

North American Oil and Gas Infrastructure *Shale Changes Everything...*

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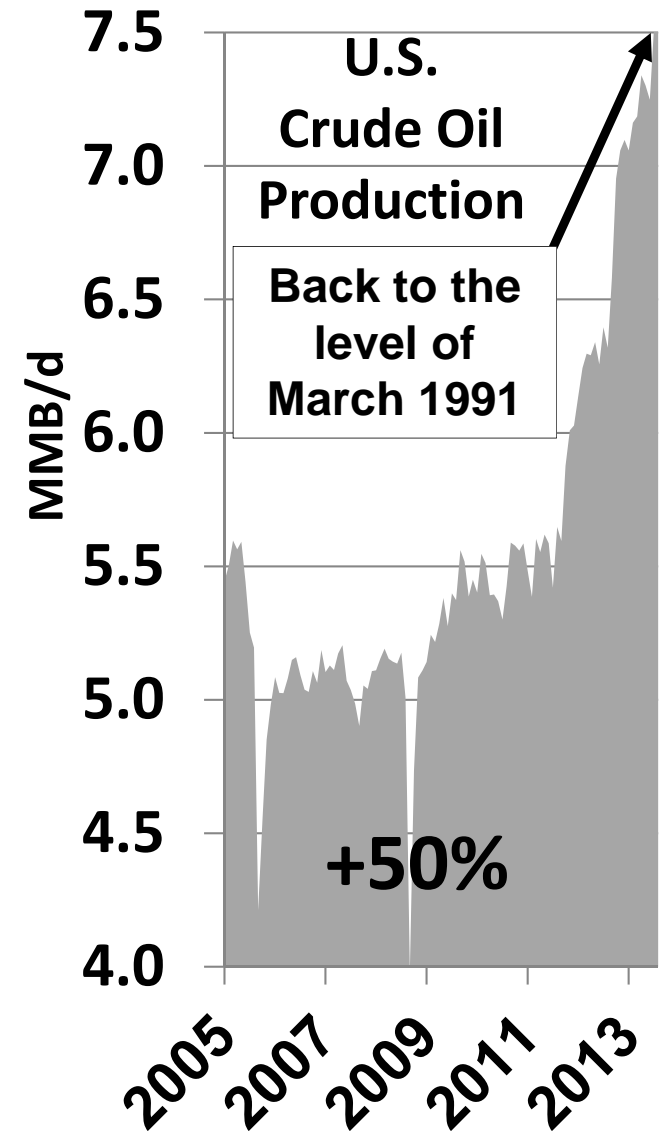
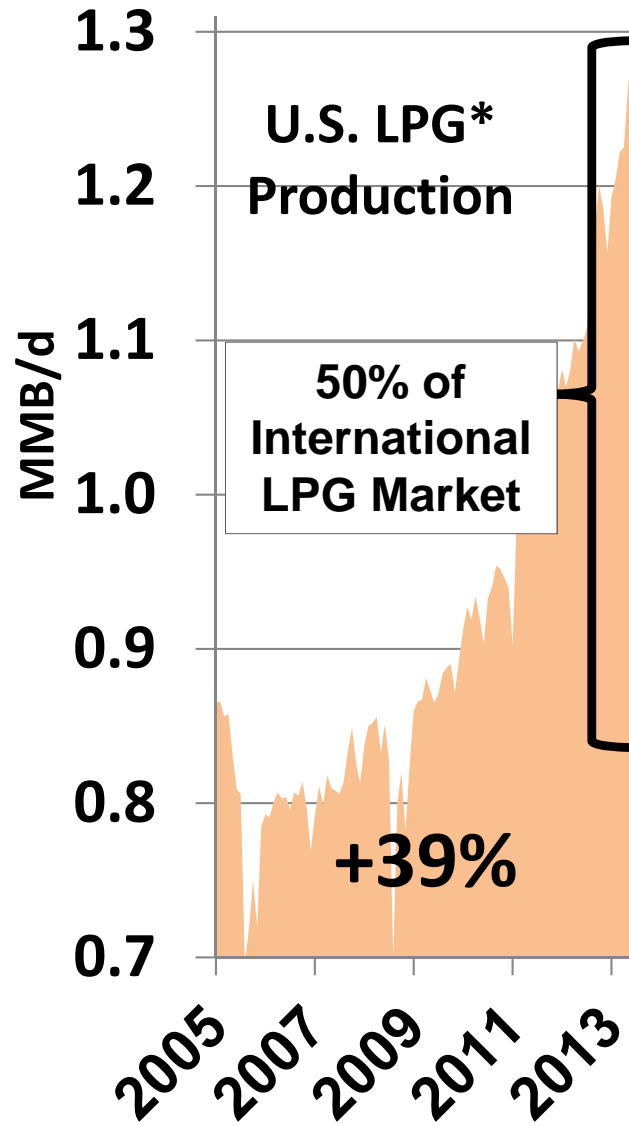
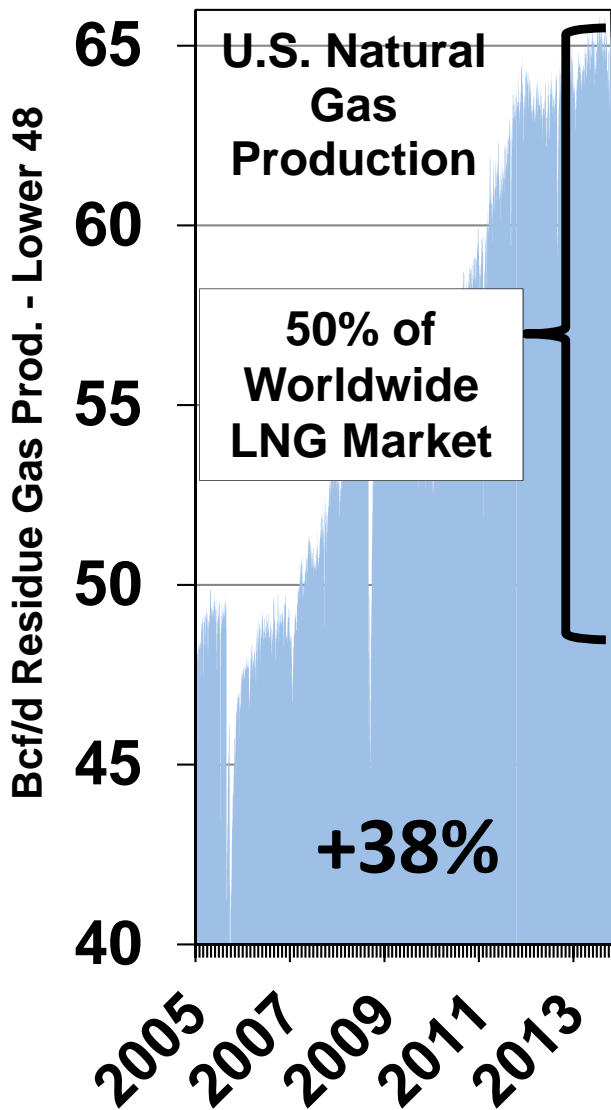
E. Russell Brazier
RBN Energy, LLC
November 14, 2013

North American Oil and Gas Infrastructure

Shale Changes Everything...



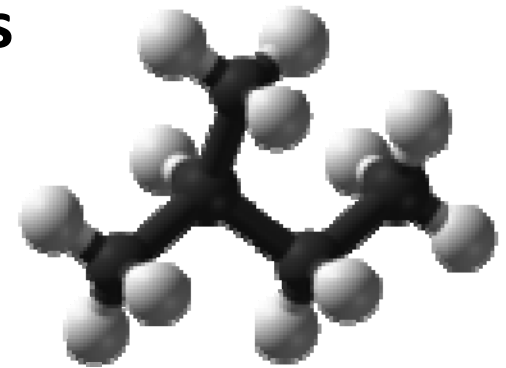
Production of Gas, NGLs and Oil is Surging



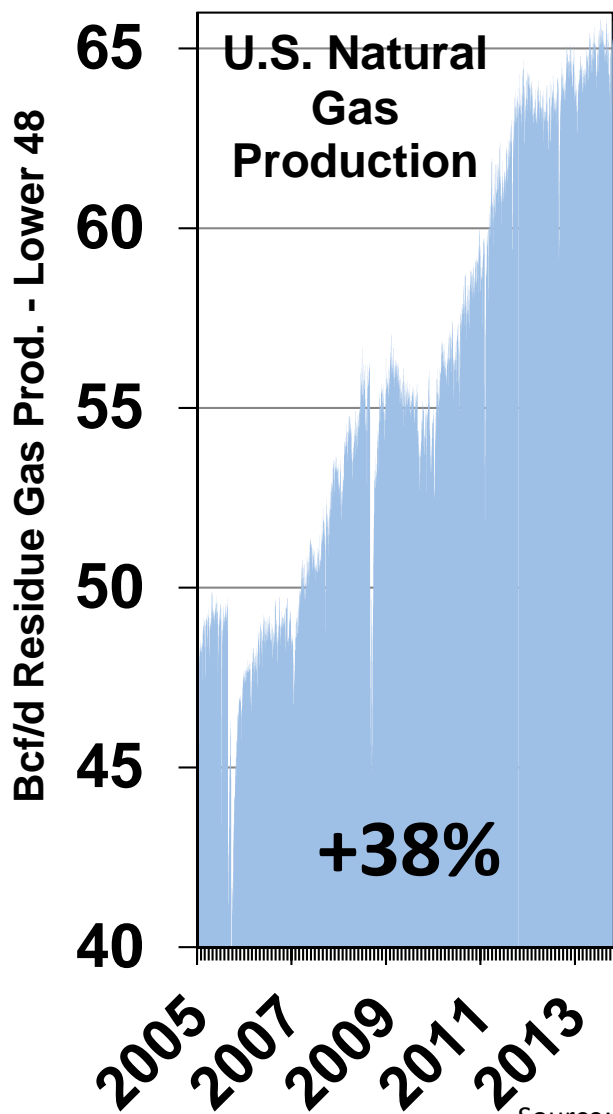
The Molecule Laws



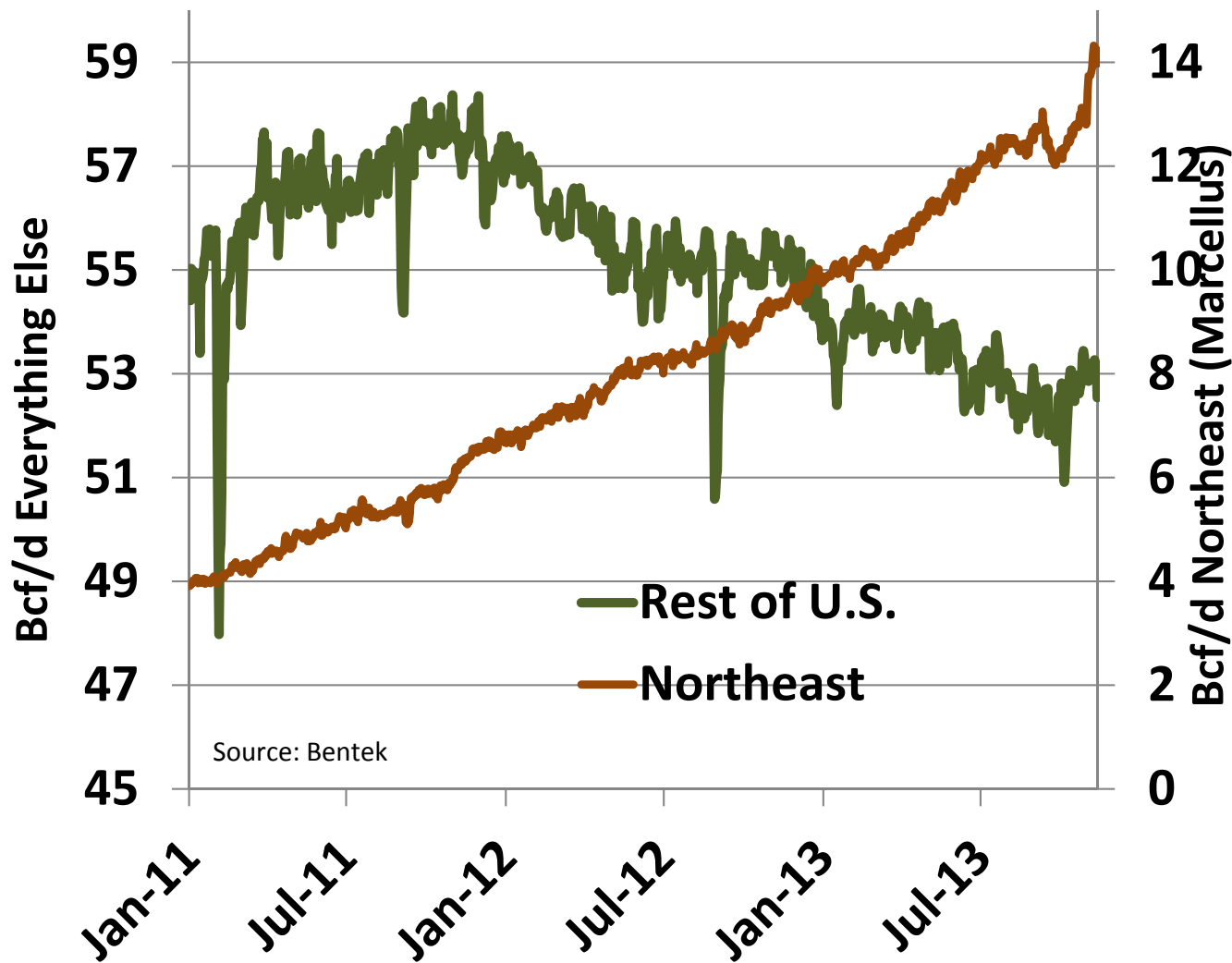
- » The U.S. is now producing more natural gas, NGLs and some grades of crude oil than we can use
- » Consequently the U.S. has shifted from a position of hydrocarbon shortage to one of surplus
- » The rules that cover the export of hydrocarbons were written during the decades of shortage
- » Those rules state that whether a particular hydrocarbon can be exported depends on
 - The shape of its molecules
 - How those molecules were processed
 - The temperature at which those molecules were processed
- » Those rules made no difference when there was nothing to export. Now they do.



