Supply and Demand

Ohio Gas Association
2013 Market Conditions Conference

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Overview

PIRA Energy Group, founded in 1976 and based in New York City, is an international energy consulting firm specializing in global energy market analysis and intelligence.

PIRA's distinct advantage is in providing the most comprehensive, independent and commercially oriented energy data and research on short- and long-term supply and demand fundamentals and price.

Markets Covered:

- Crude Oil and Refined Products
- Natural Gas, NGLs, LNG
- Electricity and Coal
- Biofuels, Renewables, Emissions
- Agriculture

PIRA's Clients

More than 500 entities spread across some 60+ countries, including:

PIRA's Offerings

- Retainer client services – "baskets" of timely analytical reports, data sets, forecasts, and direct access to senior PIRA consultants
- Data streams focusing on demand, supply, refining, by-fuel prices, and more
- Multi-client studies on specific market topics of current relevance
- Project consulting that is customized to a client's need
- Seminars and client briefings
- Training on oil and gas markets

PIRA's North American Natural Gas Retainer Service

Keeps clients updated on U.S., Canadian and Mexican natural gas market developments, while providing ongoing fundamentals market analysis and intelligence. Includes:

- Monthly Gas Forecast
- Regional production and gas trade reports
- Weekly Gas Flash report
- Access to over 25 regional natural gas and NGL price forecasts for North America

Global LNG Service

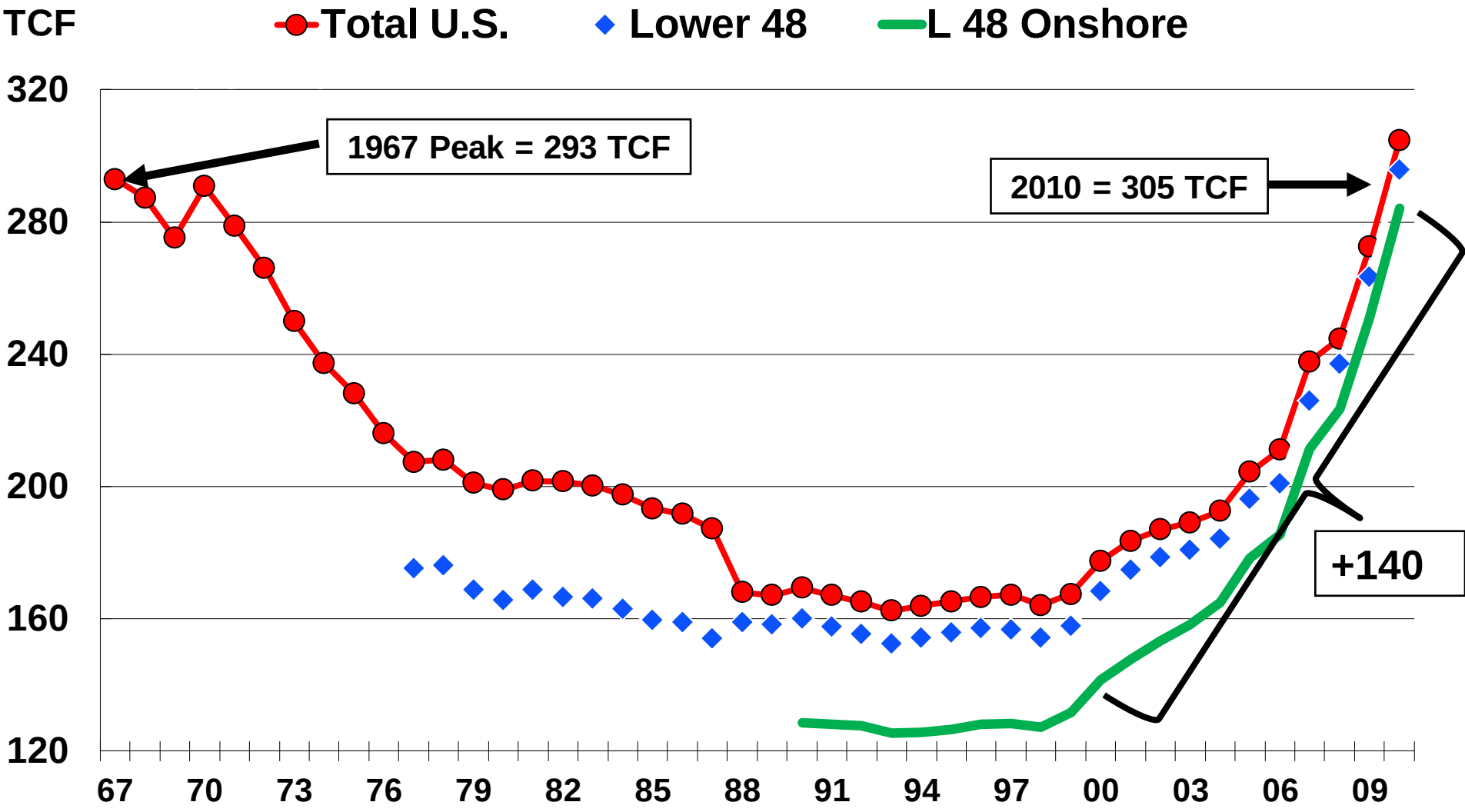
Provides a rigorous fundamentals analysis and intelligence of worldwide LNG markets. Includes:

- Monthly LNG Forecast
- Weekly LNG Fundamentals Scorecard
- LNG Sport Price Calculator
- Global LNG and Gas Database

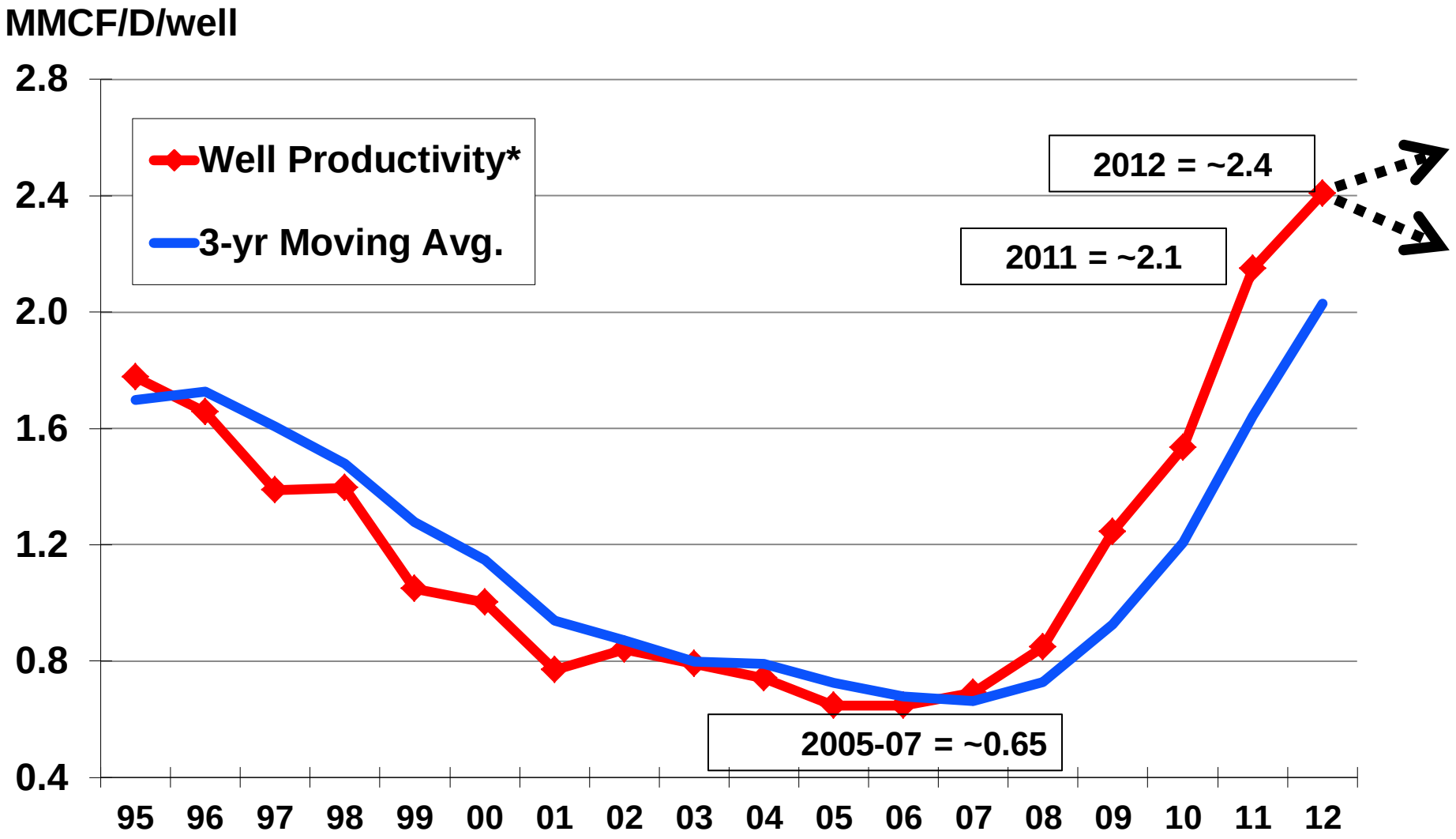
Current Multi-Client Studies on Natural Gas and LNG:

- "Gas Demand Implications of the Shale Revolution: Assessing the Building Blocks of North American Gas"
- "Liquefied Henry Hub: The Repercussions of North American LNG Exports at Home and Abroad"

Shale Production Barely Scratching Surface of Resource Potential — U.S. Now Supply Long



Lower 48 Onshore Gas Well Productivity Has More than Trebled in Recent Years



Based on 20% average annual decline rate.

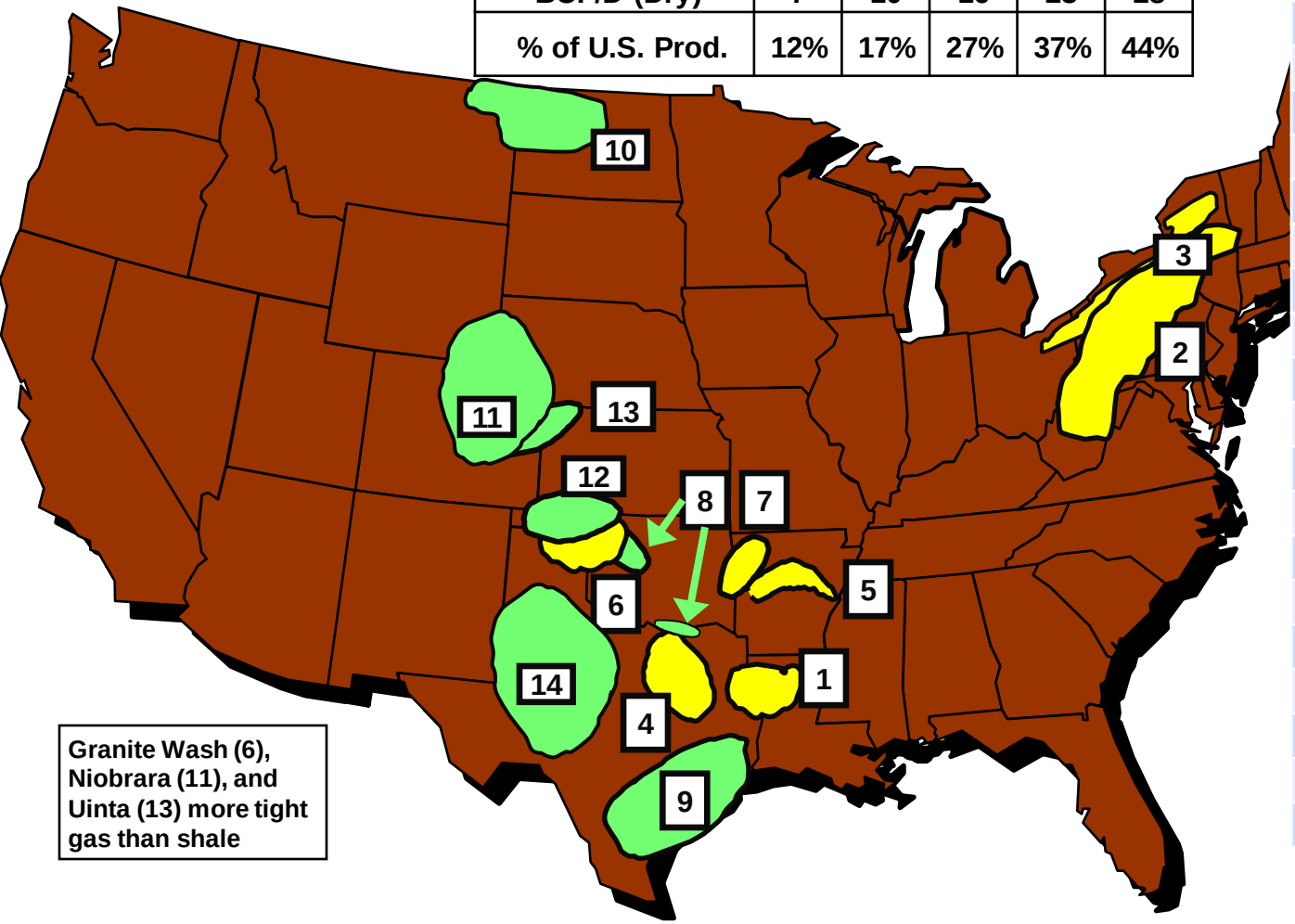
Lower 48 Shale Revolution Phase II: Oil Dominance Over Natural Gas

PIRA

Gas-Oriented

Oil -Oriented

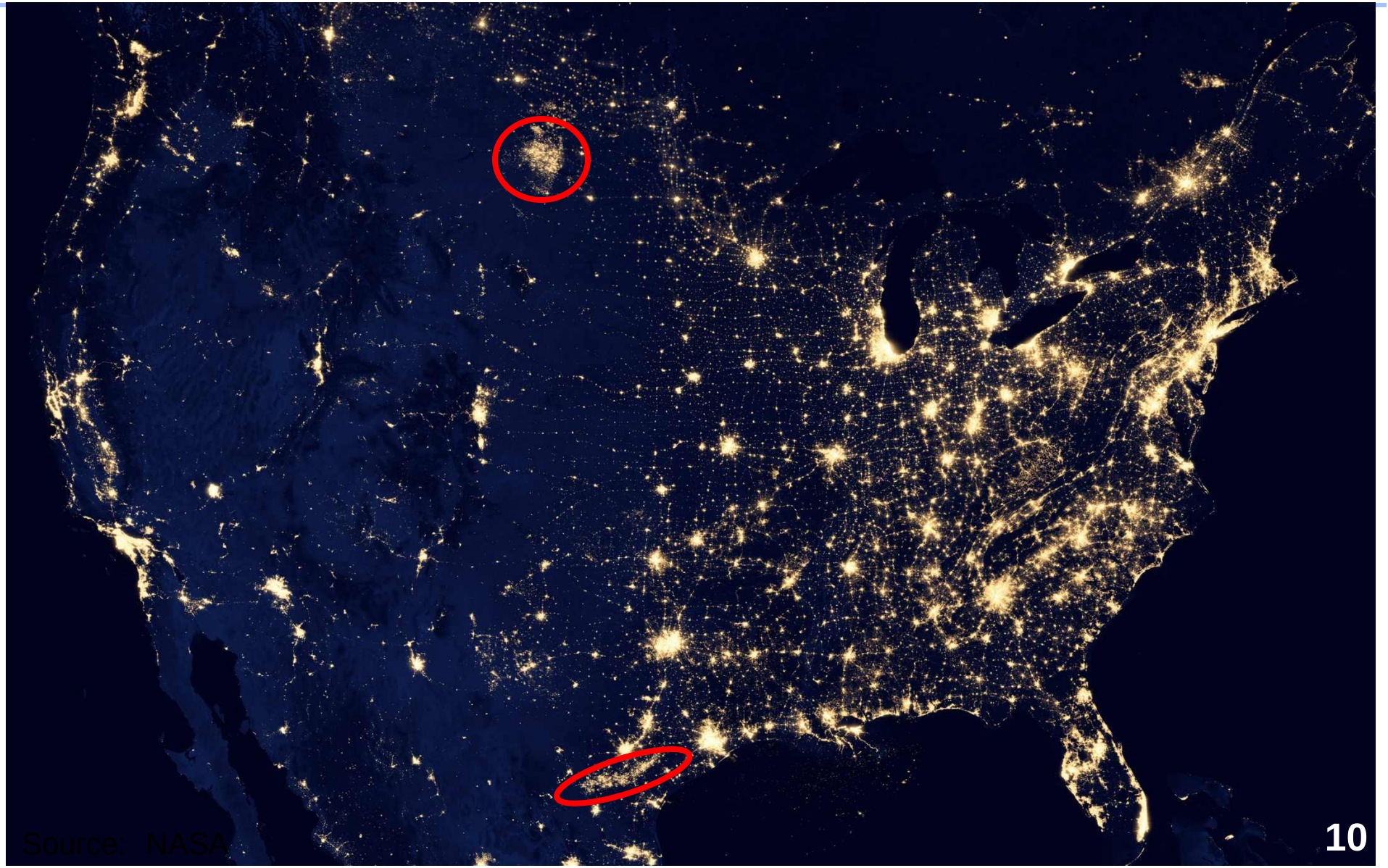
U.S. Shale Gas Production					
Annual Average	2008	2009	2010	2011	2012
BCF/D (Dry)	7	10	16	23	28
% of U.S. Prod.	12%	17%	27%	37%	44%



