U.S. Shale Gas and Tight Oil:
Game-Changers for the U.S. and the World

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• U.S. unconventional oil and natural gas production renaissance: scale and scope

• Many benefits generated
  1) Economic
  2) Environmental
  3) Energy security

• Steps to support continuation of the success story and to meet the world’s energy needs affordably
World-Scale Growth in U.S. Unconventional Natural Gas and Oil Production

U.S. Natural Gas Production
(Billions of cubic feet per day)

U.S. Oil Production
(Million barrels per day)

Source: U.S. Department of Energy, Energy Information Administration (EIA)
America’s "Big Four" Unconventional Fields are World-Class Discoveries

Map shows wells drilled in U.S. Lower 48 states since start of 20th century; well locations from U.S. Geological Survey; resource estimates based upon publically available sources and ConocoPhillips estimates.
Growth in Production Restored U.S. Role as Leading Oil Producer

Crude, Condensate and NGLs Production for Top 10 Countries, 2014

- **United States**: 10 MBD
- **Saudi Arabia**: 11 MBD
- **Russia**: 12 MBD
- **China**: 4 MBD
- **Canada**: 3 MBD
- **Iran**: 1.5 MBD
- **UAE**: 1.5 MBD
- **Iraq**: 1 MBD
- **Kuwait**: 0.5 MBD
- **Mexico**: 0.5 MBD

OPEC Neutral Zone production split between Saudi Arabia and Kuwait
Impact of Lower Market Prices: U.S. Producers Adapt and Improve

**U.S. Natural Gas Production and Prices**
- Henry Hub, $/mmbtu (Right axis)
- Production in Billion cubic feet per day (Left axis)

**U.S. Crude Oil Production and Prices**
- Brent, $/barrel (Right axis)
- Production in Million barrels per day (Left axis)

*** 2016 and 2017 data are EIA forecasts

Shale Gas and Tight Oil Production Underpinned Massive Economic Benefits

Oil & Natural Gas Production Spurred U.S. Jobs and Economic Growth

**Oil and Gas Sector Expanded While Other Sectors Lagged**

Index of Job Growth: Jan. 2007 = 1.0

"For every job created in oil production, three jobs are created in the supply chain and six more in the broader economy."*

**U.S. Unemployment Rate**

U.S. oil & gas drove 40% of U.S. GDP growth from 2008-2013*

Sources: U.S. Bureau of Labor Statistics (Total Private Sector Jobs, NAICS 211000 and 213112) for data displayed on graphs; Quotations(*) from IHS Inc., "Unleashing the Supply Chain" released March 2015, pp. 4-5.
Positive effects for U.S. Pet-Chem, Manufacturing and Trade

U.S. Natural Gas Liquids Production and Foreign Trade (Million barrels per day)

Manufacturing Employment Reversed a 12-year Decline (Annual % change)

Sources: U.S. Energy Information Administration (NGL production and trade data); Bureau of Labor Statistics (jobs data)
U.S. Oil Production Prevented Higher Prices in Recent Years

Brent Crude Oil Prices Would Have Been $12 to $40 per Barrel Higher in 2013

Source: ICF International for American Petroleum Institute, October 30, 2014
Free Trade Prevents Steep Discounts on Domestic Crude Prices

• With U.S. crude production in decline, the domestic crude oil price discount is small today.

• Without crude exports, seasonal discounts would have been possible even with production declining today when U.S. refineries are in steep maintenance turnarounds.

• Without crude exports, the domestic crude price discount would have grown over time as the global oil price recovered and U.S. crude production growth resumed.

• Crude exports are more likely to be economic when U.S. refineries are in turnaround.

Benchmark Crude Price Differential
WTI – Brent ($/bbl)

Source: ICE, CME Group
Critical Success Factors for U.S. Production Growth

• Legal and fiscal systems that facilitate investment
  - Private property & mineral rights
  - Fit for purpose regulations
  - Efficient permitting process

• Large drilling fleet and service/support capabilities

• Highly developed transportation infrastructure

• Transparent market pricing
  - Numerous market hubs
  - Liquid Spot and Forward markets
Shale Gas Helps Reduce CO₂ Emissions in Power Generation

### U.S. CO₂ Emissions from Energy Use

- **Energy Source:** Biomass
  - Pounds of CO₂ per MWh of Power: 2,988
- **Energy Source:** Coal
  - Pounds of CO₂ per MWh of Power: 2,249
- **Energy Source:** Oil
  - Pounds of CO₂ per MWh of Power: 1,672
- **Energy Source:** Natural Gas
  - Pounds of CO₂ per MWh of Power: 1,135
- **Energy Source:** Nuclear; Hydro; Renewables
  - Pounds of CO₂ per MWh of Power: Low or None

### Sources:
- 2025 target as per President Obama
- CO₂ generated in electricity generation from California State Polytechnic University
Paradigm Shift: Short to Long on Domestic Supplies

Liquefied Natural Gas Imports (bcf per day)

U.S. Crude Oil Production (millions of barrels per day)

U.S. Net Energy Imports (millions of BOE per day)

Source: U.S. Energy Information Administration (EIA); LNG and Net Energy Imports predictions from EIA AEO 2005 Report
The Future of North American Production is Shale
(Bcf/day)

Shale
Gas from Tight Oil
Other

Marcellus is the Growth Leader
Growth in production 2015-2020
(Bcf/day)

Marcellus
Haynesville/Fayetteville
Permian
Anadarko
Gulf Coast
Bakken
Niobrara

Source: Wood Mackenzie; U.S. and Canada production combined
Affordable Shale Gas Enables LNG Exports

U.S. Liquefaction Operational & Under Construction Today

- **Operational**
- **Under Construction**

Almost 70 MTPA (9 BCFD) capacity Online by 2020

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<th>Year</th>
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Source: Map, ConocoPhillips; Liquefaction volumes, Wood Mackenzie
U.S. Tight Oil Production Has Helped Stabilize World Oil Supplies

Growth in Global Supply Disruptions

Increase in losses since 2009

Growth in U.S. Tight Oil Production

Increase in production since December 2009

Source: U.S. Department of Energy, EIA, Short Term Energy Outlook
Summary

• Domestic production created numerous, wide-ranging benefits across the country
  o Jobs and Income growth in states with shale resources plus other regions providing service or supply-chain inputs to production
  o U.S. CO2 emissions fell following increase in use of natural gas for power generation
  o U.S. and global energy security enhanced by reliability and competitiveness of U.S. supplies

U.S. unconventional gas and oil renaissance: True Game-Changers for Global Gas and Oil Markets