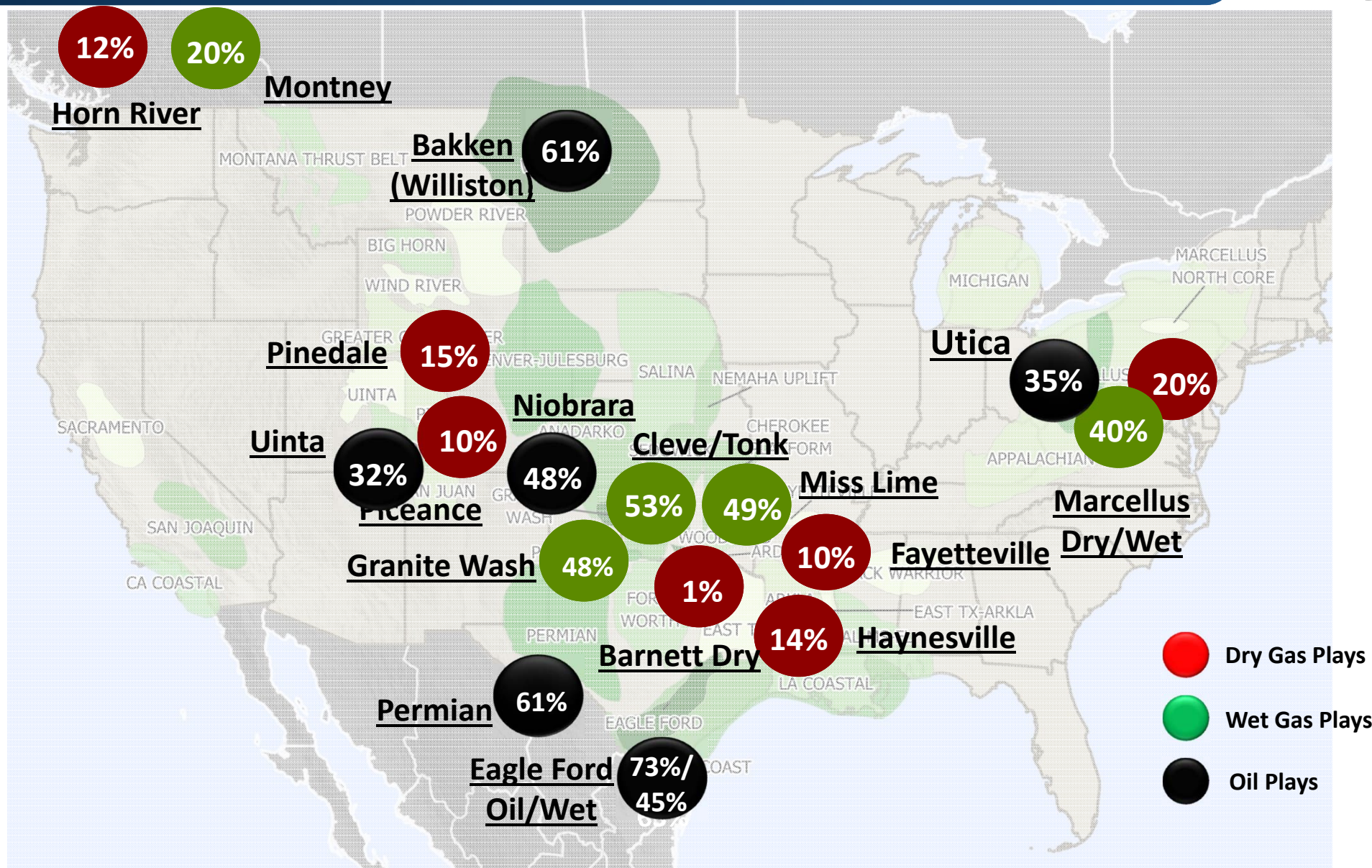
Northeast Production Off the Scale



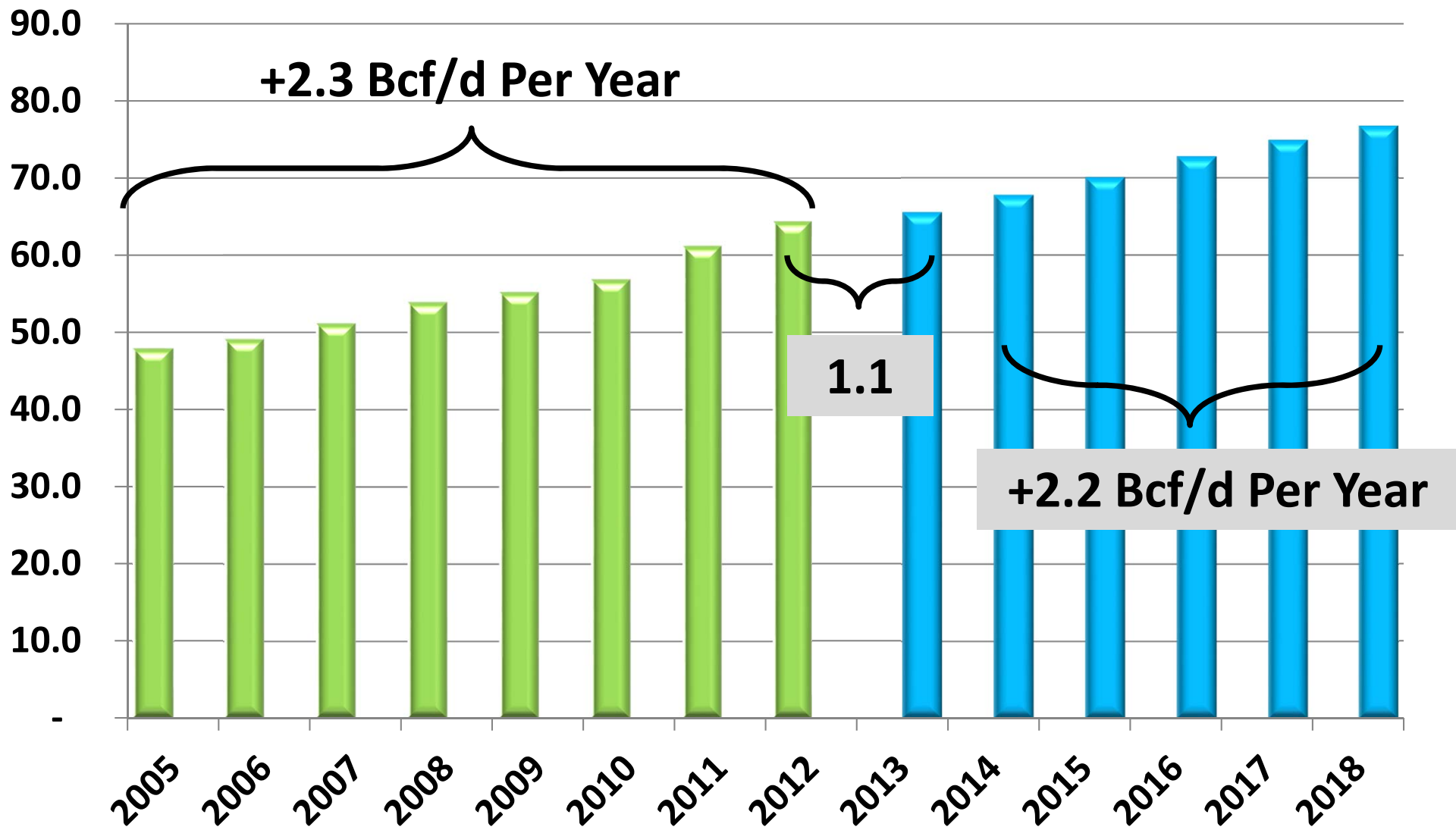
Source: EIA



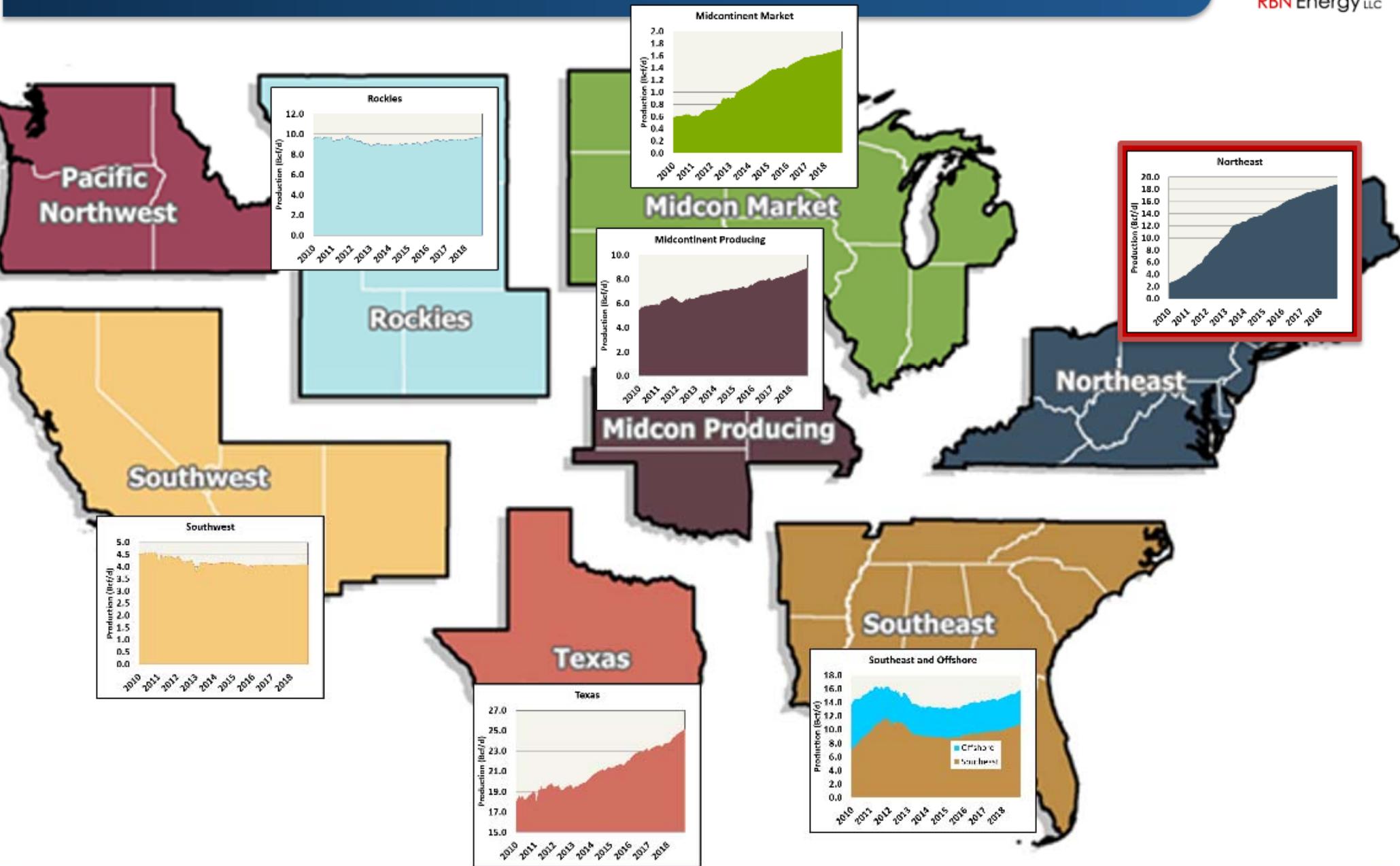
Producer Rates of Return



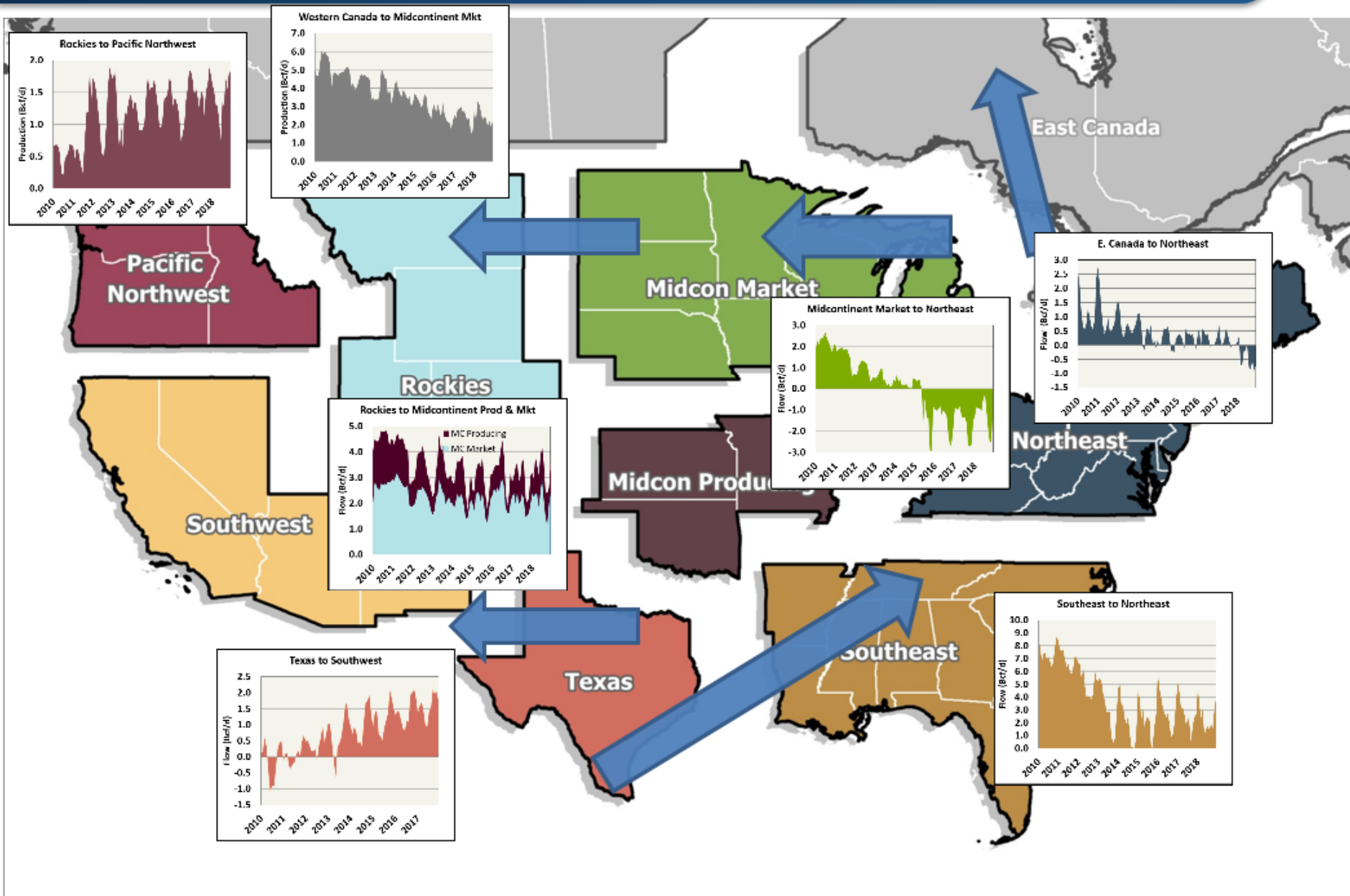
U.S. Dry Gas Production Forecast to Grow 11 Bcf/d from 2013 to 2018