Granite Wash (6), Niobrara (11), and Uinta (13) more tight gas than shale

	Active Rigs: 7/11/13	Gas-Oil
	Unconventional: 1,178	395-783
1	Haynesville	38-1
2	Marcellus	77-0
3	Utica	20-6
4	Barnett	23-5
5	Fayetteville	14-0
6	Granite Wash	54-2
7	Woodford-Arkoma	2-0
8	Woodford-Other	0-53
9	Eagle Ford	113-96
10	Bakken	0-164
11	Niobrara	15-29
12	Miss. Lime	0-84
13	Uinta	5-22
14	Permian Group	6-318
	Bone Springs	3-54
	Clearfork	0-7
	Strawn/ Atoka	0-90
	Wolfberry	2-101
	Wolfcamp	1-50
	Wolffork	0-16

Bakken & Eagle Ford Flaring in 2012



Source: NASA

TRR Estimates Underpin the Market's Growing Optimism Regarding Future U.S. Gas Production

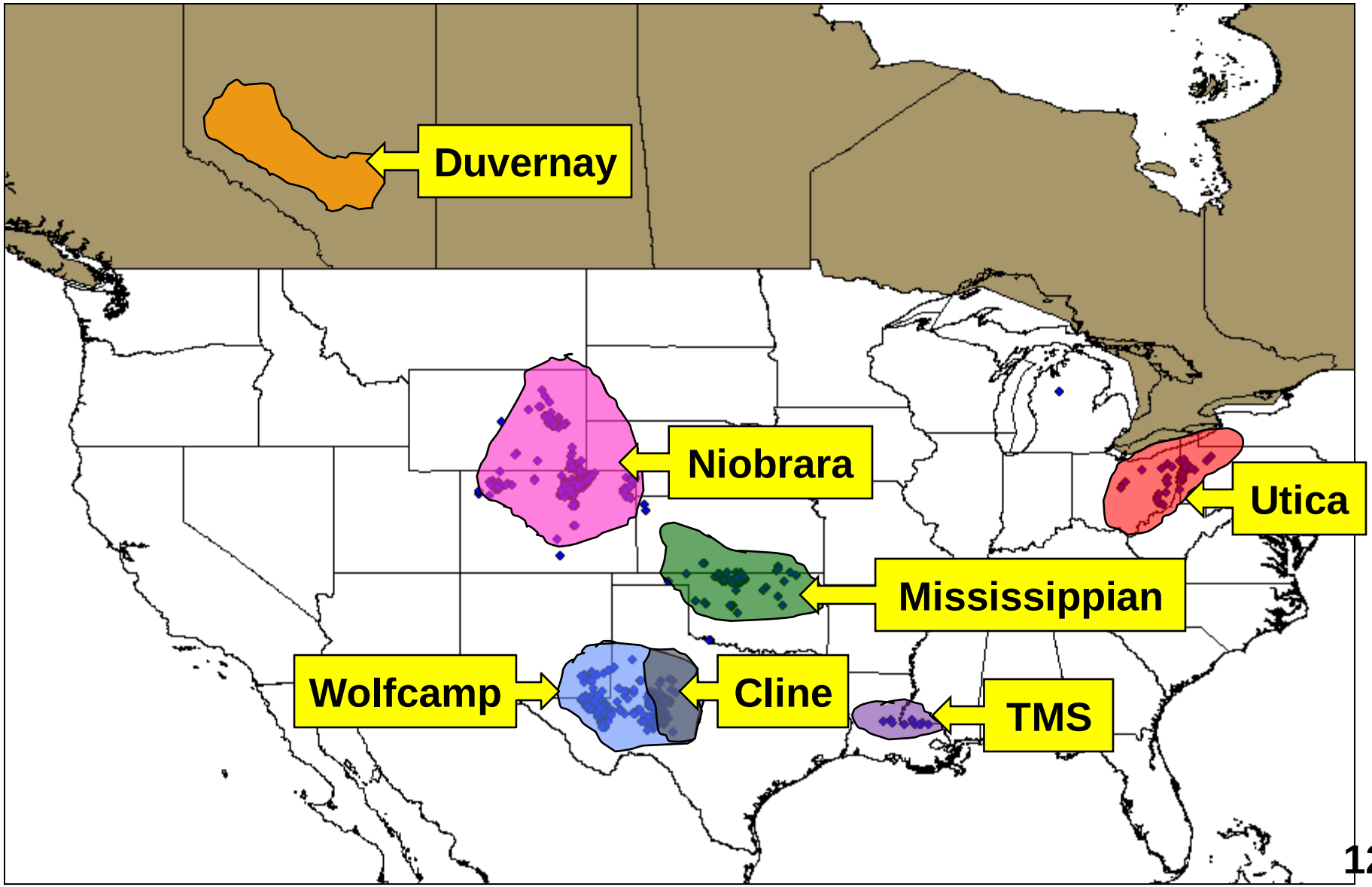
U.S. Natural Gas Technically Recoverable Resource (TRR) Estimates*

Estimate -TCF	Year	Total	Shale Only	Marcellus	Marcellus Percentage
NPC	2011	2,230	1,000	NA	NA
EIA: AEO	2011	2,543	862	410	48%
EIA: AEO	2012	2,203	542	141	26%
EIA: AEO	2013	2,335	637	148	23%
PGC	2013	2,700	1,073	335	31%

*TRR estimates include proven reserves .

National Petroleum Council (NPC)
Potential Gas Committee (PGC)

Emerging Unconventional Plays In North America

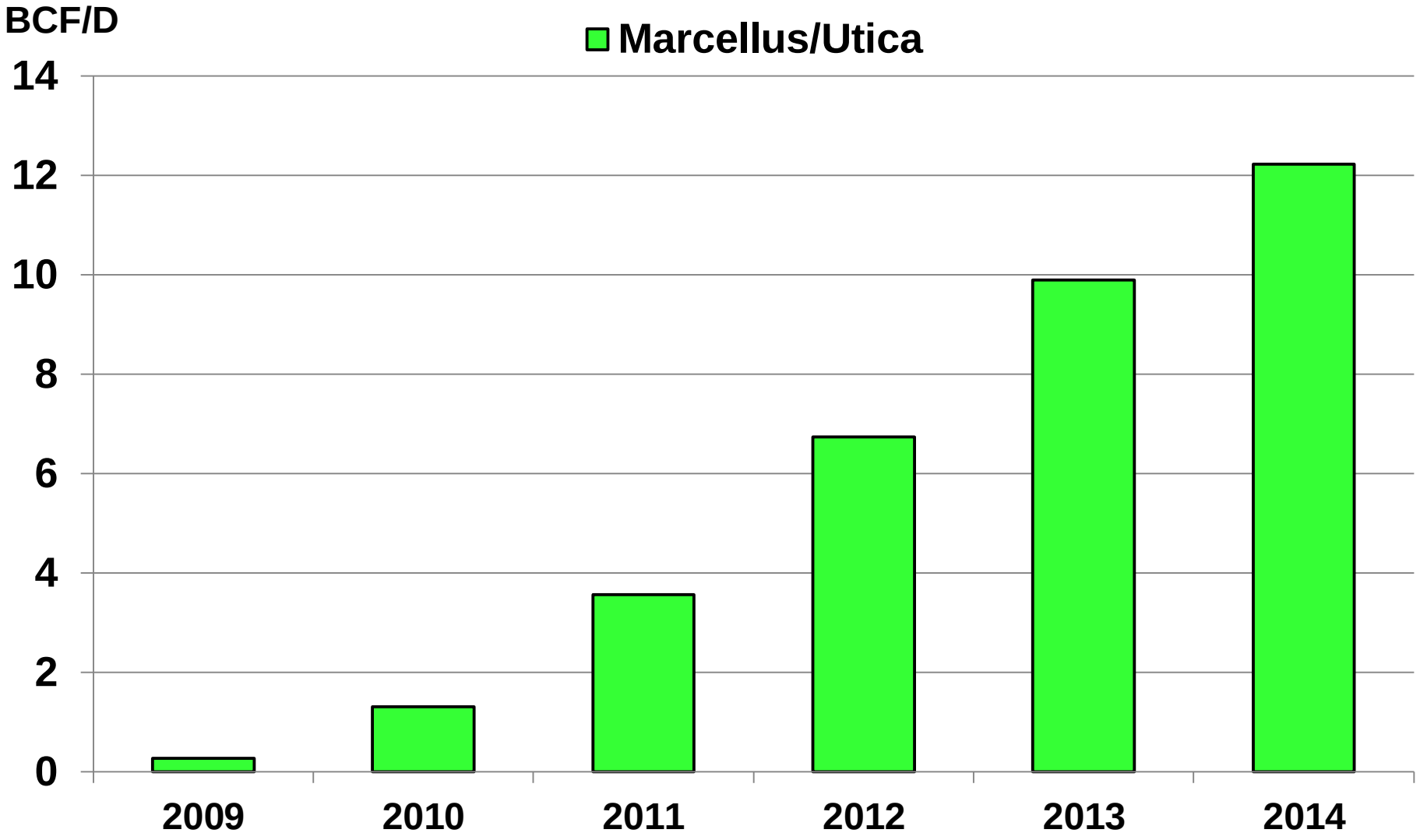


Key Supply Dynamics:

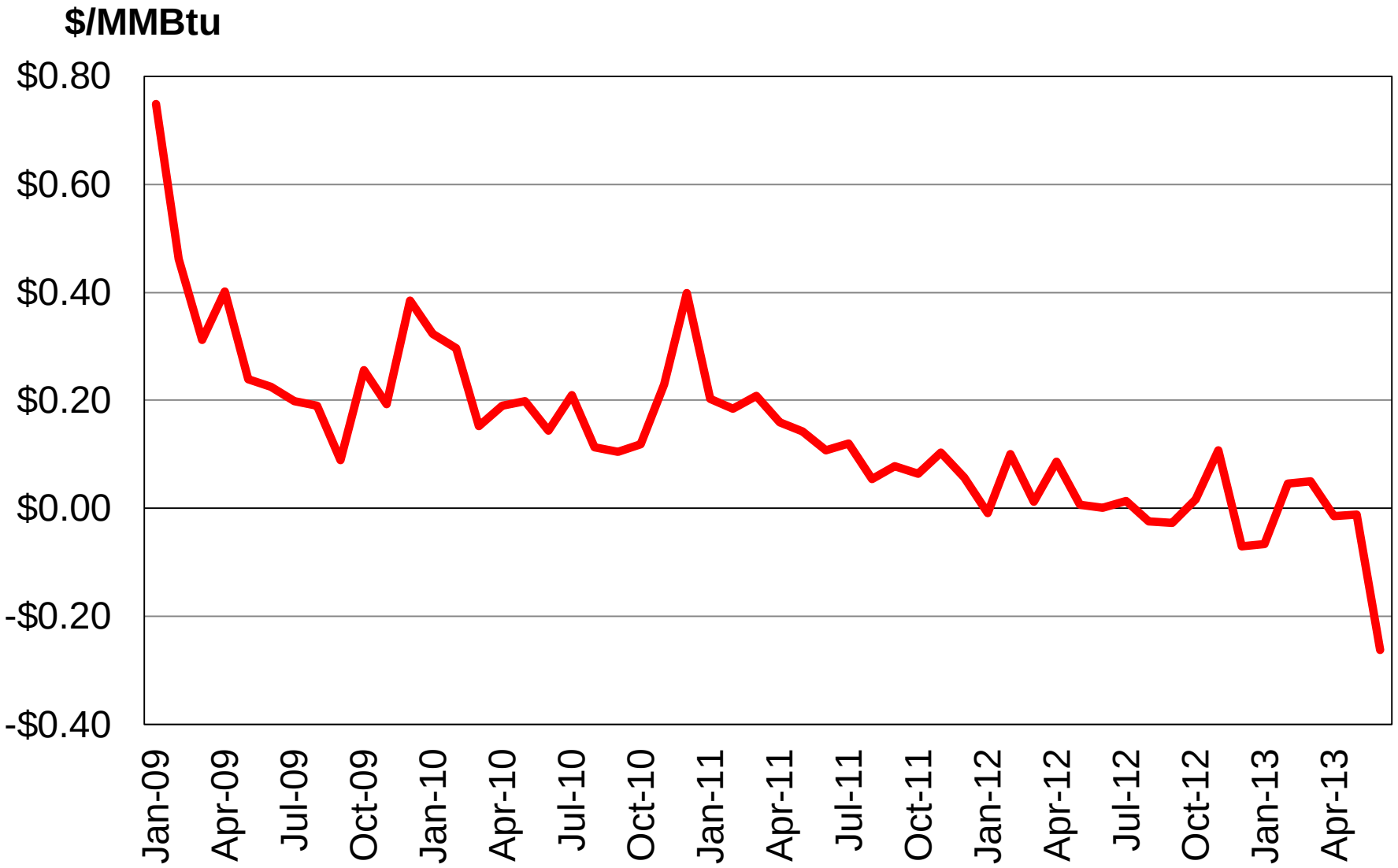
- **Supply Abundance No Longer in Question**
  - » Exploration risk replaced with development risks — IP/EUR variability
  - » Gas drilling efficiency and well productivity gains continue, but should be increasingly mitigated by growing focus on NGLs
- **Regulatory Uncertainty Still Looms**
  - » Demand and supply questions remain unanswered, including LNG
  - » Some concerns about hydraulic fracturing water disposal

- **Post 2013 through Mid-Decade**
  - » Given modest demand upside, little-to no room for higher-cost dry gas
  - » Associated gas and NGL-rich plays will remain preferred targets
- **Mid-Decade through Next Decade**
  - » Demand-side game changers: transportation + LNG exports
  - » Gas price advantage relative to oil narrows
  - » Demand curve shift will support return to higher-cost dry gas plays

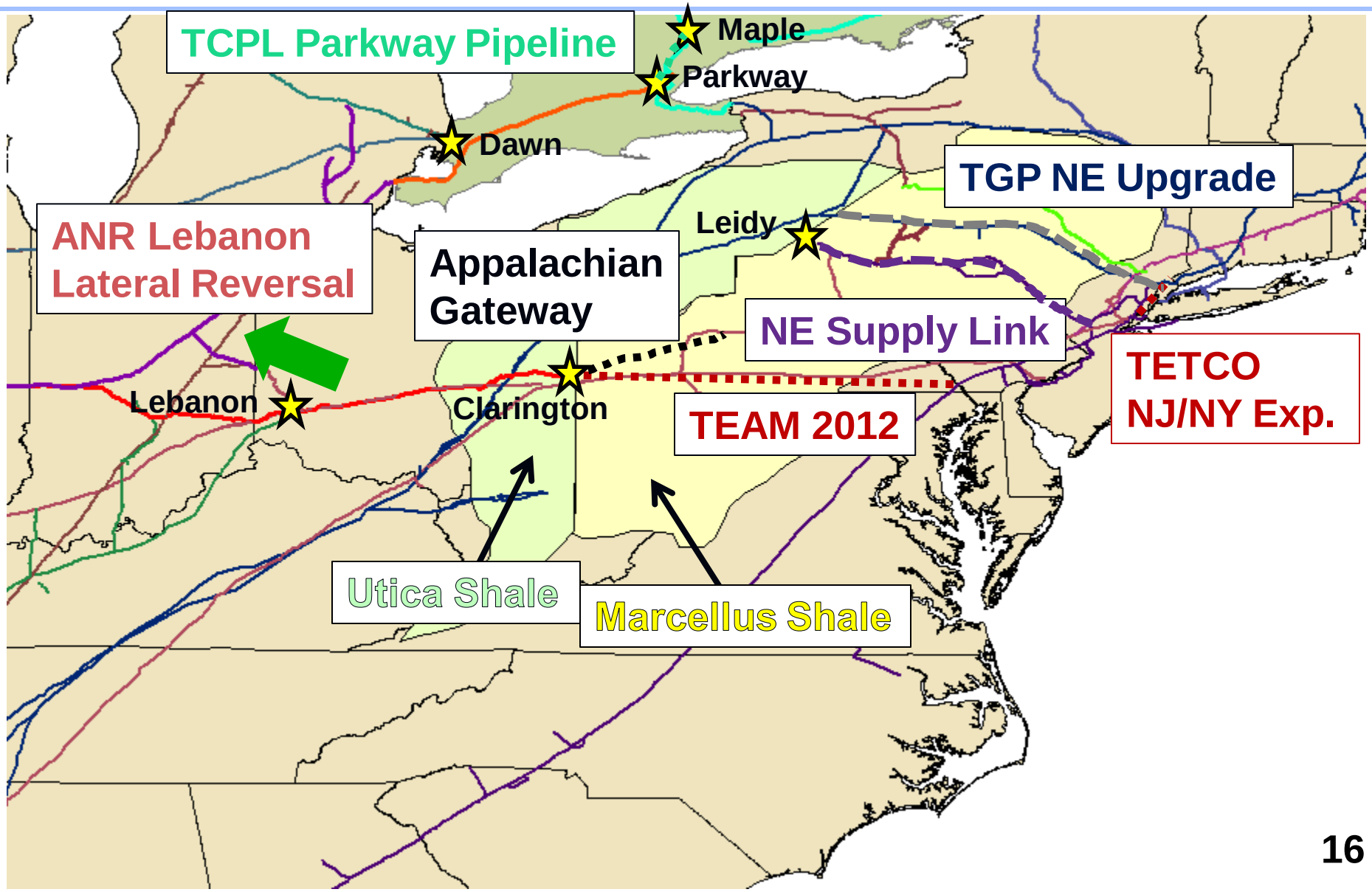
Marcellus Shale Growth Raises Supply Push Pressures Beyond Northeast



