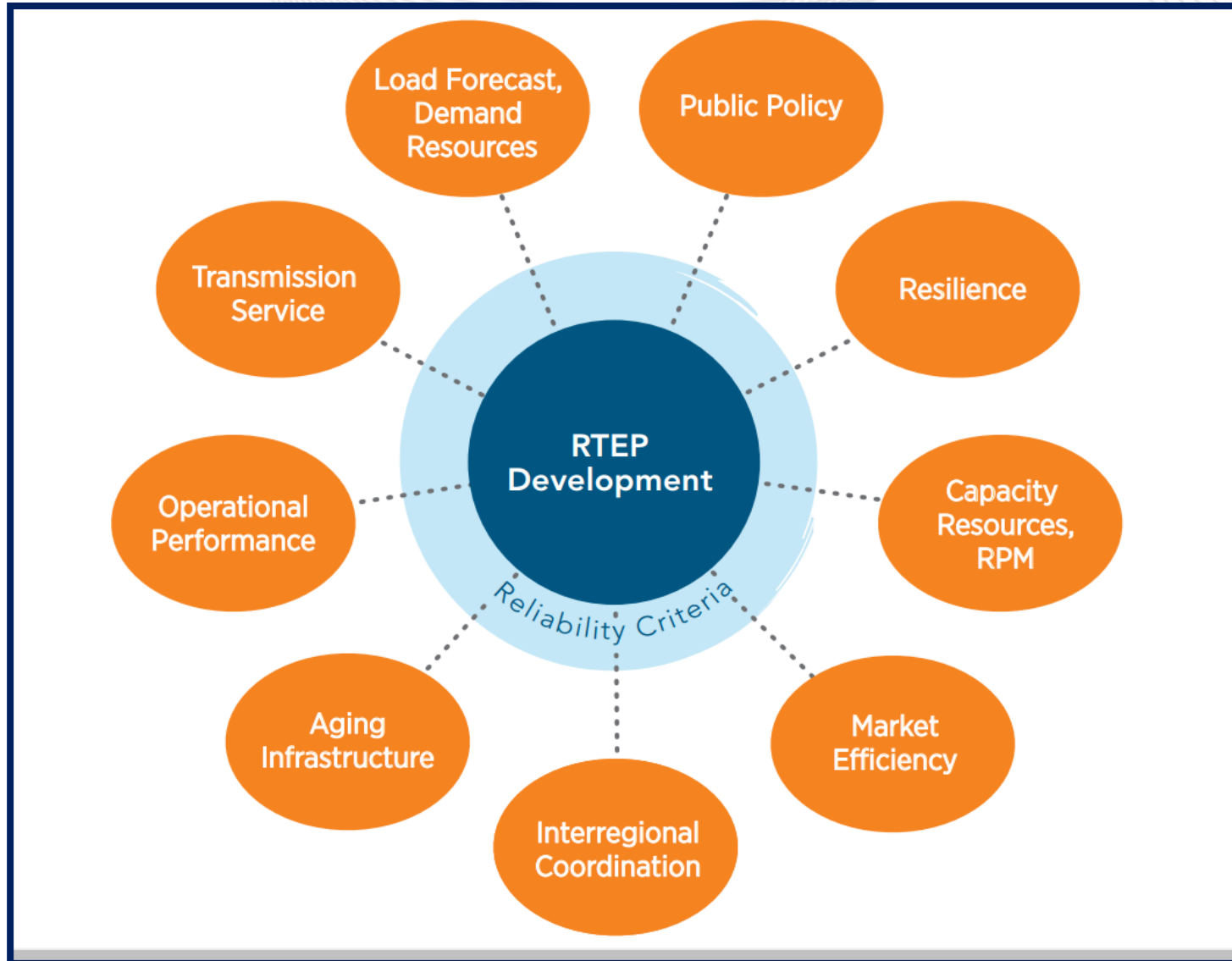




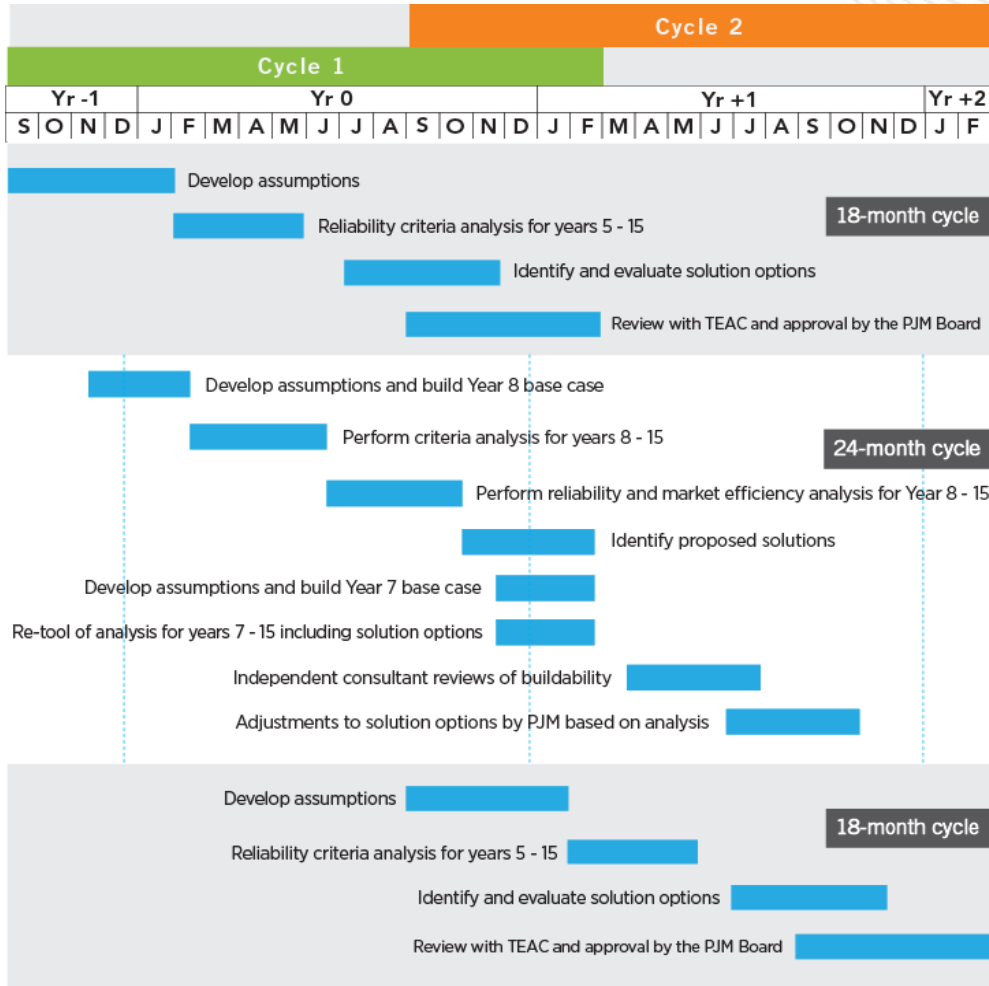
PJM Regional Transmission Expansion Planning (RTEP) Process