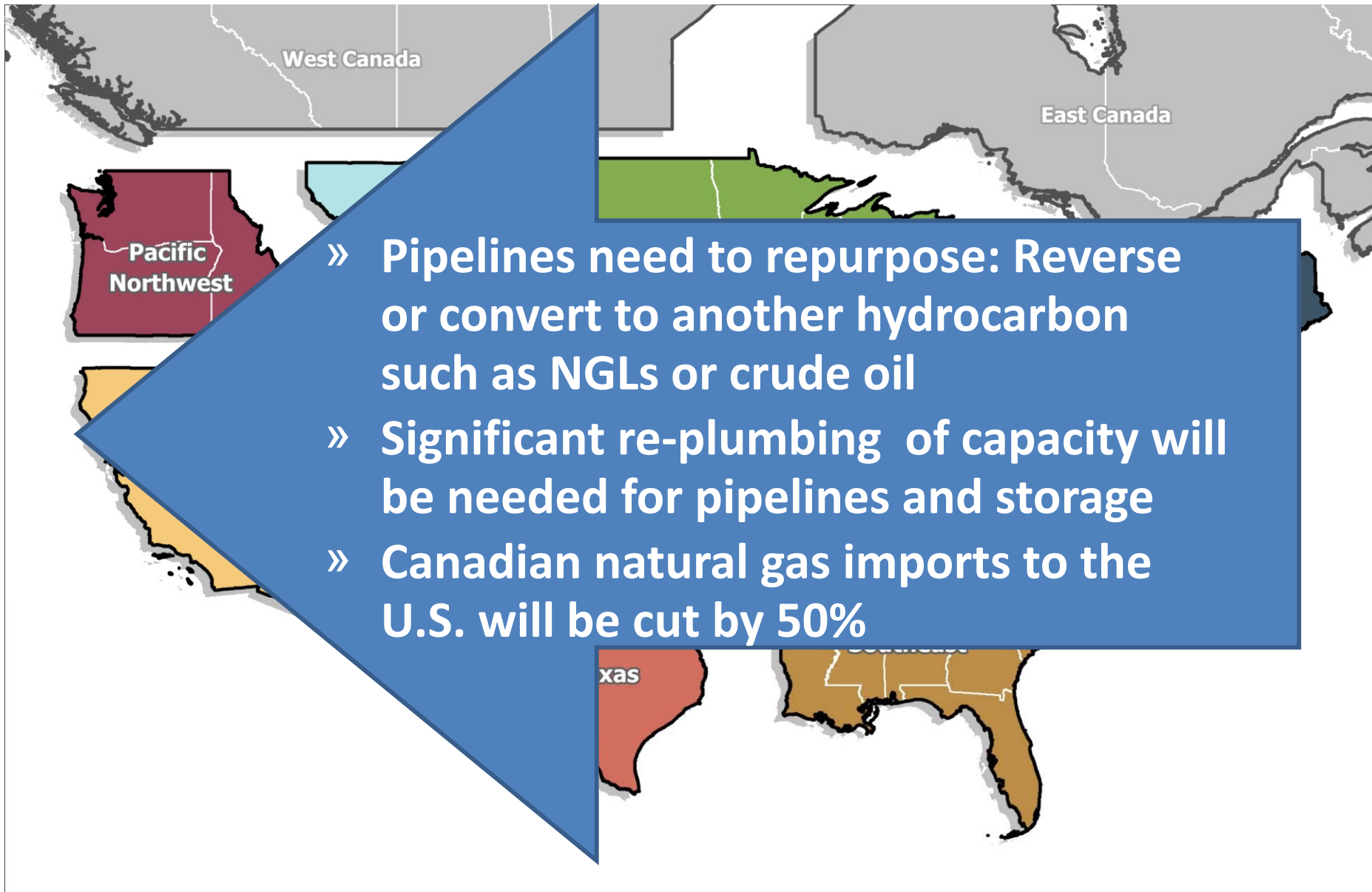
Regional Natural Gas Production Outlook



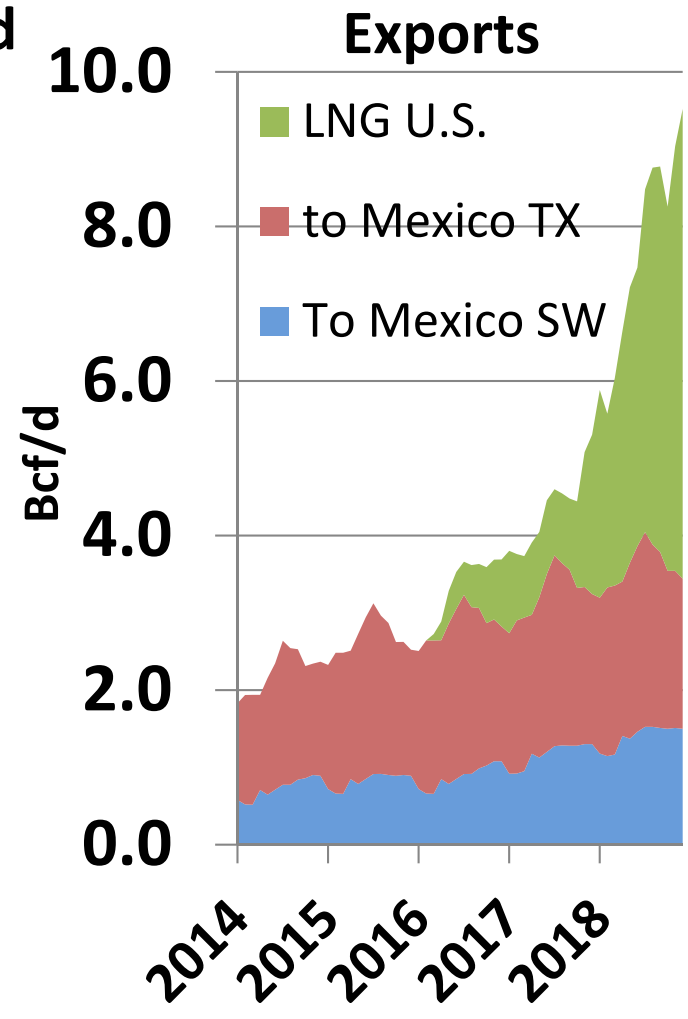
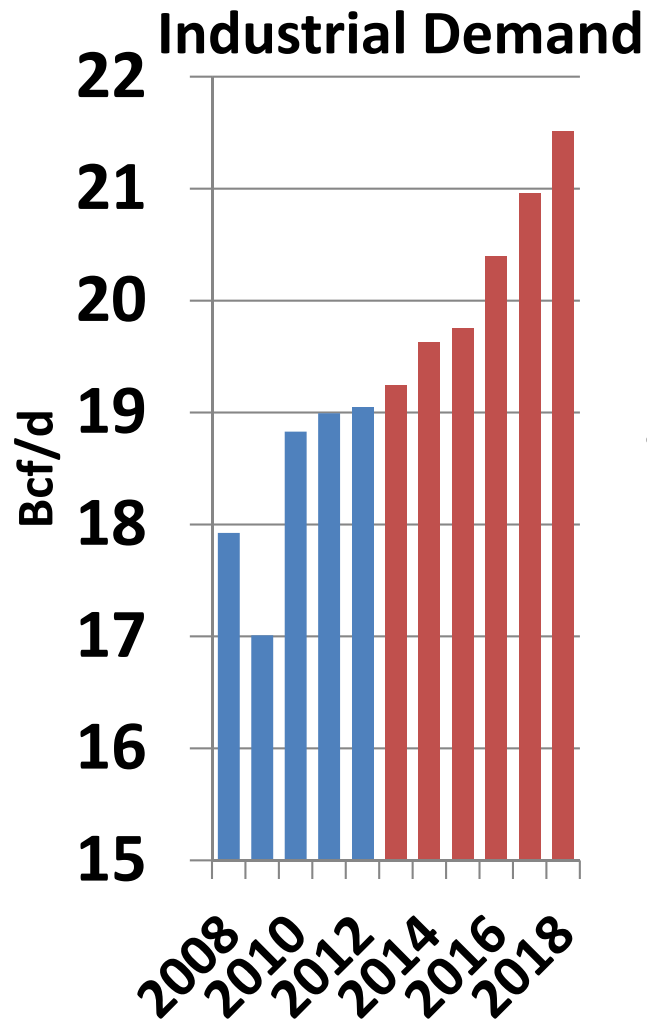
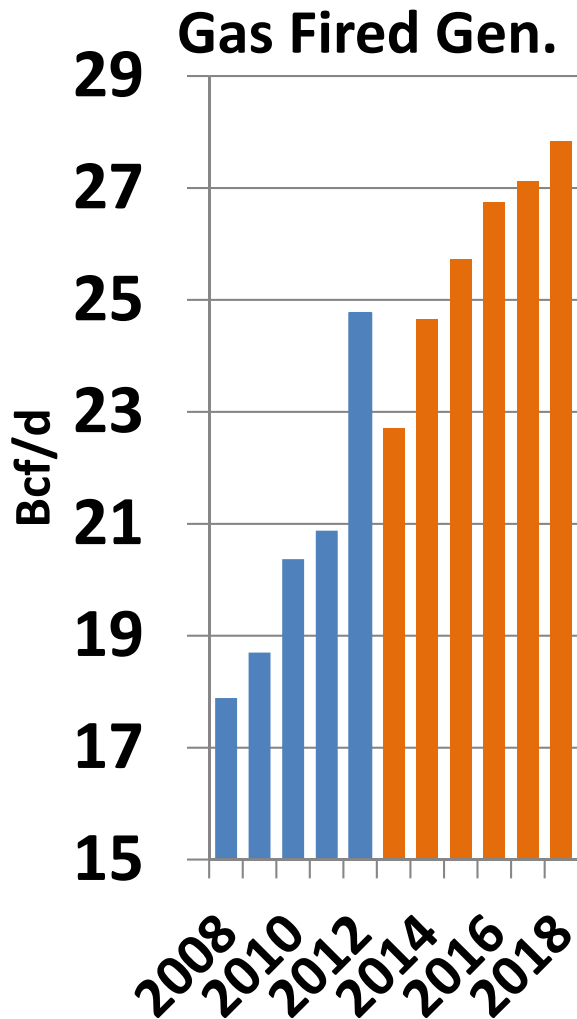
Flow Analysis – Intra-Regional



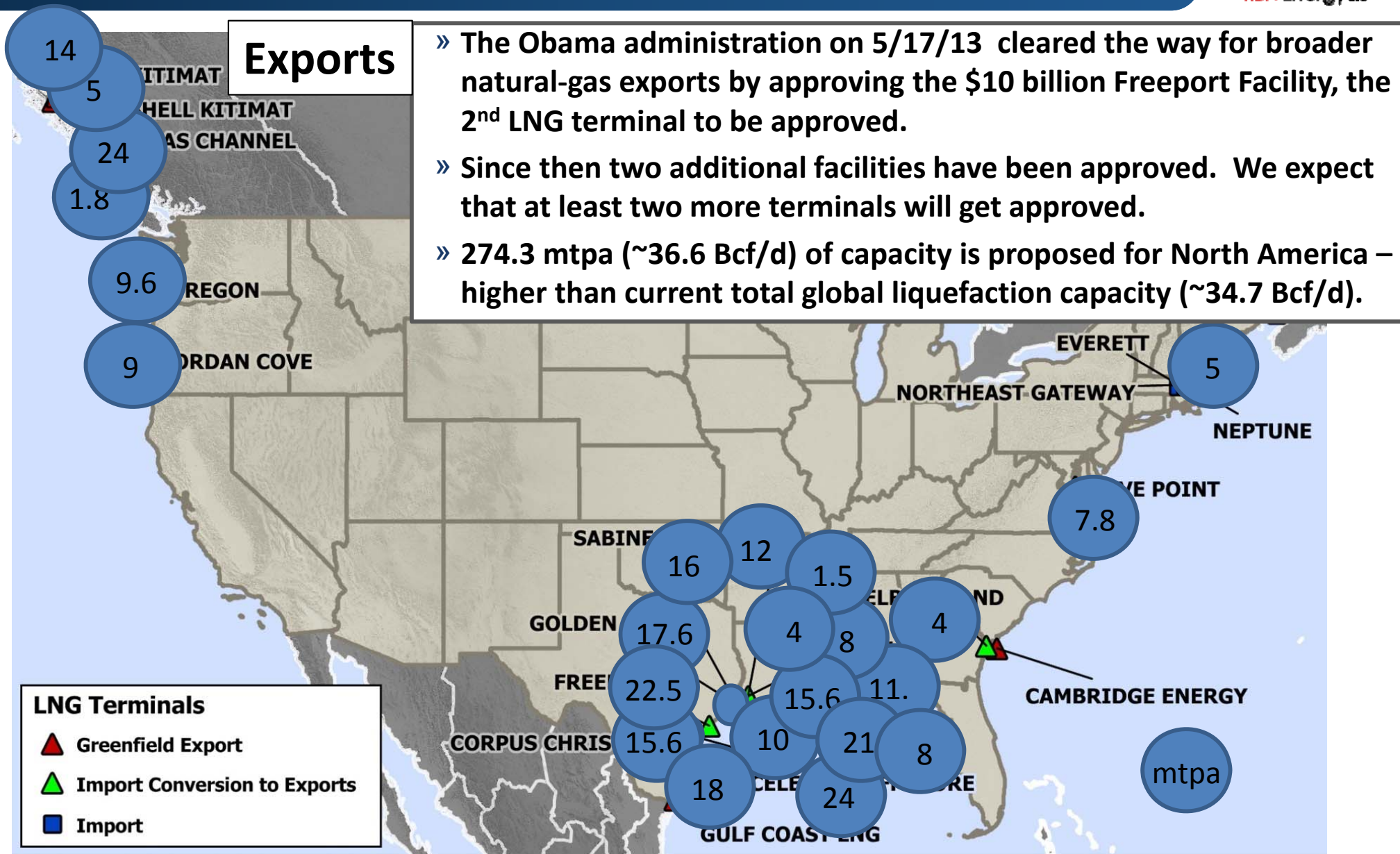
Flow Analysis – Intra-Regional



Power, Industrial Demand and Exports are Necessary to Balance the Gas Market



LNG Export Terminals



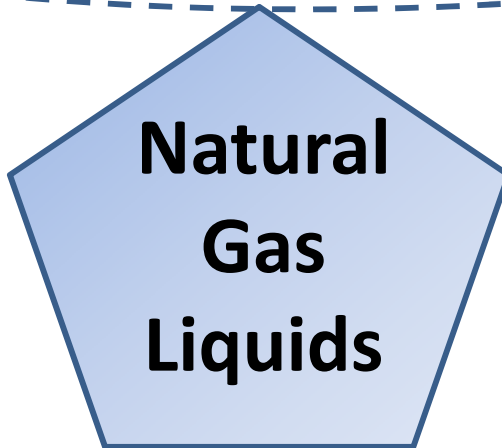
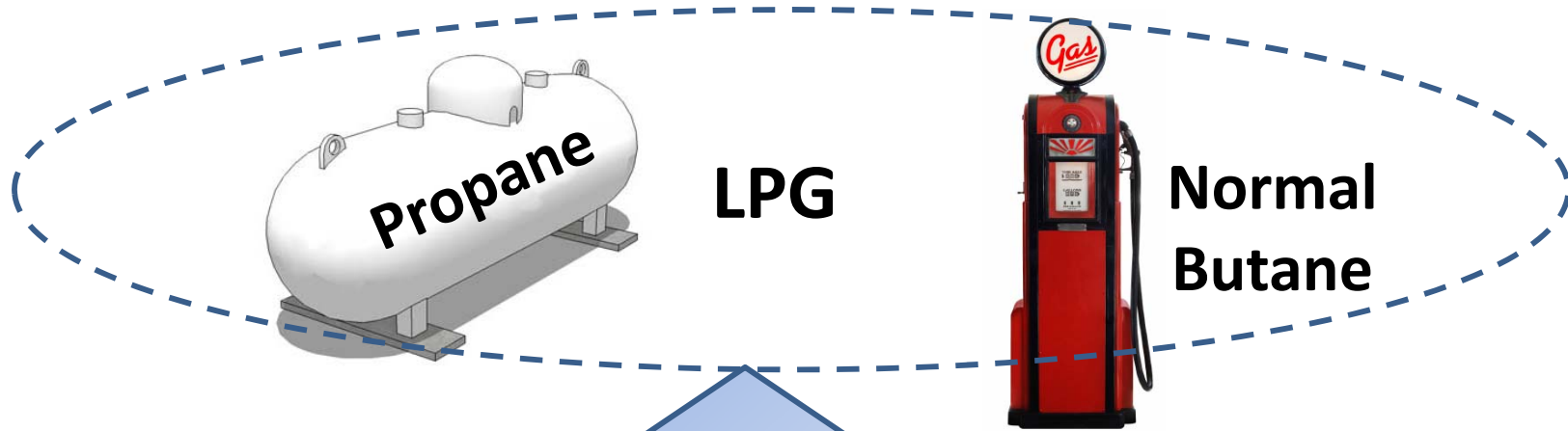
Molecule Law #1



» Methane molecules can be exported based on destination (Canada & Mexico are ok) and in the form of LNG to other countries from approved terminals.



Natural Gas Liquids (NGLs)



