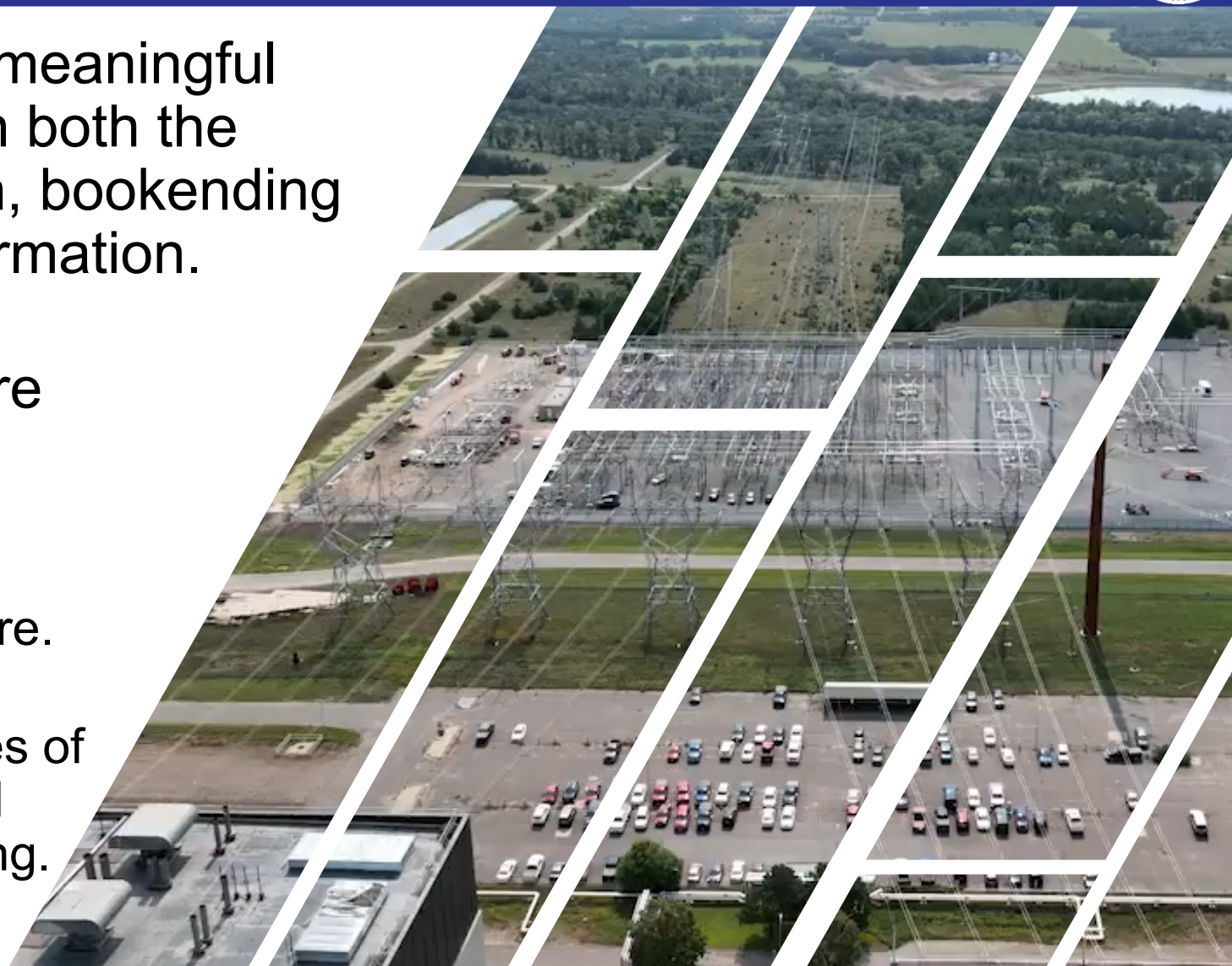
# Scenario Development in PJM

Illinois Commerce Commission
Transmission Expansion Advisory Committee
September 24, 2024

# Scenario Objectives

- PJM scenarios should capture a meaningful range of conditions that align with both the energy transition and load growth, bookending from conservative to high transformation.
- The goal is to develop scenarios that capture a range of likely future outcomes.
  - This is an opportunity to explore transmission needs given current understandings of the potential future.
  - We should not hesitate to have scenarios that are at the outer edges of what is plausible to fully understand the scope of the issues we are facing.



