Prudent Development

Realizing the Potential of North America's Abundant Natural Gas and Oil Resources

CERA Week 2012

Houston, Texas

March 5, 2012

National Petroleum Council (NPC)

Origins: Continuation of WWII government / industry cooperation.

Purpose: Solely to advise the U.S. Secretary of Energy and Executive Branch by conducting studies at their request.

Organization: A Federally chartered, self-funded Advisory Committee. Not an advocacy group, does not lobby.

Membership: Broad and balanced. Approximately 200 members from all segments of the oil and gas industries and broader stakeholders.

Study Participants: Diverse interests and expertise relating to the topic being addressed.

Study Reports: All NPC advice is provided in reports approved by its members and available to the public. They can be viewed and downloaded a no cost from the NPC website – www.npc.org

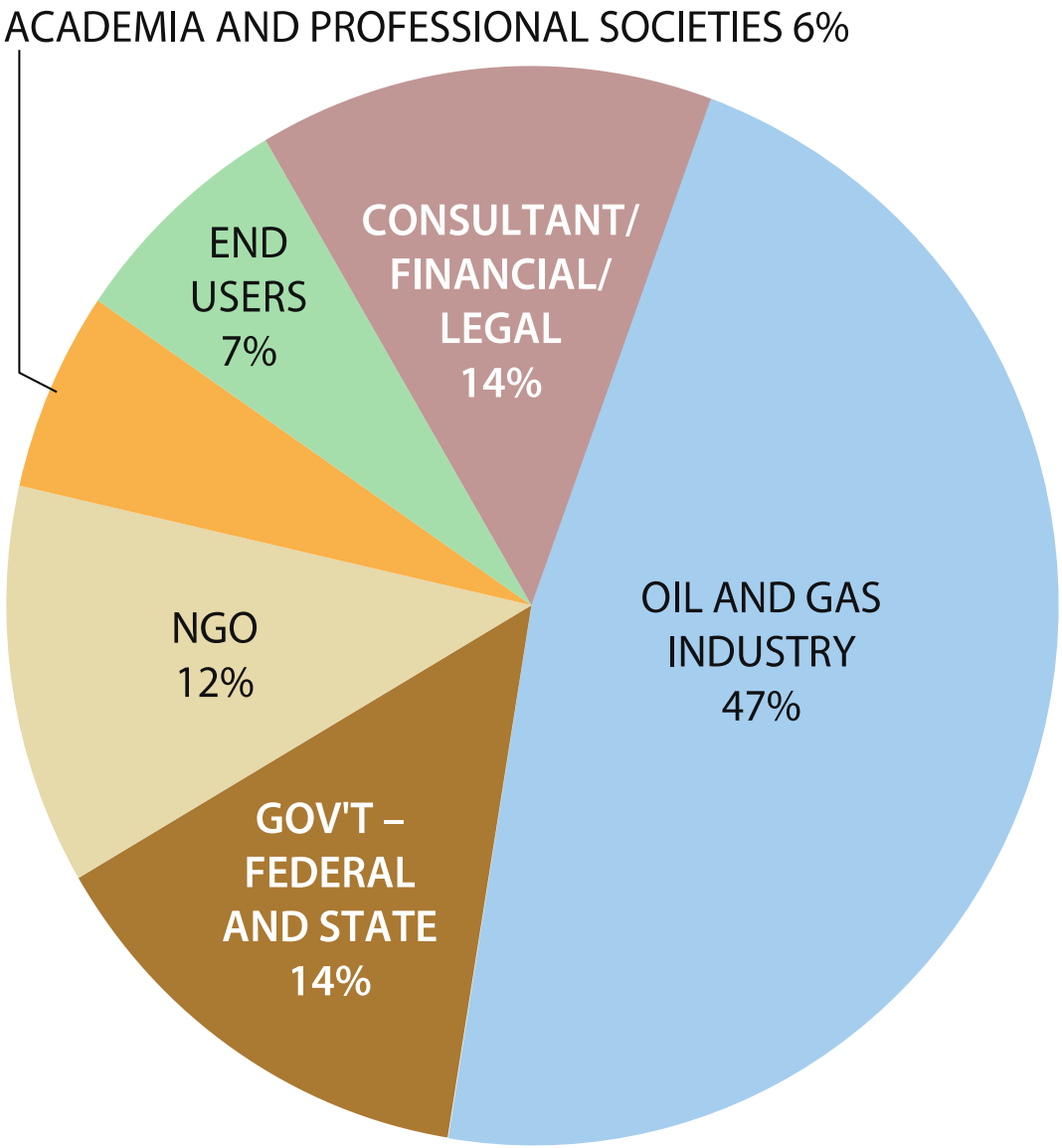
Prudent Development Study Objectives

- **Assess the N. American resource base – natural gas and oil**
  - Conventional
  - Unconventional
- **Describe the role of technology**
  - Environmental
  - Operational
- **Assess N. American supply and demand**
  - Through 2035
  - With a view to 2050
- **Identify the potential role of natural gas to lower emissions**
- **Meet national objectives: economic, environmental, security**

