



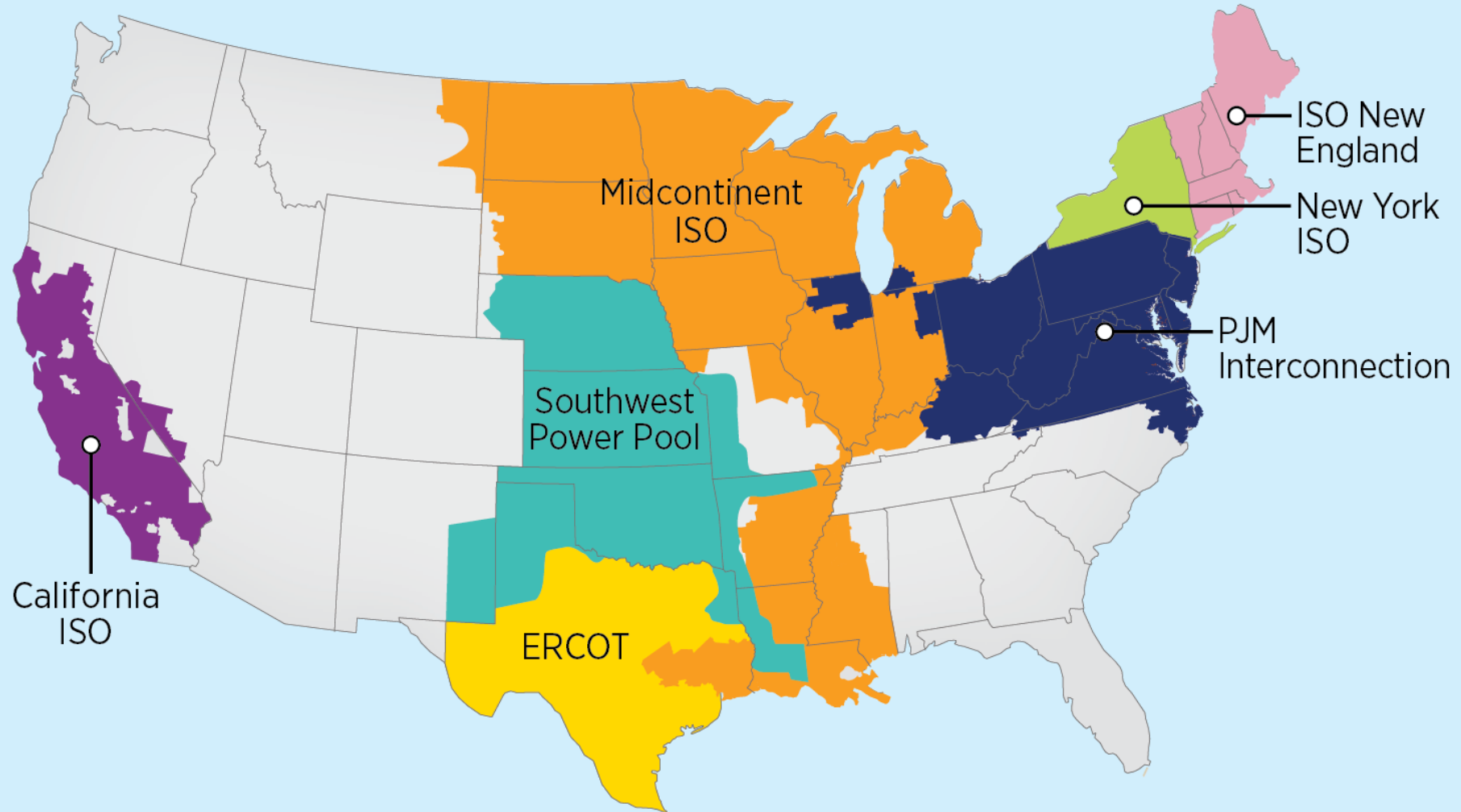
Resource Adequacy in PJM

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- Background on PJM
- How PJM ensures Reliability through Resource Adequacy
 - Capacity Market
 - Fixed Resource Requirement
- Evolving Fuel Mix and Emerging Reliability Risks
- PJM Resource Adequacy Reforms

