Will North American LNG Exports Impact Rockies Gas Prices?

Presentation to:
18th Annual Wyoming Oil & Gas Fair
Jackson Hole, WY

By:
John Harpole

Mercator Energy

September 19, 2014

Politics & Markets for Natural Gas: From Russia to the Rocky Mountains

Presentation to:
Twelfth Annual Wyoming Natural Gas Fair
Jackson Hole, Wyoming

September 18, 2008

By:
John A. Harpole

Mercator Energy

Energy Security?

- By the year 2020, Gazprom will supply nearly 70% of the European Union's natural gas.
- Would you pursue a conflict with a country that you depend on for the majority of your energy needs?

September 18, 2008

Let’s discuss your cost of natural gas.

September 18, 2008

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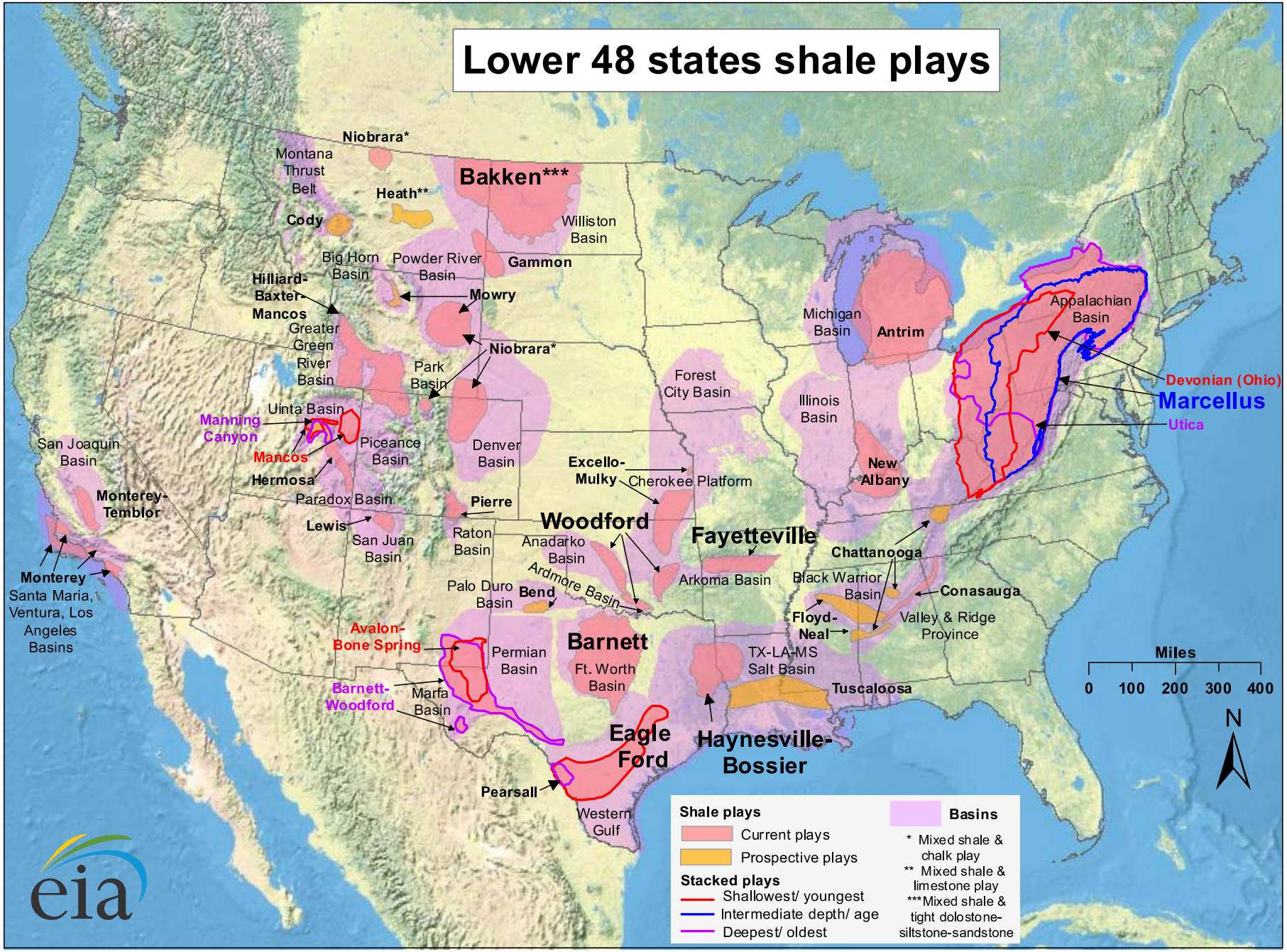


Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

Key insights on U.S. drilling productivity and production trends

- The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources

Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

Key insights on U.S. drilling productivity and production trends

- The number of wells drilled nationwide that produce both oil and natural gas increased from 37% in 2007 to 56% in 2012

Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

Key insights on U.S. drilling productivity and production trends

- Higher drilling efficiency and new well productivity, rather than an increase in the rig count, have been the main drivers of recent production growth

Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

Key insights on U.S. drilling productivity and production trends

- Steep legacy production decline rates are being offset by growing production from new wells

Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

Key insights on U.S. drilling productivity and production trends

- Six shale plays account for nearly 90% of domestic oil production growth and virtually all domestic natural gas production growth over the last few years

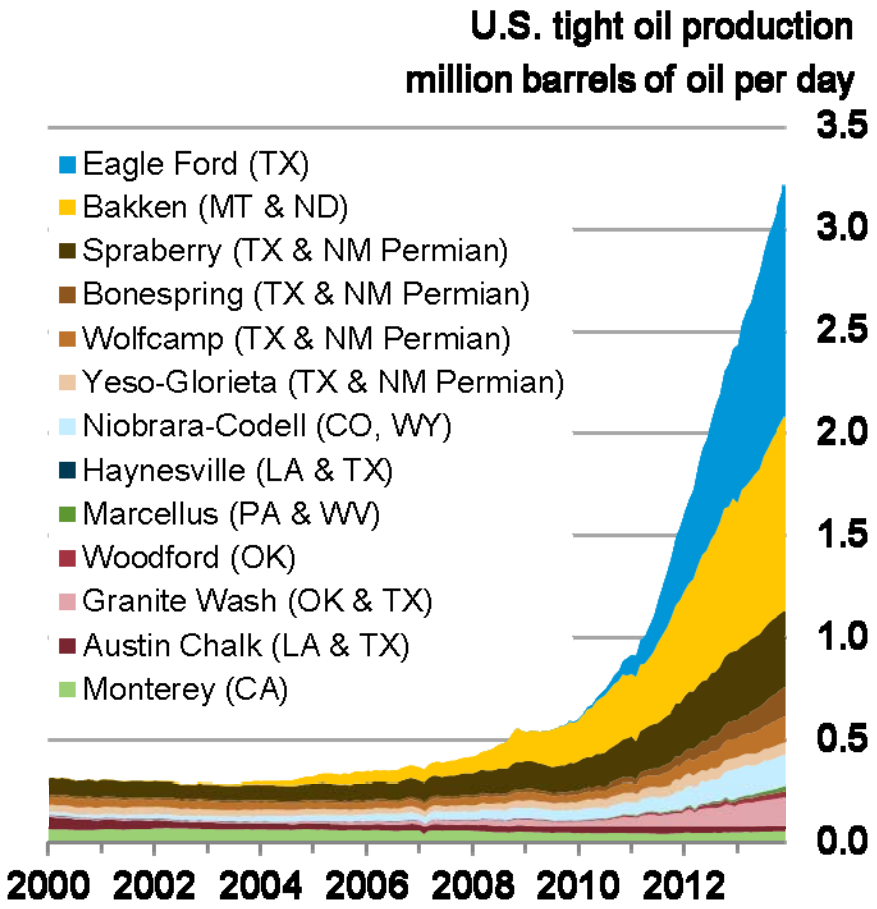
Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

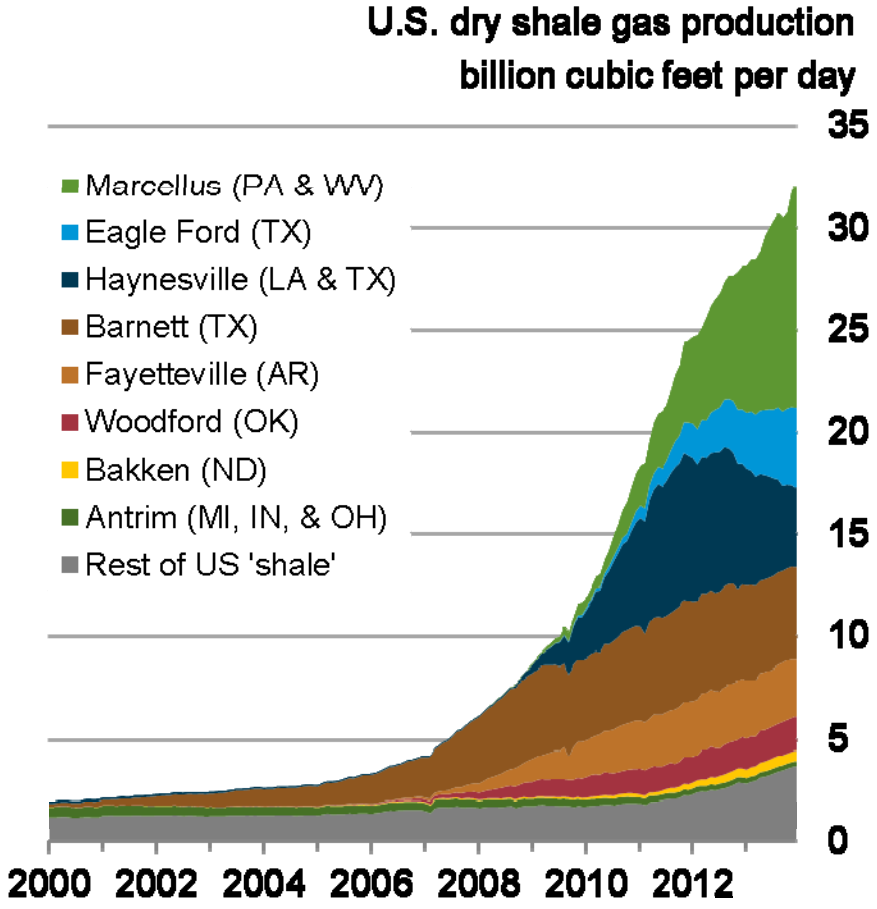
Key insights on U.S. drilling productivity and production trends