Ethane

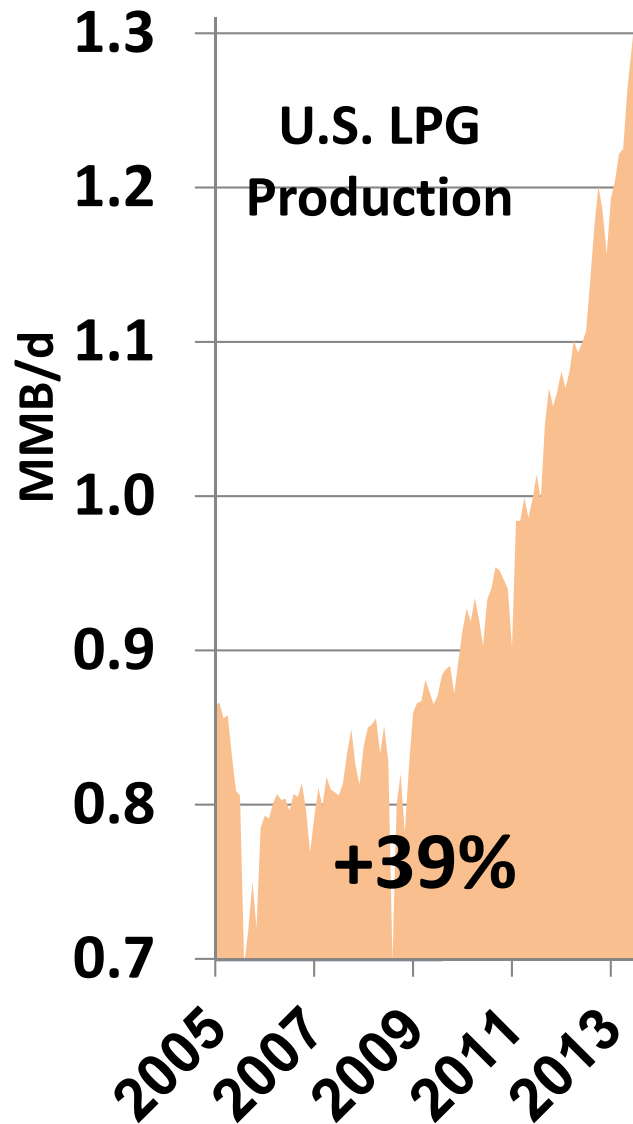


Natural Gasoline

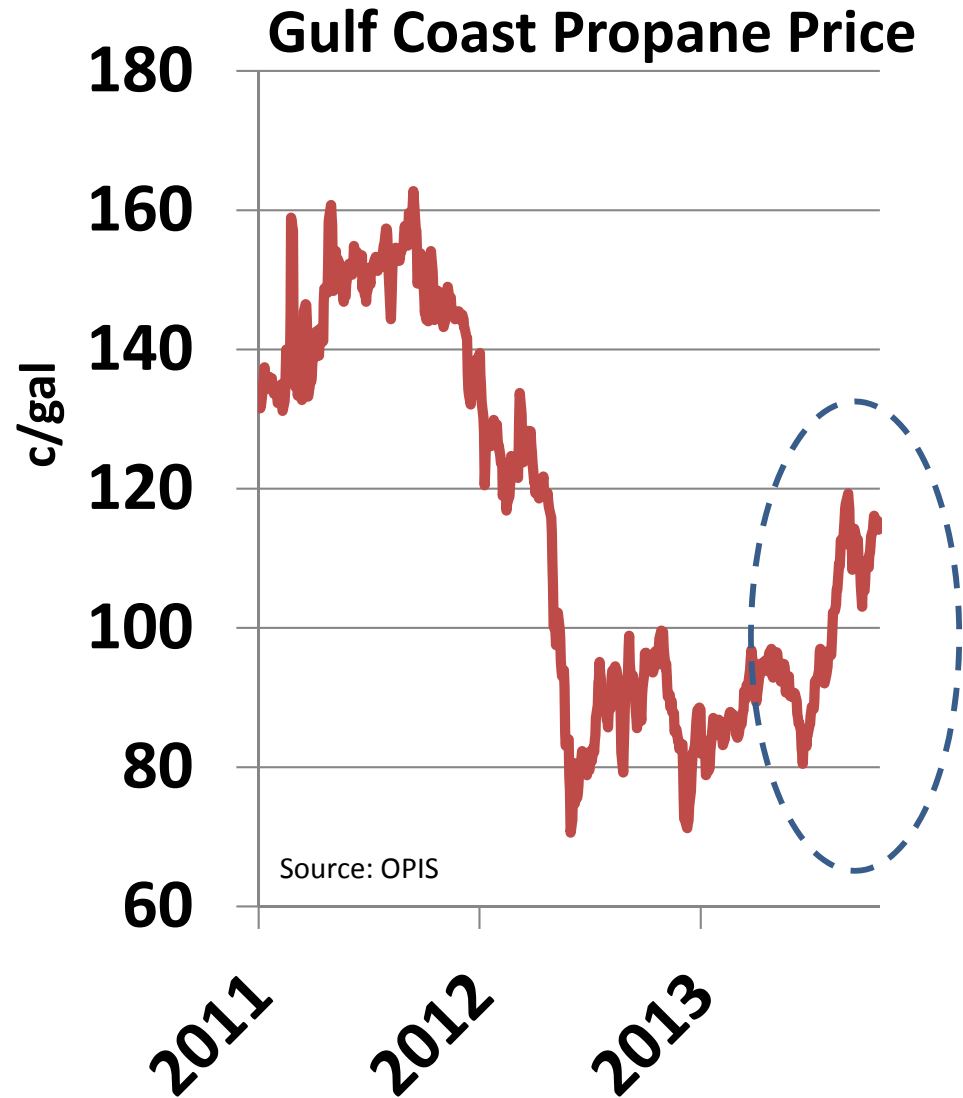


Iso-butane

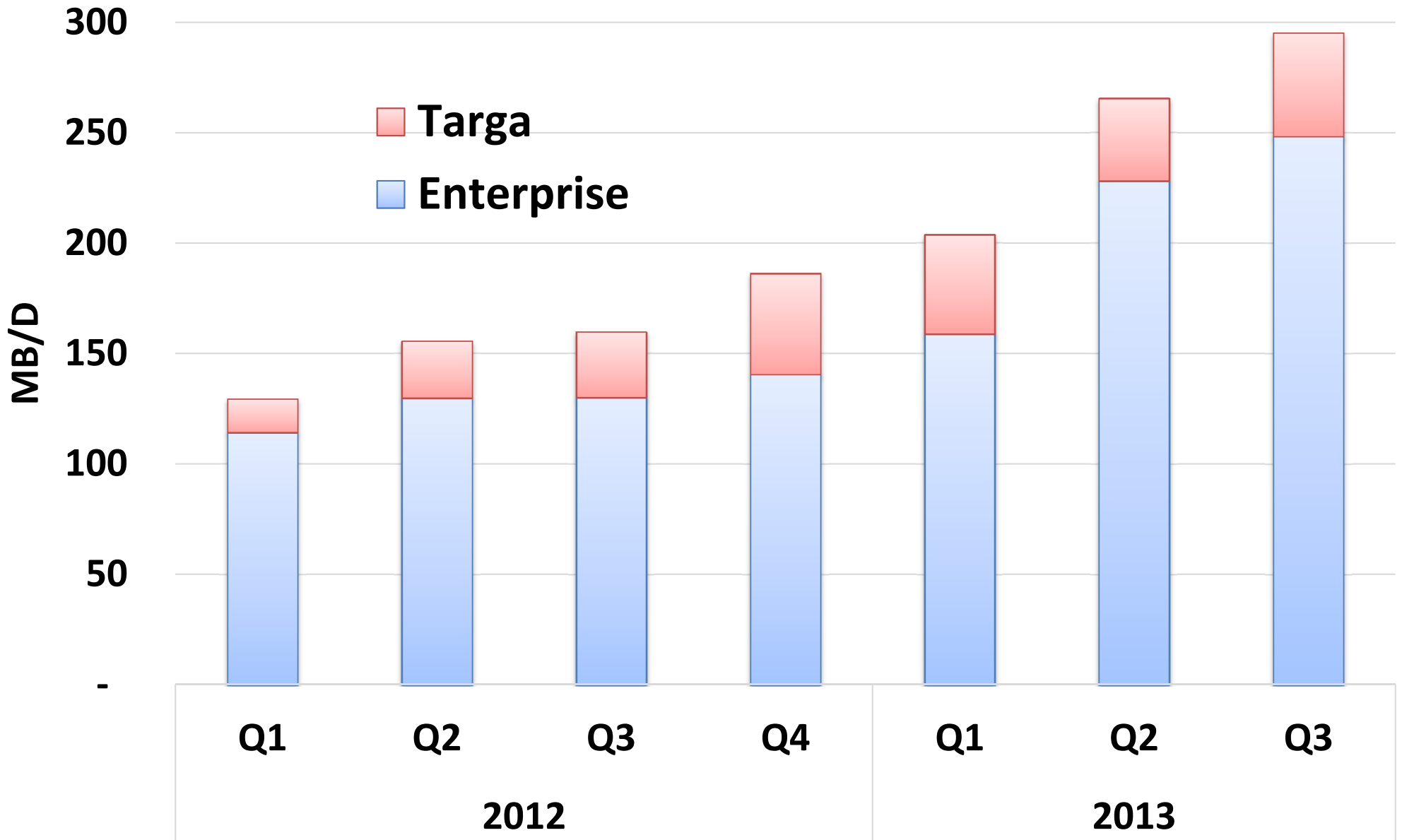
LPG Production/Prices



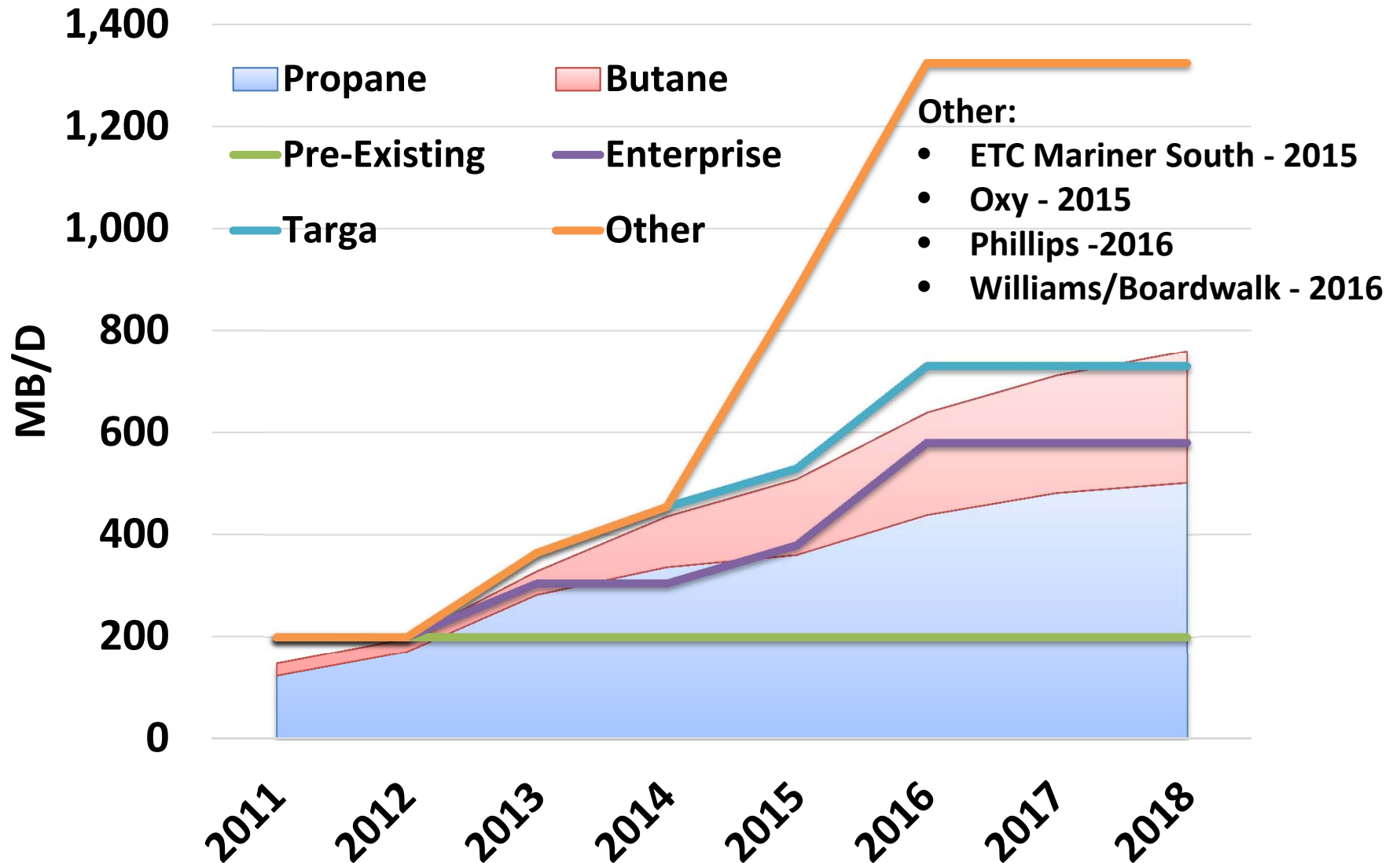
Source: EIA



LPG Exports Surge



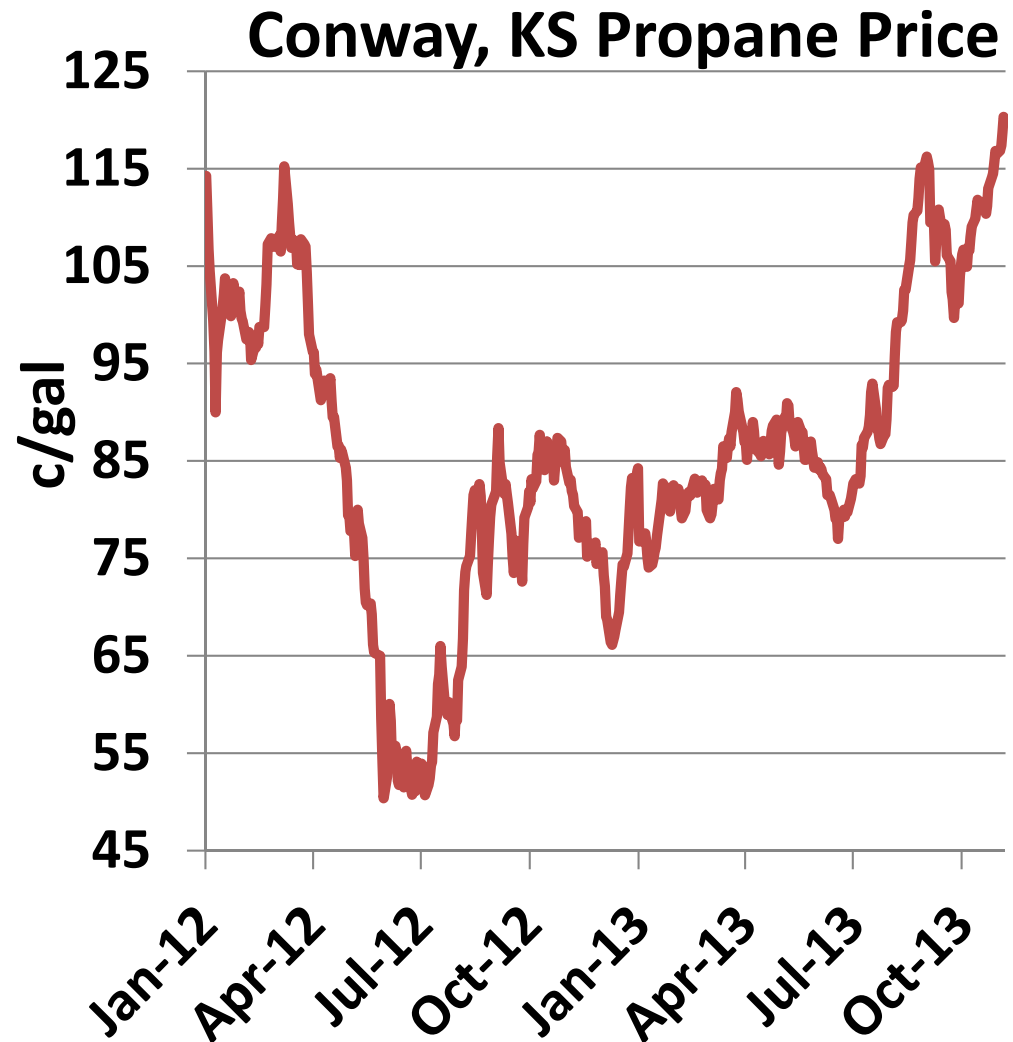
Gulf Coast LPG Export Capacity



Molecule Law #2

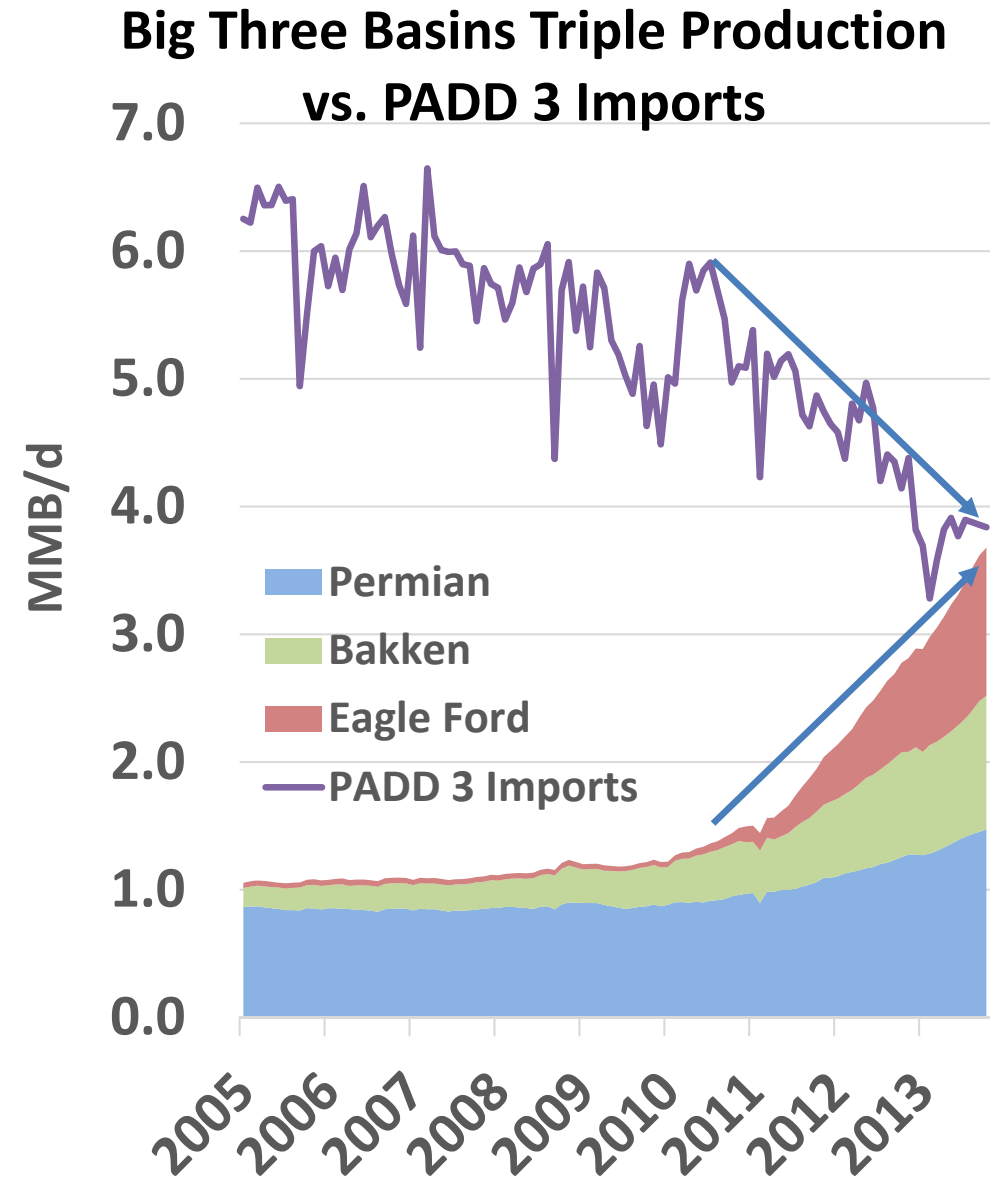
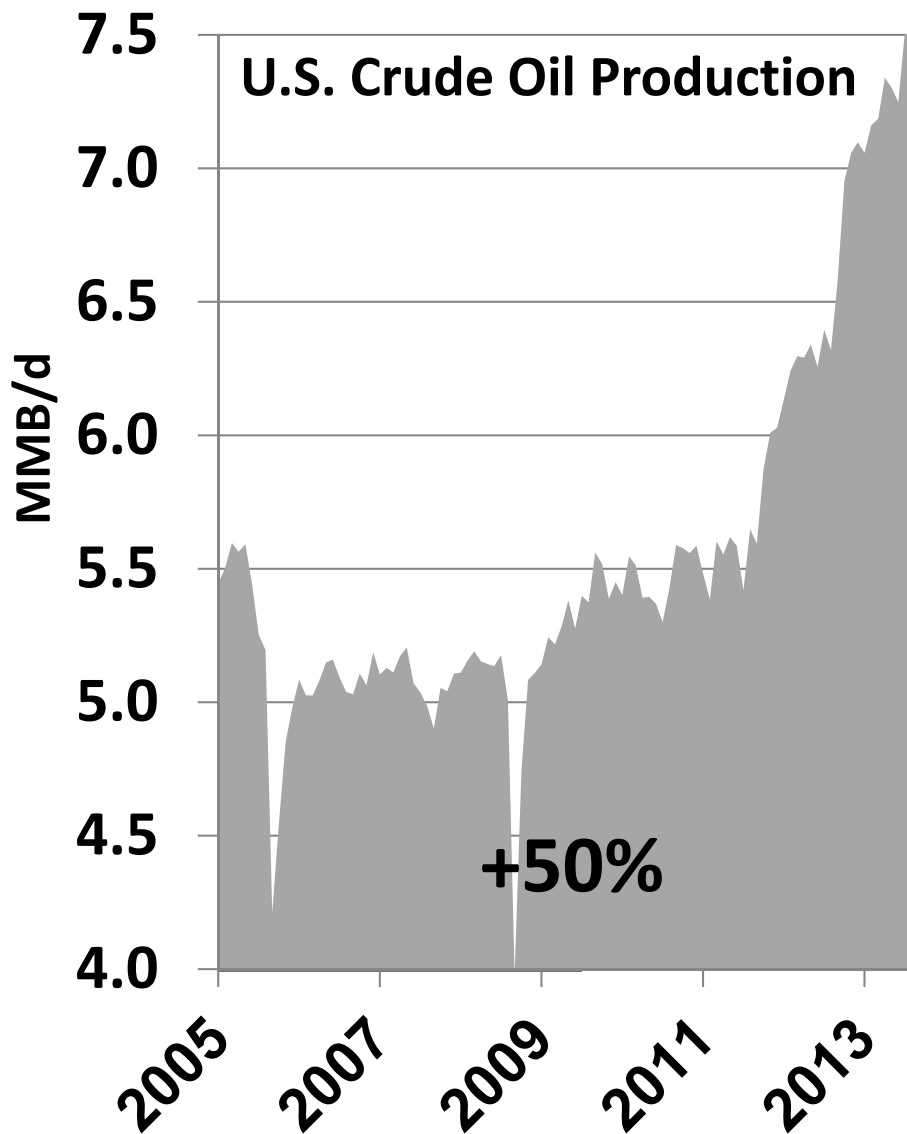


