



PJM Energy Transition: Resource Retirements, Replacements and Risks

MIC Workshop
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- Introduction & Context
- Analysis Details
 - Supply Exits
 - Supply Entry
 - Demand Expectations
- Findings



A “Living Study”

- Energy Transition in PJM: Frameworks for Analysis
- Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid



Current Phase

- Energy Transition in PJM: Resource Retirements, Replacements and Risks

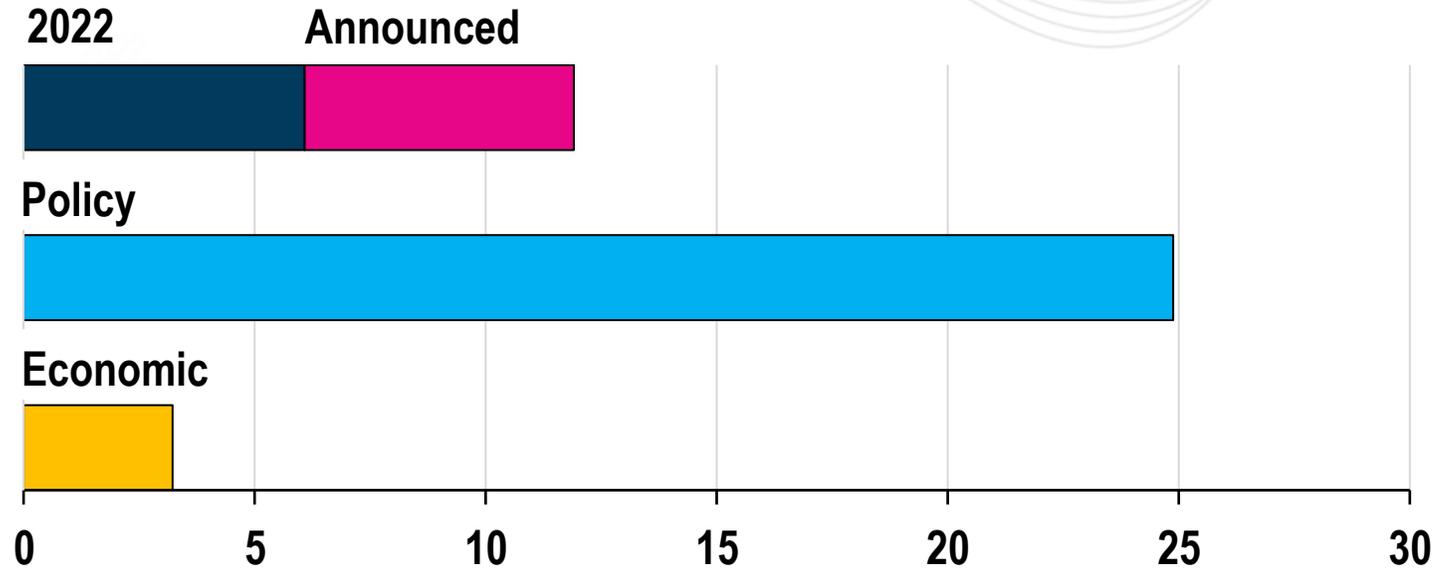


Takeaways

- Intent is to inform and initiate discussions given industry trends

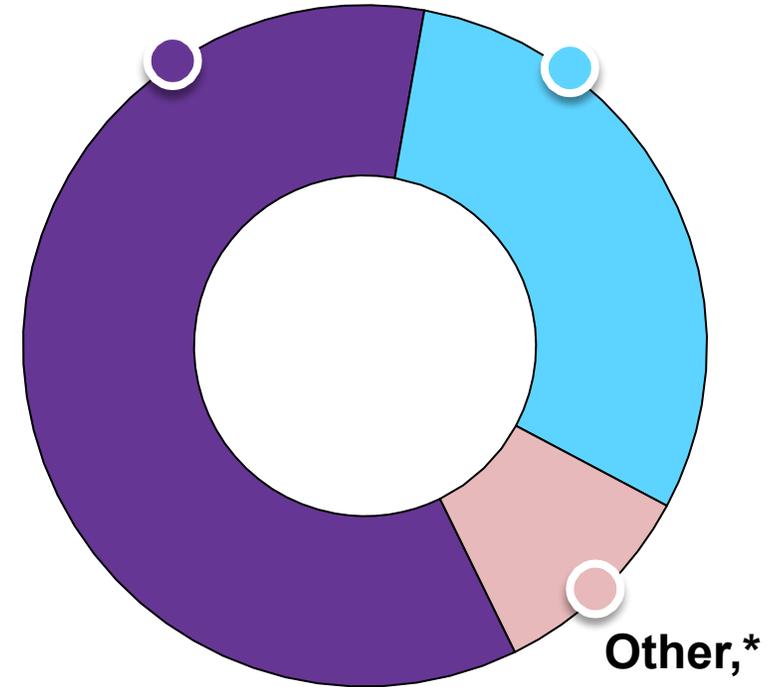
Supply Exits

Total Forecasted Retirement Capacity (GW)



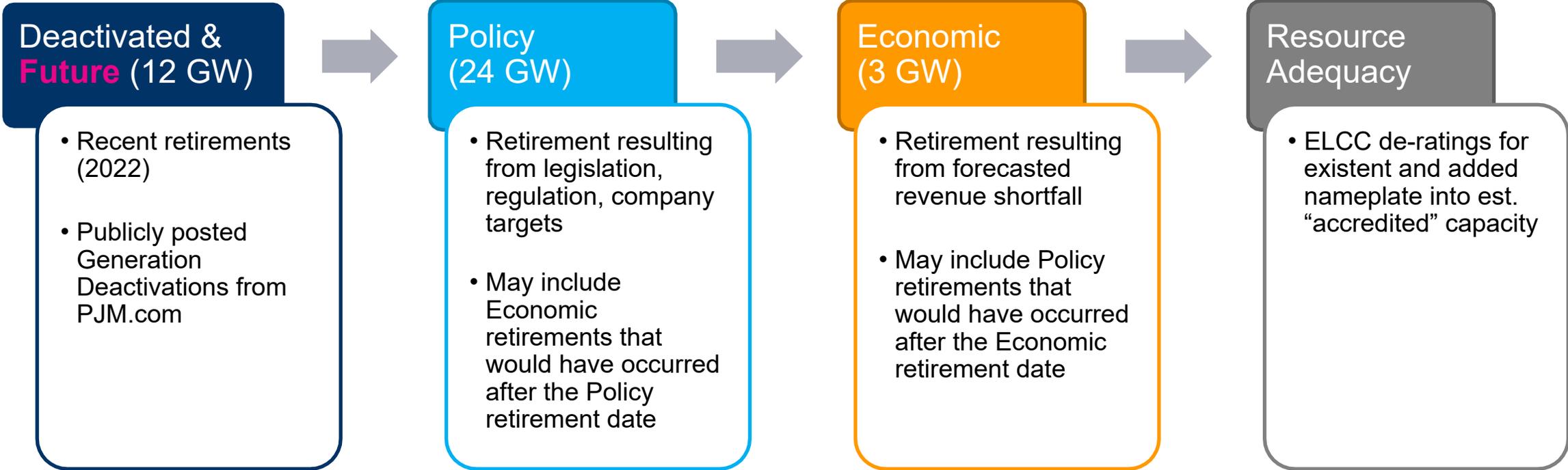
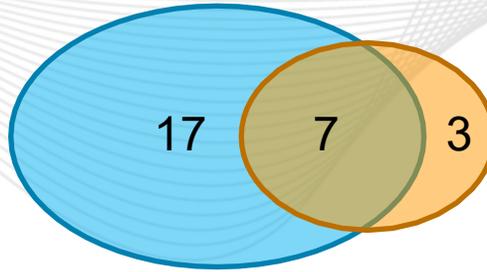
This **40 GW** represents **21% of PJM's current 192 GW** of installed generation

