TEXAS RE

NERC Interregional Transfer Capability Study Summary

For

ERCOT Supply Analysis Working Group

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November 22, 2024

ITCS Objectives

Congress directed NERC to perform a study of Interregional Transmission Capacity (ITCS) in the Fiscal Responsibility Act of 2023. ITCS aligns with ERO's obligations to perform reliability assessments

- Independent and objective
- System-wide perspective
- Reliability focus
- Collaboration and coordination
- Strategic planning
- Repeatable process

ITCS Scope: Fiscal Responsibility Act of 2023

Part I: Calculate current total transfer capability

Part II: Recommend prudent additions to transfer capability

Part III: Recommend how to meet and maintain transfer capability

ITCS Timeline Overview

Fiscal Responsibility Act of 2023
June 3, 2023

Study Cases Prepared and Initial Actions Complete
January 31, 2024

2024/2025 Transfer Analysis Complete
August 2024

Recommendation for Prudent Additions Complete
October 2024

Parts II and III Report
October 2024

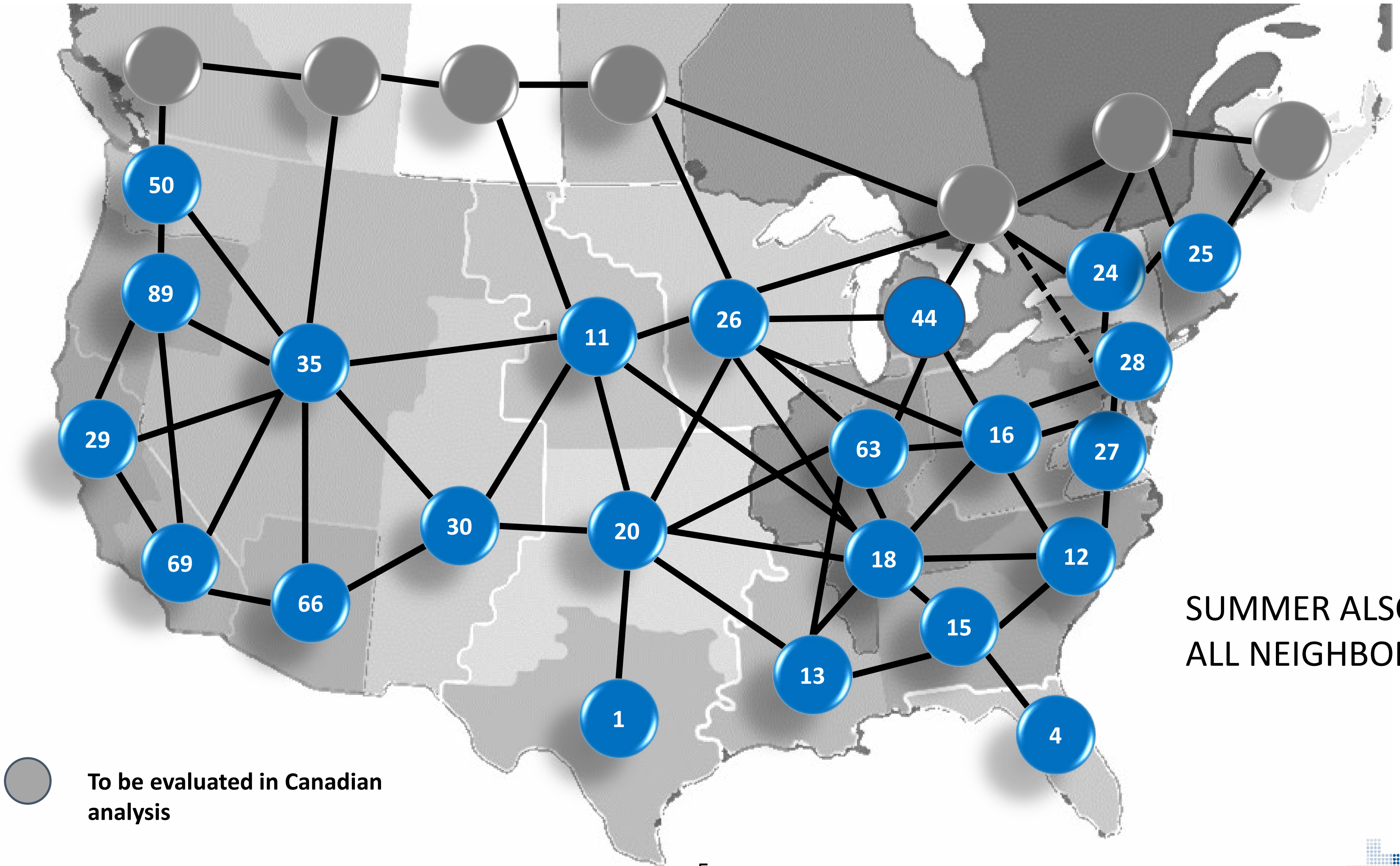
Final Report submitted to FERC
November 19, 2024

