ZERO EMISSION GRID

PJM Transition Cluster -1 Analysis

May 2024

PJM transition Cluster -1 Analysis

Overview

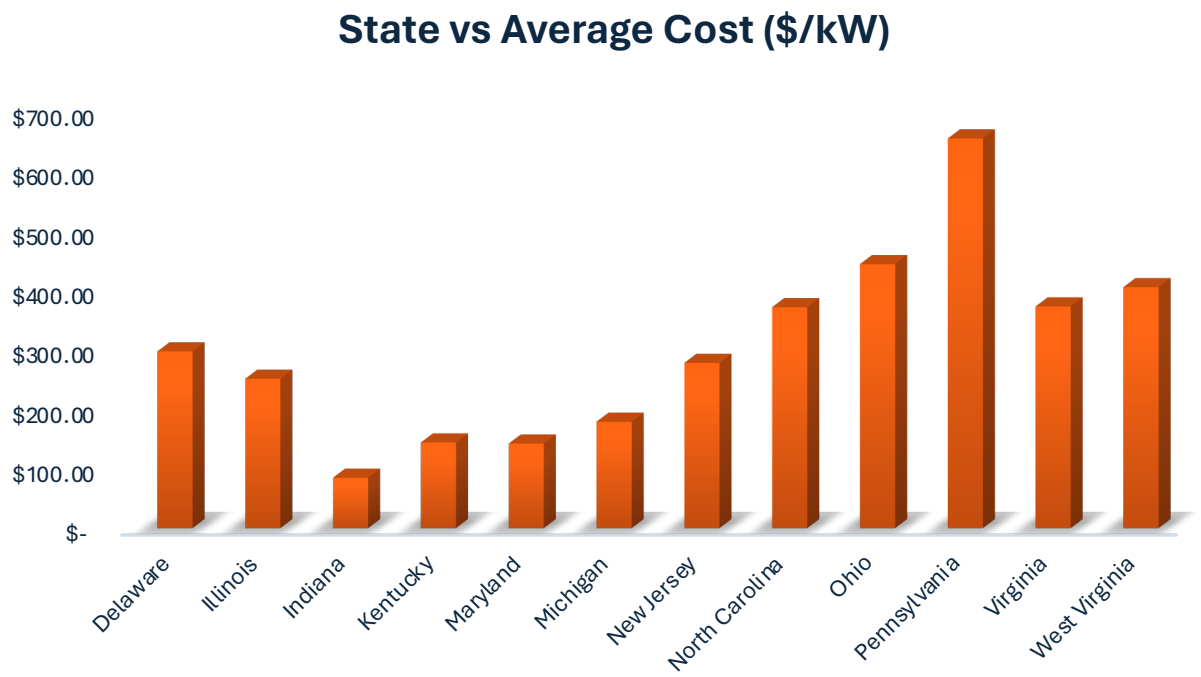
- 734 projects in the AE1 through AG1 queues did not receive an Interconnection Service Agreement or Wholesale Market Participation Agreement as of the Transition Start Date of July 10, 2023. Per PJM Tariff Part VII, Subpart B, section 303, these projects were eligible to transition to the Reformed Interconnection Process provided they submitted readiness requirements by Friday, September 8th, 2023. PJM confirmed that there were 616 Projects that have satisfactorily submitted all necessary readiness documents.
- Transition Cycle 1: These are projects that posted sufficient readiness requirements, were studied using the PJM load flow process, and did not qualify for the Expedited Process. They will be reprioritized and continue in Transition Cycle 1.
- Originally Expedited Process, shifted to TC1: Projects originally dispositioned as Expedited Process. The results of the refreshed Expedited Process analysis reveal that the project is no longer eligible for the Expedited Process and will shift to Transition Cycle 1. These projects will become part of the TC1 model at Phase 2 and receive a Phase 2 System Impact Study along with the other projects in Transition Cycle 1.
- PJM published the completion of Phase I System Impact Studies (SIS) for 306 Transition Cycle 1, generation queue projects as part of Transition Cycle #1 of PJM's new interconnection process.
- Developers now have 30 days to decide whether to proceed with their new service requests into the next study phase of Transition Cycle #1, which will begin June 20. Since PJM has moved it new reform process, PJM will parallelly kick off the transition cycle 2 projects. The phase-1 projects are now expected to complete the phase -2 studies and prepare the readiness for construction.
- Out of 734 projects, 428 projects have posted sufficient readiness requirement, were studied using PJM load flow models and have been determined to qualify for the Expedited Process.

