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Assuring a Reliable BPS through the Expansion of Interregional Transfer Capability: NERC ITCS

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WECC Reliability Assessments Committee
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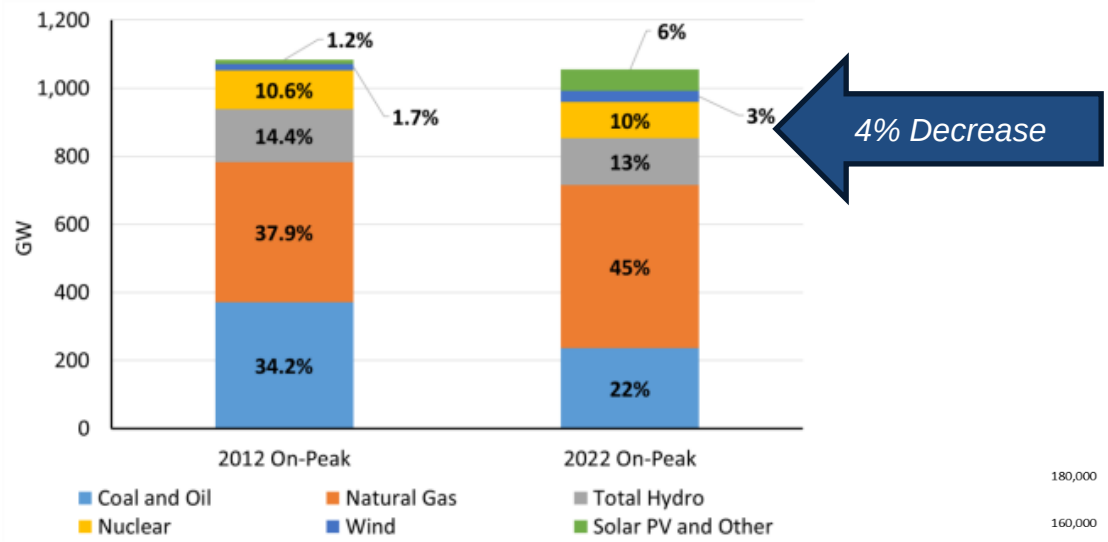
RELIABILITY | RESILIENCE | SECURITY



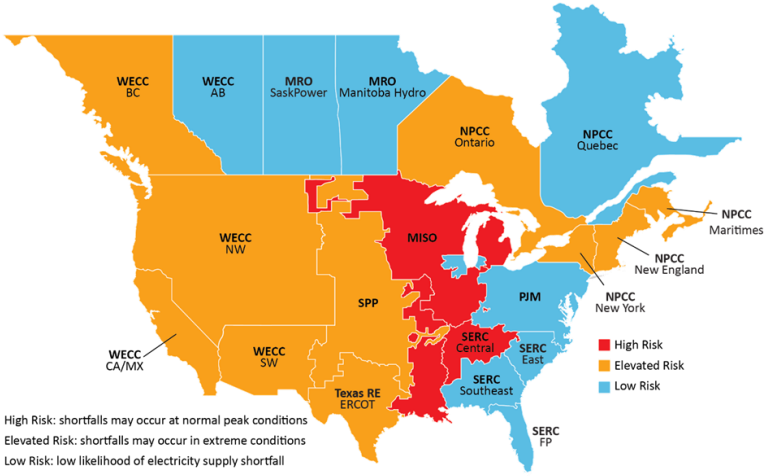

Across an Interconnected System: Less Resources Means More Reliance on Neighbors

2012 and 2022 Peak Capacity Resource Mix NERC-Wide

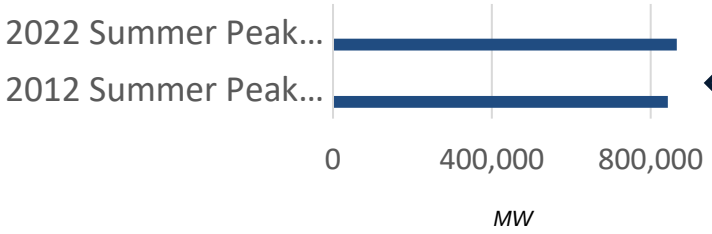


4% Decrease

2024-2033 Risk Areas

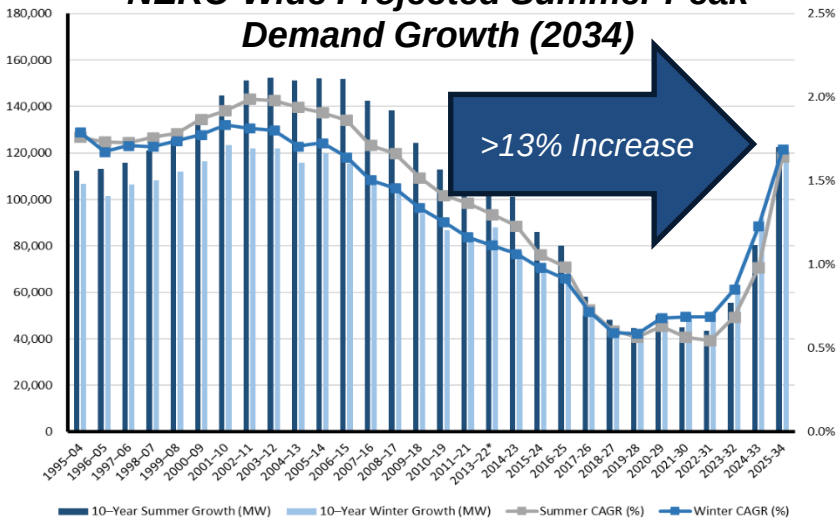


NERC-Wide Summer Peak Demand Changes 2012 and 2022



3% Increase

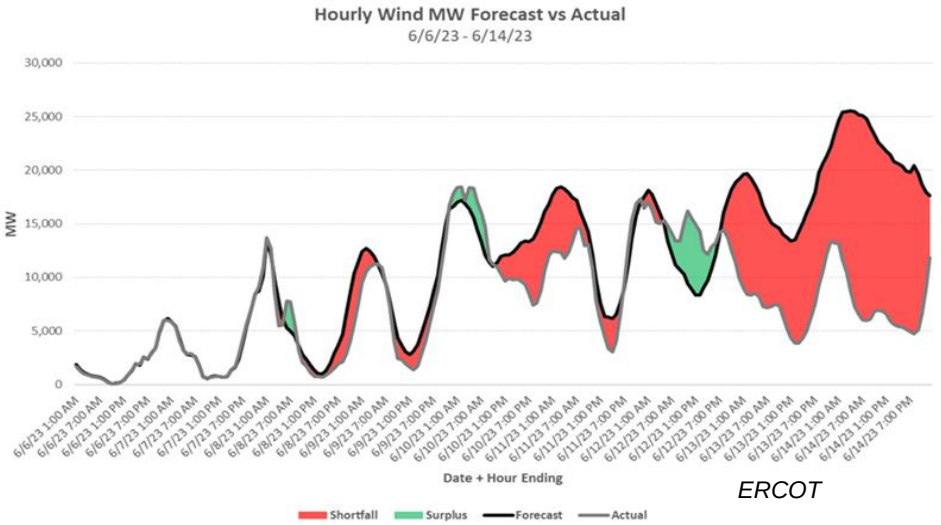
NERC-Wide Projected Summer Peak Demand Growth (2034)



