2018 North Carolina State Infrastructure Report
(January 1, 2018 – December 31, 2018)

May 2019

This report reflects information for the portion of North Carolina within the PJM service territory.
1. Planning
  • Generation Portfolio Analysis
  • Transmission Analysis
  • Load Forecast

2. Markets
  • Capacity Market Results
  • Market Analysis

3. Operations
  • Emissions Data
Executive Summary
(May 2019)

- **Existing Capacity:** Natural gas represents approximately 21.0 percent of the total installed capacity in the North Carolina service territory while hydro and solar represent approximately 41.4 percent and 31.0 percent, respectively. This differs from PJM where natural gas and coal are at 40.2 and 30.7 percent of total installed capacity.

- **Interconnection Requests:** Solar represents approximately 92.6 percent of new interconnection requests in North Carolina.

- **Deactivations:** North Carolina had no deactivations or deactivation notifications in 2018.

- **RTEP 2018:** North Carolina RTEP 2018 projects total more than $10 million in investment. North Carolina had no supplemental projects in 2018. These investment figures only represent RTEP projects that cost at least $5 million.

- **Load Forecast:** North Carolina load growth is nearly flat, averaging between 0.9 and 1.1 percent per year over the next 10 years. This is slightly higher than the PJM RTO load growth projections of 0.4 percent over the next 10 years.
• **2021/22 Capacity Market:** North Carolina cleared 48 MW more Demand Response and Energy Efficiency resources than in the prior auction.

• **1/1/18 – 12/31/18 Performance:** North Carolina’s average locational marginal prices were consistently at or above PJM average LMPs. Imported resources represented 54.9 percent of generation produced in the Dominion region of North Carolina.
PJM operates bulk electric system facilities (and others monitored at lower voltages), in Northeastern North Carolina including those of Dominion North Carolina Power (DOM). These transmission facilities deliver power to customers from native generation resources and those throughout the RTO – arising out of PJM market operations – as well as power imported interregionally from systems outside PJM.
Planning
Generation Portfolio Analysis
PJM – Existing Installed Capacity
(CIRs, December 31, 2018)

- Coal, 56,653 MW
- Natural Gas, 74,194 MW
- Nuclear, 33,362 MW
- Waste, 865 MW
- Oil, 9,499 MW
- Solar, 640 MW
- Hydro, 8,346 MW
- Wind, 1,165 MW
Summary:
Natural gas represents approximately 21.0 percent of the total installed capacity in the North Carolina territory while hydro represents approximately 41.4 percent.
Overall in PJM, natural gas represents approximately 40.2 percent of installed capacity while coal represents 30.7 percent.
Solar represents approximately 92.6 percent of new interconnection requests in North Carolina.

*Note: Nameplate Capacity represents a generator’s rated full power output capability.
North Carolina – Percentage of Projects in Queue by Fuel Type
(as of December 31, 2018)
## North Carolina – Interconnection Requests

(Unforced Capacity, As of December 31, 2018)

<table>
<thead>
<tr>
<th>Source of Energy</th>
<th>Complete In Service</th>
<th>Withdrawn</th>
<th>In Queue</th>
<th>Under Construction</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Projects</td>
<td>Capacity, MW</td>
<td>No. of Projects</td>
<td>Capacity, MW</td>
<td>No. of Projects</td>
</tr>
<tr>
<td>Non-Renewable</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>32.0</td>
<td>1</td>
</tr>
<tr>
<td>Storage</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>32.0</td>
<td>1</td>
</tr>
<tr>
<td>Renewable</td>
<td>11</td>
<td>250.7</td>
<td>73</td>
<td>2,710.5</td>
<td>29</td>
</tr>
<tr>
<td>Methane</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>12.0</td>
<td>0</td>
</tr>
<tr>
<td>Solar</td>
<td>11</td>
<td>250.7</td>
<td>62</td>
<td>2,423.2</td>
<td>29</td>
</tr>
<tr>
<td>Wind</td>
<td>0</td>
<td>0.0</td>
<td>9</td>
<td>195.3</td>
<td>0</td>
</tr>
<tr>
<td>Wood</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>80.0</td>
<td>0</td>
</tr>
</tbody>
</table>

Total: 11 projects, 250.7 MW in service, 1,396.6 MW in queue, 600.4 MW under construction, 4,990.2 MW grand total.
North Carolina – Future Capacity Mix

Based on known queued interconnection requests and deactivation notices through December 31, 2022, adjusted to reflect the probability of commercialization as indicated by historical trends specific to an interconnection request’s state/zonal location and fuel type.