FERC Posts Report for Public Comments

Canadian Analysis Q1 2025

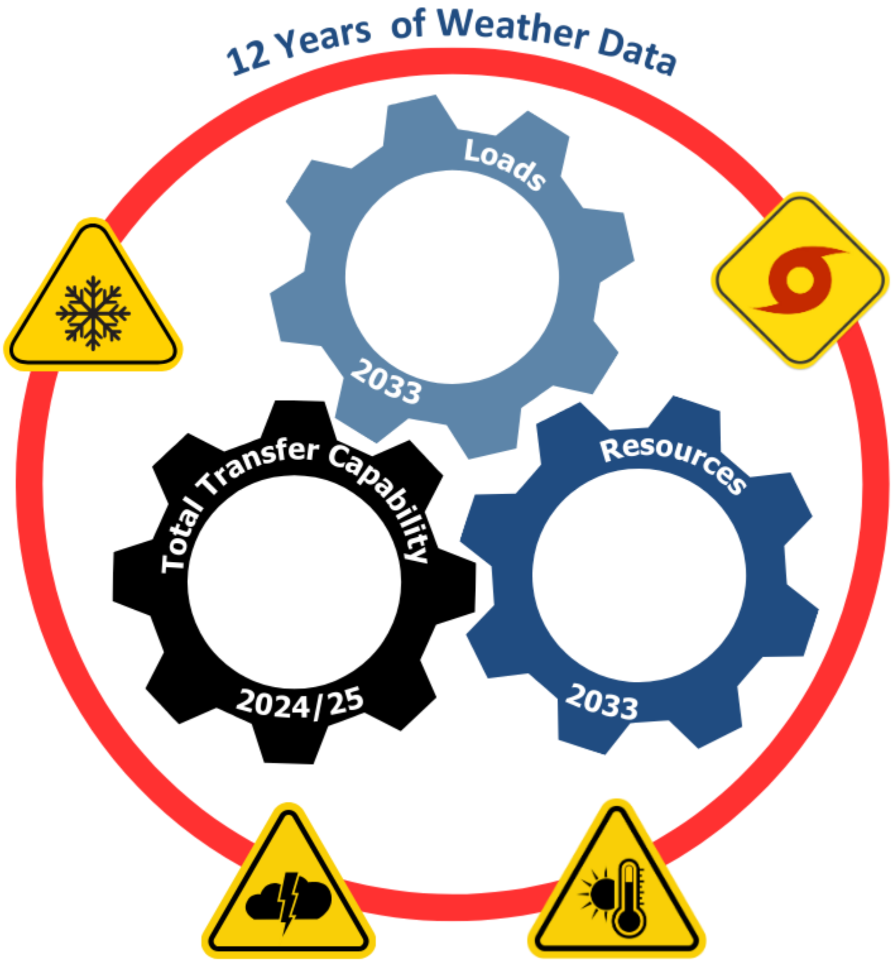
FERC files its report to Congress

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



SUMMER ALSO CALCULATED – ALL NEIGHBORS LOWER

Part II Prudent Additions Study Approach



What are technically prudent additions to interregional transfer capability?