Nebiat Tesfa, Transmission Planning
IPSAC May 23, 2023

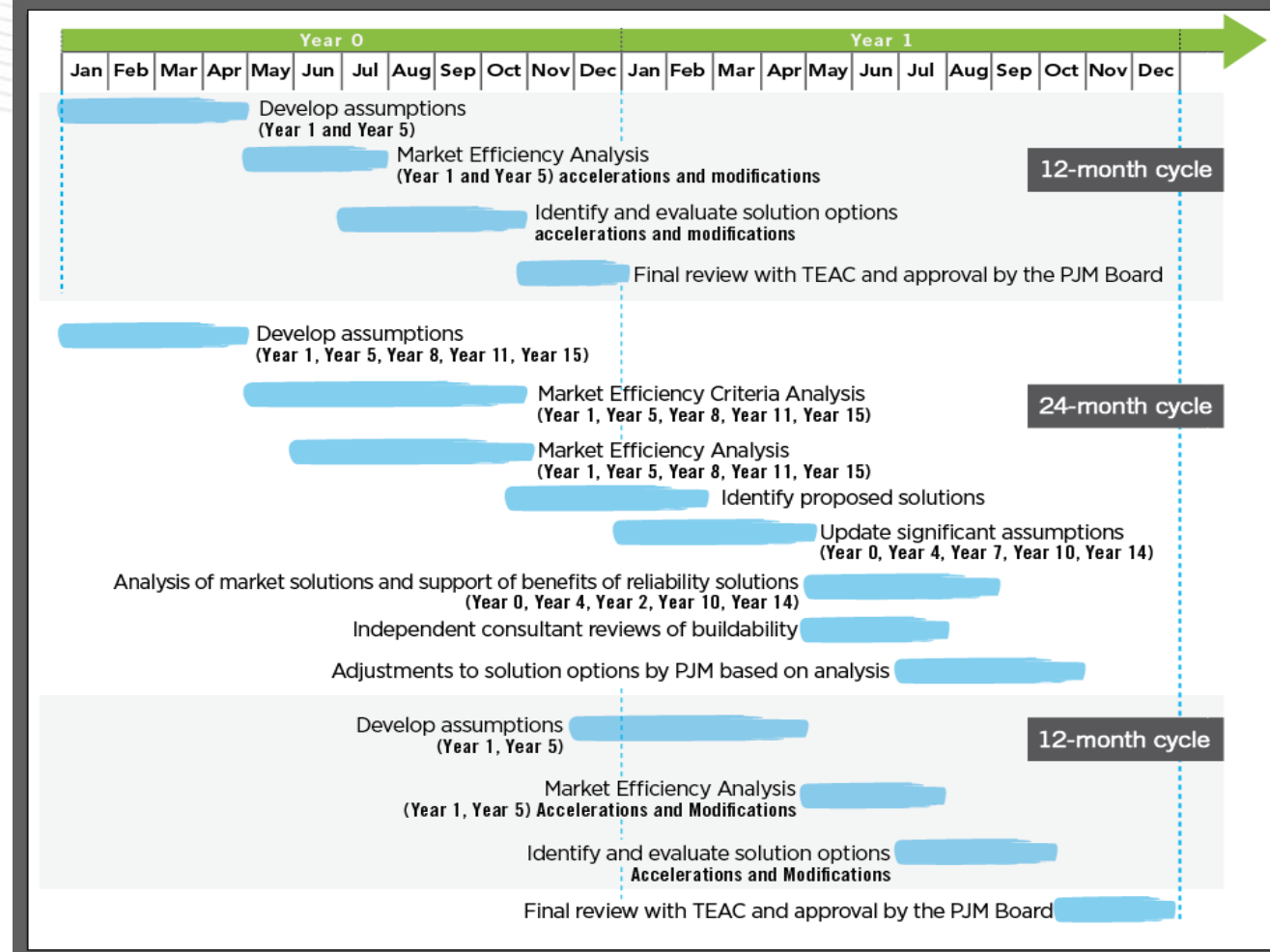
- Planning Committee (PC)
 - <http://www.pjm.com/committees-and-groups/committees/pc.aspx>
- Transmission Expansion Advisory Committee (TEAC)
 - <http://www.pjm.com/committees-and-groups/committees/teac.aspx>
- Interregional Planning
 - <http://www.pjm.com/planning/interregional-planning.aspx>
- Services and Requests
 - <http://www.pjm.com/planning/services-requests.aspx>
- RTEP Development
 - <http://www.pjm.com/planning/rtep-development.aspx>
- Manual 14B
 - <http://www.pjm.com/-/media/documents/manuals/m14b.ashx>