» **LPG (propane and butane) molecules can be exported to any non-sanction country, regardless of the needs of the U.S. market**

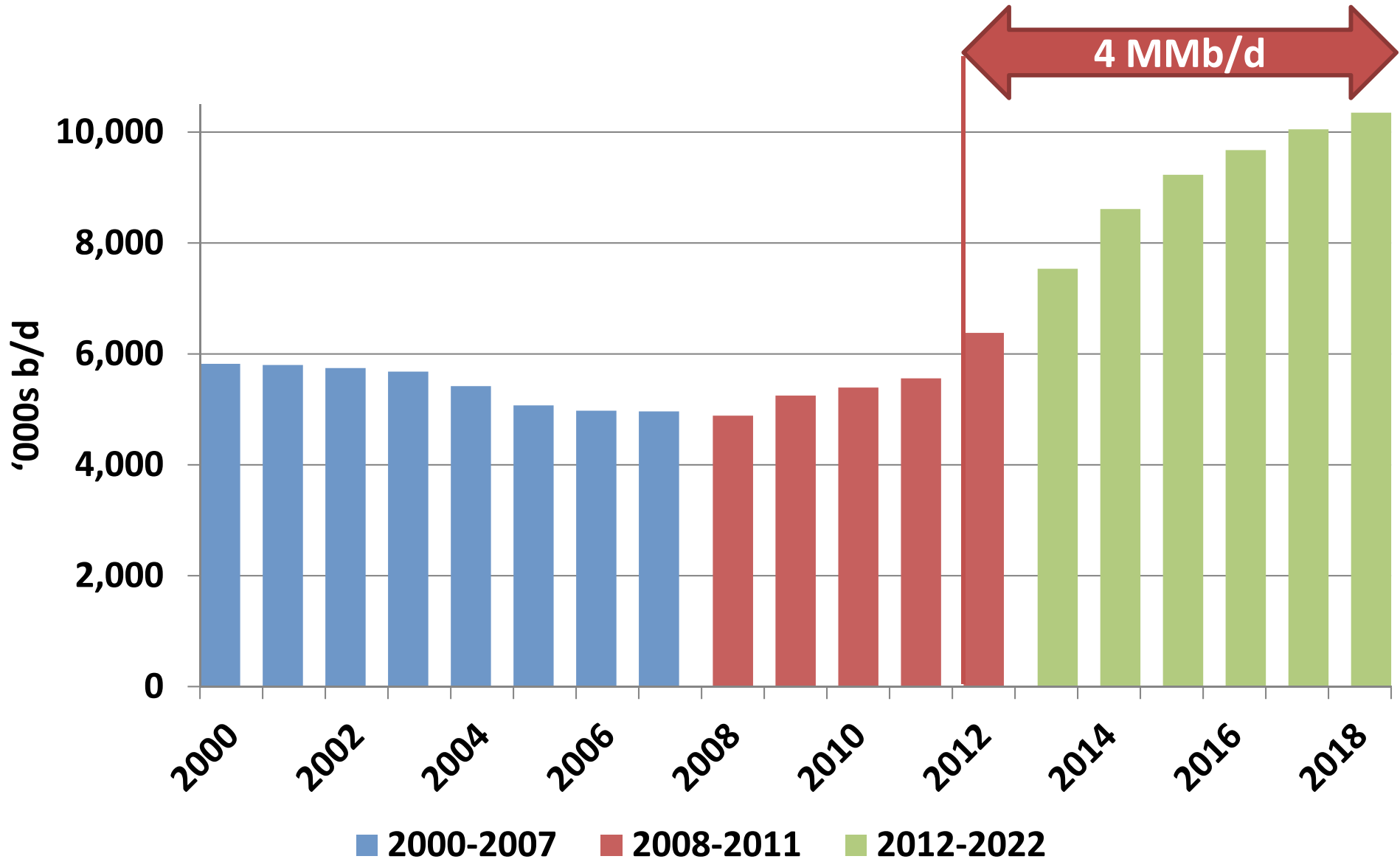


Source: OPIS

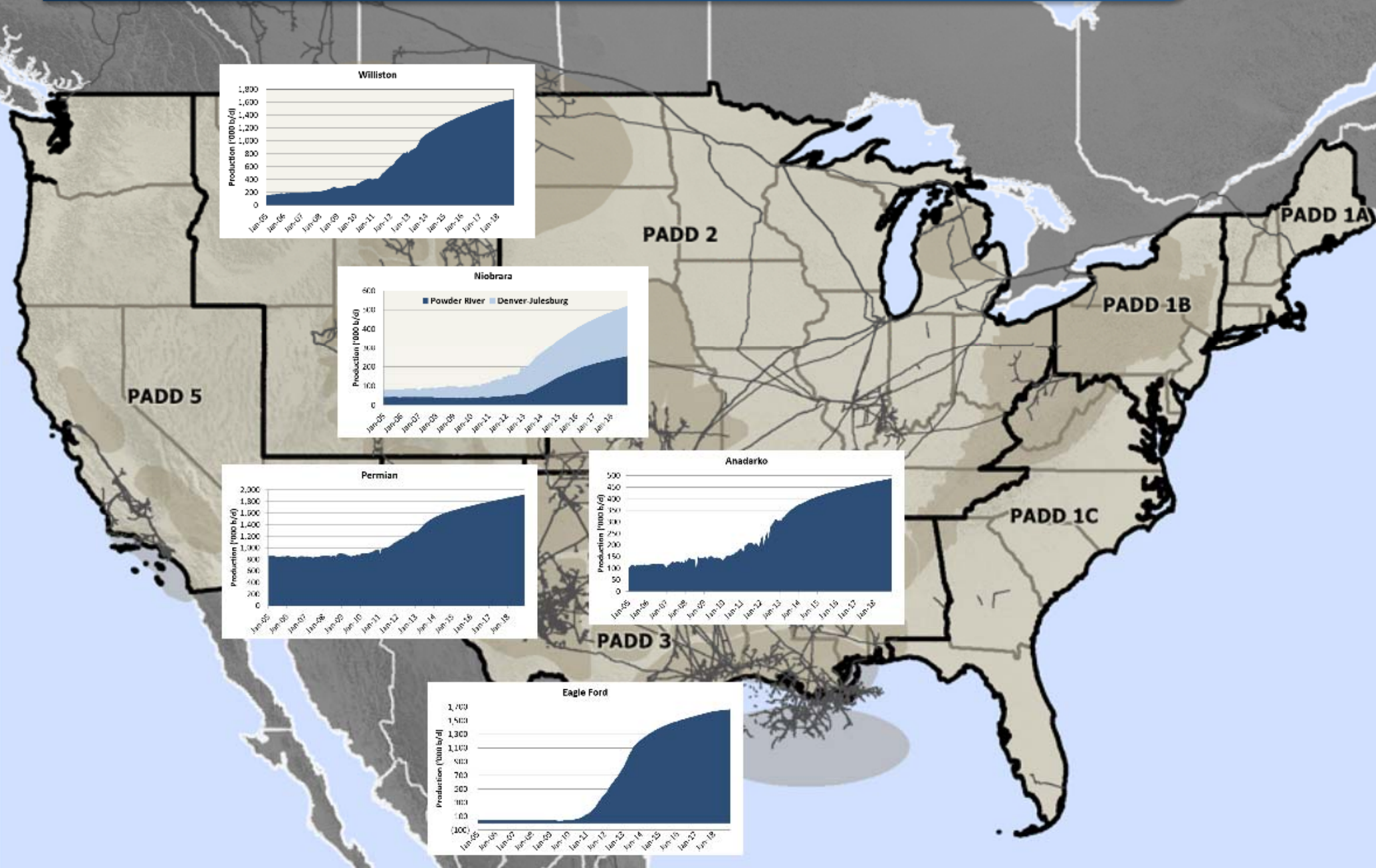
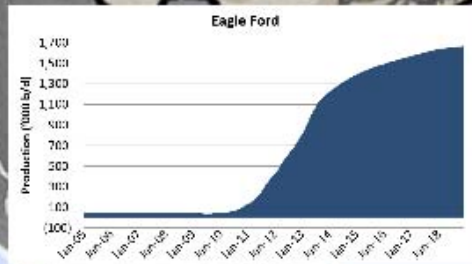
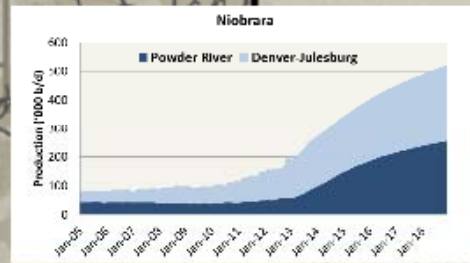
Surging Oil Production, Declining Imports