- *Strengthen reliability*
- *Serve load under extreme conditions*
- *Do not create other reliability problems*

Energy Margin Methodology for Part II: Scope and Limitations

What this method DOES	What this method DOES NOT
✓ Prioritize regions for interregional transfer capability	× Represent actual physical power flows across the network … not a planning study
✓ Tracks daily and hourly availability of all resource types	× Track individual resource performance or replace a full energy assessment/LOLE study
✓ Calculates relative surplus and deficit in each region, at the same time	× Calculate relative costs or prices between regions
✓ Performs a reliability-only dispatch of resources	× Perform an economic, least-cost (production cost) dispatch
✓ Allows regions to import from one region while exporting to another	× Only evaluate “neighbor” flows
✓ Assumes full import capability from neighbors	× Evaluate potential import from non-adjacent planning areas (neighbor’s neighbor)
✓ Obtain results driven by extreme weather	× Consider probability of extreme conditions

Six-Step Prudent Addition Process

Identify

1. **Identify regions that are import constrained during Resource Deficiency hours (region is unable to keep its energy margin above 3%)**

Quantify

2. **Calculate maximum shortage (MW) during Resource Deficiency hours**

Prioritize

3. **Identify constrained interfaces during Tight Margin hours**
   Scarcity Factor Difference = measures relative resource surplus on the sending end (source) relative to the importing region (sink)

Allocate

4. **Increase all constrained interfaces at ~33% of max shortage (MW),**
   - Only increase by a portion of the max shortage to capture interactive effects between regions (increase in one interface affects flows across others)
   - Increase for each interface proportional to the scarcity factor difference
   - Interfaces with relatively high surplus on sending end available during tight margin hours get proportionally larger increase

