Electricity Advisory Committee

MEMORANDUM

TO: **Honorable Steven Chu, Secretary**
Honorable Patricia Hoffman, Assistant Secretary for Electricity Delivery and Energy Reliability

FROM: **Electricity Advisory Committee**
Richard Cowart, Chair

DATE: **October 28, 2011**

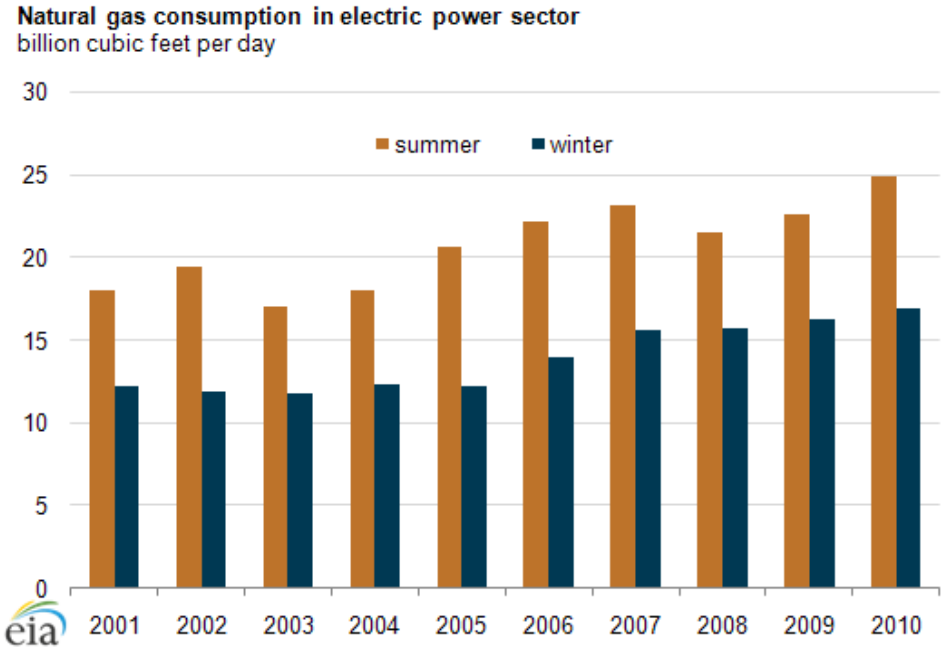
RE: **Interdependence of Electricity System Infrastructure and Natural Gas Infrastructure**

Introduction

On March 30, 2011, the Obama Administration released an official *Blueprint for a Secure Energy Future*. Overarching goals set forth in the *Blueprint* included developing and securing American energy supplies, thereby reducing the nation's dependence on foreign fuel sources; and focusing on the expansion of "cleaner sources of electricity, including renewables like wind and solar, as well as clean coal, natural gas, and nuclear power. . . ." In order to realize these energy goals, the interdependence of the Nation's electric infrastructure and natural gas infrastructure must be recognized and examined, in order to determine whether greater reliability and efficiencies may be achieved.

Natural Gas as a Fuel Source for Generation of Electricity

The U.S. Energy Information Administration (EIA) reported in its July 5, 2011 publication, *Today in Energy*, that at the end of 2010, natural gas-fired generators constituted 39 percent of the Nation's total electric generation capacity. Almost 237 GW of natural gas-fired generation capacity came online between 2000 and 2010, equaling 81 percent of the total amount of generation capacity added during that time period. Furthermore, according to EIA data, natural gas-fired generation's share of U.S. electricity generation during the past ten years has grown 44 percent.



Source: U.S. Energy Information Administration, *Today in Energy*, "Natural gas use in the electric power sector is growing," July 6, 2011, citing the EIA's *Natural Gas Monthly*.
Note: Summer is defined as May through September; winter is defined as November through March.

The Nation's increased reliance on natural gas as a fuel source for the generation of electricity is attributable to several factors.