Coal, Natural Gas, Other,*

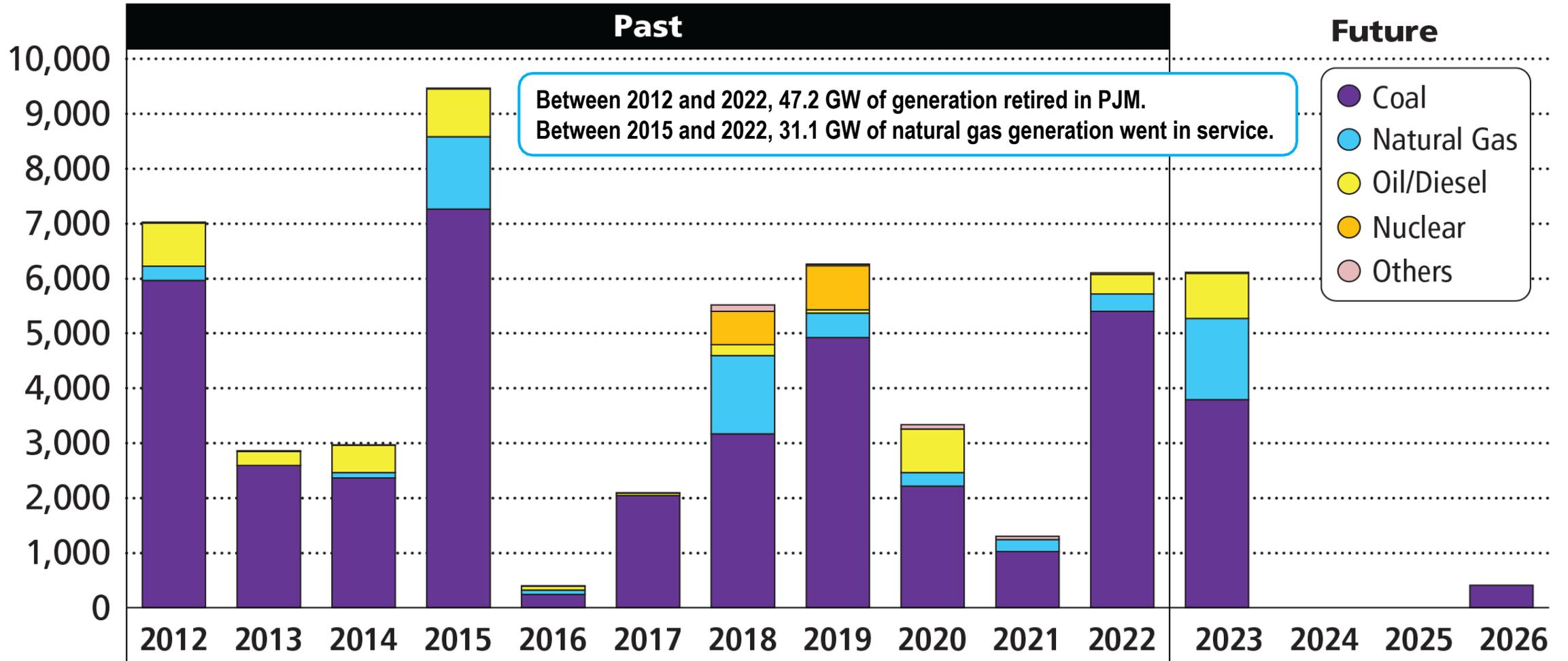


*Other includes diesel, etc.

