

QUADRENNIAL ENERGY REVIEW: SECTOR-SPECIFIC APPENDICES

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The U.S. Department of Energy (DOE) published four sector-specific appendices with the first Quadrennial Energy Review (QER), which was published in April 2015¹, and focuses on the nation's infrastructure for transporting, transmitting, and delivering energy. The QER appendices address liquid fuels, natural gas and electricity, and outline the emergency authority of the Federal Government.

Appendix A - Liquid Fuels

In 2014, the U.S. became the world's largest producer of liquid fuels. The liquid fuel component is varied and complex. The infrastructure includes oil refineries, crude oil pipelines, oil product pipelines, oil rail terminals, oil ports, waterborne transport, storage terminals, petroleum reserves, alternative fuels production facilities, and alternative fuel transportation.

Increases in waterborne transport for energy-related demands have put the focus on the ports. Investment in ports, harbors, and waterways will be essential to meet the demand. Historically, refineries primarily received foreign crude by barge; however, in 2012 and 2013, refineries received more domestic than foreign crude by barge. The Mississippi River provides a route for barges to Gulf Coast refineries, but during the times of the year when sections of the river are shutdown or traffic is limited (e.g., hurricanes, flooding, drought, accidents, oil spills), barge shipments will be severely disrupted.

Over the past 10 years, three hurricanes have impacted the petroleum product supplies. The most severe impact was damage to the Gulf Coast refineries (lost refinery capacity). Responsibility for resiliency of privately held infrastructure lies with state public utility commissions and federal regulators.

Appendix B - Natural Gas

U.S. natural gas production increased 33 percent between 2005 and 2013. Natural gas produced from shale formations has increased tenfold and accounts for about half of the U.S. natural gas production. The continental United States has a robust natural gas infrastructure. Between 2008 and 2013, approximately 4,000 miles of interstate pipelines were constructed. The natural gas prices at Henry Hub (benchmark for U.S. gas prices) fell 55 percent between 2005 and 2013.

Natural gas demand is projected to increase by 2030. Three factors contribute to that projection:

1. Electric power generation – Plentiful supply and low price of natural gas, plus the recent environmental standards encouraging fuels with lower emissions profiles.
2. Industrial use - The availability of low cost gas in the U.S. has increased consumption and increased investment in projects able to use that gas. Four hundred twenty-four industrial projects have been announced.
3. Exports – By 2030, export terminals are projected to demand between 5.1 and 8.3 billion cubic feet per day. Also projecting that new pipelines and permitting will be required.

¹ U.S. Department of Energy QER website (<http://energy.gov/qer>)

Appendix C - Electricity

The grid is the core of the electricity system. The grid is generation, transmission, distribution, and storage, as well as the information infrastructure that monitors and coordinates. The system exists to serve the load, that is, the demand from customers. In the early days, the electric power industry was local, but today it is an interconnected system that spans the country. However, at the state level, the differences in resource mix and priorities remain.

The grid of the future must adapt to change. Current drivers of that change include:

- The growing use of natural gas to power electricity generation
- Low load growth
- Distributed generation
- Increasing deployment of renewable energy and the retirement of coal and nuclear generation
- Growing interaction at the federal, state, and local level.

There is an emerging interdependence between the natural gas and electric infrastructure. Plentiful supply and historically low gas prices have changed the economics of the electric power markets and gas fired electricity generation increased 73 percent from 2003 to 2013. Information technology infrastructure and electricity system hardware have become more interdependent over the past two decades. The network and software technologies have enhanced situational awareness and enhanced operational efficiencies, but they have also made the electric system more susceptible to cyber threats.

Appendix D - Federal Emergency Authorities and Policy Directives

The Federal Government has authority and powers regarding the energy sector in the event of an emergency. Following is a sample of the emergency authorities and power directives:

- Federal Power Act (FPA), 16 U.S.C. § 791a et seq.: Provides the Secretary of Energy authority to order temporary interconnections of facilities and to request the generation, delivery, interchange, or transmission of electric energy necessary to meet an emergency.
- Natural Gas Policy Act (NGPA), 15 U.S.C. § 717 et seq.: Authorizes the President to allocate supplies of natural gas to help alleviate an existing or imminent severe natural gas shortage.
- Powerplant and Industrial Fuel Use Act (FUA), 42 U.S.C. § 8301 et seq.: Provides the President authority in times of a severe energy supply interruption to allocate coal to power plants or to order a switch to a fuel other than natural gas or petroleum.
- Federal and state agencies have access to waiver authorities to enable action in response to events that impact fuel diversity, such as:
 - DOT waiver used for hazardous materials specifications that relaxes standards for vehicles used to ship fuel
 - EPA waiver used for vapor recovery that allows fuel terminals to forego the use of vapor recovery equipment
 - State waiver for biofuel blending that allows the lifting of blending fuel quotas
 - State waiver for retail labeling requirements that allows the sale of fuels that don't contain the mixture labeled at the pump.

Today's aging infrastructure is vulnerable as we move liquid fuels and electricity from supply areas to demand areas and the costs and timing are affected by congestion in ports, waterways, and rail systems. The QER appendices provide analyses of the key U.S. fuels/energy carriers.