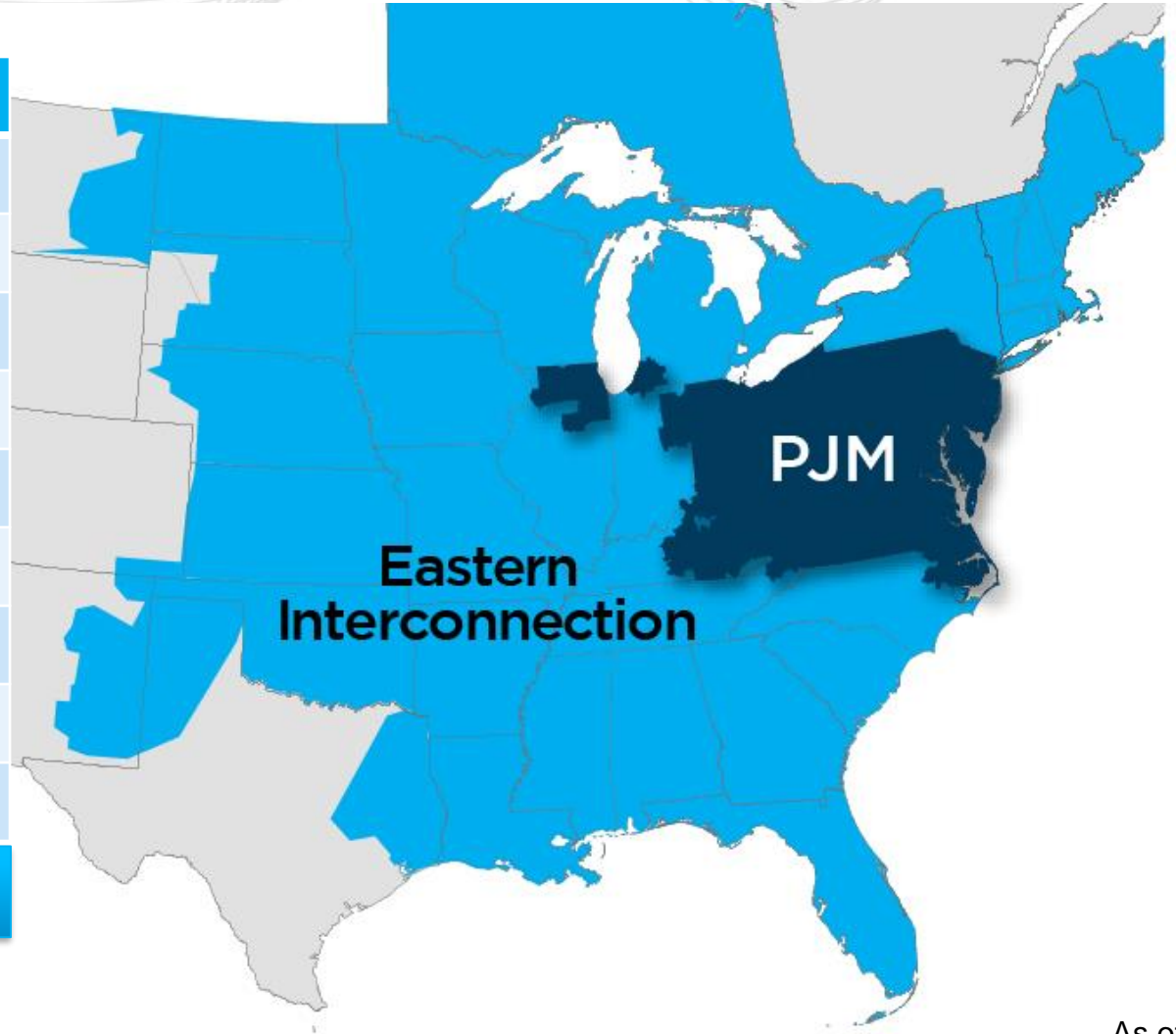
Background on PJM



Key Statistics

Member companies	1,060+
Millions of people served	65
Peak load in megawatts	165,563
Megawatts of generating capacity	185,442
Miles of transmission lines	85,103
2020 gigawatt hours of annual energy	782,683
Generation sources	1,436
Square miles of territory	368,906
States served	13 + DC