PJM's 2-year Reliability



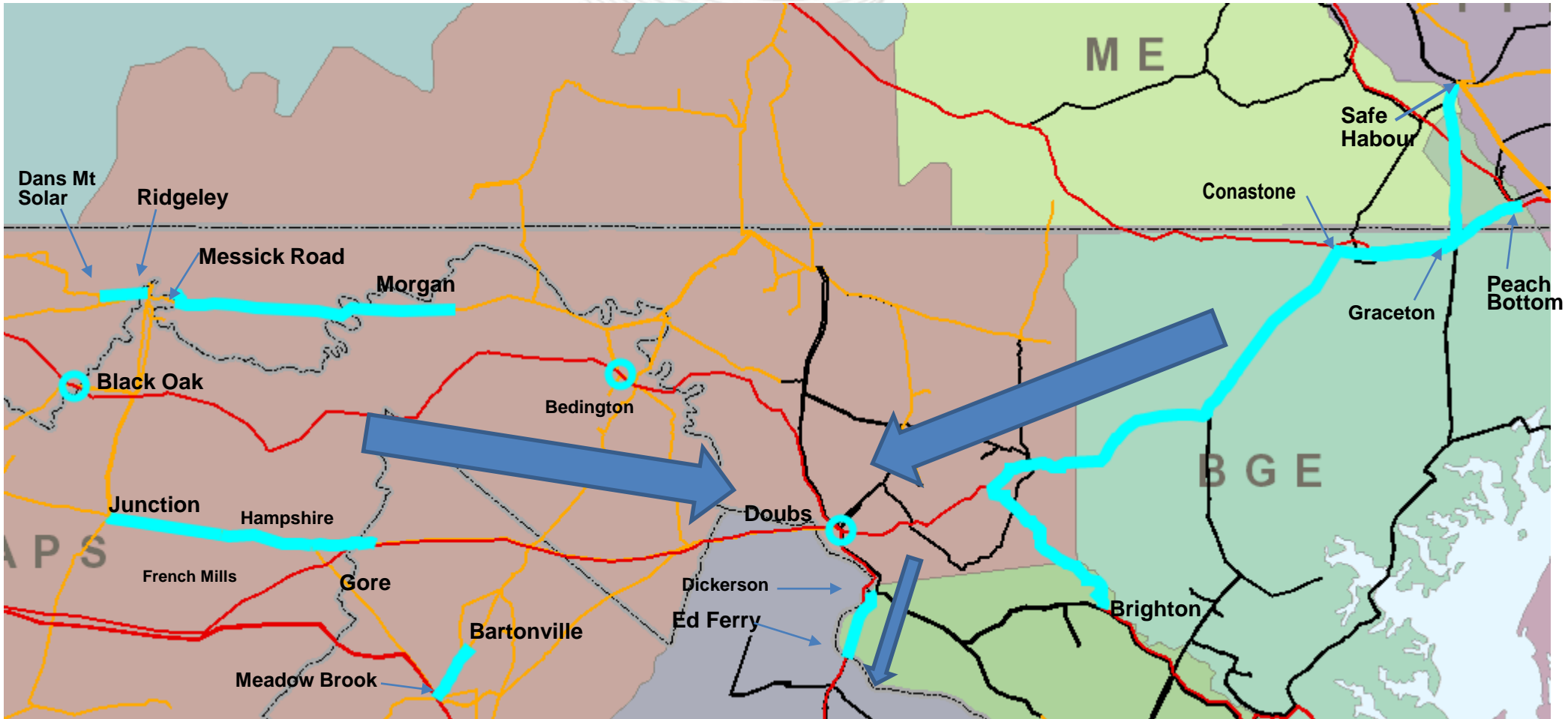
PJM's 2-year Market Efficiency



2023 RTEP Assumptions and Updates

2022 Reliability RTEP Window 3 Update

- The Data Center Load Growth rate (currently concentrating in areas of Northern Virginia) continues to increase.
- FirstEnergy's APS zone (just north of Virginia) is also experiencing Data Center load development.
- This concentrated load growth is driving high flows:
 - Within the Northern Virginia Dominion Transmission System
 - Into the Data Center concentrated load pocket (Regional Flows) from
 - West and East towards Doubs-Goose Creek
 - South into and out of Bristers towards Loudon
- Major voltage support needs within Dominion and APS will be required.
 - Some of the voltage violations are observed under N-0 conditions (fictitious VARs required to solve the case).
 - Heavy Regional transfers will require reinforcement to support the regional transfers.



Address identified transmission system constraints upto and including 2028 (~7.5 GWs of load increase based on 2023 PJM Forecast):

1. Within the Data Center Loads serving areas in Northern Virginia and APS/Doubs
2. Regional bulk transmission reinforcements to enable needed power transfers.

Develop/Assess sub-group enhancements for the interim 5.5 GW load increase level:

- Assess if there is a subset of enhancements that needs to be prioritized to ensure meeting the reliability requirements for the first 5.5GW load growth.

Goal: Ensure a robust set of transmission enhancement proposals are selected to address the forecasted load growth in the area.

- Constructability, economics, flexibility and other relevant factors will be considered.