- The Bakken and Eagle Ford plays account for about two-thirds of oil production growth; the Marcellus play accounts for about three-quarters of natural gas production growth

Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources





Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through December 2013 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

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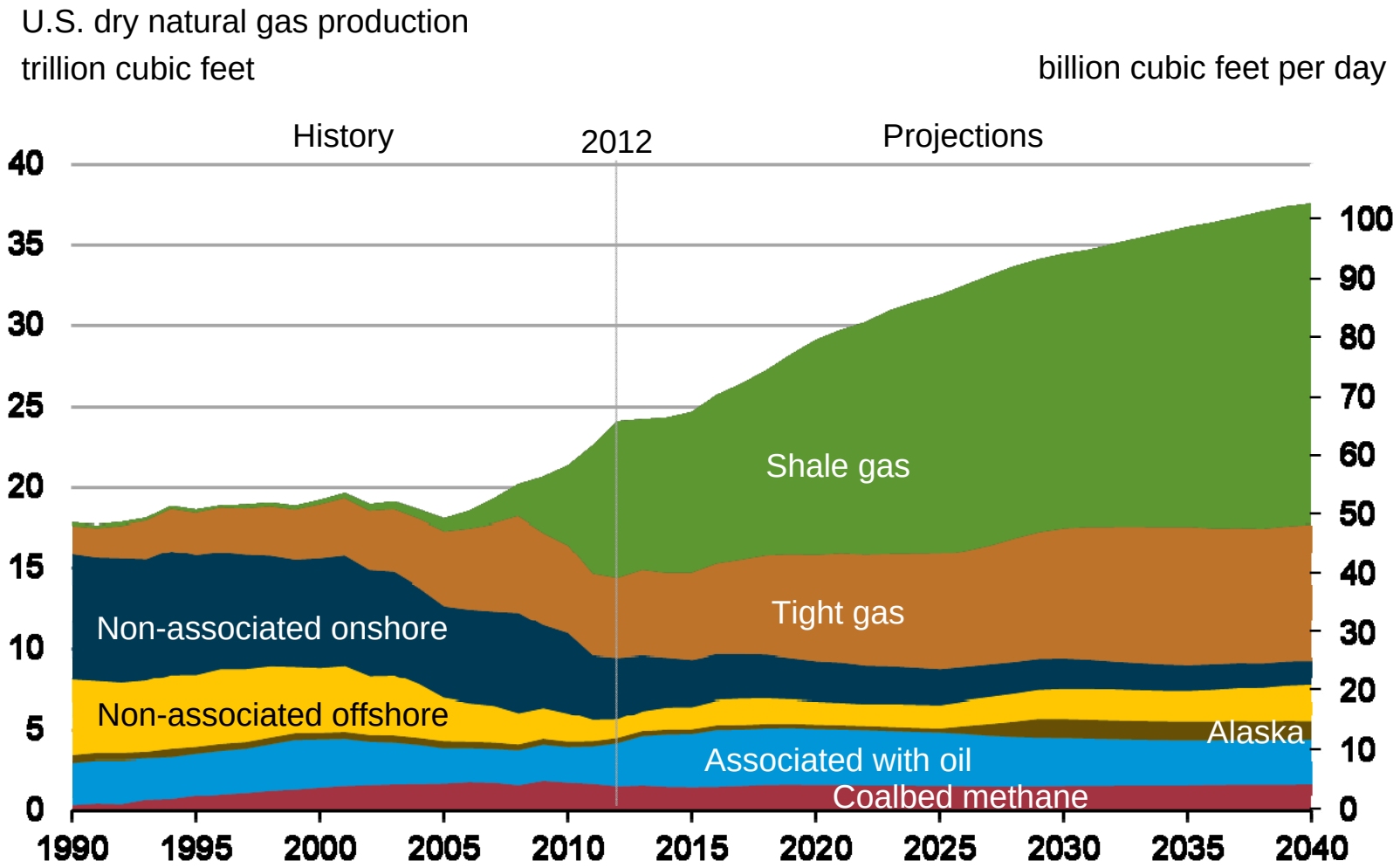
Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

U.S. shale gas leads growth in total gas production through 2040 to reach half of U.S. output



Source: EIA, Annual Energy Outlook 2014 Early Release

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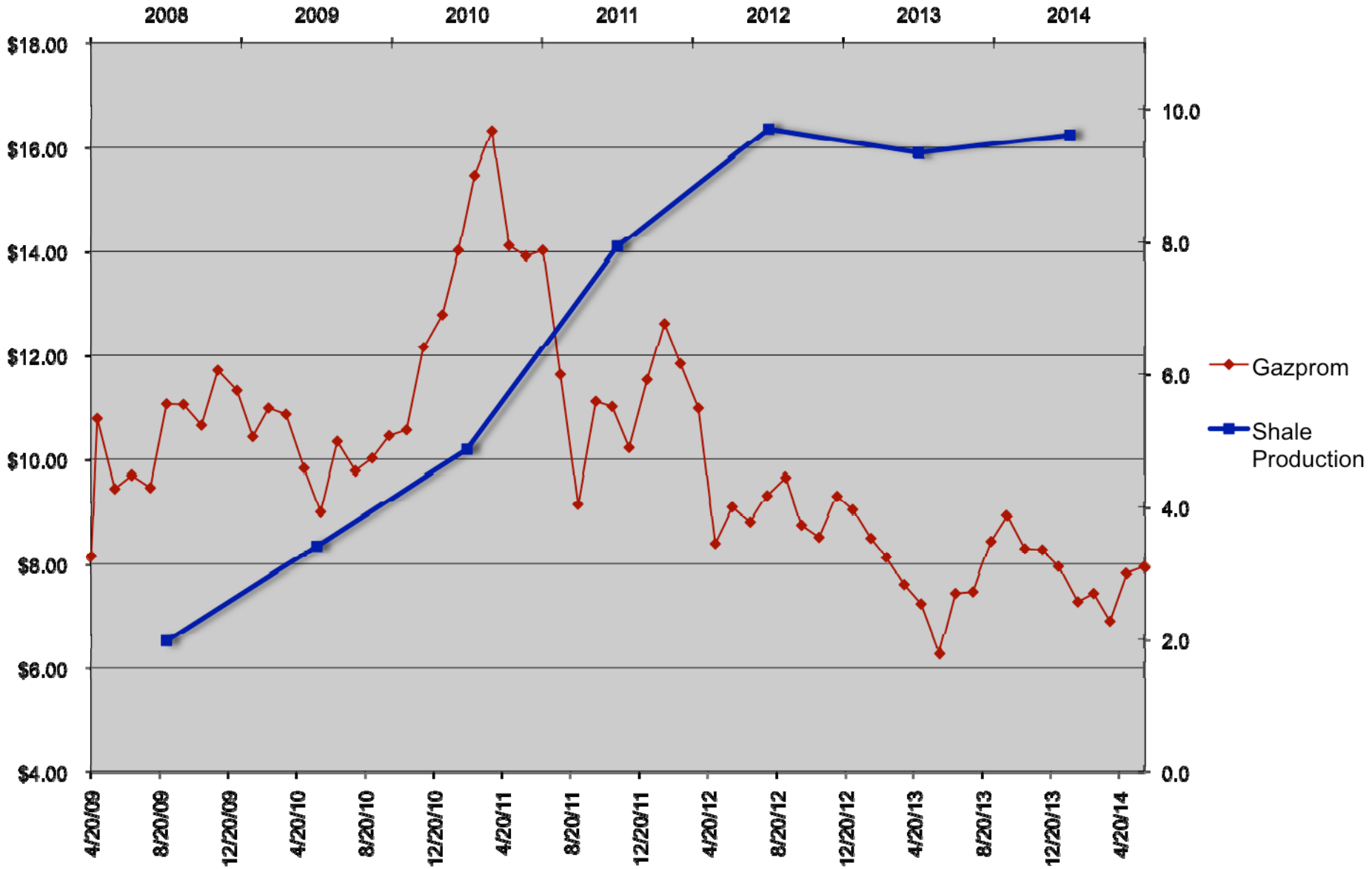
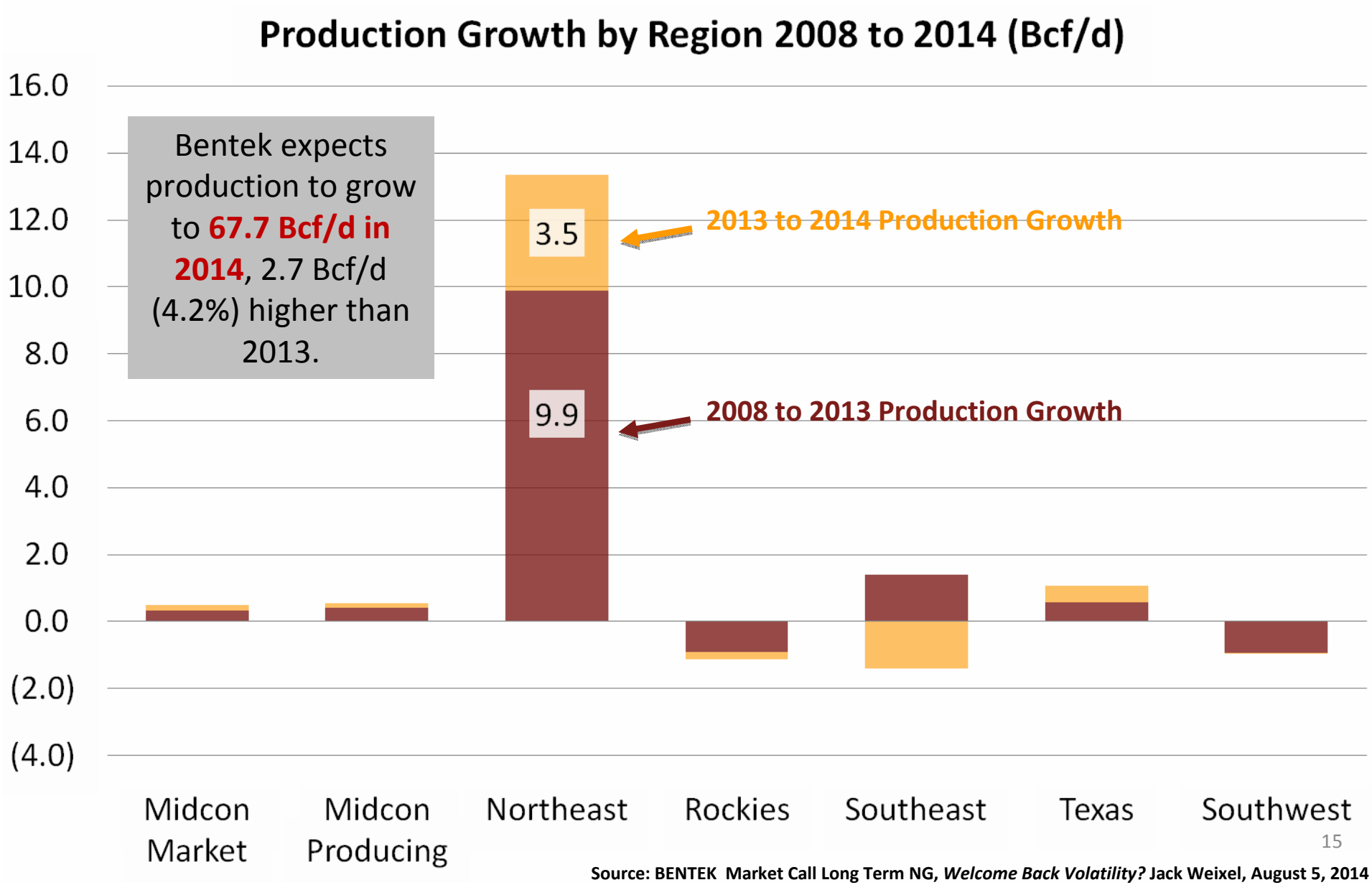
Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