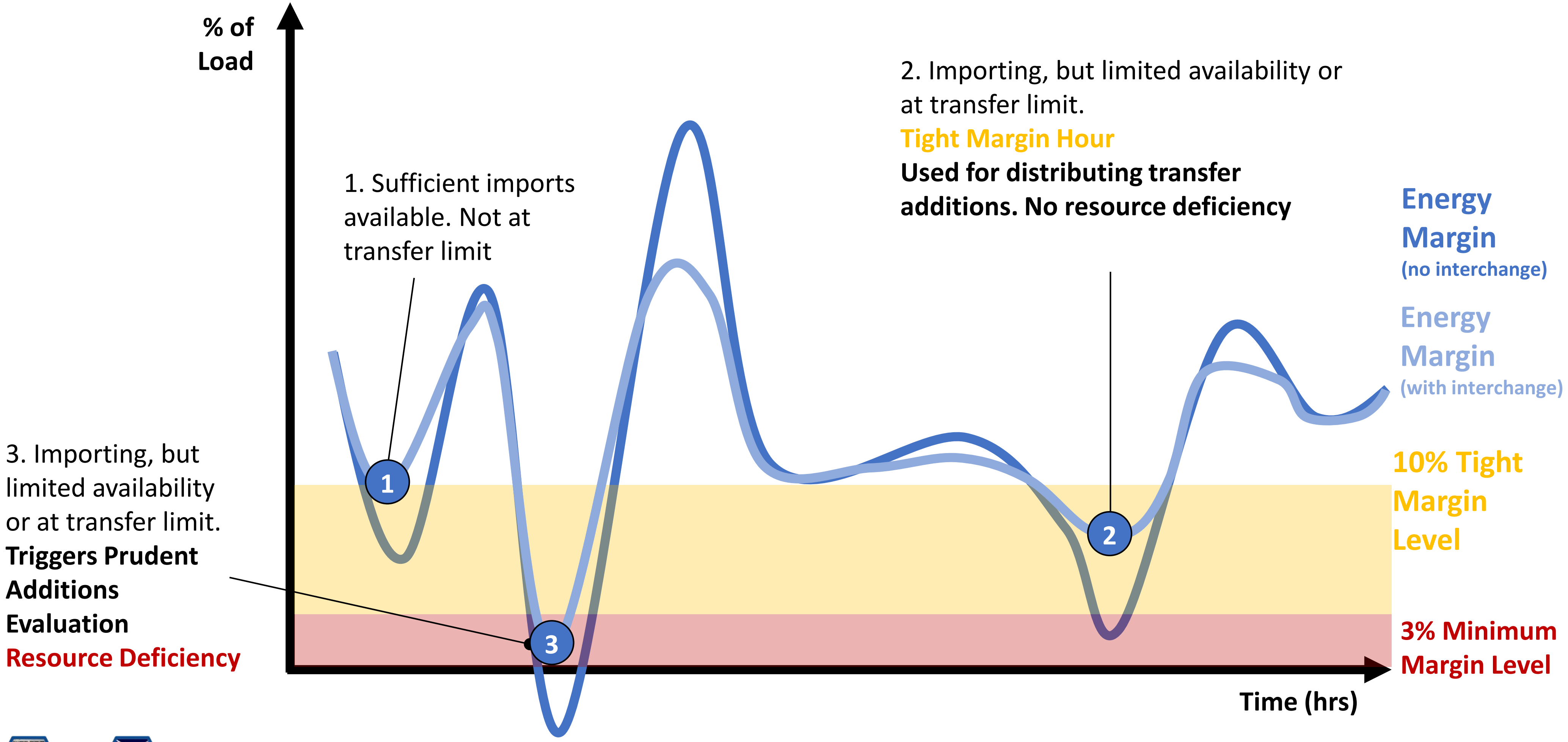
Iterate

5. **Iterate until all resource deficiencies are mitigated, or until improvement stops because there are no available resources on sending end**

Finalize

6. **Determine "prudent" level after all runs are complete based on resolving shortfalls**

Step 1: Identify hours and regions with resource deficiencies



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Step 2: Quantify maximum deficiency

Max resource deficiencies by weather year, by region (2033)

Transmission Planning Region	WY2007	WY2008	WY2009	WY2010	WY2011	WY2012	WY2013	WY2019	WY2020	WY2021	WY2022	WY2023	Max Resource Deficiency
Washington	0	0	0	0	0	0	0	0	0	0	0	0	0
Oregon	0	0	0	0	0	0	0	0	0	0	0	0	0
California North	0	0	0	0	0	0	0	0	0	0	3,211	0	3,211
California South	0	0	0	0	0	0	0	0	0	0	0	0	0
Southwest	0	0	0	0	0	0	0	0	0	0	0	0	0
Wasatch Front	0	0	0	0	0	0	0	0	0	0	0	0	0
Front Range	0	0	0	0	0	0	0	0	0	0	0	0	0
ERCOT	1,361	0	0	9,400	0	0	0	8,977	14,853	18,926	14,321	12,108	18,926
SPP-N	0	0	0	0	0	0	0	0	0	155	0	0	155
SPP-S	0	0	0	0	0	0	0	0	0	4,137	0	0	4,137
MISO-W	0	0	0	0	0	0	0	0	0	0	0	0	0
MISO-C	0	0	0	0	0	0	0	0	0	0	0	0	0
MISO-S	0	0	560	0	629	0	0	0	0	0	0	0	629
MISO-E	0	0	0	0	1,676	0	0	0	5,715	979	0	0	5,715
SERC-C	0	0	0	0	0	0	0	0	0	0	0	0	0
SERC-SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SERC-Florida	0	0	1,030	1,152	0	0	0	0	0	0	0	0	1,152
SERC-E	0	0	0	0	0	0	0	0	0	0	5,849	0	5,849
PJM-W	0	0	0	0	0	0	0	0	0	0	0	0	0
PJM-S	0	0	0	0	0	0	0	0	0	0	4,147	0	4,147
PJM-E	0	0	0	0	0	0	0	0	0	0	0	0	0
New York	0	81	0	3,244	1,748	2,631	1,229	0	0	0	0	3,729	3,729
New England	0	0	0	85	0	984	68	0	0	0	0	0	984