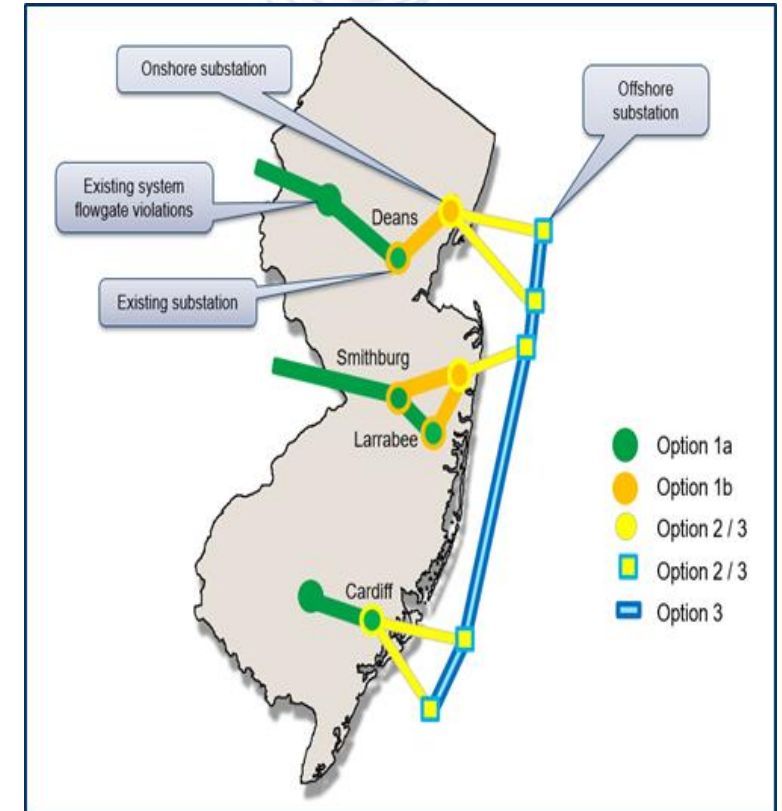
- Window Opened; February 24th 2023
 - PJM posted preliminary planning basecases on January 31st 2023
 - 60 Day Window – Closing April 25th 2023
 - PJM extended the window closing to May 31st 2023
- Purpose:
 - Address reliability needs in the Dominion and APS zones primarily associated with Data Center Load forecasts (up to 7,500 MWs by 2027-28)
 - Seeking robust and flexible solutions to address the reliability needs in those specific areas

- PJM annually presents the assumptions at the beginning of each year. See the link below for details of the presentation.
- <https://www.pjm.com/-/media/committees-groups/committees/teac/2023/20230110/item-07---2023-rtep-assumption.ashx>

- As part of the 24-month RTEP cycle, a year 7 (2030) base case will be developed and evaluated as needed as part of the 2023 RTEP
- The year 7 case will be based on the 2028 Summer case that will be developed as part of this year's 2023 RTEP
- Purpose: To identify and develop longer lead time transmission upgrades

- Similar to the 2022 RTEP and per the PJM Operating Agreement, a proposal window will be conducted for all reliability needs that are not Immediate Need reliability upgrades or are otherwise ineligible to go through the window process.
- FERC 1000 implementation will be similar to the 2022 RTEP.
 - Advance notice and posting of potential violations
 - Advance notice of window openings
 - Window administration

- The total 6,400 MW offshore wind injection will be modeled similar to how Capacity Interconnection Rights are maintained for retired generator.
 - Capacity staging will be taken into account in 5 and 8 year cases
- The required upgrades/transmission overlay identified through the NJ SAA window will be modeled.
 - Transmission staging will be taken into account in 5 and 8 year cases



For more detail information on NJOSW, see links below:

<https://www.pjm.com/-/media/committees-groups/committees/teac/2022/20221104-special/nj-osw-saa-summary-report.ashx>

<https://www.pjm.com/-/media/committees-groups/committees/teac/2022/20221104-special/item-01---nj-osw-saa.ashx>

- Data Center Load:
 - Based on the 2023 load forecast ~7.5 GWs of load increase due to Data Center in Dominion and APS mainly around Northern Virginia
- Major Deactivation since the 2022 RTEP studies:
 - Brandon Shore 1 and 2 → ~1300MW
 - Homer City 1,2 and 3 → ~1900MW
 - Yorktown 3 → ~767 MW
 - Joliet 6,7 and 8 → ~1381 MW