Gazprom Share Price vs. US Shale Gas Production



Northeast Continues to Drive Production Growth



Source: BENTEK Market Call Long Term NG, *Welcome Back Volatility?* Jack Weixel, August 5, 2014

Large Scale Industrials Additions

US Gas-to-Liquids Projects

Project	Owner	Location	State	Region	Annual Capacity (bbl)	Estimated demand (MMcf/d)	In-service
Calumet GTL	Calumet Specialty Products	Karns City	PA	Northeast	511,000	14	2014
Juniper GTL	SGC Energia	Westlake	LA	Southeast	401,500	11	2015
Clean Energy Center	Marcellus GTL	Duncansville	PA	Northeast	730,000	20	2016
Sundrop Fuels	Sundrop Fuels (w/Chesapeake)	Boyce	LA	Southeast	1,428,571	39	2016
Pinto Energy	Pinto Energy	Ashtabula	OH	Northeast	1,022,000	28	2016
Primus Green Energy	Primus Green Energy	Hillsborough	NJ	Northeast	662,000	18	2016
Big Lake Fuels	G2X Energy	Lake Charles	LA	Southeast	4,562,500	125	2017
Escalera GTL	Escalera Resources / Wyoming GTL	Cheyenne	WY	Rockies	5,475,000	135	2018
Westlake GTL	Sasol	Westlake	LA	Southeast	35,040,000	960	2020
Nerd Gas	Nerd Gas	TBD	WY	Rockies	3,650,000	100	n/a
Micro GTL	Greyrock Energy	TBD	TBD	TBD	365,000	10	n/a
miniGTL	Carbon Sciences	TBD	Texas	Texas	365,000	10	n/a
Total U.S.					**54,212,571**	**1,470**	

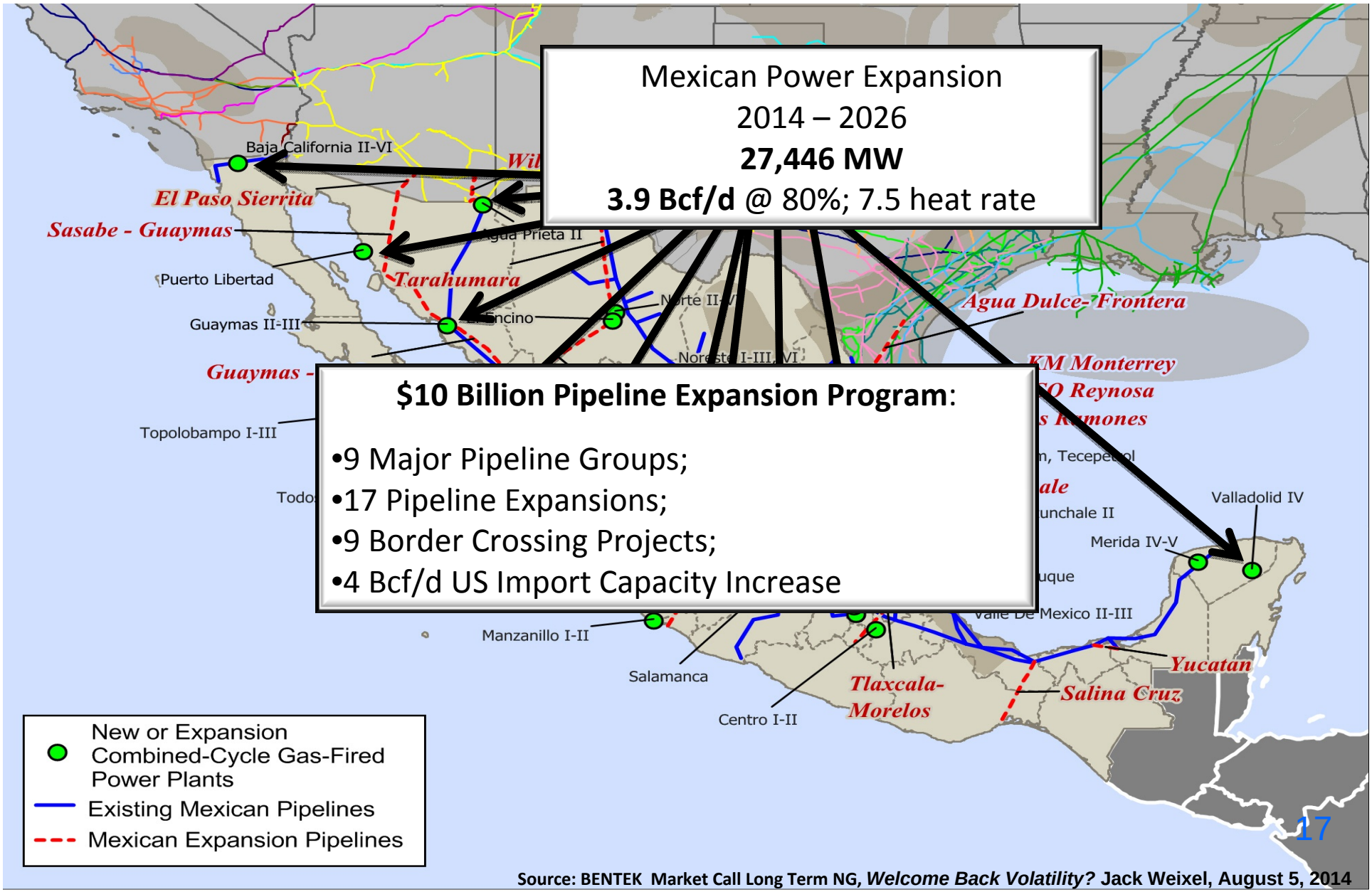
With a GTL project, 10 Mcf of natural gas typically equals 1 barrel (42 gallons) of product.

Large Scale Industrial Additions Include:
- 1.5 Bcf/d of proposed GTL facilities
- 1.3 Bcf/d of Fertilizer facilities (25)
- 1.6 Bcf/d of Methanol facilities (13)

Chemical
Industrial
Metals
Petroleum

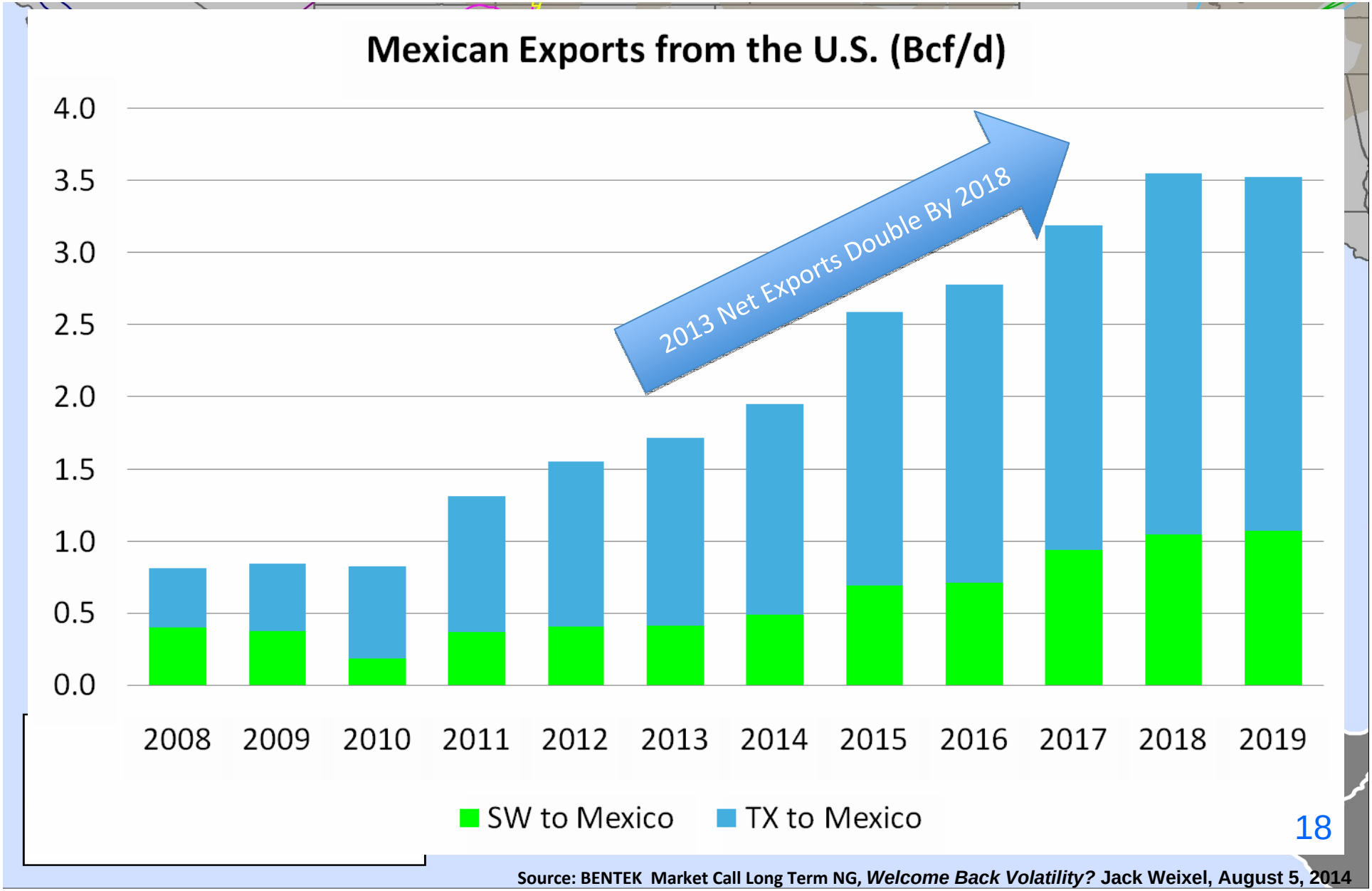
Source: BENTEK US Industrial Demand Tracker,
***Welcome Back Volatility?* Jack Weixel, August 5, 2014**

