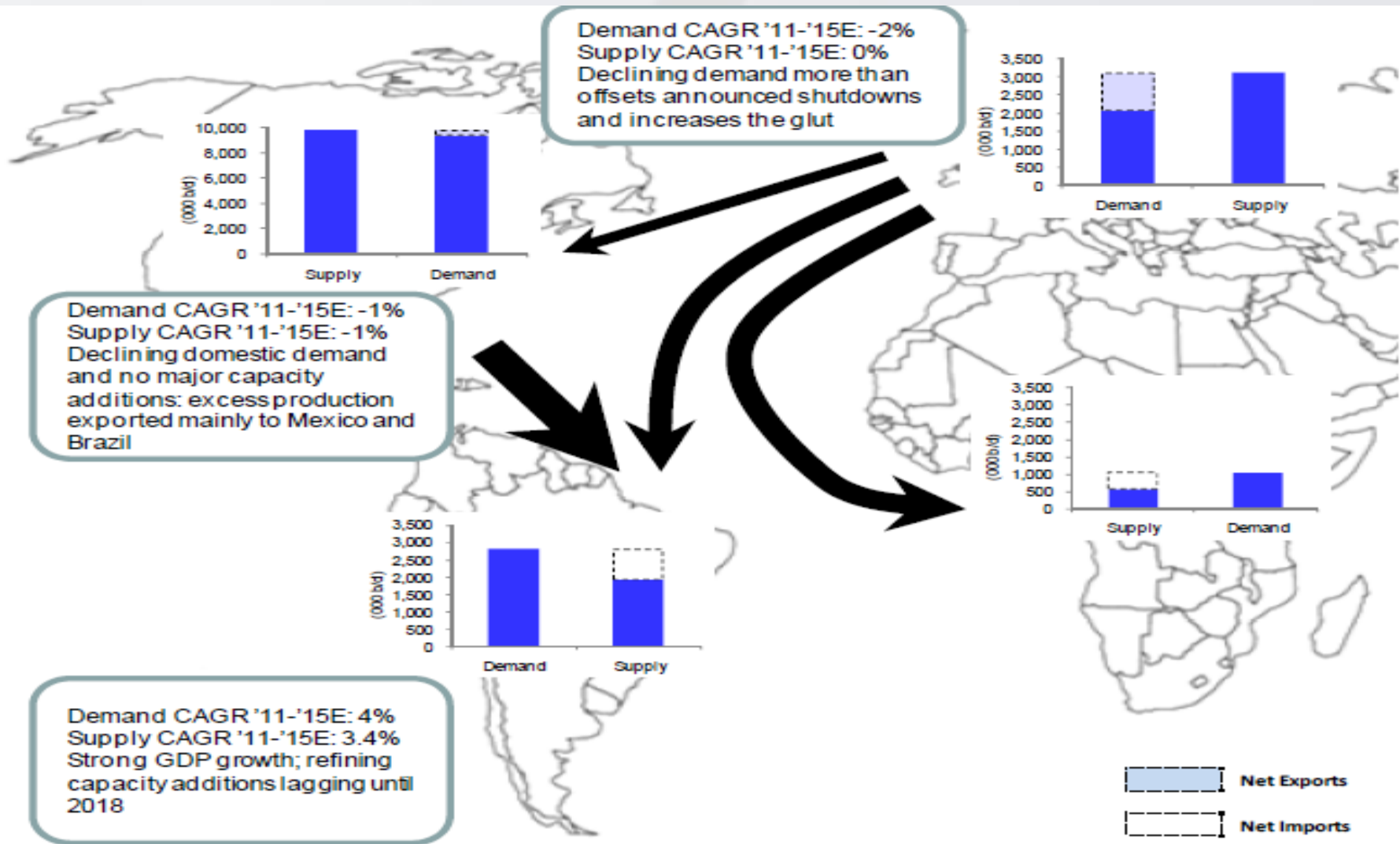
Distillate Trade Flows in 2015



Note: Take away capacity stays on schedule, no export restrictions!!!

Source: Deutsche Bank, EIA, Wood Mackenzie, EIA

Gasoline Trade Flows in 2015



Note: Take away capacity stays on schedule, no export restrictions!!!

Source: Deutsche Bank, EIA, Wood Mackenzie, EIA

Where Are We Headed

•
US refining capacity remains constant at 17.5m b/d

Aggressive Canadian heavy discounting will drive heavy volumes to the Gulf Coast via Enbridge and Keystone XL.

