Environmental Regulatory Update

Environmental Advisory Group

Patricio Silva
SENIOR ANALYST
Presentation Overview

• National Trends

• Regional Trends

• Changes in Federal Environmental Regulatory Policy
  – Major Environmental Rules Related to Coal, Natural Gas, and Nuclear Generation

• MATS Update

• Load-Weighted Real-time Marginal Unit by Month (2017-2018)
NATIONAL TRENDS
2018 U.S. Capacity Retirements

- U.S. power generation capacity retirements continued from 2017 (11.5 GW) through 2018 (16.9 GW):
  - 11.8 GW in coal-fired capacity retirements (70%)
  - 3.78 GW in gas-fired capacity retirements (22.4%)
- Retired fossil capacity tended to have lower capacity factors (53.7% for coal, 10.6% for natural gas in 2017)
- Unfavorable economic conditions driving fossil and nuclear retirements nationwide
- Cumulative coal retirements (74,722 MW 2010-2018) expected to have limited impact on national emission trends

Sources: EIA; S&P Global Market Intelligence
2019 Forecast U.S. Capacity Changes

- In 2019, changes expected in U.S. generating capacity include:
  - 49,420 MW in new capacity expected to enter service
    - 22,447 MW of wind
    - 13,993 MW of natural gas
    - 11,050 MW of solar
  - 8,597 MW expected to retire:
    - 5,834 MW of coal
    - 1,801 MW of natural gas
    - 683 MW of nuclear
  - 2,216 MW fuel switching

- In New England 1,572 MW in new natural gas, oil, solar, wind capacity expected, while 683 MW in nuclear capacity retires

Sources: EIA; S&P Global Market Intelligence
EIA Forecasts U.S. Energy-Related Carbon Dioxide Emissions Increased 2.8% in 2018

U.S. annual carbon emissions by source
million metric tons

- total energy
- petroleum
- natural gas
- coal

Source: Short-Term Energy Outlook, January 2019

Components of annual change
million metric tons

- natural gas
- petroleum
- coal
- net change

Source: EIA
EIA AEO2019 Reference Case - Electric Sector Emissions

Projections reflect decreasing coal generation, increasing natural gas generation emissions

Electric sector emissions (Reference case)

EIA forecasts the power sector experiences a notable shift in fuels used to generate electricity, driven in part by historically low natural gas prices. Increased natural gas-fired electricity generation; larger shares of intermittent renewables; and additional retirements of less economic coal and nuclear plants occur during the projection period.
EIA AEO2019 Reference Case – New England Electric Sector Projected Emissions
SYSTEM GENERATION, EMISSIONS & WATER USE TRENDS
Fossil Fuel Deliveries to New England Power Plants

**2017**

<table>
<thead>
<tr>
<th>Coal (1000 tons)</th>
<th>Natural Gas (MMcf)</th>
<th>Oil (MBbls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>197.687</td>
<td>352097.855</td>
<td>502.148</td>
</tr>
</tbody>
</table>

**2018**

<table>
<thead>
<tr>
<th>Coal (1000 tons)</th>
<th>Natural Gas (MMcf)</th>
<th>Oil (MBbls)</th>
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<tbody>
<tr>
<td>93.9</td>
<td>243846.6</td>
<td>718.8</td>
</tr>
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</table>

Source: EIA
Annual, Monthly Energy Generation (GWh) for New England

<table>
<thead>
<tr>
<th>Monthly Energy Data (GWh)</th>
<th>2017</th>
<th>2018</th>
<th>Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation</td>
<td>102,564</td>
<td>103,702</td>
<td>1,138</td>
</tr>
<tr>
<td>Pumping Load</td>
<td>1,717</td>
<td>1,804</td>
<td>87</td>
</tr>
<tr>
<td>Net Interchange (+ = Import)</td>
<td>20,373</td>
<td>21,409</td>
<td>1,036</td>
</tr>
<tr>
<td>Imports</td>
<td>23,260</td>
<td>23,488</td>
<td>228</td>
</tr>
<tr>
<td>Exports</td>
<td>-2,887</td>
<td>-2,080</td>
<td>807</td>
</tr>
<tr>
<td>Net Energy for Load (GWh) *</td>
<td>121,220</td>
<td>123,307</td>
<td>2,087</td>
</tr>
</tbody>
</table>