Mexico Plans 42 Gas-Fired Power Projects!!



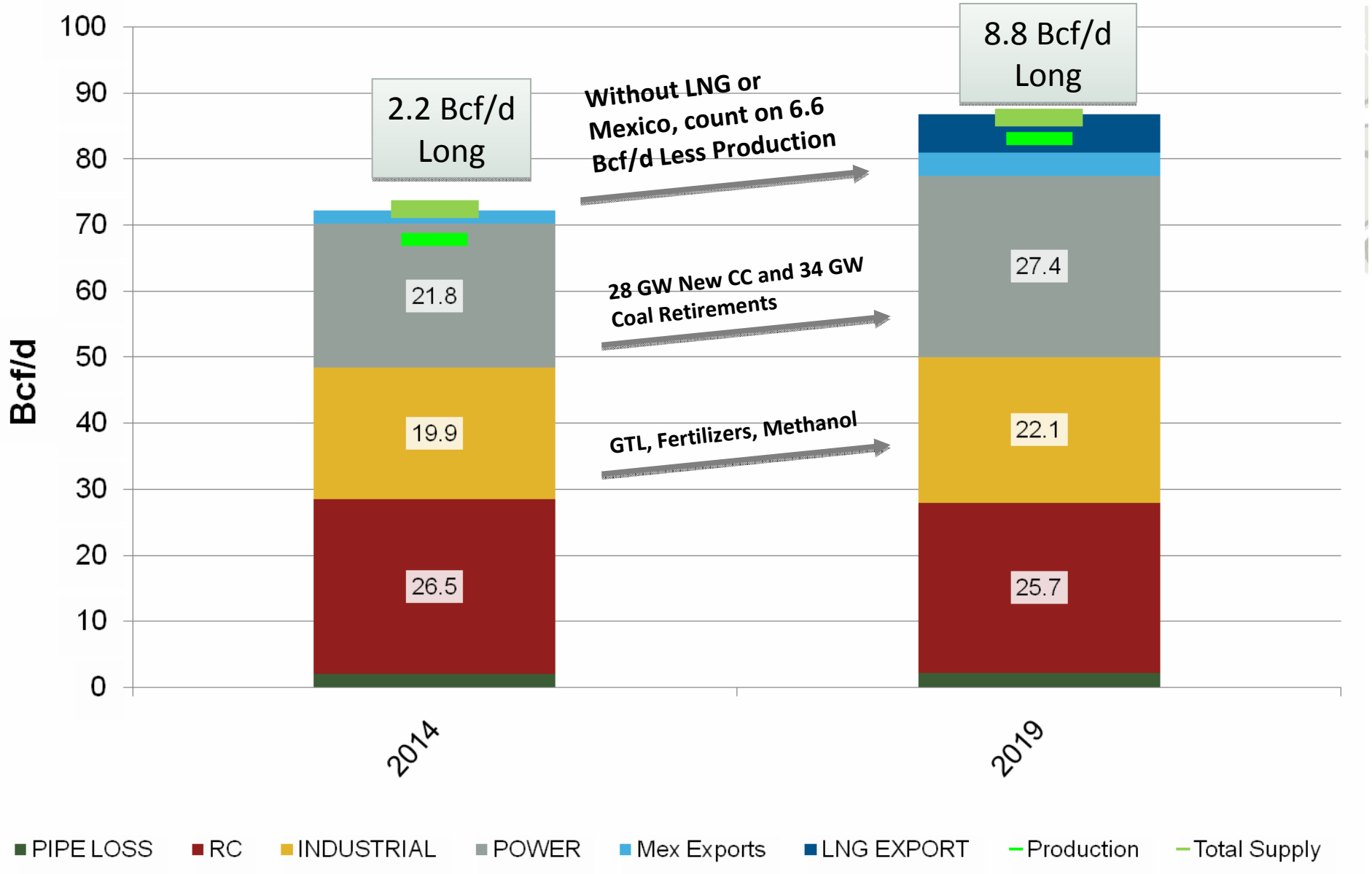
Source: BENTEK Market Call Long Term NG, *Welcome Back Volatility?* Jack Weixel, August 5, 2014

Mexico Plans 42 Gas-Fired Power Projects!!



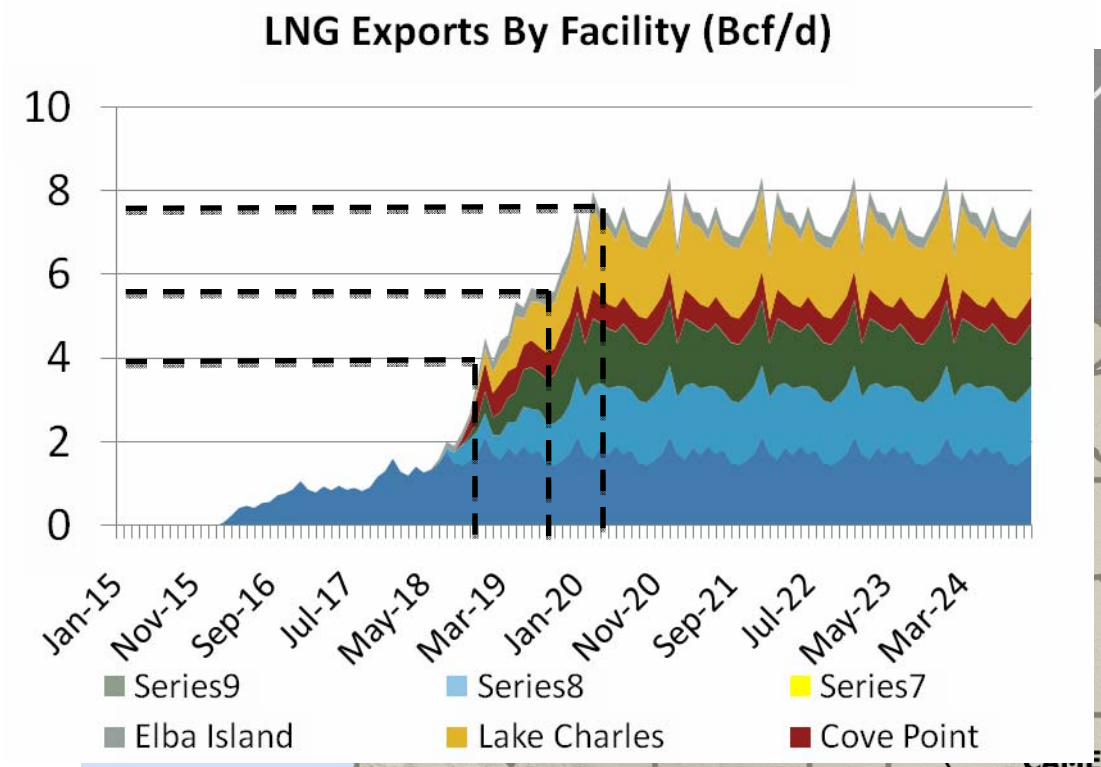
Source: BENTEK Market Call Long Term NG, *Welcome Back Volatility?* Jack Weixel, August 5, 2014

Growth in Power Burn Critical, with LNG and Mexican Exports Buttressing Production Forecast