U.S. Oil Production 10 MMb/d in 2018



U.S. Crude Oil Production Growth

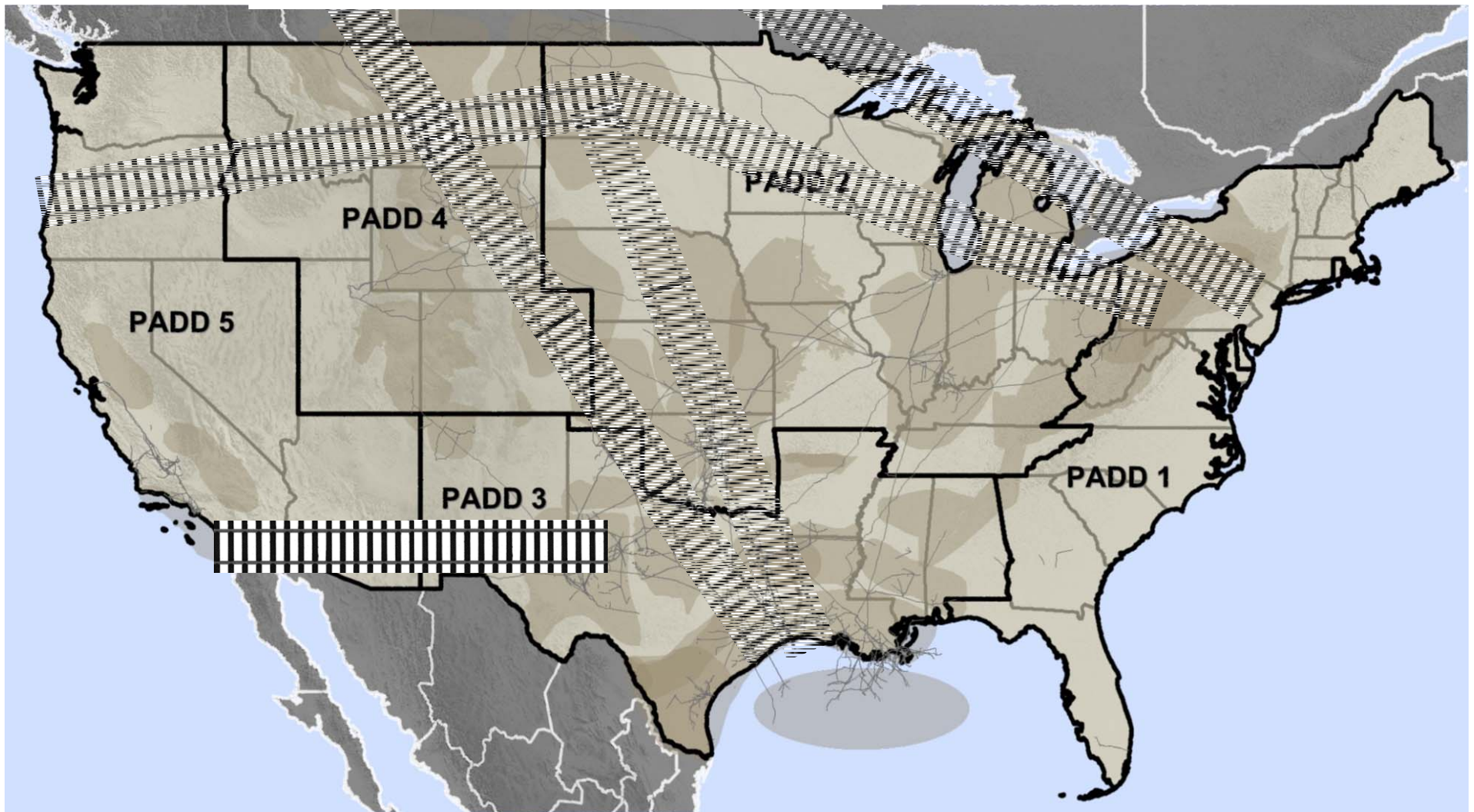


Crude Pipeline Projects Summary

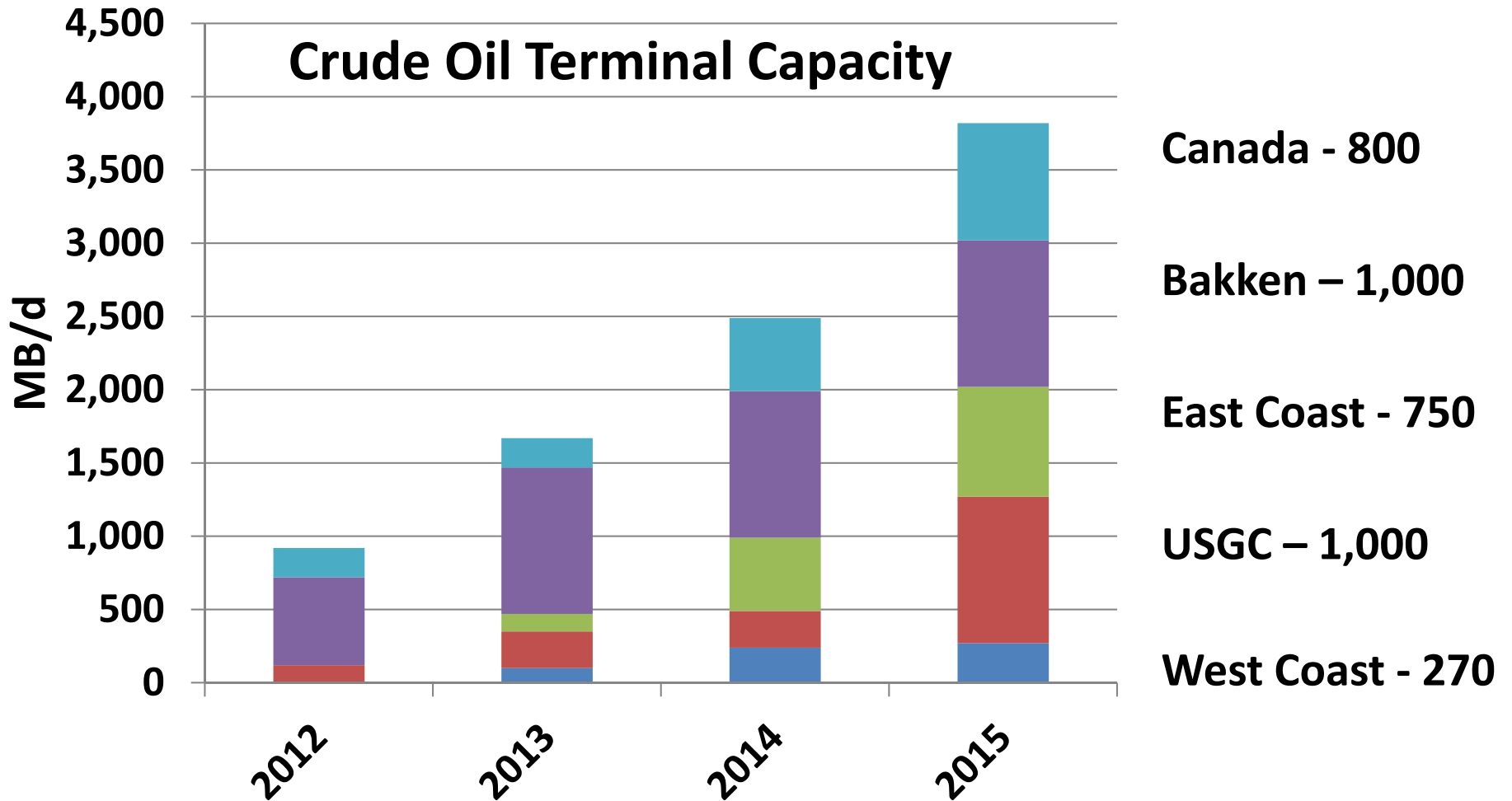


Company	Project	Mb/d	Target Market	Origin	Destination	SU
Enbridge	Line 5 Expansion	50	Ontario	Superior, WI	Sarnia, ON	2013
Sunoco Logistics	Permian Express Phase 1	150	West Texas	Wichita Falls, TX	Nederland, TX	2013
ETC Sunoco	West Texas Gulf	40	USGC	Permian, TX	Nederland, TX	2013
Magellan	Longhorn	225	Permian	Permian, TX	Houston, TX	2013
Seaway	Seaway Expansion Phase 1	250	Cushing to Gulf	Cushing, OK	Freeport, TX	2013
Enbridge	Line 9 Reversal Phase 1	240	Ontario	Sarnia, ON	Westover, ON	2013
TransCanada	Keystone Gulf Coast Pipeline	700/130	Cushing to Gulf	Cushing, OK	Nederland, TX	4Q13
Shell Pipeline	HoHo Pipeline	350	St. James	Port Arthur, TX	St James, LA	4Q13
Sunoco Logistics	Permian Express Phase 2	200	Permian	Colorado City, TX	Wortham, TX	2Q14
Rose rock	White Cliffs	80	DJ Basin	Platteville, CO	Cushing, OK	2Q14
Enbridge	Line 6B Replacement	260	Ontario	Griffith, IN	Sarnia, ON	2Q14
Enbridge	Spearhead North (Line 62)	125	Ontario	Ranagan, IL	Sarnia, ON	2Q14
Enbridge	Alberta Clipper	120	Bakken	Neche, ND	Superior, WI	3Q14
OXY, magellan	BridgeTex	278	Permian	Colorado City, TX	Houston, TX	3Q14
Enbridge	Flanagan	600	Chicago to Cushing	Ranagan, IL	Cushing, OK	3Q14
Enbridge	Line 9 Reversal Phase 2	60	Ontario	Westover, ON	Montreal, QC	4Q14
Kinder Morgan	Pony Express Conversion	210	DJ Basin	Guersney, WY	Cushing, OK	4Q14
Seaway	Seaway Expansion Phase 2	450	Cushing to Gulf	Cushing, OK	Freeport, TX	4Q14
Enbridge	Line 61 Expansion	160	Midwest	Superior, WI	Ranagan, IL	1Q15
Shell Pipeline	Westward Ho	300	St. James	St. James, LA	Houston, TX	3Q15
Eastern Gulf Crude Access	Trunkline	450	Chicago to Gulf	Patoka, IL	St James, LA	4Q15
Plains All American	Cactus Pipeline	200	Permian to Corpus	McCamey, TX	Gardendale, TX	4Q15
TransCanada	Keystone XL Northern Leg	508	Alberta Oil Sands	Hardisty, AB	Cushing, OK	2015 <
Kinder Morgan	Trans Mountain	590	Alberta Oil Sands	Edmonton, AB	Vancouver, BC	2015 <
TransCanada	Energy East Pipeline	1100	Alberta Oil Sands	Hardisty, AB	New Brunswick, QC	2015 <
Questar	Southern Trails	100	San Juan Basin	Farmington, NM	Long Beach, CA	2015 <

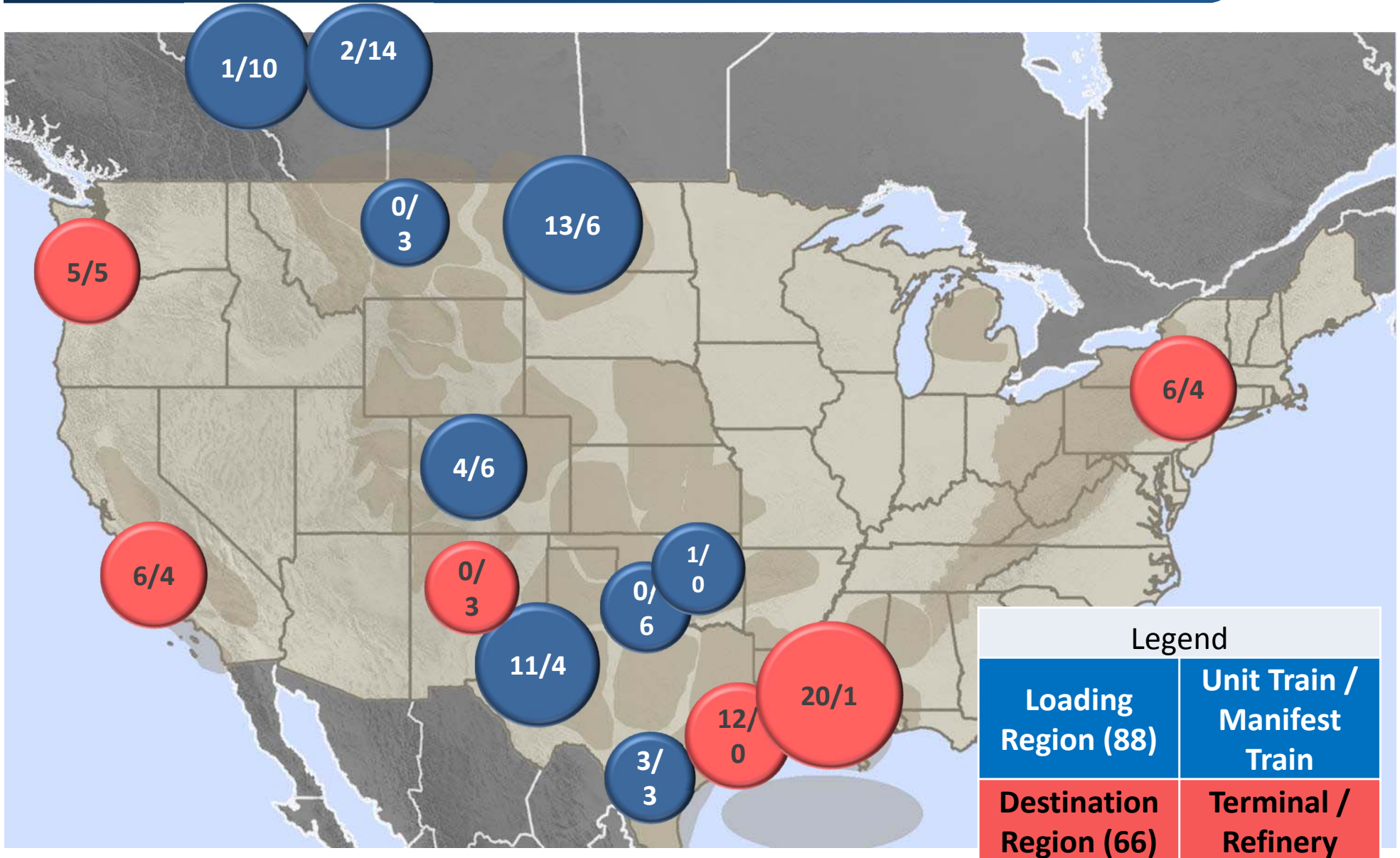
Crude by Rail Growth Continues



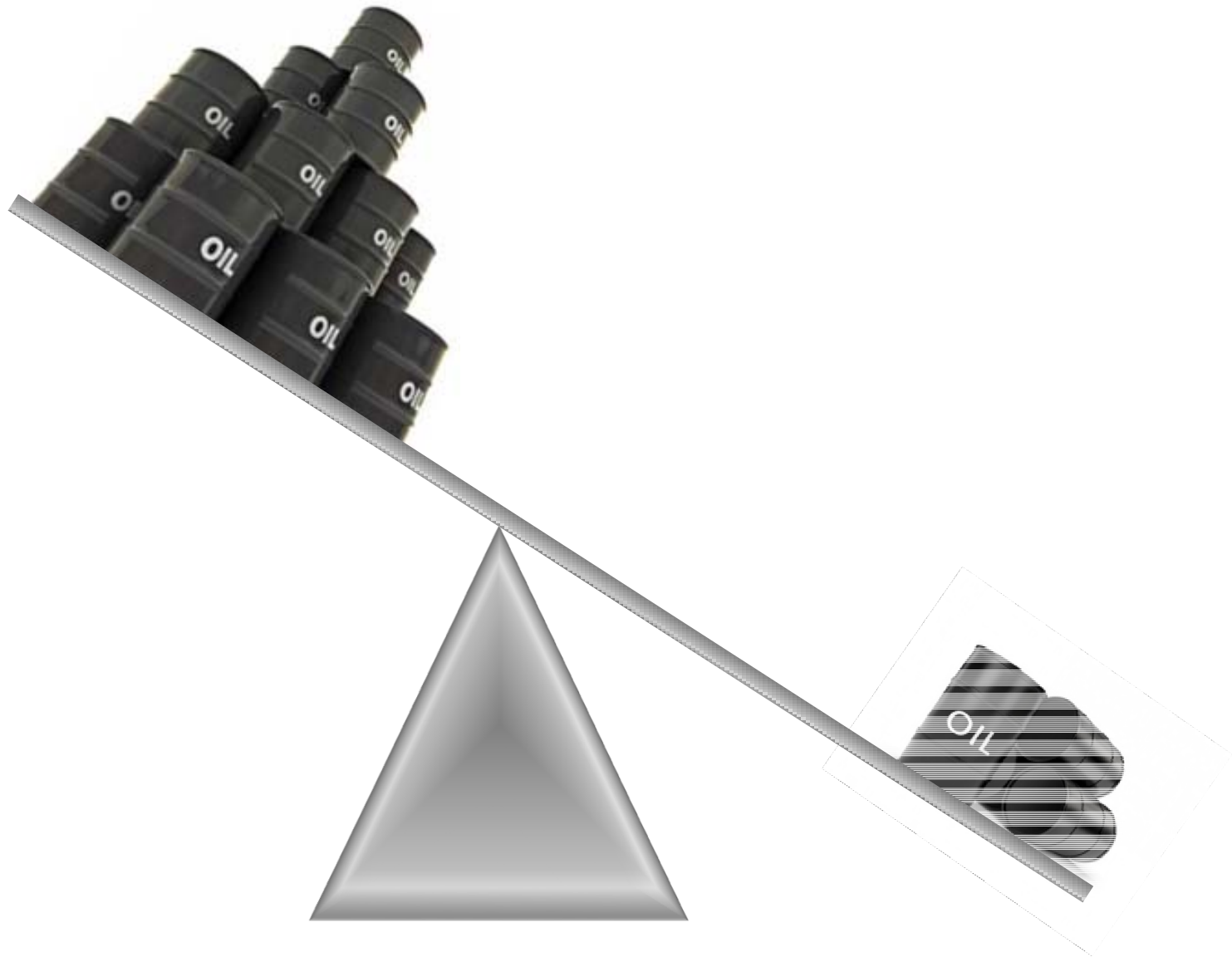
Rail Terminal Capacity Growing Fast



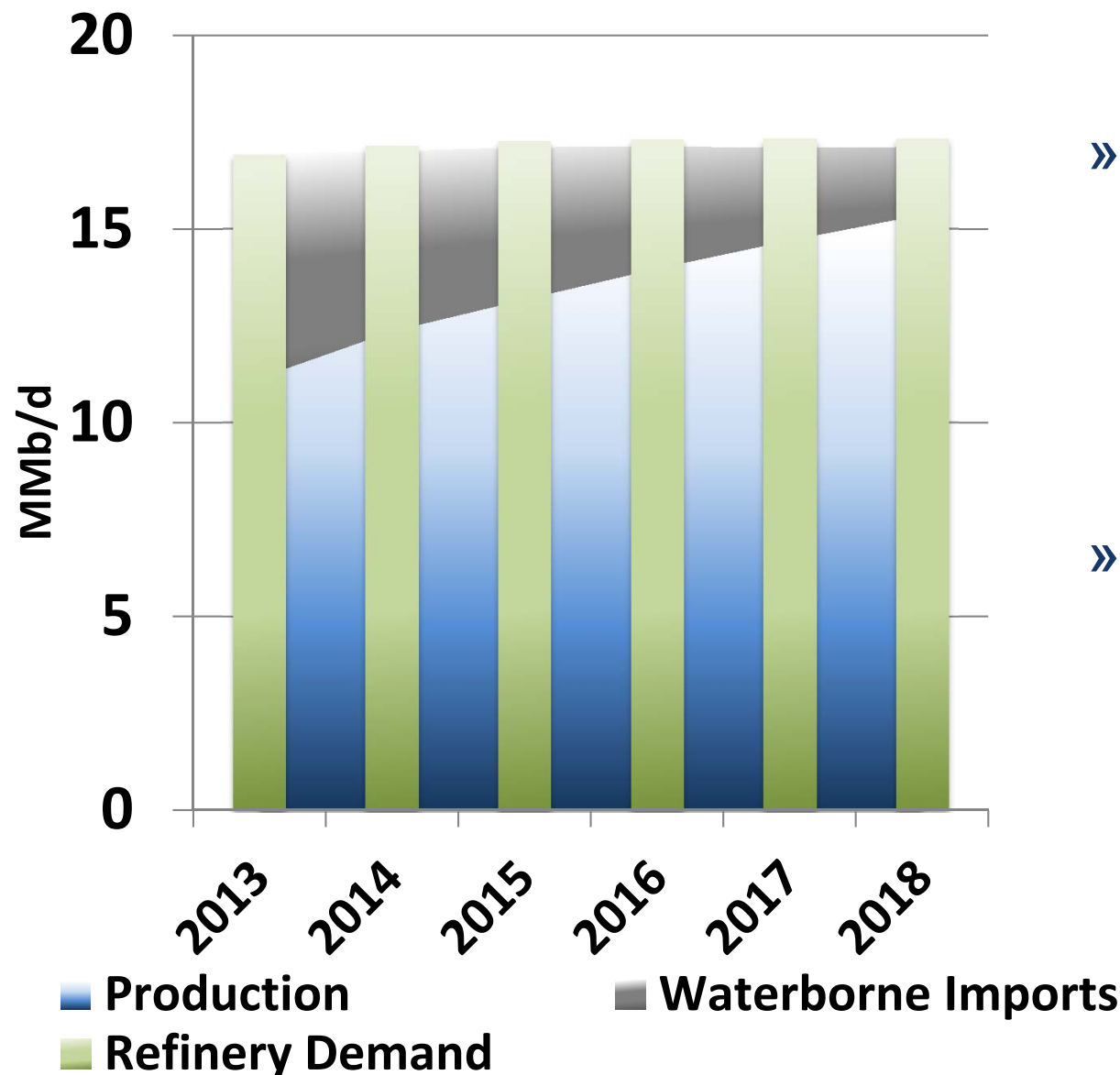
Loading and Destination Rail Terminals



Crude Oil Supply/Demand Balance



Combined U.S. and Canadian Crude Supply/Demand Balance



- » By 2018, combined U.S. and Canadian crude oil imports from overseas sources could be less than 2.0 Mb/d
- » At this rate of production growth, the combined market would be self sufficient in 2020

