Monumental Changes by 2050

- GDP: 254%
- Electricity Generation: 140%
- Energy Demand: 84%
- World Population: 9.0 billion
- People living in cities: 6.8 billion
The New Energy Reality

Energy Security is central to our national and economic security

- Demand to increase 53% by 2035
  - 90% in non-OECD countries
- Electricity demand to increase 76%
- 1.6 billion people without electricity
- $38 trillion of new investment by 2035 to meet rising demand
An Inconvenient Energy Truth

Global Energy Demand by Region: 2008 & 2035

- United States
- OECD Europe
- Russia
- Japan
- Non-OECD
- Canada
- South Korea
- Australia/NZ
- China
- Other Non...
- India
- Middle East
- Africa
- Latin America
- Mexico/Chile

Quarillion Btu

2008

2035

0 25 50 75 100 125 150 175 200 225 250

U.S. Chamber of Commerce
China: Fueling Urbanization

Steel Consumption for Urban Construction in China (million tonnes)

- 2005: 60
- 2010: 90
- 2015: 140
- 2020: 190
- 2025: 250
India’s Have Nots

- 400 million: Equals population of USA and Germany
- 600 million: Cook with wood or dung
- 900 million: No refrigeration
  - Equals population of USA, UK, Italy, Germany, France, and Spain

(U.S. Chamber of Commerce)

[Image of a bar chart showing the above information.]
US Demand for Energy

Figure 41. Primary energy use by fuel, 1980-2035

quadrillion Btu

History

Projections

- Renewables
- Biofuels
- Liquids
- Natural gas
- Nuclear
- Coal

21% INCREASE IN DEMAND
A New Paradigm: ENERGY ABUNDANCE

- **Technically Recoverable Resources**
  - 120 years of Nat Gas
  - 206 Years of Oil
  - 464 years of Coal

- **In-place Resources**
  - 586 years of Nat Gas
  - 536 years of oil
  - 9,844 years of coal

Institute for Energy Resources Analysis of U.S. Government Data
U.S. Natural Gas Production, 1990-2035

What a difference 4 years makes
## Shale Fueling Our Economy

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2015</th>
<th>2020</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs Supported (millions)</td>
<td>1.75</td>
<td>2.5</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>New Government Revenue (billions)</td>
<td>$62</td>
<td>$91</td>
<td>$111</td>
<td>$124</td>
</tr>
<tr>
<td>Economic Growth (billions)</td>
<td>$237</td>
<td>$350</td>
<td>$417</td>
<td>$475</td>
</tr>
<tr>
<td>New Labor Income (billions)</td>
<td>$125</td>
<td>$181</td>
<td>$215</td>
<td>$250</td>
</tr>
</tbody>
</table>
Fueling Our Economy

- Shale plays are on pace to create
  - +200,000 jobs in OH by 2020
  - +115,000 jobs in PA by 2020 (150,000 existing)
  - +100,000 jobs in TX, LA, and MS
- Oil & Gas sector created 9% of all American jobs in 2011
- Shale is driver behind 68% increase in domestic oil production by 2020.
- Net oil imports expected to decrease 60% in 2020... reducing America’s import bill by $200B by 2020.
- Manufacturing Renaissance
- Return of the Chemical, Fertilizer, Steel Industries
- Change the Geopolitical Balance in US favor
Fueling Our Economy

By 2035, U.S. unconventional oil and natural gas could generate more than:

- 3.5 million new jobs;
- $2.5 trillion in additional revenue;
- $5.1 trillion in investment;
- and 10 million barrels worth of added daily oil and natural gas production.
Offshore Undiscovered Technically Recoverable Federal Oil and Natural Gas Resources

Source: MMS and Department of the Interior
Where the Action IS and ISN'T

U.S. Oil and Natural Gas Production on Federal vs. Non-federal Lands and Waters

Source: EIA, Office of Natural Resource Revenue
Other U.S. Crude Oil Supply Scenarios

U.S. Oil Production Hits 11.5 million b/d

- Excess Peak Production Levels by Nearly 2.0 Mbd
- 5.9
- 1.8
- 4.1

U.S. Oil Production Outlook: 2012 to 2035

- 8.5 MMbbl/d

Source: BENTEK Crude Awakening Part 6

Source: IHS, America’s New Energy Future.
Crude oil imports decline because of:

(1) flat demand for oil; and (2) greater domestic output.
Oil & Gas is THE Job Driver

Percentage Change in Employment from 2007: O&G v All Non-Farm

- O&G: +38.6%
- All Non-Farm: -2.6%

Source: BLS
Keystone XL Pipeline proposal
Canadian Oil Sands Benefits

- Currently supports 80,000 U.S. jobs
- Could increase to 94,000 - 600,000 U.S. jobs by 2035
- Keystone XL pipeline could create 20,000 US manufacturing jobs immediately and 250,000 by 2035
- The projected impact to U.S. GDP would be between $200 billion - $800 billion
Electricity Generating Capacity Additions 1985-2035 (gigawatts)
Natural Gas-Fired Power Stations Will Gain Share

Growing interdependency of natural gas & electricity supplies creating market challenges that could affect reliability.
Domestic Coal Consumption Down

U.S. Consumption Down 27% in five years

Source: EIA Quarterly Coal Report 10-4-12
Global Coal Demand Way Up

The emergence of a mass market for autos, especially in the U.S., led to a surge in oil production.