# Scenario Development

- Midcontinent Independent Systems Operator(MISO) Futures are a good example of scenario development
- The MISO Futures at a minimum include:
  - State and federal laws and regulations and integrated resource plans are fully met.
  - State, local, utility goals are met at 85 % of their respective levels.
  - Decarbonization assumption is 40% and calculated to avoid double counting.
  - Existing economic factors drive additional generation and load estimates.
  - Electrification of vehicles increases at small rate.
- The scenarios metrics increase from these initial assumptions.

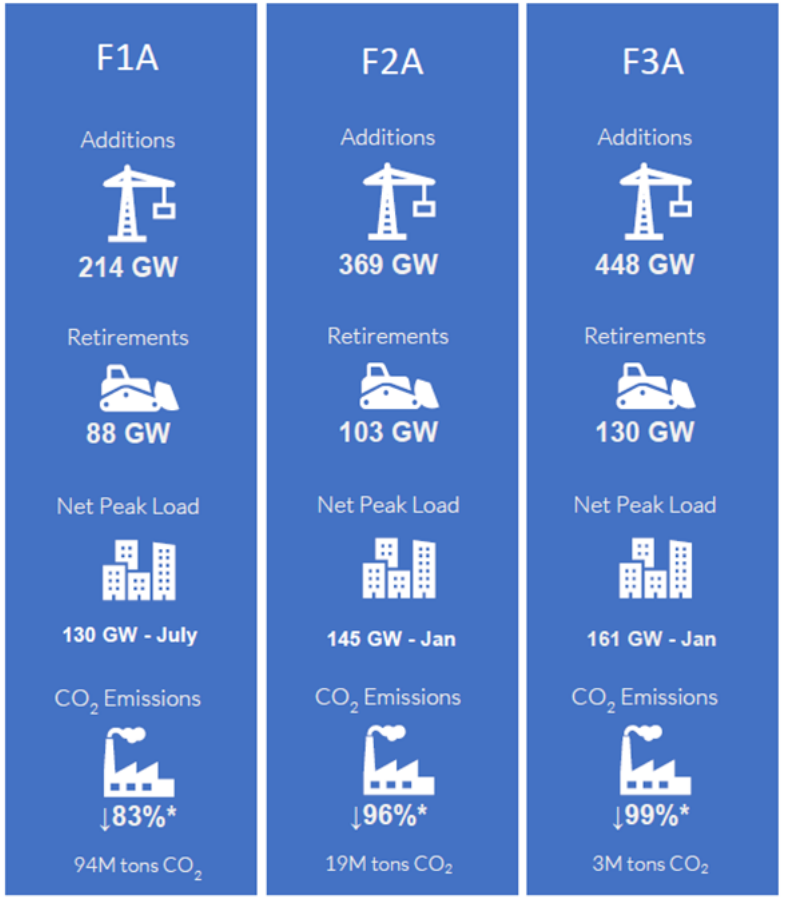



Figure 2: Summary of Future Scenario Impacts (Dec 31, 2042)

# Future Load Estimates

- Electrification will create more demand on the system and thereby increase transmission needs.
  - Scenarios must reflect an increasing reliance on electricity over a 20-year horizon.
- Load growth assumptions should include:
  - Electrification from electric vehicles, home heating, and industrial processes.
  - Data centers and artificial intelligence.
  - Potential impact of distributed energy resources.
  - Winter and summer peaking scenarios.
  - The role of energy efficiency and demand response.
  - Impact, including timing, of Inflation Reduction Act incentives and state incentives.