Strategic Petroleum Reserve



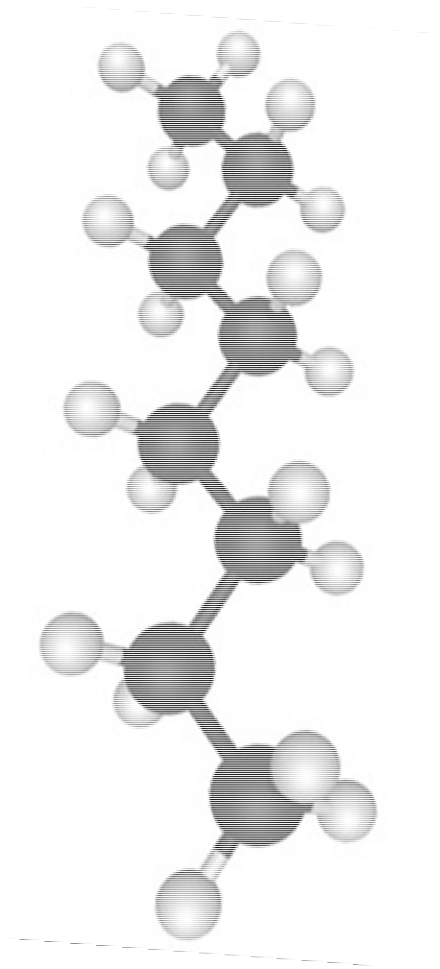
- » **What is the strategy of holding 700 million barrels of crude in inventory if the U.S. and Canada are self sufficient in crude oil supply?**



Molecule Law #3



» **Crude oil molecules* can be exported to Canada (as long as they stay in Canada), if they come from Alaska, or if they come from certain heavy oil fields in California**

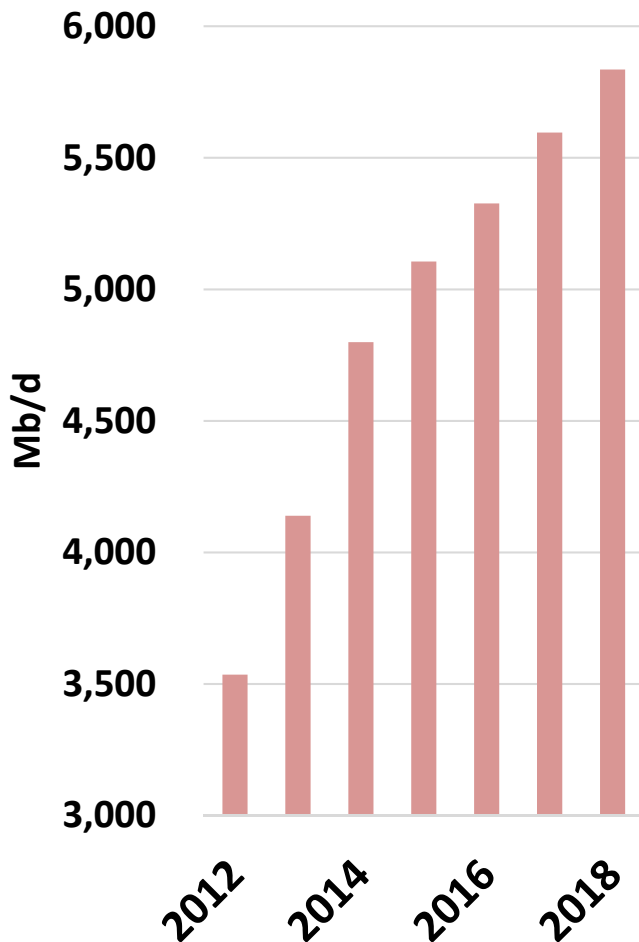


* Technically the mix of hydrocarbon molecules that make up crude oil

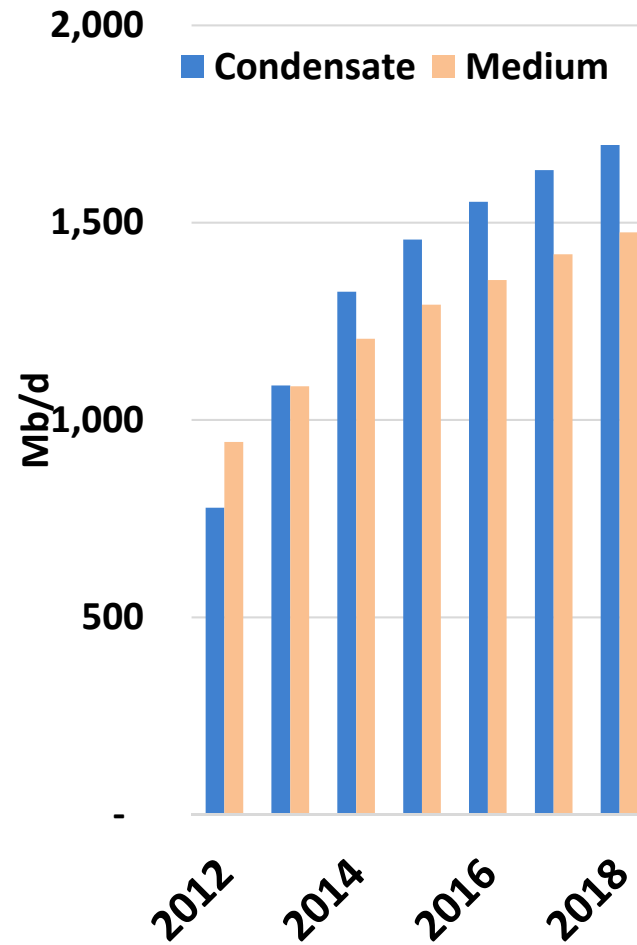
Production: Light vs. Heavy Mix



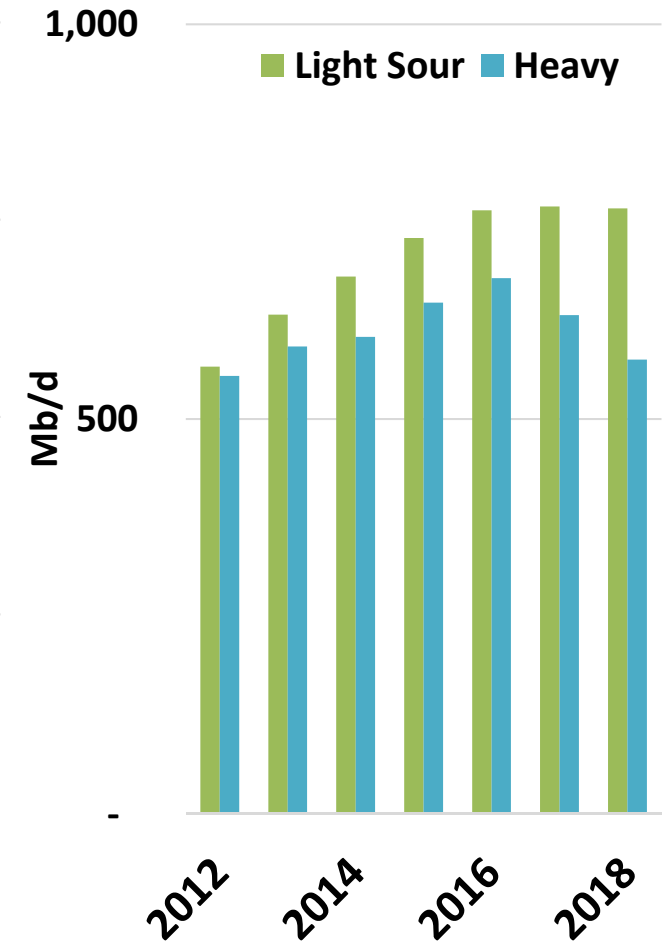
Light Sweet



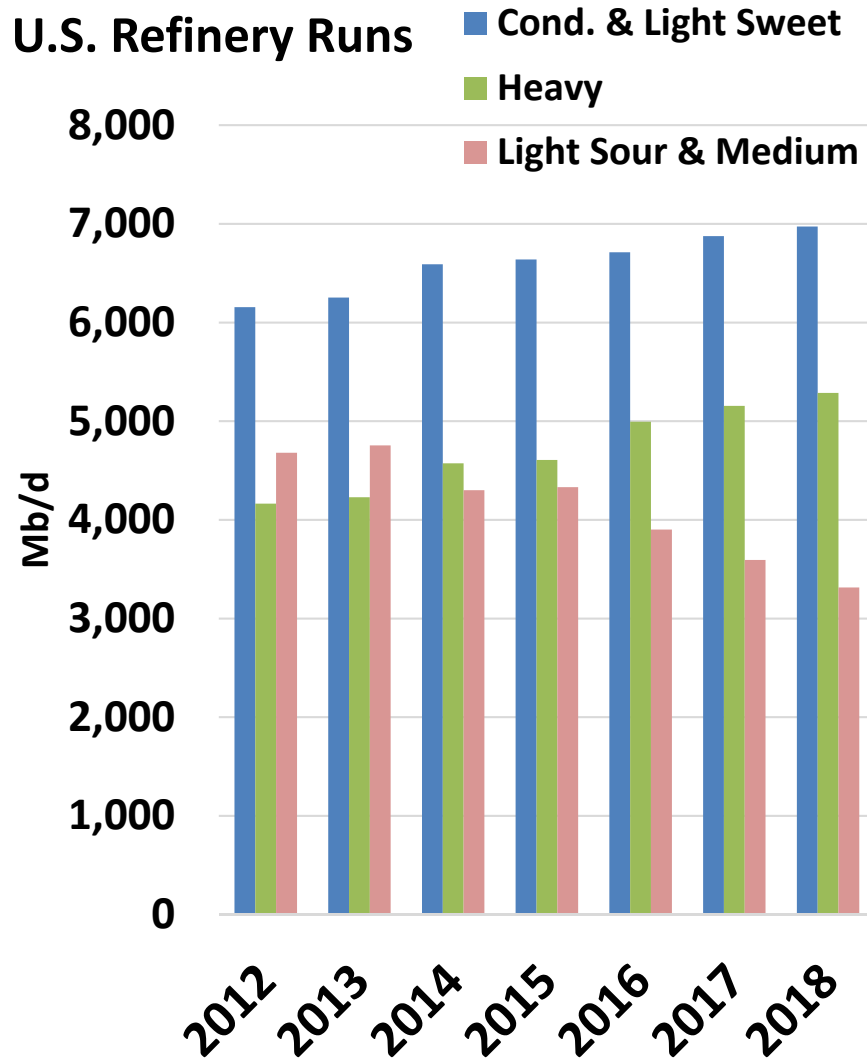
Condensate & Medium



Light Sour & Heavy

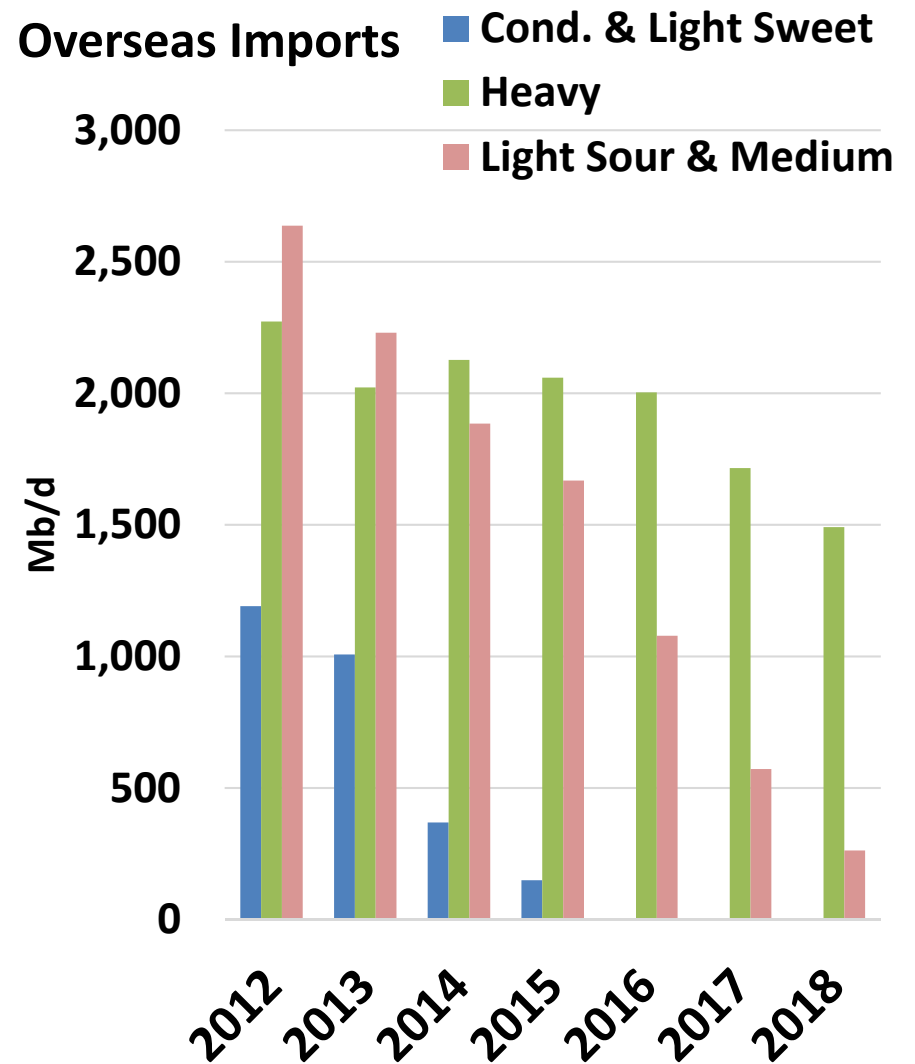
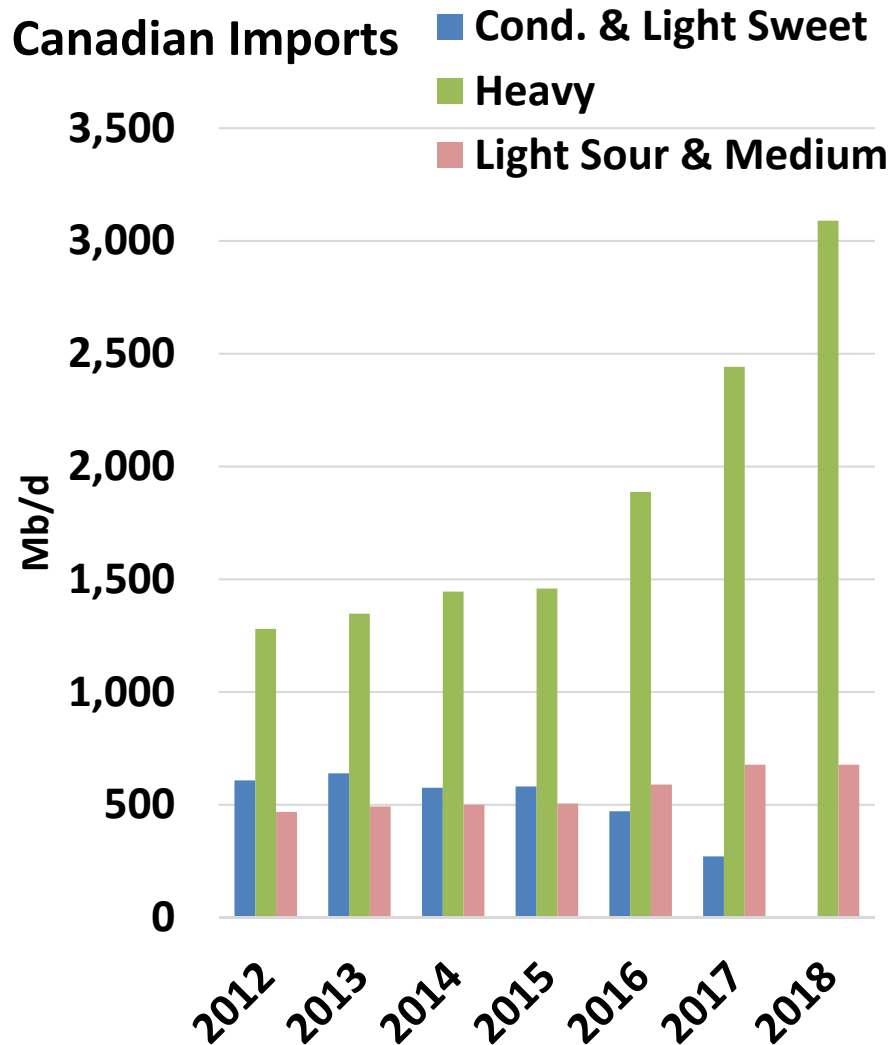


