PLANNING CHALLENGES AND NEEDS FROM A UTILITY PERSPECTIVE

INTEGRATING ECONOMIC AND RELIABILITY MODELING

Jacob Johnson – Transmission Economic Analyst – Integrated System Planning

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Xcel Energy®

WHAT WE SEE TODAY

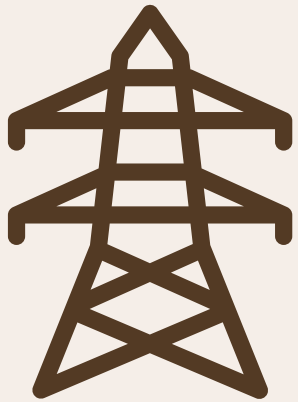
Fragmented workflows between economic and reliability planning

- Transmission planning relies on disconnected modeling frameworks
- These models are typically run sequentially—not cohesively
- Results can be directionally aligned but not consistently reconciled

GROWING RELIANCE ON MODELS FOR INVESTMENT DECISIONS

Increasing complexity and stakes in transmission planning

- Planning decisions increasingly depend on model-driven insights
- Drivers of complexity:
  - *Load growth (data centers, electrification)*
  - *Renewable integration and variability*
  - *Congestion and corridor limitations*
- Need to evaluate:
  - *Multiple portfolios*
  - *Long-term scenarios*
  - *Hourly system conditions (8760)*
- Models inform high-cost, long-lived infrastructure decisions
- Accuracy and credibility are critical



2026-2030 Capital Forecast

$60 billion total capital investment

~7,500 MW renewable generation

~3,000 MW natural gas generation

~1,900 MW energy storage

~1,500 new transmission line miles

~$5 billion for wildfire mitigation

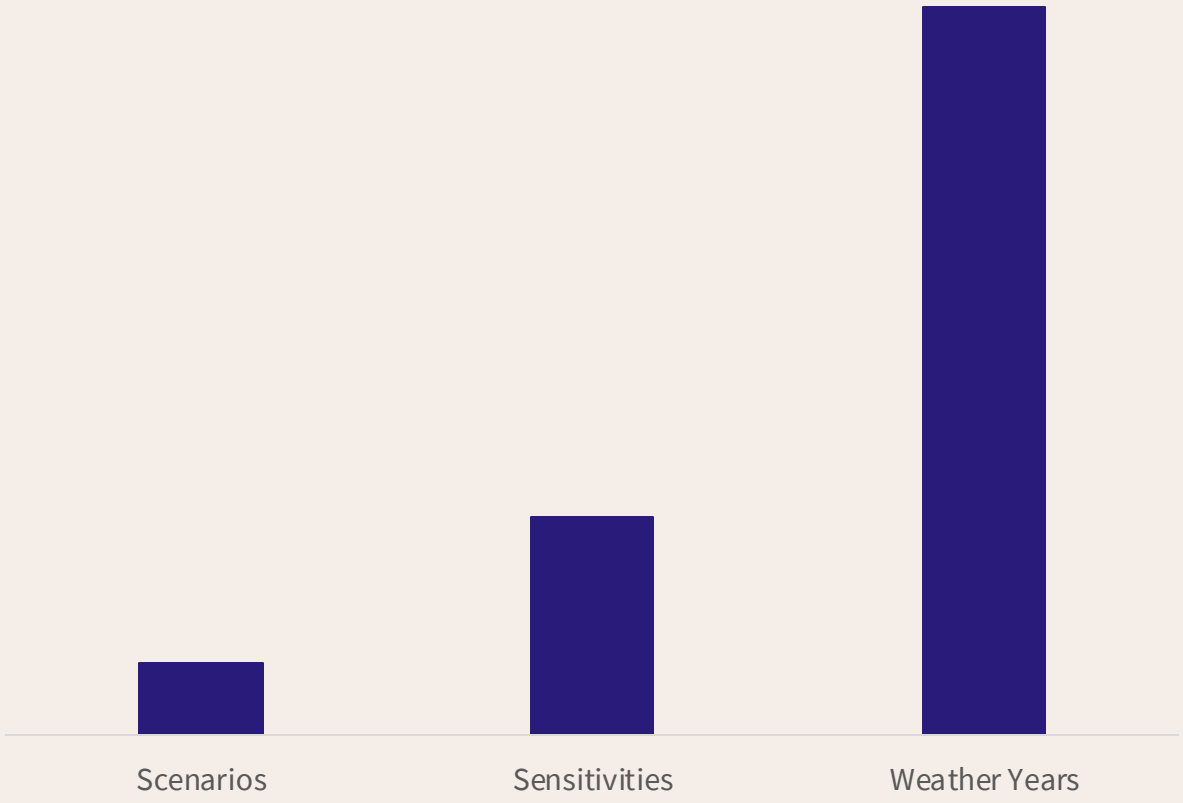
MODELING DISCONNECTS AND GAPS

Misalignment between economics and system reliability

	PCM	Reliability
Temporal	Full-year chronological	Limited snapshots
Network Representations	Simplified DC	Detailed AC
Timeframe Selection	Identifies critical or extreme conditions throughout a year	Single hour snapshots are selected
Computational Barries	Consecutive years are not ran	All hours are not scalable
Workflow	Ran separately with manual workflow	
Result	Potential under- or over-estimation of system constraints and solution value	

SCALING TRANSMISSION PLANNING ANALYTICS

Linking economic and reliability models efficiently at scale



Number of runs by case

Key Capabilities

- Use of automation to identify high-risk conditions
- Improved model integration
- Iterative PCM-power flow workflows across futures
- Stochastic probability analysis
- Scalable computation

Outcome

Enabling more informed, risk-based transmission investment decisions at scale