Forecasted Generation Retirement Workflow



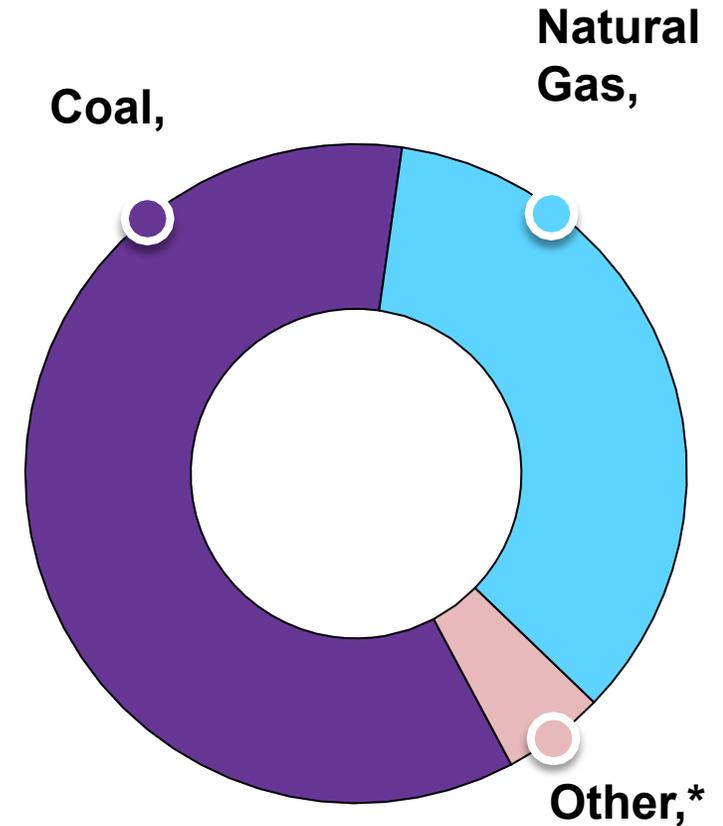
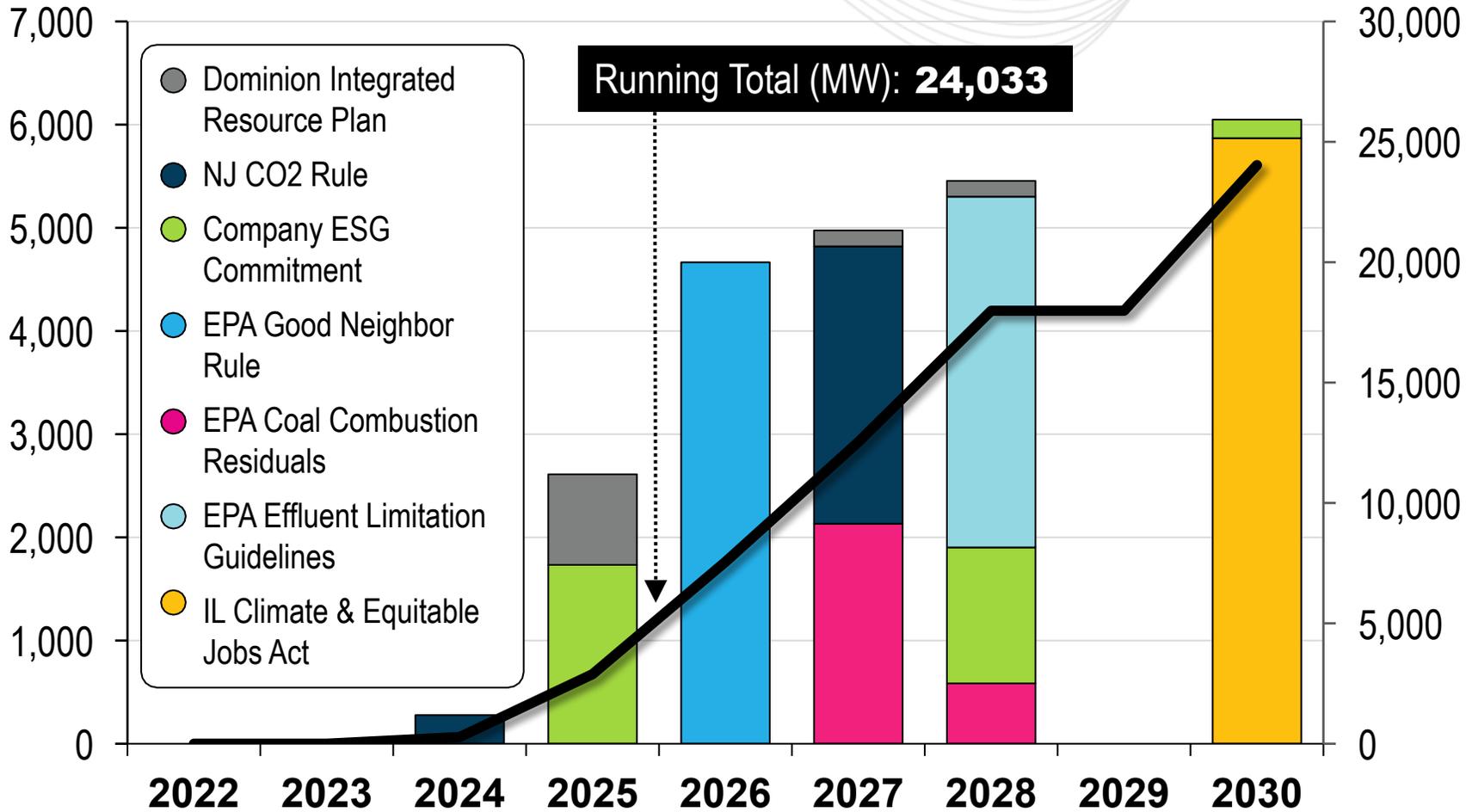
Capacity (MW ICAP)



Forecasted Policy Retirements (2022–2030)

Annual Policy Retirement Capacity (MW)

Total Policy Retirement Capacity (MW)

