



The Future for Natural Gas Use in the Power Sector

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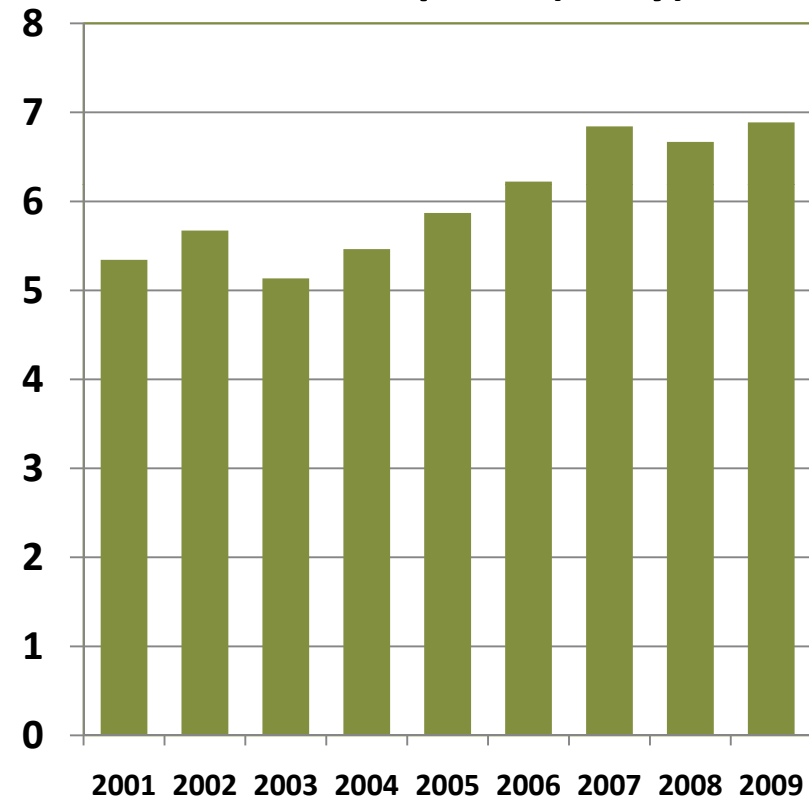
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Setting the Stage with Some Observations on Recent Market Trends



- Gas use in the Power sector has grown from 5.3 Tcf in 2001 to 6.9 Tcf in 2009.
- Concerns about the adequacy of gas supply have been replaced by optimism for continued growth in supply.
- Relatively low gas prices have spurred coal-to-gas switching during the past year or so.
- Uncertainties about environmental policies have pushed the market toward lower emissions technologies.

