National Petroleum Council

Prudent Development

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

NAESB Board Meeting

Houston, Texas

December 7, 2011

Non-Standard Disclosure

- I have been involved in energy markets for 35 years.
- I have traveled and worked in 50 countries, most of them developing, emerging, third world or transitioning economies.
- I worked at Enron for 20 years, my last assignment Managing Director, Enron Middle East.
- I am not a crook, an unindicted co-conspirator or been jailed.
- I do not have an appeal before the Supreme Court.
- We were first movers and specialized in countries where private ownership was being allowed for the first time or state owned energy assets were being privatized
- More often than not I helped write the new market rules and regulatory instituions for each country in which we operated.
- I built infrastructure projects which are unique in their capital intensity, long-lead times and extended pay back periods.
- My work around the world has provided a unique perspective: there cannot be a static regulatory approach- it must be dynamic and “fit the times.”

In Reflection

Other than war, inefficiency, bribery, corruption , extortion, fraud, nepotism, cronyism, terrorism, high energy costs, high inflation, and uncontainable exchange rates, I have worked in some great places!

The NPC

The NPC is a federal advisory committee who sole purpose is to advise the Secretary of Energy by performing studies at his request.

The council is comprised of about 200 members from all segments of the industry and broader stakeholders.

Members are selected by the Secretary of Energy.

The NPC is not an advocacy group.