21% of U.S. GDP produced in PJM



As of 2/2021

Joined in 1927

Joined in 1956

Joined in 1965

Joined in 1981

Joined in 2002

Joined in 2004

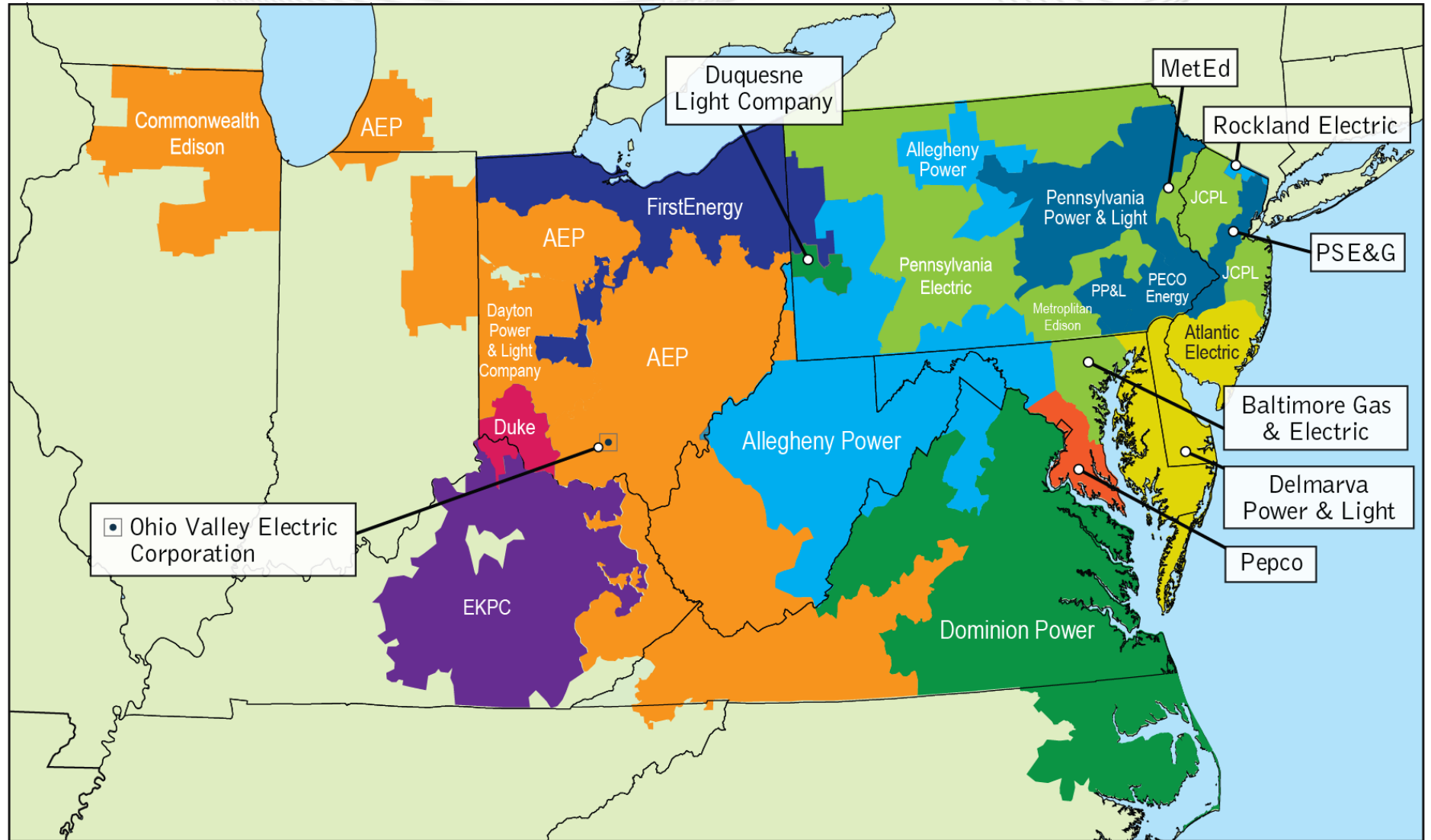
Joined in 2005

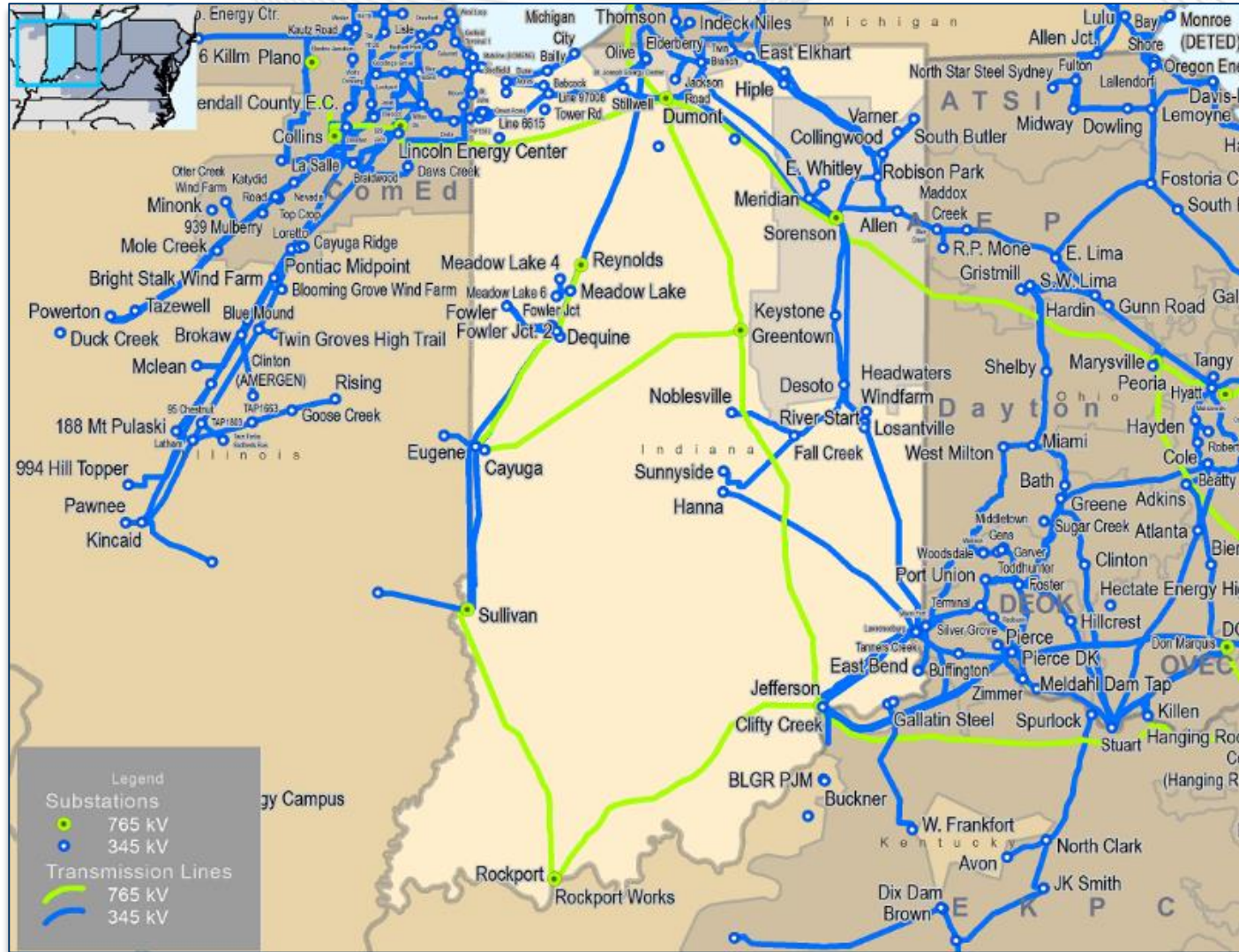
Joined in 2011

Joined in 2012

Joined in 2013

Joined in 2018





PLANNING



Planning for the future like...



OPERATIONS



Matches supply with demand like...



MARKETS



By Zone	
AE	\$20.59
AFP	\$25.55
APS	\$25.10
ATSI	\$25.46
BC	\$37.91
COMED	\$25.60
DAYTON	\$26.22
DFOK	\$25.38

Energy Market Pricing like...