**U.S. Gas Power Sector
Gas Consumption (Tcf/y)**



Source: EIA

Key Assumptions Behind ICF's Natural Gas Market Projection

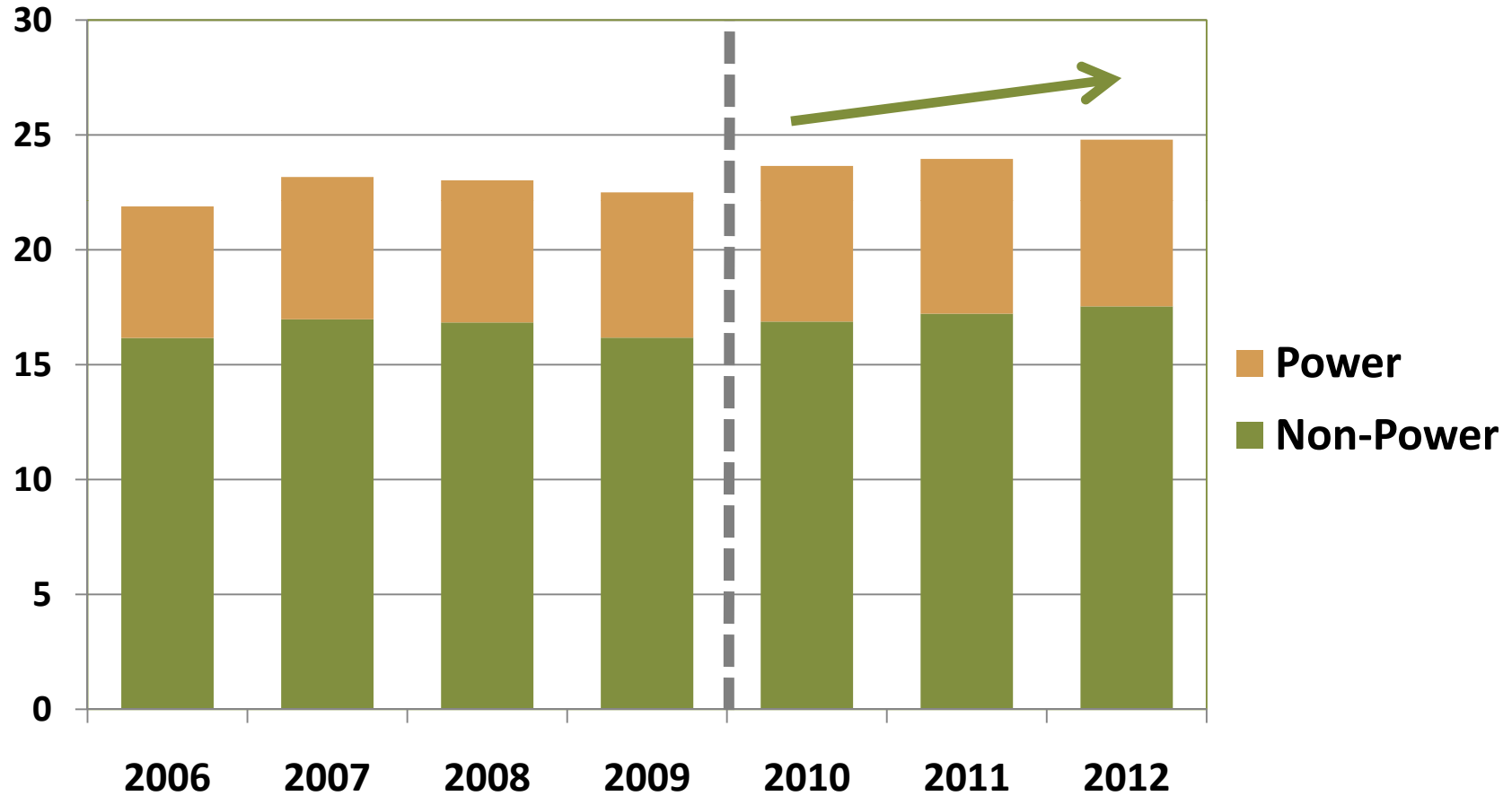


- Electricity demand growth is tied to GDP growth.
 - We assume U.S. GDP grows at 2.8% per year, and electricity demand growth averages 1.4% per year.
- Electric generation gas demand is driven by the projections for generating capacity and gas-fired generation from ICF's Integrated Planning Model (IPM).
 - ICF's electric generation and natural gas forecasts both assume a Federal cap and trade system to reduce CO₂ emissions is in effect by 2015.
- Power generation is built to satisfy load growth, subject to the costs of each competing technology.
- Demand side management and conservation measures continue to occur, consistent with recent trends.
- Gas supply is developed in ICF's Gas Market Model (GMM) based on the amount of resource available and the E&P finding and development costs associated with the different types of gas resources.
 - In the U.S. and Canada, about 2,600 of economically recoverable natural gas resource is available with current E&P practices and technologies, enough to satisfy current demand levels for up to 100 years.

Projected Near-term Gas Demand



U.S. Gas Consumption (Tcf/y)