Diverse Study Participation

Study Committee,
CSC,
Task Groups,
Subgroups

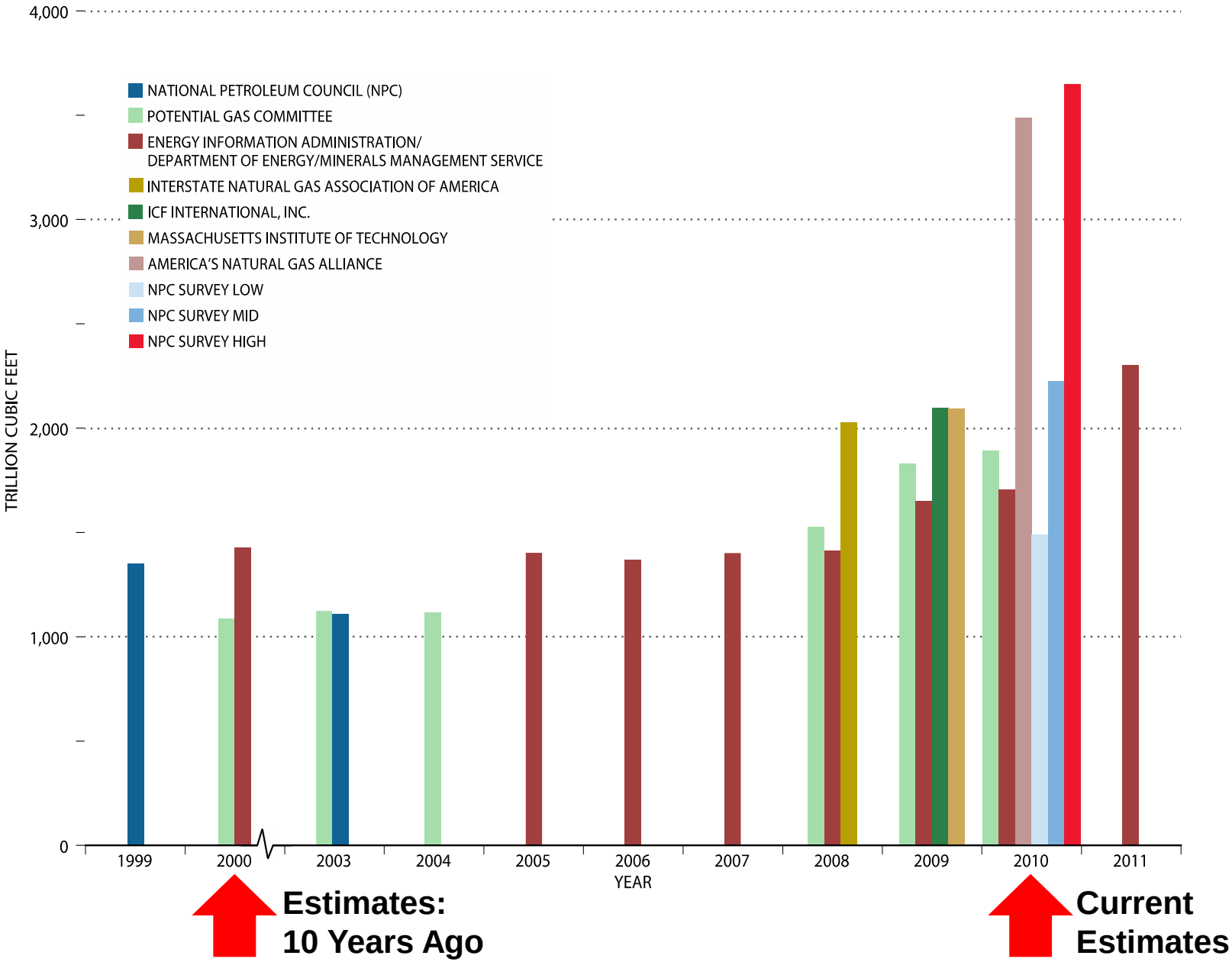
Over
400
Participants



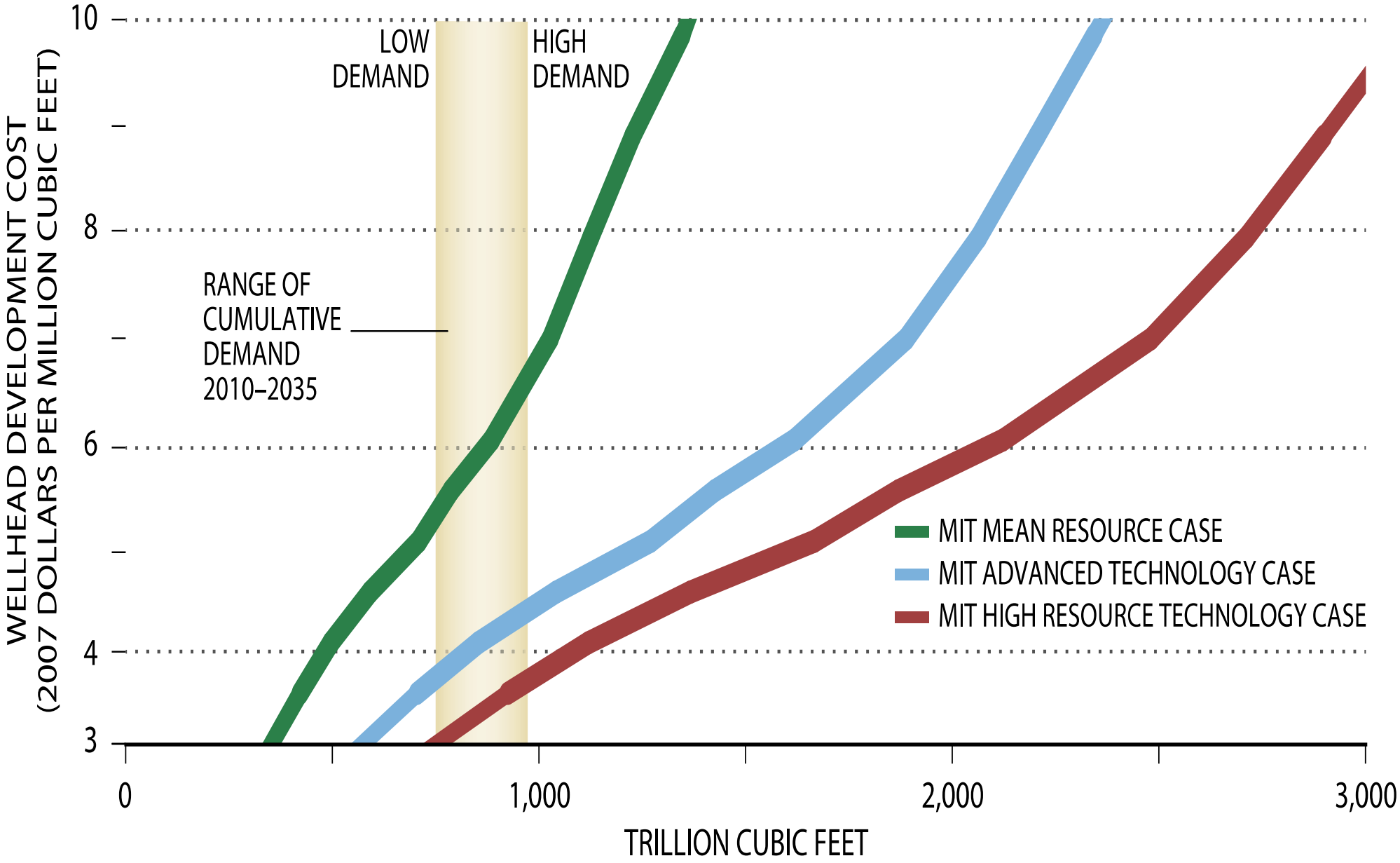
Four Major Findings

- **First, the potential supply of North American natural gas is far bigger than was thought even a few years ago**
- **Second – and perhaps surprising to many – America's oil resources are also proving to be much larger than previously thought**
- **Third, we need these natural gas and oil resources even as efficiency reduces energy demand and alternatives become more economically available on a large scale**
- **Fourth, realizing the benefits of natural gas and oil depends on environmentally responsible development**

