Assessing Regional Transportation Fuel Supply Shortages and Consequences

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Situational Awareness and Information Sharing

Energy Emergency Assurance Coordinators

- Emergency points of contact for States, DOE and energy sector
- Provide assessment, notification, news and actions taken.
- Primary and secondary contact for each sector (petroleum, electricity, natural gas) from each state
- Established in 1996 and an update and expanded MOU was signed by the Secretary of Energy in February 2016 and formally expanded to include NASEO, NARUC, NGA and NEMA
Colonial Pipeline Break

- On Friday, September 9, 2016, a mining inspector in Shelby County, Ala., detected a gasoline odor on mining property. He alerted Colonial Pipeline, which operates two pipelines in the immediate vicinity. Both pipelines were shut down as a precaution. Line 2 was restarted when it was found the leak was from line 1.

- Colonial Pipeline Line 1 was safely restarted and returned to service the evening September 21, 2016. In the time leading to the restart, over 800 personnel were on site to assist in restart and remediation efforts. Throughout this process, nearly 100 federal, state and local officials have also been on site, working alongside Colonial Pipeline to assure safe operations.

- Colonial was down for 10 days meaning and normally moves about 1.4 million gallons of gasoline per day or a total of 1.4 billion gallons over the 10 days.

- The States of Alabama, Georgia, North Carolina, South Carolina, Tennessee and Virginia -- declared states of emergency, relaxing limits on fuel transportation to help resupply markets. A number of States have also approval from EPA to waive summer grade gasoline fuels specification for RFG and RVP.
Colonial Pipeline Impacts

- Non-contract customers were cut off and contract customers were placed under allocations where they only received a percentage of their contact volumes.

- Gas stations ran out of fuel and there were lines of vehicles at the stations that were still open. While some stations received additional supply they sometimes ran out before the next delivery.

- Gasoline tanker truck wait times at the marine port of Williamston, NC were reported up to 7 hours long and other trucks were driving much longer distance to get fuel. State emergency declarations allowed driver to extent the hour they could drive as a result of waivers of federal motor carrier safety rules.

- Gasoline prices jumped up however the increases were moderated by lower demand levels seen after the summer driving season.
Many Retail Gas Stations Out of Fuel

As of Wednesday, September 21, 2016 12:13 PM
Source: http://tracker.gasbuddy.com/
Petroleum Product Supply Disruption in a Cascadia Subduction Zone Zone Scenario

- A major earthquake along the Cascadia Subduction Zone (CSZ) would produce a powerful tsunami, in addition to ground shaking, ground liquefaction, and landslides in Washington, Oregon, and northern California.

- In the Columbia River Basin, petroleum fuels are normally produced in the refinery complex north of Seattle and transported into the basin via barge and pipeline to local storage in the Portland metropolitan area.

- A 9.0-magnitude earthquake on the CSZ will severely damage a significant number of pump stations along the Olympic and Oregon Line, a refined-product pipeline system, as well as a substantial number of refined-product terminals in the region.

Source: Department of Homeland Security, Office Of Cyber and Infrastructure Analysis July 2016
Petroleum Supply Disruption in a Cascadia Subduction Zone Scenario (Cont.)

- In the 50th percentile case, two refineries (BP West Coast Products, and Phillips 66 in, Washington, with a combined operable capacity of 336 thousand barrels per day (Kbpd) suffer no damage based on Hazus damage analysis. Two other refineries (Tesoro West Coast and Shell Oil Products U.S. in Washington, with a combined capacity of 265 Kbpd) suffer slight damage. One refinery (U.S. Oil & Refining, also in Washington, with a capacity of 40.7 Kbpd) suffers complete damage.

- In the 90th percentile case, refinery damage ranges from moderate to complete. Three refineries (BP West Coast, Phillips 66, and Shell Oil Products U.S.) with a combined operable capacity of 471 Kbpd suffer moderate damage. The other two refineries (Tesoro West Coast and U.S. Oil & Refining) with a combined capacity of 160.7 Kbpd suffer complete damage.

Source: Department of Homeland Security, Office Of Cyber and Infrastructure Analysis July 2016
Petroleum Supply Disruption in a Cascadia Subduction Zone Scenario (Cont.)

- Based on the 2011 NISAC CSZ analysis, pipelines supplying crude oil input to refineries in northwest Washington are expected to suffer 15 breaks and 6 leaks, principally because of ground displacement resulting from liquefaction.

- Refined-product pipelines move product from these refineries south to the Seattle market and beyond on the Olympic and Oregon Line pipelines, to the Portland and Eugene markets, with potential for offloading at terminals to barges for delivery upstream. Combined, these systems can be expected to suffer as many as 250 breaks and 82 leaks, again principally because of ground liquefaction.

- The analysis of the capability to move products is based on normal demand levels for these commodities. For the petroleum supply chain, a great deal of uncertainty exists about the how much demand will be curtailed following such a catastrophic event.

- Damage to refineries, pipelines, and marine and pipeline terminals will take a substantial time to repair. The analysis of the capability to move products is based on normal demand levels for these commodities. For the petroleum supply chain, a great deal of uncertainty exists about the how much demand will be curtailed following such a catastrophic event.