How PJM ensures Reliability through Resource Adequacy



Adequate Supply

Resources to reliably power the system and meet customer demand



Accurate Forecasting

Projection of future customer demand and system needs



Robust Transmission

Reliable delivery of power across the grid and to customers via local distribution companies



Reliable Operations

Monitoring and dispatch of the system by trained operators

PJM System Resource Adequacy

Capacity Market / Reliability Pricing Model (RPM)

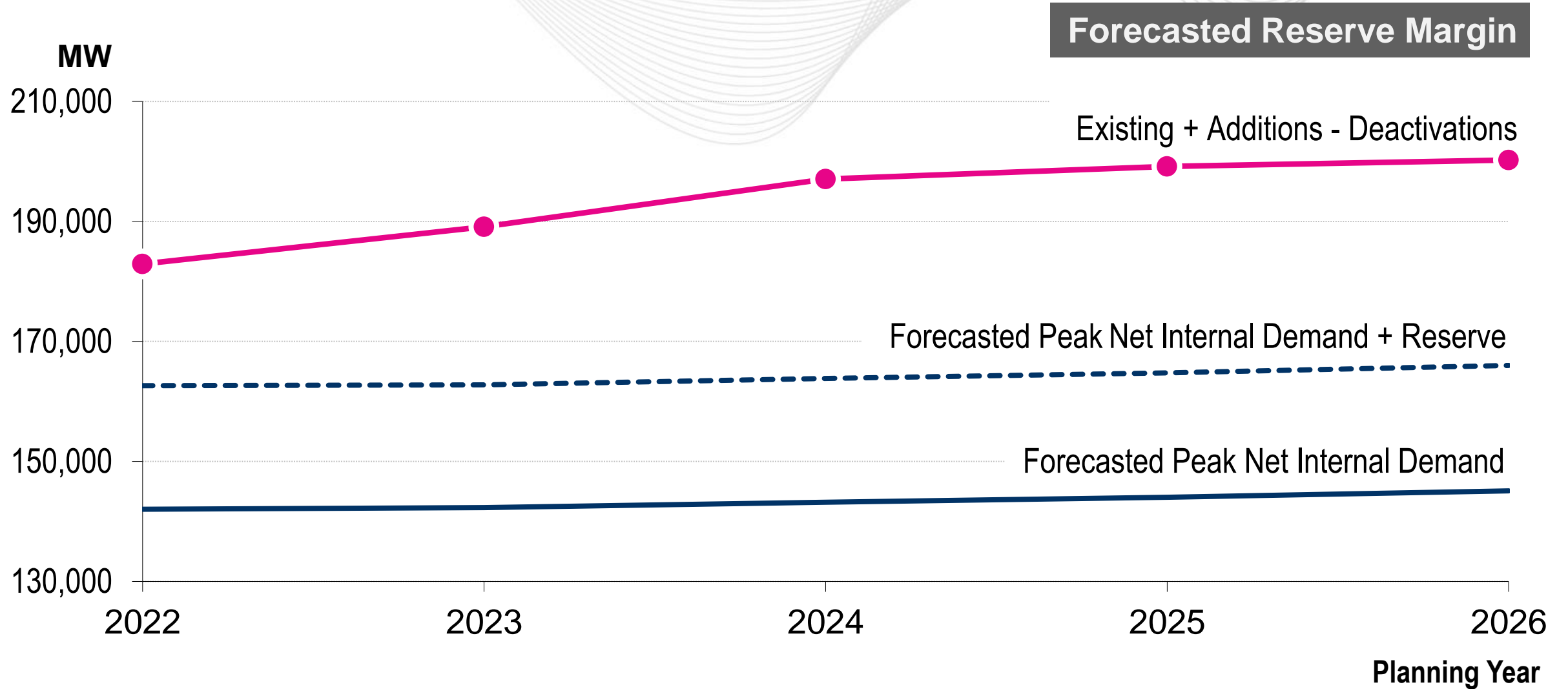
PJM secures capacity on behalf of Load Servers to satisfy capacity obligations not satisfied through self-supply.