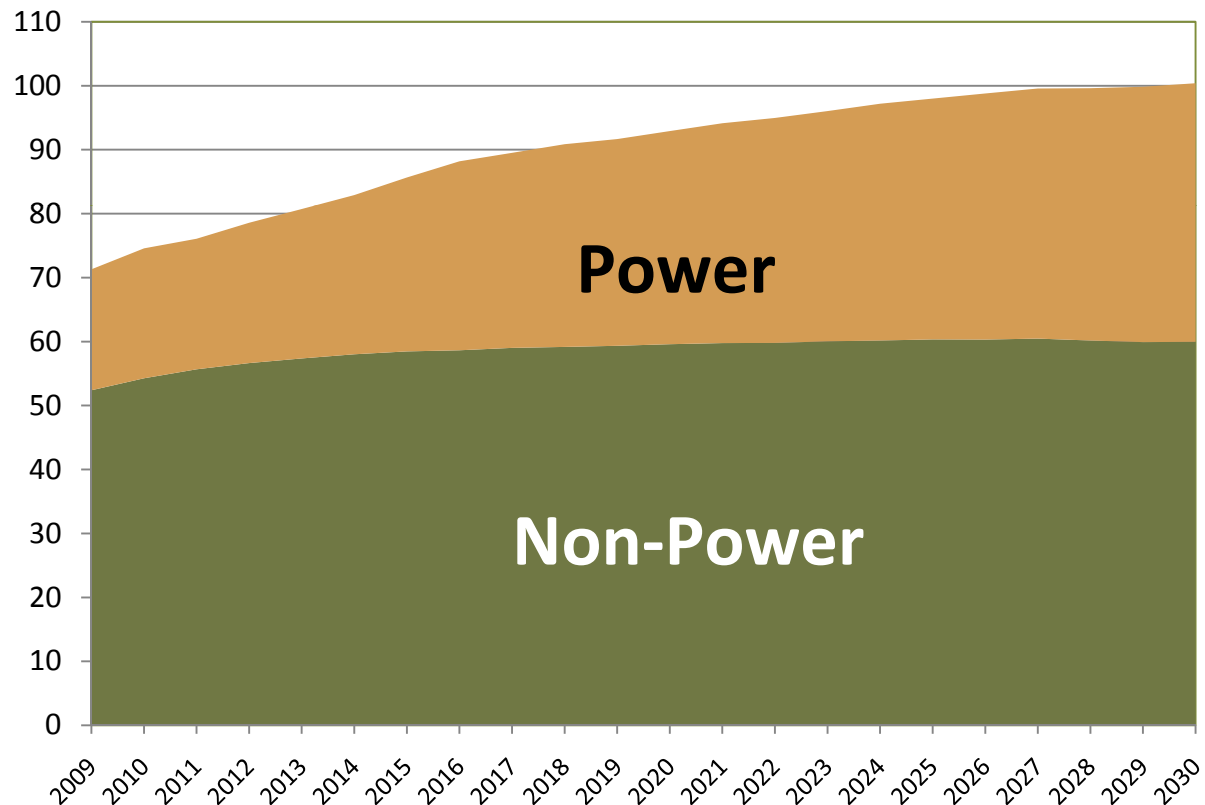


Growth in Gas Consumption Will Continue to be Driven by Growth in Gas Use for Electric Generation



- Gas consumption in the power sector is likely to double over the next 20 years.
 - By 2030, total gas consumption in the U.S. and Canada is projected to reach an average of 100 Bcf per day.
- Very little demand growth occurs in the other sectors.

U.S. and Canada Natural Gas Consumption (Annual Average Bcfd)