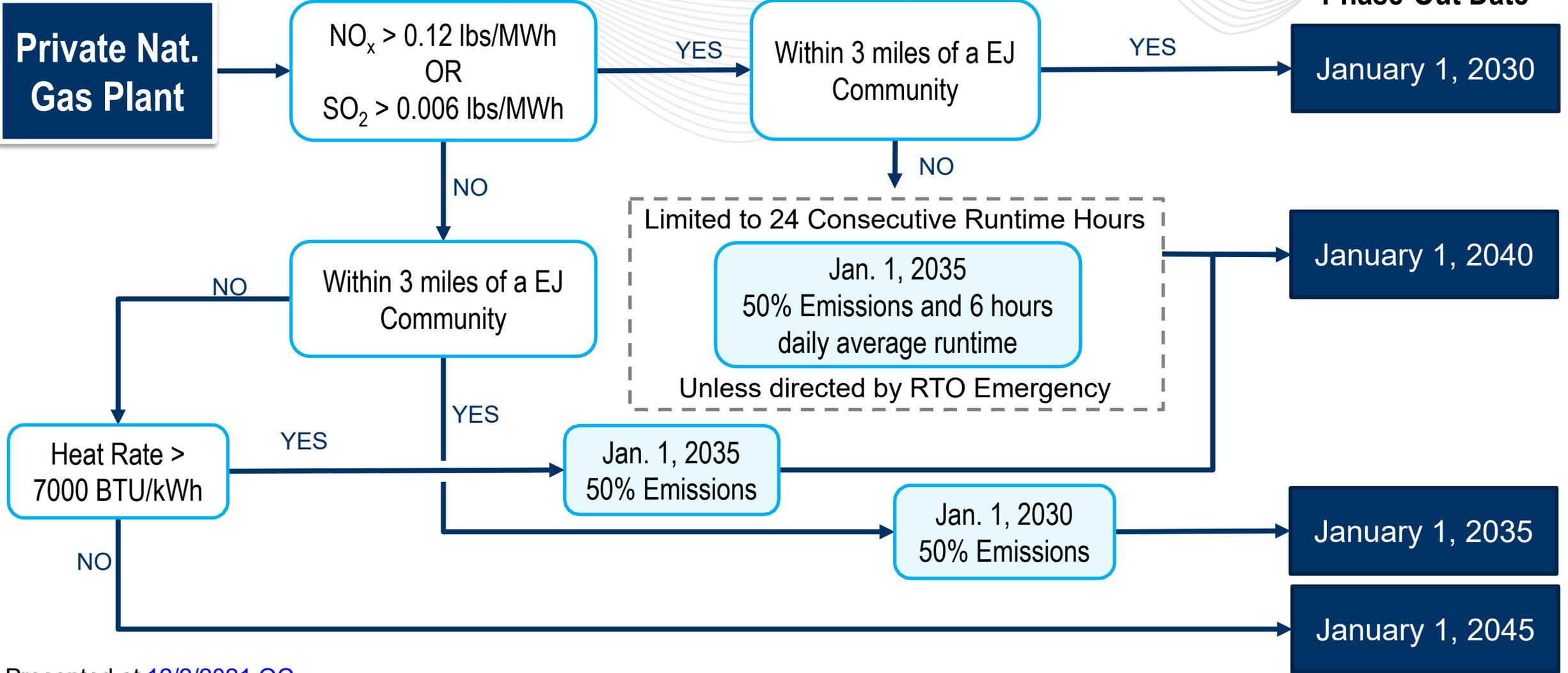


*Other includes diesel, etc.



Illinois Climate and Equitable Jobs Act

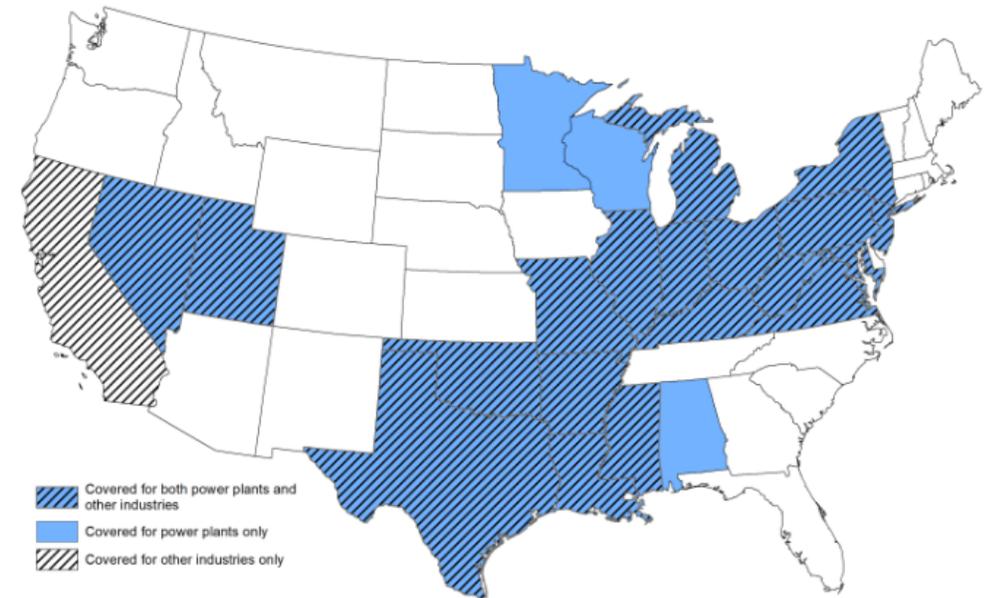
Phase-Out Date



Presented at [12/2/2021 OC](#)

- Published compliance dates and CO2 emission rate limits
 - June 1, 2024 – 1,700 lbs/MWh
 - June 1, 2027 – 1,300 lbs/MWh
 - June 1, 2035 – 1,000 lbs/MWh
- EPA emissions and energy output data for the most recent year
 - <https://campd.epa.gov/>
- Supplemented with EIA energy output data where necessary
 - <https://www.eia.gov/electricity/data/eia923/>

- Finalized March 15, 2023
- Timeframe of estimated retirements moved from 2026 to 2030
- Retirements based on need to install Selective Catalytic Reduction
 - Used EPA Clean Air Markets Program Data
- EPA estimated @ 2 GW retirements



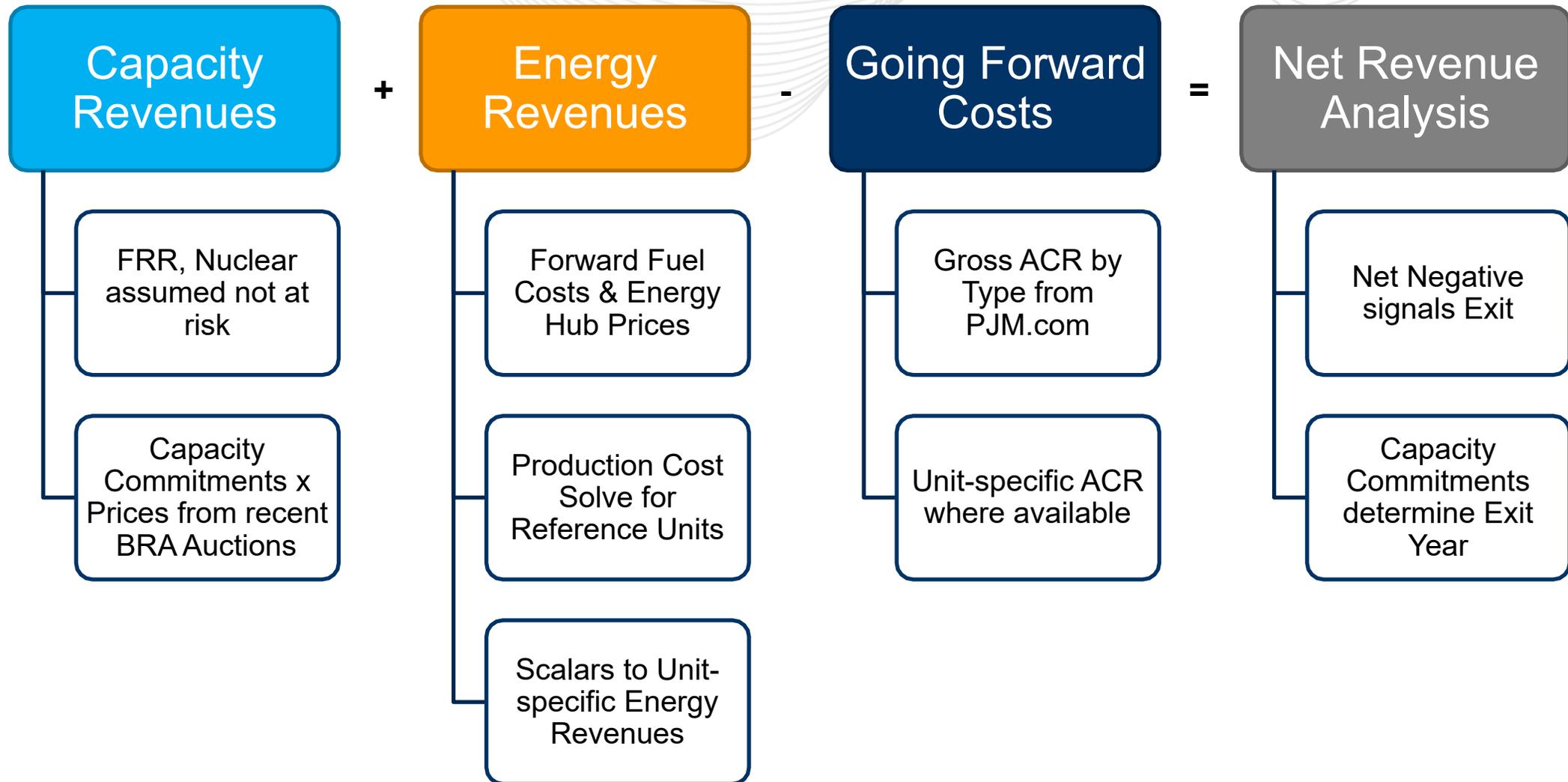
- EPA CCR rule used: *Facilities that have submitted a demonstration for section 257.103(f)(2): Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain*
 - <https://www.epa.gov/coalash/coal-combustion-residuals-ccr-part-implementation>
- EPA ELG rule used public statements of intent to retire by end of 2028
 - <https://stateimpact.npr.org/pennsylvania/2021/11/22/coal-fired-power-plants-including-two-in-pa-to-close-after-new-wastewater-rule/>