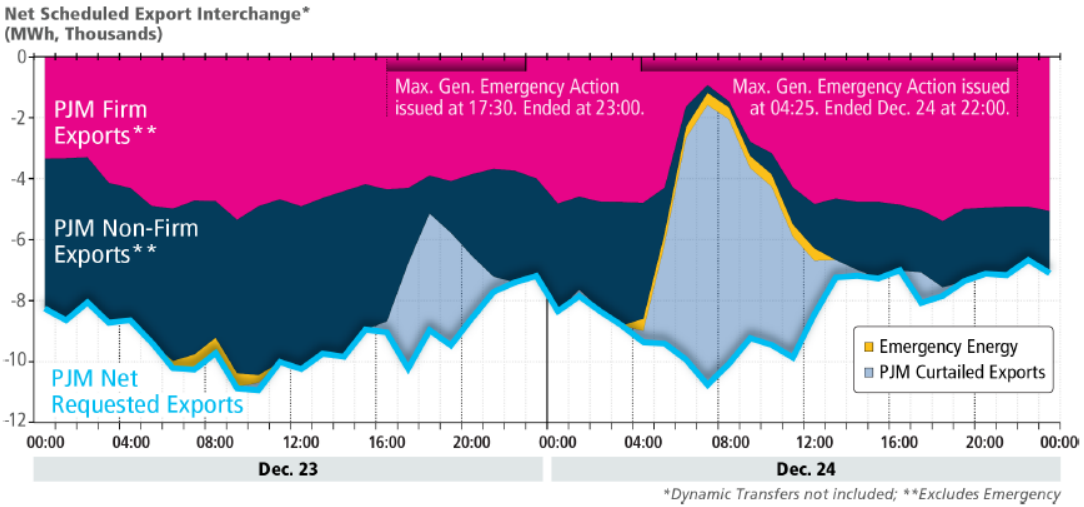
>13% Increase

Recent Examples Highlight Need for Wide-Area Energy Assessments

June 6, 2023: ERCOT, SPP, MISO: *A "wind drought" caused 60 GW of installed wind capacity to generate 300 MW*



ERCOT



December 24, 2022: PJM: *Transmission system during extreme cold weather limited the ability to export to support southern neighbors*

FRA of 2023: Required Study Elements

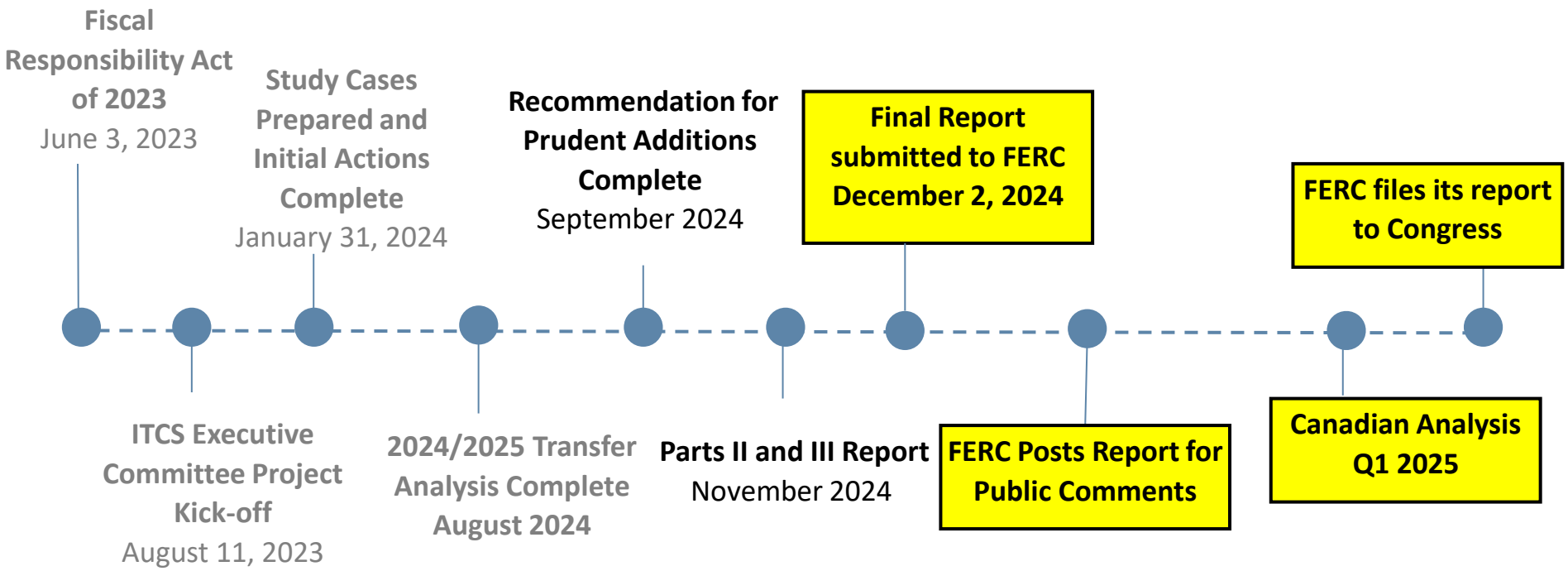
Fiscal Responsibility Act (FRA), Section 322

In consultation with the Regional Entities and transmitting utilities, NERC shall conduct a study containing three elements:

1. **Current total transfer capability,** between each pair of neighboring transmission planning regions.
2. A recommendation of **prudent additions to total transfer capability** between each pair of neighboring transmission planning regions that would demonstrably strengthen reliability within and among such neighboring transmission planning regions.
3. Recommendations on **how to meet and maintain the identified total transfer capability**, together with the prudent recommended additions in #2.

ITCS Timeline Overview

The following is a timeline of upcoming key activities:



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ITCS Study Overview

What the Study is:

- Assessed adequacy of North American interregional transmission system
- Foundational, Groundbreaking Work
- Identifies areas that may suffer energy deficiencies under extreme weather and will benefit from additional transfer capability
- Credible technical analysis, with consistent assumptions, and results that are coordinated with the industry
- Sets the stage for more in-depth studies in future

What the Study is NOT:

- Does not match every planning region's modeling approaches
- Does not prescribe specific projects
- Does not prescribe the "how", but "what" may be needed
- Does not evaluate market-based dispatched, or operational mitigations
- Is not the final step in the process (FERC will request public comments)
- Does not evaluate economics or policy
- A complete planning study

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Transfer Capability Observations and Findings

Varies Widely

- Current transfer capability changes (TTC) as percentage of peak load = 1% to 92% between regions, varying greatly depending on season and online generation dispatch

Transmission May Not Always be a Solution

- New transmission will not always increase transfer capability
- Voltage and dynamic stability limitations will determine how much power can be transferred

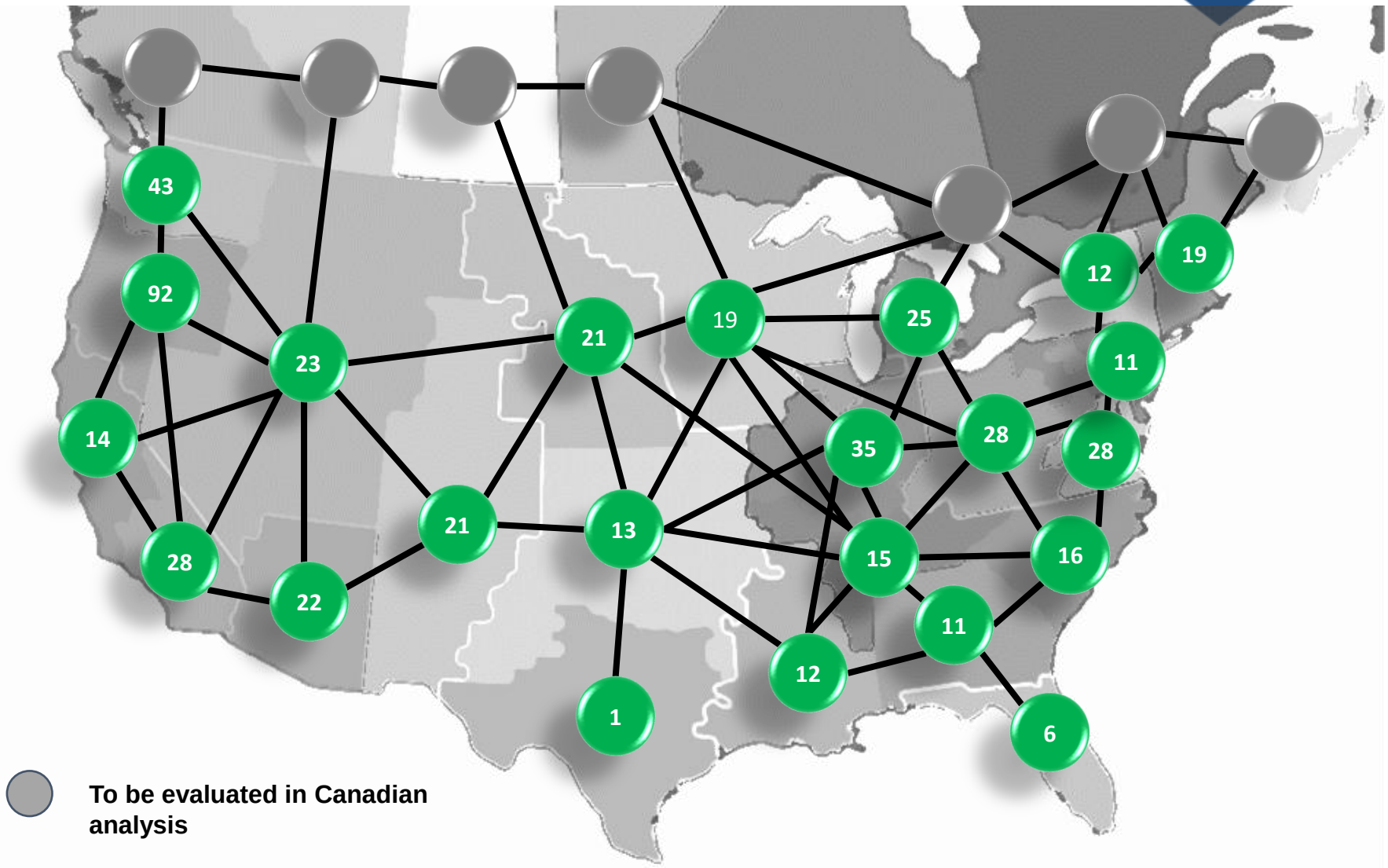
Resource Evaluation Cannot be Overlooked