- Natural gas-fired unit technologies have resulted in more efficient generation units, resulting in a greater volume of electricity per unit of natural gas burned.
- The domestic supply of natural gas has grown dramatically, due primarily to the development of shale gas production. The EIA's *Annual Energy Outlook 2011* states that U.S. shale gas production grew at an annual average rate of 17 percent between 2000 and 2006 and at an annual average rate of 48 percent during 2006 through 2010. In the *Annual Energy Outlook 2011* reference case, shale gas production is projected to grow to 12.2 trillion cubic feet by 2035, constituting 47 percent of total U.S. production.
- Natural gas prices, although traditionally volatile, have recently been relatively stable and low.
- The average capacity factors for natural gas combined-cycle generation units have increased, across all hours of the day, since 2005. Some natural gas combined-cycle units that previously served as peakers or intermediate-load serving units are now operating as baseload units.

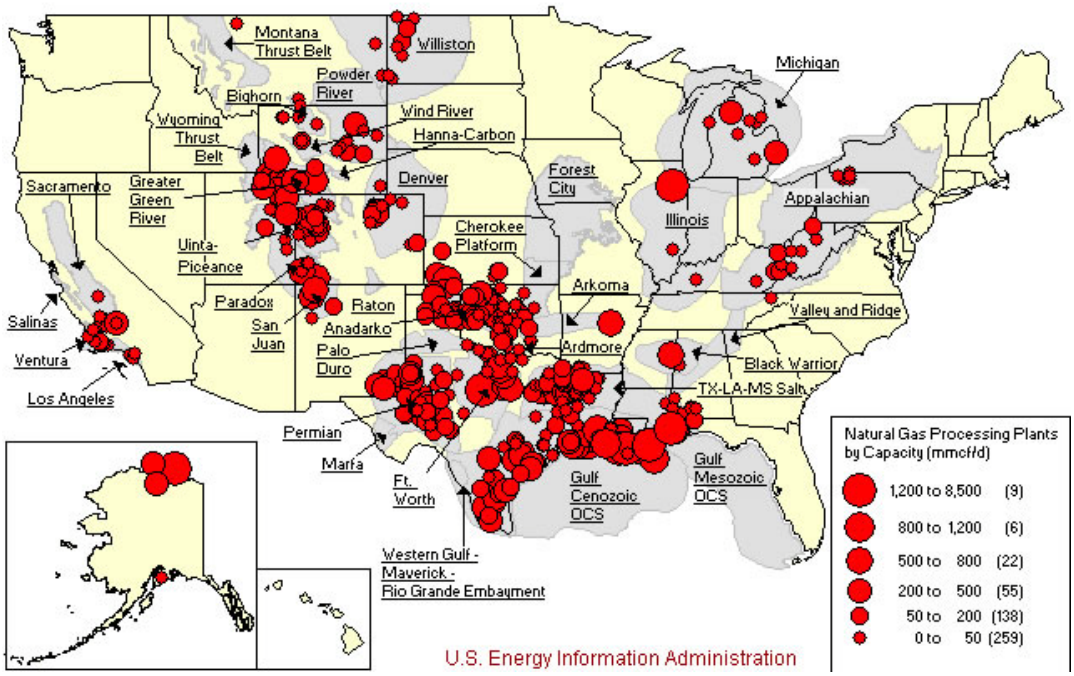
Additionally, it is likely the Nation's use of natural gas as a fuel source for electricity will continue to grow. In comparison to most other options, natural gas-fired generation

facilities are quicker to build and require less initial capital outlays. Furthermore, the Environmental Protection Agency (EPA) has recently enacted (and proposes to enact even more) major regulations that will have an impact on the Nation's ability to generate electricity. As a cleaner fuel source, and as a source of firm power needed to back up increased use of intermittent renewable resources, natural gas generation is projected to assume an even greater share of meeting the Nation's electricity needs.

Despite electricity generators' increasing reliance on natural gas, often contracts for natural gas delivery and/or supply to generation facilities are non-firm and there may be insufficient local gas storage, or alternate fuel options (such as dual fuel capability and inventory), available to ensure reliable operation of gas-fired generation during a gas pipeline contingency. The absence of natural gas during periods in which it is needed in order to provide electric service could have dire consequences.