Figure 2.2.2: Alternative Plan B (Nameplate MW)

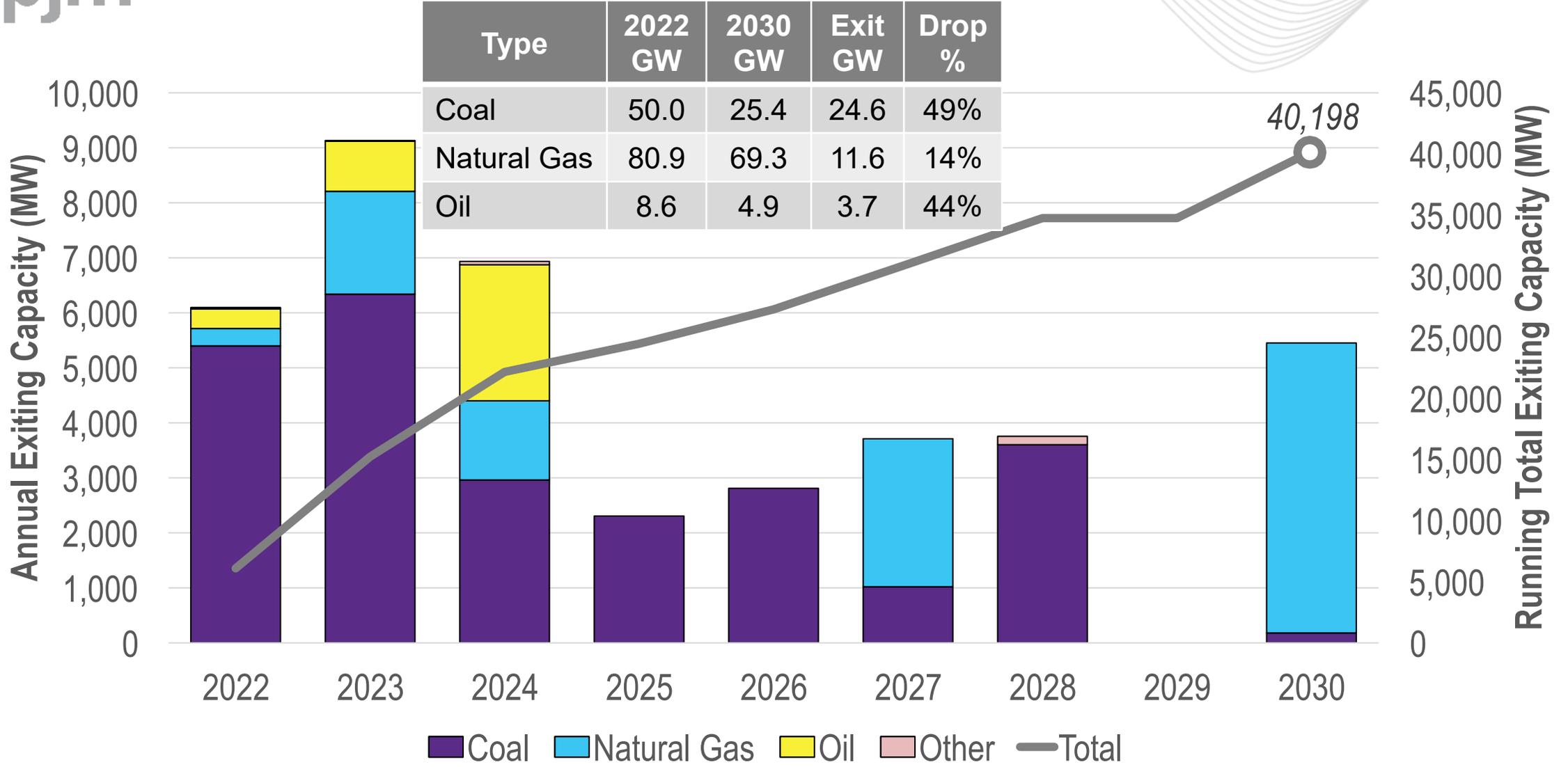
Year	Solar COS	Solar PPA	Solar DER	Wind	Storage	Natural Gas-Fired	Nuclear	Capacity Purchases	Retirements
2023	-	-	-	-	-	-	-	-	YT3, CH5&6
2024	-	-	23	-	-	-	-	-	-
2025	397	428	65	-	130	-	-	-	CL1&2
2026	812	315	110	-	120	-	-	-	-
2027	585	315	120	-	120	-	-	-	Rosemary
2028	585	315	120	-	150	-	-	-	Biomass
2029	624	336	100	-	210	-	-	-	-
2030	624	336	98	-	210	-	-	-	-

[Dominion Integrated Resource Plan](#)