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

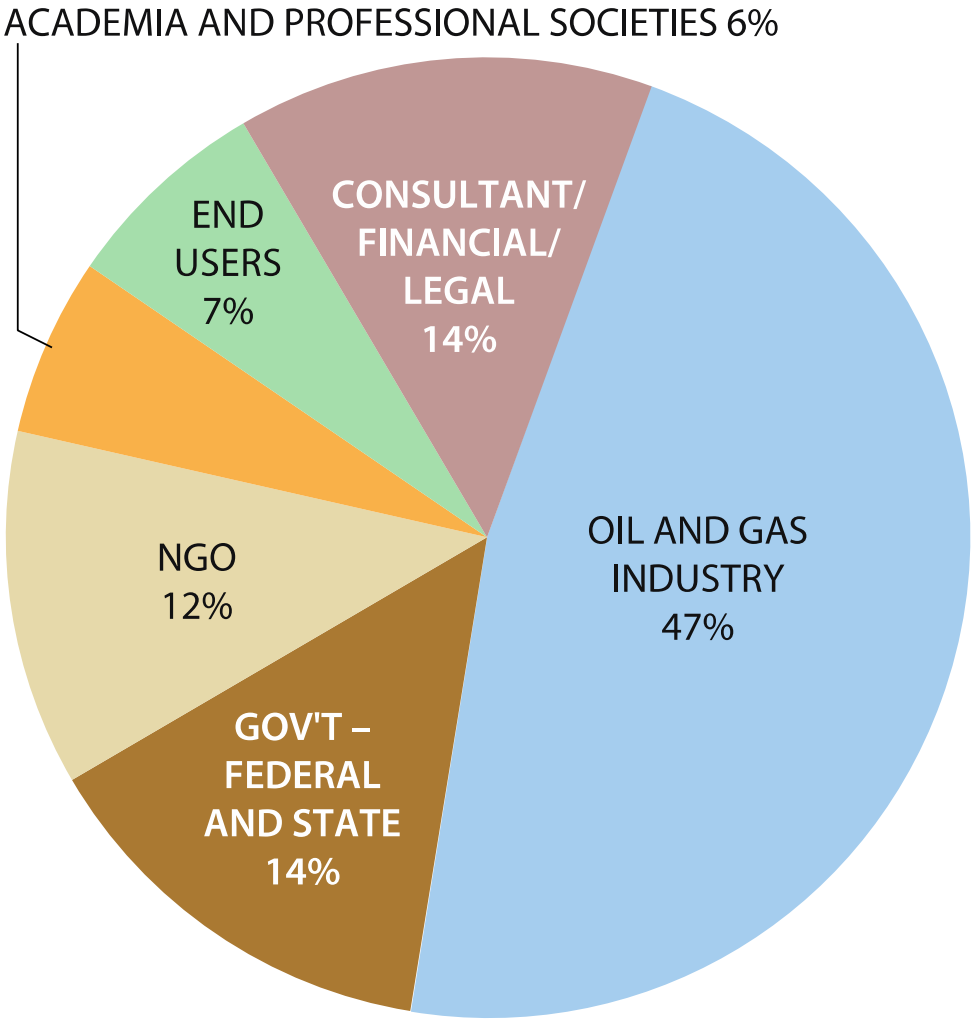
Prudent Development Study Objectives

- **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**

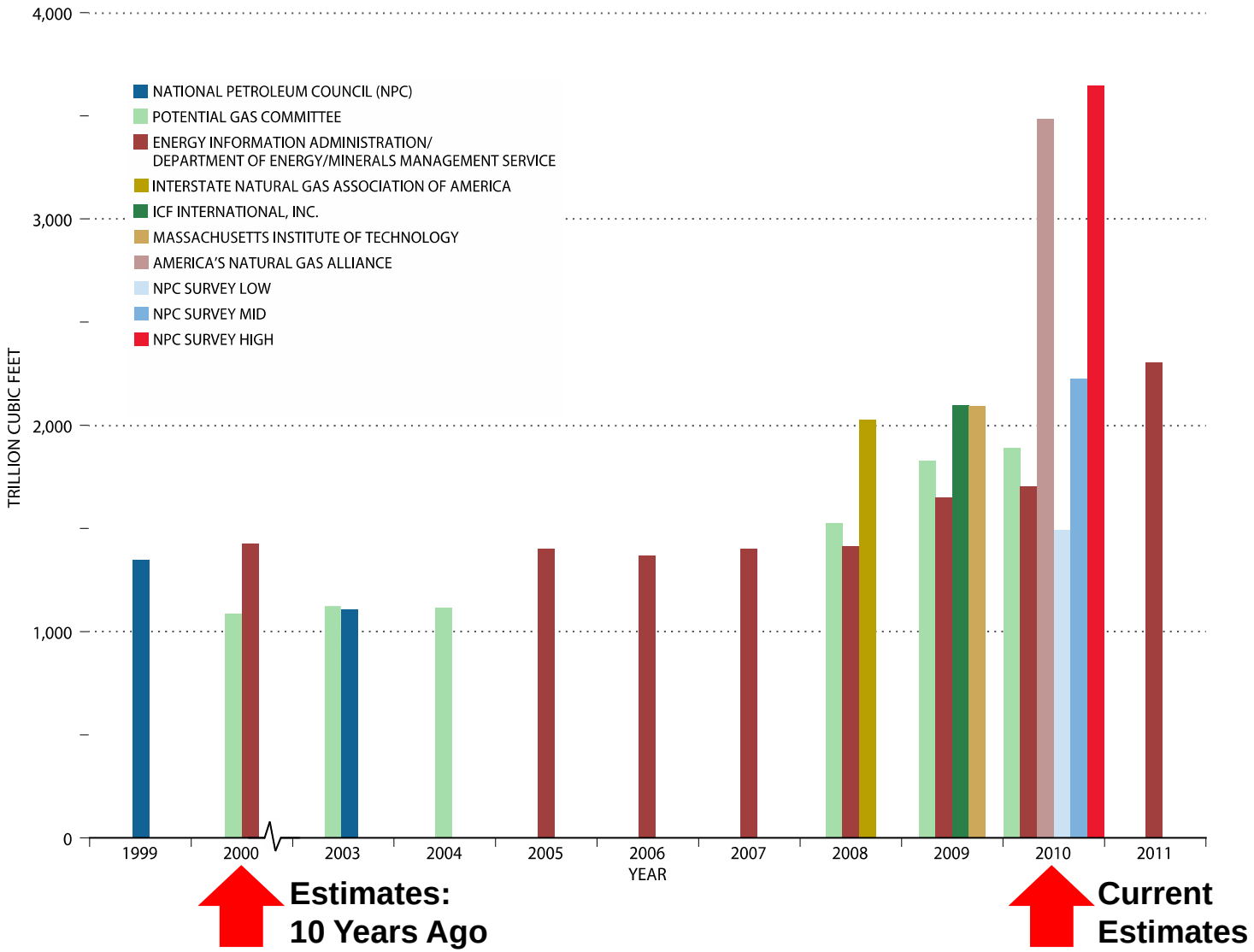