- **Wind**: 27 MW
- **Gas**: 165 MW
- **Waste**: 5 MW
- **Oil**: 18 MW
- **Solar**: 269 MW
- **Hydro**: 315 MW

![Pie chart and bar chart showing the future capacity mix for North Carolina's energy sources.](chart.png)
North Carolina – Progression History Interconnection Requests
Projects under construction, suspended, in service, or withdrawn (as of December 31, 2018)

- **Projects withdrawn after final agreement**
  - 7 Interconnection Service Agreements – 234.5 MW (Nameplate Capacity, 743.6 MW)
  - 3 Wholesale Market Participation Agreements – 34.2 MW (Nameplate Capacity, 50.0 MW)

- **Percentage of planned capacity and projects reached commercial operation**
  - 8.1 % requested capacity megawatt
  - 11.9 % requested projects
North Carolina had no generation deactivations or deactivation notifications in 2018.
Planning
Transmission Infrastructure Analysis
North Carolina had no baseline project upgrades in 2018.

Note: Baseline upgrades are those that resolve a system reliability criteria violation.
North Carolina – RTEP Network Projects
(Greater than $5 million)

<table>
<thead>
<tr>
<th>Map ID</th>
<th>Project</th>
<th>Description</th>
<th>Project Driver</th>
<th>Queue</th>
<th>Required In-Service Date</th>
<th>Project Cost ($M)</th>
<th>TO Zone</th>
<th>2018 TEAC Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>n5620</td>
<td></td>
<td>Build a three breaker ring at the new AB2-169 substation</td>
<td>Generation</td>
<td>AB2-169 (Solar)</td>
<td>12/31/2018</td>
<td>$5.45</td>
<td>Dominion</td>
<td>9/13/2018</td>
</tr>
<tr>
<td>n5719</td>
<td></td>
<td>Queue AB2-059 switching station: Build new three circuit breaker ring switchyard</td>
<td>Generation</td>
<td>AB2-059 (Solar)</td>
<td>6/1/2018</td>
<td>$5.26</td>
<td>Dominion</td>
<td>9/13/2018</td>
</tr>
</tbody>
</table>

Note: Network upgrades are new or upgraded facilities required primarily to eliminate reliability criteria violations caused by proposed generation, merchant transmission or long term firm transmission service requests.
North Carolina had no supplemental project upgrades in 2018.

Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with the following PJM criteria: system reliability, operational performance or economic criteria, pursuant to a determination by the Office of the Interconnection and is not a state public policy project.
Planning
Load Forecast
PJM Annual Load Forecasts
(January 2019)

PJM RTO Summer Peak Demand Forecast

<table>
<thead>
<tr>
<th>Load Forecast</th>
<th>2013</th>
<th>2017</th>
<th>2014</th>
<th>2018</th>
<th>2022</th>
<th>2026</th>
<th>2028</th>
<th>2030</th>
<th>2032</th>
<th>2034</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# North Carolina – 2019 Load Forecast Report

<table>
<thead>
<tr>
<th>Transmission Owner</th>
<th>Summer Peak (MW)</th>
<th>Winter Peak (MW)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019</td>
<td>2029</td>
<td>Growth Rate (%)</td>
<td>2018/19</td>
</tr>
<tr>
<td>Dominion Virginia Power *</td>
<td>954</td>
<td>1,045</td>
<td>0.9%</td>
<td>1,025</td>
</tr>
<tr>
<td>PJM RTO</td>
<td>151,358</td>
<td>156,689</td>
<td>0.3%</td>
<td>131,082</td>
</tr>
</tbody>
</table>