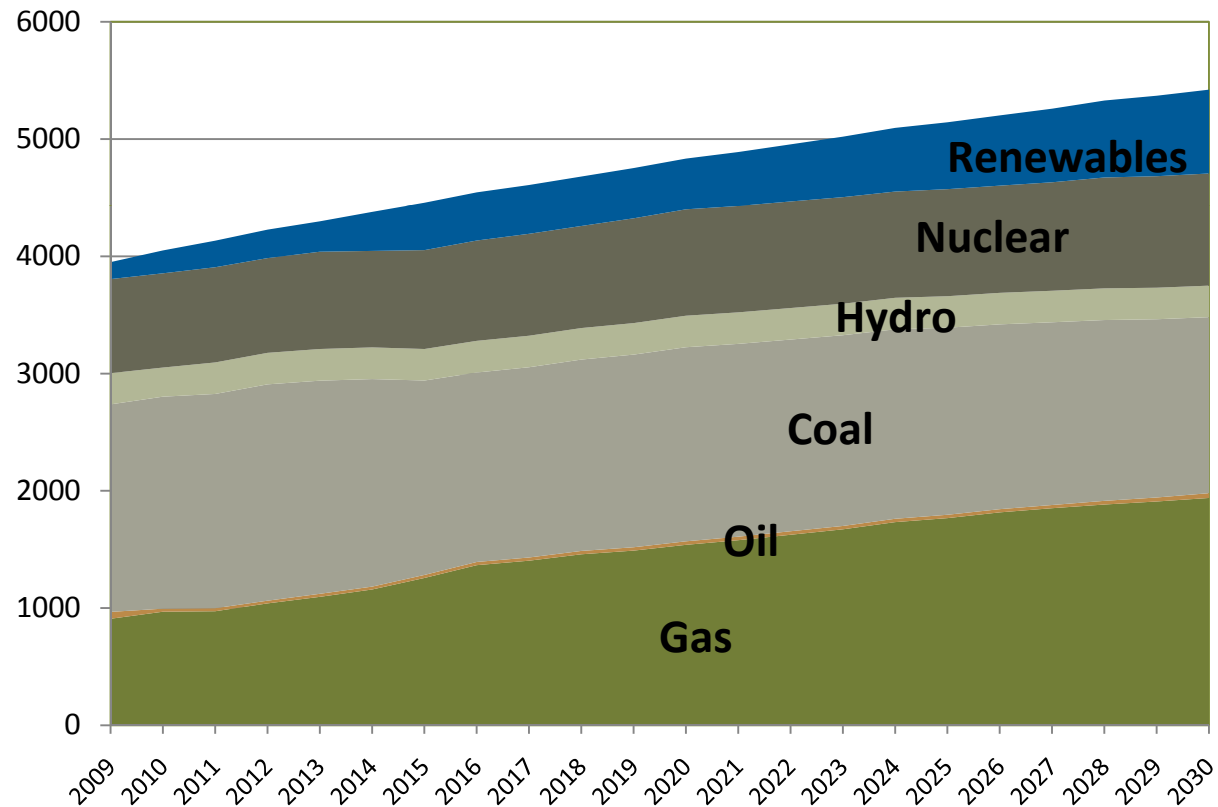


Gas-fired Generation Grows from 23% to 36% of Total Generation by 2030



- Since 1997, over 200 GW of new gas-fired capacity has been built.
 - Utilization rates for existing gas-fired plants is relatively low, so these plants can meet much of the incremental growth in electricity demand.
- Gas is an important fuel for carbon policy.
 - Generation from existing coal plants is likely to decline.
 - Renewable generation is expected to grow at a rapid pace, but from a relatively small base.
 - Significant growth in nuclear generation not expected until after 2020.

U.S. Electricity Generation by Fuel (Billions of kWh per Year)



