The Competitive Planning Process
&
Supplemental Project Planning

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PJM Interconnection
April 25, 2023

Agenda

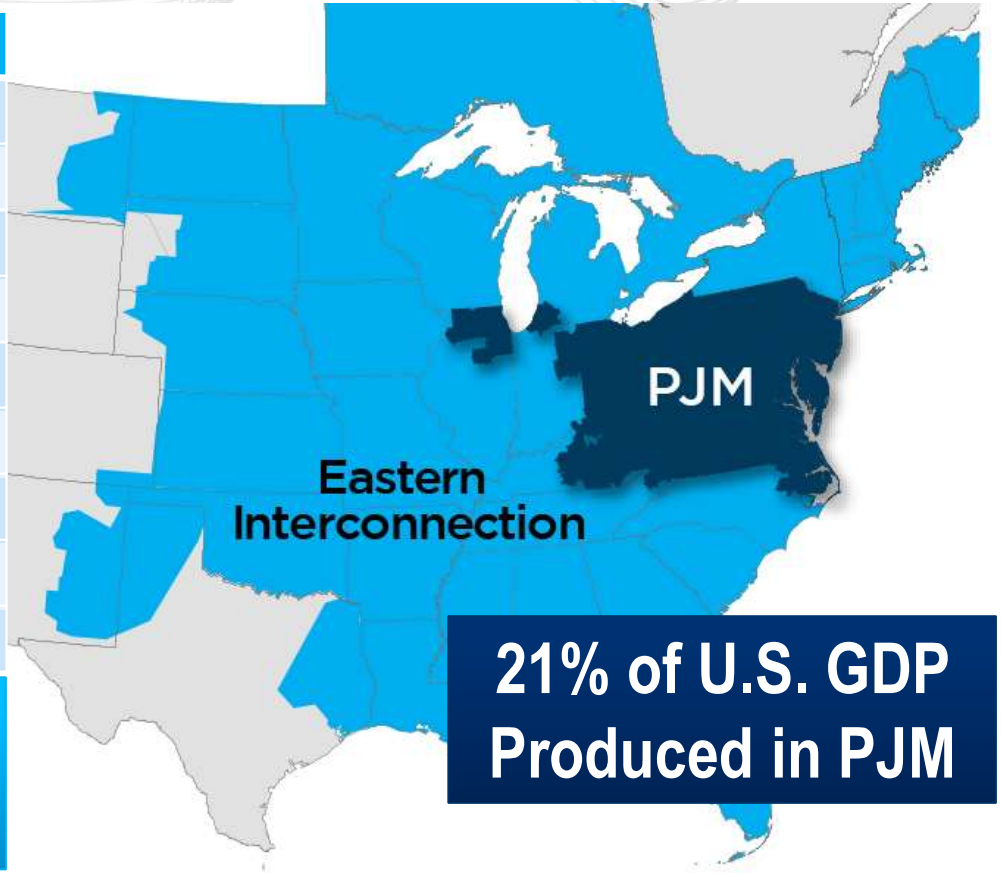
- PJM RTO Scope
- Transmission System Reliability Analysis
- Market Efficiency
- Competitive Windows & FERC Order 1000
- PJM Competitive Planning Process
- Supplemental Projects & the M3 Process

PJM RTO Scope

PJM as Part of the Eastern Interconnection

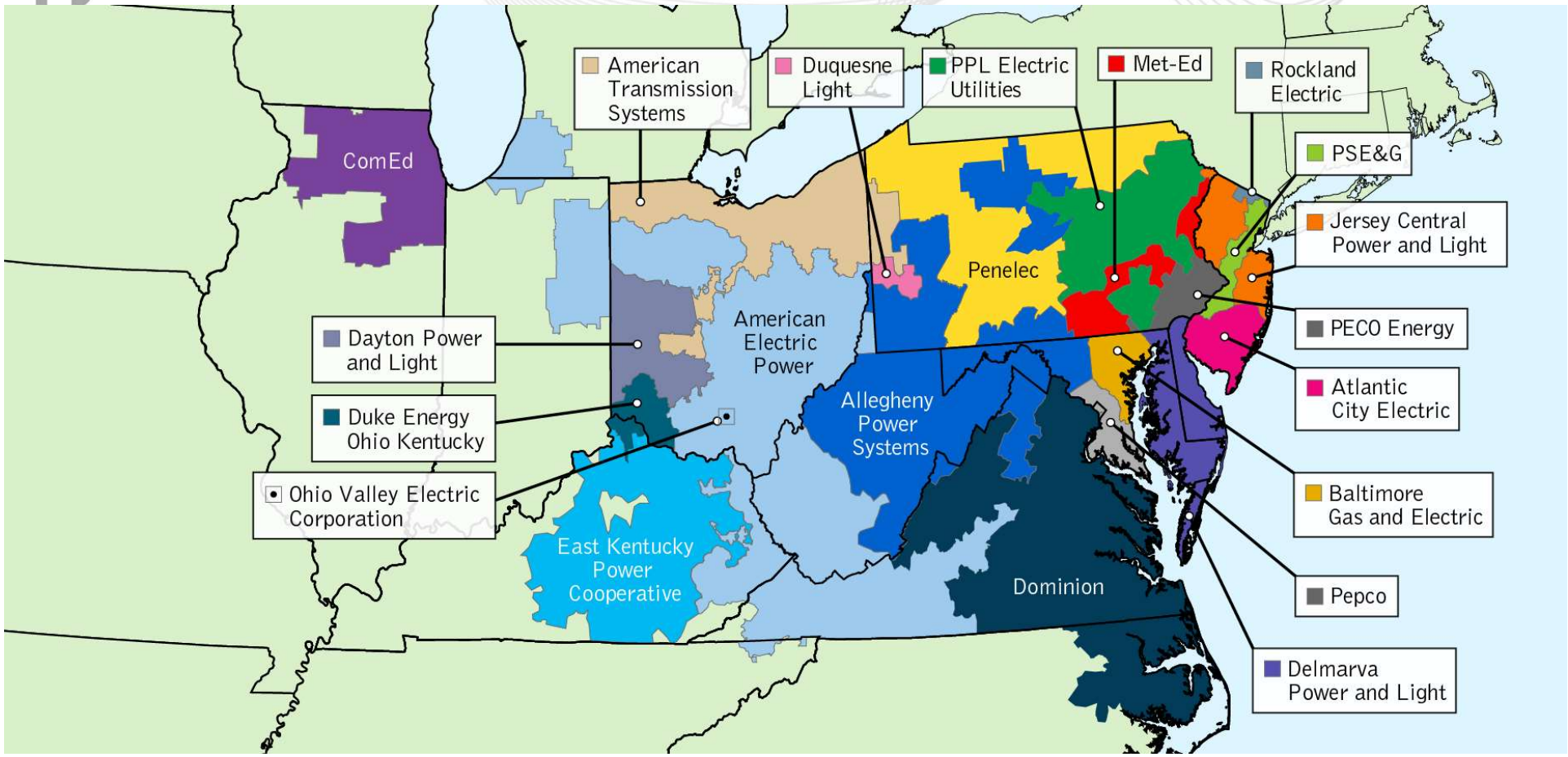
Key Statistics	
Member companies	1,110+
Millions of people served	65+
Peak load in megawatts	165,563
Megawatts of generating capacity	183,254
Miles of transmission lines	88,115
Gigawatt hours of annual energy	795
Generation sources	1,419
Square miles of territory	368,906
States served	13 + DC

- 26% of generation in Eastern Interconnection
- 25% of load in Eastern Interconnection
- 20% of transmission assets in Eastern Interconnection