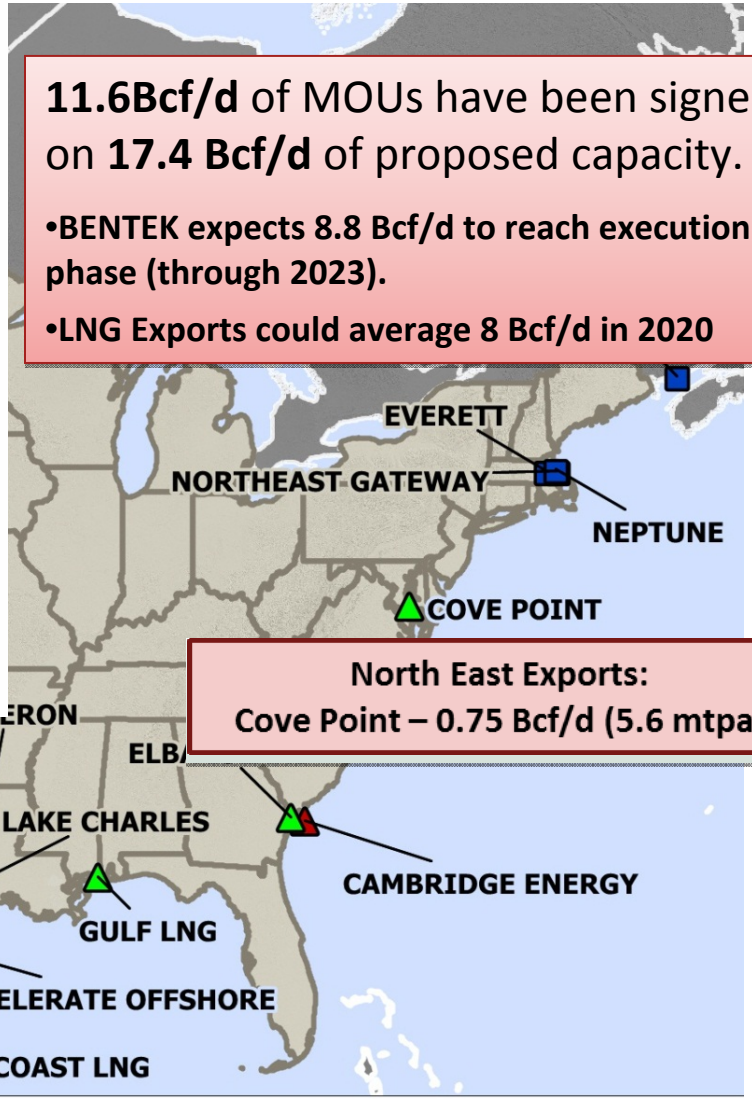
Source: BENTEK Market Call Long Term NG, *Welcome Back Volatility?* Jack Weixel, August 5, 2014

US LNG Export Forecast (MOUs)



11.6Bcf/d of MOUs have been signed on **17.4 Bcf/d** of proposed capacity.

- **BENTEK expects 8.8 Bcf/d to reach execution phase (through 2023).**
- **LNG Exports could average 8 Bcf/d in 2020**



North East Exports:
Cove Point – 0.75 Bcf/d (5.6 mtpa)

Gulf Coast Export Terminals:
Freeport LNG– 1.76 Bcf/d
Lake Charles – 2 Bcf/d
Sabine Pass – 2.4 Bcf/d
Cameron – 1.6 Bcf/d

Source: BENTEK, ***Welcome Back Volatility?*** **Jack Weixel, August 5, 2014**

10/21/2008 in Tehran, Iran
Russia, Iran and Qatar form natural gas cartel

Qatar's Deputy Premier and Minister of Energy and Industry, Abdullah bin Hamad Al-Attiya

Iranian Oil Minister, Gholam Hossein Nozari

Alexei Miller, Chief of Russia's state gas monopoly - Gazprom

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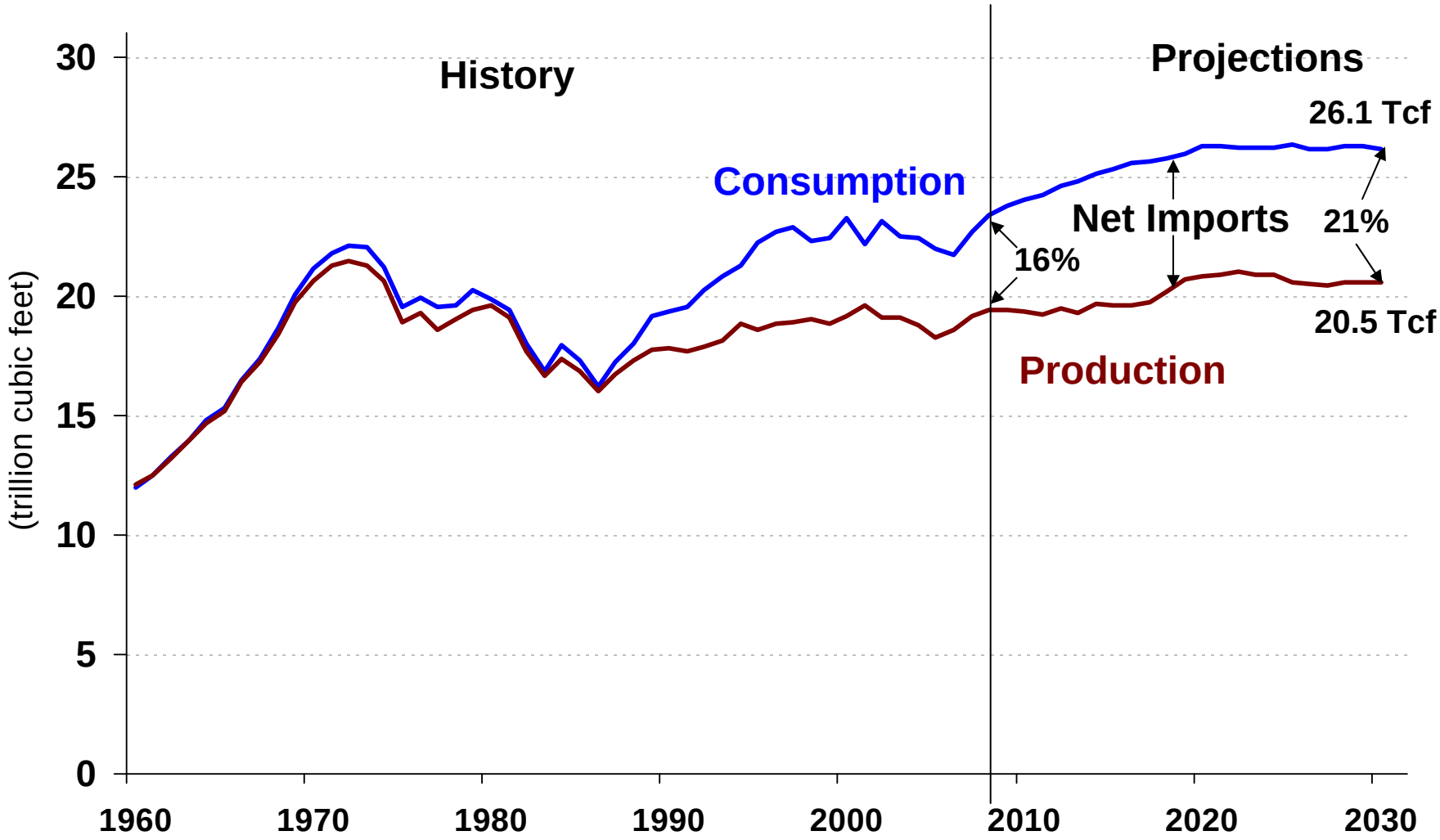
2008 Conventional Wisdom



Source: Annual Energy Outlook 2007

Natural Gas Projections from EIA and Six Others: March 28, 2007

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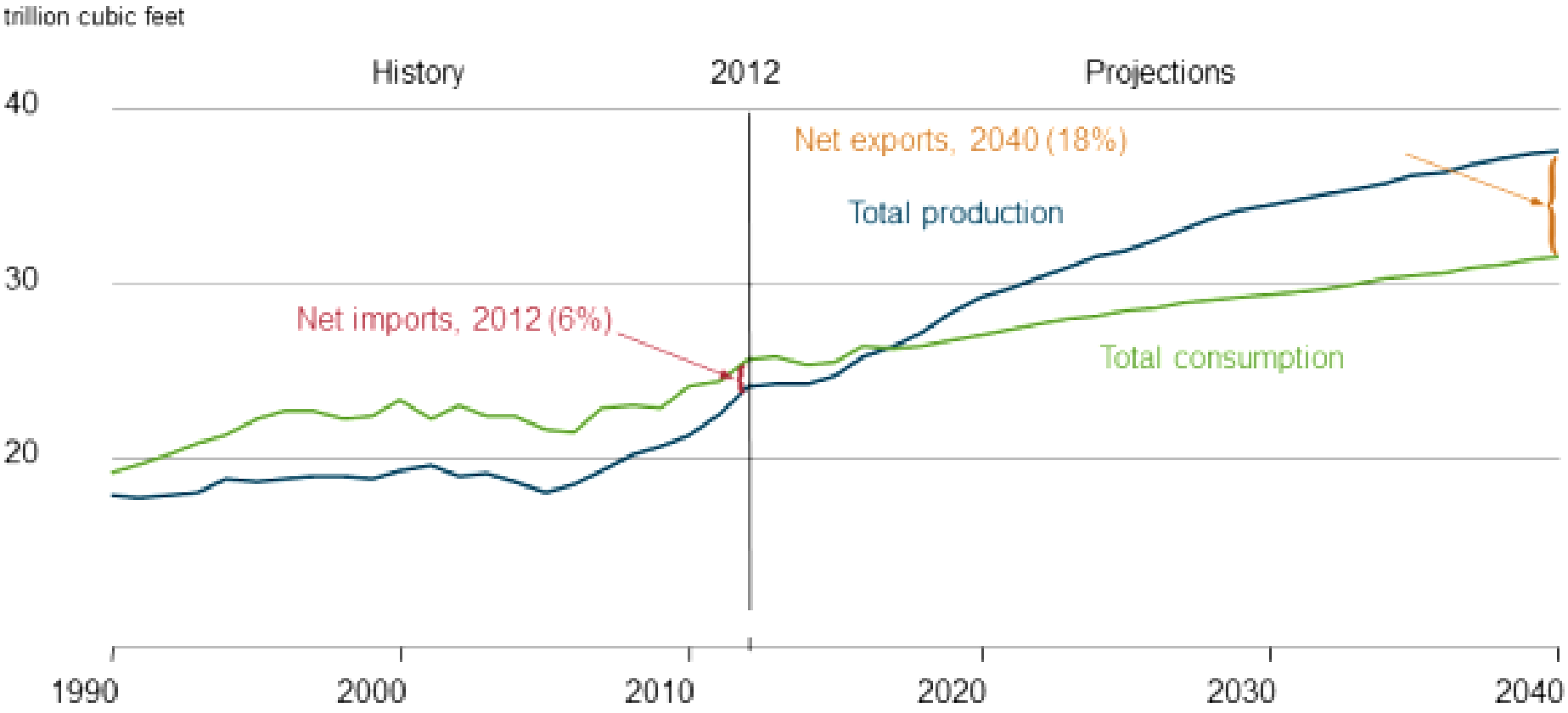
Figure MT-42. Total natural gas production, consumption, and imports in the Reference case, 1990-2040



Forecasts for Shale Gas Resource?