U.S. Gas Resource Estimates Transform Outlook

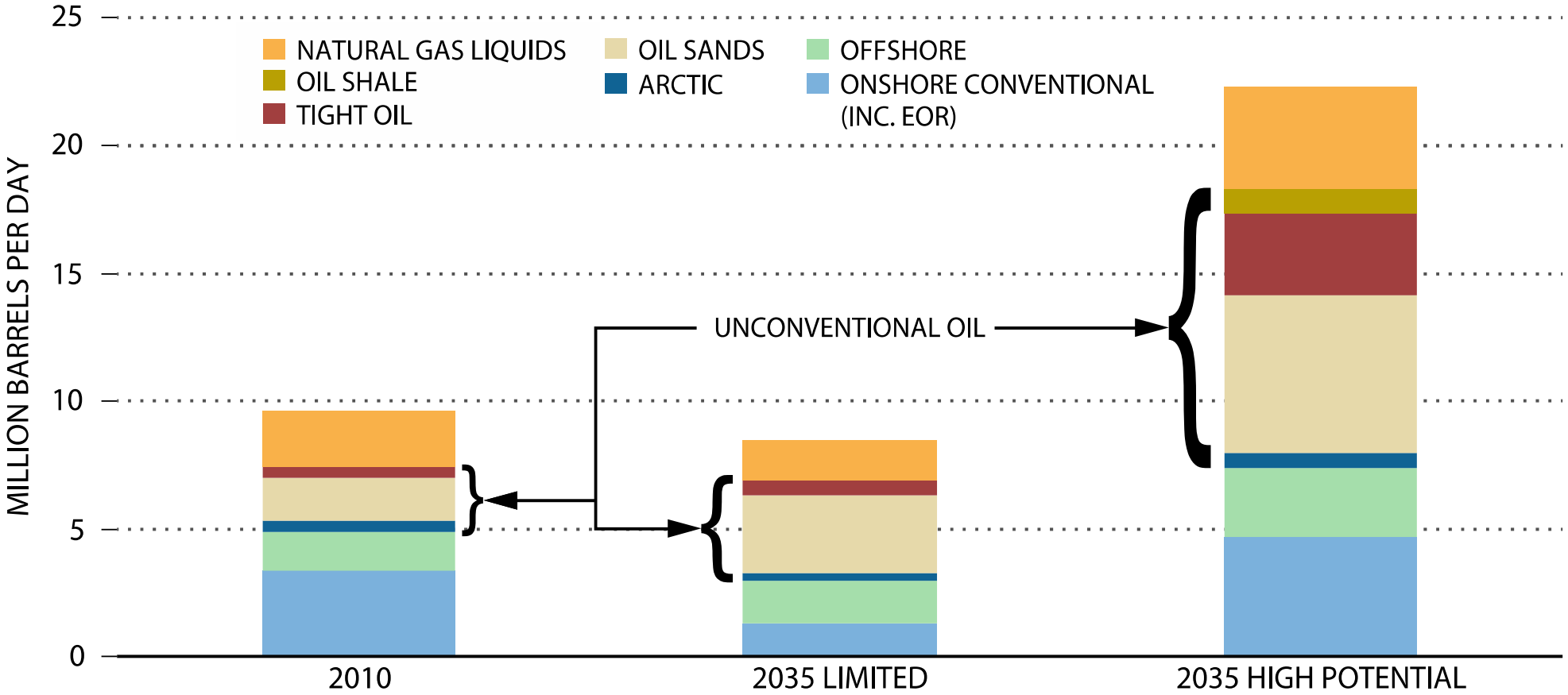


Resource Base Can Supply the Market at Moderate Cost



N.A. Oil Supply Has Large Upside, Risk of Decline

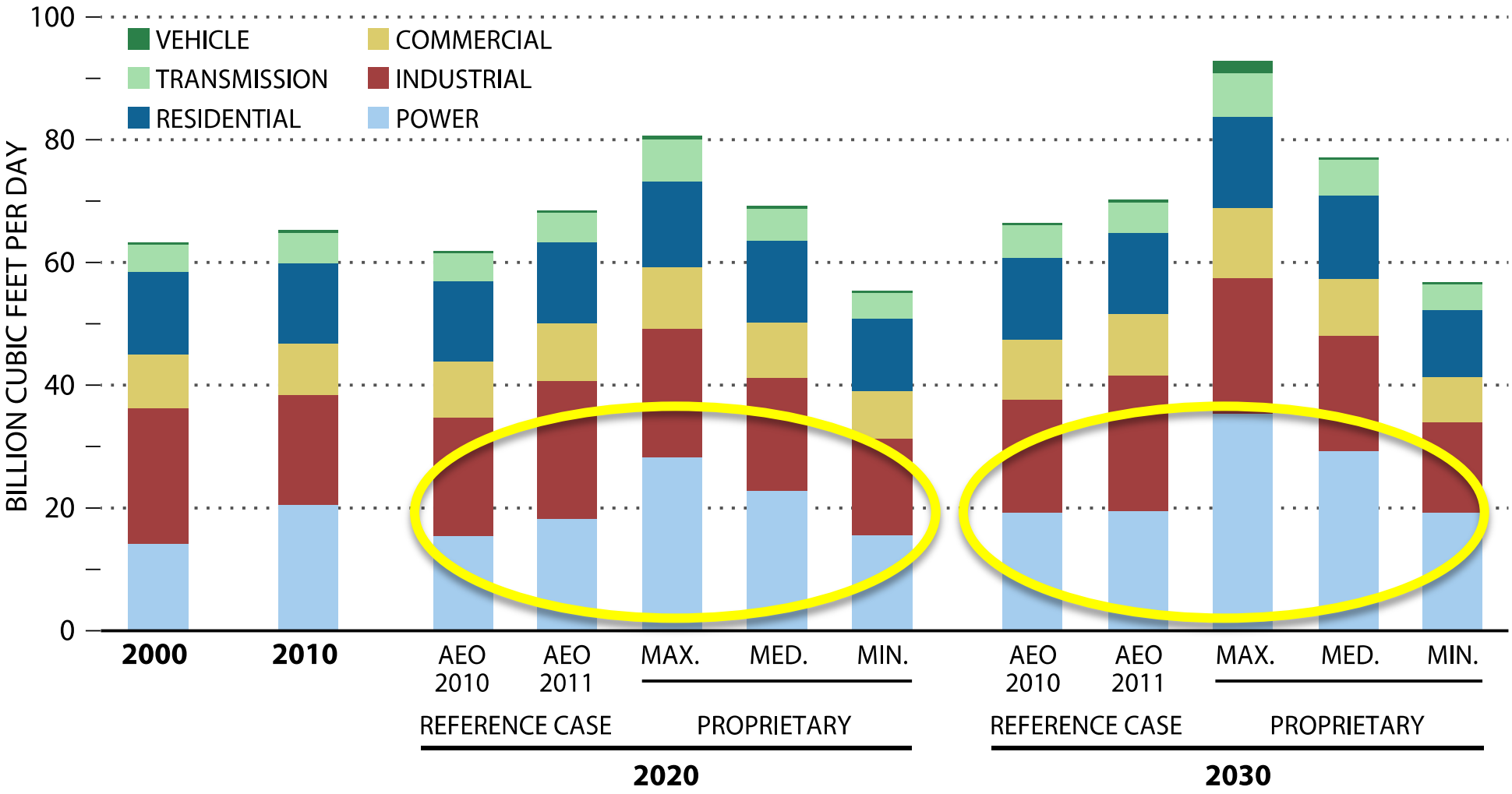
High production opportunities enabled by access frameworks



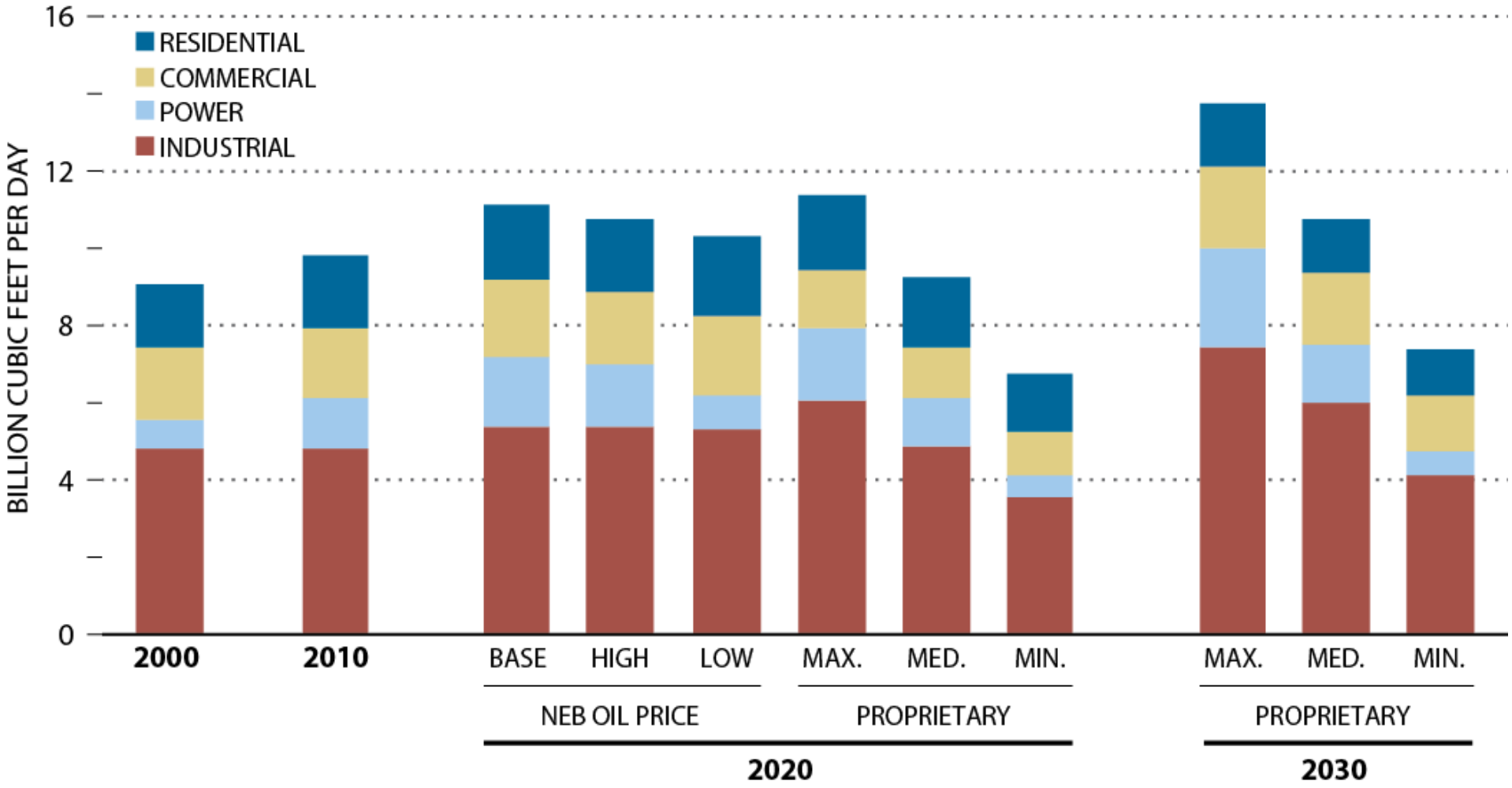
Natural Gas and Oil Have a Portfolio of Available Domestic Supply Options

