



Natural Gas in a Smart Energy Future: White Paper Summary

Project Objective: Smart energy grid development has focused exclusively on opportunities to enhance the reliability and efficiency of the electric system. However, a properly constructed **smart energy future** should combine diverse and lower-carbon energy resources within an energy delivery infrastructure that is more reliable and secure than what we have today and what can be achieved through electric smart grid technologies alone. Realizing this vision will require technological advances to enhance the **overall** efficiency of energy production, distribution and use and the reduction of associated emissions. The objective of this project was to develop a compelling vision and value proposition on why natural gas is the key to North America’s smart energy future. The white paper provides the resource for the entire natural gas industry to promote the smart energy future vision and the critical actions that must be taken to achieve it.

Value of Integrating Natural Gas in a Smart Energy Future

- Improved environmental performance, energy security, and safety
- A more efficient infrastructure, with the ability to provide demand response, accommodate emerging technologies, and new sources of supply
- Improved demand response for electric distribution through switching heating and cooling loads to natural gas and through the use of distributed generation
- Greater consumer choice resulting in maximum energy value
- More optimized energy value from renewable wind and solar through the use of fast ramping dispatchable generation

Risks of not Integrating Natural Gas in a Smart Energy Future

- The energy production and delivery infrastructure will not be optimized
- Higher Energy costs for consumers
- Consumer options for efficient energy use will be limited
- Greenhouse gas emissions will increase and be more costly to manage
- The increased use of intermittent renewable energy sources will create performance issues for the electric grid that could have been effectively addressed with natural gas
- Demand response options for the electric distribution system will be limited and more costly

Achieving the Vision of Natural Gas in a Smart Energy Future

Pursuing the vision for natural gas in a smart energy future must begin now by enhancing the energy resource mix and infrastructure that is in place, and by fully implementing existing and emerging technologies and business models. However, achieving the vision requires key actions to create or enhance key capabilities within each of the three major industry sectors identified in the study.

Supply

Delivery/Distribution

End Use

Key Capabilities for Each Sector of the Natural Gas Value Chain

Supply: Within the Supply sector, establish tighter coordination of natural gas supply and natural gas-fired electricity generation to complement variable renewable resources, thereby enhancing responsiveness and operation of the electric grid.

Delivery: Within the Delivery sector, create or improve sensing, monitoring and controlling technologies to effectively enhance the safety and efficiency of the network and accommodate both new end uses and emerging supply sources, such as those from shale or renewable gas.

End Use: Within the End-Use sector, implement technology to help consumers make well informed energy choices.

Specific Capabilities for Delivery

- Detection/prediction of third-party damage
- Automated leak detection and notification
- Automated flow control and volume/pressure management
- Automated shut-off
- Gas quality monitoring and management
- Btu composition monitoring at the customer exchange (billing)

Specific Capabilities for End Use

- Advanced natural gas cooling , distributed generation and combined heat and power (DG/CHP) systems for moderating peak electricity demand
- Energy management tools providing consumers with more intelligence to make smart energy usage and equipment choices
- Hybrid electric/renewable energy/natural gas appliances
- Measurement and verification of energy efficiency program participation

Recommendations for Action

FOR POLICYMAKERS:

Research and Development

- Include natural gas in advanced metering infrastructure development to optimize common infrastructure, interoperability and cross-compensation among all utility infrastructures including electricity and water
- Ensure that future federal funding programs including Smart Grid encourage and allow the use of funding for dedicated natural gas projects and combined electric/natural gas projects
- Develop a technology roadmap for natural gas in a smart energy future, including critical input from a broad group of stakeholders and the energy technology R&D community
- Increase governmental funding for basic as well as applied research in natural gas safety and reliability and smart energy infrastructure technology
- Establish a governmental public-private research, development and deployment program for natural gas similar in size to the electric Smart Grid programs that includes component and system suppliers

Regulatory

- Incorporate full-fuel-cycle analysis in all conservation and energy efficiency standards, including common measures of energy and greenhouse gas emissions
- Expand ongoing Smart Grid standards development efforts to include natural gas
- Provide consumers information about energy usage and energy appliance selections so they can make educated decisions
- Modify the International Green Construction Code to ensure that every new building has access to natural gas service where available
- Approve infrastructure projects in a timely manner to natural gas infrastructure can meet the needs of all current and future end-uses

FOR INDUSTRY:

- Ensure the natural gas infrastructure can meet the needs of all current and future end-uses
- Enhance the system capability to accept and distribute a wide range of renewable gas sources
- Ensure current and future natural gas infrastructure can accommodate emerging technologies, peak demand, energy efficiency programs and new sources of supply
- Create or enhance capabilities to improve natural gas asset utilization on a real-time basis
- Advocate for the use of DG/CHP systems to supply power, heat and cooling at industrial and commercial applications