Demand for Natural Gas Grows Across the U.S. and Canada

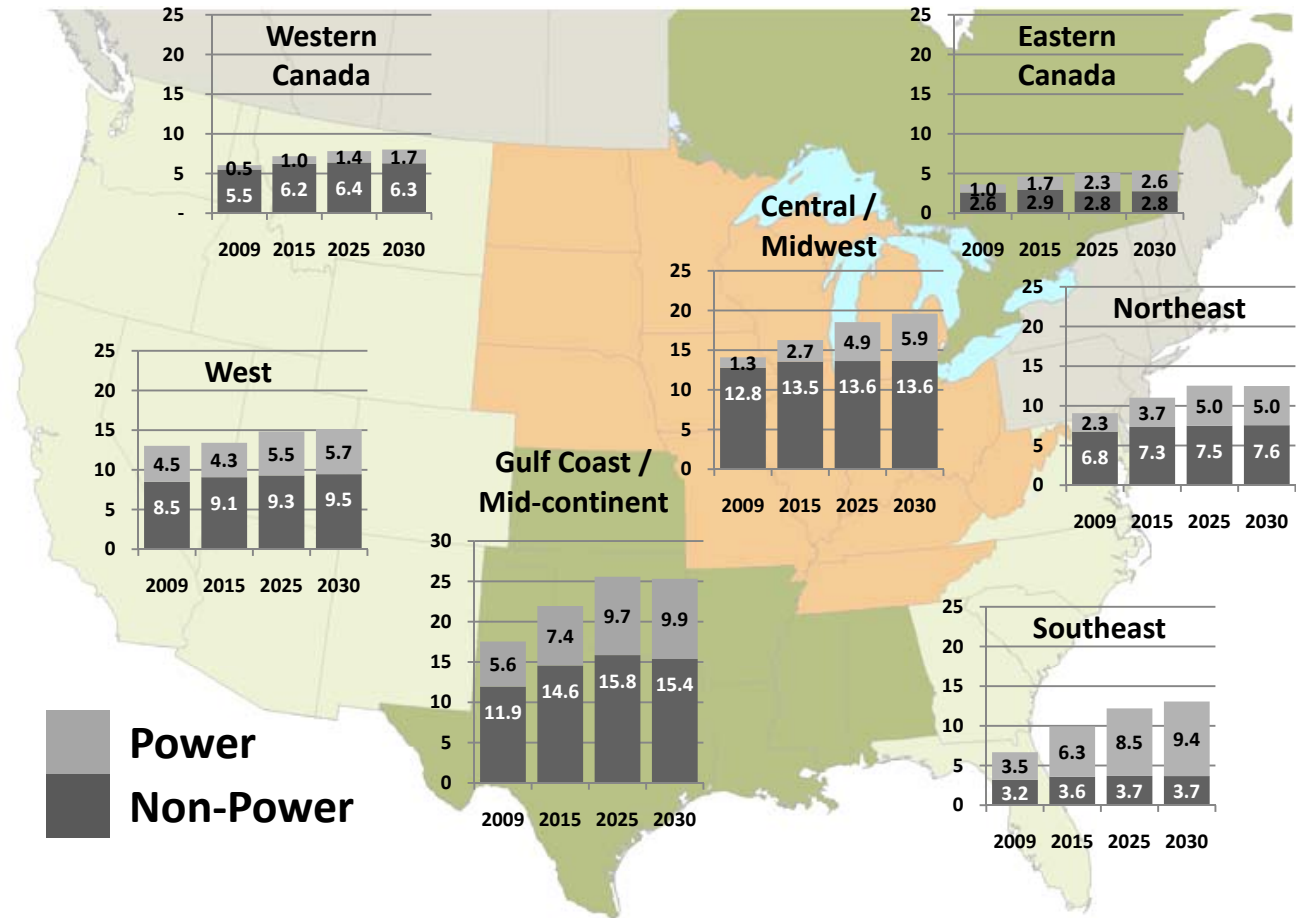


- Most of the regional growth in gas demand is due to increased gas use for electric generation.
- The largest increases occur along the Gulf Coast, in the Mid-continent, and throughout the Southeast.

 - Gas consumption across these areas increases by 14 Bcfd through 2030.

- Demand growth in Western Canada is primarily driven by increased gas use for oil sands development.

U.S. and Canada Regional Natural Gas Consumption (Annual Average Bcfd)