Reference: PJM Planning Service Requests

PJM transition Cluster -1 Analysis

Key Observations:

- Pennsylvania interconnection queue projects face the highest average upgrade cost at $653/kW, followed by Ohio at $442/kW and West Virginia at $404/kW.
- Virginia received almost 14 GW of queue requests, followed closely by Illinois with 12 GW.
- Out of all the PJM states, Indiana has the lowest average upgrade cost at $84/kW, followed by Kentucky and Maryland.

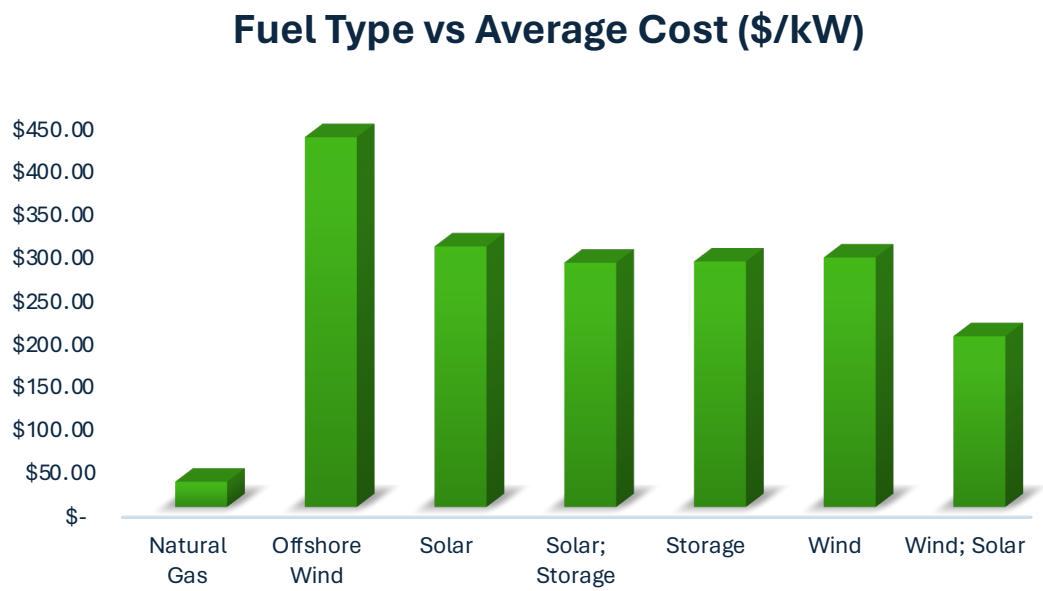


State	MW	Transmission Owner Interconnection Facilities (TOIF)	Physical Interconnection Network Upgrades	System Reliability Network Upgrades	Affected System Study Reinforcements	Total Cost ($ Million)	Average Cost ($/kW)
Delaware	1184.3	$ 2.80	$ 29.25	$ 319.12	$0.00	$ 351.17	$ 296.52
Illinois	12776.42	$ 53.45	$ 845.57	$ 2,303.03	$0.00	$ 3,202.06	$ 250.62
Indiana	7881	$ 42.07	$ 174.89	$ 448.95	$0.00	$ 665.91	$ 84.50
Kentucky	2531	$ 23.72	$ 178.22	$ 161.54	$0.00	$ 363.48	$ 143.61
Maryland	667.5	$ 0.70	$ 16.75	$ 77.16	$0.00	$ 94.61	$ 141.74
Michigan	627.2	$ 6.37	$ 3.56	$ 102.03	$0.00	$ 111.96	$ 178.50
New Jersey	357.7	$ 2.40	$ 4.40	$ 92.36	$0.00	$ 99.16	$ 277.21
North Carolina	1603	$ 5.30	$ 43.50	$ 545.44	$0.00	$ 594.24	$ 370.70
Ohio	1353	$ 5.75	$ 61.87	$ 531.65	$0.00	$ 599.27	$ 442.92
Pennsylvania	2576.6	$ 35.31	$ 206.97	$ 1,442.42	$0.00	$ 1,684.70	$ 653.85
Virginia	14195.6	$ 74.79	$ 1,349.77	$ 3,855.14	$0.00	$ 5,279.70	$ 371.93
West Virginia	275	$ 3.99	$ 1.21	$ 105.99	$0.00	$ 111.19	$ 404.33