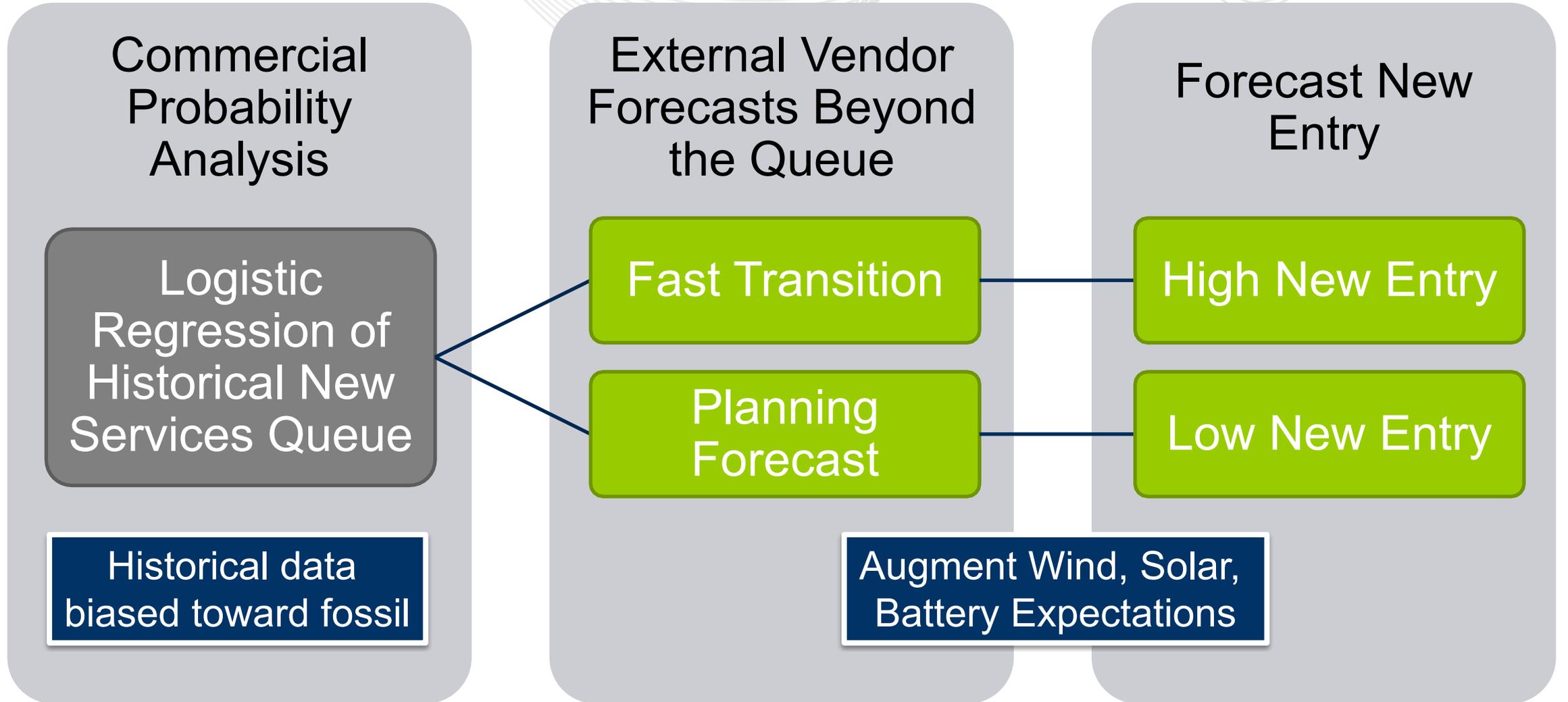
- Talen's Brandon Shores and Wagner
 - Commit to cease coal firing by end of 2025
 - Facilities have not submitted deactivation notices
 - <https://dailyenergyinsider.com/news/28327-talen-to-close-coal-fired-plants-as-it-transitions-to-renewable-energy-sources/>
- Indiana Michigan Power & AEP Generating's Rockport
 - Settlement to cease operations by end of 2028 (cited ELG rule)
 - Facility has not submitted a deactivation notice
 - https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/42586097-3c58-ec11-8f8e-001dd8023380/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=ord_45546_120821.pdf



Forecasted Capacity Exit by Fuel Type



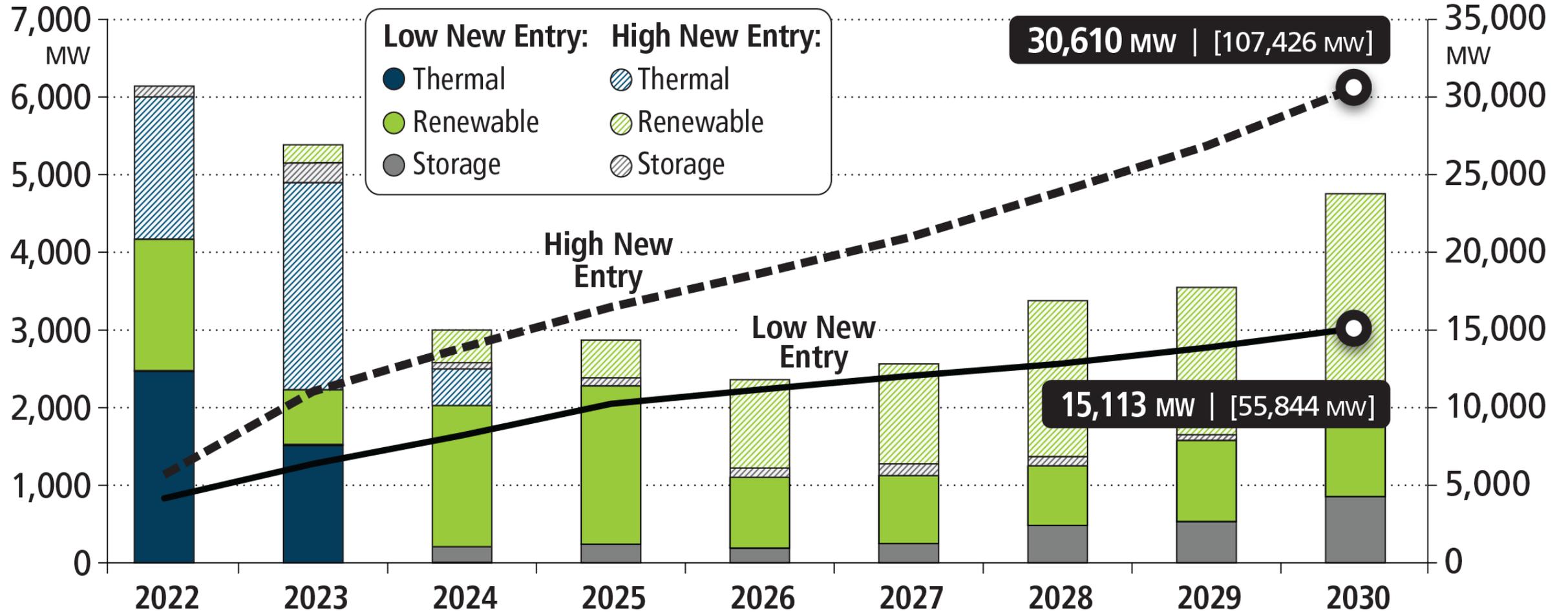
Supply Entry



PJM Forecasted New Entry (2022–2030)