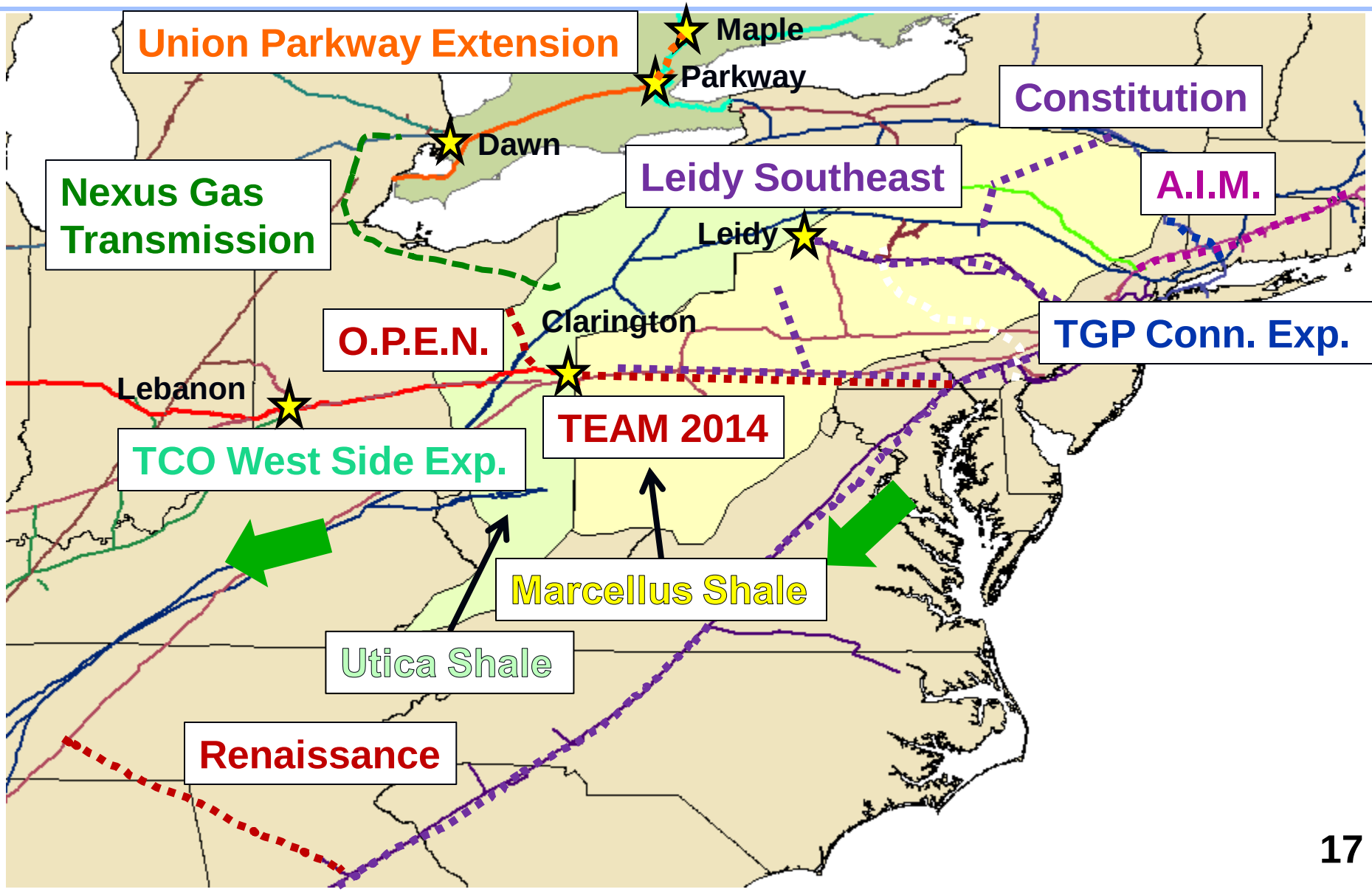
Monthly Dominion Basis



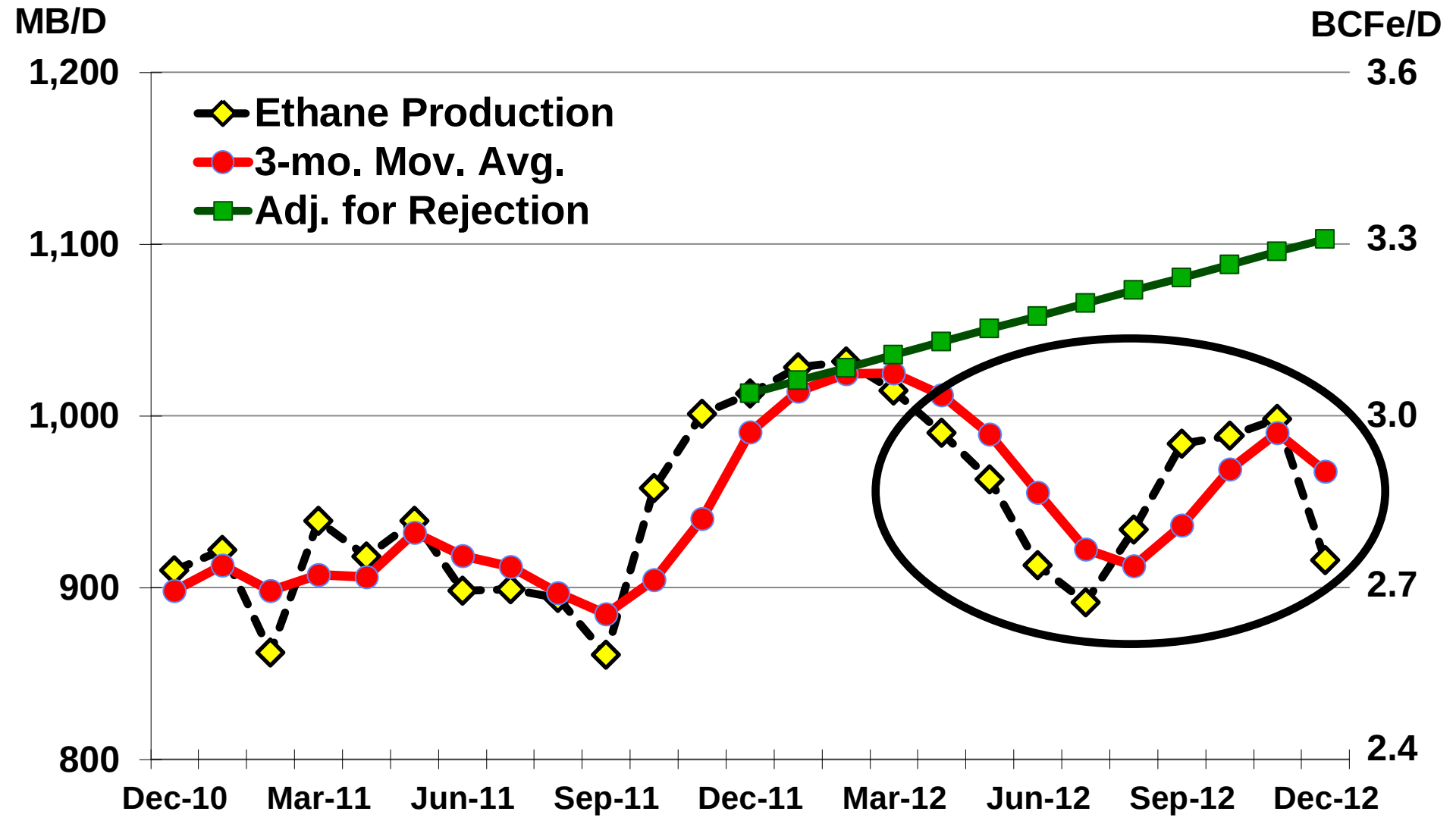
Major Marcellus/Utica Pipelines Scheduled for 2012/13



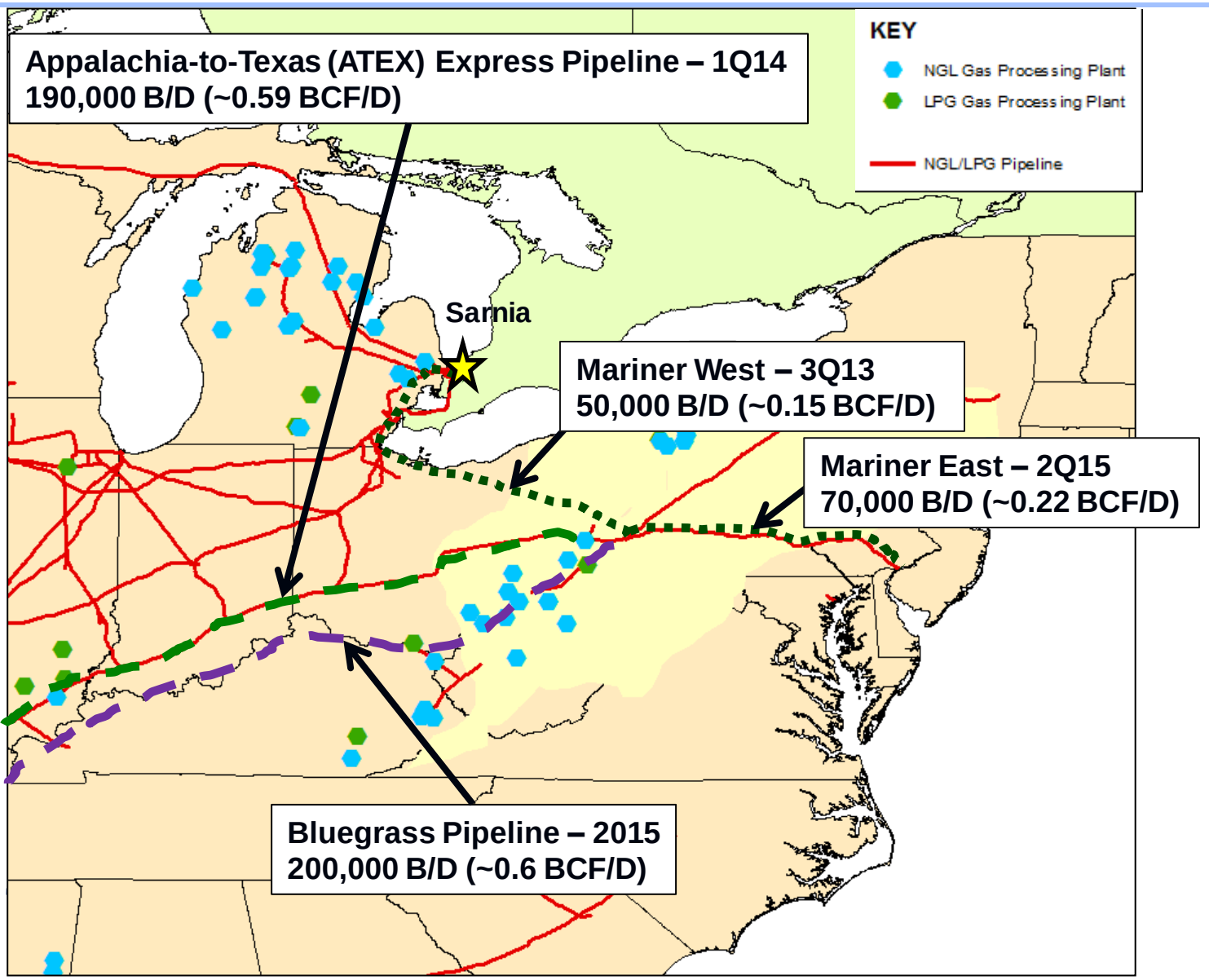
Major Marcellus/Utica Pipelines Scheduled for 2014/16



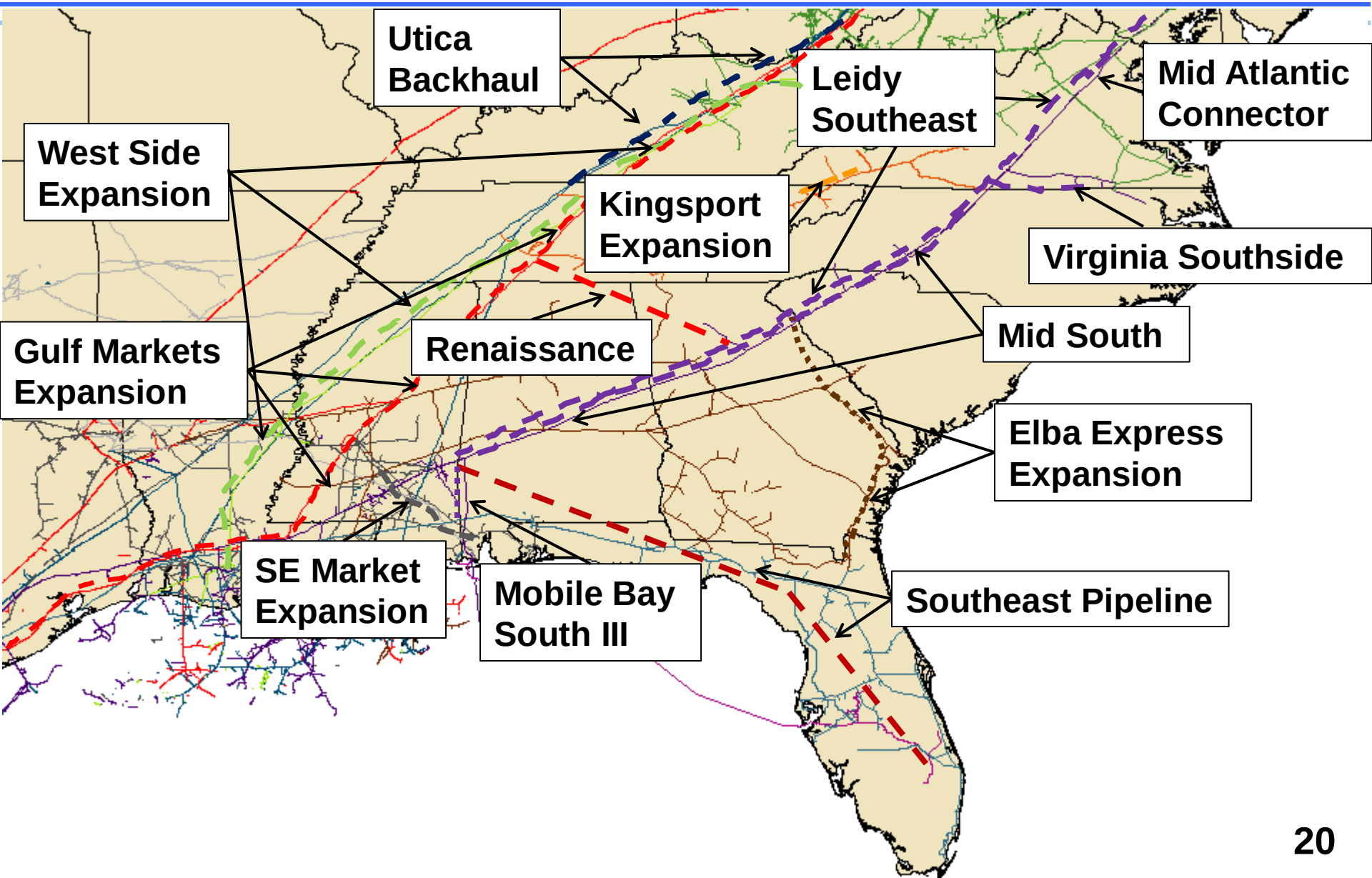
Weak Extraction Margins Lifts Ethane Rejection, Inflating Lower 48 Gas Production by ~0.6 BCF/D