PJM transition Cluster -1 Analysis

Key Observations:

- Off-shore wind projects pose the highest interconnection cost at $428/kW, followed by solar projects at $300/kW.
- Natural gas projects have the least interconnection cost at $29/kW.
- Overall, solar projects studied in TC1 sum to 19.8 GW, followed by storage projects which total 6.4 GW.



Fuel	MW	Transmission Owner Interconnection Facilities (TOIF)	Physical Interconnection Network Upgrades	System Reliability Network Upgrades	Affected System Study Reinforcements	Total Cost ($ Million)	Average Cost ($/kW)
Natural Gas	704	$ 5.61	$ 2.60	$ 12.34	$0.00	$ 20.55	$ 29.19
Offshore Wind	5120	$ 17.60	$ 800.90	$ 1,373.73	$0.00	$ 2,192.23	$ 428.17
Solar	19812	$ 102.29	$ 1,142.50	$ 4,731.91	$0.00	$ 5,976.70	$ 301.67
Solar; Storage	6129	$ 59.74	$ 245.77	$ 1,427.82	$0.00	$ 1,733.33	$ 282.81
Storage	6426	$ 46.22	$ 419.05	$ 1,361.23	$0.00	$ 1,826.49	$ 284.23
Wind	3535	$ 17.41	$ 270.71	$ 732.77	$0.00	$ 1,020.89	$ 288.79
Wind; Solar	199	$ 1.10	$ 19.00	$ 19.25	$0.00	$ 39.35	$ 197.75

PJM transition Cluster -1 Analysis

Key Observations:

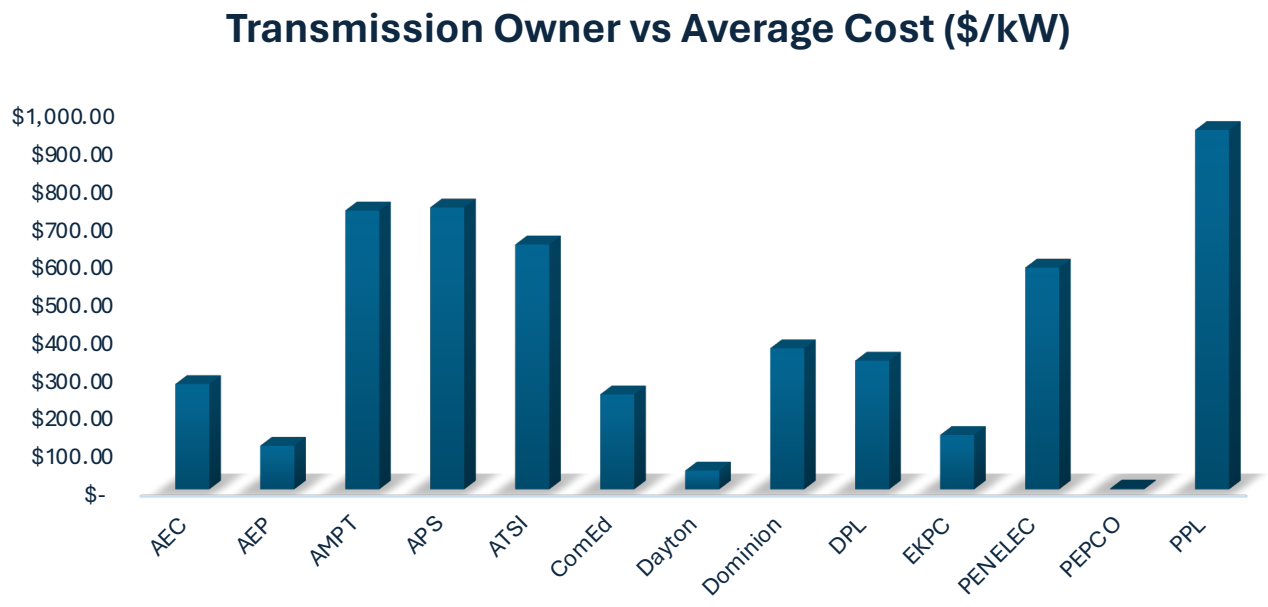
In the latest interconnection TC1 queue studies:

- Dominion had the highest volume of projects, with 15.8 GW studied.
- ComED followed closely, with 12.7 GW of projects.

Network upgrade costs vary significantly across different utilities:

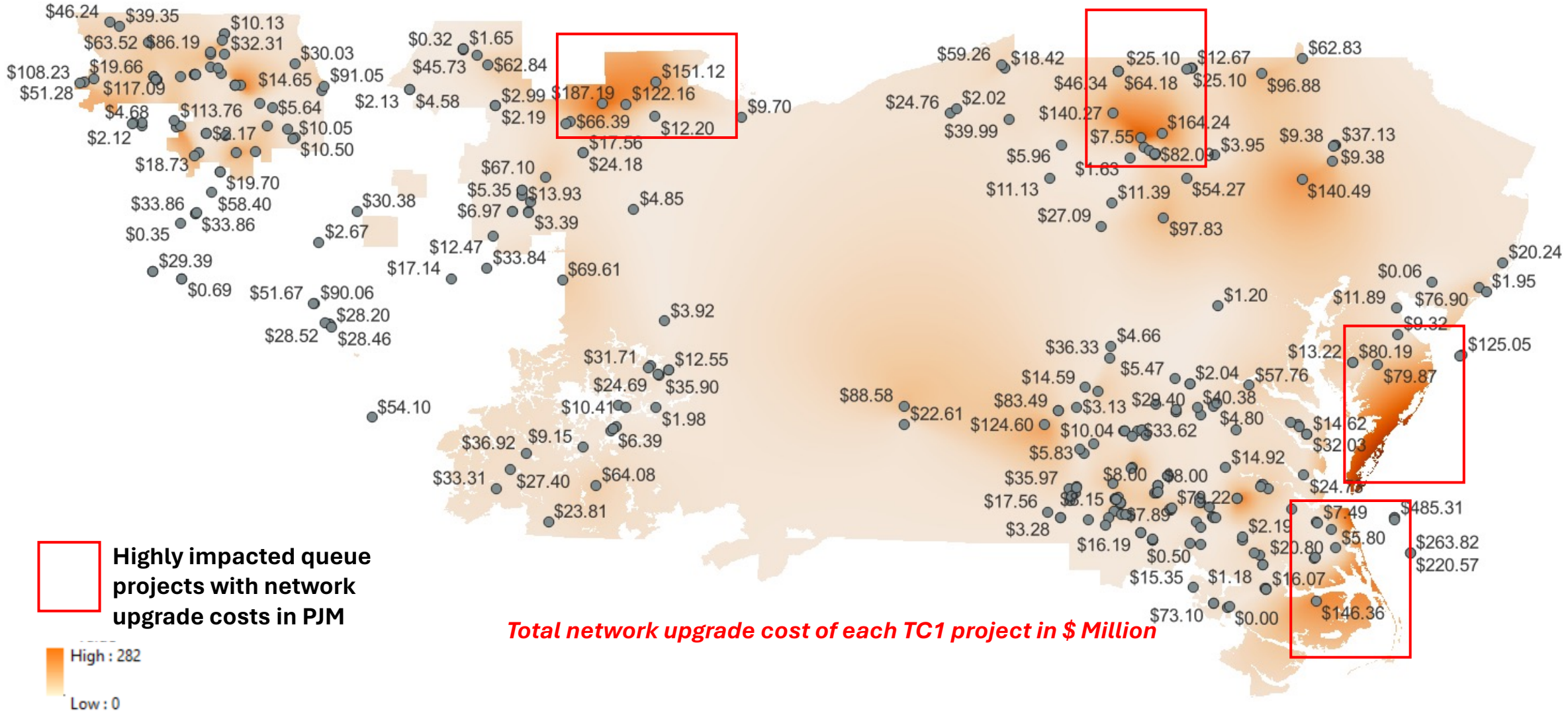
- PPL has the highest network upgrade cost at $948/kW.
- APS is next, with a cost of $744/kW.
- PEPCO has the lowest network upgrade cost at $2/kW.
- Dayton follows, with a cost of $49/kW.