- 2008 - **347 TCF** - Energy Information Administration (EIA)
- 2008 - **840 TCF** - Navigant for Clean Skies Foundation
- 2009 - **616 TCF** - Potential Gas Committee (PGC)
- 2011 - **827 TCF** - Energy Information Administration (EIA)
- 2013 – **1,073 TCF** - Potential Gas Committee (PGC)

Source: Various resource estimates

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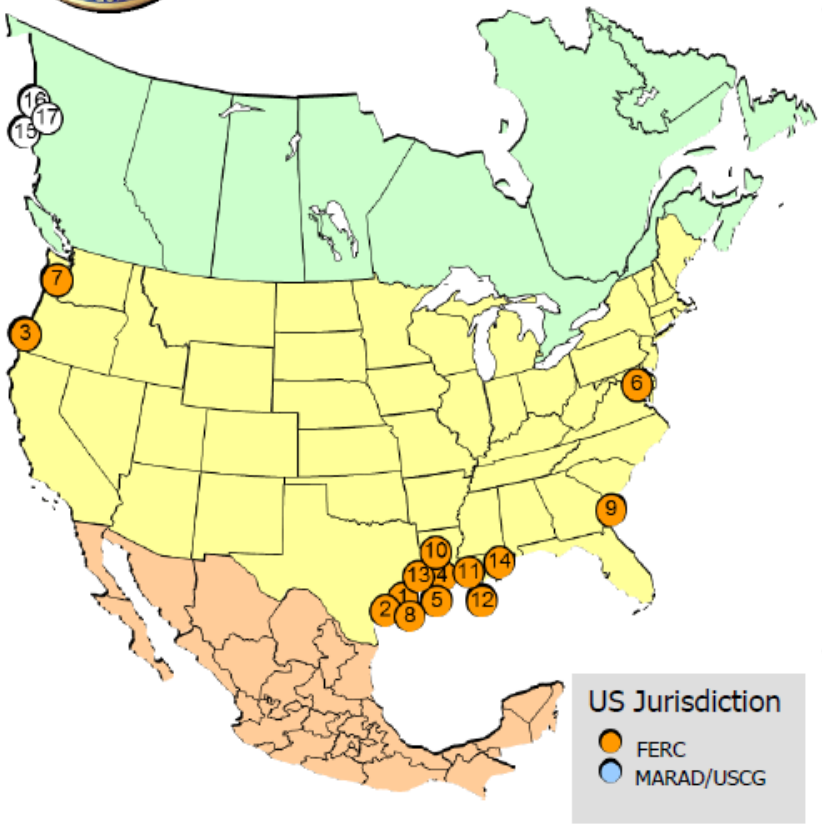
Energy Security for the U.S.

In 2013 the U.S. consumed 26 TCF of natural gas. According to the Potential Gas Committee, the Energy Information Administration and MIT, the most recent range of technically recoverable U.S. reserves (using current technology) is from 2,200 to 3,500 TCF.

Proposed LNG Export Facilities

North American LNG Export Terminals
Proposed



Export Terminal

PROPOSED TO FERC

1. **Freeport, TX:** 1.8 Bcfd (Freeport LNG Dev/Freeport LNG Expansion/FLNG Liquefaction) (CP12-509)
2. **Corpus Christi, TX:** 2.1 Bcfd (Cheniere – Corpus Christi LNG) (CP12-507)
3. **Coos Bay, OR:** 0.9 Bcfd (Jordan Cove Energy Project) (CP13-483)
4. **Lake Charles, LA:** 2.2 Bcfd (Southern Union - Trunkline LNG) (CP14-120)
5. **Hackberry, LA:** 1.7 Bcfd (Sempra – Cameron LNG) (CP13-25)
6. **Cove Point, MD:** 0.82 Bcfd (Dominion – Cove Point LNG) (CP13-113)
7. **Astoria, OR:** 1.25 Bcfd (Oregon LNG) (CP09-6)
8. **Lavaca Bay, TX:** 1.38 Bcfd (Excelerate Liquefaction) (CP14-71 & 72)
9. **Elba Island, GA:** 0.35 Bcfd (Southern LNG Company) (CP14-103)
10. **Sabine Pass, LA:** 1.40 Bcfd (Sabine Pass Liquefaction) (CP13-552)
11. **Lake Charles, LA:** 1.07 Bcfd (Magnolia LNG) (CP14-347)
12. **Plaquemines Parish, LA:** 1.07 Bcfd (CE FLNG) (PF13-11)
13. **Sabine Pass, TX:** 2.1 Bcfd (ExxonMobil – Golden Pass) (PF13-14)
14. **Pascagoula, MS:** 1.5 Bcfd (Gulf LNG Liquefaction) (PF13-4)

PROPOSED CANADIAN SITES IDENTIFIED BY PROJECT SPONSORS

15. **Kitimat, BC:** 1.28 Bcfd (Apache Canada Ltd.)
16. **Douglas Island, BC:** 0.23 Bcfd (BC LNG Export Cooperative)
17. **Kitimat, BC:** 3.23 Bcfd (LNG Canada)

As of May 21, 2014

** Filed Certificate Application*

Office of Energy Projects

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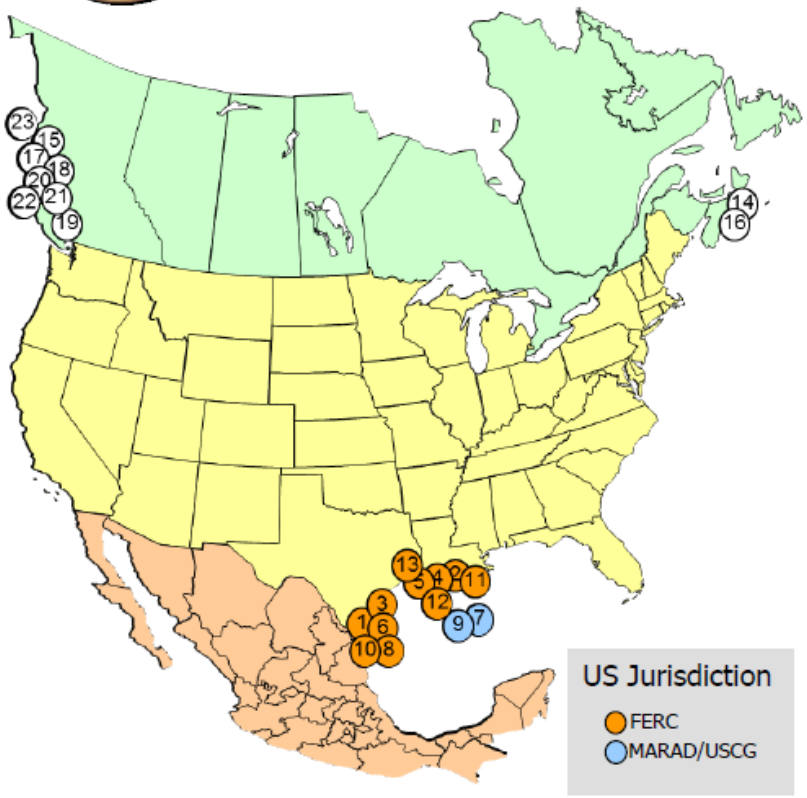
Potential LNG Export Facilities

North American LNG Export Terminals
Potential



Export Terminal

POTENTIAL U.S. SITES IDENTIFIED BY PROJECT SPONSORS

1. **Brownsville, TX:** 2.8 Bcfd (Gulf Coast LNG Export)
2. **Cameron Parish, LA:** 0.16 Bcfd (Waller LNG Services)
3. **Ingleside, TX:** 1.09 Bcfd (Pangea LNG (North America))
4. **Cameron Parish, LA:** 0.20 Bcfd (Gasfin Development)
5. **Cameron Parish, LA:** 0.67 Bcfd (Venture Global)
6. **Brownsville, TX:** 3.2 Bcfd (Eos LNG & Barca LNG)
7. **Gulf of Mexico:** 3.22 Bcfd (Main Pass - Freeport-McMoRan)
8. **Brownsville, TX:** 0.94 Bcfd (Annova LNG)
9. **Gulf of Mexico:** 1.8 Bcfd (Delfin LNG)
10. **Brownsville, TX:** 0.27 Bcfd (Texas LNG)
11. **Plaquemines Parish, LA:** 0.28 Bcfd (Louisiana LNG)
12. **Cameron Parish, LA:** 0.54 Bcfd (SCT&E LNG)
13. **Port Arthur, TX:** 0.2 Bcfd (WesPac/Gulfgate Terminal)