* PJM notes that Dominion Virginia Power serves load other than in North Carolina. The Summer Peak and Winter Peak MW values in this table each reflect the estimated amount of forecasted load to be served by Dominion Virginia Power solely in North Carolina. Estimated amounts were calculated based on the average share of Dominion Virginia Power’s real-time summer and winter peak load located in North Carolina over the past five years.
Markets
Capacity Market Results
2021/22 Base Residual Auction Clearing Prices ($/MW-Day)
North Carolina – Cleared Resources in 2021/22 Auction
(May 23, 2018)

<table>
<thead>
<tr>
<th></th>
<th>Cleared MW (Unforced Capacity)</th>
<th>Change from 2020/21 Auction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation</td>
<td>646</td>
<td>88</td>
</tr>
<tr>
<td>Demand Response</td>
<td>57</td>
<td>28</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>731</strong></td>
<td><strong>136</strong></td>
</tr>
</tbody>
</table>

**RTO Locational Clearing Price**

$140

NOTE: Demand Response and Energy Efficiency are reported to PJM by Transmission Zone. The numbers above reflect the state’s pro-rata share of cross-state zones for illustrative purposes.
### PJM – 2021/2022 Cleared MW (UCAP) by Resource Type

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Annual</th>
<th>Summer</th>
<th>Winter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generation</strong></td>
<td>149,616 MW</td>
<td>54 MW</td>
<td>716 MW</td>
<td>150,385 MW</td>
</tr>
<tr>
<td><strong>DR</strong></td>
<td>10,674 MW</td>
<td>452 MW</td>
<td>- MW</td>
<td>11,126 MW</td>
</tr>
<tr>
<td><strong>EE</strong></td>
<td>2,623 MW</td>
<td>209 MW</td>
<td>- MW</td>
<td>2,832 MW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>162,912 MW</td>
<td>716 MW</td>
<td>716 MW</td>
<td>164,343 MW</td>
</tr>
</tbody>
</table>
# North Carolina – Offered and Cleared Resources in 2021/22 Auction

(May 23, 2018)

<table>
<thead>
<tr>
<th></th>
<th>Offered MW</th>
<th>Cleared MW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unforced Capacity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Generation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offered MW</td>
<td>682</td>
<td></td>
</tr>
<tr>
<td>Cleared MW</td>
<td>646</td>
<td></td>
</tr>
<tr>
<td><strong>Demand Response</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offered MW</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Cleared MW</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td><strong>Energy Efficiency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offered MW</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Cleared MW</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td><strong>Total Offered MW</strong></td>
<td>769</td>
<td></td>
</tr>
<tr>
<td><strong>Total Cleared MW</strong></td>
<td>731</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Demand Response and Energy Efficiency are reported to PJM by Transmission Zone. The numbers above reflect the state’s pro-rata share of cross-state zones for illustrative purposes.
North Carolina’s average daily LMPs generally aligned with the PJM average daily LMP.

Note: The price spike in January reflects the Cold Snap that lasted from 12/28/17 to 1/7/2018.
North Carolina’s average hourly LMPs were higher than the PJM average.
Amount of energy produced by North Carolina generation within the PJM service territory in 2018.

- Hydro, 19.5%
- Imports, 54.9%
- Solar, 12.0%
- Natural gas, 0.7%
- Wind, 12.0%
- Misc., 0.9%

Note: More than 4.3 million megawatt hours of energy, including imports, served the portion of North Carolina within the PJM footprint in 2018.
Operations
Emissions Data
2005-2018 PJM Average Emissions

CO₂ lbs/MWh

SO₂ and NOₓ lbs/MWh

Carbon Dioxide
Sulfur Dioxides
Nitrogen Oxides
Please note that PJM has historically used $5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to $10 million. All RTEP projects with costs totaling at least $5 million are still included in this state report. Going forward, the inclusion of RTEP projects in the State Infrastructure reports will be consistent with the RTEP listing cutoff of $10 million.

For a complete list of all RTEP projects, including those below the RTEP threshold of $10 million, please visit the “RTEP Upgrades & Status – Transmission Construction Status” page on pjm.com.