Mid-Con is short refinery capacity and product, Gulf Coast ships within PADD 3, Mid-continent and abroad.

Gulf Coast wins the battle in the shrinking Atlantic Basin, **IF Gulf Coast refiners are able to continue to increase product exports (U.S. product pricing reflects global levels).**

IF NOT,

Gulf Coast and Mid-Con refiners enter winner take all death spiral,
High Cost North American upstream output returns decline and U.S. disconnects from world product markets.

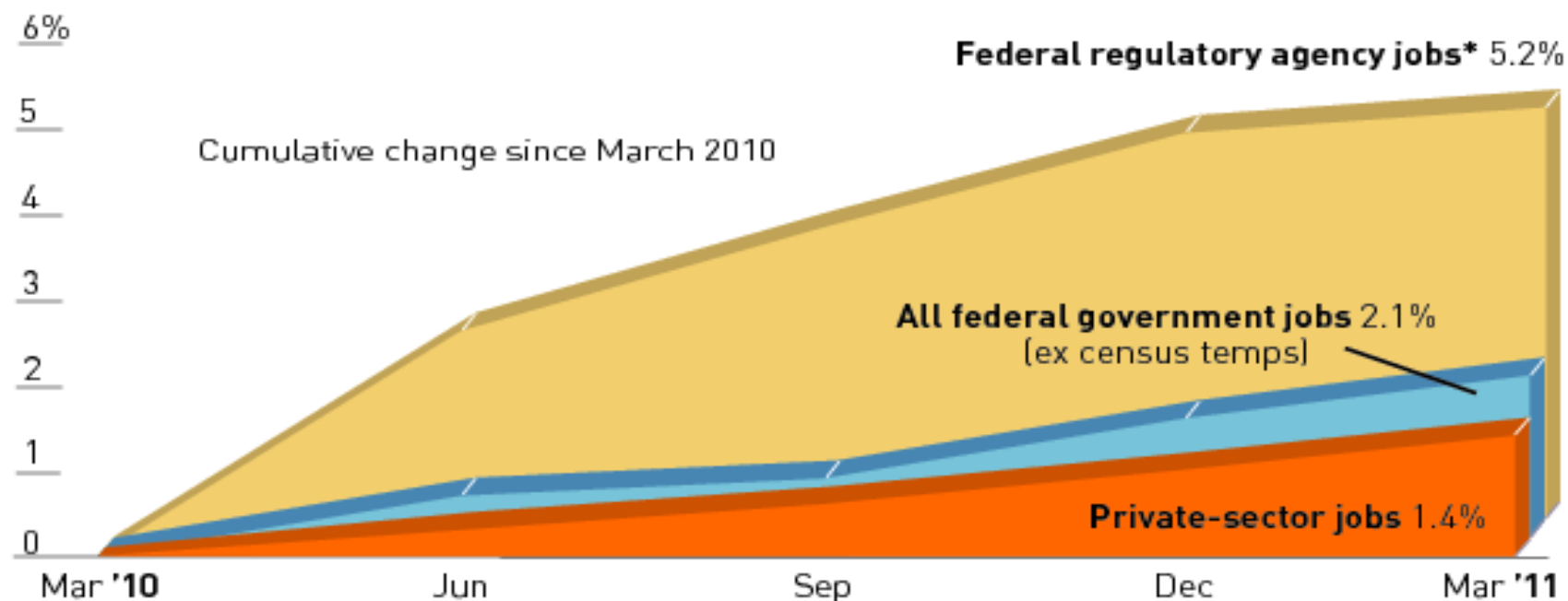
Two Final Points

**Official U.S. Government Policy Must Now Connect the Dots-
-Upstream Renaissance Needs Midstream Infrastructure and
Downstream Export Platforms.**

**U.S. Regulatory Uncertainties Could Kill the Renaissance:
export policy (**crude and product export controls**, Tier 3
Standards, GHG controls, NSPS, etc)**

Regulators' Hiring Boom

Federal regulatory agencies are ramping up staff and churning out new rules as the private sector struggles



Sources: Office of Personnel Management, Bureau of Labor Statistics, Progressive Policy Institute

*Includes roughly 20 major federal regulatory agencies, such as the EPA, FCC, FDA, etc. Does not include TSA or Consumer Financial Protection Bureau