Summer Winter Dual Season

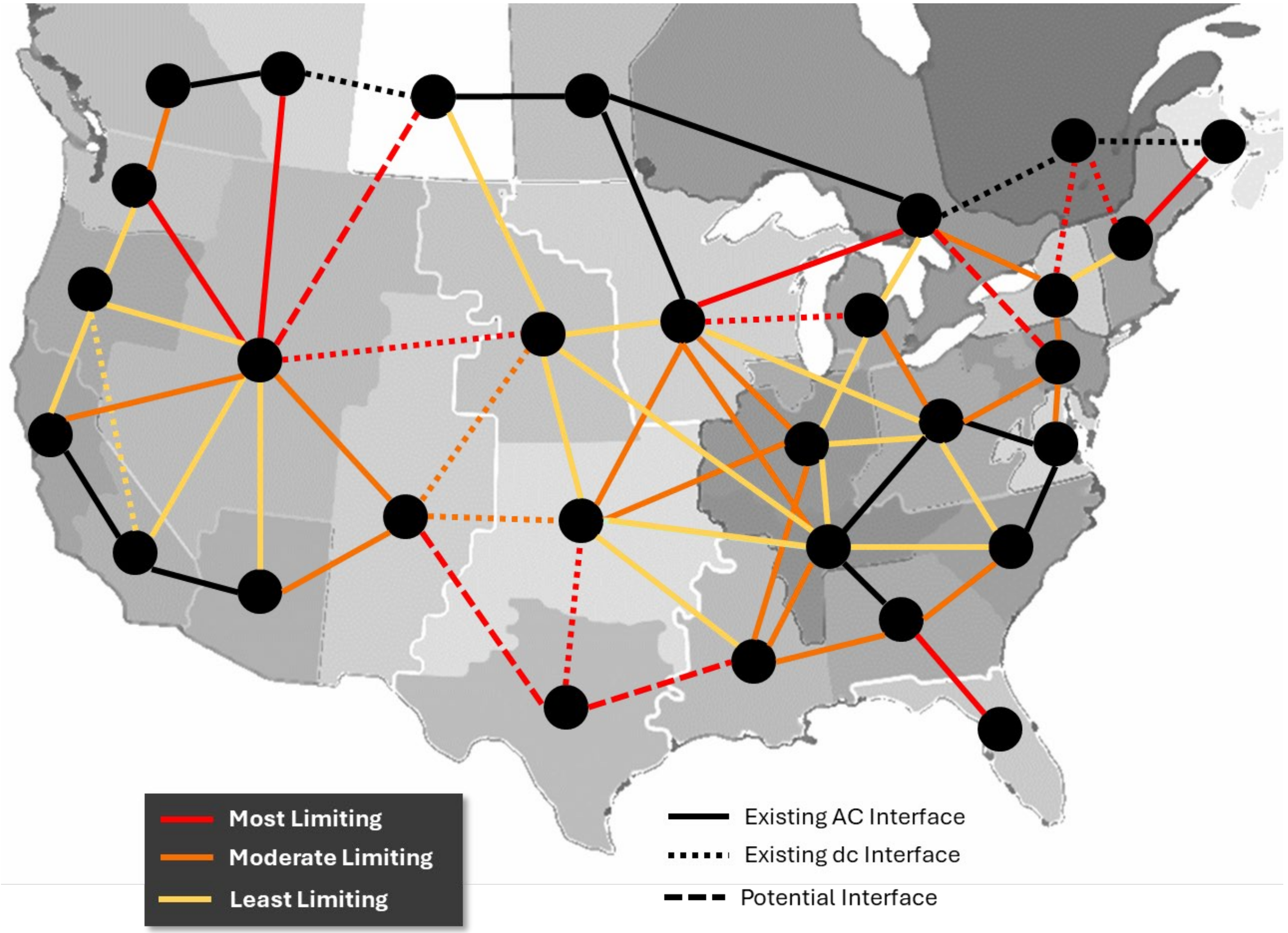
Step 3: Prioritize constrained interfaces for additions