Source: Department of Homeland Security, Office Of Cyber and Infrastructure Analysis July 2016
Risk Assessment, Mitigation & Resiliency

- You need to understand what the Risks are before you can work to mitigate the impacts and build resiliency.
- When you quantify size of the economic and human consequences the cost benefits of the investments to mitigate energy sector risks are often relatively small compared to the consequences.
- The term "mitigation" refers to the capabilities necessary to reduce loss of life and improved resiliency because fewer resources are needed for response and recovery. Results from a FEMA study showed that on average, future losses were reduced by about $3 for every $1 spent.

http://www.dhs.gov/NIPP
Risk – The potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and the associated consequences.

- **Consequences:** If something happens, what are the human and economic impacts to society?
  - Must also consider how impacts will affect interdependent infrastructures and behavior of impacted populations

- **Threats/Hazards:** What can happen? What is the frequency/probability?

- **Vulnerabilities:** Are there weak links in the energy supply chain and infrastructure? Are components antiquated/old and failure prone? Are there infrastructure co-locations or bottlenecks? Why is it critical?
  - Includes consideration of energy infrastructure attributes and interdependencies

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*Source: NIPP 2013 Partnering for Critical Infrastructure Security and Resilience*
Risk Assessment

Risk is a function of

\[\text{Consequence} \times \text{Threat} \times \text{Vulnerability}\]

$15$ million  Rifle Attack  Visible Line of Site

The April 16, 2013, attack on the Pacific Gas and Electric Company’s Metcalf substation near San Jose, California damaged 17 transformers, caused $15$ million in damage, and put the facility out of service for nearly a month.
Consequence

- Consequence analysis should address both direct and indirect effects of any hazards including: natural disaster, infrastructure failure, pandemic, cyber or terrorist attack, or other disruptive events.

- Under the National Infrastructure Protection Plan, the U.S. Department of Homeland Security works with sector specific agencies and security partners to examine assets, systems, or networks to identify “worst-case” consequences.

- Consequences for the national-level comparative risk assessment can be divided into four main categories:
  - Human impact, fatalities, and injuries
  - Economic impacts, primary/secondary
  - Impact on public confidence
  - Impact on government capability
Vulnerabilities and Criticality

- **Vulnerabilities**
  - Visible vs. not visible
  - Widely know about vs. unknown
  - Easy vs. difficult to protect perimeter
  - Inherent redundancy & resiliency
  - Security measures / standards adopted
  - Public vs. restricted access
  - Speed of response
  - Insider vulnerability
  - Cybersecurity

- **Criticality**
  - What’s really important
  - Levels of independencies
  - Relative importance
  - High consequences and impacts
  - Potential threat to public safety

Fermi nuclear power plant
Monroe, Michigan
Gathering Data & Information for Consequence Assessment

- Understanding the State energy profile
  - Capacities & Utilization
  - Energy flows, consumption & prices
- Identify who in the State is responsible for tracking trends, statistics
- Know what data is collected and how to get it and what it means
- Vulnerability Assessment

See the Energy Information Administration, Energy Explained at: eia.gov and States profiles
Oregon State Energy Assurance Plan (August 2012)

Figure 5

Energy Sector Interdependencies: Cascading Impacts

Example

Energy Sector Interdependencies: Cascading Impacts

Electricity
Supply - Demand Imbalance

Gas Production
Natural Gas Production Curtailment

Oil Pipelines
Pipeline Product Disruption

Water
Disruption of Irrigation Pumps

Cogeneration
Reduced Steam for Heavy Oil Production

Refineries
Inventory Buildup Curtail Operations

Terminals
Inventory Drawdown Supply Disruptions

Agriculture
Crop Losses

Oil Production
Reduced Heavy Oil Production

Road Transport
Fuel Shortage

Air Transport
Fuel Shortage Flight Disruptions

Banking
Financial Losses

Cascading impacts continue past Phase 3.
Threats and Hazards

State Level Data Sources

- State Hazards Analysis prepared by a number of state emergency management agencies document historical events and damages such as hurricanes, earthquakes, floods, storms, wildfires, infrastructure failures, etc.

- Energy Supply Disruption Tracking Process developed as part of the State Energy Assurance planning efforts document events and recovery timelines.

- Many, but not all, State Energy Assurance Plans contain to some assessments of the risks of an energy disruption due to all hazards. Some of these plans are not public and are considered For Official Use Only (FOUO).

- Many State Fusion Centers have a critical infrastructure protection desk that track incidents involving infrastructure sectors including energy and some prepare and issue monthly Suspicious Activity Reports.

- The Department of Energy collected data from utilities on a mandatory repost called the Electric Disturbance Events (OE-417) and the customer outage numbers are available by utility and areas affected by month and year on the DOE website.

- FEMA’s website has a listing of major disaster and emergency deceleration by state by year.
Energy Risk Resources Library

Developed by the DOE’s Office of Electricity Delivery and Energy Reliability in conjunction with the National Association of State Energy Officials (NASEO)

Introduction

Decisions regarding how to secure and invest in our Nation’s energy infrastructure are often complex. Limited resources and investment returns, tight budgets, and lack of information can hinder the process of how to best maintain or improve existing infrastructure or build new energy facilities and systems. Threats or hazards that can impact energy infrastructure and the consequences of those impacts must be known to reduce vulnerabilities. Creating a risk assessment culture can help to inform decision making when securing and building resilient energy infrastructure.