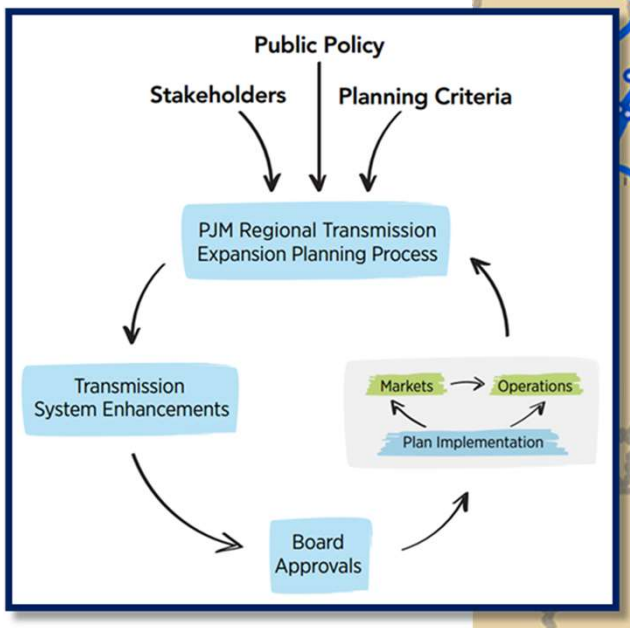


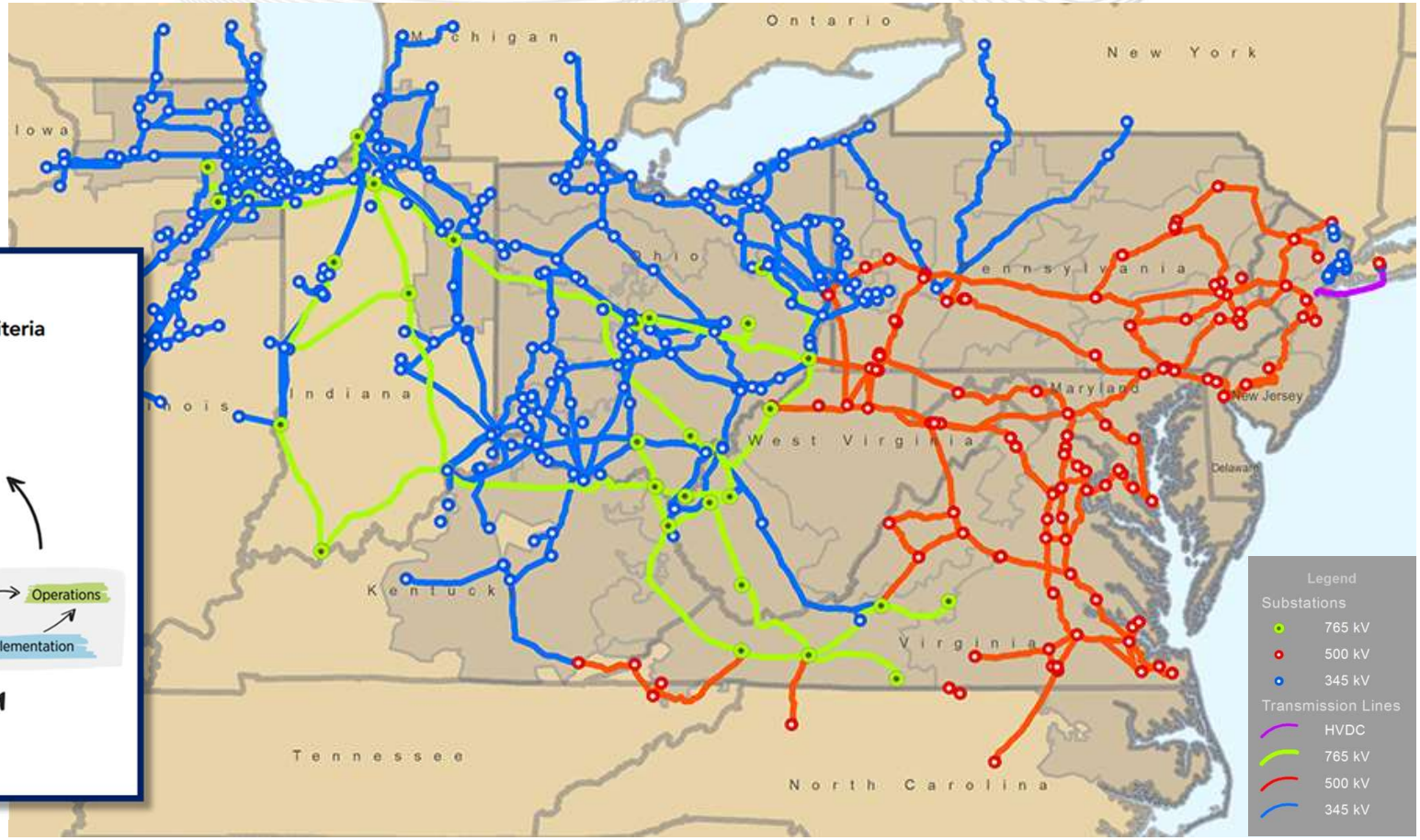
As of 2/2023

PJM Regional Scope



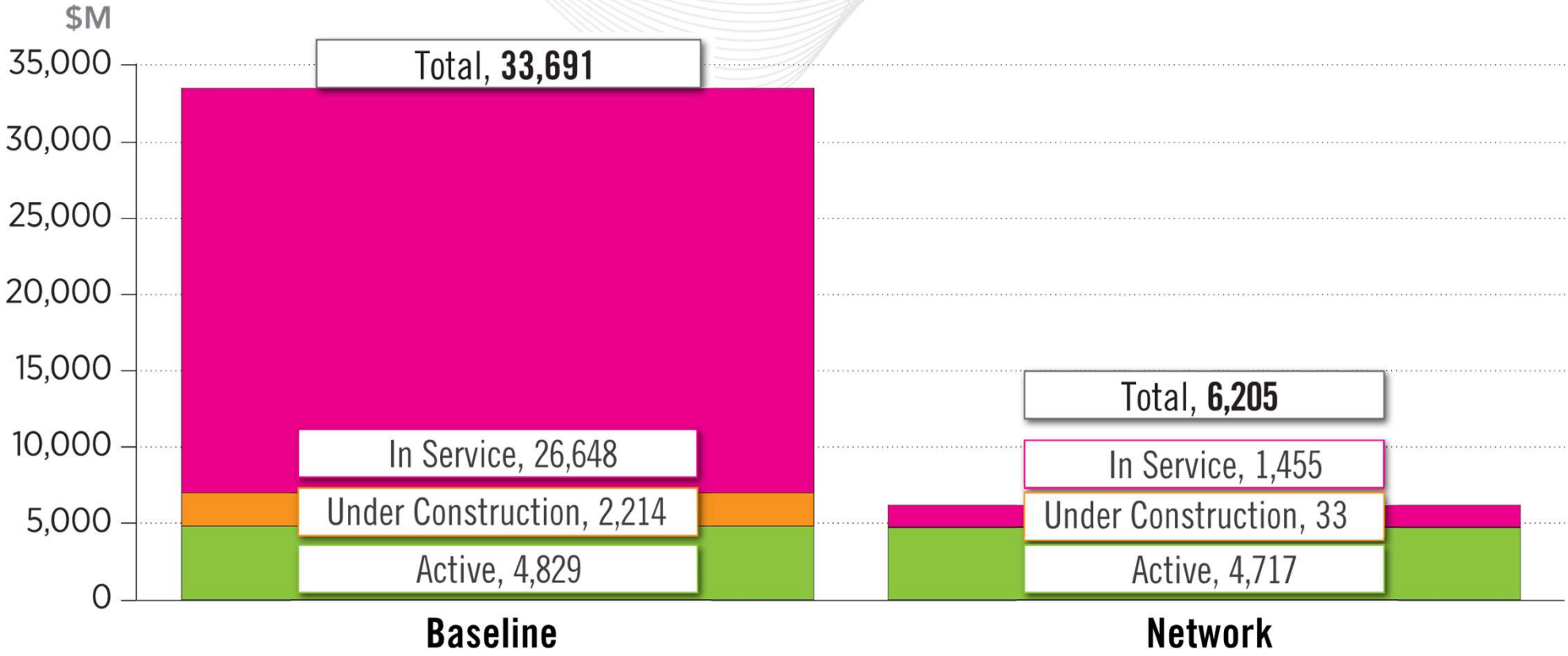
PJM Backbone Transmission





Board-Approved RTEP Projects

(as of Dec. 31, 2022)