1. Identify lines importing into deficient regions

2. Consider interfaces that hit their limit during tight margin hours

3. Prioritize interfaces that have relatively more surplus on the sending end.

*Add to both the ac total import interface and dc-only interfaces



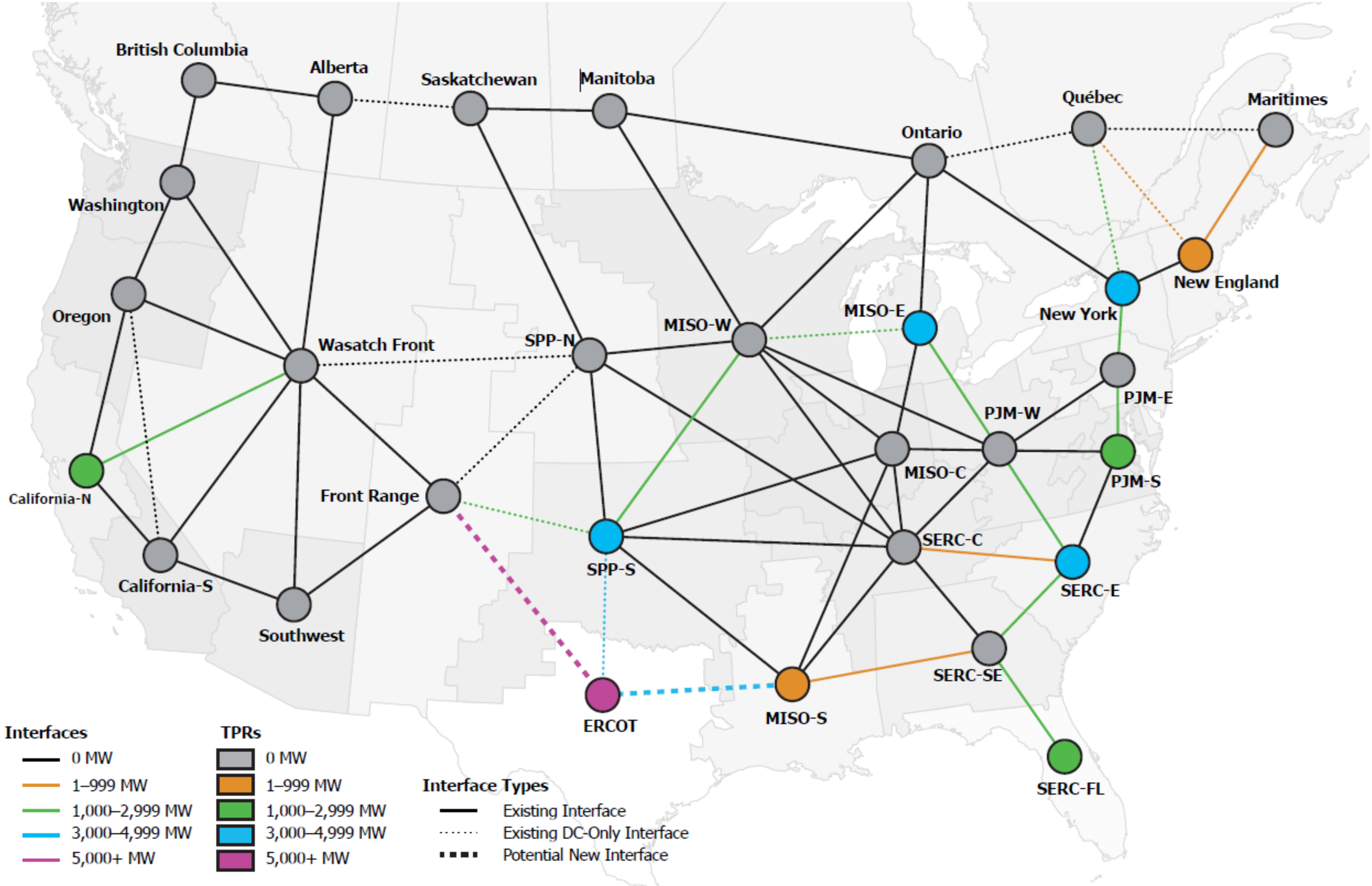
Step 4 & 5: Allocate and Iterate until resource deficiencies are resolved

1. Initial addition to transfer capability set to 33% of maximum resource deficiency.
2. Allocate across priority interfaces and rerun the energy margin analysis
3. Recalculate remaining resource deficiency
4. Calculate the reduction in deficiency relative to the addition in transfer capability as a measure of efficacy
5. Iterate until all deficiencies are resolved or transfer capability stops helping
   - Reduce maximum resource deficiency by at least 75% of additional transfer capability, or
   - Reduce resource deficiency by at least 100% of additional transfer capability in at least 4 hours

Why did we iterate?

