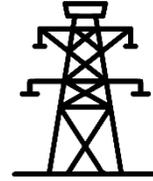
A white outline map of the PJM (Piedmont and Jersey) region is shown against a black background. The region, including parts of Pennsylvania, Maryland, Delaware, Virginia, West Virginia, and North Carolina, is filled with a solid yellow color. A large yellow rectangular box is overlaid on the left side of the map, containing the title text.

# Improving Transmission Planning in PJM

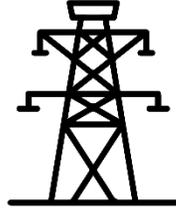
**Cullen Howe**  
**Sam Gomberg**  
March 29, 2022

# Effective long-term planning is critical to address multiple drivers



- The majority of PJM members, states, and consumers have clean energy and/or decarbonization commitments
- System reliability requires being responsive to these commitments by incorporating them into the planning process
- Climate change impacts also necessitate sound planning and investments to maintain system resilience and reliability

# Costs of inaction > Risks of action



- Building transmission carries risks, but not building necessary transmission carries higher risks
- Simply extrapolating the status-quo can become untenable during periods of major change
- Potential impacts of planning not keeping pace with change: reduced resilience, threatened reliability, unnecessarily high consumer costs, failure of member states and utilities to meet clean energy commitments

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## **Scenario-based planning principles**

- Planning should seek to identify projects that serve multiple scenarios, preparing for a wide range of future conditions
- Base case is not “status quo” case and must account for changes to load and generation that are reasonably likely to occur
- Scenarios must require and account for information regarding likely retirements/new builds

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## **Scenario-based planning principles**

- Discussions should lead to a manageable number of scenarios that account for primary drivers/trends and represent a range of possible future conditions
- Scenarios and their modeling identify system needs/issues as generation and load evolve
- Scenarios supplement and inform continued existing system assessments of granular needs

# Criteria for scenario planning are the possible range of supply & demand drivers

- **Supply side:**



- Public and private clean energy goals
- Retirements
- Changing economics

- **Demand side:**

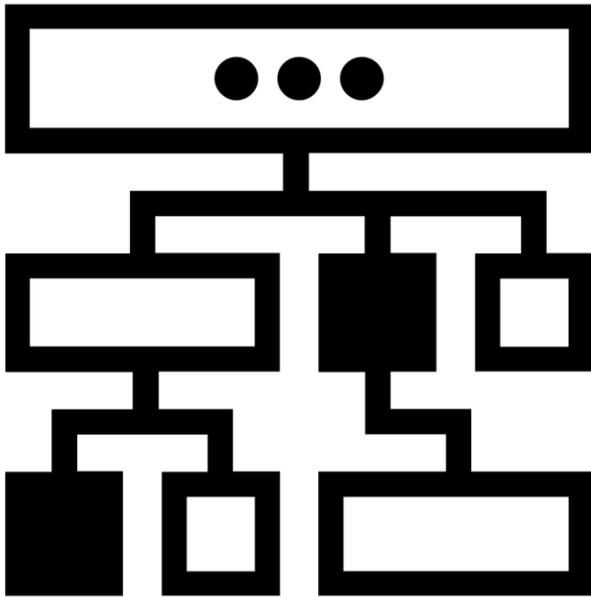


- Electrification of building and transportation sectors
- Shifts in industrial use patterns
- Adoption of demand-shifting DERs

## Scenario differences across timeframe

- Generally, scenarios should include the same *categories* of supply and demand drivers
- The differences between scenarios should focus on the range of *when* shifts in generation and load will occur and the potential *intensity* of the shift
  - Ex: How much of a 100% clean energy by 2040 target will be realized at year 8 (70%) vs year 15 (90%)
- Scenarios should enable the identification of a “least regrets” portfolio of projects that serve a range of scenarios and outcomes

# Using probabilistic methods and scenarios

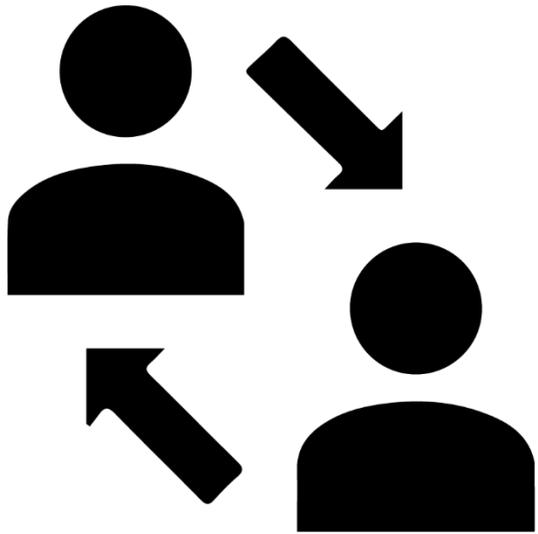


- Uncertainty remains in a deterministic approach
- PJM presently uses probabilistic load forecasts
- Modeling with scenarios is a means to evaluate options that may serve more than a single predicted future
- Decisions on transmission should prepare PJM for a range of probable outcomes

# The role of the queue in long-range planning

- Interconnection queue should inform long-range planning but planning must look out beyond projects already in the queue
- Closer coordination with stakeholders and states will help identify additional drivers and the resource mixes that can best meet system needs over the planning horizon
- High-renewable penetration/deep decarbonization scenarios can use generator expansion modeling to identify economic and geographic patterns of ongoing resource development

# The role of stakeholders



- Early and regular coordination with FERC, states, and stakeholders is critical for planning success and dramatically reduces litigation risk
- Respecting state policy differences does not mean ignoring the clean energy policy drivers of PJM member states
- Bringing in relevant state and federal permitting agencies into the process early will help streamline project approval

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