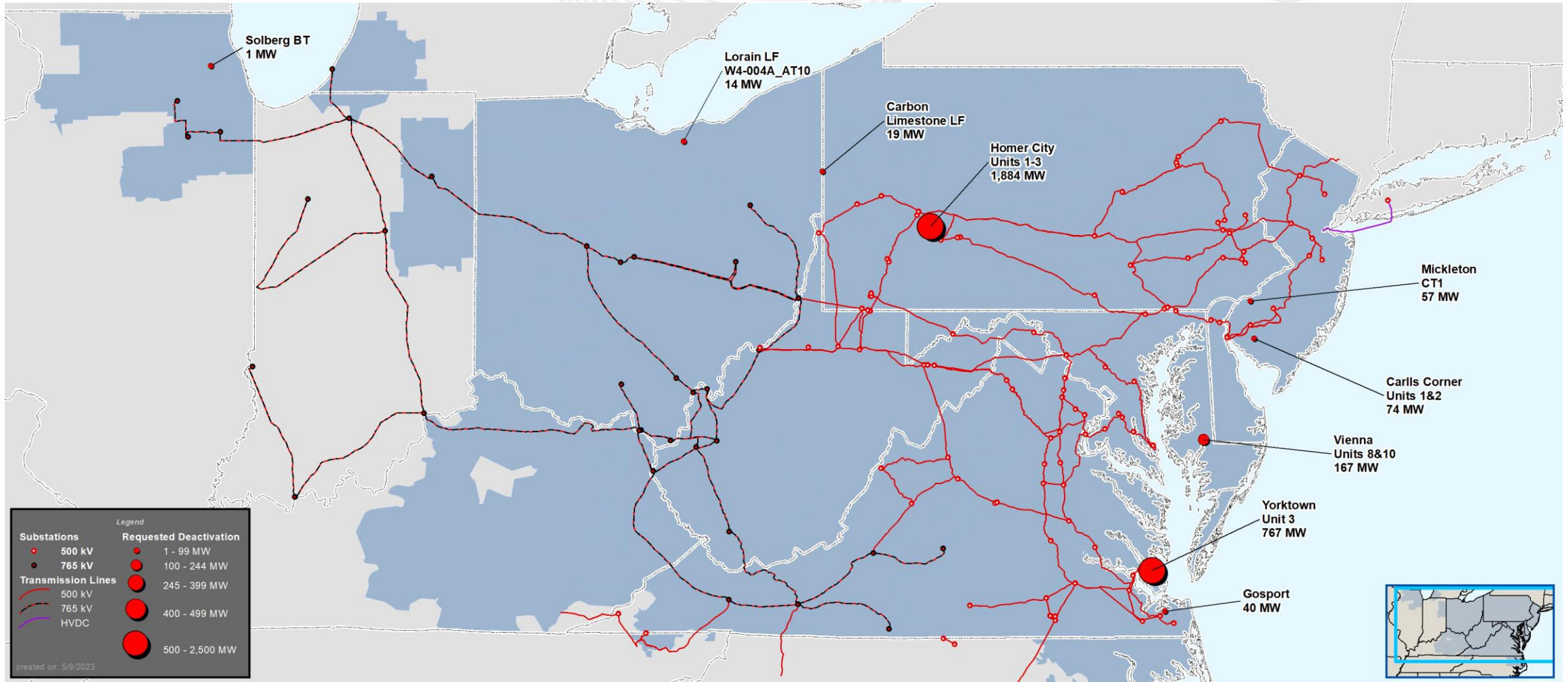
- As part of the 2023 RTEP, PJM is applying the new generator deliverability procedures and associated base case dispatch procedures that are endorsed at the PC and MRC starting with the 2023 RTEP Competitive Window 1 (to be opened in July 2023)
- The new procedure requires PJM to annually post regional assumptions related to the dispatch of wind and solar resources for summer, winter and light load conditions

See the link to the PC presentation: <https://www.pjm.com/-/media/committees-groups/committees/pc/2023/20230110/item-06---generator-deliverability-proposal-summary.ashx>

- Input Requested:
 - Stakeholder suggestions for and input to 2023 alternative sensitivity studies and scenario analysis
- Information Items (Non-RTEP Scenarios Studied by PJM):
 - PJM continue to participate in DOE Atlantic Offshore Wind Transmission study which may provide additional information for 2024 RTEP and beyond

- June/July 2023 (This time line might be impacted by Data Center window scheduled for Q1 2023.)
 - Open competitive proposal window
 - Post modeling assumptions changes and corrections for and begin mid-year retool of 2023 RTEP baseline analysis if required
 - Accounts for major new modeling assumption changes and corrections not previously considered.
 - Basic assumptions such as planning criteria and ratings methodology that changed after February will not be considered until the 2024 RTEP.
- July/August 2023
 - Close competitive proposal window
 - Finalize mid-year retool
- August to December 2023: Evaluate proposals
- October 2023 to February 2024: Approve proposals

Generation Deactivation Notification Update (Between 11/1/2022 and 4/1/2023)