- Many areas do not have sufficient committed generation to meet demand under extreme conditions (2034)
- Canadian system critical to this evaluation

Higher TTCs Will Require Significant Planning and System-Wide Reinforcements

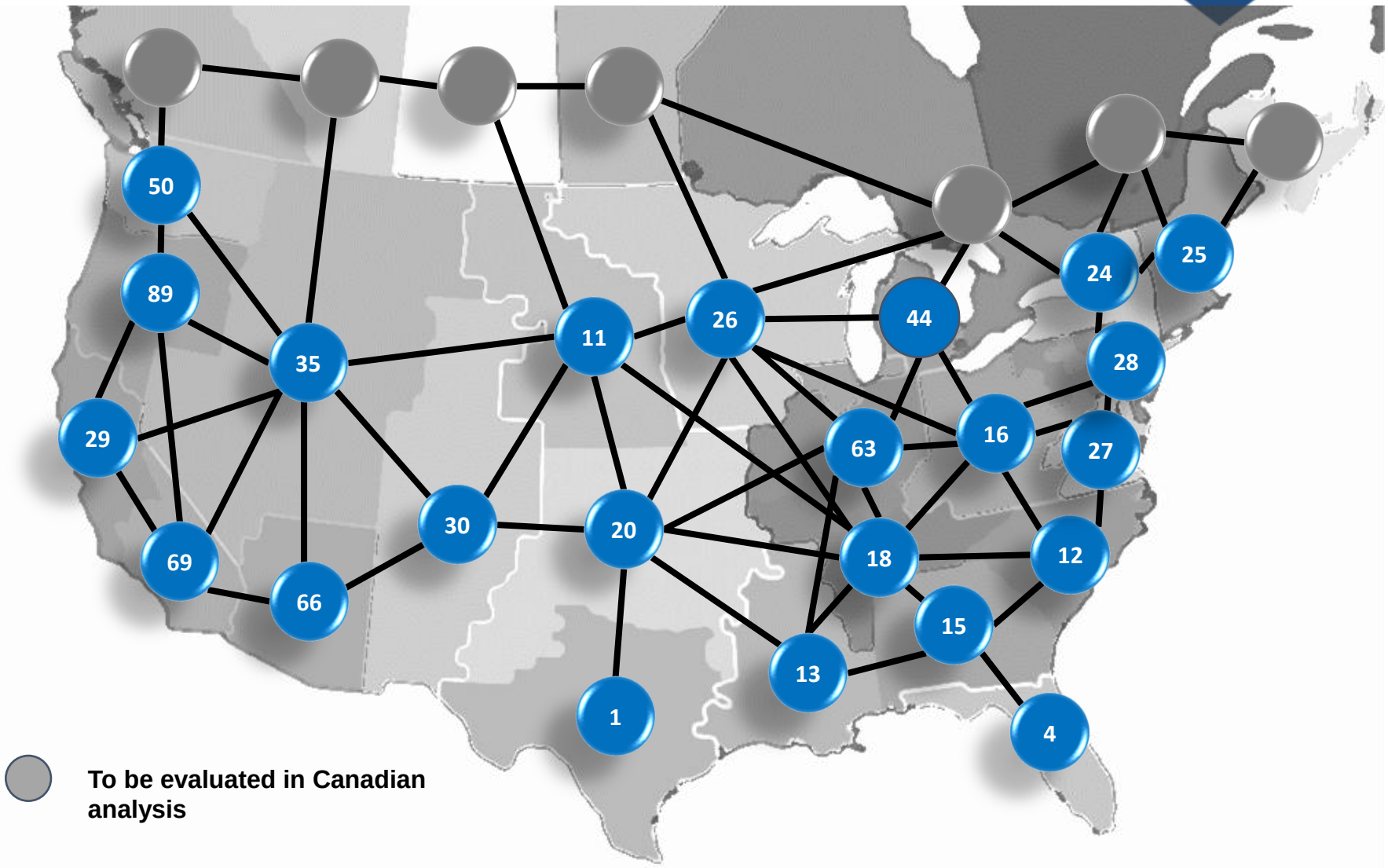
- TTC additions will require more granular stability studies once specific projects are evaluated
- Meaningful TTC additions will not be completed by 2034 without regulatory/legislative changes

Part I Total Import Capabilities as Percentage of 2024 Peak Load (Summer)