Annual Added Installed Capacity

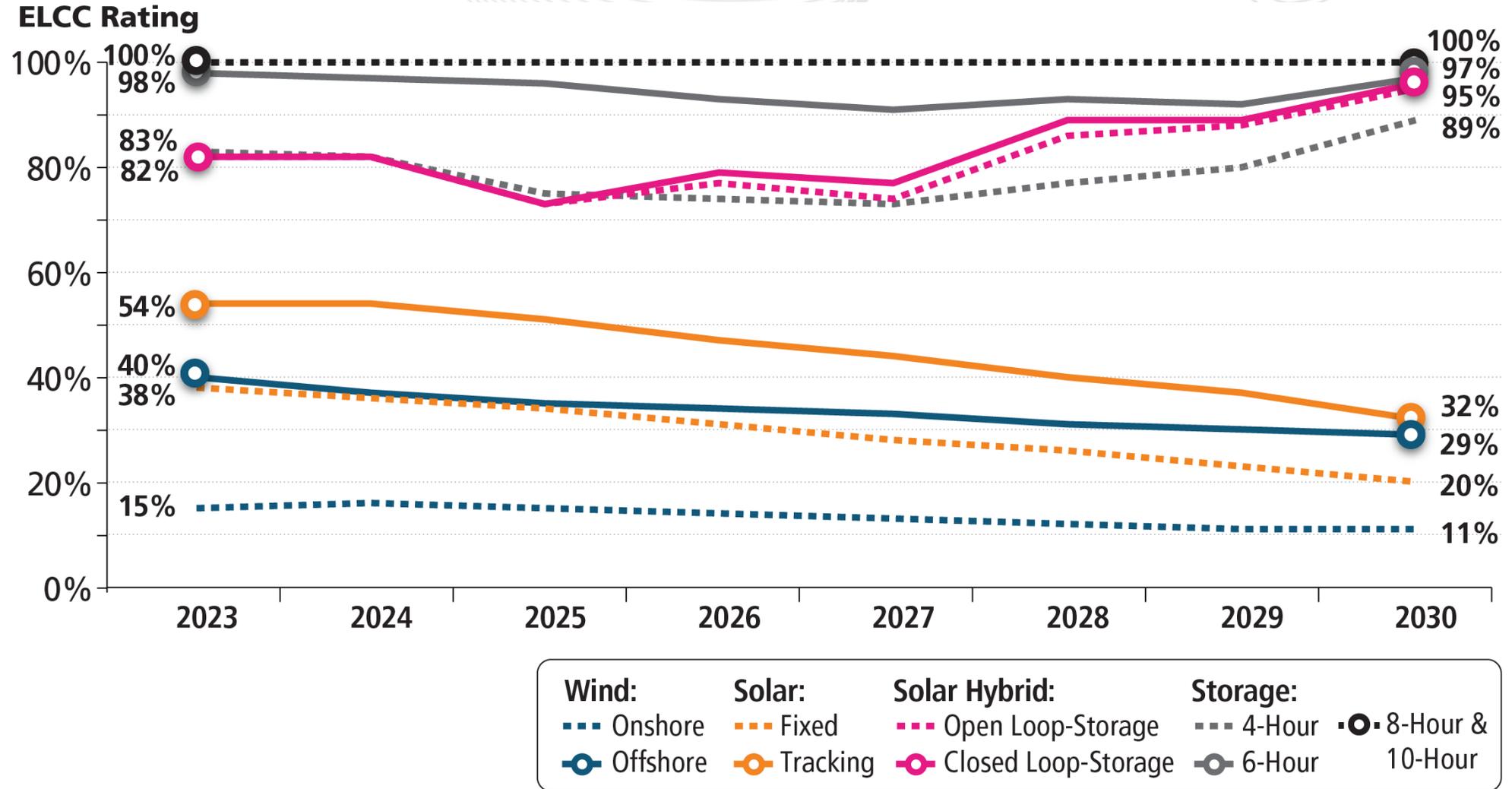
Total Added Capacity [Nameplate]



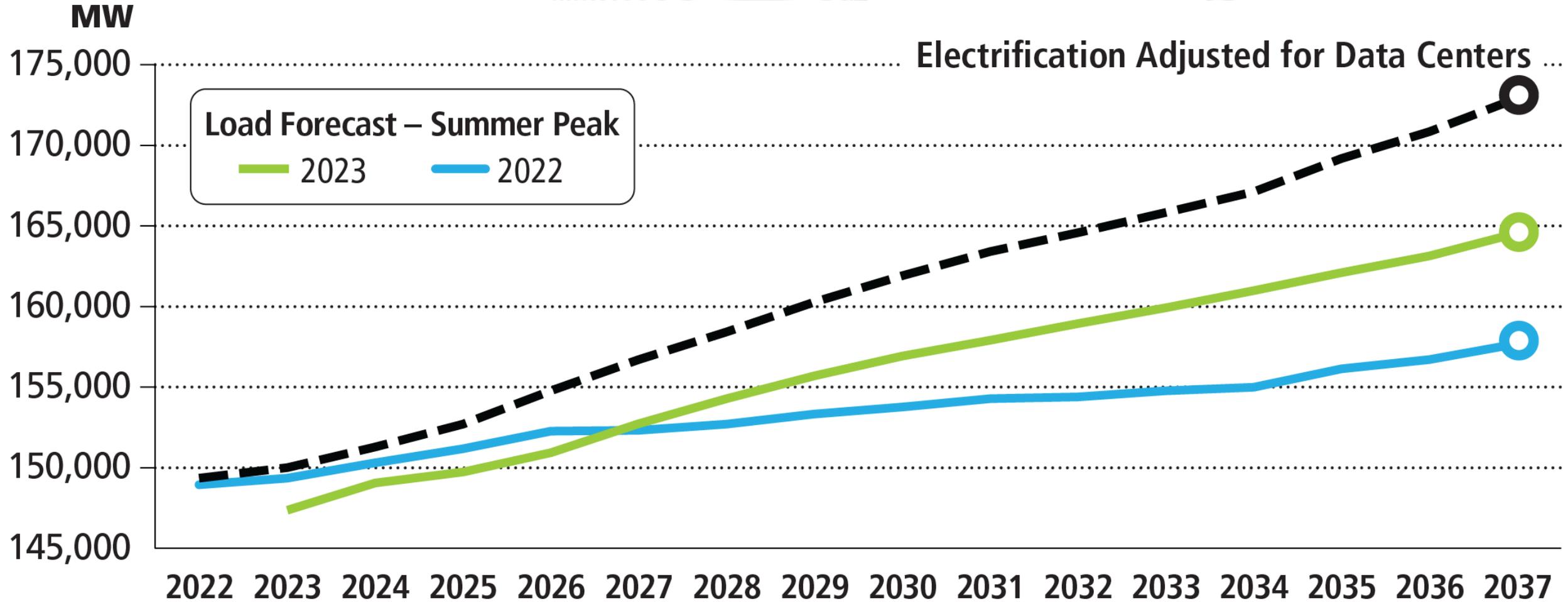
Renewable expansion includes storage, ELCC impacts; building nameplates of 56-108 GW-energy