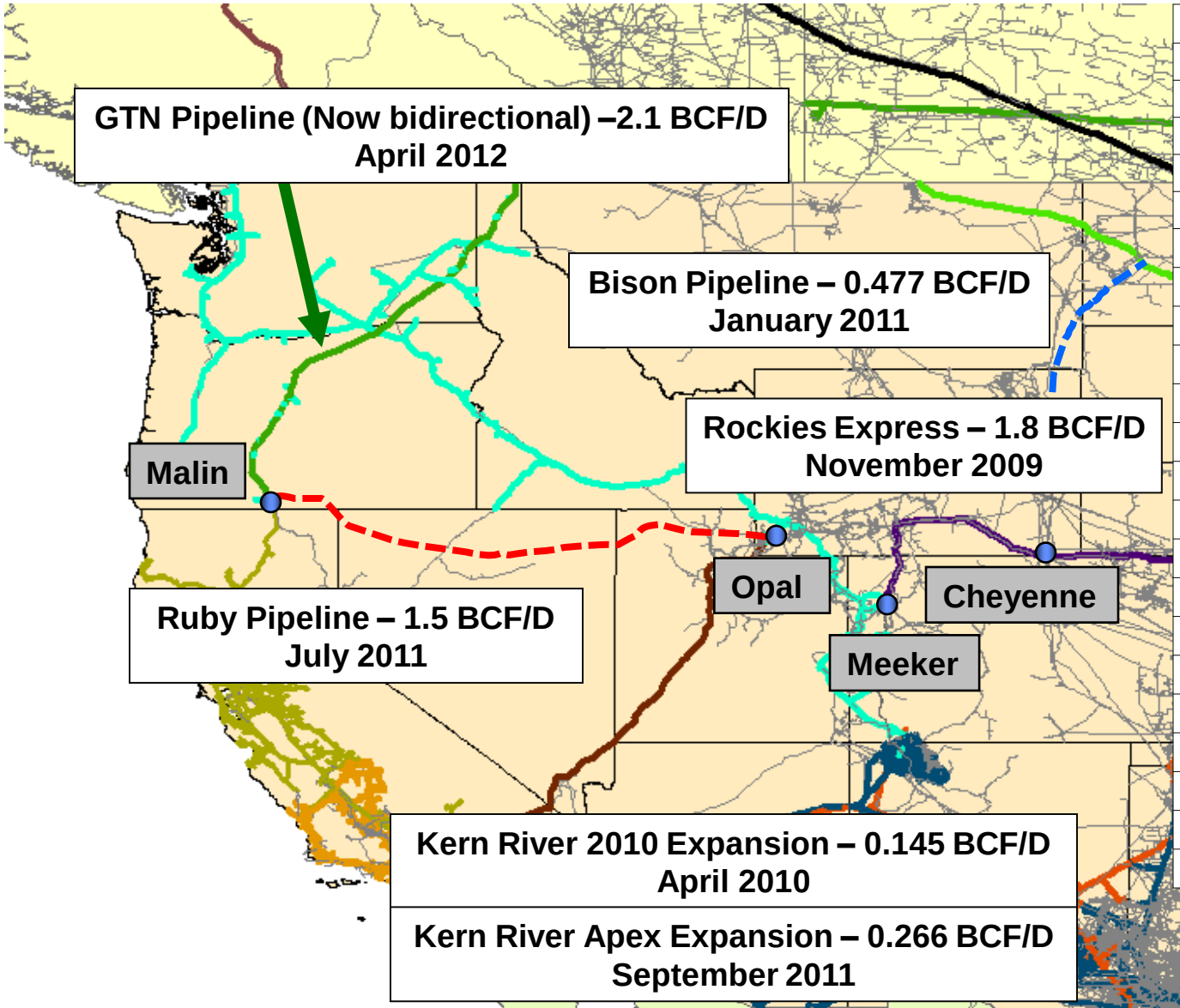
Proposed Marcellus Ethane/NGL Pipelines



Proposed Southeastern Gas Pipeline Expansions



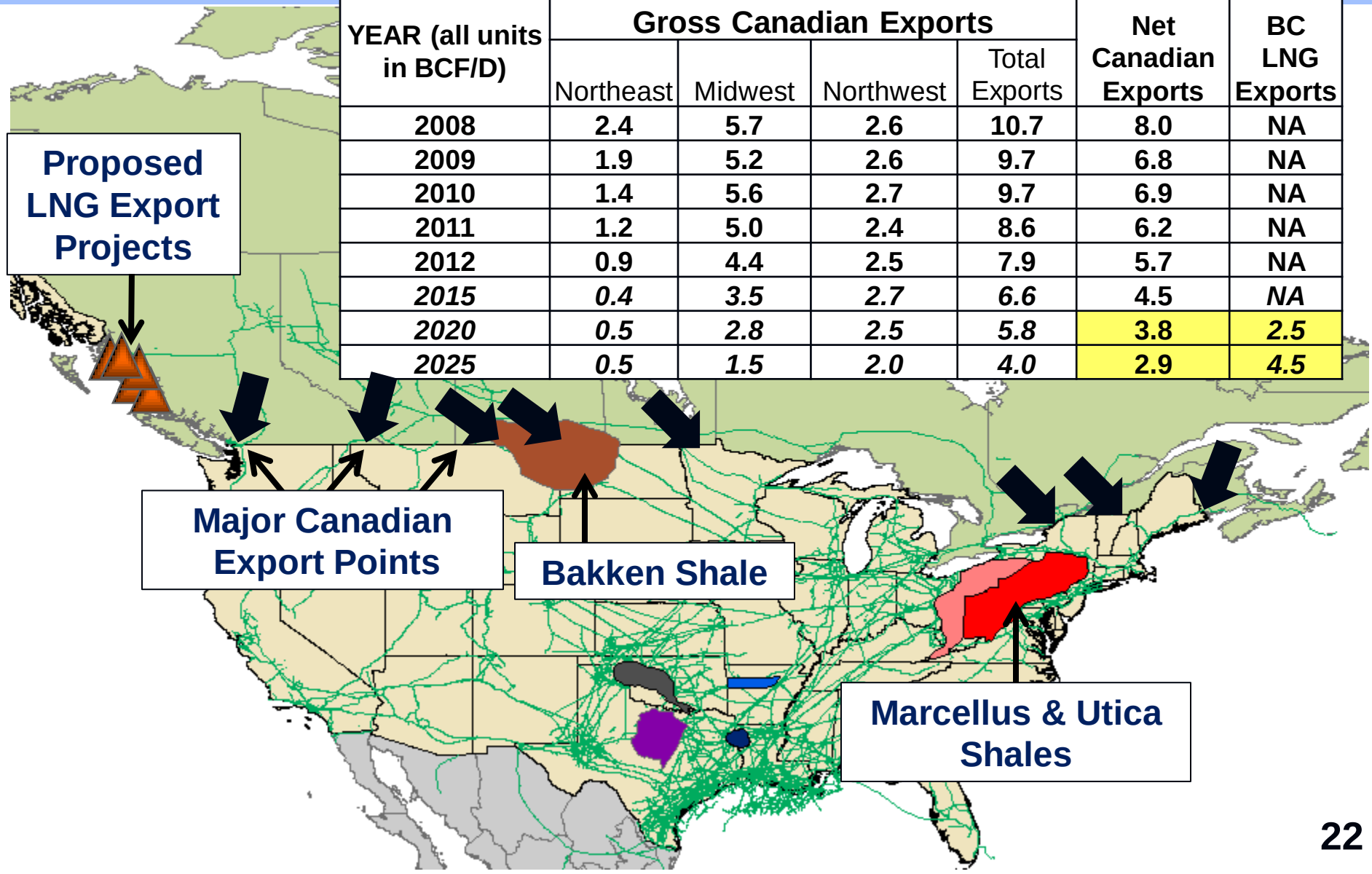
The Rockies Continues as Swing Supply with Exports to the West Greater Than the East (MW/NE)



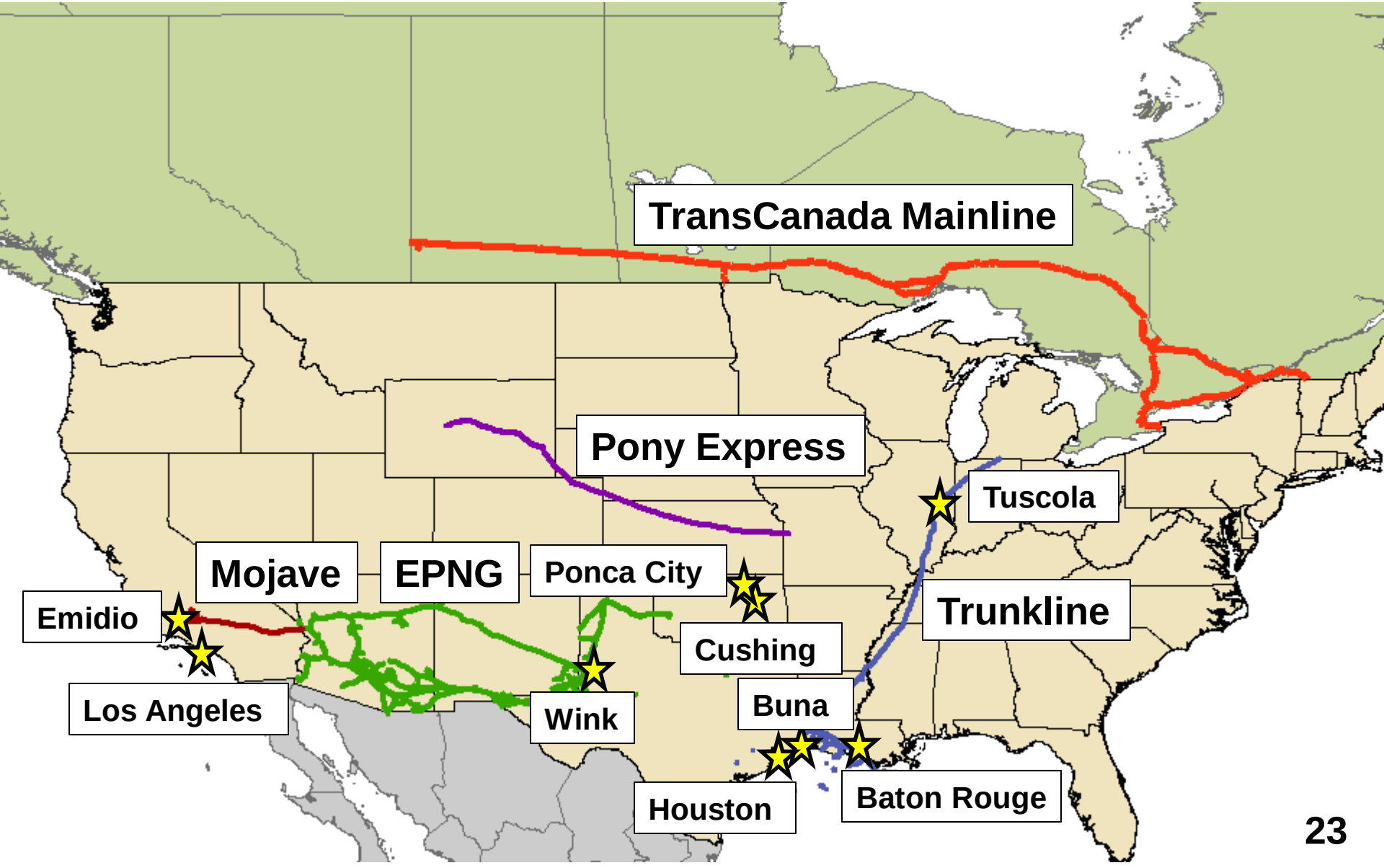
Rockies Production (BCF/D)		
2011	East	West
Oct	4.15	3.52
Nov	2.75	4.18
Dec	2.68	4.02
Jan 2012	2.81	4.40
Feb	2.82	4.22
Mar	3.27	4.08
Apr	4.01	3.79
May	3.97	3.57
Jun	3.93	3.41
Jul	4.14	3.37
Aug	3.78	3.41
Sep	3.38	3.59
Oct	2.97	3.89
Nov	2.83	4.08
Dec	2.32	4.35
Jan 2013	1.96	4.11
Feb	2.16	4.25
Mar	2.95	3.70
Apr	3.51	3.22
May	3.46	3.39
Jun	3.14	3.73

Canadian Production Growth: LNG or Bust?

YEAR (all units in BCF/D)	Gross Canadian Exports				Net Canadian Exports	BC LNG Exports
	Northeast	Midwest	Northwest	Total Exports		
2008	2.4	5.7	2.6	10.7	8.0	NA
2009	1.9	5.2	2.6	9.7	6.8	NA
2010	1.4	5.6	2.7	9.7	6.9	NA
2011	1.2	5.0	2.4	8.6	6.2	NA
2012	0.9	4.4	2.5	7.9	5.7	NA
2015	*0.4*	*3.5*	*2.7*	*6.6*	4.5	*NA*
2020	*0.5*	*2.8*	*2.5*	*5.8*	3.8	*2.5*
2025	*0.5*	*1.5*	*2.0*	*4.0*	2.9	*4.5*



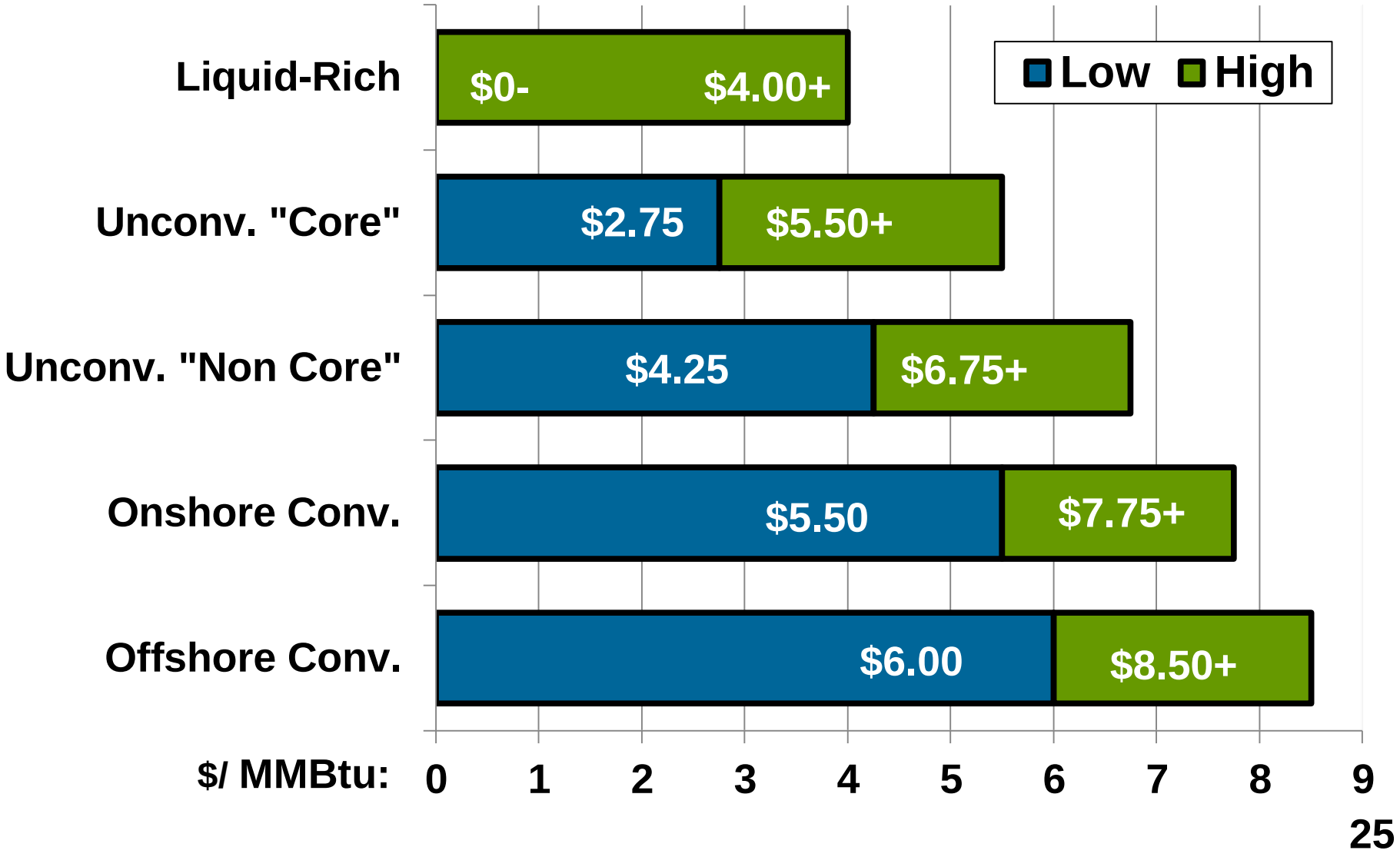
Four Potential Gas-to-Oil Pipeline Conversions



North American Gas Market

Demand Opportunities & Pricing

Hierarchy of North American Gas
Full Cycle Costs Decidedly in Favor of Shale



North American Natural Gas Market
Longer-Term Outlook

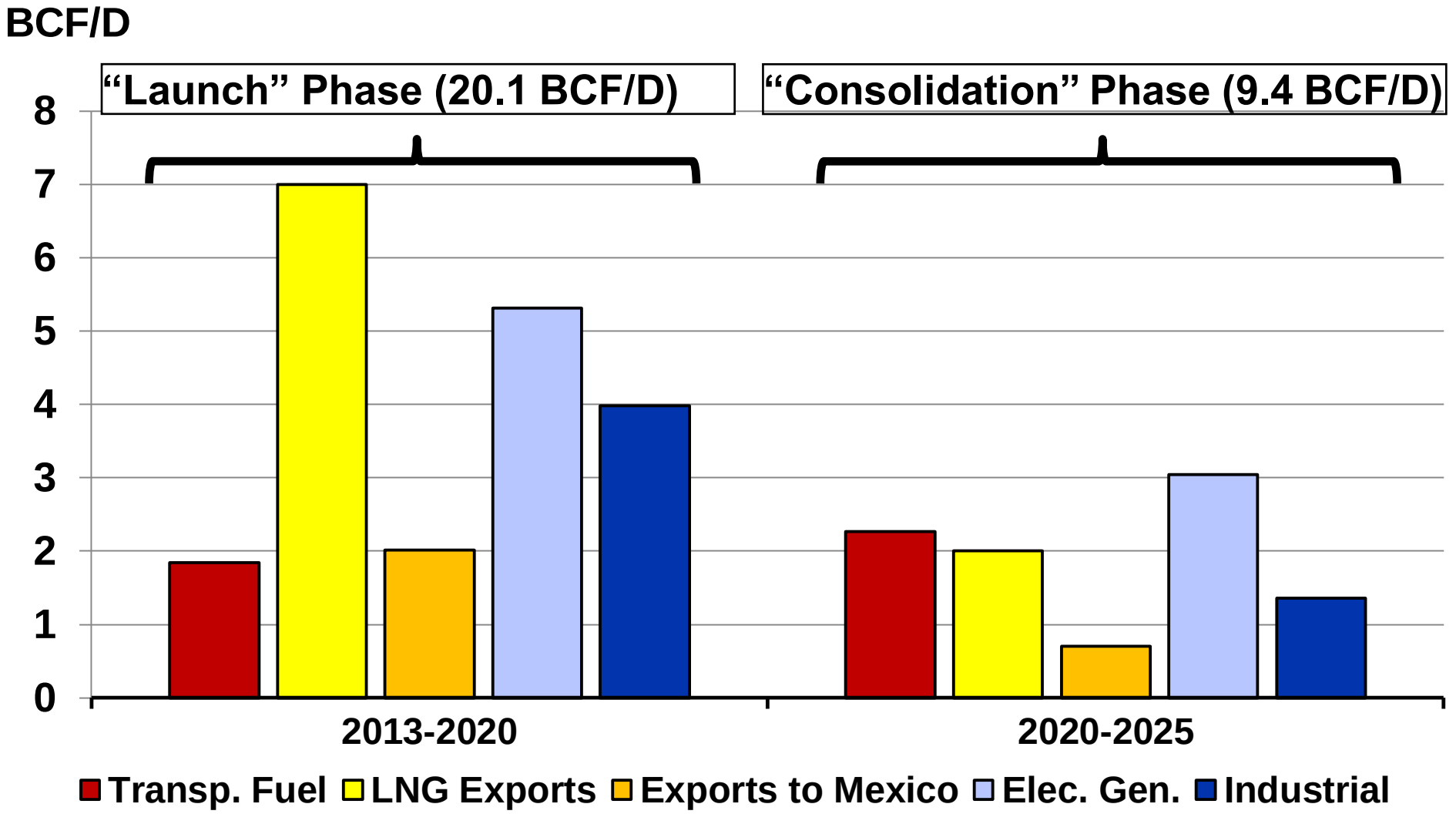
2014 through Mid-Decade

- Coal-to-Gas Still at the Margin, But Role Diminishing
- Modest Structural Demand Growth
- Little Room for Higher-Cost Dry Gas