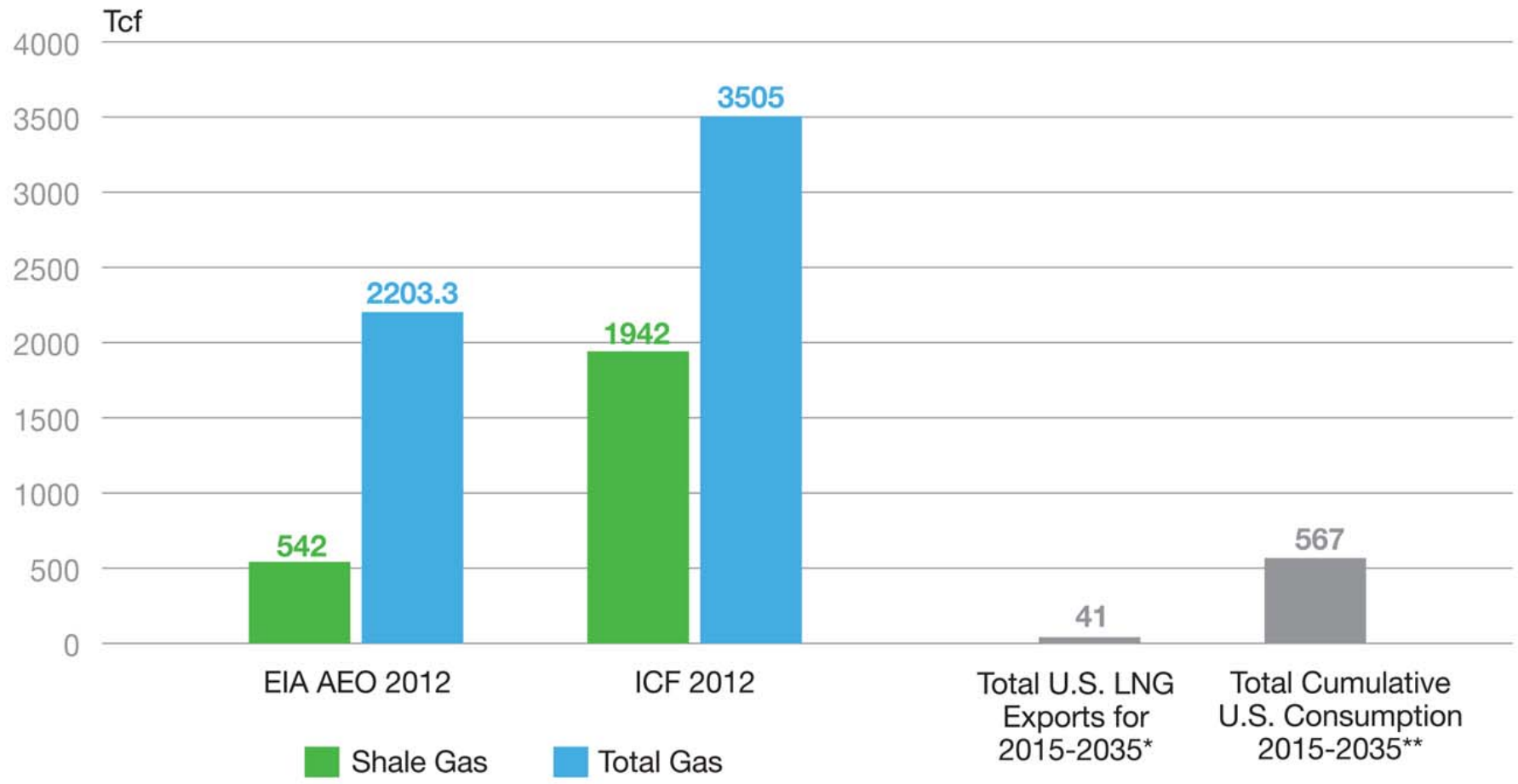
POTENTIAL CANADIAN SITES IDENTIFIED BY PROJECT SPONSORS

14. **Goldboro, NS:** 1.4 Bcfd (Pieridae Energy Canada)
15. **Prince Rupert Island, BC:** 2.91 Bcfd (BG Group)
16. **Melford, NS:** 1.8 Bcfd (H-Energy)
17. **Prince Rupert Island, BC:** 2.74 Bcfd (Pacific Northwest LNG)
18. **Prince Rupert Island, BC:** 4.0 Bcfd (ExxonMobil – Imperial)
19. **Squamish, BC:** 0.29 Bcfd (Woodfibre LNG Export)
20. **Kitimat/Prince Rupert, BC:** 0.32 Bcfd (Triton LNG)
21. **Prince Rupert, BC:** 3.12 Bcfd (Aurora LNG)
22. **Kitsault, BC:** 2.7 Bcfd (Kitsault Energy)
23. **Stewart, BC:** 4.1 Bcfd (Canada Stewart Energy Group)

As of May 21, 2014

Office of Energy Projects

Estimates of U.S. Total Natural Gas Resource Base vs. Total U.S. LNG Exports and Consumption



Source

*20 years of 6 Bcf/d of LNG exports phased in between 2015 and 2020 reaching 6 Bcf/d in 2020 and thereafter.
**Source: EIA AEO 2013ER.

American Petroleum Institute (API) "Liquefied Natural Gas: Exports – America's Opportunity and Advantage" Report, March 2014

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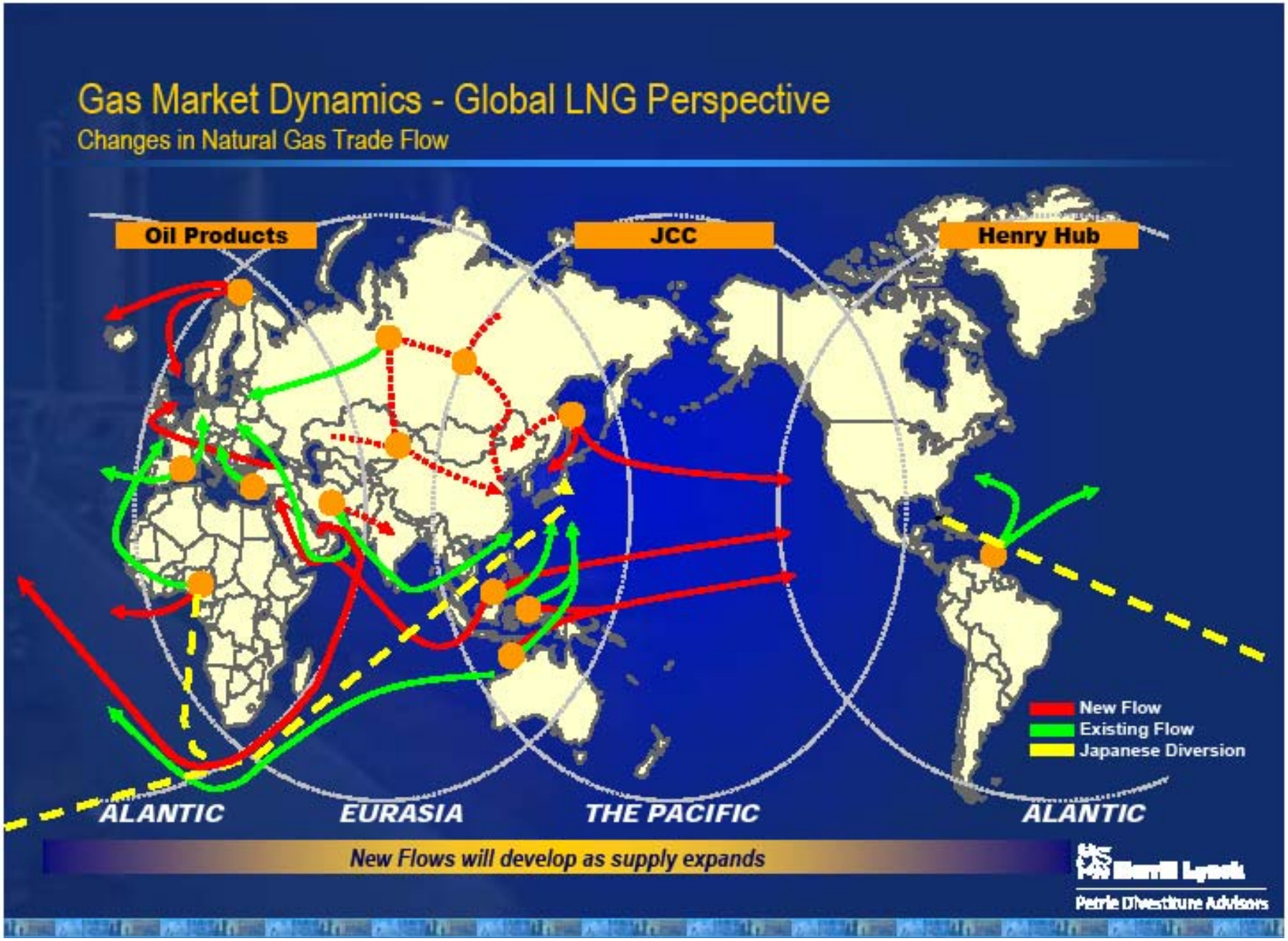
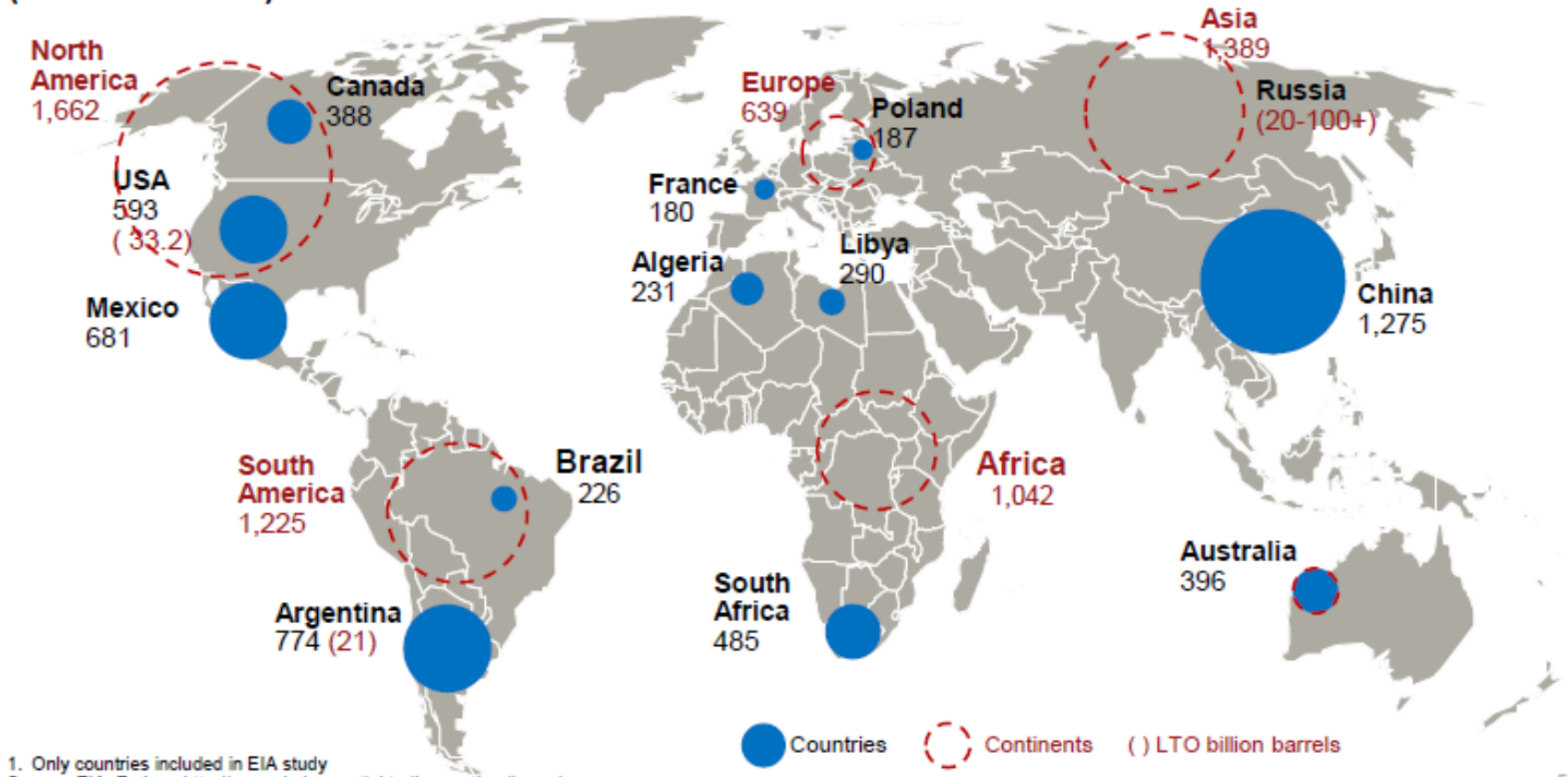

