2021 Maryland and District of Columbia State Infrastructure Report
(January 1, 2021 – December 31, 2021)

May 2022
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• **Existing Capacity:** Natural gas represents approximately 43.8 percent of the total installed capacity in the Maryland service territory while coal represents approximately 24.1 percent. Comparatively, across PJM natural gas and coal are at 44.2 and 26.6 percent of total installed capacity.

• **Interconnection Requests:** Solar represents 69.5 percent of new interconnection requests in Maryland, while storage represents approximately 27.7 percent of new requests. Because Maryland’s offshore wind projects are proposed to interconnect into Delaware, they are captured as Delaware’s queued capacity in PJM’s RTEP.

• **Deactivations:** 1,234.9 MW in Maryland provided notification of deactivation in 2021.

• **RTEP 2021:** Maryland’s 2021 RTEP project total represents approximately $48.9 million in investment.
• **Load Forecast:** Maryland and Washington, D.C.’s projected summer peak load growth is relatively flat, averaging between -0.2 and 0.1 percent annually over the next 10 years depending on the service territory. Comparatively, the overall PJM RTO projected summer load growth rate is 0.4 percent.

• **2022/23 Capacity Market:** 10,631 MW in Maryland cleared in the 2022/23 Base Residual Auction.

• **1/1/21 – 12/31/21 Market Performance:** Maryland and D.C.’s average hourly LMPs were higher than the PJM average hourly LMP.

• **Emissions:** Maryland’s average CO2 emissions increased in 2021 compared to 2020 levels.
PJM Service Area – Maryland & D.C.
Planning
Generation Portfolio Analysis
PJM – Existing Installed Capacity
(CIRs – as of Dec. 31, 2021)

- Coal, 49,670 MW
- Natural Gas, 82,510 MW
- PJM 186,868 MW
- Nuclear, 32,656 MW
- Oil, 8,558 MW
- Solar, 1,824 MW
- Wind, 2,597 MW
- Waste, 804 MW

PJM 186,868 MW
Maryland – Existing Installed Capacity
(CIRs – as of Dec. 31, 2021)

MD/DC
Total
12,416 MW

Natural Gas, 5,436 MW
Coal, 2,987 MW
Waste, 102 MW
Nuclear, 1,708 MW
Oil, 1,443 MW
Solar, 85 MW
Hydro, 592 MW
Wind, 63 MW
PJM – Queued Capacity (MW) by Fuel Type
(Requested CIRs – as of Dec. 31, 2021)

- Storage, 34,131 MW
- Wind, 8,800 MW
- Hydro, 596 MW
- Coal, 76 MW
- Methane, 6 MW
- Natural Gas, 23,887 MW
- Nuclear, 81 MW
- Other, 331 MW
- Oil, 17 MW

PJM 161,681 MW

Note: Nameplate capacity represents a generator’s rated full power output capability.
Because Maryland's offshore wind projects are proposed to interconnect into Delaware, they are captured as Delaware’s queued capacity in PJM’s RTEP. There are 7,672 MW of nameplate offshore wind capacity queued in Delaware.
### Maryland – Historical Interconnection Requests by Fuel Type
(as of Dec. 31, 2021)

<table>
<thead>
<tr>
<th></th>
<th>Active</th>
<th></th>
<th></th>
<th>Complete</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Projects</td>
<td>Capacity (MW)</td>
<td>Projects</td>
<td>Capacity (MW)</td>
<td>Projects</td>
<td>Capacity (MW)</td>
<td>Projects</td>
<td>Capacity (MW)</td>
<td>Projects</td>
<td>Capacity (MW)</td>
<td>Projects</td>
</tr>
<tr>
<td><strong>Non-Renewable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>10.0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
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<tr>
<td>Diesel</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>0.0</td>
<td>1</td>
<td>5.0</td>
<td>2</td>
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<tr>
<td>Natural Gas</td>
<td>8</td>
<td>62.3</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>34</td>
<td>3,827.2</td>
<td>66</td>
<td>33,005.1</td>
<td>108</td>
</tr>
<tr>
<td>Nuclear</td>
<td>3</td>
<td>37.4</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>0.0</td>
<td>4</td>
<td>4,955.0</td>
<td>8</td>
</tr>
<tr>
<td>Oil</td>
<td>2</td>
<td>4.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>5.0</td>
<td>2</td>
<td>16.0</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
<td>132.0</td>
<td>4</td>
</tr>
<tr>
<td>Storage</td>
<td>18</td>
<td>1,168.0</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>17.3</td>
<td>0</td>
<td>0.0</td>
<td>39</td>
<td>454.2</td>
<td>62</td>
</tr>
</tbody>
</table>