Mid-Decade through 2025

- Five Gas Demand Building Blocks
- Demand Growth Requires Higher-Cost Dry Gas
- Key Wildcards: New Plays/Higher Gas Supply Recovery Rates
- Gas Still Steeply Discounted Relative to Oil
- Call on U.S. Production and Price Implications:
  - Changing mix of Lower 48 gas deliverability and breakeven costs
  - Impact of *Launch Phase* demand surge on production at the margin

U.S. Gas Demand Building Blocks Expected To Expand In Divergent Phases, 2013-2025



Demand Growth "Building Blocks" Will Drive Future North American Gas Price Risks

Non-Traditional Building Blocks

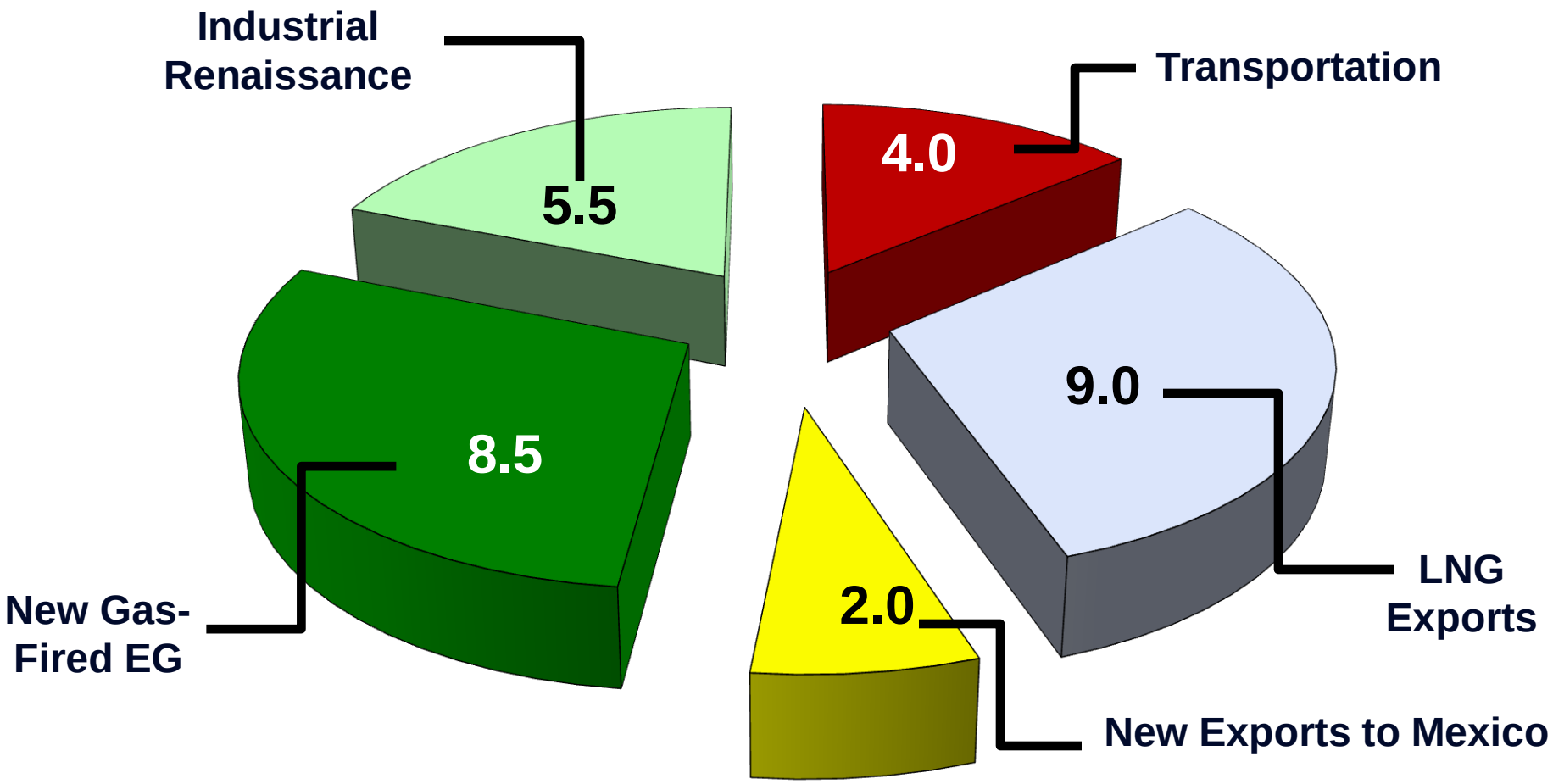
- Natural Gas Vehicles (NGVs)
- LNG Exports
- New Exports to Mexico

Traditional Market Building Blocks

- New Gas-Fired Electric Gen. (EG)
- Industrial Renaissance

How Will Gas Demand Growth "Building Blocks" Drive Future North American Gas Price Risks?

U.S. 2013-2025 Sum = 29 BCF/D (~10 TCF/Yr.)*



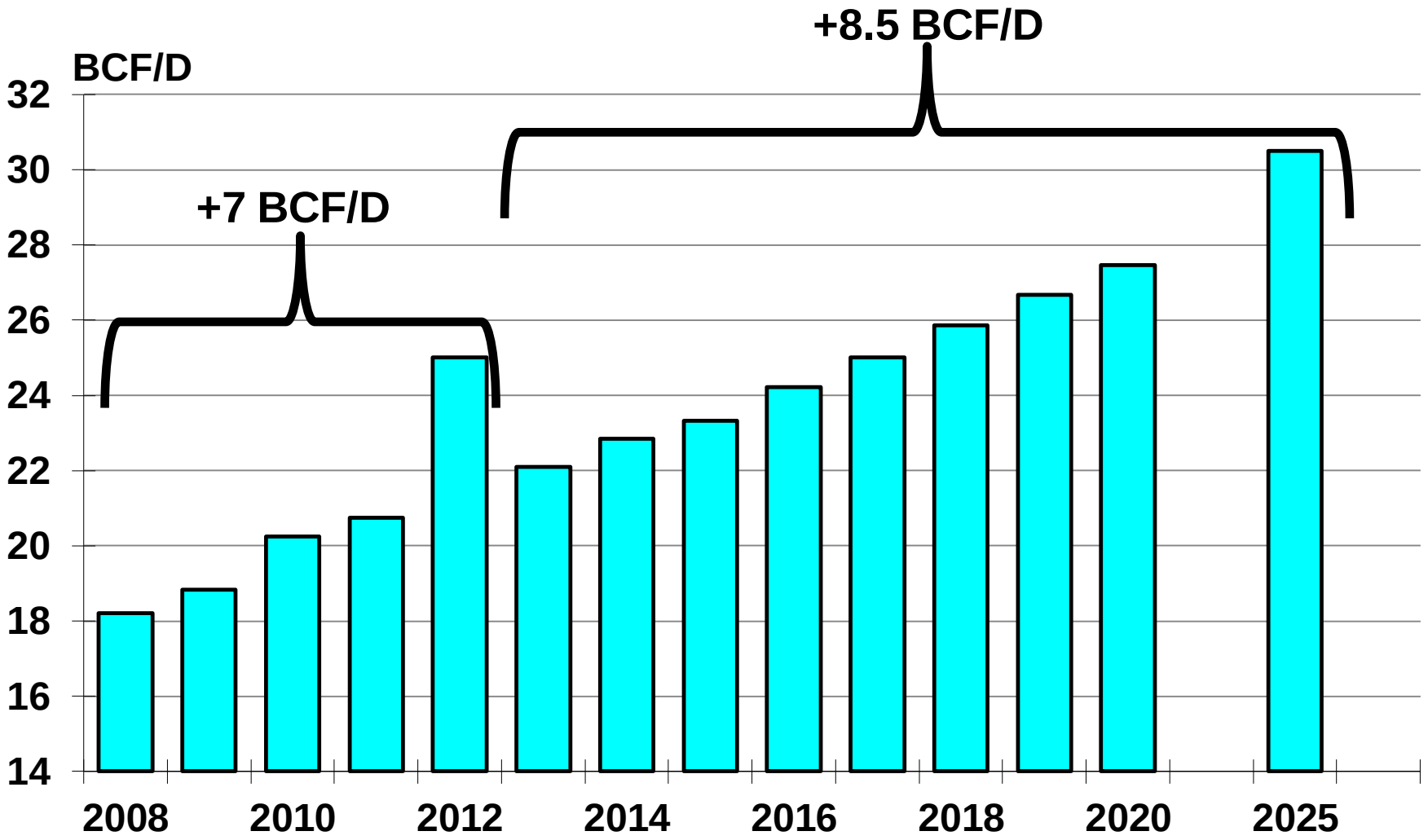
*PIRA Pre-Study Reference Case

Projections rounded.

Market Response Underway – But Slow

Activity	Status
Coal retirements	Accelerating
Gas intensive industrialization	Momentum building
Increased exports to Mexico	Starting to grow
LNG exports to oil linked markets	First under construction, post-2015
Use of gas in transportation	Private initiatives promising & state support
Conversion of gas to liquids (GTL)	Proposed $21 billion plant in LA

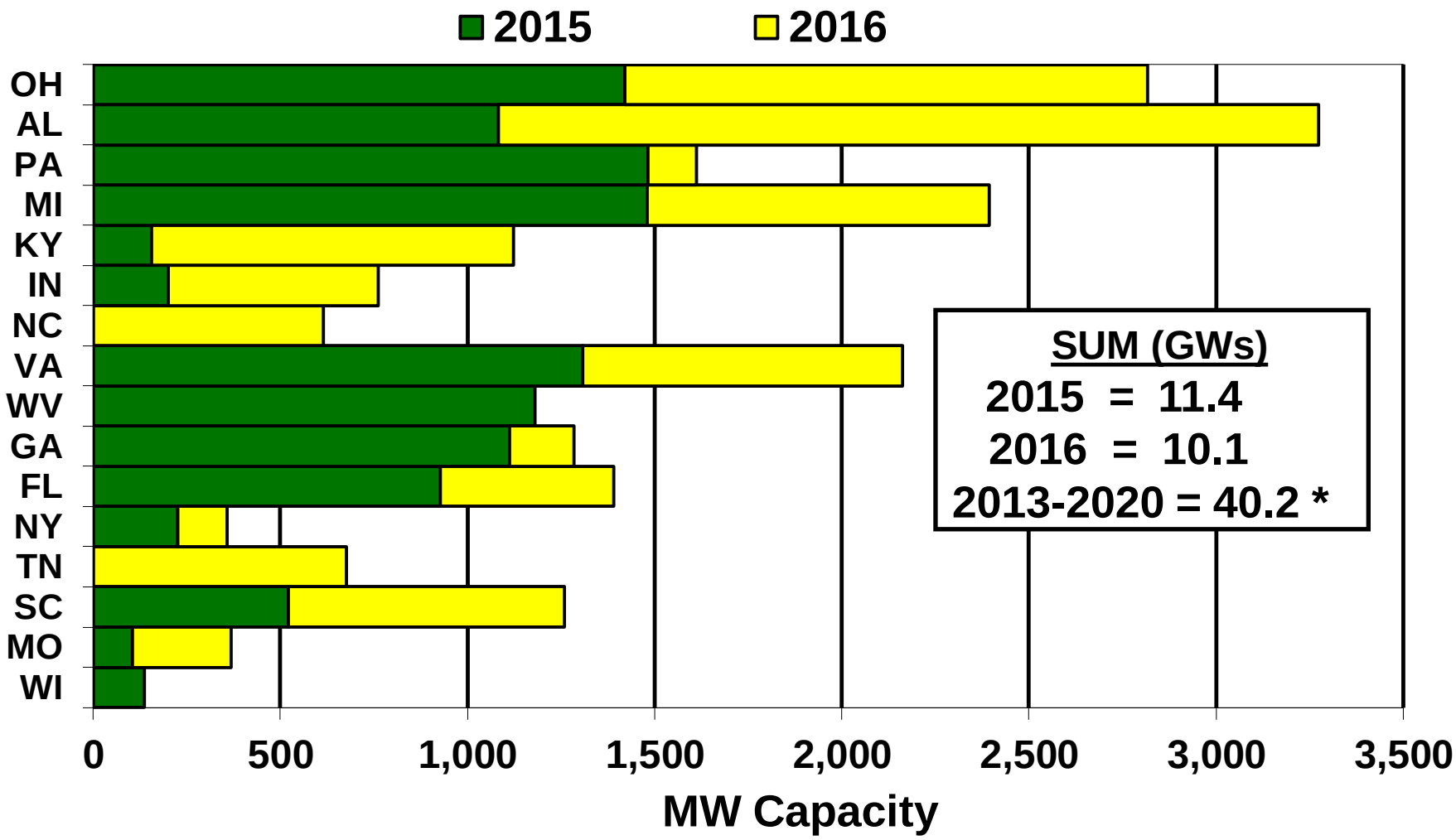
Gains From Coal-Fired EG in 2012
"Borrowed Gas Growth from the Future"



U.S. Gas-Fired Power Generation – the Leading Driver of Gas Demand, Ex. LNG Exports

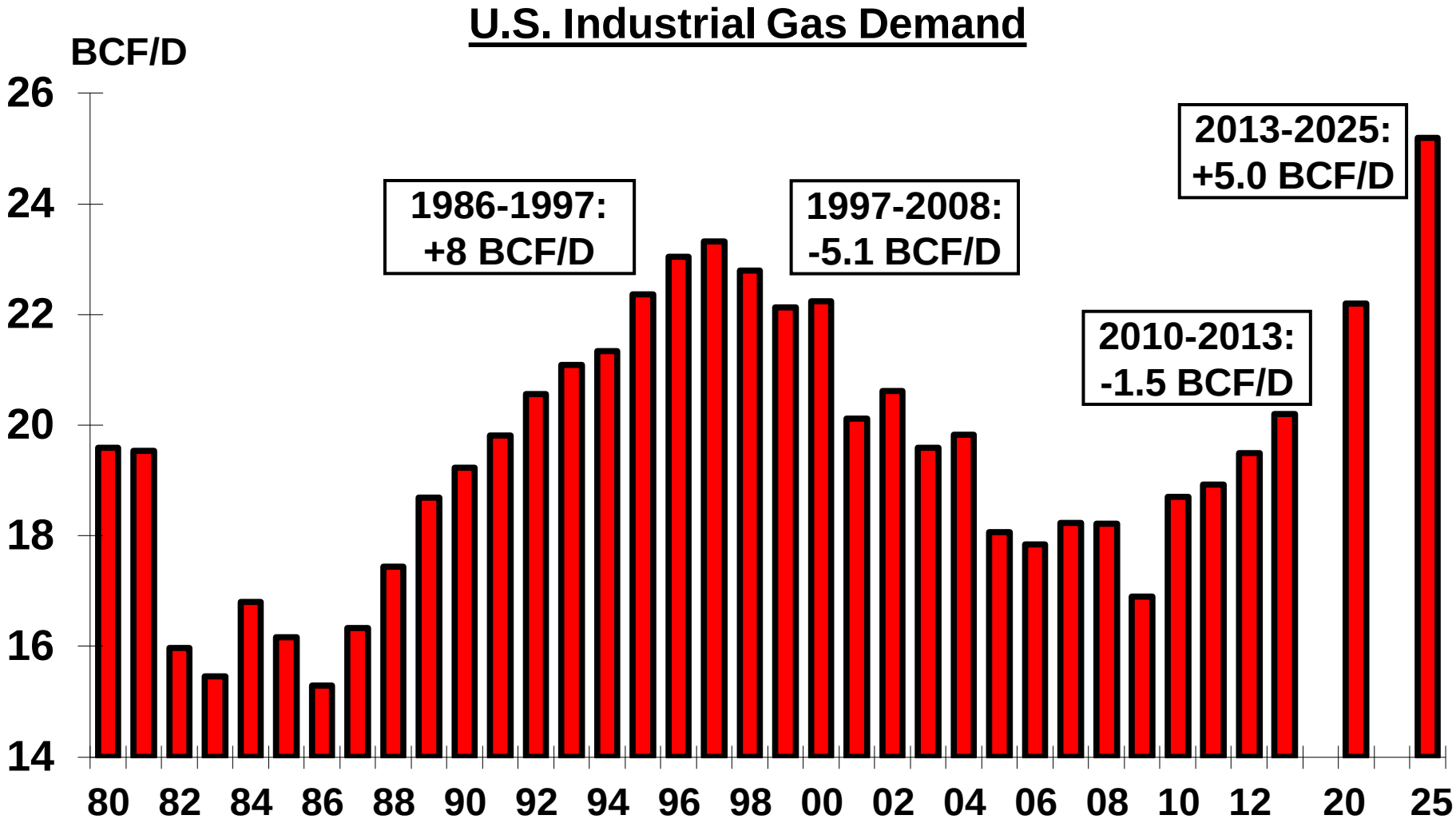
- **Most dynamic market for gas – competition with other fuels on a real-time basis in generation dispatch**
  - » Gas CCGTs more economic than nuclear or coal
  - » ~$1,000 per KW (~$2,000 in NE and PAC) vs. $3,000-3,500 for coal and ~$5,000 per KW or more for new nuclear capacity
- **Attrition of coal fleet inevitable as tightening environmental regulations and public opposition impact aging plants**
- **Obama Climate Action Plan not specific as yet, but continuing uncertainty for coal assured**
- Two dimensions of gas demand growth:
  - » CCGT capacity build to replace retiring coal units
  - » CCGT utilization, dependent on future competition in dispatch – and thus on gas prices and CO_2 costs

U.S. EG Capacity Retirements of Appalachian Coal Burning Units Intensive in 2015-16



*From YE 2013 - YE 2020 = ~4.5 BCFe/D @ 65% LF/ 175 MMCFe/D per aGW.