Fixed Resource Requirement Alternative (FRR)

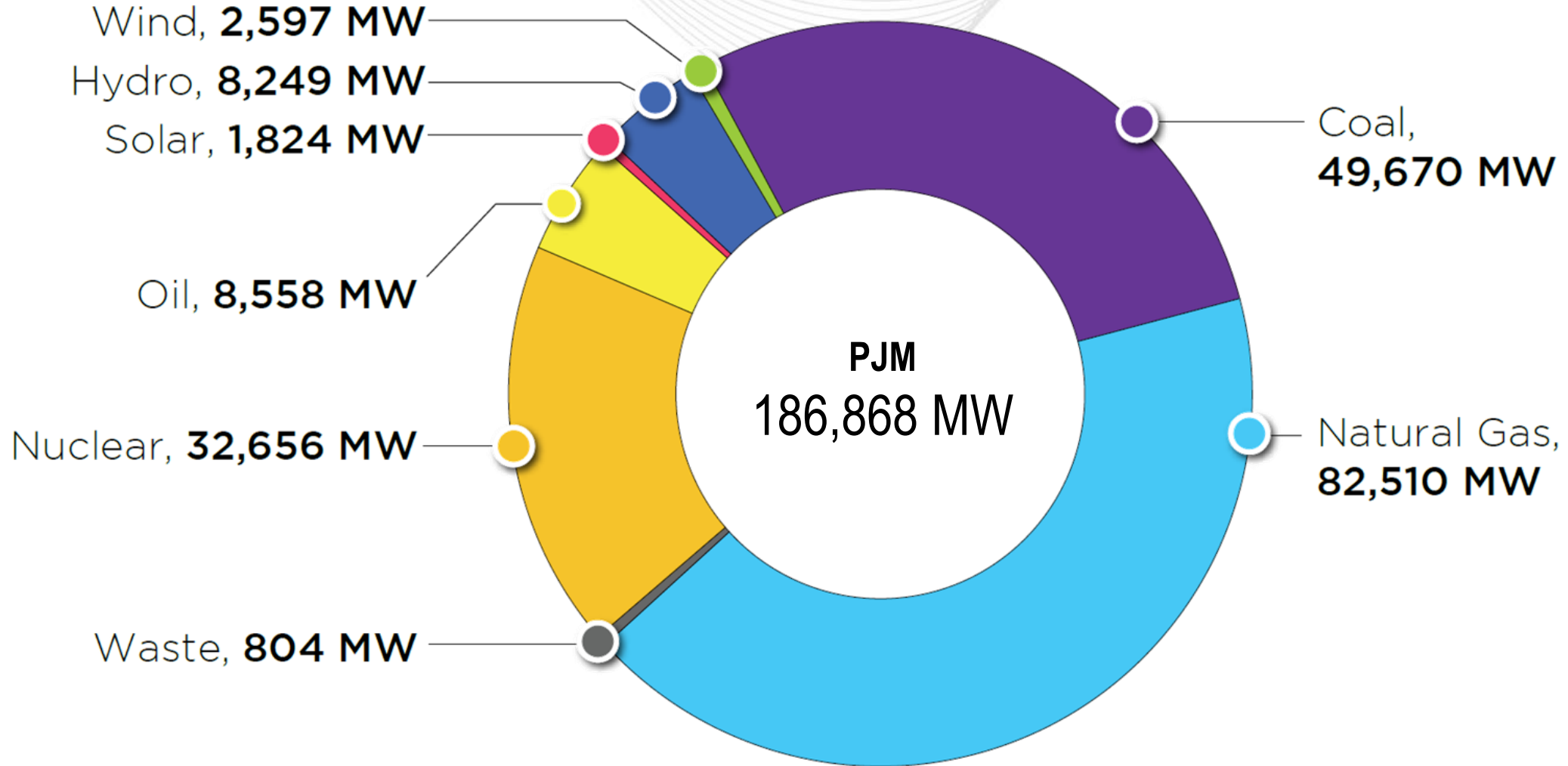
Load Server secures capacity to satisfy their load obligation, reflects commitments to PJM and satisfies on-going compliance.