| **Renewable** | | | | | | | | | | | |
| Biomass   | 0       | 0.0     | 0       | 0.0     | 0       | 0.0     | 0       | 0.0     | 12      | 227.6   | 12           | 227.6      |
| Hydro     | 1       | 15.0    | 0       | 0.0     | 0       | 0.0     | 3       | 60.0    | 4       | 88.4    | 8           | 163.4      |
| Methane   | 0       | 0.0     | 0       | 0.0     | 0       | 0.0     | 5       | 14.5    | 6       | 18.3    | 11          | 32.8       |
| Solar     | 48      | 2,502.5 | 3       | 90.8    | 34      | 379.3   | 14      | 43.0    | 196     | 1,623.8 | 295         | 4,639.4    |
| Wind      | 0       | 0.0     | 0       | 0.0     | 0       | 0.0     | 5       | 40.3    | 10      | 265.6   | 15          | 305.9      |
| **Grand Total** | 80 | 3,789.2 | 3       | 90.8    | 39      | 396.6   | 66      | 4,000.0 | 344     | 40,791.0 | 532         | 49,067.5   |

**Note:** The "Under Construction" column includes both “Engineering and Procurement” and “Under Construction” project statuses.
Maryland – Progression History of Interconnection Requests

- Applications Received by PJM: 45,296 MW
- Feasibility Studies Issued: 36,789 MW
- Impact Studies Issued: 20,096 MW
- Facilities Studies Issued: 14,786 MW
- Facilities Constructed: 4,493 MW
- In Service: 4,068 MW

- Projects withdrawn after final agreement:
  - 28 Interconnection Service Agreements: 5,668 MW, 6,164 MW
  - 48 Wholesale Market Participation Agreements: 114 MW, 229 MW

This graphic shows the final state of generation submitted to the PJM queue that completed the study phase as of Dec. 31, 2021, meaning the generation reached in-service operation, began construction, or was suspended or withdrawn. It does not include projects considered active in the queue as of Dec. 31, 2021.

- Percentage of planned capacity and projects that have reached commercial operation:
  - Requested capacity megawatts: 9%
  - Requested projects: 15.4%
# Maryland – Generation Deactivation Notifications Received in 2021

## Map of Maryland

![Map of Maryland showing generation deactivation notifications](image)

### Legend
- Orange circles indicate deactivation notices in 2021.
  - 0 - 98 MW
  - 100 - 249 MW
  - 250 - 589 MW
  - 800 - 899 MW
  - 700 - 1,320 MW
- Substations >= 345 kV
- Transmission Lines >= 345 kV

---

## Table of Generation Deactivation Notifications

<table>
<thead>
<tr>
<th>Unit</th>
<th>TO Zone</th>
<th>Fuel Type</th>
<th>Request Received to Deactivate</th>
<th>Actual or Projected Deactivation Date</th>
<th>Age (Years)</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgantown Unit 2</td>
<td>PEPCO</td>
<td>Coal</td>
<td>6/9/2021</td>
<td>5/31/2022</td>
<td>50</td>
<td>619.4</td>
</tr>
<tr>
<td>Morgantown Unit 1</td>
<td></td>
<td></td>
<td>6/9/2021</td>
<td></td>
<td>51</td>
<td>613.3</td>
</tr>
<tr>
<td>Oaks Landfill</td>
<td></td>
<td>Methane</td>
<td>4/16/2021</td>
<td>7/1/2021</td>
<td>11</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Planning
Transmission Infrastructure Analysis
Please note that PJM is now listing all transmission projects in its Annual RTEP and state infrastructure reports, beginning with this year’s 2021 Annual RTEP. In previous years only projects above a $10 million threshold were listed in the Annual RTEP Report and projects above a $5 million threshold were listed in the state infrastructure reports. This change may increase the amount of projects listed in these reports going forward now that smaller projects below the previous $5 million cutoff are being included.