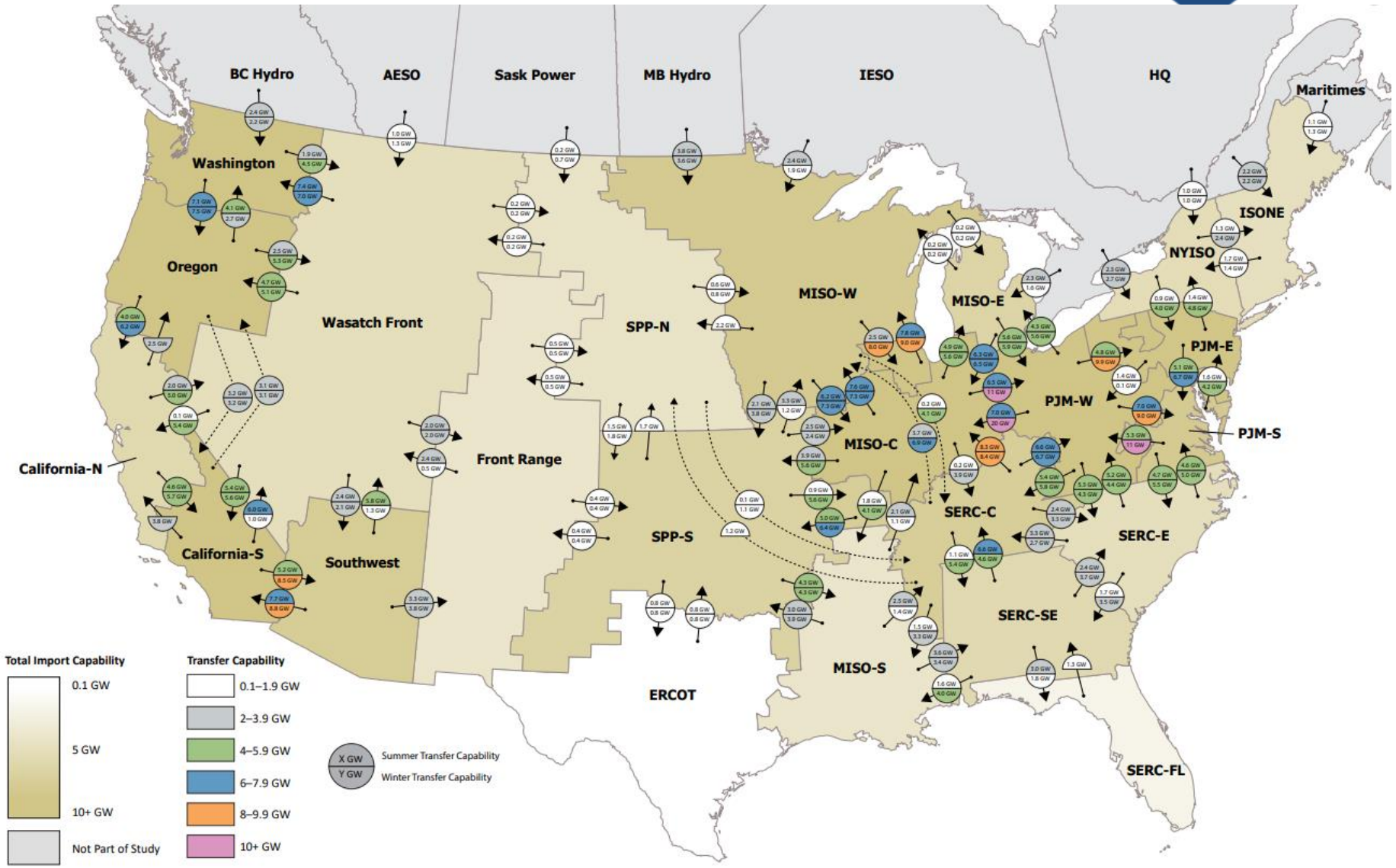
To be evaluated in Canadian analysis

Part I Total Import Capabilities as Percentage of 2024 Peak Load (Winter)

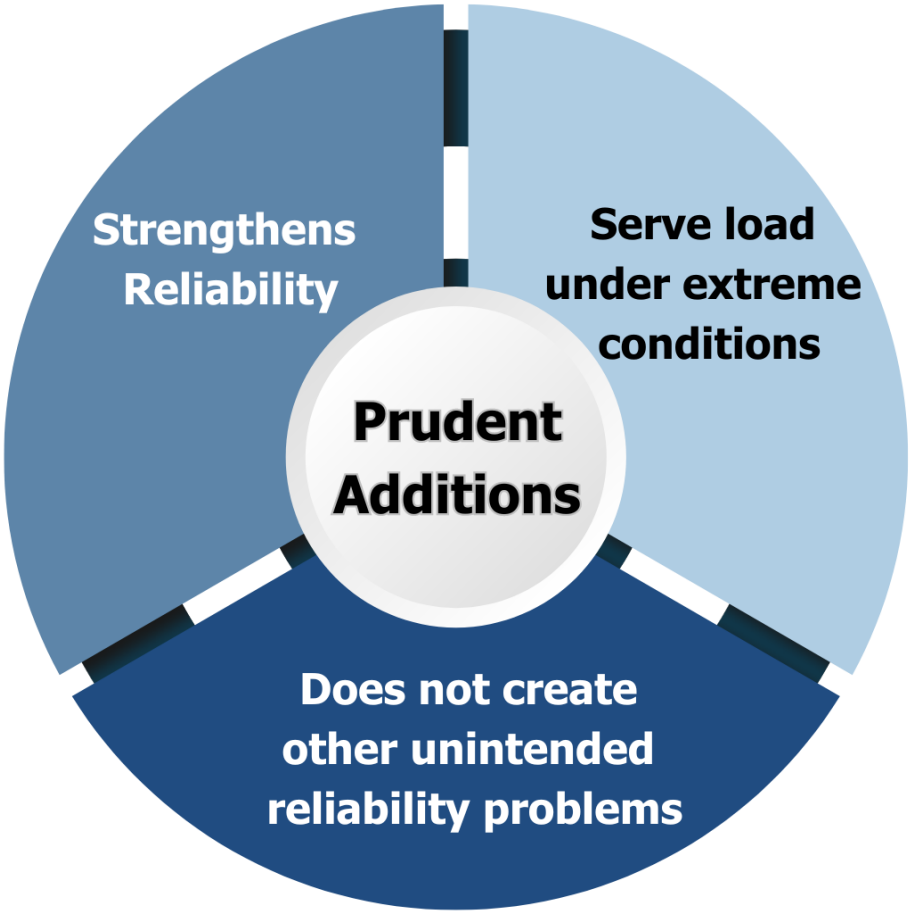


To be evaluated in Canadian analysis

Calculated Transfer Capabilities – 2024/2025 Base Case



What is Technically Prudent Additions to Transfer Capability?



FERC precedent provides that "prudence" means a determination of whether a reasonable entity would have made the same decision in good faith under the same circumstances, and at the relevant point in time.

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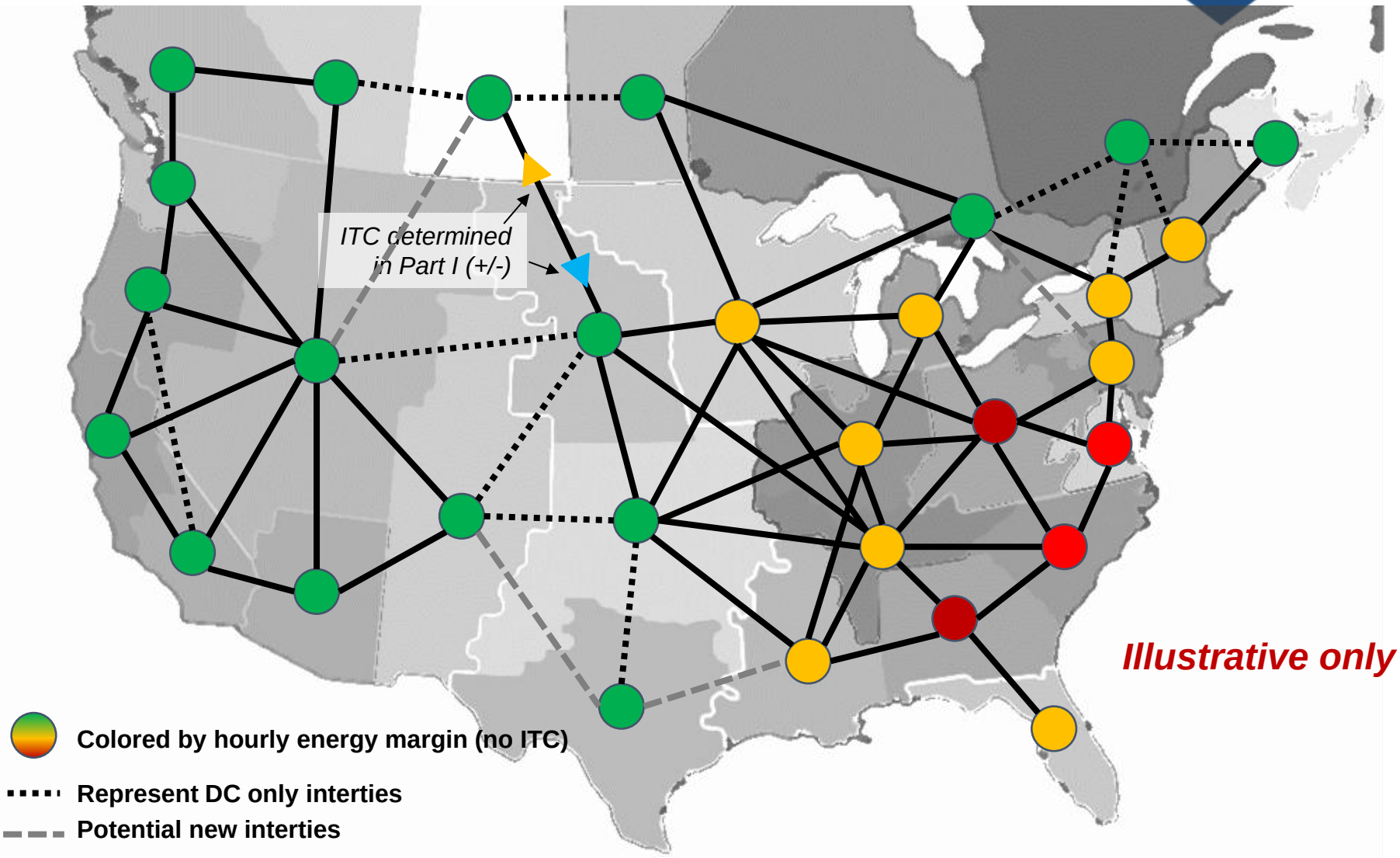
Pipe and Bubble Model