# Future Load Growth

- PJM should develop scenarios that reflect three different levels of energy growth over a 20-year period.
  - MISO Futures Report (April 2021) included these load growth assumptions:

| Low | Moderate | High |
|---|---|---|
| 1% or Less Load Growth | 30% Load Growth | 50% Load Growth |

# Changes in Generation

Scenarios must reflect estimates of new generation, including newer types of generation and emerging technologies, and anticipated retirements.

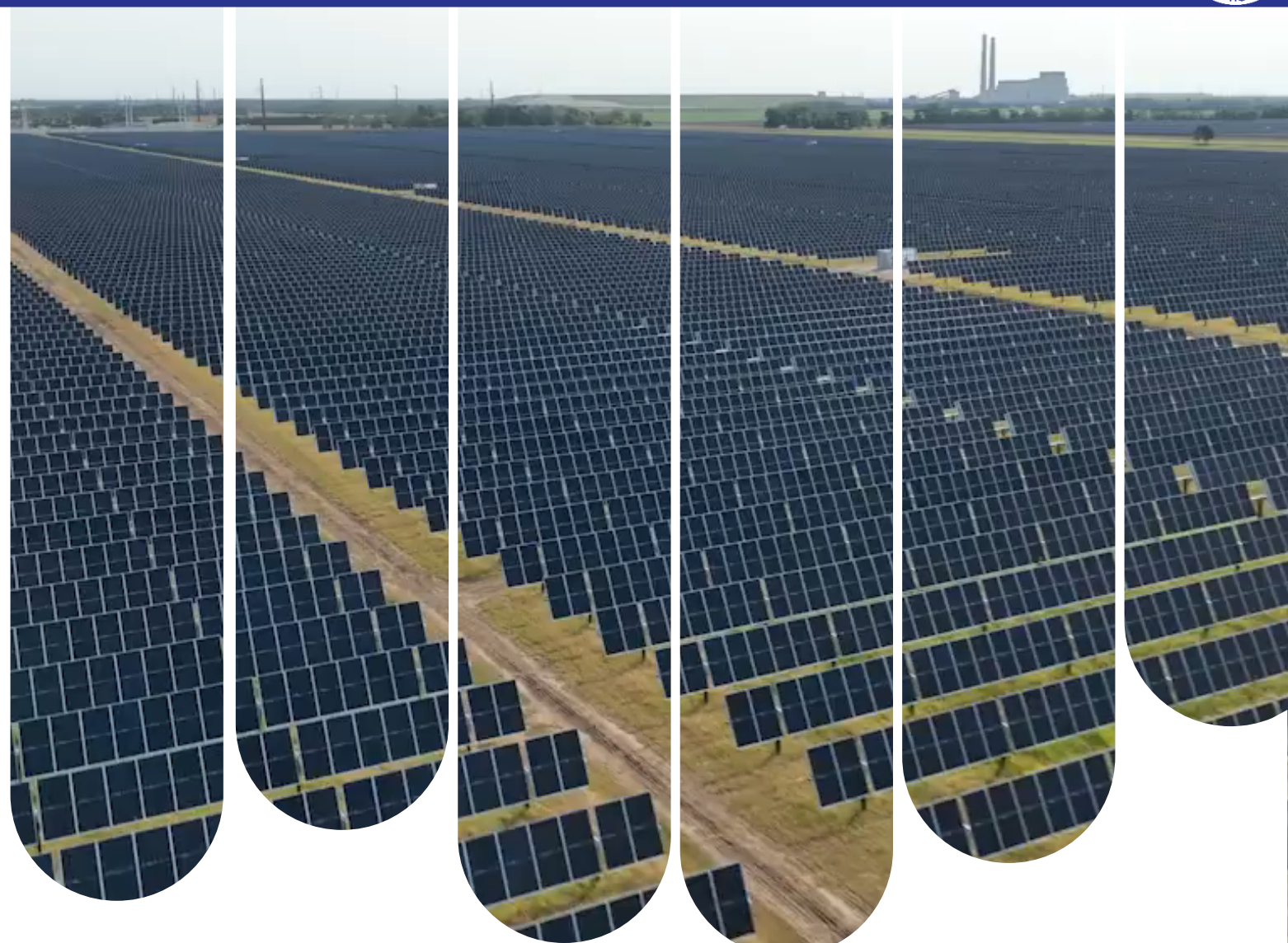
# New Generation

- Scenario planning should reflect a plausible mix of new resources needed to meet policy objectives while maintaining reliability.
- Emerging technologies that may become commercially viable should be considered.
- Resource planning in the scenarios should look beyond interconnection queue.
  - State and federal policies
  - Utility integrated resource plans
  - Corporate goals

# New Generation

Scenarios should be sensitive to siting.