PJM RTO Governing Documents

- ✓ “R” in RTO stands for “Regional”
- ✓ Planning, Operating and Market functions delegated to RTO
- ✓ *BUT*, RTO does not own lines, substations, generators, etc.
- ✓ Independence, neutrality
- ✓ Regional transmission expansion planning
- ✓ Operational, real-time responsibility for ensuring grid reliability
- ✓ Manages regional capacity, energy and ancillary service markets

RTEP Process Evolution

2013 – RTEP Process Windows

2008 / 2009 – Order No. 890 Implementation

2007/08 – Market Efficiency process

2006 – 15-year planning process

2003 - Merchant transmission interconnection process

2003 - Original economic planning process

2000 - First RTEP approved by PJM BOM

1999 - Generation interconnection process (OATT)

1997 – RTEP Protocol approved by FERC (Operating Agreement)

2007 – FERC Order No. 890

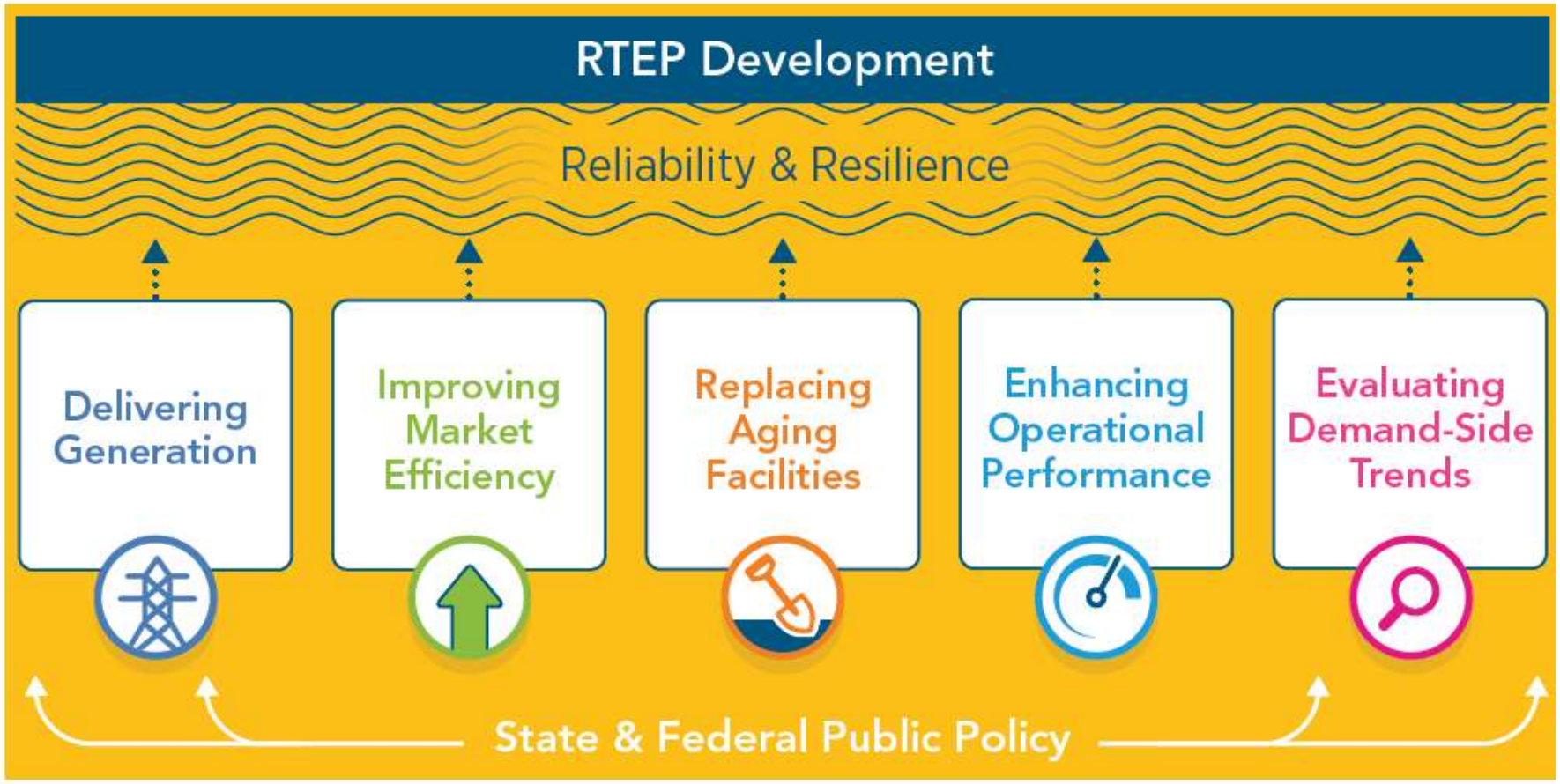
2005 – Energy Policy Act (NIETC)

2000 – FERC RTO Order

1996 – FERC Order No. 888 (OATT)

1992 – Energy Policy Act

System Expansion Drivers



RTEP Process Stakeholder Participation

Transmission Expansion Advisory Committee (TEAC)

- ✓ Input on scope and assumptions of RTEP analyses
- ✓ Review & comment on results to date and planned system enhancements
- ✓ Provide comments & recommendations to the PJM Board, or as requested by Board
- ✓ **RTEP approval authority retained by Board, not TEAC**