The complete list of all RTEP projects in PJM, including those from prior years, can be found at the “RTEP Upgrades & Status – Transmission Construction Status” page on pjm.com.

https://www.pjm.com/planning/project-construction
Maryland – RTEP Baseline Projects
(No baseline projects were planned in Washington, D.C. in the 2021 RTEP)

Note: Baseline upgrades are those that resolve a system reliability criteria violation.
### Maryland – RTEP Baseline Projects

(No baseline projects were planned in Washington, D.C. in the 2021 RTEP)

<table>
<thead>
<tr>
<th>Map ID</th>
<th>Project</th>
<th>Description</th>
<th>Required In-Service Date</th>
<th>Project Cost ($M)</th>
<th>TO Zone</th>
<th>TEAC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b3228</td>
<td>Replace two relays at Center substation to increase ratings on the 110552 circuit.</td>
<td>6/1/2025</td>
<td>$0.03</td>
<td>BGE</td>
<td>11/18/2020</td>
</tr>
<tr>
<td>2</td>
<td>b3305</td>
<td>Replace Pumphrey 230/115 kV transformer.</td>
<td>6/1/2022</td>
<td>$4.69</td>
<td>DPL</td>
<td>8/31/2021</td>
</tr>
<tr>
<td>3</td>
<td>b3326</td>
<td>Rebuild the 13707 Vienna-Nelson 138 kV line.</td>
<td></td>
<td>$38.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>b3328</td>
<td>Upgrade the disconnect switch (13710-L1) and CT at Vienna.</td>
<td>6/1/2022</td>
<td>$0.25</td>
<td>BGE</td>
<td>12/1/2020</td>
</tr>
<tr>
<td>5</td>
<td>b3332</td>
<td>Rerate the 23076 Steel-Milford 230 kV line.</td>
<td></td>
<td>$0.60</td>
<td></td>
<td>8/31/2021</td>
</tr>
</tbody>
</table>

Note: Figures represent total project costs. This does not indicate final cost allocation for projects in zones that traverse state lines.
Maryland & D.C. – RTEP Network Projects

Maryland & D.C. had no network project upgrades in 2021.

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, as well as certain direct connection facilities required to interconnect proposed generation projects.
Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with PJM criteria and are not state public policy projects according to the PJM Operating Agreement. These projects are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.
## Maryland & D.C. – TO Supplemental Projects

<table>
<thead>
<tr>
<th>Map ID</th>
<th>Project ID</th>
<th>Description</th>
<th>Projected In-Service Date</th>
<th>Project Cost ($M)</th>
<th>TO Zone</th>
<th>TEAC Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>s2563</td>
<td>Reconductor transmission line 23009 from Mount Zion to Norbeck (4.5 miles) with E3X coated conductor.</td>
<td>6/1/2022</td>
<td>$3.60</td>
<td>PEPCO</td>
<td>3/9/2021</td>
</tr>
<tr>
<td>2</td>
<td>s2587</td>
<td>Replace Riverside 230 kV circuit breaker No. B51.</td>
<td>11/30/2021</td>
<td>$1.25</td>
<td>BGE</td>
<td>7/13/2021</td>
</tr>
</tbody>
</table>
The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner’s real-time summer and winter peak load in those areas over the past five years.
Markets
Capacity Market Results
2022/2023 Base Residual Auction Clearing Prices ($/MW-Day)

- ComEd: $68.96
- DEO&K: $71.69
- RTO: $50
- BGE: $126.50
- MAAC: $95.79
- EMAAC: $97.86
<table>
<thead>
<tr>
<th></th>
<th>ANNUAL (MW)</th>
<th>SUMMER (MW)</th>
<th>WINTER (MW)</th>
<th>Total (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generation</strong></td>
<td>130,844.9</td>
<td>9.9</td>
<td>686.8</td>
<td>131,541.6</td>
</tr>
<tr>
<td><strong>DR</strong></td>
<td>8,369.9</td>
<td>442.0</td>
<td>0.0</td>
<td>8,811.9</td>
</tr>
<tr>
<td><strong>EE</strong></td>
<td>4,575.7</td>
<td>234.9</td>
<td>0.0</td>
<td>4,810.6</td>
</tr>
<tr>
<td><strong>Total (MW)</strong></td>
<td>143,790.5</td>
<td>686.8</td>
<td>686.8</td>
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</tr>
</tbody>
</table>
Maryland – Cleared Resources in 2022/23 Auction  
(June 2, 2021)

<table>
<thead>
<tr>
<th></th>
<th>Cleared MW (Unforced Capacity)</th>
<th>Change from 2021/22 Auction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation</td>
<td>9,620</td>
<td>-2,050</td>
</tr>
<tr>
<td>Demand Response</td>
<td>562</td>
<td>-228</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>449</td>
<td>+246</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,631</strong></td>
<td><strong>-2,032</strong></td>
</tr>
</tbody>
</table>

**EMAAC Locational Clearing Price**: $97.86  
**MAAC Locational Clearing Price**: $95.79  
**BGE Locational Clearing Price**: $126.50

**RTO Locational Clearing Price**: $50

**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.
### Maryland – Offered and Cleared Resources in 2022/23 Auction

(June 2, 2021)