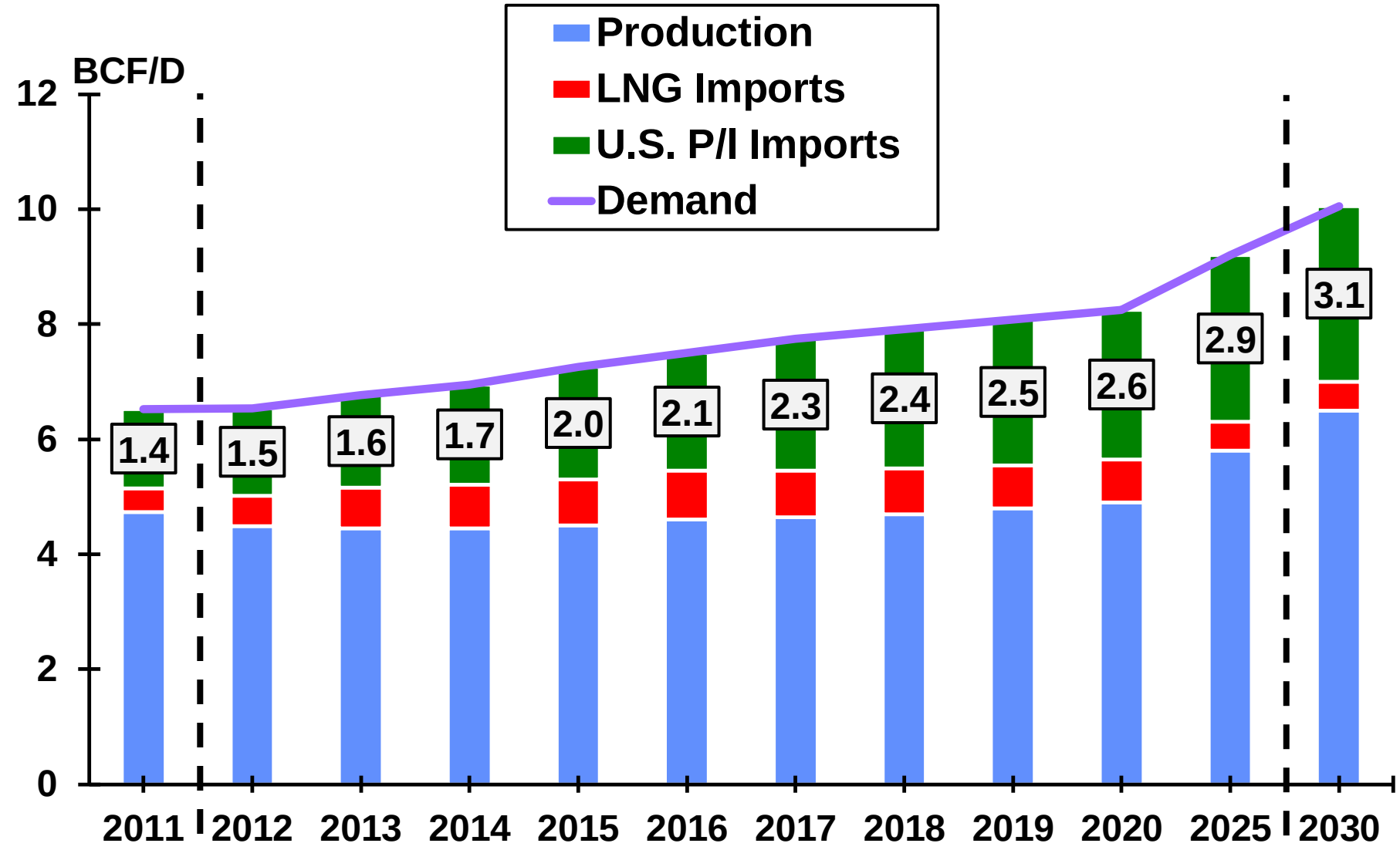
Industrial Gas Growth: Will History Repeat Thanks to Shale-Driven Gas Price Advantage?



New Large U.S. Industrial Facilities Will Simulate Post-2015 Gas Demand

- **Steel Industry Expansion**
  - Nucor Steel $3.4 billion steel plant in Louisiana, phase I to be completed later this year
  - Vallourec & Mannesmann $700 MM steel tube plant in Ohio
  - U.S. Steel $46 MM steel plant in Pennsylvania
  - Tenaris $1.3 billion steel pipe plant in Texas
- **Ethylene Crackers and Petrochemical Expansion**
  - Shell $2 billion cracker and downstream petrochemicals in PA
  - Dow Chemical ~$4 billion to re-open cracker, construct new cracker and propylene plants in Gulf Coast
  - Chevron Phillips $5 billion ethylene cracker and downstream petrochemicals in Texas
  - ExxonMobil moving ahead with new ethylene plant and two polyethylene units in Texas
  - Valero to build $700 million methanol plant near New Orleans
  - Sasol to spend $5-$7 billion on 1.5 million pounds per year ethane cracker in LA
  - Occidental Chemical, Formosa Plastics, Lyondell also with ethylene crackers plans

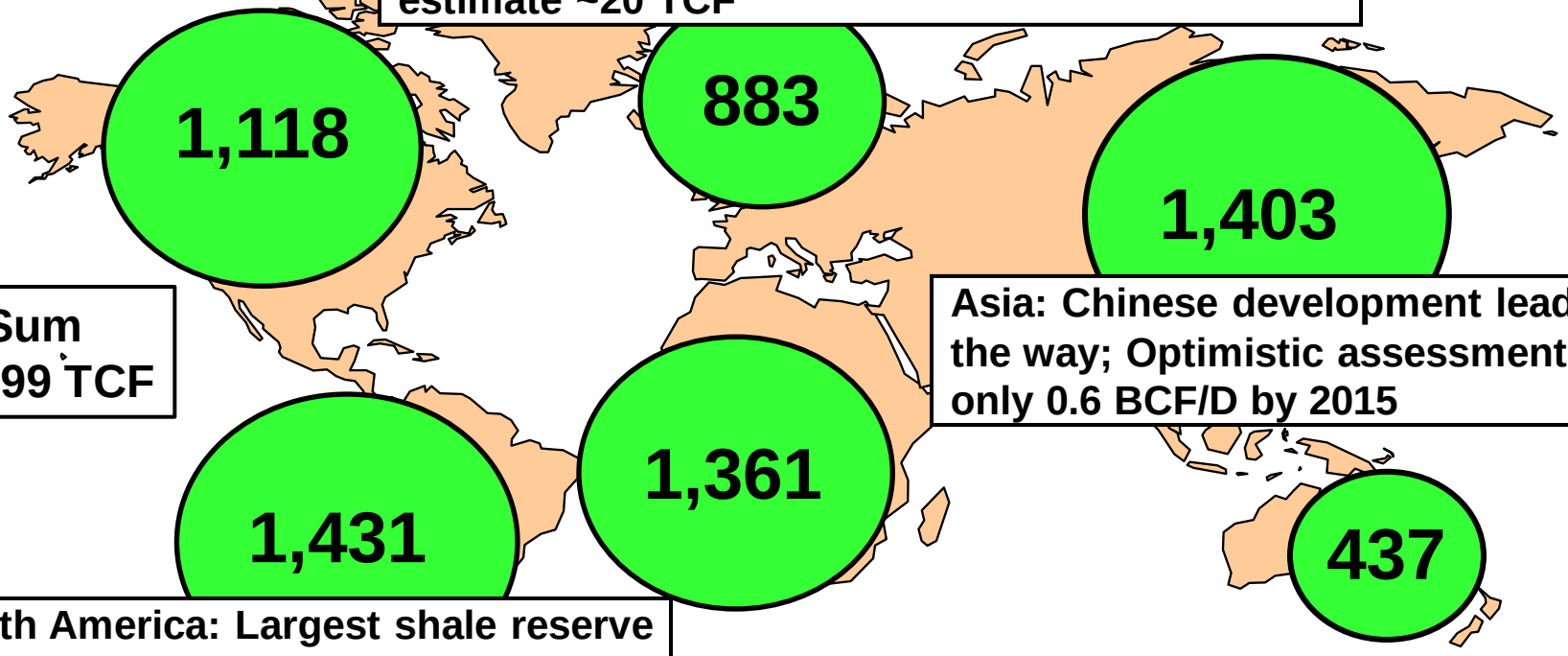
Mexican Gas Balances to Support Higher U.S. Pipeline Shipments



Global Technically Recoverable Shale Gas Reserves Huge, but Require Time and Support

Units - trillion cubic feet

Europe: Other than Poland, development slowed by fracking issues (bans in seven countries; Polish reserves now thought only 10% of EIA estimate ~20 TCF



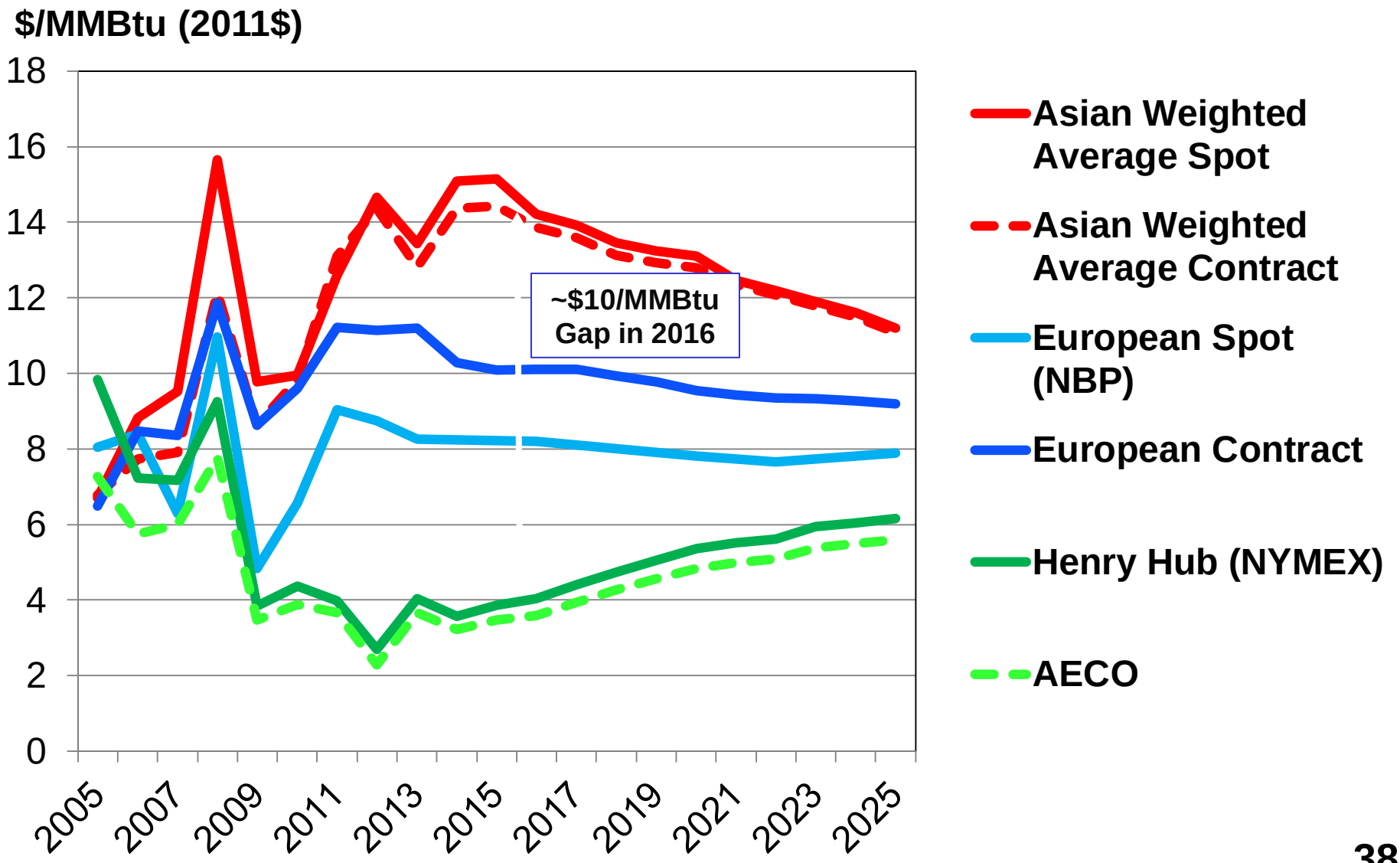
Sum ~7,299 TCF

Asia: Chinese development leading the way; Optimistic assessment is only 0.6 BCF/D by 2015

South America: Largest shale reserve development delayed by Argentina's nationalization of YPF

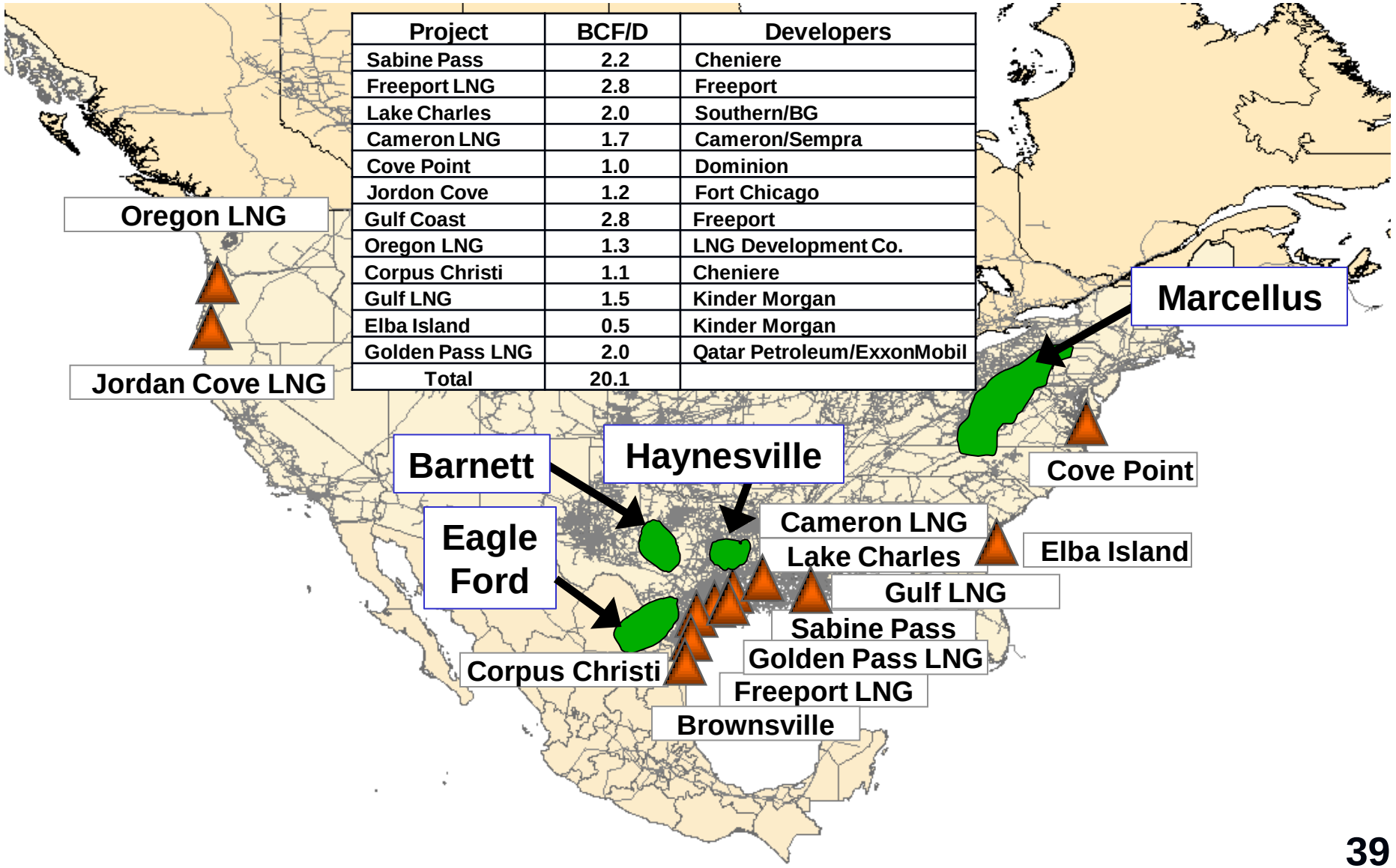
Source: EIA 2013

Why North American Liquefaction is Attractive (And the Window of Opportunity)



U.S. Proposed Liquefaction Sites And Nearby Shale Gas Plays

Project	BCF/D	Developers
Sabine Pass	2.2	Cheniere
Freeport LNG	2.8	Freeport
Lake Charles	2.0	Southern/BG
Cameron LNG	1.7	Cameron/Sempra
Cove Point	1.0	Dominion
Jordon Cove	1.2	Fort Chicago
Gulf Coast	2.8	Freeport
Oregon LNG	1.3	LNG Development Co.
Corpus Christi	1.1	Cheniere
Gulf LNG	1.5	Kinder Morgan
Elba Island	0.5	Kinder Morgan
Golden Pass LNG	2.0	Qatar Petroleum/ExxonMobil
Total	20.1	