Diverse Study Participation

Study Committee, CSC, Task Groups, Subgroups

Over 400 Participants



U.S. Gas Resource Estimates Transform Outlook

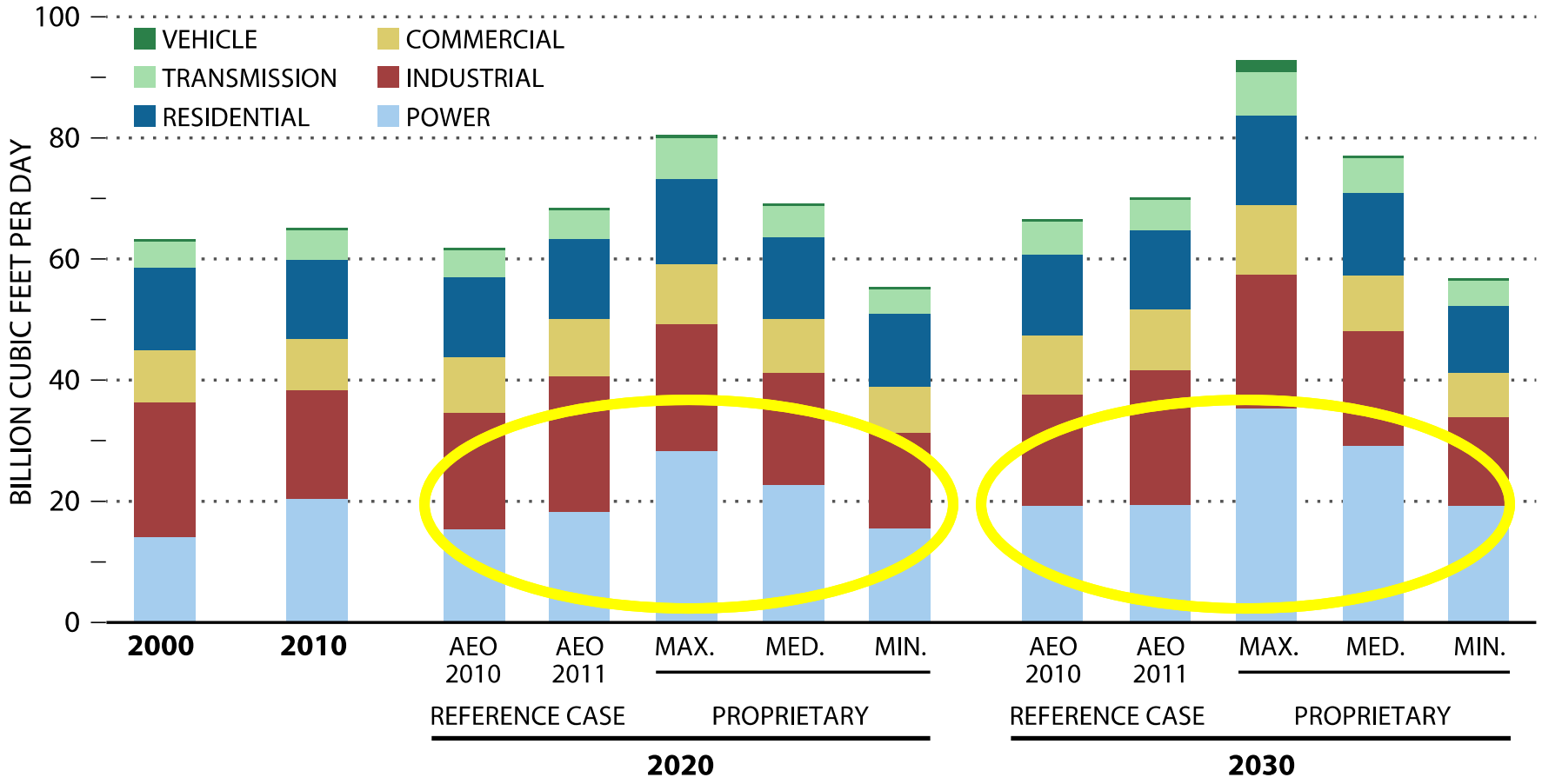


Resource/Supply

Natural Gas Supply Issues

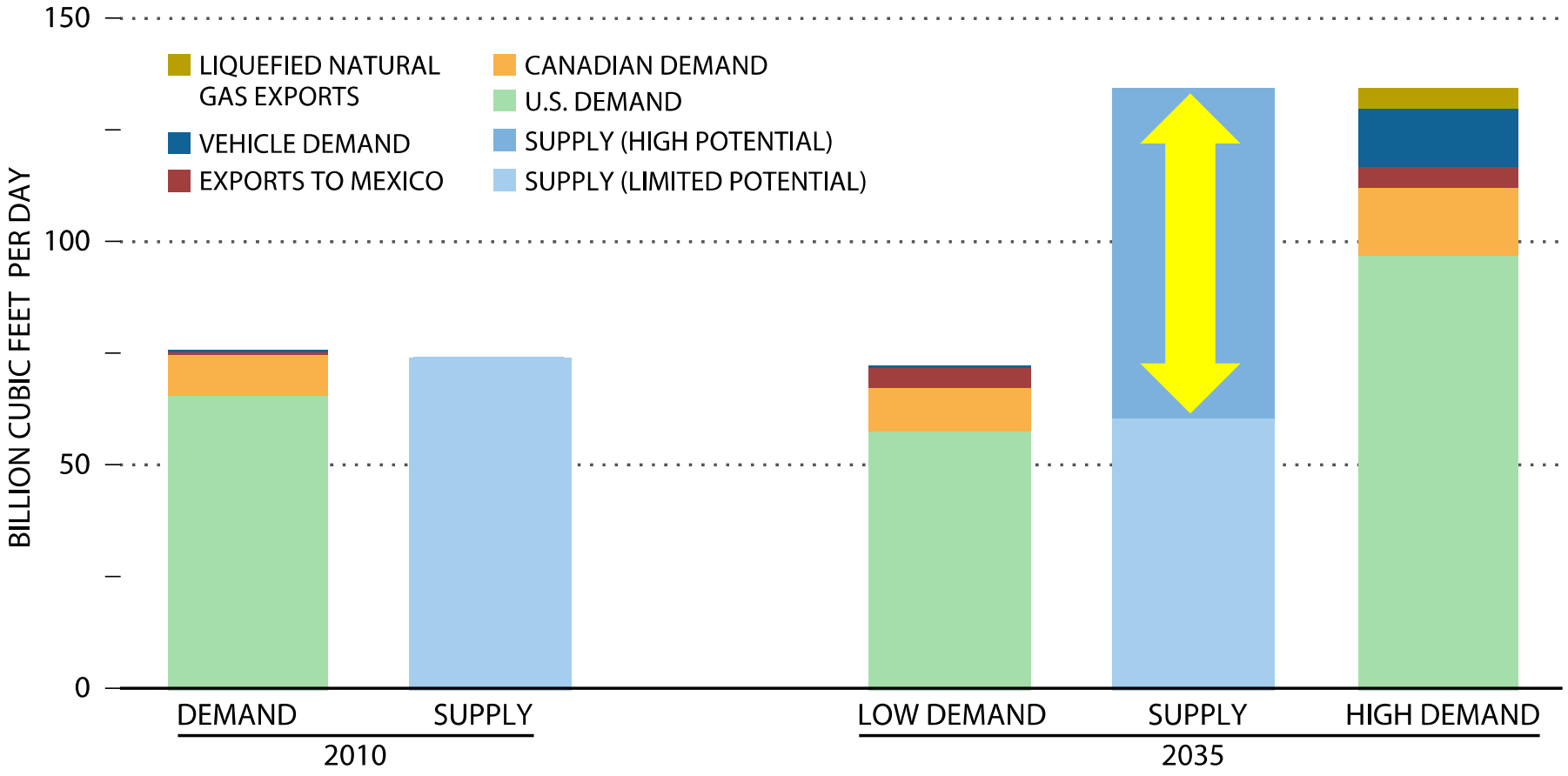
- Price and Demand
  - Power Generation/EPA Rules
  - Exports
- Environmental Issues Associated with Shale Gas Development
  - Water Use and Wastewater Disposal
  - Groundwater Contamination
  - Methane Emissions
  - Other Air Emissions