Unit(s)	Fuel Type	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Homer City 1 Unit 1,2 & 3 (1884 MW)	Coal	Penelec	7/1/2023	Reliability analysis underway
Vienna Unit 8 and CT 10 (167 MW)	Oil	DPL	6/1/2025	Reliability analysis underway
Gosport 1 F(40 MW)	Biomass	Dominion	7/1/2024	Reliability analysis complete. No violation identified
Carlls Corner CT1 and CR2 (74 MW)	Natural Gas	ACE	6/1/2024	Reliability analysis complete. No violation identified

Unit(s)	Fuel Type	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Mickleton CT1 (57 MW)	Natural Gas	ACE	6/1/2024	Reliability analysis complete. No violation identified
Yorktown (767 MW)	Oil	Dominion	5/31/2023	Reliability analysis complete; upgrades expected to be completed in future, but interim operating measures identified and unit can deactivate as scheduled

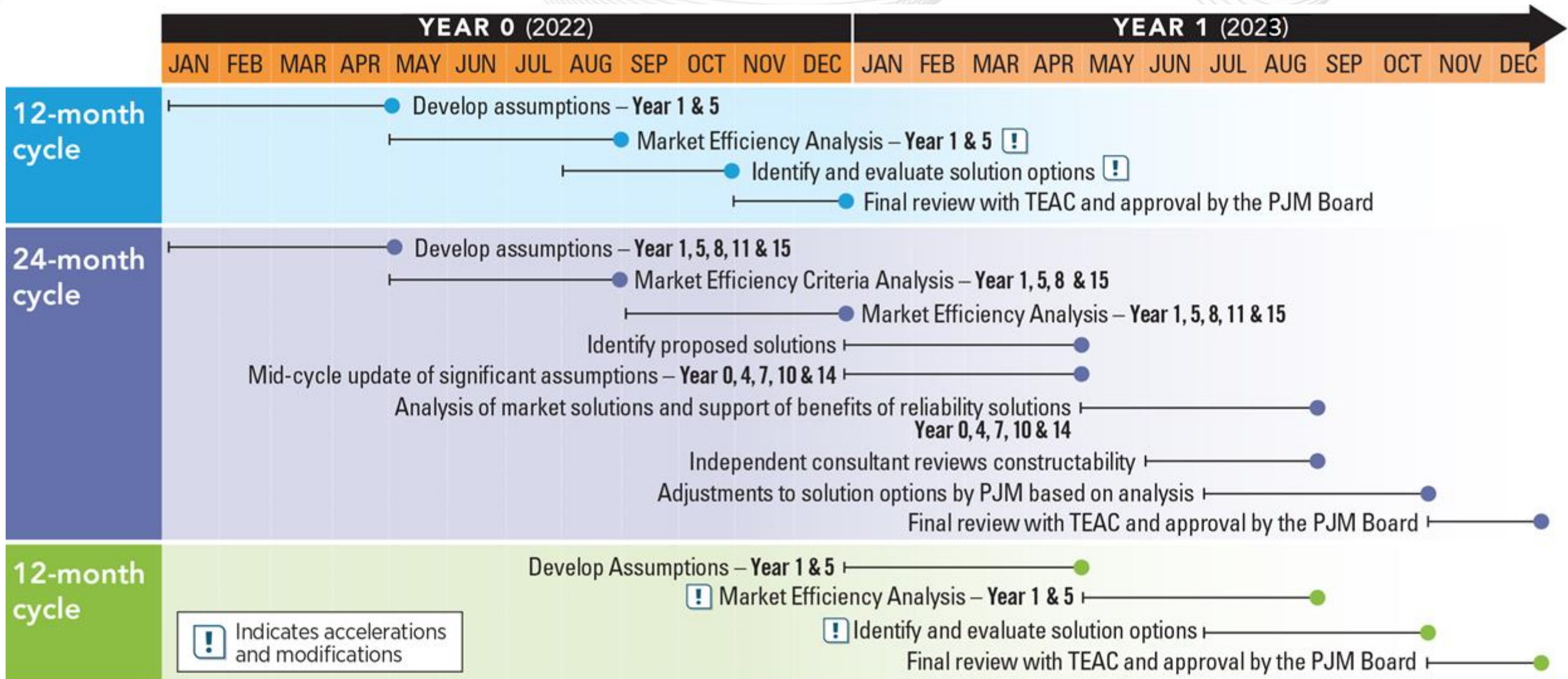
Unit(s)	Fuel Type	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Lorain 1 LF (14 MW)	Methane	ATSI	4/1/2023	Reliability analysis complete. No violation identified
Solberg 1 BT (1 MW)	Battery	ComEd	11/20/2022	Reliability analysis complete. No violation identified
Carbon Limestone LF (19.3 MW)	Methane	ATSI	11/15/2022	Reliability analysis complete. No violation identified