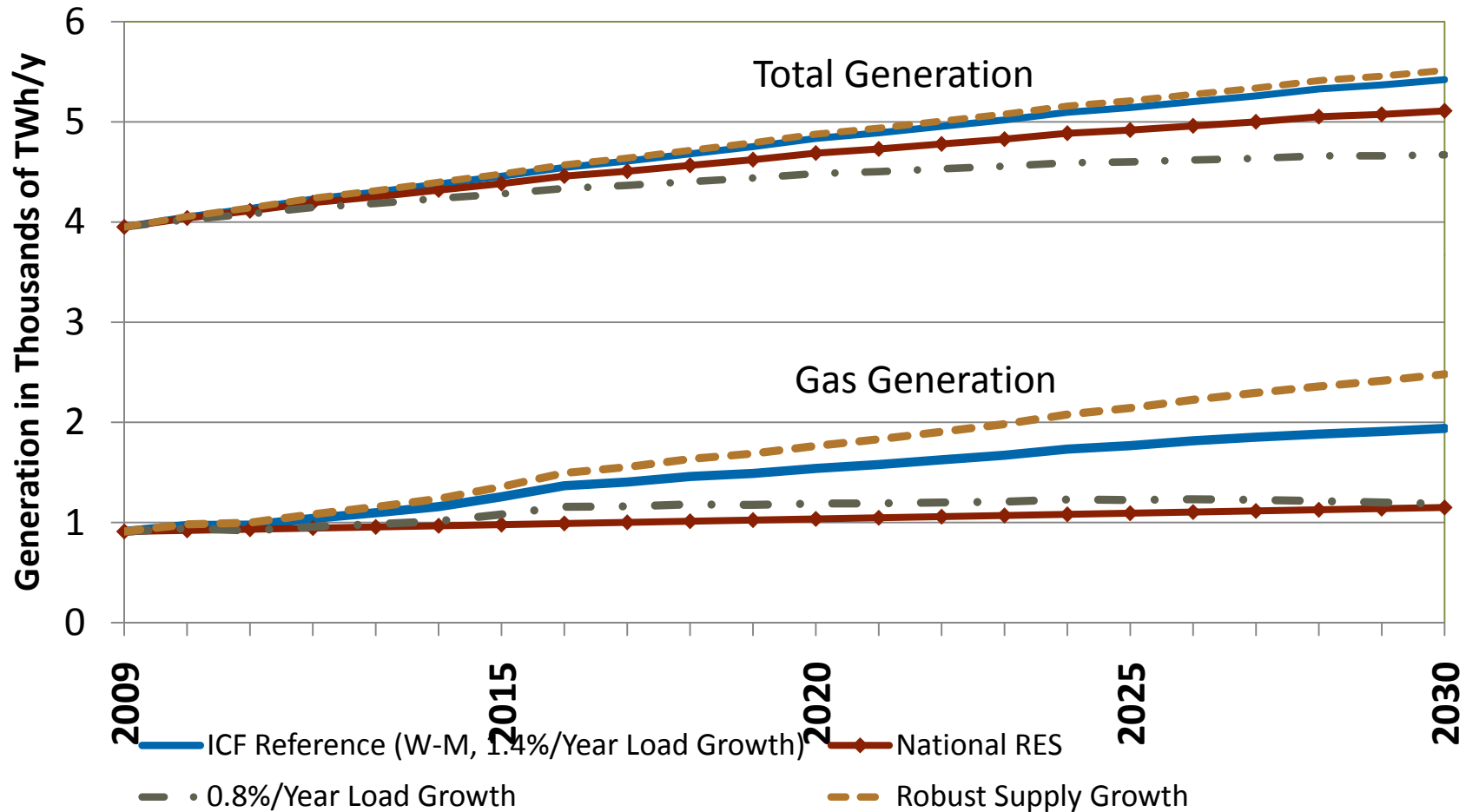


But, Uncertainties Abound

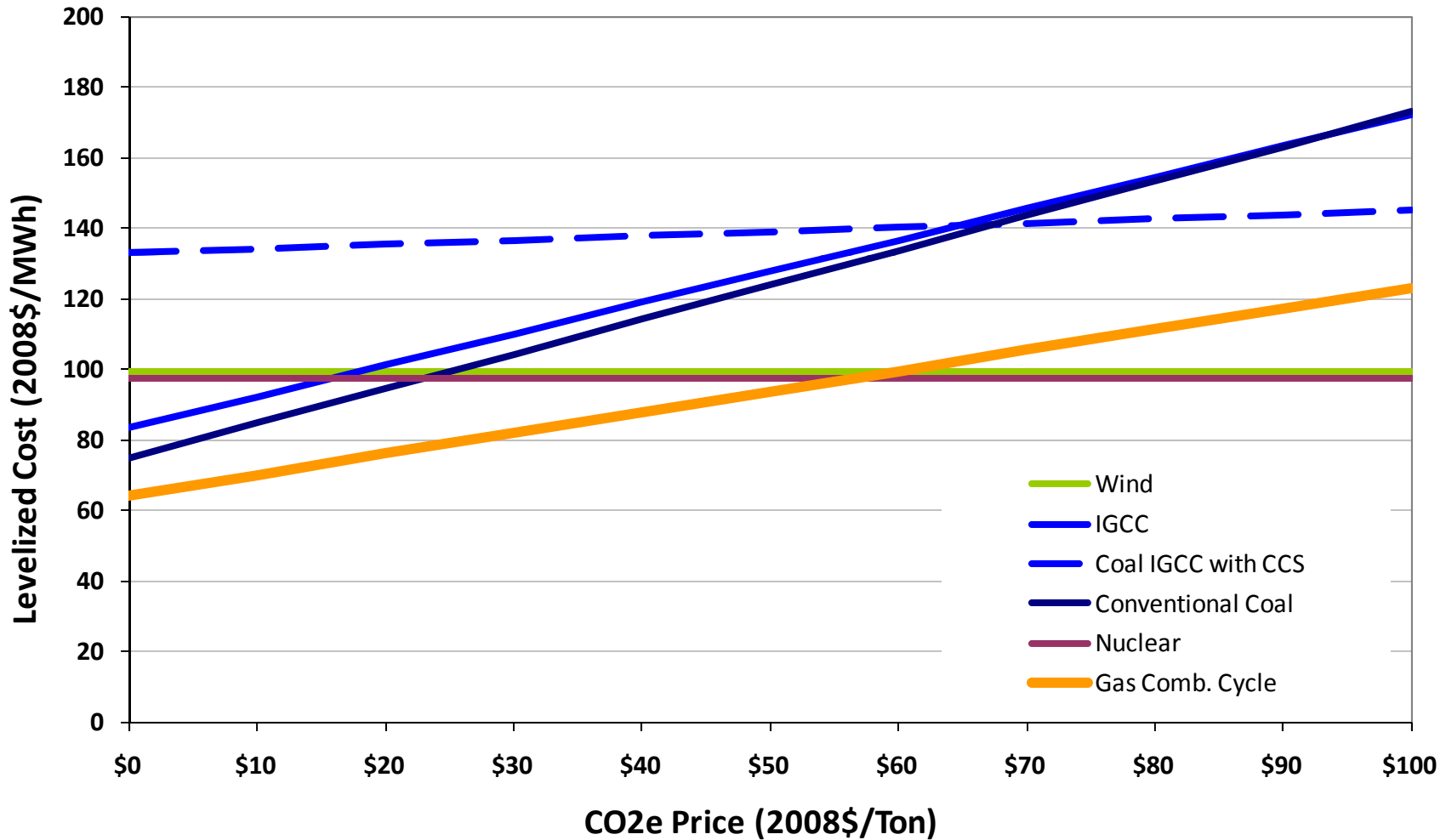


- Economic Activity and Electric Load Growth
- Nature of Environmental Policy
- Evolution of DSM and Smart Grid
- Cost of Competing Technologies

Different Policies and Supply Scenarios Have Different Impacts on Gas Generation



With a National Cap and Trade System, Gas Is the Lowest Cost Option at CO₂ Allowance Prices Under \$60/Ton



Impacts of Renewable Generation on Gas Use



- Due to the intermittent nature of wind and solar generation, back-up power supplies (i.e., gas generation and energy storage) are needed to support these technologies.
- While providing back-up power for renewables may not create much of an increase in gas demand in aggregate, demand swings may become more substantial.
 - Spikes in demand place stress on natural gas infrastructure.
 - Infrastructure investments are required to maintain the integrity and reliability of the system.

Summarizing the Potential Impacts on Gas Demand in the Power Sector



Variable	Impact on Power Sector Gas Demand
CO ₂ Cap and Trade Policy	+
Robust Supply Growth	+
Slow Electric Load Growth	-
Stringent National RES	-

Conclusions



- Significant growth of natural gas use in the power sector is projected in ICF's base case.
- ... but, the future is uncertain:
 - The direction and magnitude of future economic activity is unclear.
 - New environmental policies loom.
 - The levels of demand side management and conservation, including adoption of smart grid technologies are uncertain.
- Food for thought – new technologies in the transportation sector, like plug-in electric hybrid and CNG vehicles, could have a significant impact on gas demand growth.