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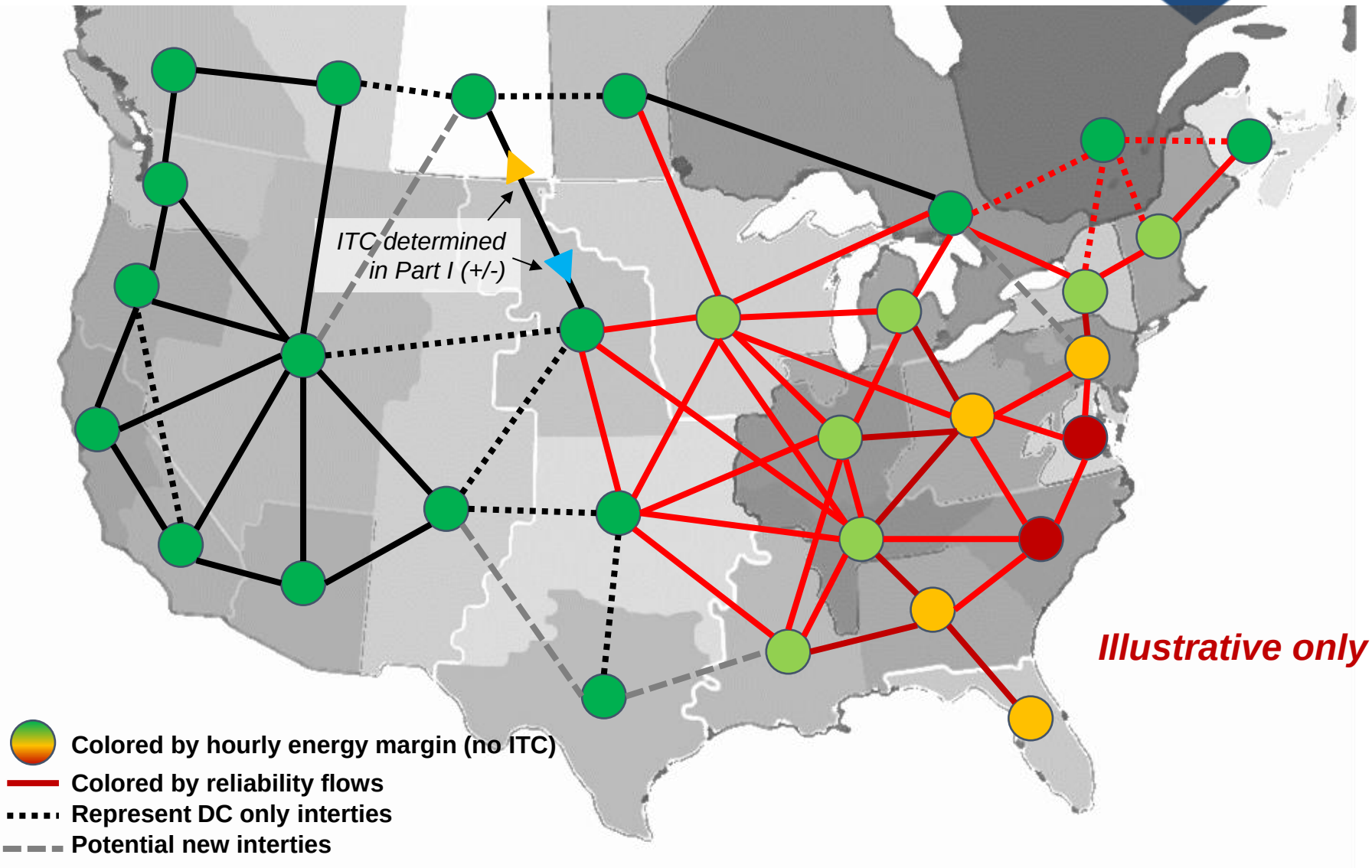
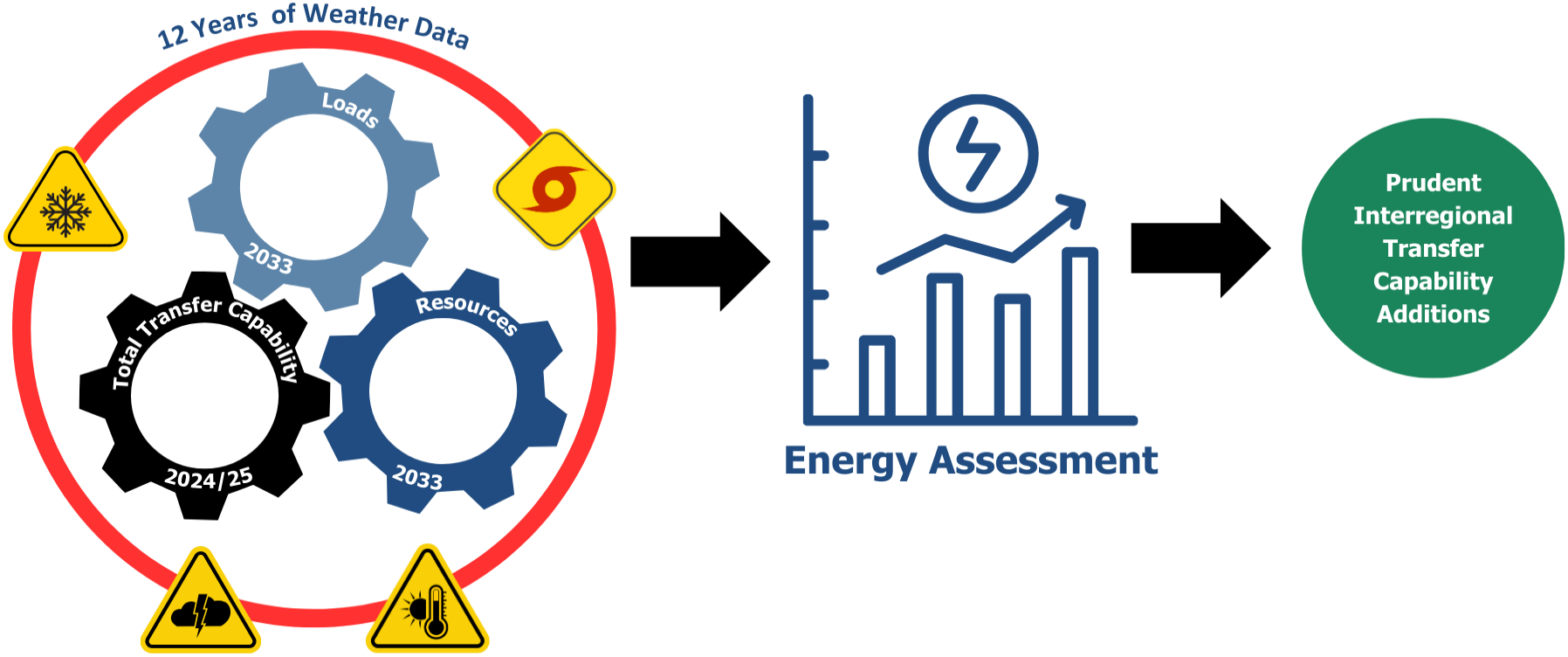
Pipe and Bubble Model