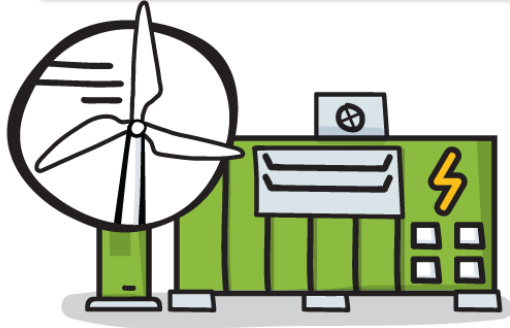
Forecasted Resource Adequacy Reserve Margin



Evolving Fuel Mix and Emerging Reliability Risks



Unprecedented number of changes in the power industry



Storage and renewables



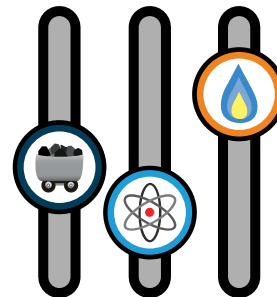
Distributed energy resources



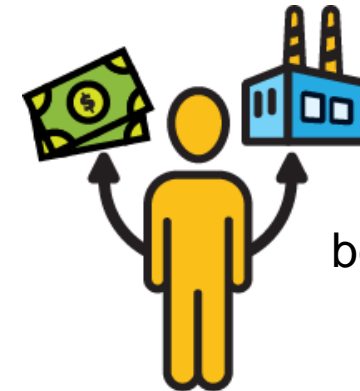
Energy efficiency



Alternative technologies

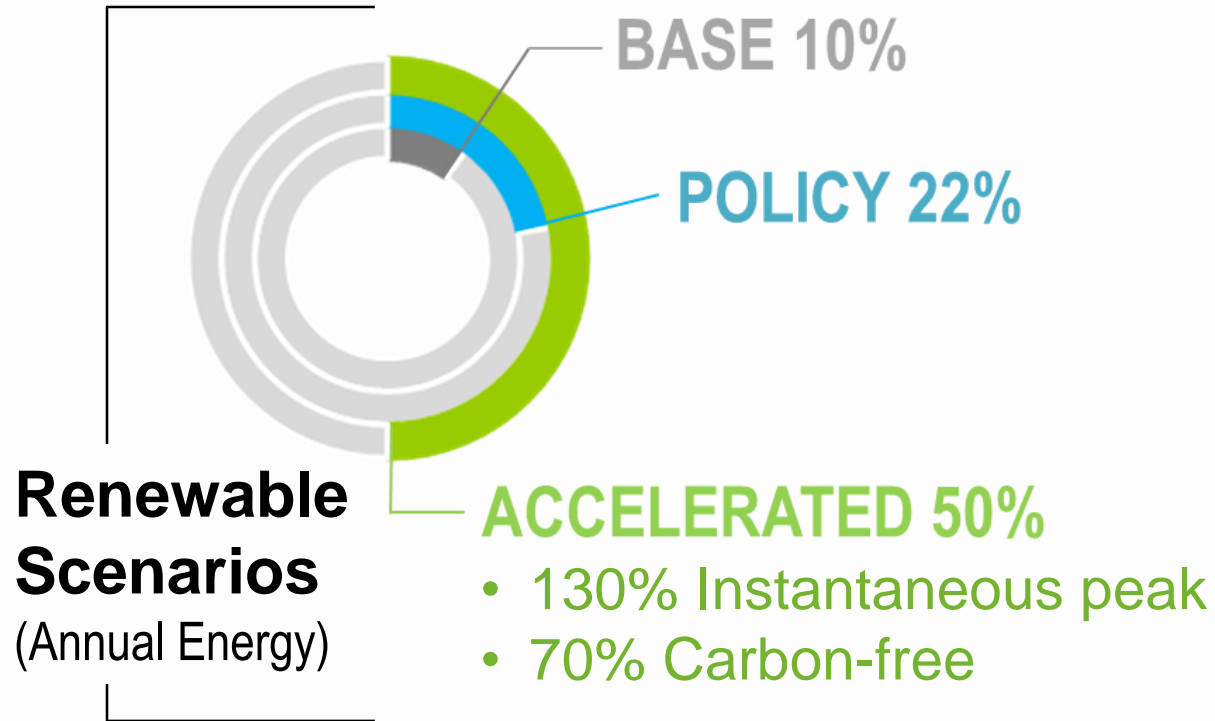


Fuel swap

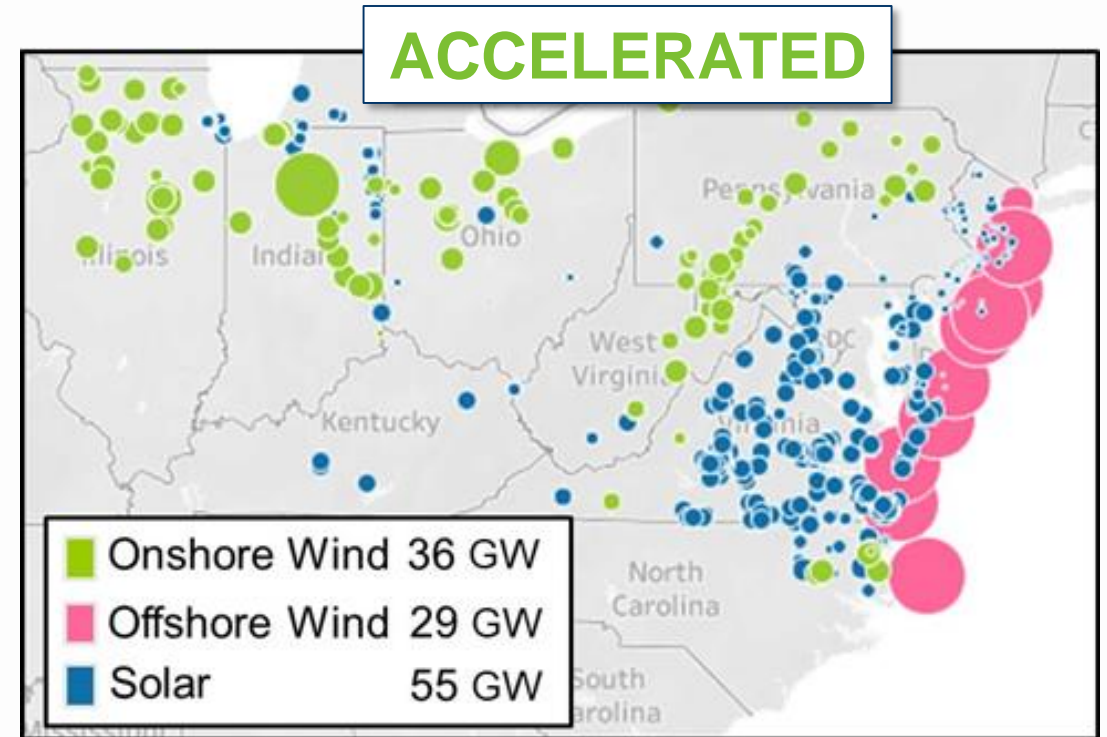


Customer behavior and choice

“**Living study**” to identify gaps and opportunities. The initial findings should not be regarded as expected outcomes, but as bookends to be refined as the study progresses.



Note: Policies and Market rules “as-is” April 2020.





Correctly Calculating Capacity Contribution of Generators is Essential



Flexibility Becomes Increasingly Important with Growing Uncertainty



Thermal Generators Provide Essential Reliability Services & an Adequate Supply will be Needed Until a Substitute is Deployed at Scale



Regional Markets Facilitate a Reliable and Cost-Effective Energy Transition



Reliability Standards Must Evolve

PJM Resource Adequacy Reforms

KWA	Issue/Topic	Description
2	Reliability Risk and Risk Drivers	Determine the types of reliability risks and risk drivers to be considered by the capacity market and how they should be accounted for.
3	Procurement Metric and Level	Determine the desired procurement metric and level to maintain the desired level of reliability
4	Performance Assessment	Determine the performance expected from a capacity resource.
5	Qualification and Accreditation	Determine the qualification and accreditation of capacity resources.
6	Obligations of Capacity Resources	Determine the desired obligations of capacity resources
8	Remaining Design Seasonal Resource Adequacy Construct	As applicable, determine any remaining design details for a seasonal capacity market construct not addressed in other KWAs
10	Fixed Resource Requirement (FRR) Rules	Determine if the Fixed Resource Requirement (FRR) rules need to be synchronized with any changes made.

KWA= 'Key Work Activity' a tracking identifier in PJM task force