Fueling Up
The Economic and Environmental Implications of the American Oil & Gas Boom

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The Dark Before the Dawn
Oil and natural gas prices
Real 2012 USD

Source: EIA, BLS, HSUS
US oil and gas production forecasts, 2008

Global supply and price

Source: IEA
Keeping America competitive requires affordable energy. And here we have a serious problem: America is addicted to oil, which is often imported from unstable parts of the world. . . . By applying the talent and technology of America, this country can dramatically improve our environment, move beyond a petroleum-based economy, and make our dependence on Middle Eastern oil a thing of the past.

—President George W. Bush
An Oil & Gas Renaissance
High prices drive exploration

Natural gas rigs and prices

Source: EIA, Bloomberg
EIA natural gas production forecasts

Billion cubic feet per day

Source: EIA
Recent natural gas production forecasts

Billion cubic feet per day

Citigroup (2012)
WoodMac (2011)
IHS (2012)
ExxonMobil (2012)
BP (2013)
IEA (2013)
EIA (2013)
Historical
Oil and gas prices part ways
Real 2012 USD per MMBTU

Source: EIA, BLS
Turning the focus to oil

Number of active rigs

Source: Baker Hughes
A turnaround in US oil supply
Million bbl/d of production

Source: EIA
EIA oil production forecasts

Million bbl/d

Source: EIA
Recent oil production forecasts

Million bbl/d

- Citigroup (2012)
- WoodMac (2011)
- IHS (2012)
- ExxonMobil (2012)
- BP (2013)
- IEA (2013)
- EIA (2014)
- Historical
Changing outlook for US dependence on imported energy
Share of total consumption

Source: EIA
Oil and gas prices part ways
Real 2012 USD per MMBTU

Source: EIA, BLS
Turning the focus to oil

Number of active rigs

Source: Baker Hughes
A turnaround in US oil supply
Million bbl/d of production

Source: EIA
And a revised oil supply outlook

Million bbl/d of production

Source: EIA
Current oil production forecasts
Crude and NGLs, million bbl/d

- Citigroup
- WoodMac
- IHS
- ExxonMobil
- BP
- IEA
- EIA
- Historical
American energy independence?
Net energy imports as a share of consumption

Source: EIA

Historical
Economic Impact
Change in global oil production, H1 2013 vs. H1 2008

Source: EIA
Change in consumer expenditures
Billion USD, 2013-2035 average

- Lower Oil Prices: $97
- Higher Oil Demand: $22
- Lower Natural Gas Prices: $70
- Higher Natural Gas Demand: $17
- Lower Coal Expenditures: $0.5
- Higher Power Demand: $8
- Lower Power Prices: $50
- Lower Renewable Expenditures: $10
- Pre-Shale: $1,580
- Optimistic: $1,403
Change in producer revenue
Billion USD, 2013-2035 average

- Pre-Shale Revenue: $738
- HIGHER OIL PRODUCTION: $255
- LOWER OIL PRICES: $101
- HIGHER NATURAL GAS PRODUCTION: $64
- LOWER NATURAL GAS PRICES: $118
- LOWER COAL PRODUCTION AND PRICES: $14
- LOWER RENEWABLE REVENUE: $8
- LOWER NUCLEAR REVENUE: $15
- Optimistic Revenue: $802
Fixed asset investment by industry
Billion 2005 chained dollars

Source: BEA
Textbook stimulus
Impact of the oil and gas boom vs. the American Recovery and Reinvestment Act

Source: Houser and Mohan
Dutch disease or Dutch sniffle?
Recent precedents

Source: IMF, UN Comtrade
Energy trade deficit
As a percent of GDP

Source: Houser and Mohan
Natural gas prices for industrial consumers
USD per MMBTU

Source: EIA, IEA
A boon to US chemicals production

Feedstock cost, USD per MMBTU

- Naphtha (Gulf Coast)
- Crude Oil (WTI)
- Ethane (Mont Belvieu)
- Natural Gas (Henry Hub)

Source: EIA, Bloomberg
Energy-intensive industry in perspective

Potential reduction in energy costs as a share of shipment value

Source: Houser and Mohan
Balancing energy savings against exchange rate effects

Potential cost reductions vs. net export exposure

Source: Houser and Mohan
Environmental Effects
US CO2 emissions have dropped sharply
Actual vs. projected energy-related CO2 emission, million tons

Source: EIA
CO2 emissions, US vs. EU

Billion tons
What explains the drop?
Actual vs. projected energy-related CO2 emissions in 2012

Source: EIA, BEA, authors' estimates
Power generation – pre-shale vs. optimistic
Billion kwh
US CO2 emissions
Billion tons

- Pre-Shale
- Conservative
- Optimistic
- Historical
Change in US CO2 emissions by source
Million tons, 2013-2035 annual average

- Pre-Shale: 5,556
- Optimistic: 5,447

- POWER SECTOR FUEL SWITCHING: -363
- OTHER FUEL SWITCHING: -14
- HIGHER POWER DEMAND: 54
- HIGHER RESIDENTIAL DEMAND: 16
- HIGHER COMMERCIAL DEMAND: 28
- HIGHER INDUSTRIAL DEMAND: 63
- HIGHER TRANSPORT DEMAND: 44

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Power generation – pre-shale vs. optimistic w/ carbon price

Billion kwh

Pre-Shale w/ Carbon Price


Coal 44% 23% 20% 18% 15% 12% 9% 6% 3% 1% 0%
Nat Gas 5% 8% 10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30% 32% 34% 36% 38% 40% 42% 44% 46% 48% 50%
Petroleum 25% 28% 31% 34% 37% 40% 43% 46% 49% 52% 55% 58% 61% 64% 67% 70% 73% 76% 79% 82% 85% 88% 91% 94% 97%
Nuclear 7% 6% 5% 4% 3% 2% 1% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%
Hydro 12% 10% 8% 6% 4% 2% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%
Other Renewables 7% 6% 5% 4% 3% 2% 1% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%

Optimistic w/ Carbon Price


Coal 44% 23% 20% 18% 15% 12% 9% 6% 3% 1% 0%
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Other Renewables 7% 6% 5% 4% 3% 2% 1% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%
Trade Policy Implications
Natural Gas Trade

Net Imports as a share of US consumption, 2007 projections vs. actual

Source: EIA
Turnaround in US oil trade
Million bbl/d

Source: EIA and RHG estimates
Average Net Back to the Powder River Basin, 2007-2012

$ per short ton, 8800 btu/lb

During 2007-2012, PRB mine-mouth prices averaged $12 per short ton.

Chinese Spot Price in Guangzhou

Net Back to PRB

Source: Bloomberg, SX Coal and Rhodium Group estimates
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