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Source: ISO-NE
New England Emitting Generation & Estimated CO$_2$ Emissions (MWh, Metric Tons)

Emitting Generation (MWh)

- 2017: 58,000,000 MWh
- 2018: 58,000,000 MWh

Estimated CO$_2$ Emissions (Metric Tons)

- 2017: 20,000,000 tons
- 2018: 20,000,000 tons

Sources: ISO-NE
New England 2017 vs. 2018 SO₂ & NOₓ
Emissions (Short Tons)

2018 emission increases attributable in part to changes in weather, economic growth, energy prices, and fuel mix

SO₂ Emissions

NOₓ Emissions

Sources: ISO-NE; EPA
Water Withdrawals for Power Generation by Fuel Type in New England (Million Gallons)

2016 Water Withdrawals (Million Gallons)

- Coal
- Black Liquor
- Distillate Oil
- Natural Gas
- Nuclear
- Residual Oil
- Wood

2017 Water Withdrawals (Million Gallons)

- Coal
- Black Liquor
- Distillate Oil
- Natural Gas
- Nuclear
- Residual Oil
- Wood

Source: EIA
Water Consumption for Power Generation by Fuel Type in New England (Million Gallons)

2016 Water Consumption (Million Gallons)

2017 Water Consumption (Million Gallons)

Source: EIA
CHANGES IN FEDERAL ENVIRONMENTAL REGULATORY POLICY
Overview of Federal Environmental Rulemakings Impacting Energy Infrastructure

• **Clean Air Act**
  – New Source Review Applicability changes
  – Clean Power Plan Repeal, Affordable Clean Energy Rule Replacement

• **Clean Water Act**
  – Proposed jurisdictional limit to affected water bodies
  – Wastewater discharge compliance deadlines deferred

• **Endangered Species Act/Migratory Bird Treaty Act**
  – Protections limited for threatened and endangered species and habitats
  – Protections limited for migratory birds

• Most actions intended to either rollback or streamline permitting, licensing, or compliance rules for a range of energy infrastructure
  – Uncertain regional impact, developers see potential adverse impact on levelized costs for various types of energy infrastructure

Sources: EPA; MJ Bradley & Associates LLC
Overview of Federal Environmental Rulemakings Impacting Energy Infrastructure

- Extended federal government shutdown creating uncertainty for the power sector as closure of various departments and agencies stalls rulemakings, permitting and information gathering and reporting functions
  - Increasing risk of regulatory ‘snapback’ as delays in permitting, rulemaking, guidance or adverse litigation outcomes leave developers with uncertain or conflicting regulatory obligations
  - Bureau of Ocean Management, Environmental Protection Agency unable to move forward during federal shutdown on siting or permitting matters directly impacting development of energy infrastructure in the region
## Major Environmental Rules Related to Coal, Natural Gas, and Nuclear Generation