Many approaches have been developed to analyze components of risk related to energy infrastructure. Private industry, trade and research organizations, Federal and State agencies, and as National Laboratories have developed resources that can be used to assess risk. Risk assessment approaches range from general descriptions of state energy profiles and infrastructure (qualitative) to methods based on scoring and specific metrics that analyze risk of energy assets and systems (quantitative). There are numerous methodologies or tools that have been developed to evaluate risk or components of risk.

The purpose of this Energy Risk Resource Library is to catalogue these approaches and data to assist analysts and policy makers in making more risk informed decisions to improve energy sector resilience.

The Energy Risk Resource Library is designed to inform risk assessment practitioners on the importance of risk assessment and the methods and approaches used. It provides practitioners with an overview of risk assessment, the U.S. energy sector, and resources for monitoring energy infrastructure risks. It also provides information on advanced resources including analytical tools, methods, data, and relevant studies.

About this Website

http://energy-oe.maps.arcgis.com/apps/MapSeries/index.html?appid=ece7b1c390b24177b4361784104cab7d
Or Google: “State and Regional Energy Risk Assessment Initiative”
# Some Key Petroleum Statistics

<table>
<thead>
<tr>
<th>Petroleum, including: gasoline, distillate fuel oils, propane, etc.</th>
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</thead>
<tbody>
<tr>
<td>Monthly State Petroleum Product Use</td>
<td>Prime Supplier Sales Volumes by State</td>
</tr>
<tr>
<td>State and regional inventories</td>
<td>Refinery, bulk terminal, stocks by state</td>
</tr>
<tr>
<td>Working and net available shell storage capacity</td>
<td>PAD Level Storage Capacity</td>
</tr>
<tr>
<td>Retail prices gasoline and diesel fuel</td>
<td>By state - current daily, historical</td>
</tr>
<tr>
<td>Residential Heating Oil and Propane Prices</td>
<td>Weekly by states during the heating season</td>
</tr>
<tr>
<td>Refinery Production by PADD</td>
<td>Weekley by PADD and for PADD 1 by SubPADD</td>
</tr>
<tr>
<td>Refinery and pipeline operations</td>
<td>U.S Refinery Planned Outages</td>
</tr>
<tr>
<td>Pipeline, Marine, and Rail Deliveries</td>
<td>Pipeline, Tanker, Barge and Rail by PADD</td>
</tr>
<tr>
<td>Crude oil and Petroleum Product Imports to the East Coast</td>
<td>Monthly and annual imports total and barrels per day</td>
</tr>
<tr>
<td>PADD 1 and PADD 3 Transportation Fuels Markets</td>
<td>Shows Transportation Movements and Supply and Demand</td>
</tr>
</tbody>
</table>
The U.S. Energy Information Administration (EIA) launched its Weekly Energy Snapshots that showcases the best of EIA’s graphs on prices, production, inventories, trade, and other key energy data. The album, updated each Friday before noon on EIA’s Flickr page, highlights data and statistics from the week in charts, graphs, maps, and other images. For example it contains:

- **Prices.** The album features data visualizations that illustrate pricing dynamics in the electricity, natural gas, coal, and petroleum markets. Several charts show weekly and yearly ranges for spot U.S. electricity prices by region, spot U.S. natural gas prices by region, spot crude oil prices in the West Texas Intermediate and Brent markets, and weekly spot coal prices by region.

- **Inventories.** The album includes graphs and visualizations that show current levels of U.S. energy inventories of crude oil, gasoline, propane, distillate, and coal. The amount of working natural gas in underground storage and the five-year storage averages are also represented.

- **Production.** Graphs and visualizations included in the album also provide information on weekly coal production in the United States, differences in coal production by week and year, and more detailed information about coal production by region. Other production images provide insight into weekly U.S. natural gas production and weekly outages at nuclear electric generating units.
State Energy Risk Profiles

The profiles examine the relative magnitude of the risks that each State's energy infrastructure routinely encounters in comparison with the probable impacts. The profiles address natural and man-made hazards with the potential to cause disruption of the electric, petroleum, and natural gas infrastructures.

Developed by the U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability
Support the updating and expansion of state energy assurance plans: (a partial excerpt)

- Strengthen and expand state, local, and tribal energy assurance planning and resilience efforts by incorporating innovative technologies and measures to improve resilience.
- Build state in-house energy assurance expertise.
- Build regional energy assurance capability to allow states, localities, and tribes to better identify the potential for energy disruptions, quantify the impacts of those disruptions, and develop comprehensive mitigation and response plans.
- As part of these plans, states should also assess needs for backup electricity at retail gasoline stations along emergency evacuation routes.
- DOE should encourage strong intergovernmental coordination to ensure state and local energy assurance plans interface with one another, as well as with Federal and private sector disaster and emergency response plans.

Thank you!

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