Sub-Regional RTEP Committees

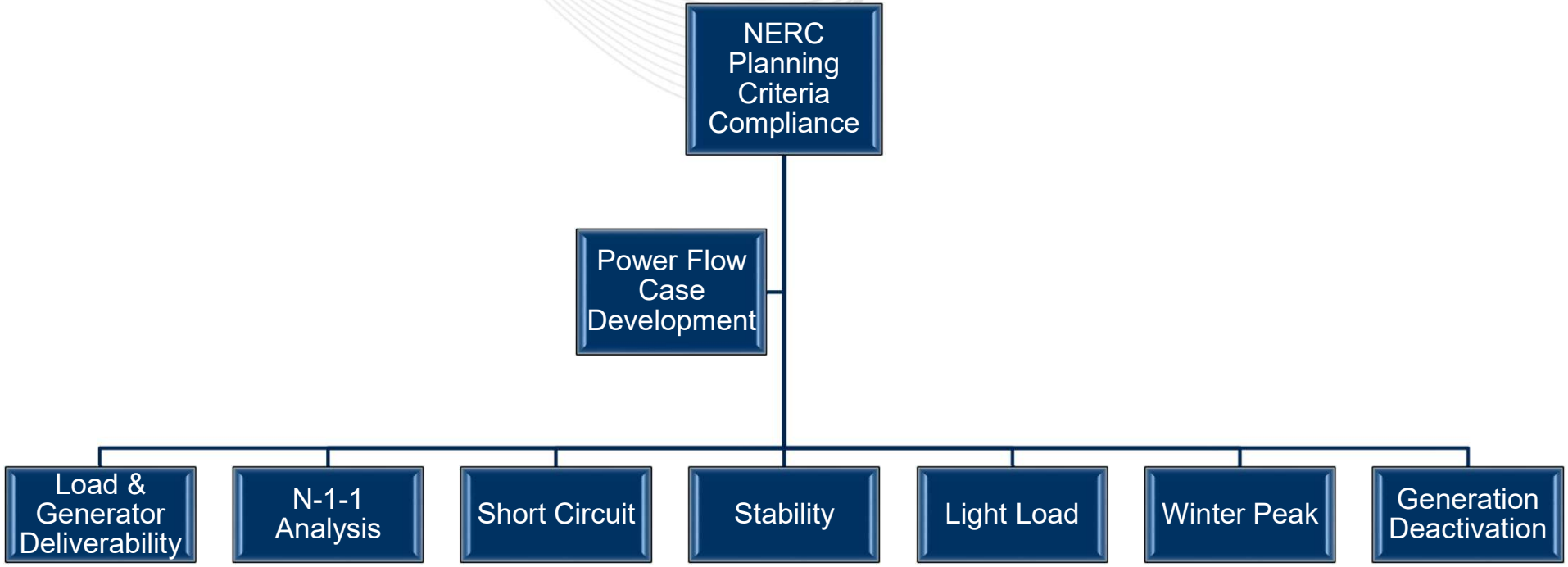
- ✓ Mid-Atlantic, Western, Southern
- ✓ Review RTEP enhancements at local level 230 kV and below

RTEP Process Studies

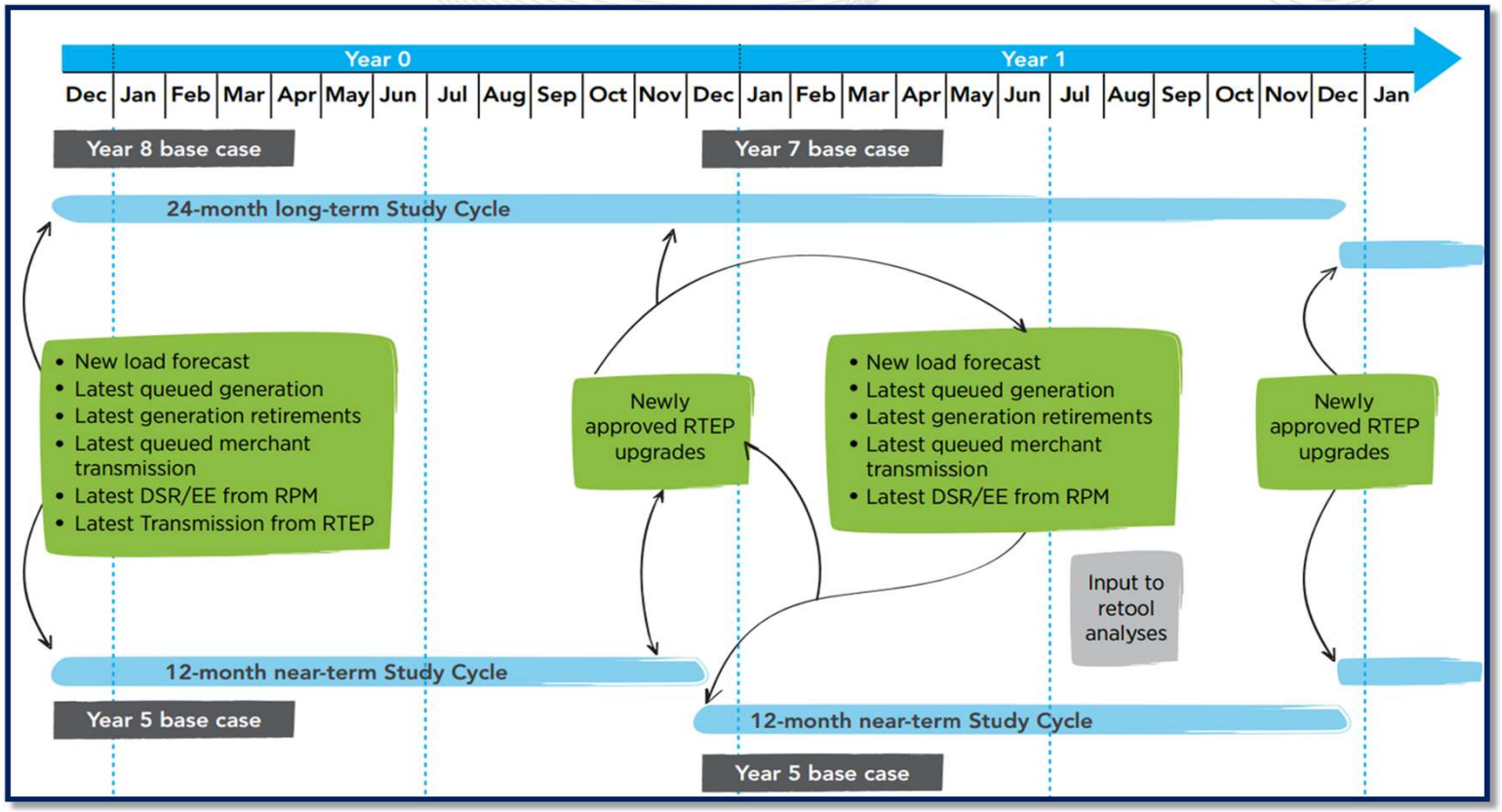
- ✓ Baseline reliability
  - NERC Criteria
- ✓ Baseline market efficiency
  - Reduce Congestion
- ✓ New service studies (e.g., generator interconnection)
- ✓ Scenario studies
- ✓ Interregional coordination

Transmission System Reliability Analysis

Transmission System Reliability Analysis



Power Flow Case Development



NERC Planning Criteria Compliance

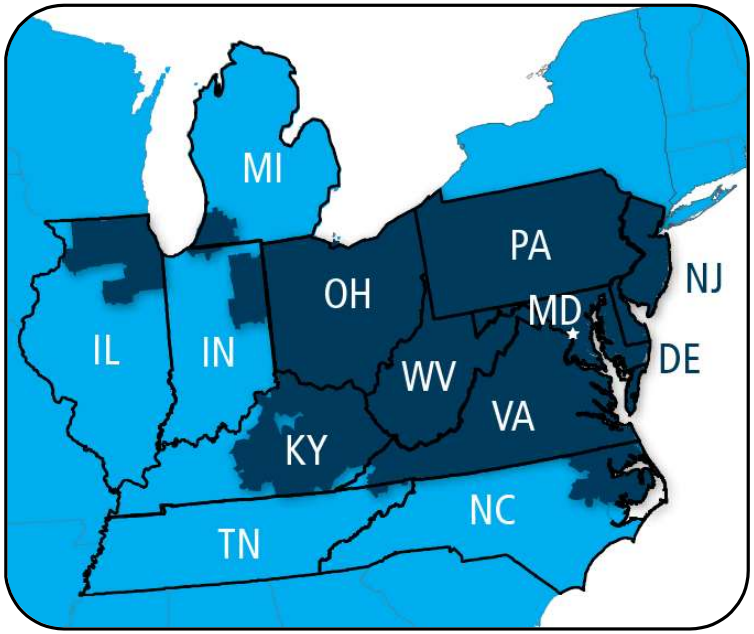
Steady State Analysis	NERC Planning Events
Base Case N-0 - No Contingency Analysis	P0
Base Case N-1 – Single Contingency Analysis	P1
Base Case N-2 – Multiple Contingency Analysis	P2, P4, P5, P7
N-1-1 Analysis	P3, P6
Generator Deliverability	P0, P1
Common Mode Outage Procedure	P2, P4, P7
Load Deliverability	P0, P1
Light-Load Reliability Criteria	P1, P2, P4, P5, P7

Market Efficiency

PJM Market Simulations Context

PJM Market Efficiency process simulates the electric market using production costing software to:

- Understand internal and interregional congestion
- Assess future energy and capacity market congestion
- Approve economic-based transmission upgrades



Mitigating Congestion Costs

Congestion is a measure of the extent to which marginal generating units are dispatched to serve load due to transmission constraints.