Two Types of U.S. LNG Export Authorizations

Two types of U.S. LNG export licenses for domestic supply

- Free Trade Agreement (FTA) countries are granted approval without Department of Energy (DOE) evaluation
- Exports to non-FTA countries are granted approval only, if DOE deems in the "public interest" under Section 3 of the Natural Gas Act

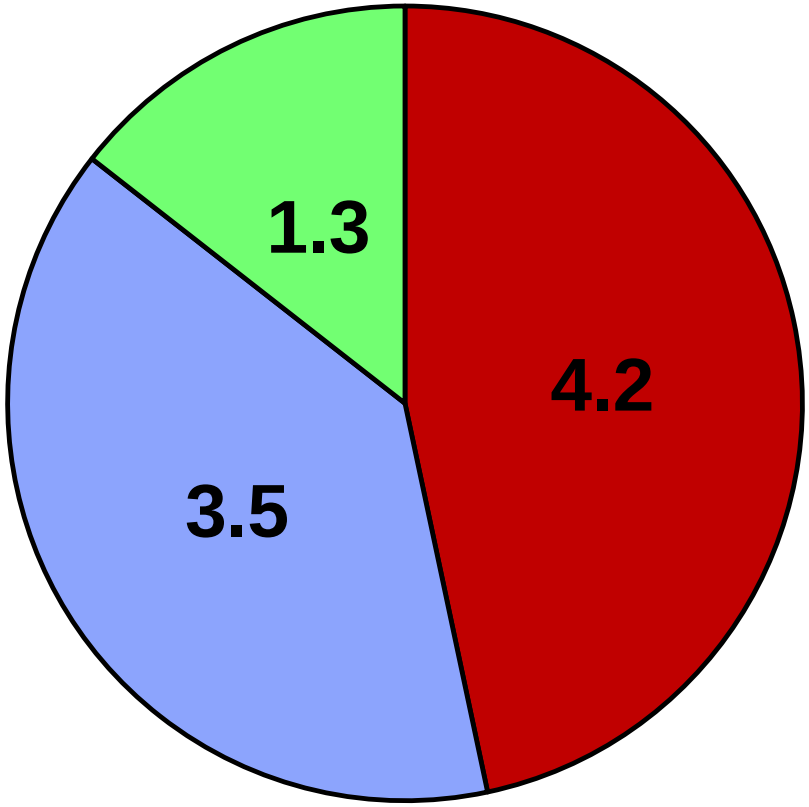
U.S. Free Trade Agreement Countries		
Australia	Bahrain	Canada
Chile	Costa Rica	Dominican Republic
El Salvador	Guatemala	Honduras
Israel	Jordan	Korea
Mexico	Morocco	Nicaragua
Oman	Peru	Singapore

North American LNG Export Regulatory Issues

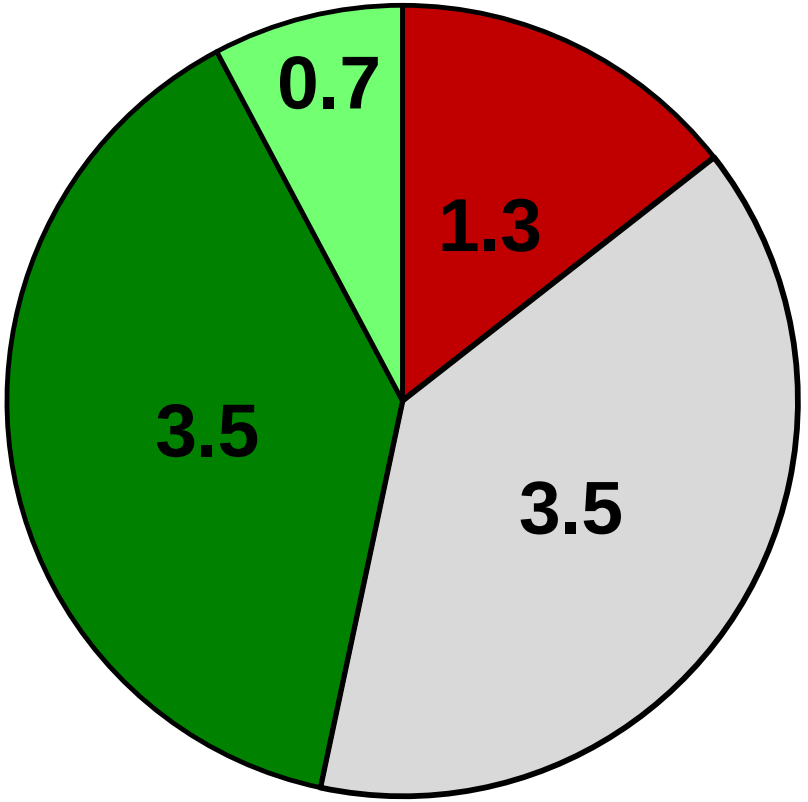
- **U.S. Government Cautious About Allowing Large-Scale LNG Exports**
  - » U.S. Department of Energy (DOE) study on impact of LNG exports contained 63 scenarios, all of which showed that LNG exports generated net benefits for the U.S. economy
  - » DOE has received ~200,000 public comments
  - » Freeport LNG non-FTA license in June 2013 first approval in two years
    - – PIRA expects two or three more decisions by end of this year
  - » Outside of the Gulf Coast, there is significant U.S. local and state opposition to LNG export facilities
- **Canadian Government Supporting LNG Exports**
  - » NEB has approved all LNG export project filings to date
  - » British Columbia government supporting export LNG projects
    - – Goal of five LNG export plants in B.C. by 2020
    - – Spending at least $222 million on roads for shale gas access

