QUADRENNIAL ENERGY REVIEW: ENERGY TRANSMISSION, STORAGE, AND DISTRIBUTION INFRASTRUCTURE (PUBLISHED APRIL 2015)

by
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In June 2013, the federal government initiated a quadrennial cycle (every 4 years) of energy reviews. The reviews are intended to provide a roadmap for U.S. energy policy. The first Quadrennial Energy Review (QER) was published in April 2015[1] and focuses on the nation's infrastructure for transporting, transmitting and delivering energy (TS&D Infrastructure). The U.S. Energy system has changed significantly. The U.S. has become the leading producer of oil and natural gas combined, solar electricity generation has increased 20-fold, electricity from wind energy has almost tripled, and there is an increased focus to reduce greenhouse gas emissions from the energy sector. There has also been a lack of investment in replacing components of that infrastructure due to age and obsolescence.

Key Findings

- Mitigating energy disruptions is fundamental to infrastructure resilience
- TS&D infrastructure is vulnerable to many natural phenomena
- Threats and vulnerabilities vary substantially by region
- Recovery from natural gas and liquid fuel system disruptions can be difficult
- Cyber incidents and physical attacks are growing concerns
- High-voltage transformers are critical to the grid
- Assessment tools and frameworks need to be improved
- Shifts in the natural gas sector are having mixed effects on resilience, reliability, safety, and asset security
- Dependencies and interdependencies are growing
- Aging, leak-prone natural gas distribution pipelines and associated infrastructures prompt safety and environmental concerns

Recommendations

- Develop comprehensive data, metrics, and an analytical framework for energy infrastructure resilience, reliability, safety, and asset security
- Establish a competitive program to accelerate pipeline replacement and enhance maintenance programs for natural gas distribution systems
- Support the updating and expansion of state energy assurance plans
- Establish a competitive grant program to promote innovative solutions to enhance energy infrastructure resilience, reliability, and security
- Analyze the policies, technical specifications, and logistical and program structures needed to mitigate the risks associated with loss of transformers
- Analyze the need for additional or expanded regional product reserves

[1] U.S. Department of Energy (http://energy.gov/epsa/quadrennial-energy-review-qer)

- Integrate the authorities of the President to release products from regional petroleum product reserves into a single, unified authority.

Table 1. Components of TS&D Infrastructure Considered in this Installment of the QER

Fuel/Energy Carrier	TS&D Infrastructure Element/System
Electricity	Transmission lines and substations Distribution lines and distributed generation Electricity storage Other electric grid-related infrastructure
Natural Gas	Natural gas gathering lines Transmission Pipelines Natural gas storage facilities Processing facilities Distribution pipelines and systems LNG production/storage facilities (including export terminals)
Coal	Rail, truck, barge transport Export terminals
Crude Oil/Petroleum Products	Crude oil pipelines Crude Oil and Product import and export terminals Rail, truck, barge transport Oil Refineries Strategic Petroleum Reserve & Regional Petroleum Product Reserves CO_2 pipelines (including EOR)
Biofuels	Transport of feedstock and derived products, bio-refineries
SOURCE: QER Report, Chapter 1, Table 1-1	

The QER is highlighting the need for the undertaking of a multi-year program of support for the updating and expansion of state energy assurance plans. Louisiana's Energy Assurance Plan was developed under a grant funded through the American Recovery and Reinvestment Act of 2009. The estimated cost for this program is $350 - $500 million over 10 years. 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.