Congestion occurs when available, least-cost energy cannot be delivered due to transmission constraints. As a result, higher cost units must be dispatched to meet load.

Congestion Costs (Millions)				
	Congestion Cost	Percent Change	Total PJM Billing	Percent of PJM Billing
2008	$2,052	NA	$34,300	6.0%
2009	$719	(65.0%)	$26,550	2.7%
2010	$1,423	98.0%	$34,770	4.1%
2011	$999	(29.8%)	$35,890	2.8%
2012	$529	(47.0%)	$29,180	1.8%
2013	$677	28.0%	$33,860	2.0%
2014	$1,932	185.5%	$50,030	3.9%
2015	$1,385	(28.3%)	$42,630	3.2%
2016	$1,024	(26.1%)	$39,050	2.6%
2017	$698	(31.9%)	$40,170	1.7%
2018	$1,310	87.8%	$49,790	2.6%
2019	$583	(55.5%)	$39,200	1.5%

Data Source: Monitoring Analytics, LLC, 2019 State of the Market Report for PJM, Table 11-11 Total PJM congestion costs (Dollars (Millions)): 2008 through 2019

Market Efficiency Analysis Objectives

- **Long-Term Window**
  Identify new transmission projects that may result in economic benefits.
- **Reevaluation Analysis**
  Review cost and benefits of economic-based transmission projects included in the RTEP to assure that they continue to be cost beneficial.
- **Acceleration Analysis**
  Determine which reliability-based transmission projects, if any, have an economic benefit if accelerated or modified.
- **“Hybrid” Projects**
  Design in more robust manner reliability-based transmission projects already included in the RTEP that when modified would provide economic benefits by relieving one or more economic constraints.

Competitive Windows
&
FERC Order 1000

What is FERC Order 1000?

- In July 2011, the Federal Energy Regulatory Commission (FERC) issued Order 1000
- Purpose was to increase regional transmission development by:
  - Eliminating long-standing monopolies
  - Creating competition
  - Incentivizing innovative cost-effective projects

What is FERC Order 1000?

- According to FERC:
  - *"Order 1000 will remove barriers to the development of transmission, promoting cost-effective planning and the fair allocation of costs for new transmission facilities. This enhanced transmission planning will provide a strong foundation for updating the grid to provide reliable transmission service as well as an opportunity to achieve goals that states and local authorities have set for lower emissions, demand-side resources and renewable energy."*

FERC Order 1000 Key Points

- Increase participation in regional transmission planning:
  - Requires transmission planning at the regional & interregional level resulting in a transmission plan
- Eliminate Right of First Refusal (ROFR)
  - No entity solely “owns” the right to construct and/or operate transmission facilities
  - Qualified entities can bid on project
- Establish cost allocation policies
  - Costs allocated “roughly commensurate” with benefits

PJM Competitive Planning Process

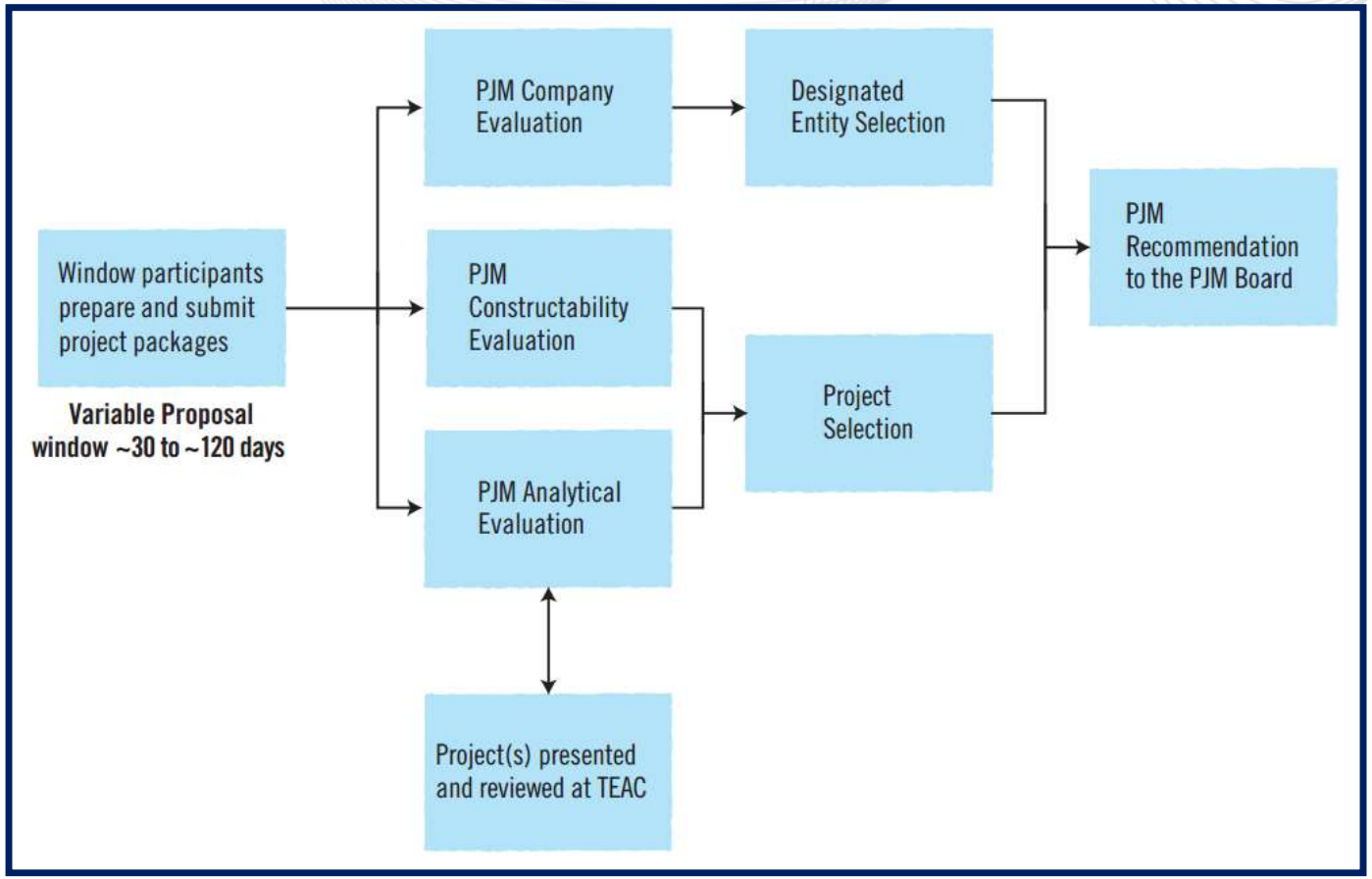
Implementing Order No. 1000 – RTEP Process Windows

- ✓ July 21, 2011: FERC issues Order No.1000 (RM10-23-000)
- ✓ Feb. 29, 2012 – July 22, 2013: PJM and TOs submit a series of compliance filings
- ✓ May 15, 2014: FERC accepts PJM and TOs' filings, affirmed by DC Court of Appeals on August 15, 2014
- ✓ Opportunity for non-incumbent transmission developers to submit project proposals through a RTEP process window to be considered for project construction, ownership, operation and financial responsibility

Competitive Solicitation for Solutions

- ✓ Greater opportunities for transmission development, construction, maintenance and operation by non-incumbents
- ✓ One or more needs: reliability, market efficiency, operational performance, public policy
- ✓ Competitive solicitation window based process project classes:
  - *Long-lead and economic-based projects*: reliability or market efficiency driven system enhancements in year six or beyond – 120 day window
  - *Short-term projects*: reliability driven system enhancements needed in year four or five – 60 day window.
  - *Immediate-need projects*: reliability driven system enhancements needed in three years or less; window if possible, likely less than 30 days nominally.