Resource Type	Nameplate (GW)		Installed Capacity (GW)	
	Low New Entry	High New Entry	Low New Entry	High New Entry
Natural Gas	3.8	8.8	3.8	8.8
Offshore Wind	10.0	10.3	2.6	4.1
Onshore Wind	14.3	43.3	1.0	6.7
Solar	23.9	40.4	4.6	6.1
Battery	3.4	3.6	2.8	3.2

Impact of Capacity Accreditation on Existing Renewables and Storage



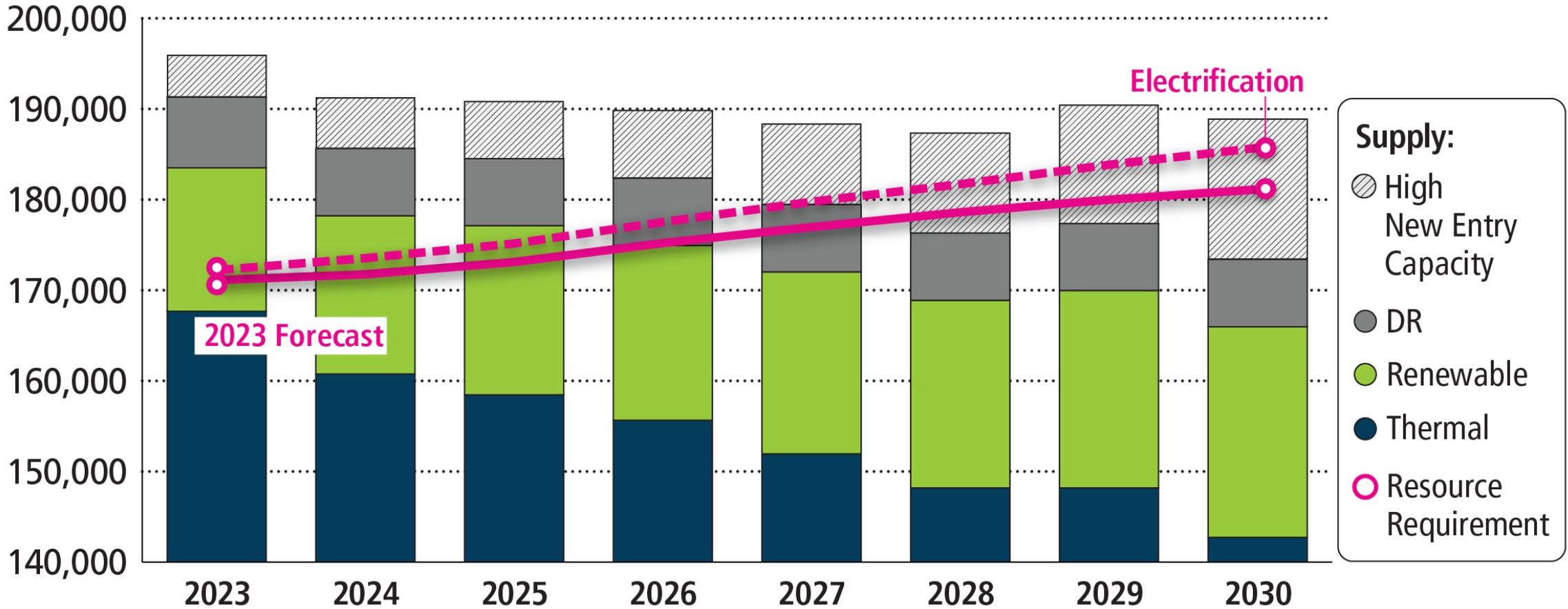
Demand Expectations



- Load Forecast development is handled through PC and LAS
 - Included additional data centers are consistent with assumptions for 2023 Load Forecast
- DERs are currently reflected through BtM (net with load) and interconnection queue not through potential aggregation (FERC Order 2222)
- Electrification discussed is a sensitivity. Any additional winter risk that this may cause is not included in this study.
 - PJM Report - [Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid](#)

Findings

MW ICAP





Reserve Margin Projections Under Study Scenarios

For the first time in recent history, PJM could face decreasing reserve margins should trends of high load growth, increasing rates of generator retirements, and slower entry of new resources continue.

Reserve Margin	2023	2024	2025	2026	2027	2028	2029	2030
Low New Entry								
2023 Load Forecast	23%	19%	17%	15%	11%	8%	8%	5%
Electrification	22%	18%	16%	13%	10%	7%	6%	3%
High New Entry								
2023 Load Forecast	26%	23%	21%	19%	17%	16%	17%	15%
Electrification	25%	22%	20%	18%	15%	14%	14%	12%

- Potential for **asymmetrical pace within the energy transition**, where resource retirements and load growth exceed pace of new entry, **underscores need for better accreditation, qualification and performance requirements** for capacity resources. At the current pace of new entry, resource adequacy risks could emerge by 2028-2030.
- **The composition and performance characteristics of the resource mix** will ultimately determine PJM's ability to maintain reliability.

Study highlights the importance of PJM's ongoing stakeholder initiatives:

- Resource Adequacy Senior Task Force
 - Critical Issue Fast Path – Resource Adequacy
- Clean Attribute Procurement Senior Task Force
- Interconnection Process Subcommittee
- Resource Adequacy Analysis Subcommittee
- Load Analysis Subcommittee