- **In the near-term, currently commercial developments:**
  - Gulf of Mexico, Oil Sands, EOR, tight oil, onshore unconventional gas
- **In the medium-term, recognised high-potential areas with currently restricted access:**
  - Arctic, "new" offshore regions, plus all the above
- **In the long-term, resources which need new technologies and/or new access and regulatory regimes:**
  - Methane hydrates, shale oil (kerogen), U.S. oil sands, plus all the above
- **Medium and long-term options need sustained access, appropriate regulatory certainty, technology development and focus on environmental performance**
- **Pipeline, storage and processing facilities will need to expand to accommodate increased supply**

Power Sector Drives U.S. Gas Demand Outlook

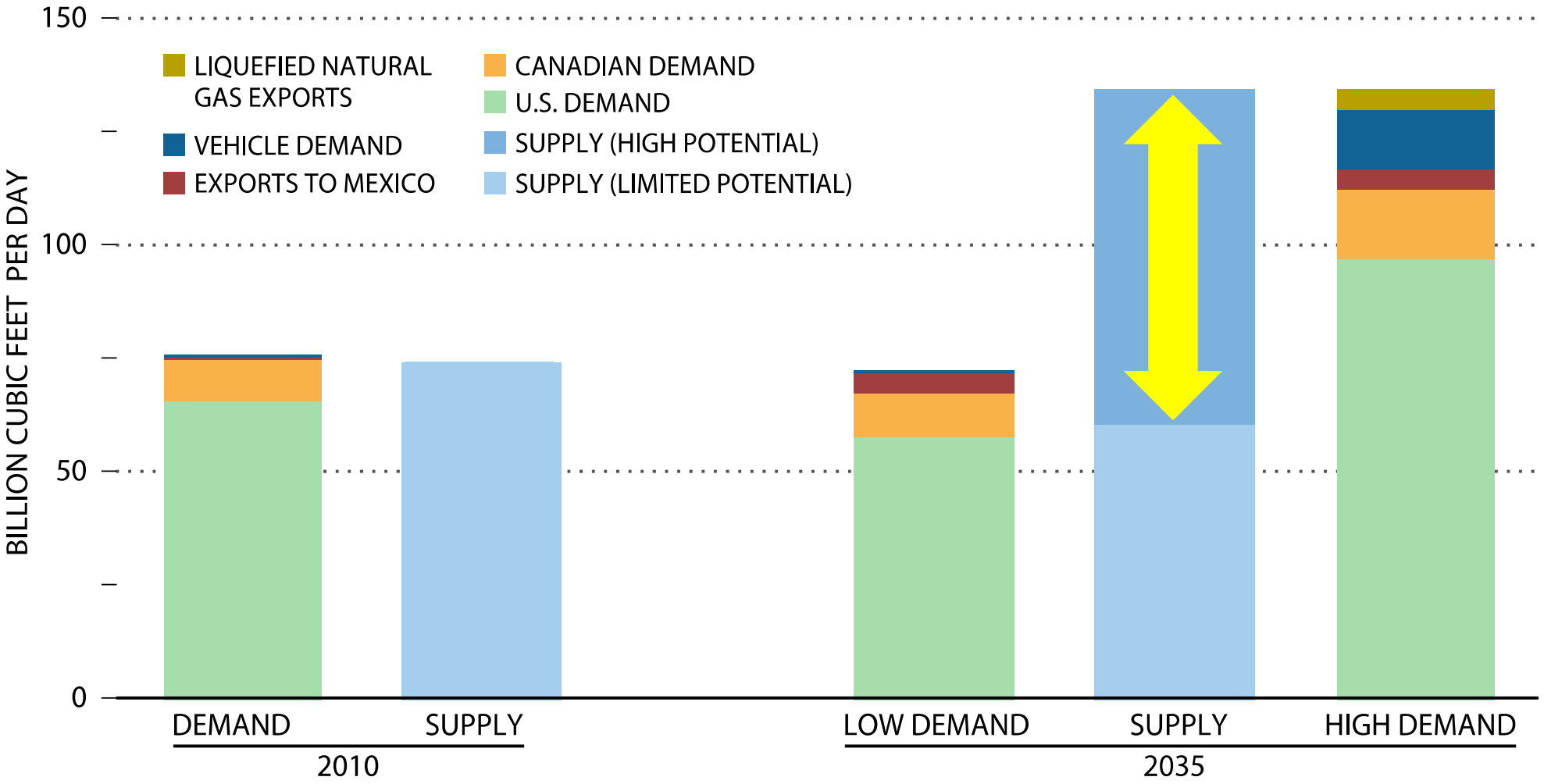


Industrial and Power Demand Drive Canadian Outlook



Source: NPC
Notes: NEB = National Energy Board 2009 Cases

North American Natural Gas Can Meet Even the Highest Potential Demand



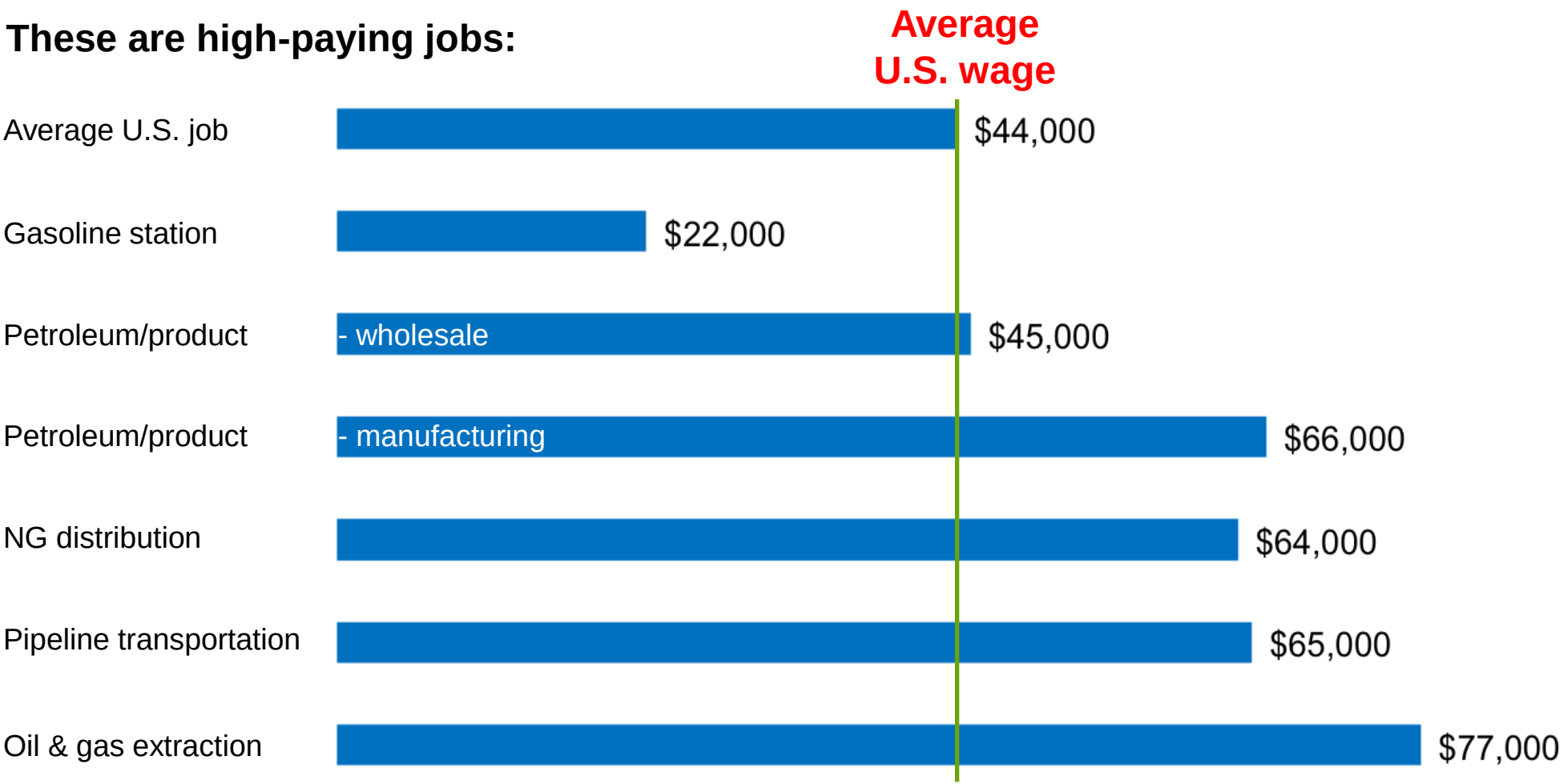
Demand Related Recommendations

- **Better Reflect Environmental Impacts in Markets and Fuel/Technology Choices**
  - Keep option for deep reductions of GHG emissions by supporting Carbon Capture and Sequestration (CCS) R&D that is fuel neutral
  - Develop and Adopt Methodologies for Full Fuel Cycle Analysis
- **Enhance the Efficient Use of Energy**
  - Support Energy Efficiency Measures for Buildings and Appliances
  - Remove Disincentives for Utilities to Deploy Energy Efficiency Measures
  - Remove Barriers to Combined Heat and Power
- **Enhance the Regulation of Markets**
  - Allow Utilities to Effectively Manage Natural Gas Price Risk through Hedging and Long Term Contracts
  - Harmonize Interaction between Natural Gas and Power Markets