Global production to meet oil by 2017

Source: EIA Quarterly Coal Report 10-4-12
Exports have increased 190% in three years
2012 will beat all-time high in 1981
EPA’s Rulemakings on the Runway

- Revised Stormwater Regulation (Post Construction) NPRM 11/11
- Boiler MACT Reconsideration NPRM 12/11
- Petroleum Refineries - Heat Exchangers NESHP Reconsideration Final rule 11/11
- Clean Water Protection Rule NPRM 1/12
- Oil & Natural Gas Sector NESHAP/NSPS Final rule 3/12
- Steam Electric Power Efficient Standards NPRM 7/12
- CERCLA Section 108(b) Requirements for Hard Rock Mining NPRM 3/12
- Gas Turbines HAP Petition to Delist Final rule 11/12
- Human Subjects Rule Revisions Final rule 12/11
- TRI Reporting for Metal Mining Activities Final rule 12/11
- Utility MACT Final rule 12/11
- Nitric Acid Plants NSPS Final rule 4/12
- NOx and SOx Secondary NAAQS Review Final rule 4/12
- CERCLA/PCRA Animal Waste Air Reporting Requirements NPRM 8/12
- NGW Tailoring Rule - Step 3 NPRM 2/12
- Herbal Incense NSPS Final rule 9/12
- Chesapeake Bay CAFO Rule Final rule 9/12
- Mercury Cell Chlor-Alkali MACT Final rule 9/12
- TSCA Regulations on Long-Chain Perfluorinated Chemicals NPRM 3/13
- EPA Effluent Limitations Guidelines is NPRM 7/12
- Lead Dust Hazard Standards NPRM 3/13
- NPDWR for Perchlorate NPRM 3/13
- Coalbed Methane Effluent Standards NPRM 6/13
- NPDWR for Perchlorate NPRM 3/13
- Shale Gas Extraction Pretreatment Standards NPRM 10/14
- Pre-Proposal Stage
- PM2.5 Implementation Rule Revision Pre-Proposal Stage
- Lead NAAQS NPRM 12/13
- Ozone NAAQS NPRM 7/13
- Brick and Structural Clay and Clay Ceramics NESHP Pre-proposal stage

- Primary Lead Smelting NESHP Final rule 11/11
- Secondary Aluminum Production NESHP NPRM 12/11
- Nuclear Operations Radiation Protection Standard ANPRM 12/11
- 2011
- Primary Aluminum Reduction NESHP NPRM 11/11
- Secondary Lead Smelters NESHP NPRM 12/11
- Polymers and Resins NESHP NPRM 12/11
- GHG NSPS for EGUs NPRM 1/12
- Cement MACT Amendments NPRM 2/2012
- Operating Uranium Mill Tailings NESHP NPRM 3/12
- NSPS Review for Residential Wood Heaters NPRM 1/12
- Lead Paint Standards for Public and Commercial Buildings NPRM 6/12
- Part 63 Malfunction Amendments NPRM 4/12
- Agricultural Worker Protection Standard Revisions NPRM 7/12
- 1-Hour SO2 NAAQS Implementation NPRM 7/12
- Certification of Pesticide Applicators NPRM 10/12
- TRI Industry Sectors Expansion NPRM 1/12

- 2012
- Petroleum Refinery NESHP/NRPS NPRM 12/11
- NSPS & EG for CISWI - Reconsideration NPRM 12/11
- Pulp and Paper NESHP NPRM 1/12
- Water Quality Standards Regulatory Clarifications NPRM 3/12
- Certification of Pesticide Applicators NPRM 10/12
- TRI Industry Sectors Expansion NPRM 1/12
- CAFE Reporting Rule Final rule 7/12
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- Air Quality Regulations
- Fuel Regulations
- GHG Regulations
- Air Toxics Regulations
- Pesticides
- Toxic Substances
- Waste
- Water
- Other
U. S. first quarter total carbon dioxide emissions from energy demand, 1992 to 2012

million metric tons

1,800
1,600
1,400
1,200
1,000
800
600
400
200
0

U.S. Strategy - More Realism

"NO SILVER BULLET APPROACH"

- Maximize Efficiency
- Increase domestic oil and gas
- Recognize role for nuclear and clean coal
- New alternative transportation fuels
- Sustainable policy on renewables
- Modernize our infrastructure
- Exert authority to get beyond NOPE syndrome
- Invest in our technology solutions and our intellectual foundation for innovation

Achievable Climate Approach
ON THE TABLE: America’s national security, investment climate and competitiveness

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