Part II: Prudent Additions Recommendations



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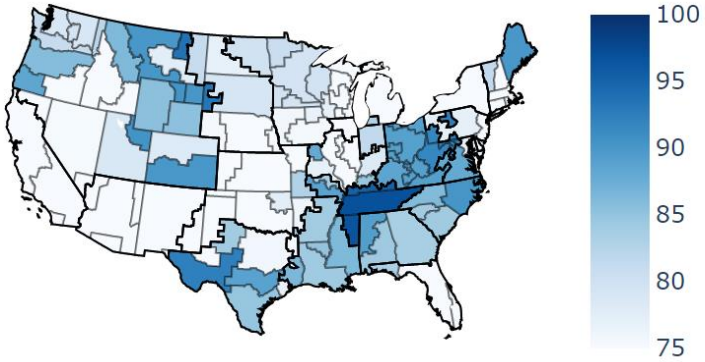
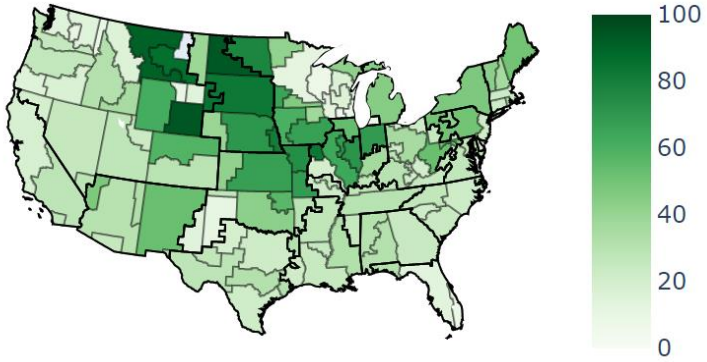
Energy Assessment: Cold Snap Example

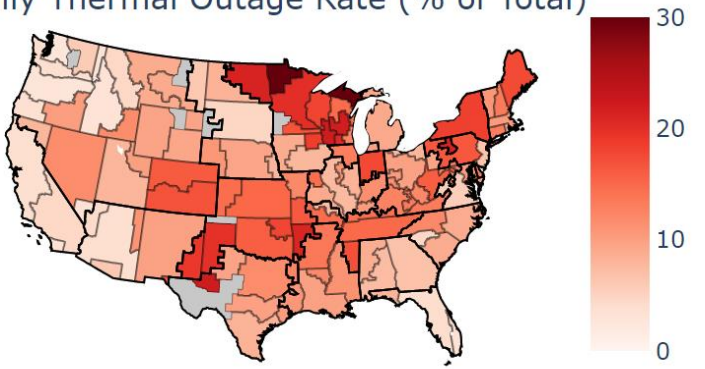
Maximum Daily Load (% of Annual Peak)



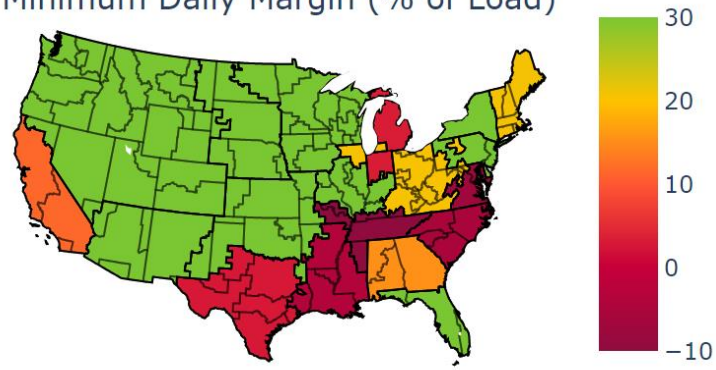
Average Daily Wind & Solar Capacity Factor (%)



Daily Thermal Outage Rate (% of Total)

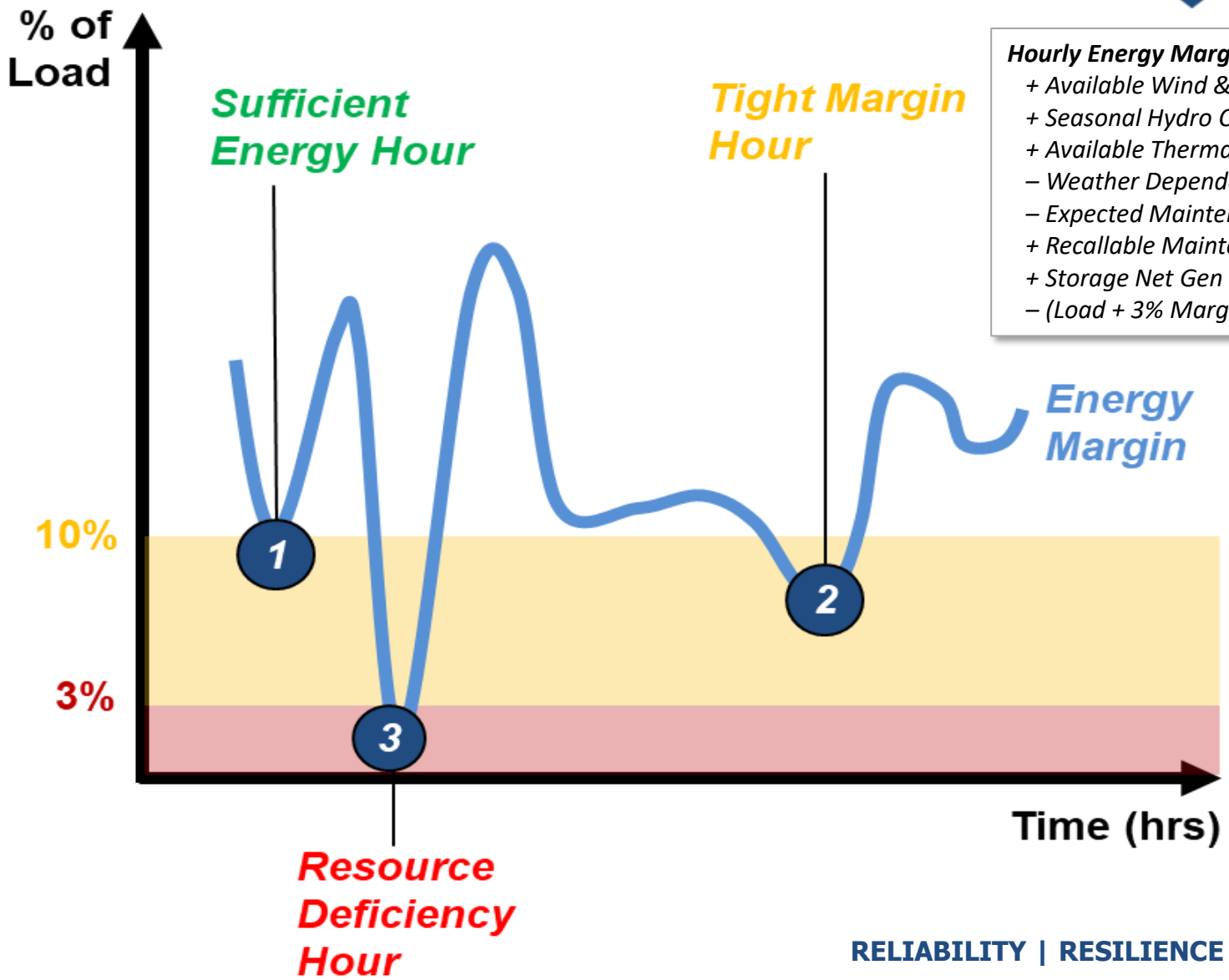


Minimum Daily Margin (% of Load)



Source: ESIG Transmission Resilience Task Force (Telos Energy)
https://www.esig.energy/transmission-resilience/