Power Sector Drives U.S. Gas Demand Outlook



Demand

North American Natural Gas Can Meet Even the Highest Potential Demand



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

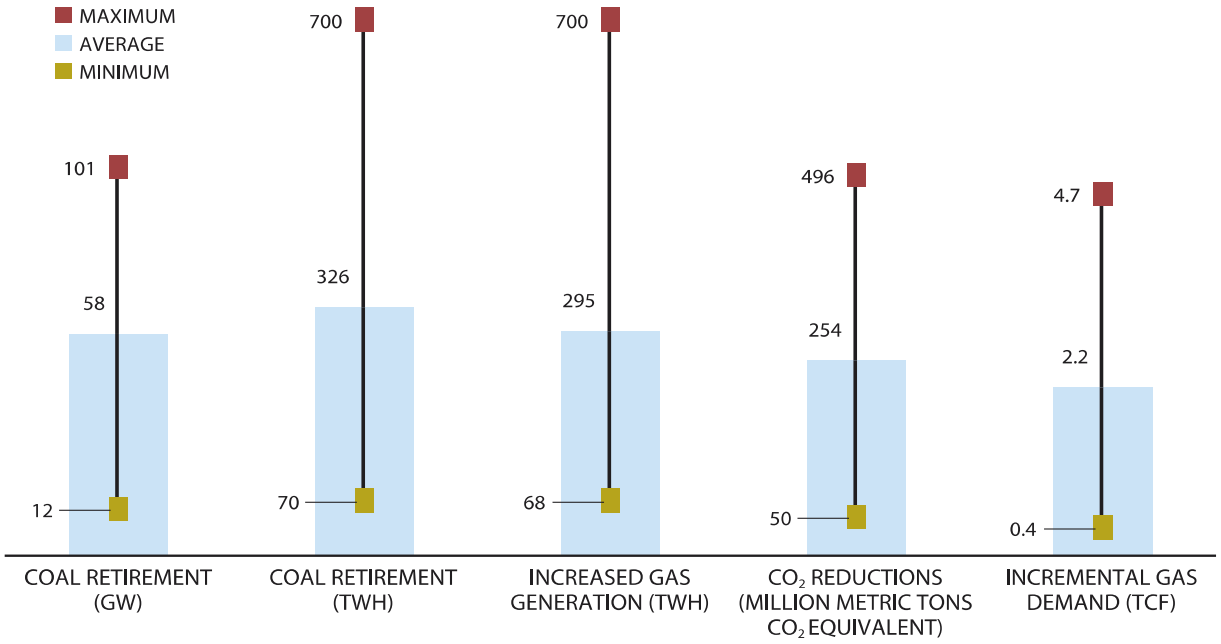
- **Enhance the Regulation of Markets**
  - Allow Utilities to Effectively Manage Natural Gas Price Risk through Hedging and Long Term Contracts
  - Harmonize Interaction between Natural Gas and Power Markets

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)

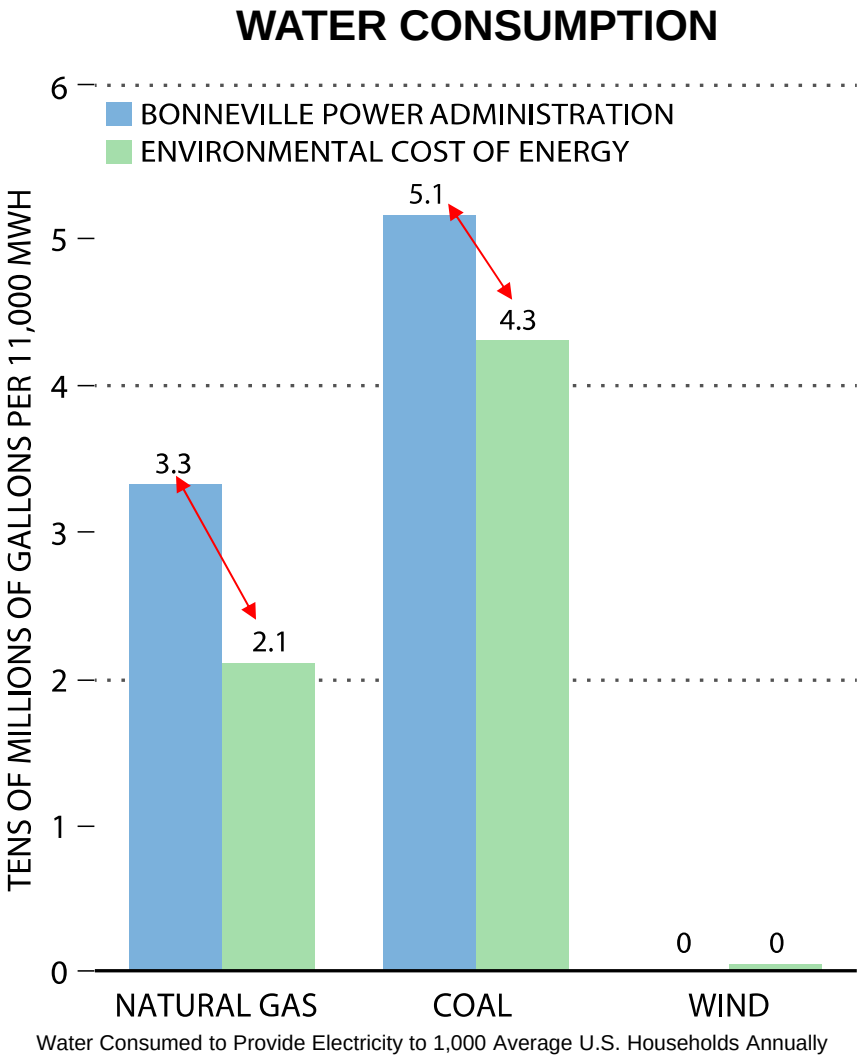
Summary of Results – Average, Maximum, and Minimum Values across All Studies