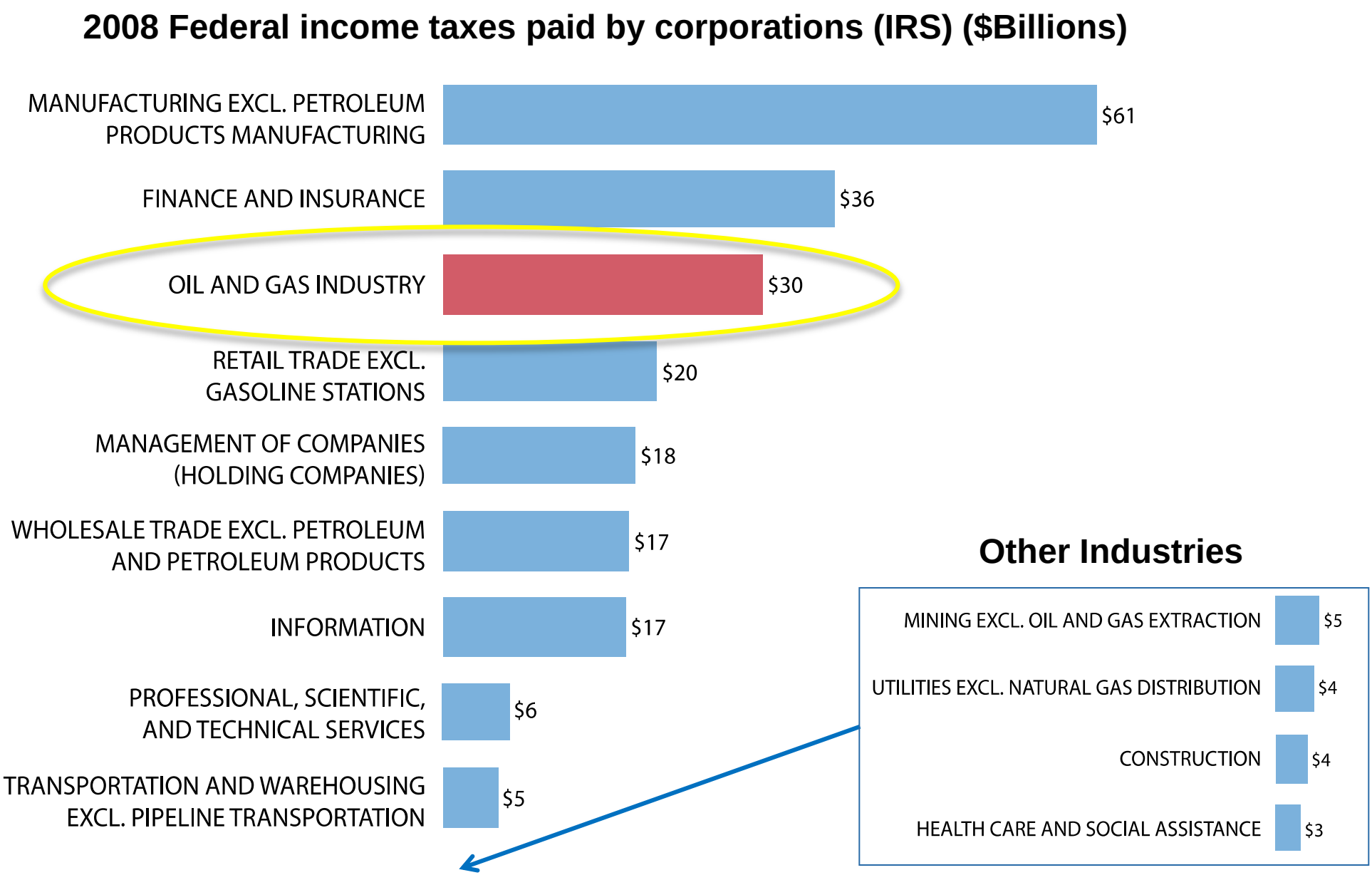
Domestic Oil & Gas Has Large Employment Impact

- Direct jobs in the oil & gas industry: 2+ million
- Total direct/indirect jobs from oil & gas industry activity: 9+ million
- Labor income: $175 billion direct, $533 billion total

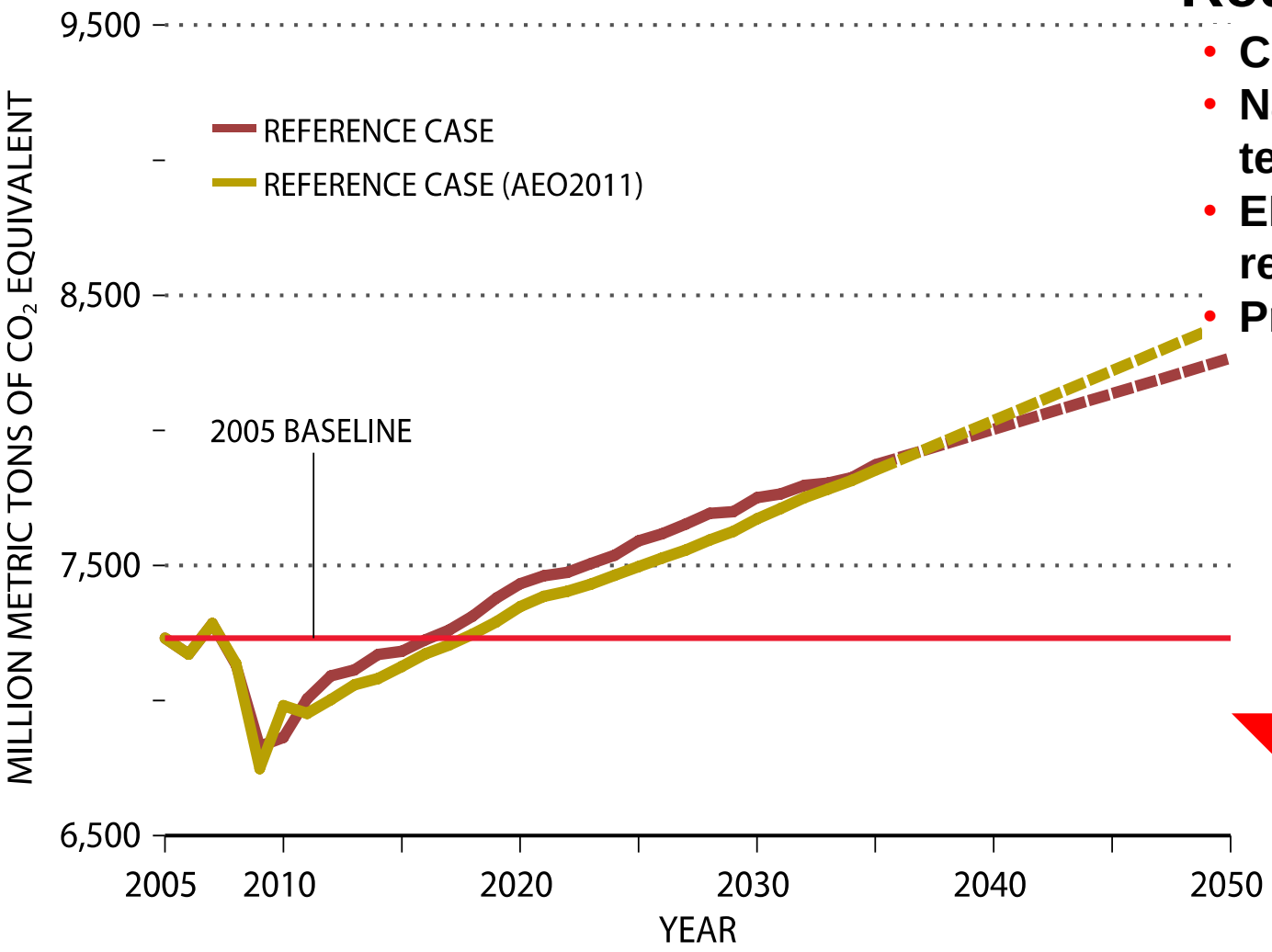
These are high-paying jobs:



Oil and Gas Is a Substantial Source of Government Revenue



Greenhouse Gas Emissions



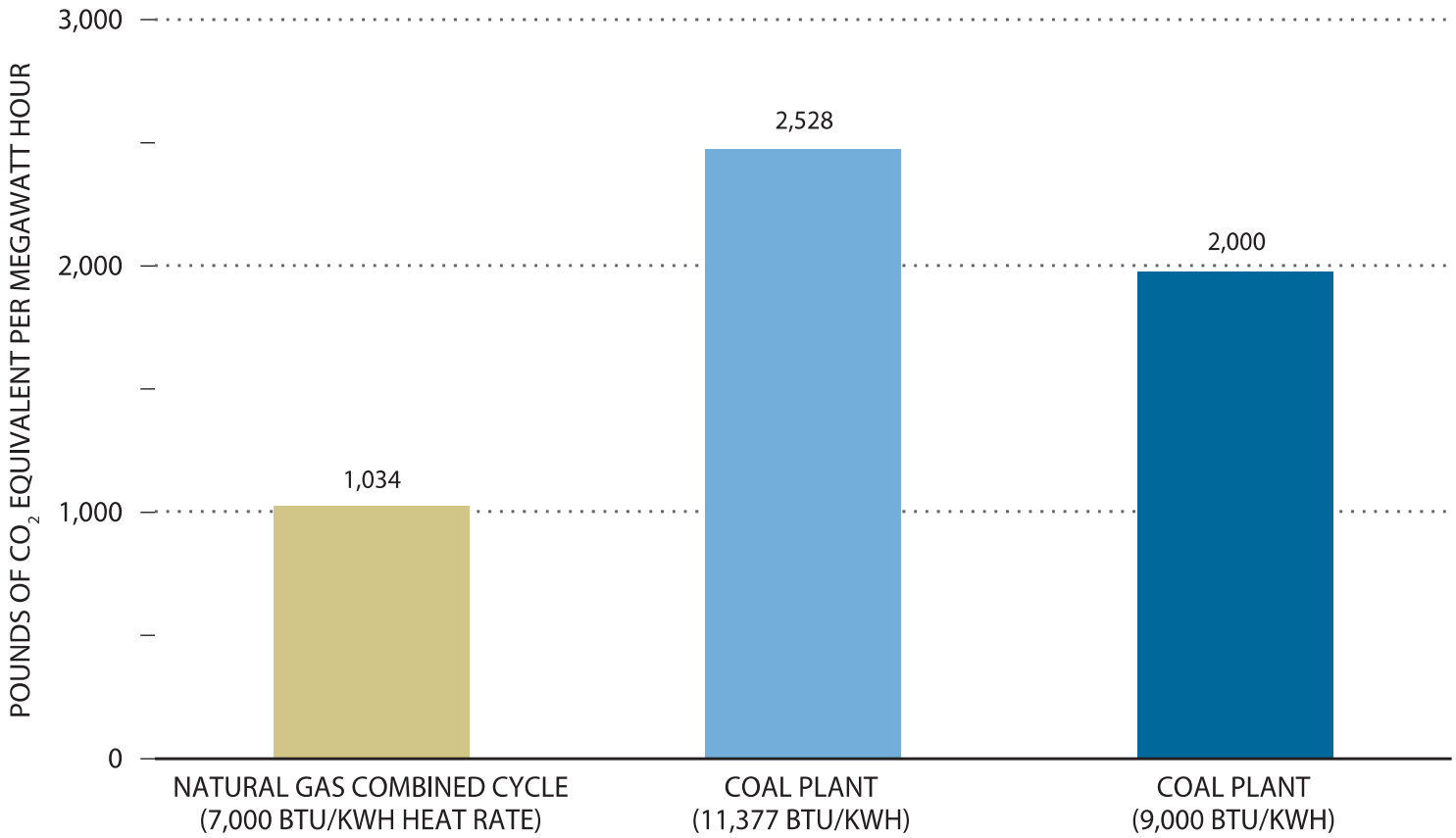
Reduction Pathways

- Coal displacement
- Natural gas end-use technologies
- EPA non-GHG regulations
- Price on carbon

GHG Emissions Are Rising – But Natural Gas Can Be Part of the Solution to Help to Lower GHG Emissions

Natural Gas Has Lower GHG Emissions

LCA GHG Emissions from Natural Gas-Fired Plants are 50-60% Lower than Existing Coal-Fired Plants

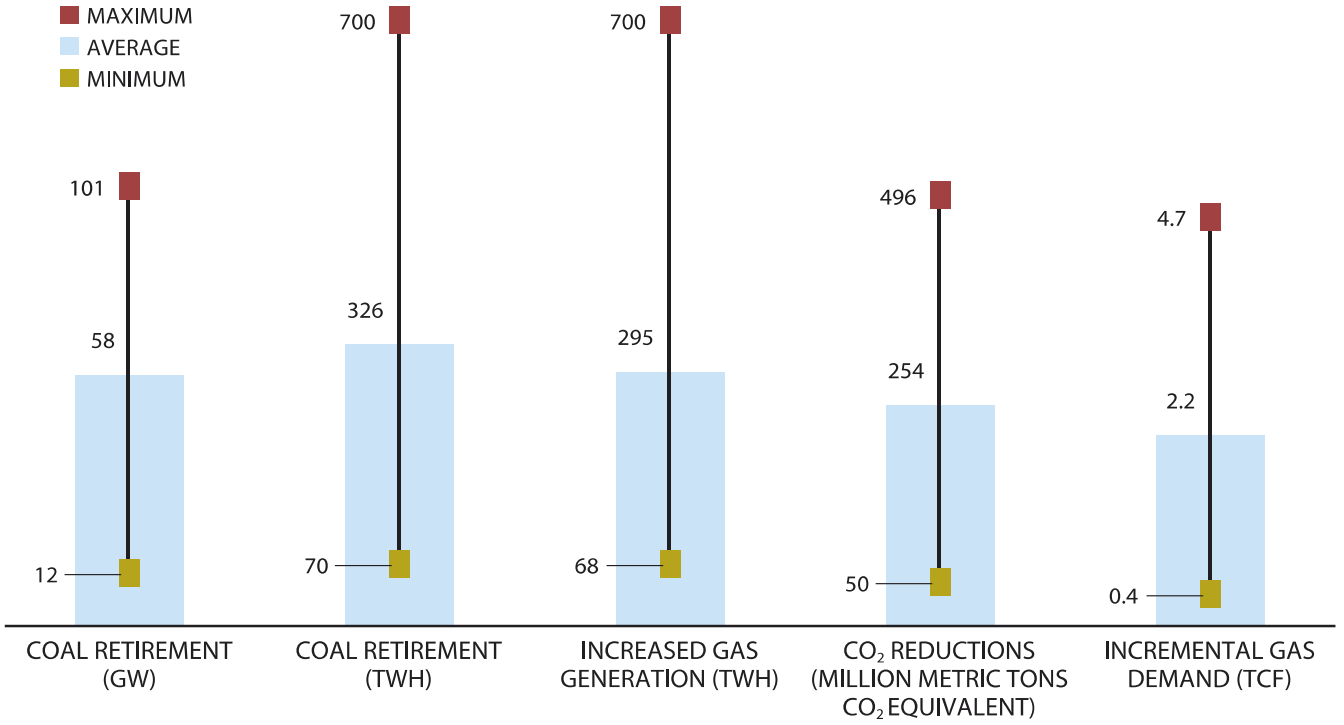


Gas Combined Cycle Plants have 99% Lower SO_2 and Hg Emissions and about 82% Lower NO_x Emissions Relative to Pulverized Coal Units

Impact of EPA non-GHG Rules

Impact of non-GHG EPA Rules on Coal Plants Averages 58 GW of Retirements to 2020 (~18% of the 316 GW of Total U.S. Coal-Fired Generation Capacity)

Summary of Results – Average, Maximum, and Minimum Values across All Studies



58 GW replaced by gas would lower power sector sulfur dioxide, nitrogen oxides, and mercury emissions by 19%, 16%, and 12 % below 2005 levels.