PJM Market Efficiency Update

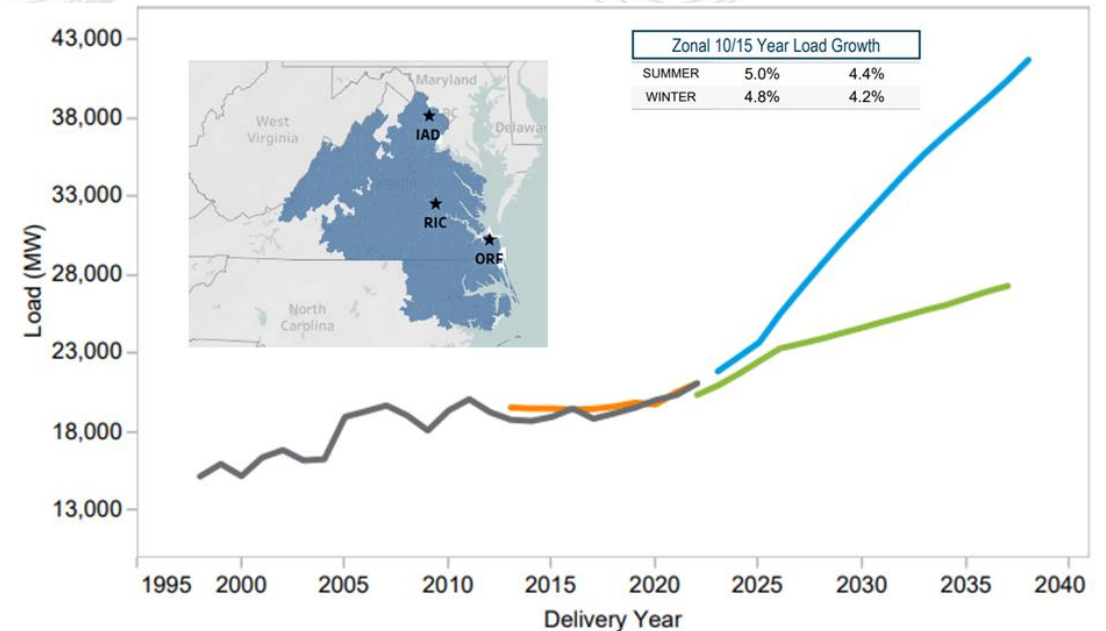
Nick Dumitriu

Principal Engineer, PJM Market Simulation



- PJM Market Efficiency Assumptions
 - Hitachi Energy PROMOD Database (Spring 2022).
 - Load Forecast and Demand Response from PJM 2022 Load Forecast Report.
 - Fuel and Emissions Price forecasts provided by Hitachi Energy (Spring 2022).
- Completed updating the ME Base Case with the reliability upgrades from the 2022 Window 1 and 2022 Multi-Driver Window
 - Congestion impact presented at January 10th TEAC.
 - PROMOD modeling data posted on the PJM ME secure page.
- Currently analyzing the congestion impact of the new PJM load forecast from the 2023 Load Forecast Report that includes the new Dominion data center load forecast.

- Sensitivity scenario uses the 2023 Load Forecast with APS/DOM data center updates.
- RTEP Topology updated to reflect the new data center injections, associated supplemental projects, and new bus level load profile.



<https://pjm.com/-/media/library/reports-notice/load-forecast/2022-load-report.ashx>

- *Due to high data center load forecast, PROMOD SCED engine has difficulty achieving a reasonable dispatch for the 2030 and 2033 simulations, a high number of hours have emergency energy and overloads.*
- *The extreme levels of PROMOD congestion are an indicator of reliability violations and prevent evaluating the congestion drivers.*

- PJM will delay the opening of the 2022/2023 Long-Term Window until the reliability violations for the 2022 Window 3 are addressed.
- PJM will continue to monitor the progress and provide additional details to stakeholders at future TEAC meetings.
- Updates to the Market Efficiency Base Case will be posted as necessary.