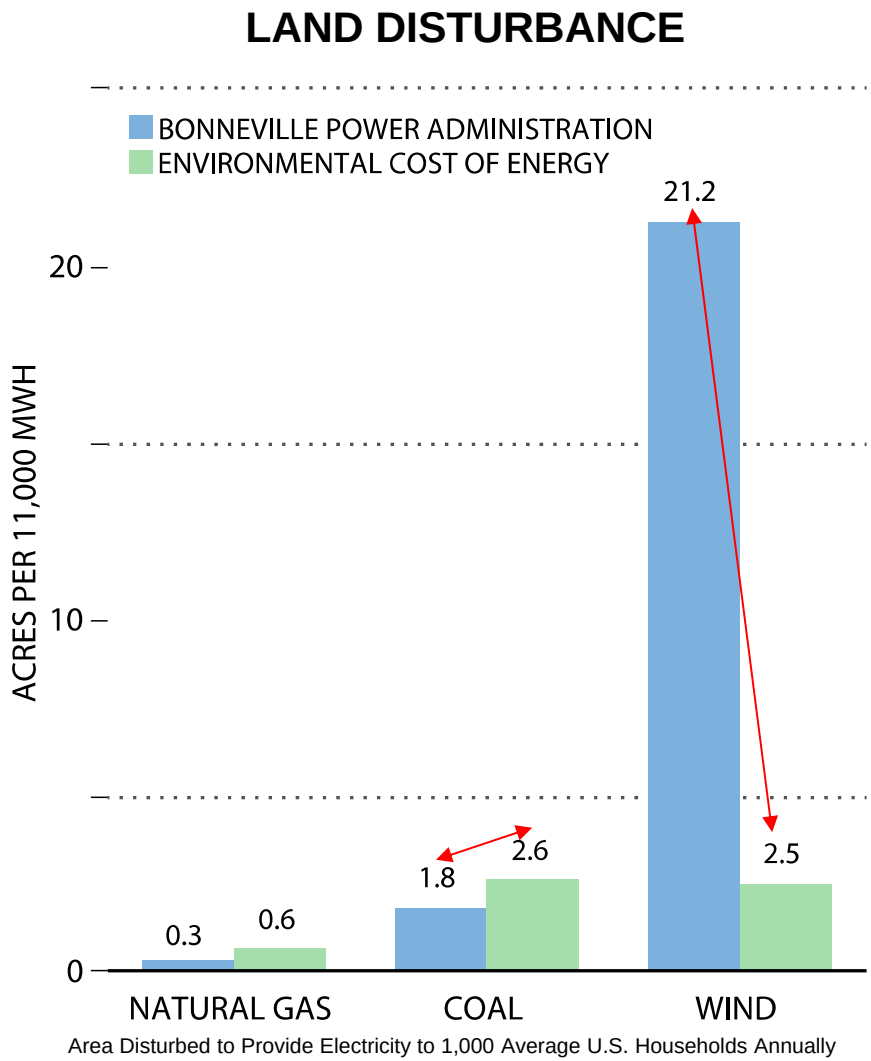


58 GW replaced by gas would lower power sector sulfur dioxide, nitrogen oxides, and mercury emissions by 19%, 16%, and 12 % below 2005 levels.