<table>
<thead>
<tr>
<th>Title</th>
<th>Year Finalized</th>
<th>Years Implemented</th>
<th>Authorizing Statute</th>
<th>Major Provisions</th>
<th>Generation Sources Affected</th>
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  • States consider requirements for power plants on a case-by-case basis  
  • Requires controls to reduce mortality to fish and other aquatic organisms   | Coal Natural Gas Nuclear                                                  |
| Cross-State Air Pollution Rule             | 2011           | Phase 1: 2015     | Clean Air Act       | • The Cross-State Air Pollution Rule replaced the Clean Air Interstate Rule starting on January 1, 2015, and requires states to reduce power plant emissions of SO₂ and NOₓ that contribute to ozone emissions and fine particle pollution in other states | Coal Natural Gas            |
  • The 2015 update sets the first Federal limits on levels of toxic metals that can be discharged | Coal Natural Gas            |
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| **New Source Review**                      | 1980; policy updates in 1996 and 2002 | 1980; 2002 updates 2018 EPA revises applicability | Clean Air Act | • Affects stationary sources of air pollutants. Requires that a new or modified power plant obtain a pre-construction permit to ensure, among other things, that modern pollution control equipment is installed.  
• Requirements differ depending on whether or not the plant is located in an area that meets the requirements under the National Ambient Air Quality Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Coal Natural Gas            |
| **Mercury and Air Toxics Standards**       | 2012           | 2015-2016 Implemented 2017 Litigation suspended 2018 EPA proposes rollback | Clean Air Act | • Set mercury, arsenic, acid gases, and other toxic pollutants emissions limits for coal- and oil-fired power plants  
• Operators had until April 2015 to comply with many plants receiving additional multi-year extensions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Coal Oil                    |
| **Coal Combustion Residuals Rule**         | 2015           | 2015-2018; 2018 rule revised, court overrules changes | Resource Conservation and Recovery Act | • Addresses groundwater contamination risks from coal combustion residuals (i.e., “coal ash”) disposal in unlined landfills and surface impoundments by establishing national standards for disposal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Coal                        |
# Major Environmental Rules Related to Coal, Natural Gas, and Nuclear Generation

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| **Regional Haze Rule**         | 1999; policy revisions in 2017 | Implemented Revised state plans due in 2021, some plans under review | Clean Air Act       | • Requires states to develop long-term strategies, including enforceable measures to improve visibility in 156 national parks and wilderness areas  
• Aims at returning visibility to natural conditions by 2064 | Coal Oil Natural Gas |
| **Carbon New Source Performance Standards** | 2015 | 2016 Litigation suspended pending EPA review  
2018 EPA proposes changes | Clean Air Act       | • Carbon New Source Pollution Standards established CO₂ emission standards for new fossil fuel-fired generators under Clean Air Act section 111(b) | Coal Oil Natural Gas |
| **Clean Power Plan**           | 2015 | 2018 EPA proposes repeal | Clean Air Act       | • The Clean Power Plan, establishes CO₂ emission standards for existing power plants under section 111(d) of the Clean Air Act | Coal Oil Natural Gas |

Source: DOE
MERCURY AND AIR TOXICS STANDARDS (MATS)
EPA proposes changes to Mercury and Air Toxics Standards (MATS)

- **December 2018**: EPA proposes changes to Mercury and Air Toxics Standards (MATS) which limited mercury and other toxic pollutant emissions from existing coal- and oil-fired steam thermal generators
  - MATS imposed hazardous air pollutants (HAPs) emissions from coal- and oil-fired generators, requiring reductions of 90% in mercury emissions and reductions in acid gases and particulate matter emissions
  - Any modification or reversal of the 2016 Supplemental Notice could undermine the MATS requirements and jeopardize some affected generators’ ability to recover capital costs incurred with the required pollution control retrofits
  - Any modifications to the cost benefit analyses for this rulemaking will likely establish a precedent for other rulemakings

- No regional impact expected, affected generators remain subject to independent state air toxics limits

- EPA scheduled to propose the MATS Residual Risk and Technology Review and Cost Review for public comment late in 2019

Sources: EPA; MJ Bradley & Associates LLC
LOAD-WEIGHTED REAL TIME MARGINAL UNIT FUEL DATA BY MONTH (2017-2018)
Load-Weighted Real time Marginal Unit Fuel Data by Month (2017-2018)

In this time period, on average, the marginal unit was: natural gas (75%); pumped storage (17%); oil (2%); coal (1.9%); hydro (1.9%); wind (1.1%); and, other (1%)
Questions