Electricity as a Necessity for the Natural Gas Industry

Natural Gas Processing Plants and Production Basins, 2009



Source: U.S. Energy Information Administration, GasTran Natural Gas Transportation Information System.

Electricity is a necessity throughout the natural gas supply chain, including at production, pipeline, processing, and distribution facilities. The early-February 2011 outages in the Southwest served as a powerful reminder of the critical role electricity plays in day-to-day operations of many sectors, including the natural gas industries. For example, in the joint report issued by the Federal Energy Regulatory Commission (FERC) and the North

American Electric Reliability Corporation (NERC) on the early-February 2011 outages[1], it is estimated that controlled rolling blackouts implemented by the Electric Reliability Council of Texas (ERCOT) and customer curtailments caused or contributed to 29 percent of the production outages in the Permian Basin region and 27 percent of the production outages in the Fort Worth Basin.

When siting a natural gas processing facility, the availability of reliable and affordable electric service is a critical consideration, and interruption of electric service to such a facility can have negative safety and financial consequences observable long after electric service is restored. According to EIA data, as of 2009, there were 493 operational natural gas processing plants in the United States with a combined operating capacity of 77 billion cubic feet per day. The national average natural gas processing plant capacity showed a net increase of about 12 percent between 2004 and 2009 (not including the State of Alaska), and the nine largest plants in the Country represented 31 percent of the Nation's total processing capacity. The majority of large production and processing facilities utilize onsite generation of electricity. However, not all facilities do so, and interruption of electric service to a single large facility, can substantially affect the U.S.'s total processing capacity.

Another complication is that the demand for electric service at a remote gas production and/or processing site can develop more rapidly than necessary electric infrastructure can be put into service, because licensing and construction of large-scale electric generation and/or transmission infrastructure is often a multiple-year endeavor.

Electricity Advisory Committee Recommendations

1.) Given the interdependence of the Nation's electric infrastructure and natural gas infrastructure, the U.S. Department of Energy (DOE) should facilitate:

- Coordination among oversight and policymaking agencies or other regulatory bodies;

[1] NERC has initiated a special reliability assessment that takes a broad view within North America on how the growing interdependence of gas and electric industries can impact electricity production and overall reliability. *Reliability Assessment: A Primer on the Natural Gas and Electric Power Industries Interdependency - PHASE I*, reviews projected gas supply, projected pipeline infrastructure, the electric-gas industry interface, as well as the challenges of aligning a relatively slow moving product (*i.e.,* gas) with a fast moving service (*i.e.,* electricity). Additionally, this assessment will review the recommendations from NERC's 2004 *Gas/Electricity Interdependencies and Recommendations* report, provide an update and status on these recommendations, and determine follow-on actions to fulfill recommendations. The special assessment will also include gas demand projections, which include sensitivities based on assumed carbon prices, a range of possible outcomes on shale gas availability, and increased demand due to the retirement of coal plants and construction of more gas-fired generation.

The Phase I report is expected to be available in mid-November 2011.

- Identification of realistic alternative, redundant, and/or backup systems needed for reliable, continuous operation of the interdependent infrastructures;
- Testing of these systems routinely to ensure they will operate when called upon;
- Inclusion of cost/benefit impacts analyses on other infrastructures when considering policies; and
- Periodic reassessment of the status of interdependent infrastructures to determine whether shifts in technology or policy have changed their relationship with one another. Such assessments should include an evaluation of whether the retirement of existing electric generation will result in the development of additional gas generation and thereby place greater demands on the natural gas system.

2.) In particular, DOE should focus the coordination/research/facilitation activities that are listed above on:
    - Policies to ensure that gas supply and gas pipeline capacity will be available to generation resources on a firm basis when required to maintain power system reliability;
    - Policies, market rules, and technologies to enhance the contribution of gas generation as a quick-response balancing resource on power systems that will see an increasing penetration of variable renewable sources; and on
    - Evaluating the degree to which aging natural gas pipeline system links may be subject to failure with consequences for the electric sector.

3.) Such assessments should include an evaluation of whether the retirement of existing generation will result in the development of additional gas-fired generation and thereby place greater demands on the natural gas system.

These recommendations were approved by the Electricity Advisory Committee at its meeting on October 20, 2011.