Emissions Related Recommendations

- **Provide regulatory certainty to the power sector on the EPA non-GHG rules while maintaining system reliability.**
- **Use industry-government partnerships to promote technologies, protocols, and practices to measure, estimate, report, and reduce emissions of methane in all cycles of production and delivery**
- **As policymakers consider energy and environmental policies, they should consider effective and efficient methods to internalize the cost of carbon impacts**
  - Policies should be national, economy-wide, market-based, and part of an effective global framework
- **Keep option for deep reductions of GHG emissions through lower emitting technologies or Carbon Capture and Sequestration (CCS) R&D that is fuel neutral**

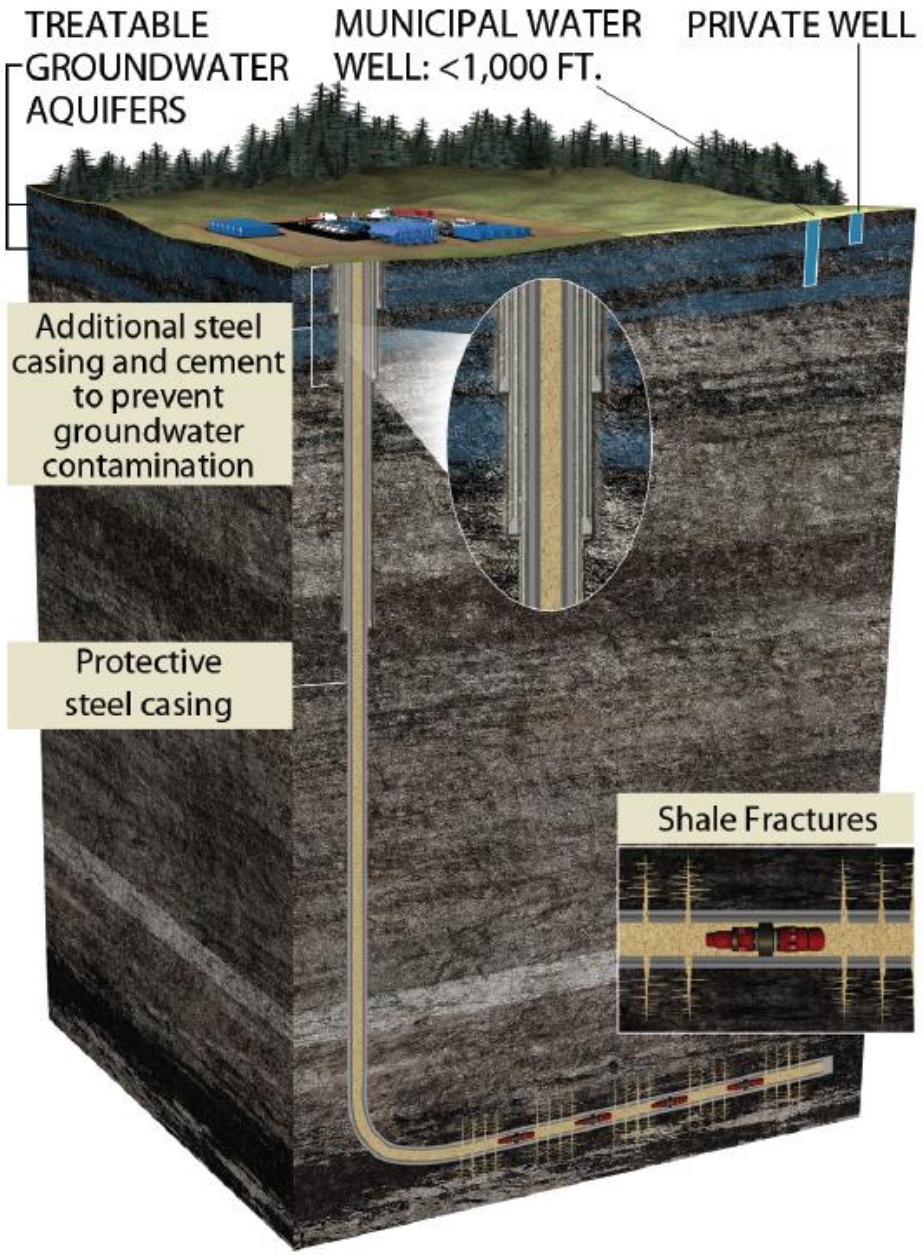
Prudent Development

In order for the U.S. to realize the benefits of substantial resource abundance, development must be done prudently.

Prudent development is:

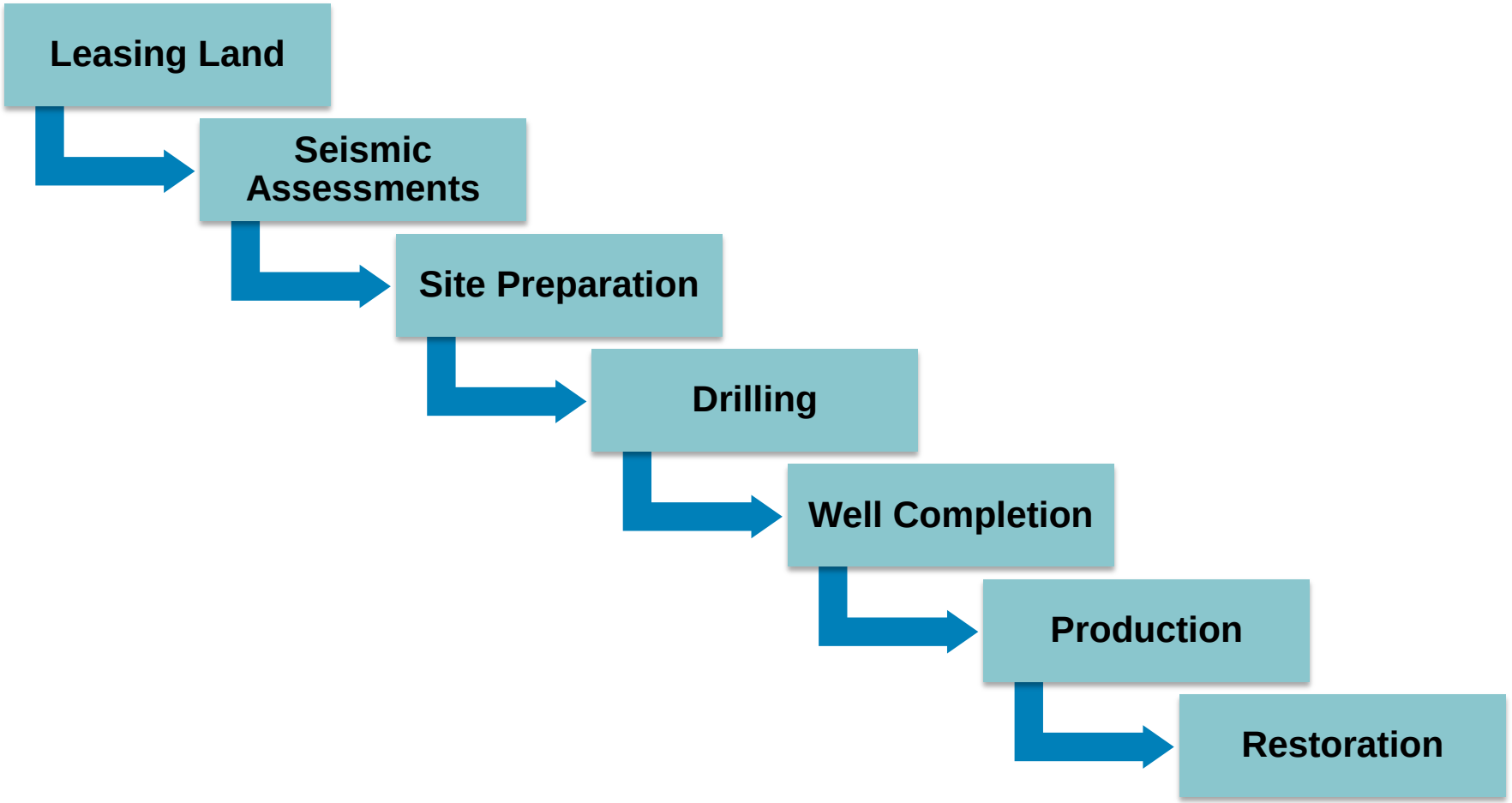
- **Essential for public trust and confidence**
- **Required for continued and expanded access**
- **Fundamental for long term industry success**