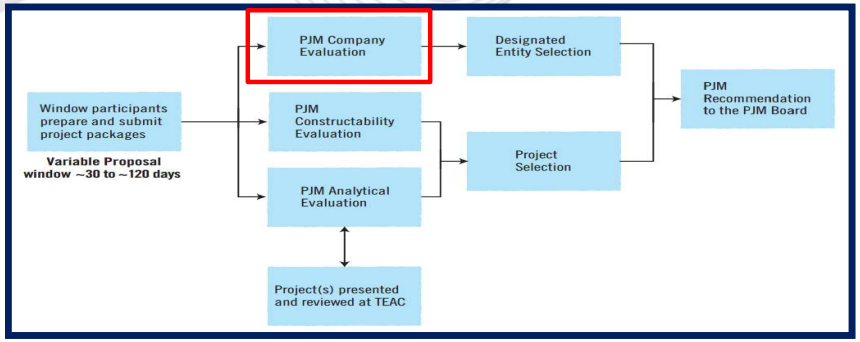
RTEP Process Window Proposal Evaluation



Designated Entity Pre-Qualification

- ✓ For a company to be considered a Designated Entity for proposed project(s)
  - Can this company build and own a generic transmission project?
- ✓ Conceptual Criteria:
  - Previous Record, Experience, Plans to Gain Necessary Expertise
  - Standardized Practices
  - Financial Statements
  - Equipment History: Failures, Remedies, Spares
  - Right-of-Way Experience
- ✓ Pre-qualification transparency via PJM web site

Company Evaluation

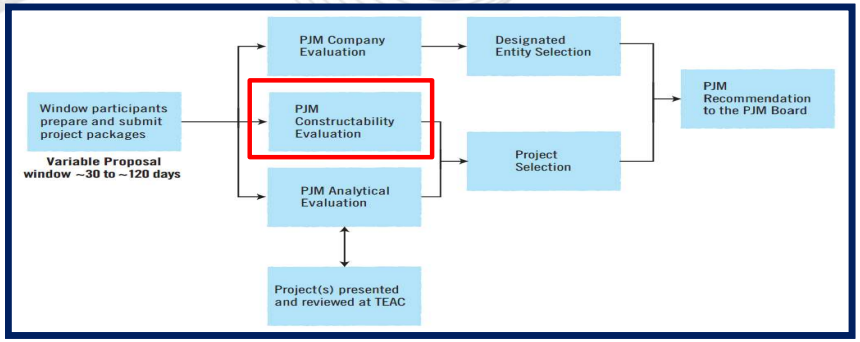


- ✓ Info submitted as part of the project proposal package

- ✓ Project specific experience:
  - Evidence of ability to secure financing
  - Engineering / Design
  - Development / Right-of-Way Acquisition
  - Construction
  - Operations
  - Maintenance

Constructability Evaluation

(process subject to further development)

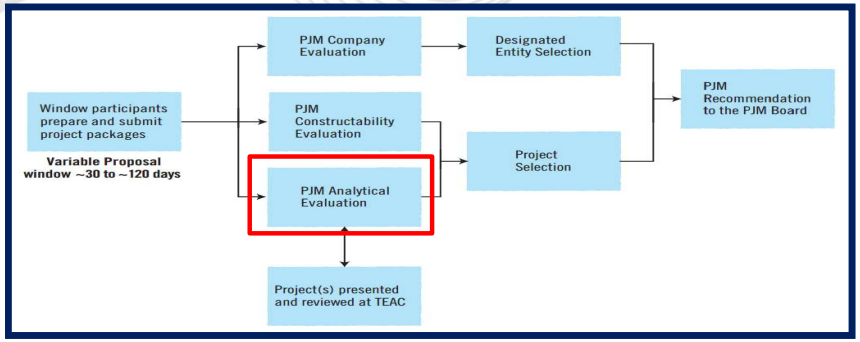


✓ Assessment of project/construction risks:

- Cost estimate
  - Design
  - Material
  - Labor
  - Overhead
  - Contingency
- Project finance plan
- Project plan
  - Permits required
  - Right of way acquisition
  - Project one-line diagram
  - Station(s) general arrangement
  - Transmission line route
- Operational plan
  - Control center
  - Telemetry
- Schedule
  - Engineering
  - Right of way acquisition
  - Long lead time equipment
  - CPCN requirements
  - Construction permitting
  - Construction activities
  - Contract labor procurement plan
  - Outage plan
- Maintenance plan
- Compliance with standards organizations
- Other data as required

Analytical Evaluation

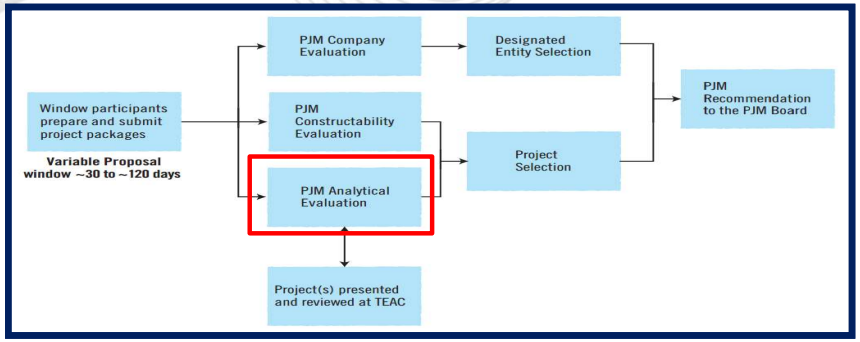
(process subject to further development)



- ✓ Proposal would solve identified issues
- ✓ Which project most efficient, cost-effective?
- ✓ Relevant project benefits meet 1.25:1 Benefit-to-Cost Ratio Threshold
- ✓ Secondary benefits - addressing other system reliability, operational performance, market efficiency or public policy objectives
- ✓ Other factors:
  - Ability to complete project on time
  - Risk / delay to obtain required regulatory approvals

More on Analytical Evaluation…

(process subject to further development)



Reliability Analyses

- ✓ Does project solve issue as proposed?
- ✓ Does it cause other reliability issues?
- ✓ Transient stability, voltage, thermal, and short circuit performance
- ✓ NERC reliability planning criteria