Sabine Pass Liquefaction Project: Distribution of Capacity Ownership

Under Construction
Phase I – Two Trains
9 MTPA ~ 1.2 BCF/D

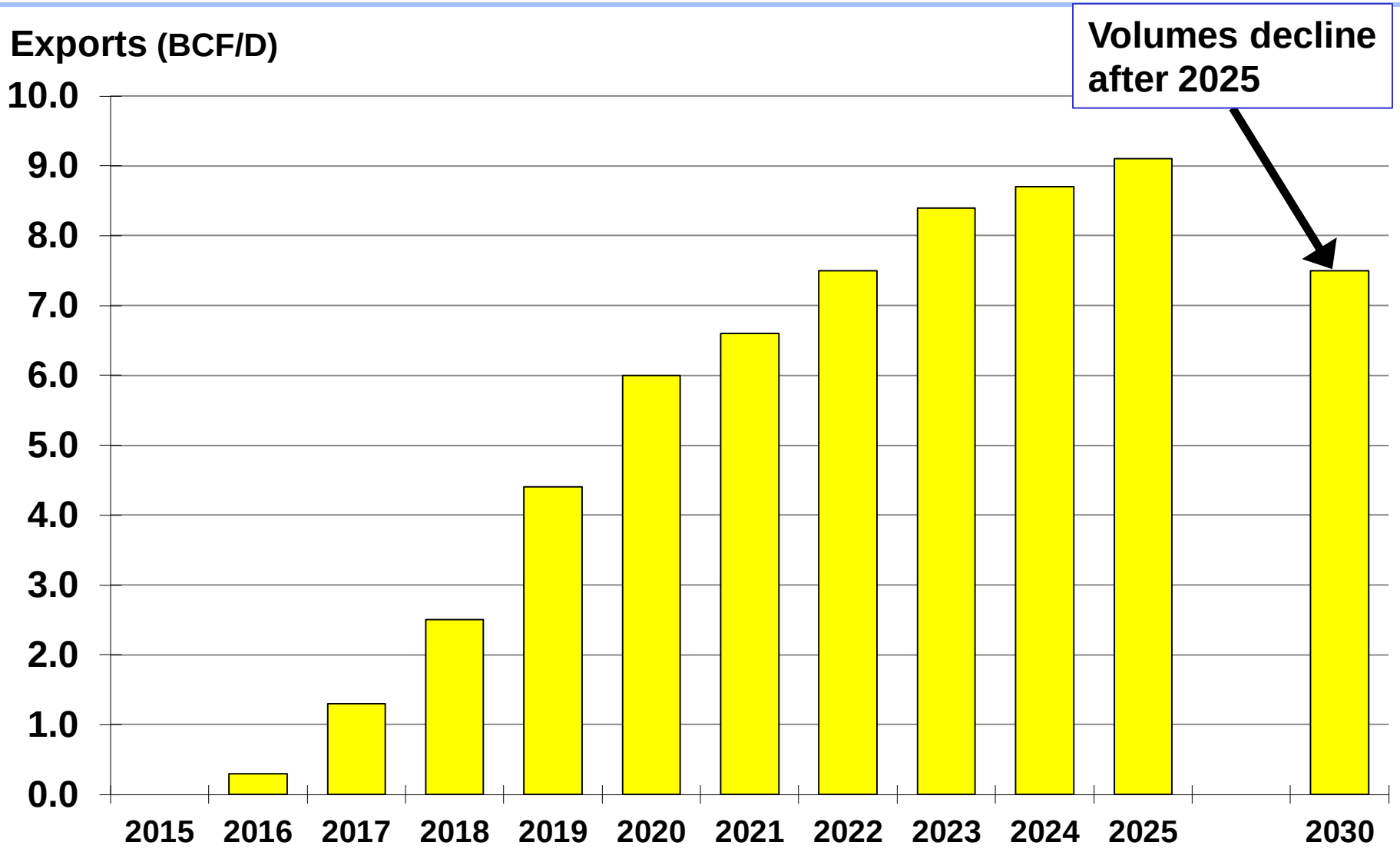


EPC Contract Signed
Phase II – Two Trains
9 MTPA ~ 1.2 BCF/D

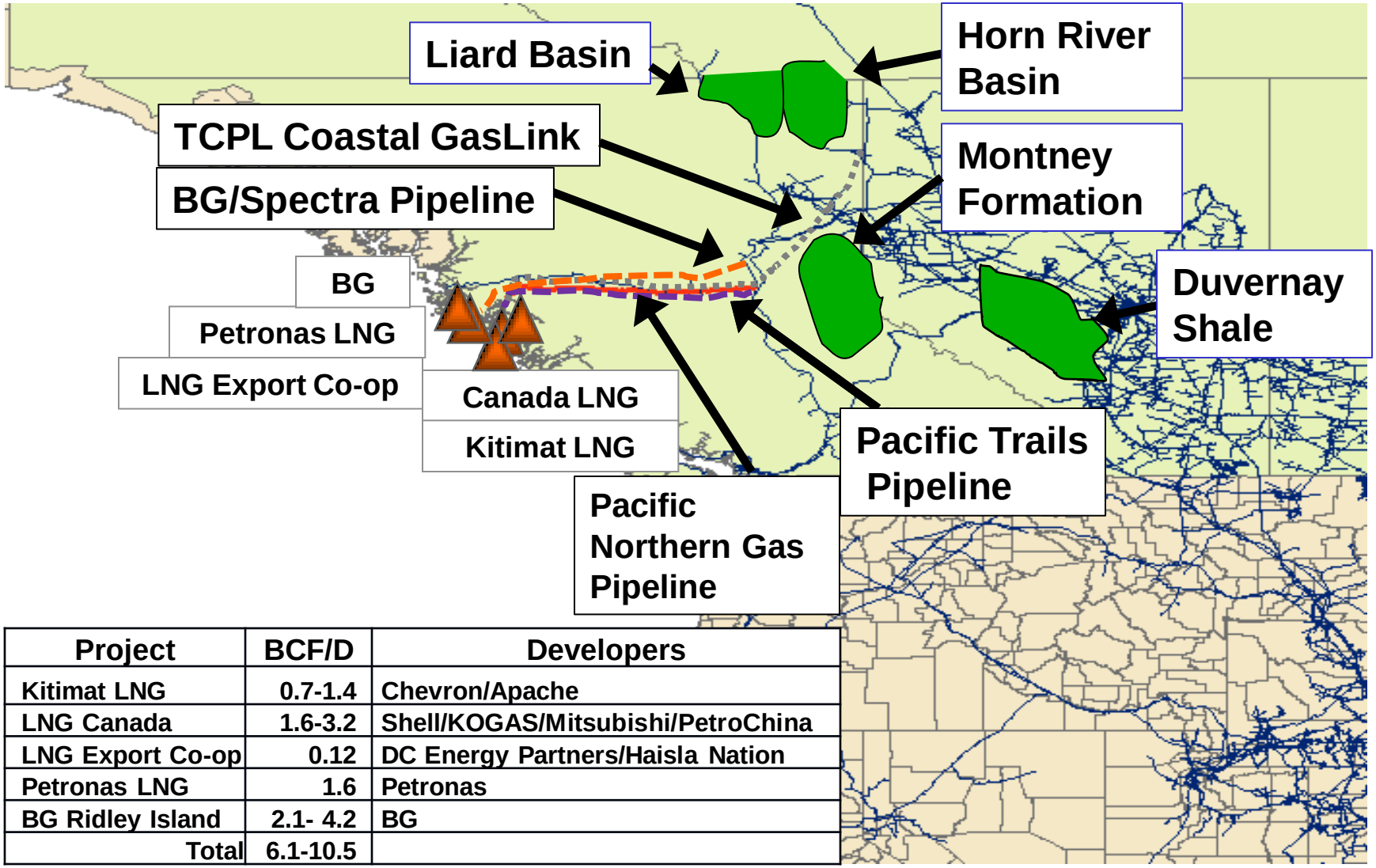


Note – Reports indicate Cheniere does not plan to retain any capacity

Lower 48 U.S. LNG Reference Case

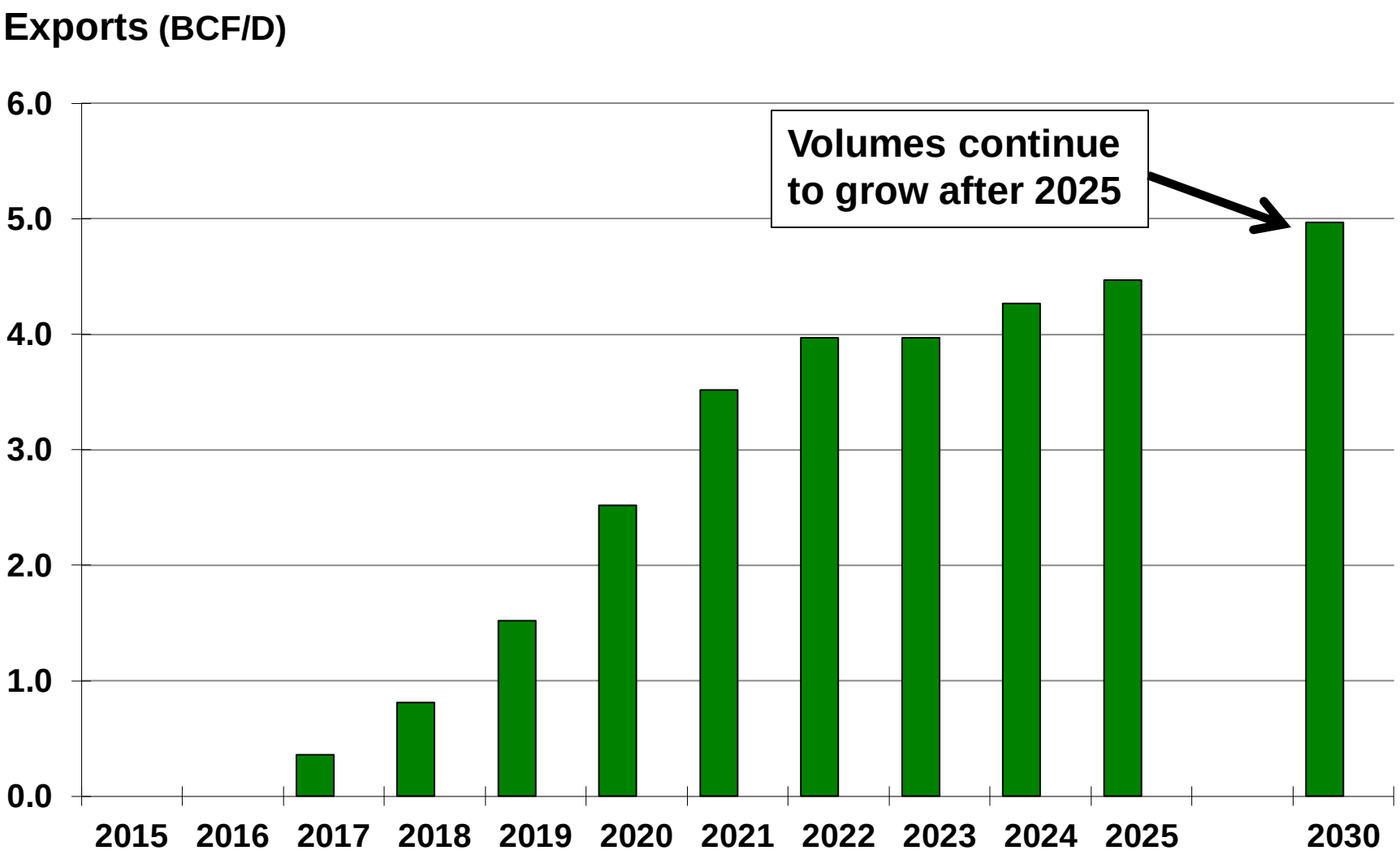


British Columbia Proposed Liquefaction Sites and Nearby Shale Gas Plays

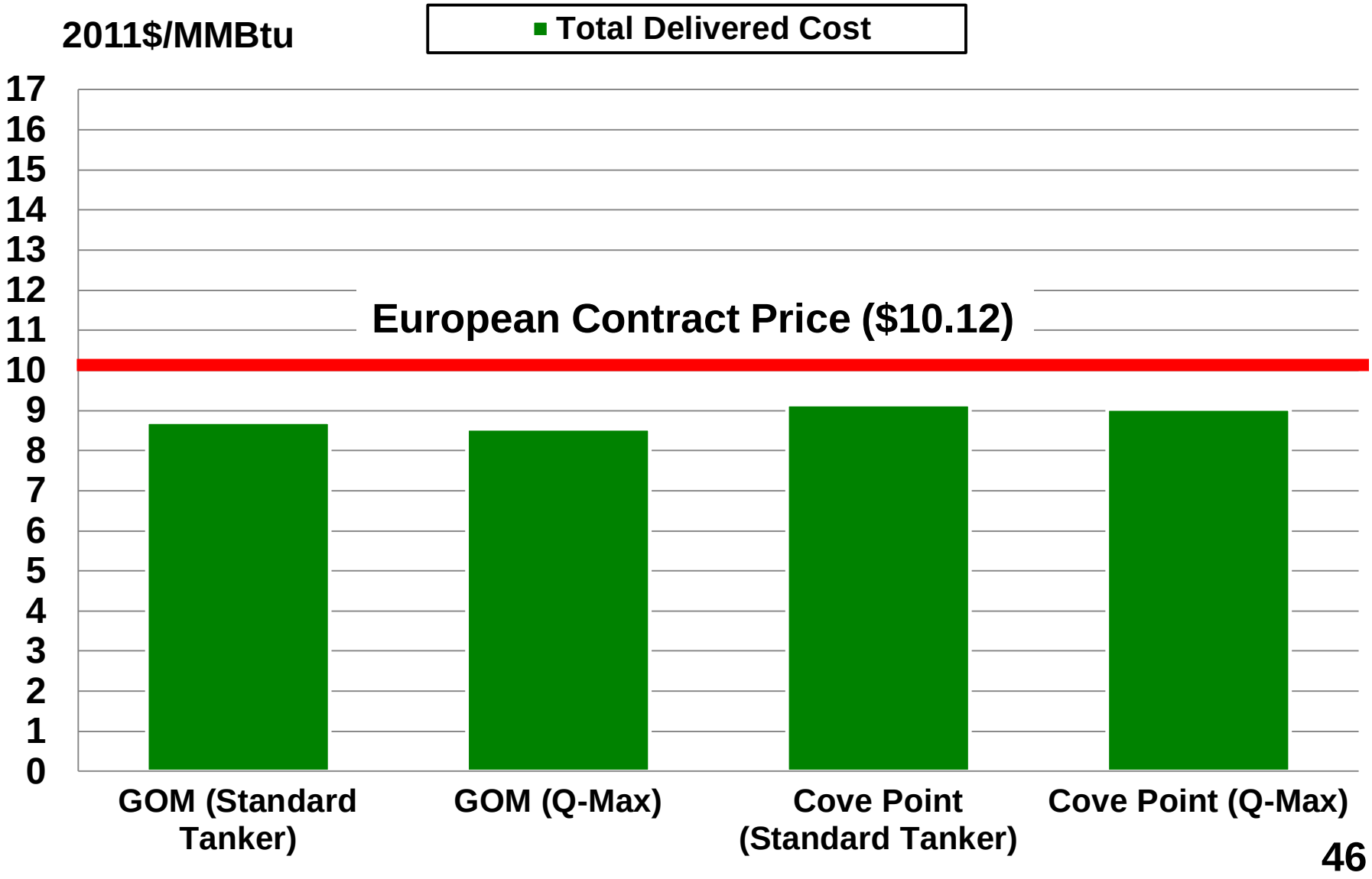


Project	BCF/D	Developers
Kitimat LNG	0.7-1.4	Chevron/Apache
LNG Canada	1.6-3.2	Shell/KOGAS/Mitsubishi/PetroChina
LNG Export Co-op	0.12	DC Energy Partners/Haisla Nation
Petronas LNG	1.6	Petronas
BG Ridley Island	2.1- 4.2	BG
Total	6.1-10.5	

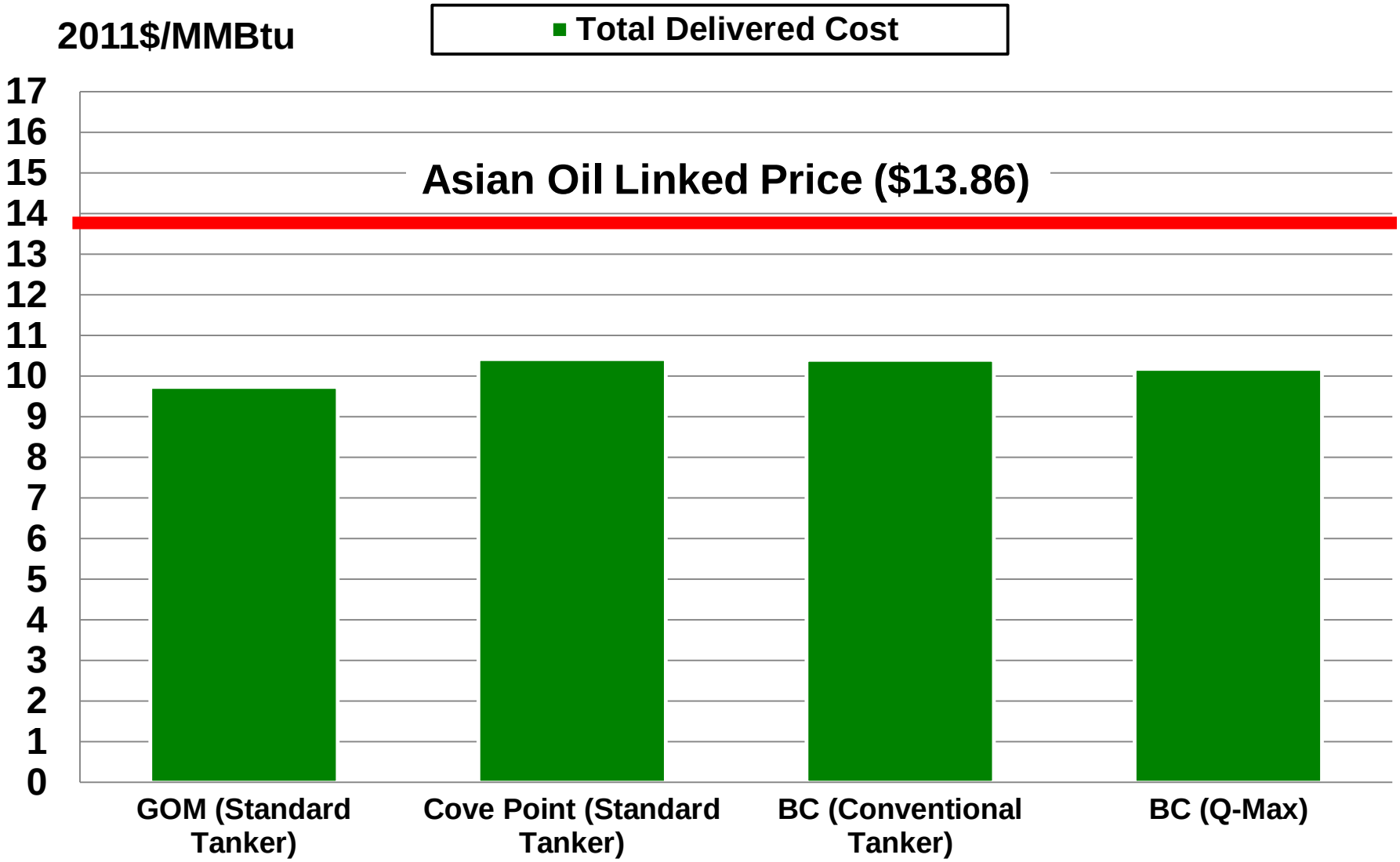
British Columbia LNG Export Case



Estimated U.S. LNG Export Cost to Europe Assuming PIRA 2016 Prices



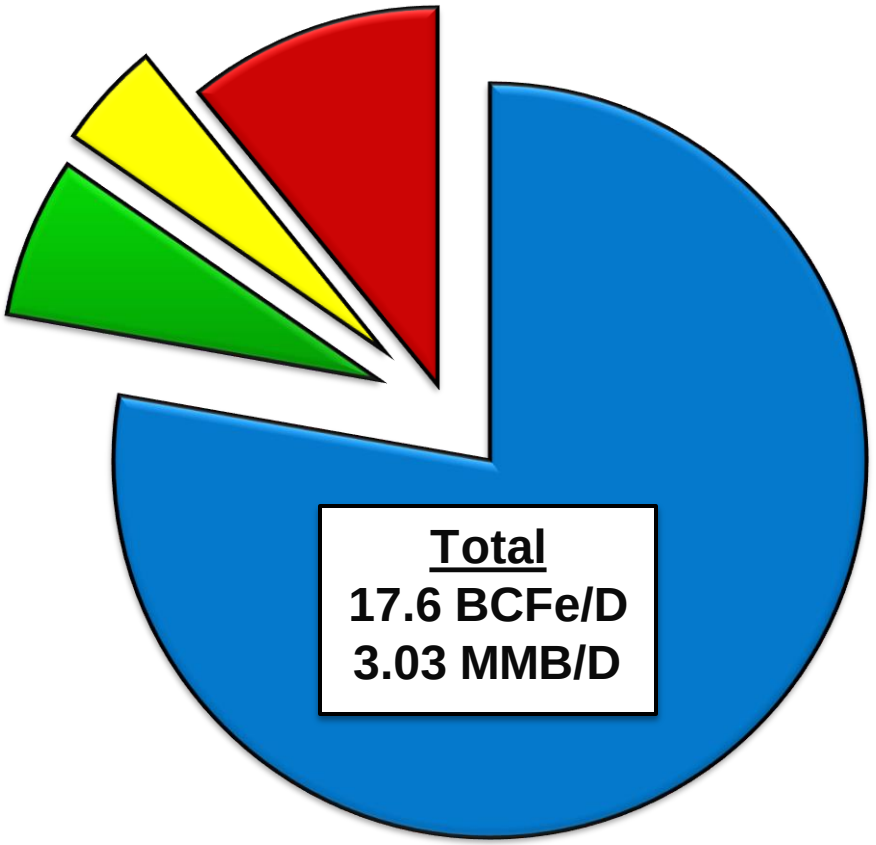
Estimated North American LNG Export Cost to Asia Assuming PIRA 2016 Prices



U.S. Diesel Fuel for Transportation
A Massive Target for Natural Gas

Approximate 2011 Volumes

	BCFe/D	MMB/D
On-Highway	13.7	2.36
Railroad	1.2	0.21
Vessel	0.8	0.14
Off-Highway	1.9	0.33



Off-Highway includes farm use.

PIRA estimates based on EIA "Sales of Distillate Fuel Oil by End Use 2011."

Major Fleet Market Share and Build-out of Infrastructure Scheduled to be Significant by 2015

- **Major fleets planning on measurable share of natural gas vehicles**
  - » Frito Lay fleet will be 20% powered by natural gas by year end
  - » AT&T's fleet was 7% powered by natural gas at the beginning of 2013 and will have 8,000 CNG NGVs by the end of 2014
  - » UPS will have more than 800 LNG trucks on the road by the end of 2014
  - » Proctor and Gamble for-hire loads will be 20% natural gas by 2015
    - – Included a natural gas requirement for the first time for the fleets that transport its products
- **Public access fueling commitments spreading**
  - » Clean Energy has 76 stations complete and 17 under development
  - » Blu and ENN joint venture aiming to install 50 truck stops in 2013 alone
  - » Trillium CNG ~101 stations by 2016
  - » Shell and Travel Centers of America are planning to develop up to 100 stations
- **LNG Locomotives the Next Transportation Market?**
  - » BNSF will begin testing a small number of locomotives using liquefied natural gas (LNG) as an alternative fuel
  - » Other North American railroads considering LNG as an alternative fuel for trains include:
    - – Canadian National Railroad
    - – Union Pacific
    - – Norfolk Southern
    - – CSX

LNG Long-haul Trucking Economics Relative to Diesel Fuel Suggest a Rapid Payback

Diesel Fuel		Natural Gas (LNG Trucks)		
		Henry Hub	**$5.00/MMBtu**	**$4.00/MMBtu**
Diesel Btu/Gallon	128,000	**LNG Btu/Gallon**	75,000	
Diesel Wholesale	$3.15/gal	**LNG Wholesale**	$0.65/dge	$0.50/dge
		Field to Pump	$0.40/dge	
Markup w/Tax	$0.85/gal	**Markup w/Tax***	$1.10/dge	
At the Pump	**$4.00/gal**	**At the Pump**	**~$2.15/dge**	**~$2.00/dge**
Fuel Efficiency	6 miles/gal	**Fuel Efficiency**	6 miles/dge	
Miles Traveled/Yr.	120,000			
Diesel Gallons/Yr.	20,000			
Diesel Cost/Yr.	**$80,000**	**LNG Cost/Yr.**	**$43,000**	**$40,000**

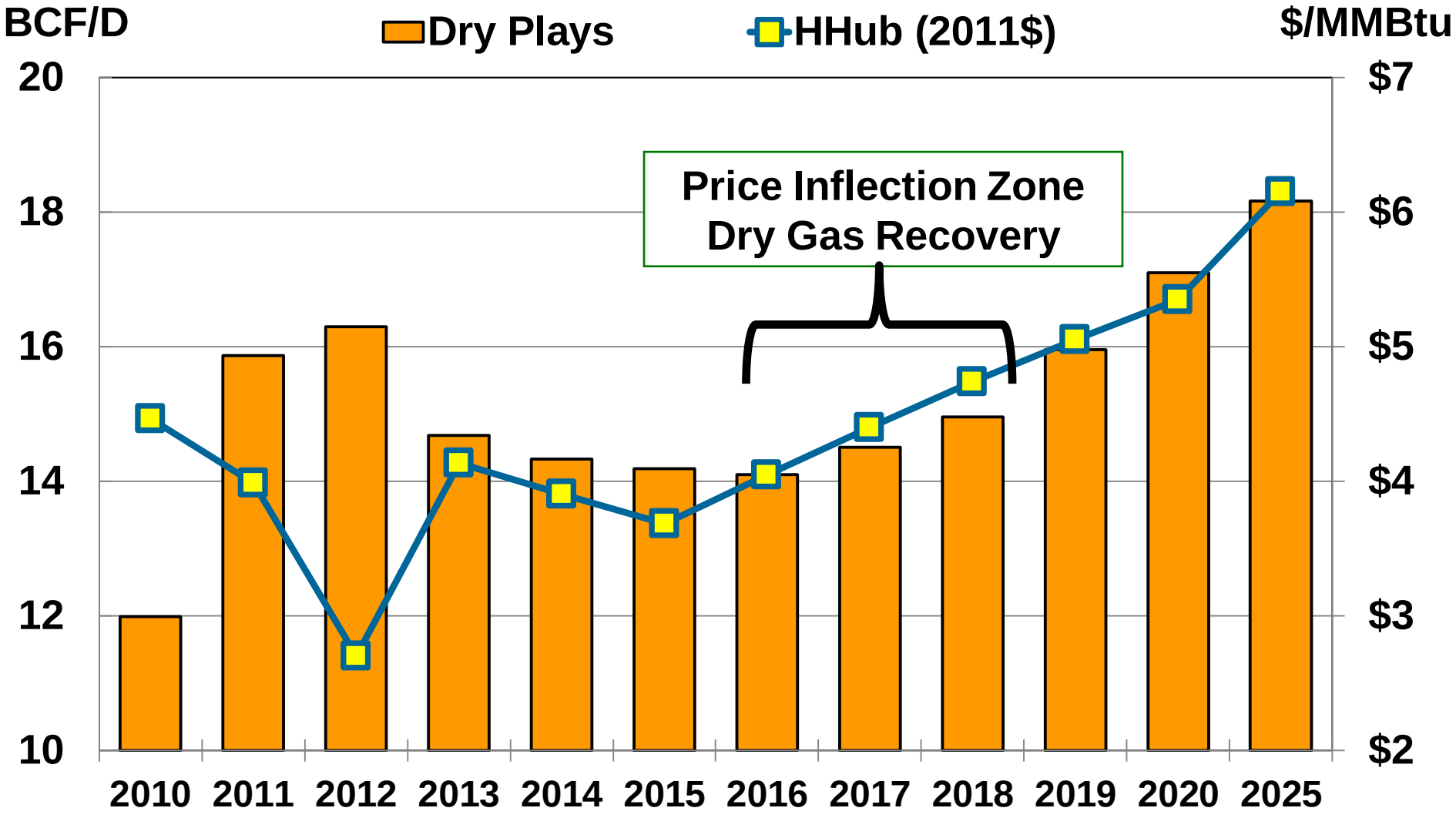
*Assumes shift to taxation on energy equivalent rather than volumetric basis. LNG $/gallon adjusted by 1.7 (128,000/75,000) to diesel gallon equivalent.

LNG, Diesel Class 8 Truck and Fuel Costs

	CWI 11.9L Spark Ignition		15L HPDI Single Tank	
LNG Truck Premium	$40,000		$70,000	
LNG Fuel Cost Savings				
Per DGE	$2.15	$2.00	$2.15	$2.00
Annual	$37,000	$40,000	$37,000	$40,000
LNG Net Additional First Year Cost				
LNG Net Cost	$3,000	Break Even	$33,000	$30,000
Payback Period (Years)				
Payback Yrs.	1.1	1.0	1.9	1.7

Per DGE difference reflect $5/MMBtu versus $4/MMBtu Henry Hub gas prices.

Mid-Decade Gas Price Inflection Zone to Mark U.S. Dry Gas Production Recovery



Dry Plays exclude all Marcellus/Utica shale.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