- **Saturation effects.** As regions start to export more, their energy margins will go down and there will be less to export in the following iteration.
- **Multiplier effects.** Transmission and energy limited resources (Storage and DR) work together.
- **Interactive effects.** Flows between regions will change relative surplus and scarcity

Step 6: Finalize prudent addition recommendations



Part II Deficiencies and Recommended Prudent Additions (Final)

Transmission Planning Region	Weather Years (WY) / Events	Resource Deficiency Hours	Maximum Deficiency (MW)	Additional Transfer Capability (MW)	Interface Additions (MW)
California North*	WY2022 Heat Wave	17	3,211	1,100	Wasatch Front (1,100)
ERCOT*	Winter Storm Uri (WY2021) and nine other events	135	18,926	14,100	Front Range (5,700) MISO-S (4,300) SPP-S (4,100)
SPP-S	Winter Storm Uri (WY2021)	34	4,137	3,700	Front Range (1,200) ERCOT (800) MISO-W (1,700)
MISO-E	WY2020 Heat Wave and two other events	58	5,715	3,000	MISO-W (2,000) PJM-W (1,000)
MISO-S	WY2009 and WY2011 summer events	4	629	600	ERCOT (300) SERC-SE (300)
SERC-E	Winter Storm Elliott (WY2022)	9	5,849	4,100	SERC-C (300) SERC-SE (2,200) PJM-W (1,600)
SERC-Florida	Summer WY2009 and Winter WY2010	6	1,152	1,200	SERC-SE (1,200)
PJM-S	Winter Storm Elliott (WY2022)	20	4,147	2,800	PJM-E (2,800)
New York	WY2023 Heat Wave and seven other events	52	3,729	3,700	PJM-E (1,800) Québec (1,900)
New England	WY2012 Heat Wave and two other events	5	984	700	Québec (400) Maritimes (300)
TOTAL				35,000	

*Not all deficiency hours were resolved in these events

Part III Scope: Meet and Maintain

Mandate calls for:

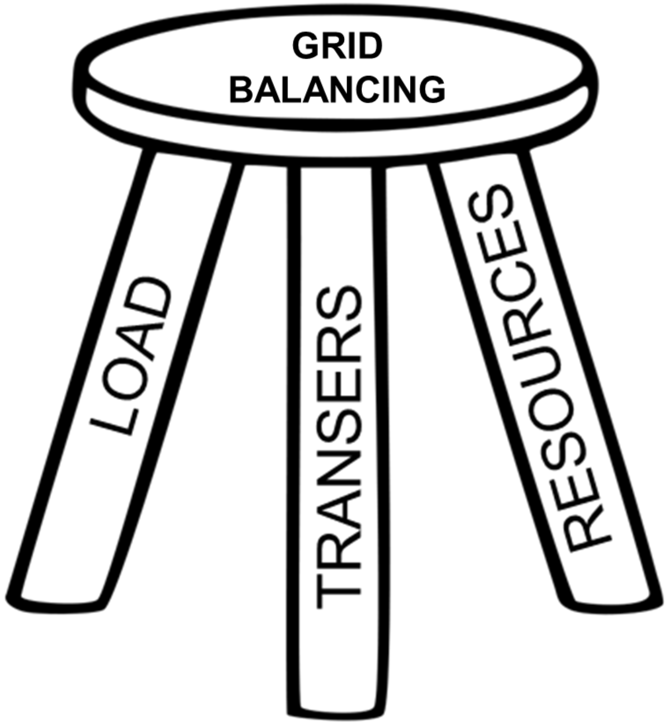
- “Recommendations to meet and maintain total transfer capability together with such recommended prudent additions to total transfer capability...”

Report will describe general measures and actions needed to achieve and sustain the identified transfer capability and any recommended enhancements.

- Additional Analysis
- Capital & Infrastructure
- Grid Enhancing Technologies
- Markets & Regulatory
- Resource Additions

Considerations When Reviewing the Report

- Wide-area energy margin assessment and scenario development called for consistency in assumptions and approach, rather than individual entity practices.
- Extreme weather (especially Uri-like scenario) drives results; results do not consider probability of occurrence.
- Study uses transfers to resolve deficiencies below a 3% margin, rather than additional internal demand response or generation (beyond 2033 projections).
- Study does not consider costs or economic factors.
- No specific transmission projects are identified, nor are implementation barriers addressed, technical, financial or regulatory.



[Interregional Transfer Capability Study (ITCS)]

Questions?

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Ensuring electric reliability for Texans