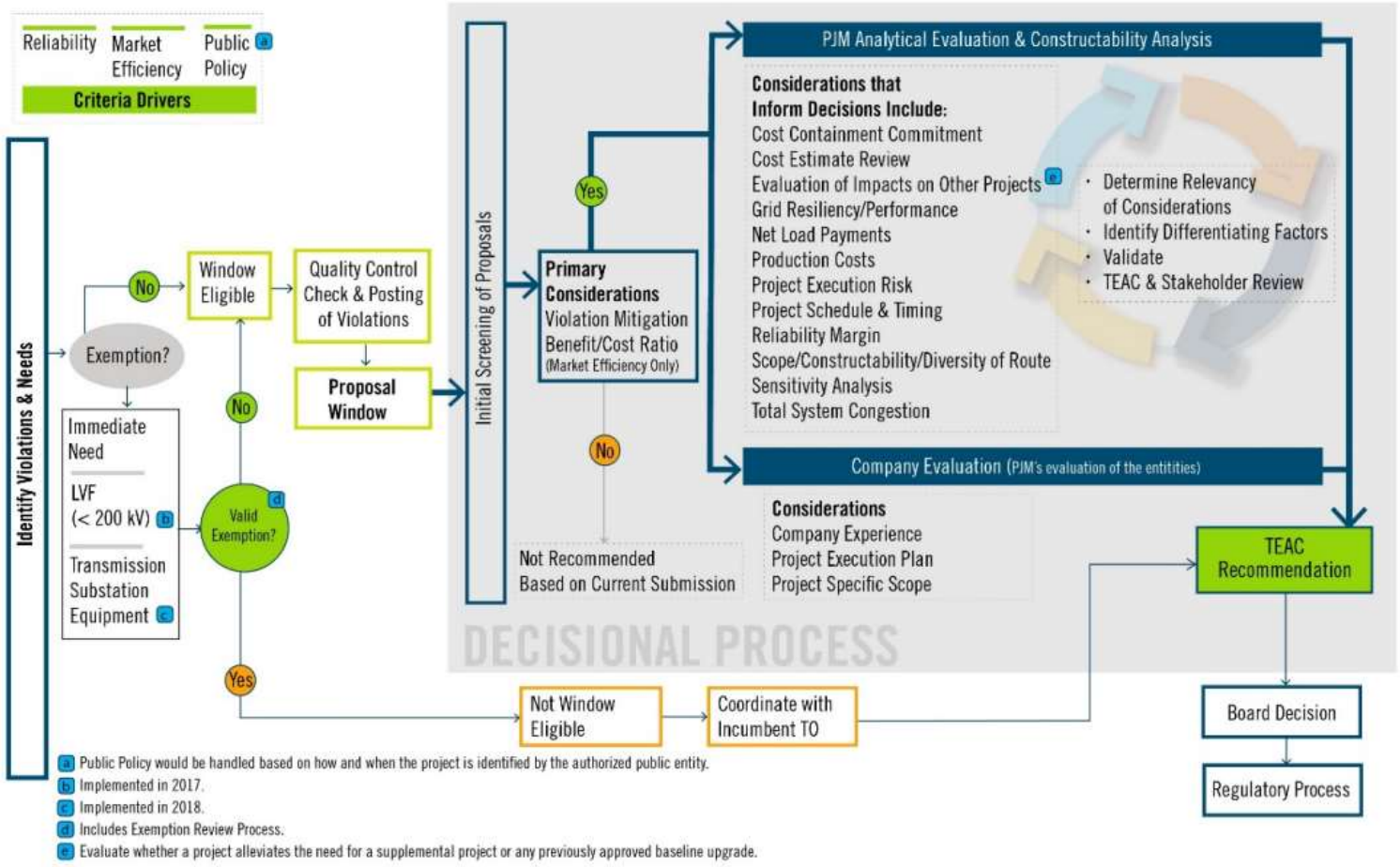
Market Efficiency Analyses

- ✓ Congestion relief as proposed?
- ✓ Meet established 1.25:1 benefit-to-cost metric?

Public Policy Analyses

- ✓ Ability to satisfy public policy objectives (e.g., renewable energy delivery)

Decisional Process



Recent Proposal Window Updates

- ✓ Proposal Fees & Non-Refundable Deposits
  - Fees only apply to a proposing entity who indicates their intention to be the Designated Entity for the competitive project
    - Proposals with cost estimates > $5M → $5,000 deposit
  - The Designated Entity will be responsible for actual costs incurred by PJM to evaluate project submittal
    - Non-refundable deposits will be credited toward actual costs incurred by PJM
    - Each proposal will be invoiced and payment is due within 15 days
    - PJM may utilize third-party consultants to perform additional analysis required to evaluate the proposal, and will invoice the estimated cost of the third-party consultant
  - Operating Agreement 1.5.8 (c)

Proposal Window Status

	2020 RTEP Proposal Window 1	2020 RTEP Proposal Window 2	2020 RTEP Proposal Window 3	2020 RTEP Proposal Window 4	2020/21 Long-Term Window 1	2021 SAA Proposal Window to Support NJ OSW	2021 RTEP Proposal Window 1	2021 RTEP Proposal Window 2	2021 RTEP Proposal Window 3
Window Open	7/1/2020	7/1/2020	9/18/2020	3/3/2021	1/11/2021	4/15/2021	7/2/2021	11/3/2021	11/3/2021
Window Close	8/31/2020	7/31/2020	10/19/2020	4/2/2021	5/11/2021	9/17/2021	8/31/2021	1/12/2022	12/8/2021
Objective	2025 RTEP	2025 RTEP	2025 RTEP	2025 RTEP	Market Efficiency Congestion, 15 Year Reliability Analysis	Support NJ OSW	2026 RTEP	2026 RTEP	2026 RTEP
Flowgates	207	1	48	1	4	N/A	577	2	3
Proposals	47	1	2	13	34	79	57	10	3
Proposal From Incumbents	43	1	1	13	26	41	35	4	3
Proposal From Non-Incumbent	4	0	1	0	8	38	22	6	0
Entities	8	1	2	5	8	13	10	3	1
Cost Range	$1.1M - $88.9M	$7.6M	$12.9M-$21.1M	$7.1M-$20.7M	$620K-$129M	$384k - $7.18B	$600k-$136M	$4.8M - $62.67M	$4.2M - $12.956M

- 2022 RTEP Proposal Window 1
- 2022 Multi-Driver Window
- 2022/2023 Long-Term Window 1

Cost Allocation

- Cost allocation rule and procedures
  - FERC set general cost allocation requirements for new transmission investments in Order 1000
    - Commensurate with benefits
  - PJM tariff and manuals describe detailed methodology
    - PJM tariff Schedule 12

      *Baseline reliability, market efficiency and multi-driver system enhancements
    - Manual M14A & M14B
- PJM responsibilities
  - PJM staff develops allocations based on tariff and manual procedures
  - PJM Board approves allocations
  - PJM files allocations with FERC (baseline upgrades only)

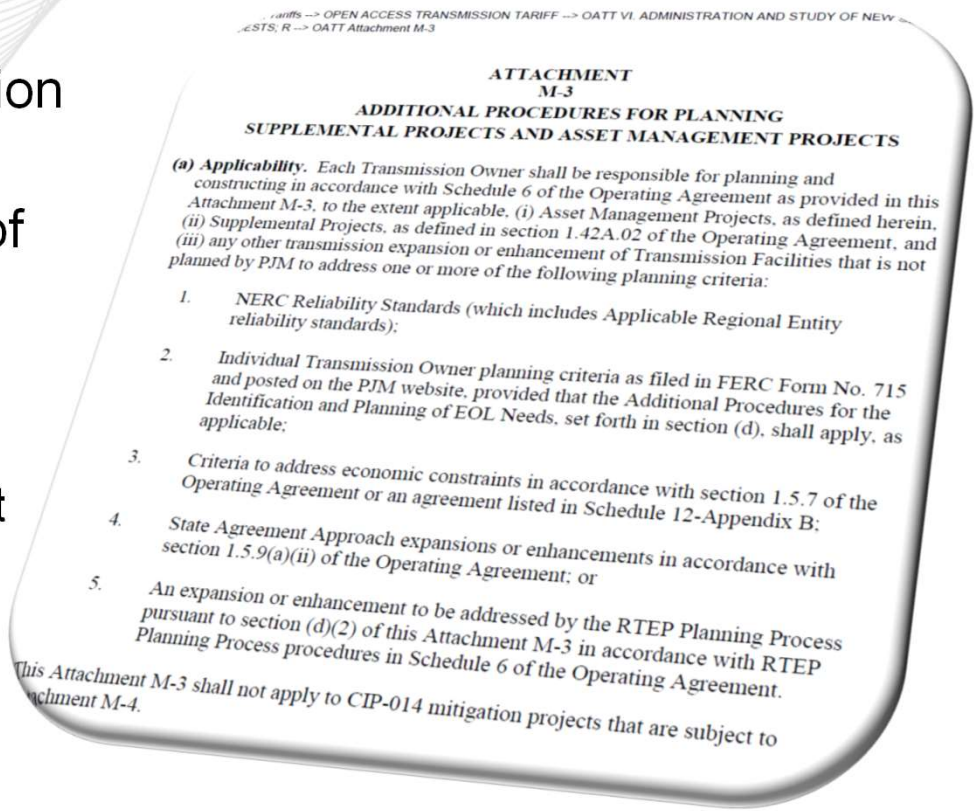
Supplemental Projects & the M3 Process

What are Supplemental Projects?