These disparities in network upgrade costs are critical for developers to consider. High upgrade costs in regions like PPL and APS might deter some projects or require additional financial planning and risk assessment. Conversely, lower costs in regions like PEPCO and Dayton could make those areas more attractive for new projects, potentially accelerating development timelines and improving financial feasibility.



Transmission Owner	MW	Transmission Owner Interconnection Facilities (TOIF)	Physical Interconnection Network Upgrades	System Reliability Network Upgrades	Affected System Study Reinforcements	Total Cost ($ Million)	Average Cost ($/kW)
AEC	357	$ 2.40	$ 4.40	$ 92.36	$0.00	$ 99.16	$ 277.75
AEP	9670	$ 65.77	$ 255.91	$ 791.68	$0.00	$ 1,113.36	$ 115.14
AMPT	166	$ -	$ -	$ 122.16	$0.00	$ 122.16	$ 735.91
APS	546	$ 0.30	$ 16.90	$ 389.08	$0.00	$ 406.28	$ 744.11
ATSI	599	$ 0.34	$ 38.18	$ 348.47	$0.00	$ 386.99	$ 646.06
ComEd	12776	$ 53.45	$ 845.57	$ 2,303.03	$0.00	$ 3,202.06	$ 250.63
Dayton	98	$ 0.25	$ 4.60	$ -	$0.00	$ 4.85	$ 49.49
Dominion	15481	$ 72.03	$ 1,353.20	$ 4,336.45	$0.00	$ 5,761.69	$ 372.18
DPL	1309	$ 3.50	$ 44.80	$ 396.28	$0.00	$ 444.58	$ 339.63
EKPC	2531	$ 23.72	$ 178.22	$ 161.54	$0.00	$ 363.48	$ 143.61
PENELEC	1645	$ 5.32	$ 156.01	$ 801.23	$0.00	$ 962.56	$ 585.14
PEPCO	542.5	$ -	$ 1.20	$ -	$0.00	$ 1.20	$ 2.21
PPL	304.8	$ 29.56	$ 16.97	$ 242.55	$0.00	$ 289.08	$ 948.44

Heatmap of PJM transition cluster-1 costs



Highly impacted queue projects with network upgrade costs in PJM

Total network upgrade cost of each TC1 project in $ Million

Next Steps

- Understanding and tracking these network upgrades are more important. As these more expensive projects are dropped off, the overall network upgrade costs may decrease for the projects that continue. This shift can lead to more favorable economic conditions for the remaining projects, as the aggregate cost burden is redistributed and potentially reduced. Understanding these dynamics can help developers better forecast expenses, adjust their strategies, and prioritize projects with more stable and lower upgrade costs.
- By analyzing market trends, regulatory impacts, and technological advancements, Zero Emission Grid provides developers with the information needed to make informed decisions, optimize project costs, and maintain competitiveness in a dynamic market. This support can help developers mitigate risks and capitalize on opportunities in the evolving landscape of interconnection queue cycle.
- Developers now have a timeframe until June 20th to decide on the phase 2 of the studies. This period is crucial for assessing the feasibility of continuing with their projects, especially considering the potential cost dynamics and network upgrade expenses. During this time, developers evaluate the insights provided by Zero Emission Grid, analyze the economic and technical aspects of their projects, and make informed decisions about proceeding to the next phase. Strategic planning and thorough analysis within this timeframe will be essential to optimize project outcomes and manage financial risks effectively.