Gas Market Dynamics - Global LNG Perspective
Changes in Natural Gas Trade Flow
Oil Products
JCC
Henry Hub
New Flow
Existing Flow
Japanese Diversion
ALANTIC
EURASIA
THE PACIFIC
ALANTIC
New Flows will develop as supply expands
Merrill Lynch
Petrie Divestiture Advisors

ATKearney

Resource potential in North America is massive – with the Rockies accounting for a significant fraction

Major global shale gas and LTO opportunities[1]

Technically recoverable shale gas (trillion cubic feet) and LTO (Billion barrels) resources



1. Only countries included in EIA study
Source: EIA, Forbes, http://www.shale-gas-tight-oil-argentina-ii.com/

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World Gas Reserves 2003 vs. 2013

2003 Rank	Country	Proved Reserves, Trillion Cubic Feet (2003)	Proved Reserves Trillion Cubic, Feet (2013)	2013 Rank
1	Qatar	910.1	890	3
2	Iran	970.8	1187	2
3	United Arab Emirates	213.9	215.025	7
4	Saudi Arabia	238.4	287.844	5
5	Russia	1694.4	1688	1
6	Algeria	160.4	159.05	10
7	Turkmenistan	102.4	265	6
14	**United States**	**186.9**	**308.436**	**4**
15	Canada	56.6	68.166	18

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Shale Revolution?

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Gazprom's Current Near-Monopoly Supply Position

% of Supply from Gazprom/Russia	
Slovakia	100%
Macedonia	100%
Finland	99%
Bulgaria	97%
Serbia & Montenegro	87%
Lithuania	84%
Hungary	80%
Czech Republic	79%
Greece	76%

Source: "Domestic Consumption" EIA International Energy Annual, 2007; "Exports 2006 and 2007" Gazexport as cited by Energy Intelligence, March 2008

Gazprom's Current Near-Monopoly Supply Position (cont'd)

% of Supply from Gazprom/Russia	
Austria	74%
Slovenia	64%
Poland	62%
Ukraine	66%
Turkey	60%
Germany	40%
Croatia	37%
Italy	30%
France	25%

Source: "Domestic Consumption" EIA International Energy Annual, 2007; "Exports 2006 and 2007" Gazexport as cited by Energy Intelligence, March 2008

Putin Takes Over Crimea

KyivPost
INDEPENDENCE. COMMUNITY. TRUST

Russian armed forces seize Crimea as Putin threatens wider military invasion of Ukraine

The New York Times

Putin Reclaims Crimea for Russia and Bitterly Denounces the West

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Nord Stream Pipeline

- ECONOMIC ASPECTS
- POLITICAL ISSUES
- EVIRONMENTAL CONCERNS
- SOCIAL IMPLICATIONS

Source: *Europe Doubles Down on Russian Gas to Feed its Energy Appetite,* by Andrew Haney, Ricardo Bracho, Nick Wolfe and Max Faith

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South Stream Pipeline

	Russia (UGSS expansion)	Offshore part	European part (onshore)	Total
Length, km	2500	925	1730	4300
Capacity, bcm (at the entry point in Bulgaria)	63	63		63
CAPEX, bln. Euro	9,1	10,0	6,1	25,2

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History of Kovykta

- **1987** – Kovykta Discovered
- License to develop held by Russia Petroleum (Majority of RP owned by TNK-BP)
- **June 2006** - Top TNK-BP Engineer Enver Ziganshin murdered
- **June 2007** - TNK-BP offered to sell stake for $700-$900 million to Gazprom, but deal never materialized
- **June 2010** - Russia Petroleum filed for bankruptcy
- TNK-BP attempted to sell field to state owned Rosneft but failed
- **March 2011**- Gazprom bought Russia Petroleum's assets, including Kovykta, for $711 million

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Kovykta Gas Field

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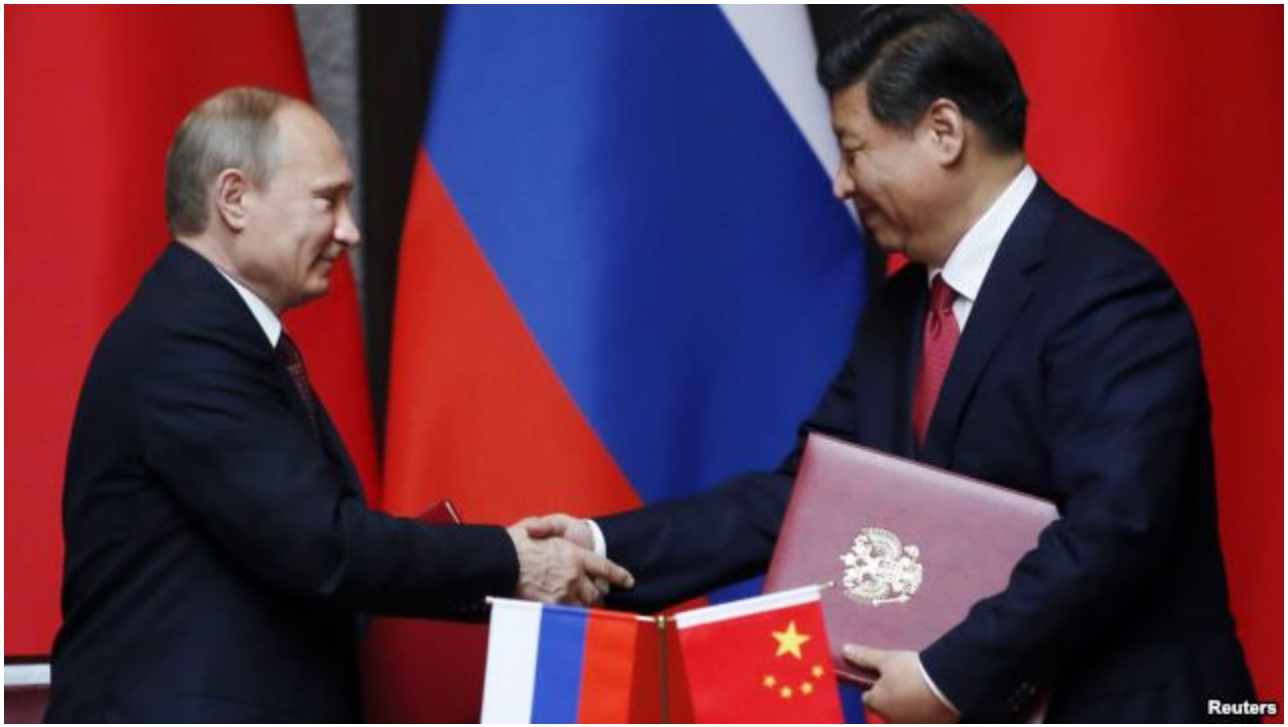
Kovykta Today

May 2014 -

The Washington Post

China, Russia sign $400 billion gas deal



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$35.4 Billion Demanded in Letter to EU

Bloomberg

Putin Calls on Europe to Aid Ukraine or Face Gas Supply Risk

FOX NEWS

Putin warns Europe about Ukraine gas debt

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Top ten countries with technically recoverable shale resources

Shale oil		
rank	country	billion barrels
1	Russia	75
2	United States	58
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**

Shale gas		
rank	country	trillion cubic feet
1	China	1,115
2	Argentina	802
3	Algeria	707
4	United States	665
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
	World total	**7,299**

Note: ARI estimates U.S. shale oil resources at 48 billion barrels and U.S. shale gas resources at 1,161 trillion cubic feet.
Source: United States: EIA and USGS; Other basins: ARI.

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Source: *Outlook for U.S. shale oil and gas,* Presentation to Argus Americas Crude Summit, 01/22/2014, Adam Sieminski, EIA Administrator

A Global Picture

Global demand for natural gas is expected to increase between 18 Bcf/day and 38 Bcf/day by 2025.

ICF International expects worldwide liquefaction capacity outside the U.S. to expand by nearly 50 Bcf/day by 2025.

Current U.S. export projects at the DOE account for deliveries of approximately 35 Bcf/day of LNG.

According to ICF, “With projections of world demand for LNG ranging from 50-65 Bcf/day by 2025, global LNG supply may exceed demand.”

Contact Information

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Citations for Report

All of the information utilized for this report is a compilation of information pulled from the following data sources:

Energy Information Administration (EIA)
Bentek Energy, Jack Weixel
American Petroleum Institute (API)
Ponderosa Advisors LLC
The Washington Post
Office of Energy Projects
Potential Gas Committee (PGC)
Office of Fossil Energy
Fox News
Bloomberg
Office of Oil Gas Global Security Supply
U.S. Department of Energy
Raymond James and Associates, Inc.
Charif Souki, Cheniere Energy Inc.; Cheniere Research
U.S. Federal Energy Regulatory Commission
Institute for Energy Research (IER)
Bernstein Research
Western Energy Alliance
Sutherland LNG Blog
Platts Gas Daily Report, A McGraw Hill Publication
Colorado Oil and Gas Association