Emissions

Estimating Environmental Footprints of Energy Sources





Ops/Environment

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.**

Emissions

NPC Report
Summary

- **We have enormous gas and oil 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**

Harmonization of U.S. Natural Gas and Power Markets

- From 2000 to 2010 the use of natural gas for generation increased from 16% to 24% of total electric sector generation.
- Clearly, the natural gas and power industries are becoming increasingly interdependent.
- However the rules and service arrangements that govern the natural gas and electric markets differ from one another so that inefficiencies occur.
- Intraday time lines are also inconsistent, such as between the natural gas and electric scheduling processes.
- As intermittent renewable generation capacity increases, the power sector increasingly focused on natural gas-fired generation with its flexible operating characteristics.
- However most peaking generators contract only for interruptible transportation service or rely on the capacity release market to transport gas on the pipeline.
- At the heart of all of the harmonization issues is how costs should be allocated, whether for maintaining enough pipeline capacity to serve an increase in power generation load, or for compensating generators for backing up intermittent renewable generation.

The First Step Is to Find a Way to Harmonize Interests

- For producers: the power generation is the largest incremental market and the potential exists for long-term contracts.
- For pipelines: shippers who need new capacity and will benefit from that capacity, must pay for that capacity.
- For distributors: No financial benefit from power load, obligation to serve residential and commercial gas customers.
- For gas power generators: no assurance that they can recover the fixed costs associated with either firm transportation or firm gas supplies.
- Renewables: will not pay for back up service.
- Regulators: must enforce gas distributors obligation to serve but must keep the lights on.

A Missed Opportunity? The Cuban Model

- Working on the U.S. gas and electric systems is often like owning a car in Cuban.
- You can’t buy a new one so you spend all your time looking for spare parts.
- You can keep the car running, but the mileage is lousy, it breaks down a lot and you still roll up the windows by hand.
- The money would be better spent on buying a new model rather than maintaining a “vintage” vehicle.

A Missed Opportunity? The Cuban Model

- The Challenge: with all this gas, there is an opportunity to not just tweak the electricity and gas systems but to revisit the structure and operation of regional energy systems in their entirety:
- Are we looking at what the energy mix will look like 20-25 years from now and how the systems need to be set up to support that fuel mix?
- Do we understand how today's systems are inadequate and where we need to take these systems for the future?
- Can energy systems of the future can be based on interconnected energy hubs and thus form a distributed power generation structure?
- How can we combine energy storage technology, distributed generation, electronics, infrastructure, risk assessment tools, computing power, and energy integration to make it possible to selectively draw power from a variety of sources, store it as needed, and route it to users based on availability and need?
- Do we treat today’s problems as discrete to each industry or do we solve these problems by inventing new regional energy systems?

Why Has An Expanded Role for Natural Gas Been Ignored?

- Partly it's a Perception Problem:
  - It's a Small Industry (people only see their gas burner)
  - All Fossil fuels are the same (ignorance about life cycle costs)
  - Energy Policy is About Electricity and Renewables
  - The Use of Natural Gas Is a Bridge to Nowhere (we'll failed to promote new applications)
  - We're run by old people, and are an old fashioned fuel using old technologies.

Natural Gas Is
An Old Fashioned Fuel
Using Old Technology
An Industry Run By Old people

At least the renewable industry has updated their image of the natural gas industry as we sort out what has become a contentious relationship

At first we supported renewables

Then we became “partners” with renewables

And now It’s a marriage with renewables

- At the beginning of my presentation I noted my belief that there cannot be a static regulatory approach- it must be dynamic and “fit the times”.
- And If you don’t believe that “the times are a changing” then look at my sons announcement of the birth of his first child last month.
- In addition to the usual name, date of birth, and weight, he had the following at the bottom:

Jackson Version 1.0

Now that I've had some time spent with iJackson 1.0, I've got a few things to work on for the first software update:

- Inconsistent volume control: either too quiet (is this thing on?) or piercingly loud.
- Diaper status indicator: Often indicates complete before filling is actually completed. Sometimes this almost seems by design.
- Inconsistent User Interface: Inputs that worked an hour ago often no longer work or achieve the opposite effect.
- Alarm clock completely useless: it goes off completely randomly rather than at the desired time. Triggered by nearby REM sleep ?