Production: Light vs. Heavy Mix

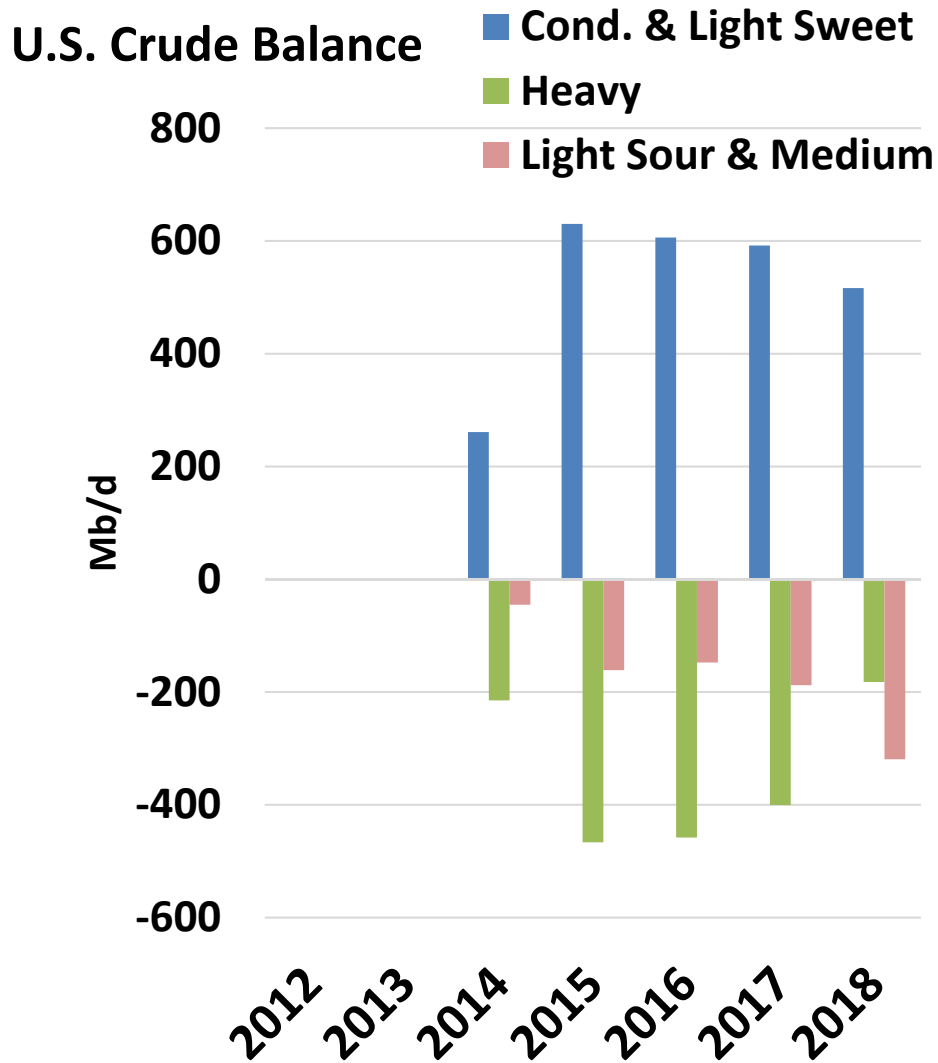


- » Refinery runs of condensate and light sweet crude increase
- » Refinery runs of heavy crude increase
- » Refinery runs of light sour and medium crude decrease

Imports: Light vs. Heavy Mix



U.S. Crude Oil Quality Imbalance



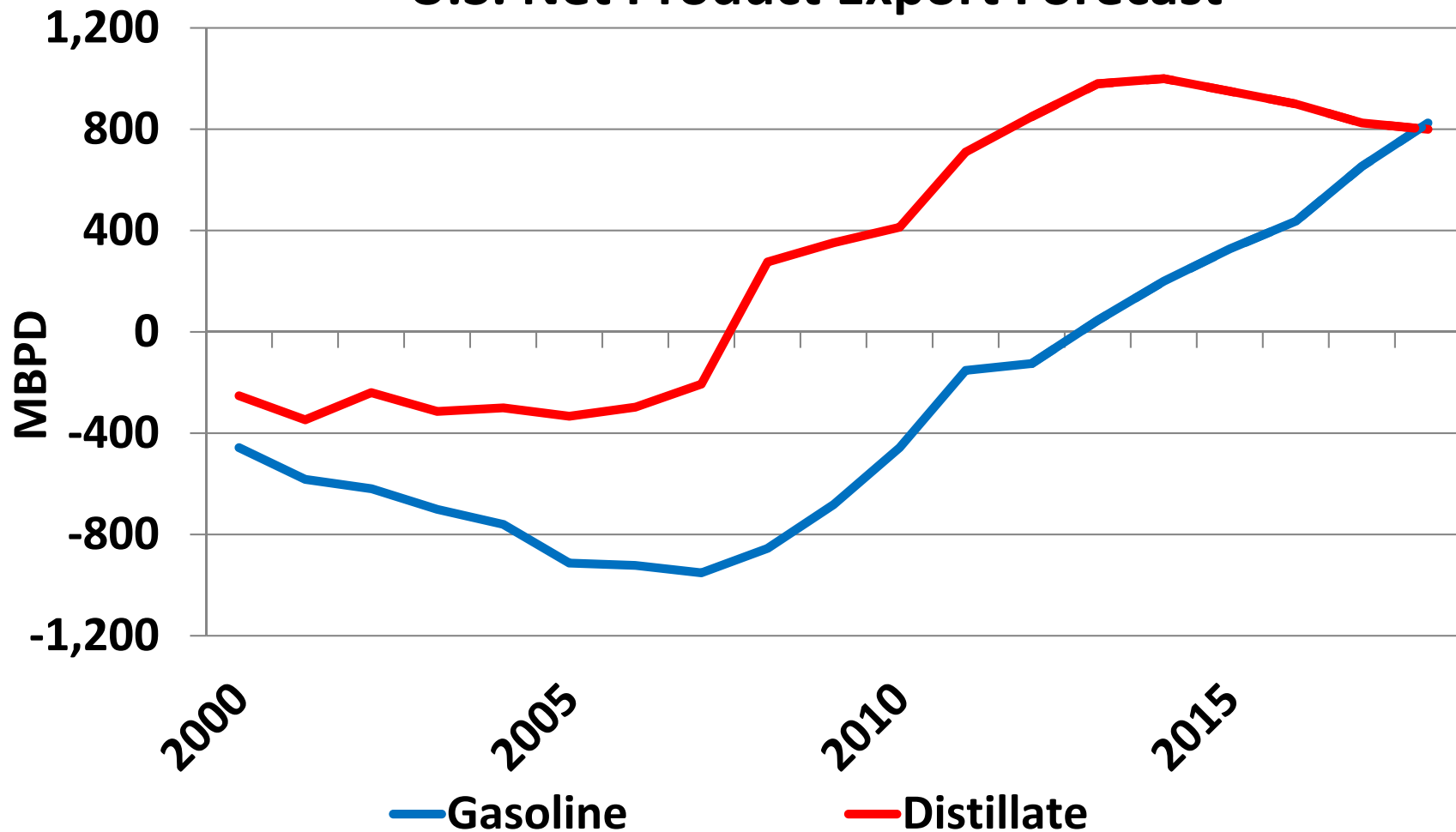
» Although overall supply and demand are roughly in balance, there is a 500-600 Mb/d quality imbalance starting in 2015 and continuing until either

- A) Refinery upgrades are made, or
- B) U.S. allows crude exports of light barrels, which would be replaced by heavy imports

Market Balances on Product Exports



U.S. Net Product Export Forecast



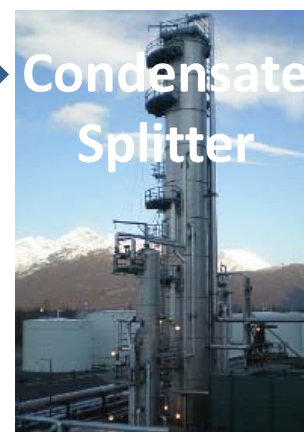
Molecule Law #4



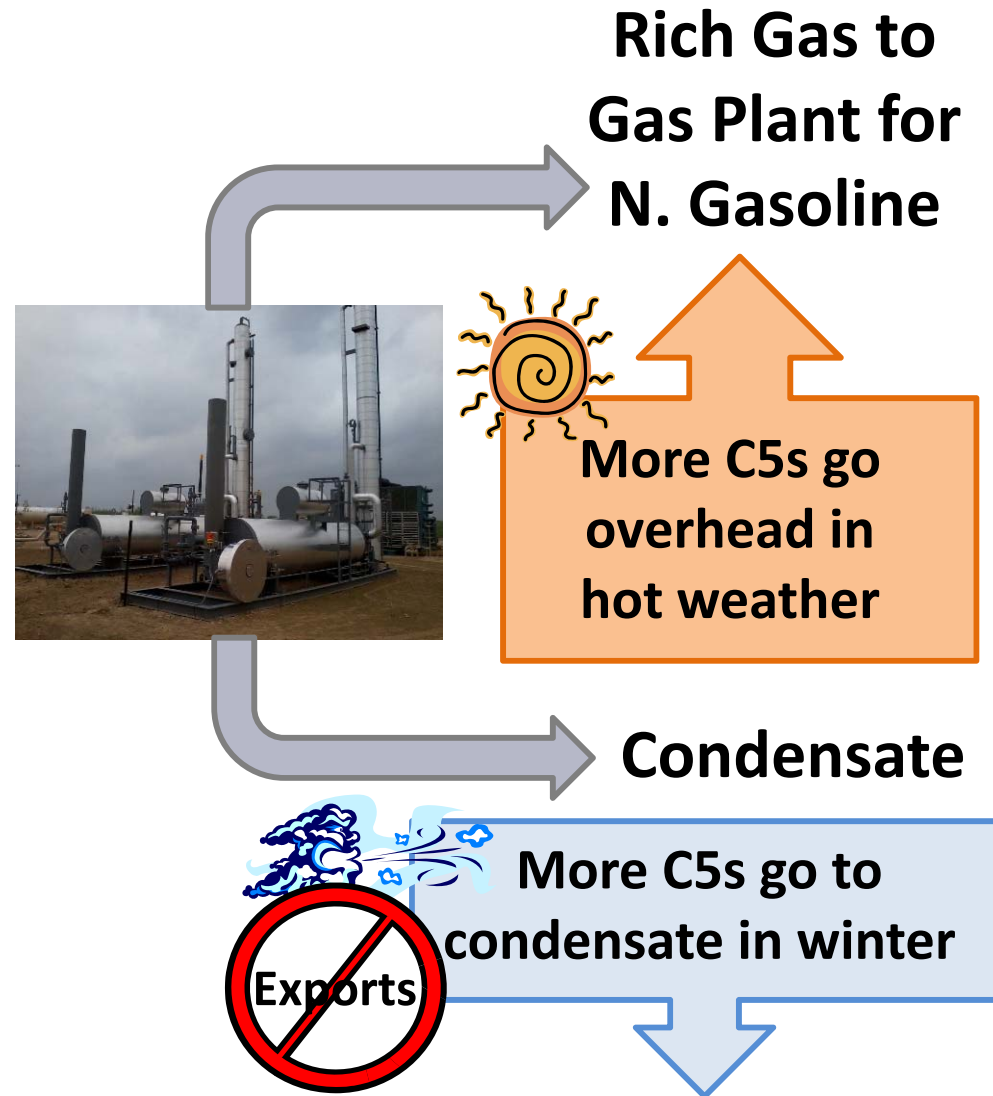
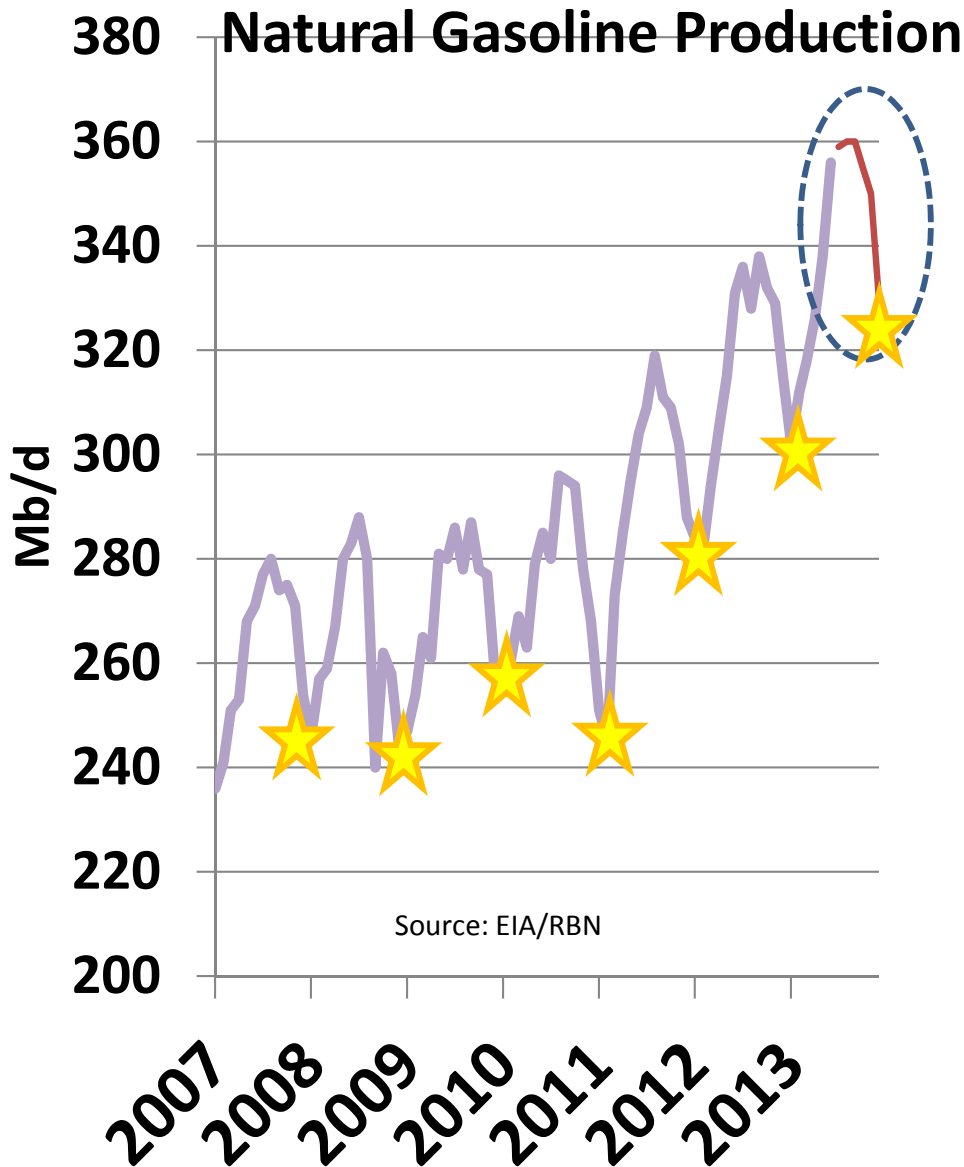
- » **Motor gasoline and diesel molecules can be exported to any non-sanction country, regardless of the needs of the U.S. market**



N. Gasoline/Condensate/Pentane+/Naphtha: "C5s"



Why Does Natural Gasoline Production Decline each Winter?



Molecule Laws #5 and #6



- » **Natural gasoline molecules can be exported to any non-sanction country, regardless of the needs of the U.S. market**
- » **Condensate molecules can only be exported to Canada, even if they are the exact chemical equivalent of natural gasoline, and would have been produced as natural gasoline had the weather been warmer**



North American Oil and Gas Infrastructure

Shale Changes Everything...



- » U.S. natural gas production continues at all time record highs, driven primarily by Appalachian supplies
- » Northeast surpluses will push gas out of the region, reversing traditional gas flows; Gas/LNG exports will relieve the general oversupply situation
- » NGL production will continue to increase with exports relieving the imbalances
- » U.S. crude oil production will grow to more than 10 MMb/d by 2018
- » New pipeline capacity will bring supplies to the Gulf Coast; rail will move supplies to the East and West Coasts; Domestic barrels will push out imports
- » The U.S. crude market could be up to 600 Mb/d out of balance between light and heavy crude by 2015 unless exports are permitted

North American Oil and Gas Infrastructure

Shale Changes Everything...



- » There is a common theme across natural gas, NGL and crude oil markets:
- » In a world of surplus, exports balance the market
- » Thus constraints on exports will result in market imbalances
- » Inconsistencies in export policies will create artificial arbitrage opportunities that will be exploited by some market participants



Free Our Molecules!



» All hydrocarbon molecules should be treated equally, regardless of race, creed or sexual orientation

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