Technology Drives Industry



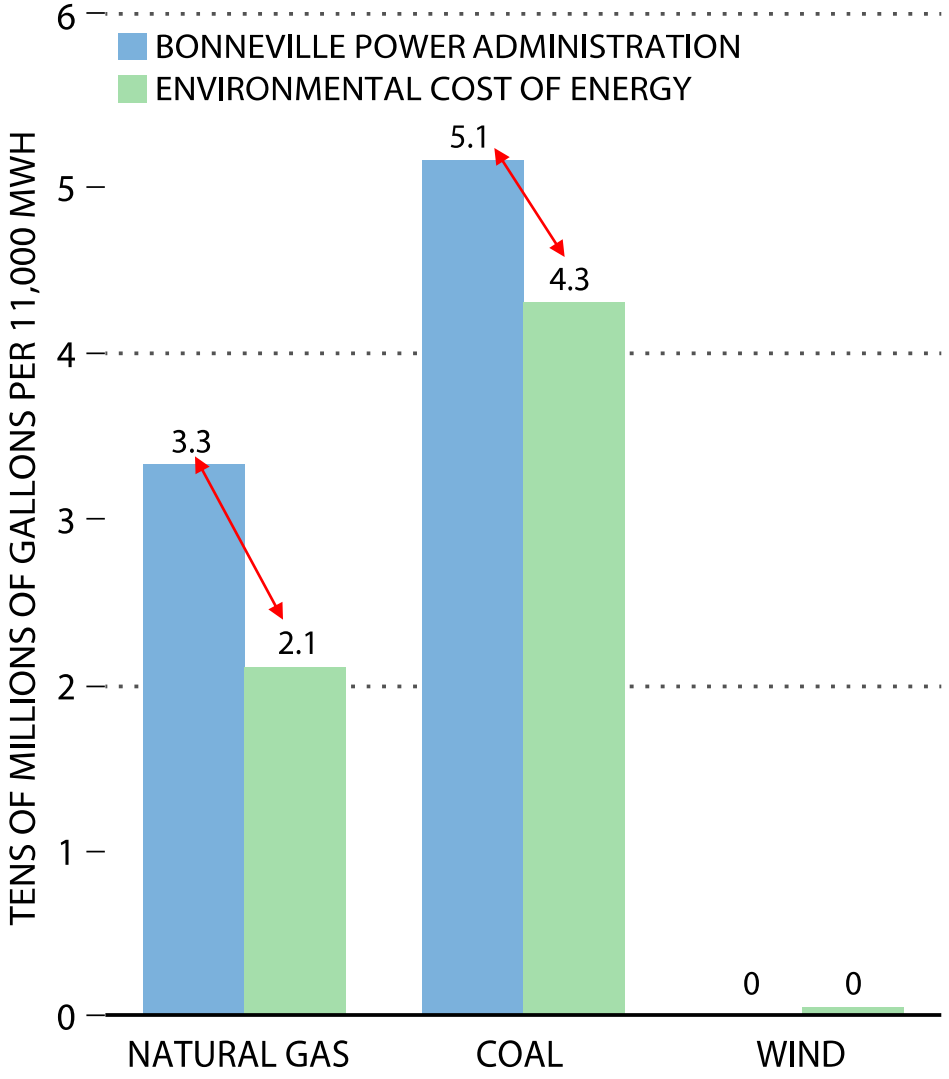
- **Advances in technology lead regulation**
- **Importance of information sharing**
- **Strengthens environmental performance**
- **Support for innovation**

Development is Regulated Through the Life Cycle



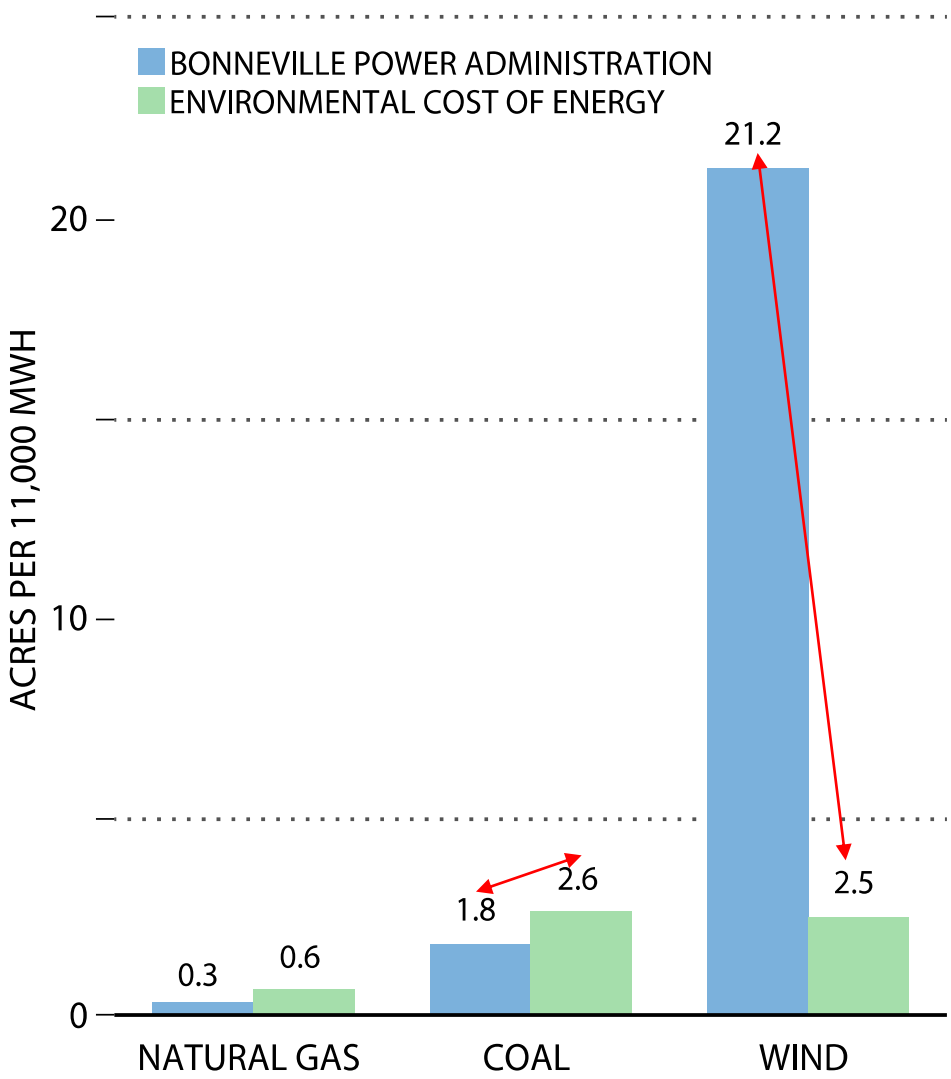
Estimating Environmental Footprints of Energy Sources

WATER CONSUMPTION



Water Consumed to Provide Electricity to 1,000 Average U.S. Households Annually

LAND DISTURBANCE



Area Disturbed to Provide Electricity to 1,000 Average U.S. Households Annually

Policies to Support Prudent Development

- **Leadership Commitment in Industry and Government**
- **Establish Regional Councils of Excellence**
- **Adopt Policies for More Effective Regulation**
- **Commit to Community Engagement**
- **Develop Consistent Methodologies for Environmental Footprint Analysis**

Summary

- **We have enormous oil and gas resources – of potential value and importance to the nation**
- **There's enough supply to support national objectives – including our economic, environmental and security interests**
- **The lynchpin to realizing these benefits is prudent development – We have to do this right.**
- **And our recommendations help us move toward these outcomes.**
- **Access the report at www.npc.org**

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