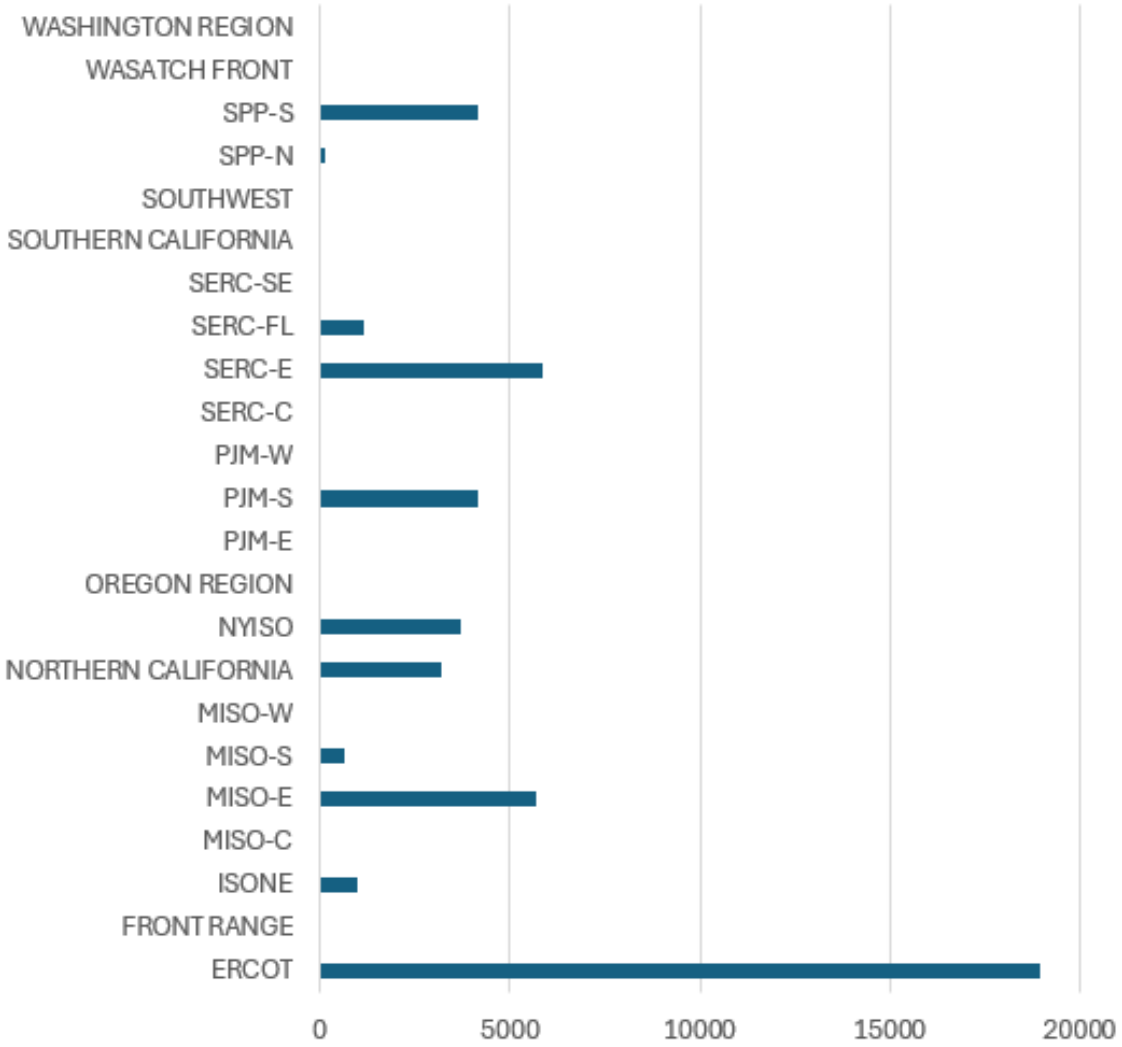
Energy Assessment to Identify Prudent Additions



Hourly Energy Margin =

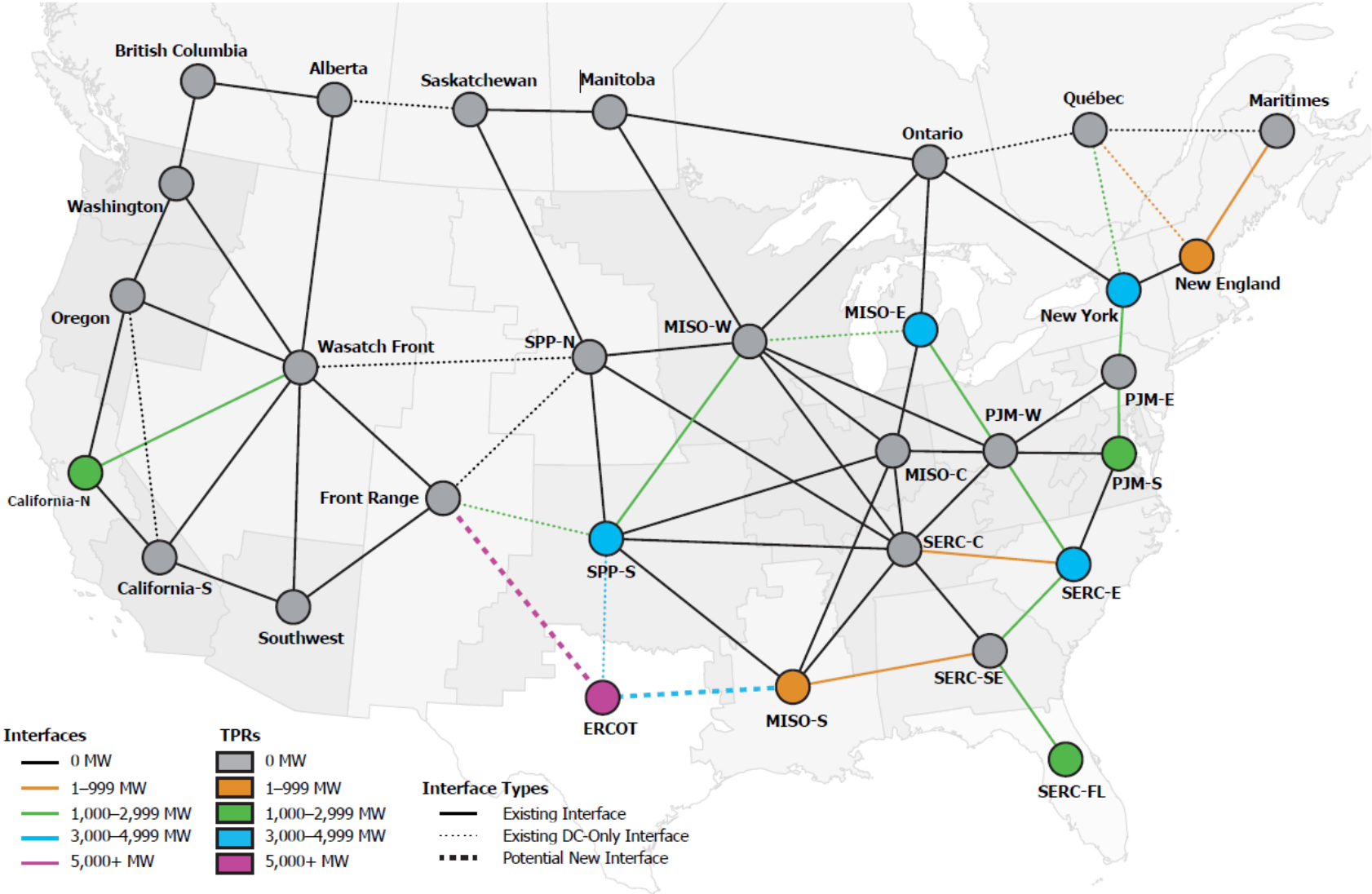
+ Available Wind & Solar
+ Seasonal Hydro Capacity
+ Available Thermal
– Weather Dependent Outages
– Expected Maintenance
+ Recallable Maintenance
+ Storage Net Gen
– (Load + 3% Margin)

Energy Assessment Maximum Deficiency Identified (Preliminary)