- Scenarios should recognize siting limitations.
- Scenarios should identify resource-rich zones within states and optimize development of resources that would benefit from being located there.

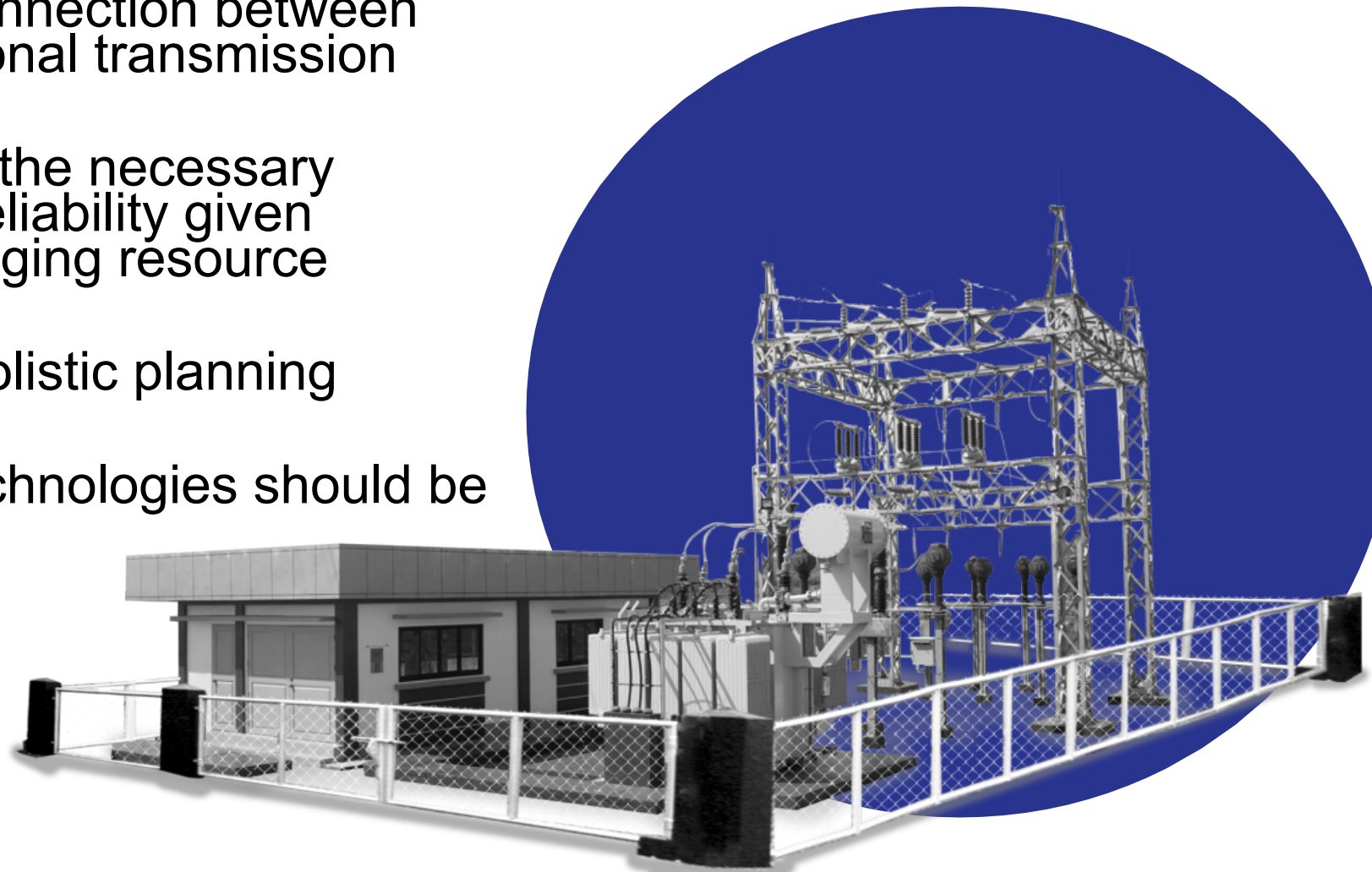


# Retirements

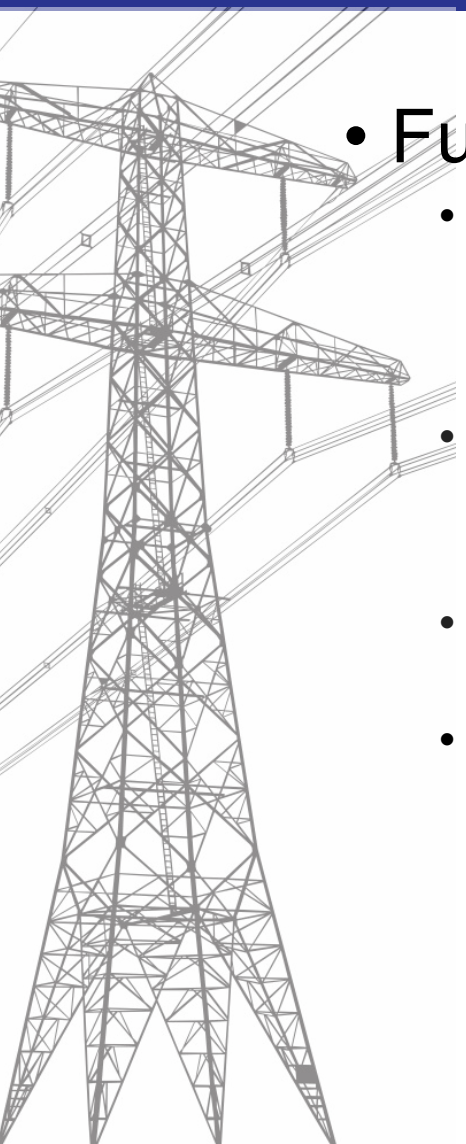
- PJM should consider more than announced retirements when planning.
  - Across scenarios, PJM should increase its assumptions about thermal retirements reflective of current policy requirements and market trends.
  - For each generation type, PJM should examine if new technologies will allow an extension of their life (e.g., carbon capture/carbon sequestration) or uprating (e.g., current nuclear facilities) and incorporate them according to feasibility.
  - It is important that PJM explain its retirement assumptions for each resource class.

# Additional Factors to Consider

- Scenario planning should directly consider the impact of improved interconnection between PJM and neighboring regional transmission operators.
- Scenarios should address the necessary transmission to maintain reliability given extreme weather and changing resource fleets.
- Scenarios should reflect holistic planning principles.
- Advanced transmission technologies should be included in scenarios.



# Appendix



- Future Load Growth Studies:
  - Zhou, Ella, and Trieu Mai. (2021) *Electrification Futures Study: Operational Analysis of U.S. Power Systems with Increased Electrification and Demand-Side Flexibility*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-79094. https://www.nrel.gov/docs/fy21osti/79094.pdf.
  - Wilson, J. D., & Zimmerman, Z. (2023). *The Era of Flat Power Demand is Over.* Grid Strategies. http://gridstrategiesllc.com/wp-content/uploads/2023/12/National-Load-Growth-Report-2023.pdf
  - North American Electric Reliability Council (2023) *2023 Long-Term Reliability Assessment* *NERC 2023 LTRA*
  - Mai, Trieu, Paige Jadun, Jeffrey Logan, Colin McMillan, Matteo Muratori, Daniel Steinberg, Laura Vimmerstedt, Ryan Jones, Benjamin Haley, and Brent Nelson. 2018. *Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-71500. https://www.nrel.gov/docs/fy18osti/71500.pdf