- Transmission expansion or enhancements driven by Transmission Owner (TO) identified needs
  - Example: Transmission facilities reaching end of their useful life.
- They are not needed to comply with PJM reliability, operational performance, FERC Form No. 715, economic criteria or State Agreement Approach projects
- Supplemental project drivers are “supplemental” to Operating Agreement specified criteria

Attachment M-3

- "Attachment M-3" refers to location within PJM's Open Access Transmission Tariff (OATT)
- Outlines procedures for the planning of Supplemental Projects
  - Applicability
  - Definitions
  - Procedures for Review of Attachment M-3 Projects
  - Additional Procedures for the Identification and Planning of EOL Needs
  - Modifications



...ariffs --> OPEN ACCESS TRANSMISSION TARIFF --> OATT VI. ADMINISTRATION AND STUDY OF NEW ...
...ESTS; R --> OATT Attachment M-3

ATTACHMENT
M-3
ADDITIONAL PROCEDURES FOR PLANNING
SUPPLEMENTAL PROJECTS AND ASSET MANAGEMENT PROJECTS

(a) Applicability. Each Transmission Owner shall be responsible for planning and constructing in accordance with Schedule 6 of the Operating Agreement as provided in this Attachment M-3, to the extent applicable, (i) Asset Management Projects, as defined herein, (ii) Supplemental Projects, as defined in section 1.42A.02 of the Operating Agreement, and (iii) any other transmission expansion or enhancement of Transmission Facilities that is not planned by PJM to address one or more of the following planning criteria:

1. NERC Reliability Standards (which includes Applicable Regional Entity reliability standards);

2. Individual Transmission Owner planning criteria as filed in FERC Form No. 715 and posted on the PJM website, provided that the Additional Procedures for the Identification and Planning of EOL Needs, set forth in section (d), shall apply, as applicable;

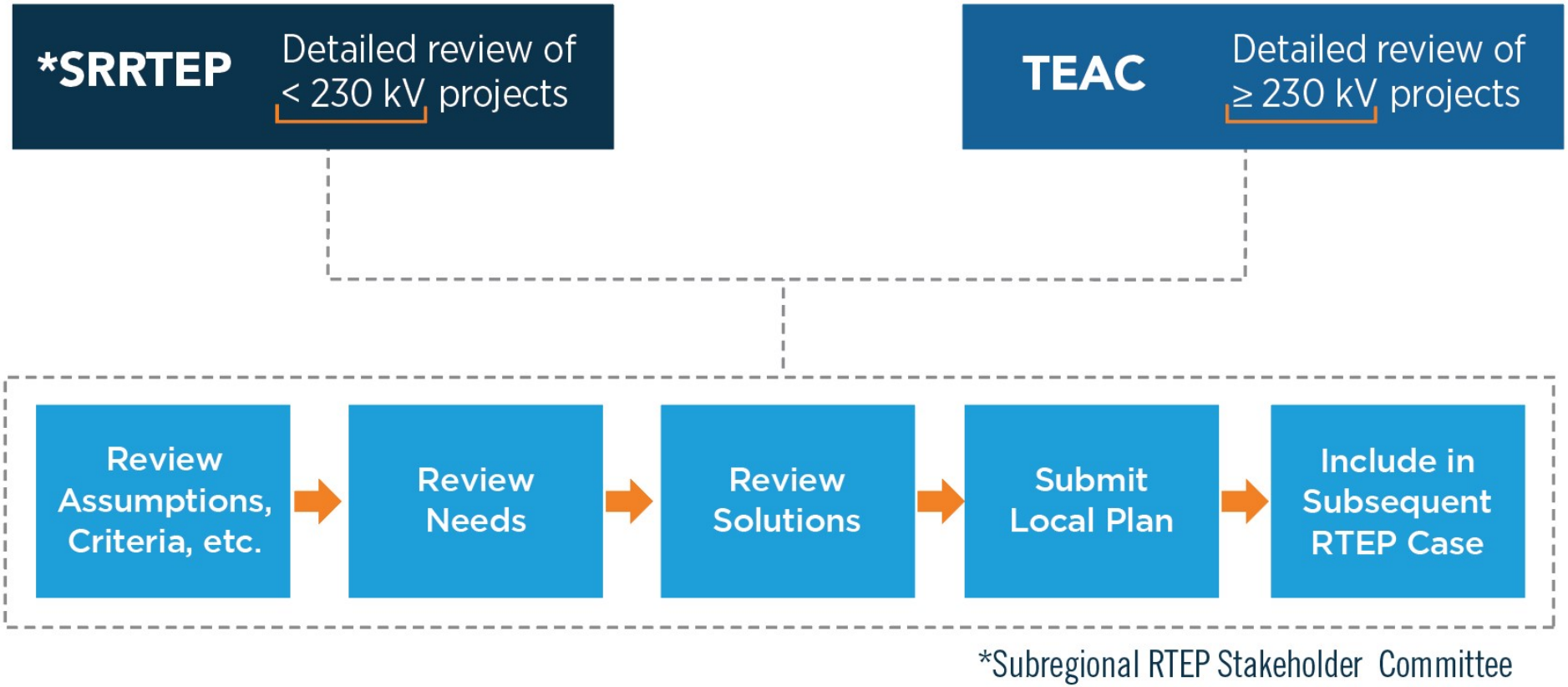
3. Criteria to address economic constraints in accordance with section 1.5.7 of the Operating Agreement or an agreement listed in Schedule 12-Appendix B;

4. State Agreement Approach expansions or enhancements in accordance with section 1.5.9(a)(ii) of the Operating Agreement; or

5. An expansion or enhancement to be addressed by the RTEP Planning Process pursuant to section (d)(2) of this Attachment M-3 in accordance with RTEP Planning Process procedures in Schedule 6 of the Operating Agreement.

This Attachment M-3 shall not apply to CIP-014 mitigation projects that are subject to ...chment M-4.

Attachment M3 Process for Supplemental Projects



*Subregional RTEP Stakeholder Committee

Primary Supplemental Project Drivers

Customer Service	Provide service to new and existing customers; interconnect new customer load; address distribution load growth, customer outage exposure, equipment loading, etc.
Equipment Material Condition, Performance and Risk	Address degraded equipment performance, material condition, obsolescence; end of the useful life of equipment or a facility; equipment failure; employee and public safety; environmental impact.
Operational Flexibility and Efficiency	Optimize system configuration, equipment duty cycles and restoration capability; minimize outages.
Infrastructure Resilience	Improve system ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event, including severe weather or geomagnetic disturbances.
Other	Meet objectives not included in other definitions such as, but not limited to, technological pilots, industry recommendations, environmental and safety impacts, etc.

Contact

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