- Capacity expansion determined by projections in Long-Term Reliability Assessment
- Tightening energy margins driven:
  - assumed extreme weather conditions
  - increased load growth
  - on-going retirement of conventional generation
  - shift toward a higher proportion of variable (wind and solar)
  - energy-limited resources (e.g., battery storage).
- Number of hours in these conditions range from 1-20

Prudent Addition Recommendations (Preliminary)



Recommended Prudent Additions (Preliminary)

Recommended Prudent Additions				
Transmission Planning Region	**Events / Drivers**	**Event Seasons**	**Interface for Additions**	**Prudent Addition Recommendation (MW)**
Northern California	2022 Heat Wave	Summer	Wasatch Front	1,100
ERCOT	Winter Storm Uri (2021) and four other events	Summer and Winter	Front Range, MISO-S, SPP-S	15,100
SPP-S	Winter Storm Uri (2021)	Winter	ERCOT, Front Range, MISO-W, SERC-C, SPP-N	3,700
MISO-E	2020 and two other events	Summer	MISO-W, PJM-W	3,000
MISO-S	2009 and 2011	Summer	ERCOT, SERC-SE	600
SERC-FL	Summer 2009 and Winter 2010	Summer and Winter	SERC-SE	1,200
SERC-E	Winter Storm Elliott (2022)	Winter	PJM-W, SERC-C, SERC-SE	4,100
PJM-S	Winter Storm Elliott (2022)	Winter	PJM-E	2,800
NYISO	2023 Heat Wave and five other summer events	Summer	PJM-E, Québec	3,700
ISONE	2012 and two other summer events	Summer	Québec, Maritimes	700
Total Prudent Additions Recommendations				36,000

ITCS Insights On Prudent Additions

- 10 regions show energy deficiencies under extreme weather
- Transmission capacity can amplify benefits of demand response and storage (e.g., X MW of incremental transmission capacity can relieve 1.5-2x MW of energy deficit under certain conditions)
- Initial results show that transfer capability alone cannot resolve many deficiencies, without including Tier 2 additions (which are much less certain)
  - Western interconnection and ERCOT are short under planned additions and with expanded transfer capacity
  - Balance of US can meet demand with planned additions, confirmed retirements, and identified “prudent” transmission expansion
  - Duration of deficit conditions range from 1-20 hours (2033)

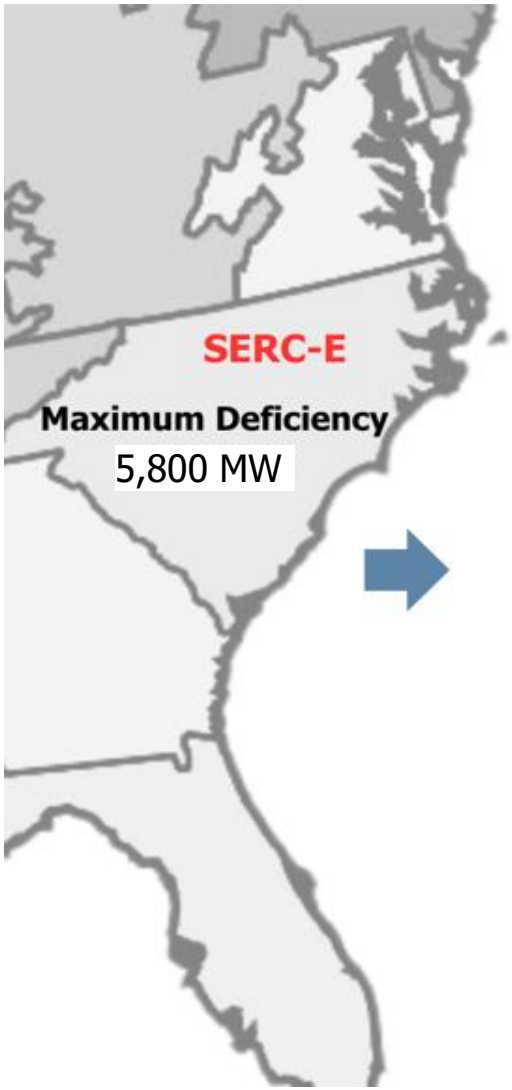
ITCS Insights On Prudent Additions (Contd.)

- Potential for energy inadequacy identified in all 12 studied weather years
- 36 GW of additional transfer capability is recommended across United States
- Import capability required during extreme weather varied significantly, so a one-size-fit-all minimum requirement may be inefficient and may be ineffective
- Enhancing some of the interregional ties between interconnections (Eastern, Western, ERCOT and Quebec) provides considerable benefits under extreme weather conditions
- Total simultaneous import capability is also critical

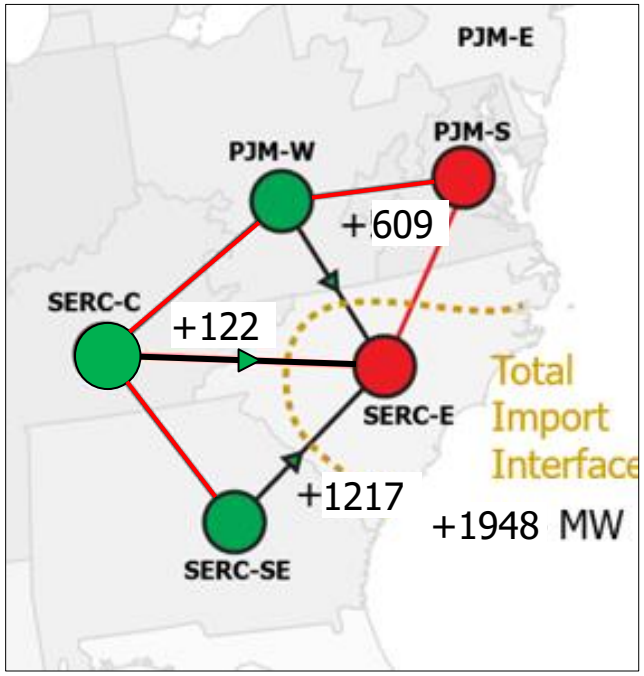
Plans for Canadian Analysis

Calculate	Calculate US to Canada transfer capability
Calculate	Calculate inter-provincial transfer capability
Calculate	Simultaneous import capability into each region
Perform	Perform energy margin analysis
Recommend	Recommend prudent additions

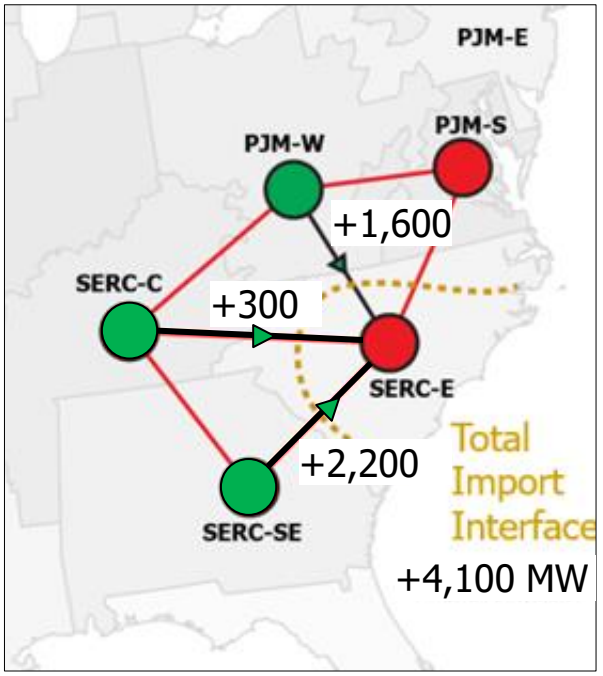
Example of Prudent Addition Analysis: SERC-E (2033)



First Iteration: Utilize Existing Import Capability and Excess Available Generation from Neighbors



Third Iteration: Maximum Support from Neighbors, Prioritized by Excess Available Generation



5,463 MW of Existing Import Capability + 4,100 MW of Prudent Additions = **9,563 MW of Needed Import Capability**

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Questions and Answers