<table>
<thead>
<tr>
<th>Unforced Capacity</th>
<th>Offered MW</th>
<th>Cleared MW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offered MW</td>
<td>11,570</td>
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</tr>
<tr>
<td>Cleared MW</td>
<td>9,620</td>
<td></td>
</tr>
<tr>
<td><strong>Demand Response</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offered MW</td>
<td>630</td>
<td></td>
</tr>
<tr>
<td>Cleared MW</td>
<td>562</td>
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<tr>
<td><strong>Energy Efficiency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offered MW</td>
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<td></td>
</tr>
<tr>
<td>Cleared MW</td>
<td>449</td>
<td></td>
</tr>
<tr>
<td><strong>Total Offered MW</strong></td>
<td>12,654</td>
<td></td>
</tr>
<tr>
<td><strong>Total Cleared MW</strong></td>
<td>10,631</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.*
### Washington, D.C. – Cleared Resources in 2022/23 Auction

(June 2, 2021)

<table>
<thead>
<tr>
<th></th>
<th>Cleared MW (Unforced Capacity)</th>
<th>Change from 2021/22 Auction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generation</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Demand Response</strong></td>
<td>104</td>
<td>0</td>
</tr>
<tr>
<td><strong>Energy Efficiency</strong></td>
<td>85</td>
<td>+54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>189</td>
<td>+54</td>
</tr>
</tbody>
</table>

**MAAC Locational Clearing Price**

$95.79

**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.
<table>
<thead>
<tr>
<th>Unforced Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generation</strong></td>
</tr>
<tr>
<td>Offered MW</td>
</tr>
<tr>
<td>Cleared MW</td>
</tr>
<tr>
<td><strong>Demand Response</strong></td>
</tr>
<tr>
<td>Offered MW</td>
</tr>
<tr>
<td>Cleared MW</td>
</tr>
<tr>
<td><strong>Energy Efficiency</strong></td>
</tr>
<tr>
<td>Offered MW</td>
</tr>
<tr>
<td>Cleared MW</td>
</tr>
<tr>
<td><strong>Total Offered MW</strong></td>
</tr>
<tr>
<td><strong>Total Cleared MW</strong></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.
Markets
Market Analysis
Maryland – Average Daily LMP

LMP ($/MWh)

- PJM Average RT Daily LMP
- Maryland Average RT Daily LMP
Maryland’s average hourly LMPs were higher than the PJM average hourly LMP.
Maryland – Net Energy Import/Export Trend

Positive values represent exports and negative values represent imports.
Washington, D.C.’s average hourly LMPs were higher than the PJM average hourly LMP.
Washington, D.C. – Net Energy Import/Export Trend

Positive values represent exports and negative values represent imports.
Operations
The data in this chart comes from EIA Form 923 (2021).
2005 – 2021 PJM Average Emissions

Carbon Dioxide
Nitrogen Oxides
Sulfur Dioxide
Maryland – Average Emissions (lbs/MWh)

(Feb. 2022)

- **CO₂** (lbs/MWh)
- **SO₂ and NOₓ** (lbs/MWh)

**CO₂** values:
- 2005: 1,400 lbs/MWh
- 2006: 1,300 lbs/MWh
- 2007: 1,300 lbs/MWh
- 2008: 1,300 lbs/MWh
- 2009: 1,200 lbs/MWh
- 2010: 1,200 lbs/MWh
- 2011: 1,100 lbs/MWh
- 2012: 1,100 lbs/MWh
- 2013: 1,000 lbs/MWh
- 2014: 900 lbs/MWh
- 2015: 800 lbs/MWh
- 2016: 700 lbs/MWh
- 2017: 600 lbs/MWh
- 2018: 500 lbs/MWh
- 2019: 400 lbs/MWh
- 2020: 300 lbs/MWh
- 2021: 200 lbs/MWh

**SO₂ and NOₓ** values:
- 2005: 16 lbs/MWh
- 2006: 14 lbs/MWh
- 2007: 12 lbs/MWh
- 2008: 10 lbs/MWh
- 2009: 8 lbs/MWh
- 2010: 6 lbs/MWh
- 2011: 4 lbs/MWh
- 2012: 2 lbs/MWh
- 2013: 1 lbs/MWh
- 2014: 0.5 lbs/MWh
- 2015: 0.25 lbs/MWh
- 2016: 0.1 lbs/MWh
- 2017: 0.05 lbs/MWh
- 2018: 0.02 lbs/MWh
- 2019: 0.01 lbs/MWh
- 2020: 0.005 lbs/MWh
- 2021: 0.002 lbs/MWh