

### U.S. Shale Gas and Tight Oil:

## Game-Changers for the U.S. and the World

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### Outline

- 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



### America's "Big Four" Unconventional Fields are World-Class Discoveries





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### Growth in Production Restored U.S. Role as Leading Oil Producer

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





### Impact of Lower Market Prices: U.S. Producers Adapt and Improve

**U.S. Natural Gas Production and Prices** 

**U.S. Crude Oil Production and Prices** 



\*\*\* 2016 and 2017 data are EIA forecasts

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### Shale Gas and Tight Oil Production Underpinned Massive Economic Benefits



Contribution to value-added GDP: \$1,400 per capita

Annual savings from low-cost natural gas: \$800 per household

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Federal tax revenue contribution: Equal to a 13% reduction in the federal budget deficit

\$1.400

13%

Source: AMERICA'S UNCONVENTIONAL ENERGY OPPORTUNITY; 2015; Porter, Gee, Pope; Harvard Business School and Boston Consulting Group. Note: prior to oil price collapse.



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



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### Positive effects for U.S. Pet-Chem, Manufacturing and Trade

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



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## (Annual % change) 2% 0% -2% -4% -6% -8% -10% -12%

Manufacturing Employment Reversed a 12-year Decline

1998 2000 2002 2004 2006 2008 2010 2012 2014

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

Real 2014 \$/BBL



#### U.S. Consumer Gasoline Prices Would Have Been \$0.30 to \$0.94 per Gallon Higher in 2013





### 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



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### 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 CO<sub>2</sub> Emissions in Power Generation

#### U.S. CO<sub>2</sub> Emissions from Energy Use (million tonnes per annum)

# CO<sub>2</sub> Emissions Associated with Electricity Generation

Energy Source	Pounds of CO <sub>2</sub> per MWh of Power
Biomass	2,988
Coal	2,249
Oil	1,672
Natural Gas	1,135
Nuclear; Hydro; Renewables	Low or None



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### Paradigm Shift: Short to Long on Domestic Supplies





### North American Natural Gas Production Outlook

The Future of North American Production is Shale





### Affordable Shale Gas Enables LNG Exports





### U.S. Tight Oil Production Has Helped Stabilize World Oil Supplies



#### Growth in U.S. Tight Oil Production





### Summary

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

