NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

# Inter-Regional Transfer Capability Study

## Study Framework and Plan

2023 ESIG Fall Technical Workshop
William Lamanna

**RELIABILITY | RESILIENCE | SECURITY**




# Study Elements

## Fiscal Responsibility Act, Section 322

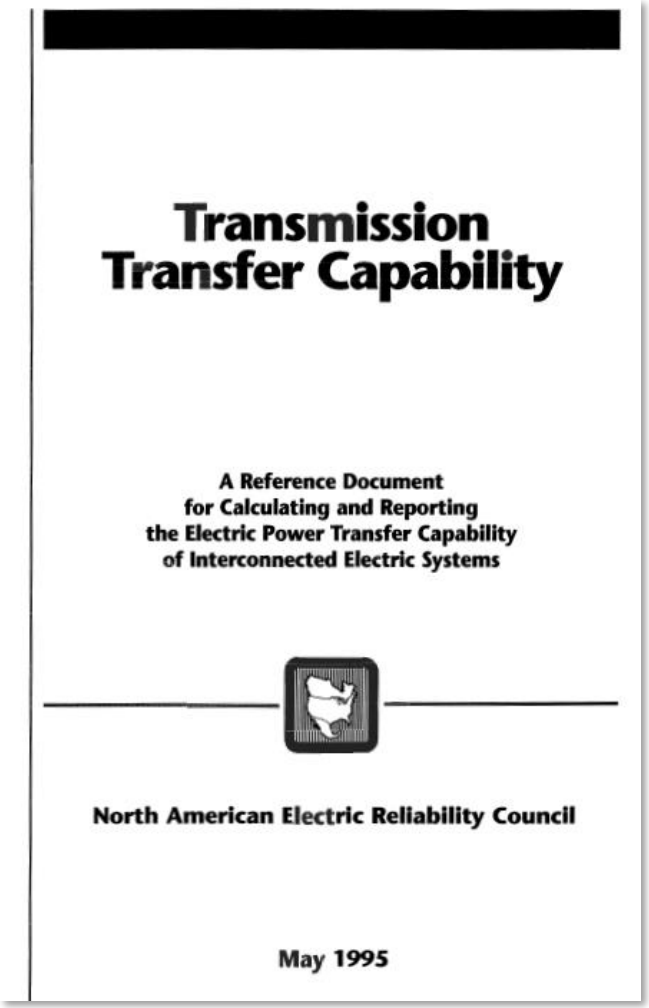
*In consultation with the Regional Entities and transmitting utilities, NERC shall conduct a study containing three elements:*

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.

# Purpose and Background

NERC is studying the reliable transfer of power between neighboring "transmission planning regions" and will file with FERC a recommendation of prudent additions to total transfer capability to meet future demand and strengthen reliability. NERC recognizes that strong and flexible electric transmission systems capable of coping with a wide variety of system conditions are necessary for a reliable supply and delivery of electricity. NERC is engaging industry stakeholders to gather inputs, assumptions and conditions and ensure the study comprehensive and inclusive of necessary information.

# Transfer Capability


Transmission Transfer Capability

A Reference Document for Calculating and Reporting the Electric Power Transfer Capability of Interconnected Electric Systems

North American Electric Reliability Council

May 1995

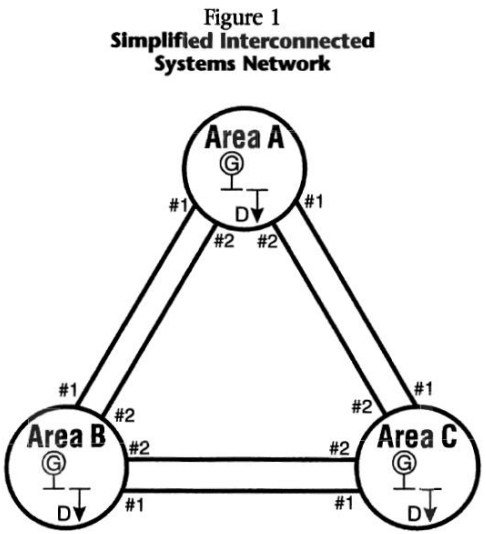
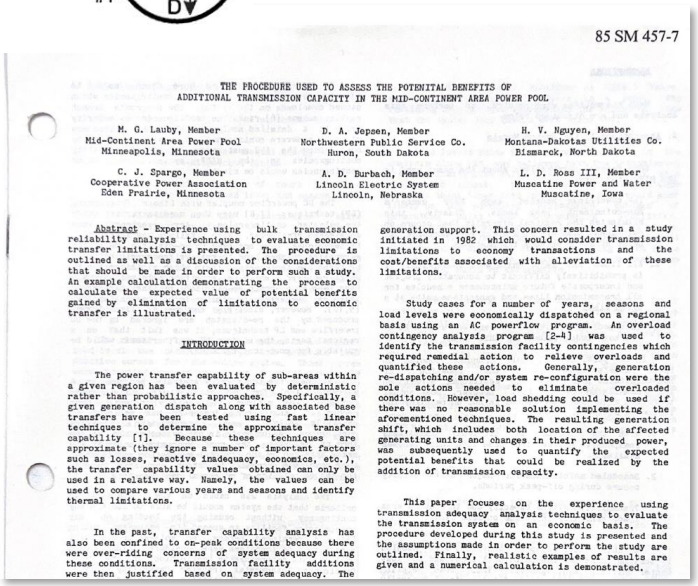


Figure 1
Simplified Interconnected Systems Network

***Definition:*** *the amount of electric power that can be moved or transferred reliably from one area to another area of the interconnected transmission systems by way of all transmission lines (or paths) between those areas under specified system conditions, or such definition as contained in Commission-approved Reliability Standards.*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THE PROCEDURE USED TO ASSESS THE POTENITAL BENEFITS OF ADDITIONAL TRANSMISSION CAPACITY IN THE MID-CONTINENT AREA POWER POOL

M. G. Lauby, Member
Mid-Continent Area Power Pool
Minneapolis, Minnesota

D. A. Jepsen, Member
Northwestern Public Service Co.
Huron, South Dakota

H. V. Nguyen, Member
Montana-Dakotas Utilities Co.
Bismarck, North Dakota

C. J. Spargo, Member
Cooperative Power Association
Eden Prairie, Minnesota

A. D. Burbach, Member
Lincoln Electric System
Lincoln, Nebraska

L. D. Ross III, Member
Muscatine Power and Water
Muscatine, Iowa

Abstract - Experience using bulk transmission reliability analysis techniques to evaluate economic transfer limitations is presented. The procedure is outlined as well as a discussion of the considerations that should be made in order to perform such a study. An example calculation demonstrating the process to calculate the expected value of potential benefits gained by elimination of limitations to economic transfer is illustrated.

INTRODUCTION

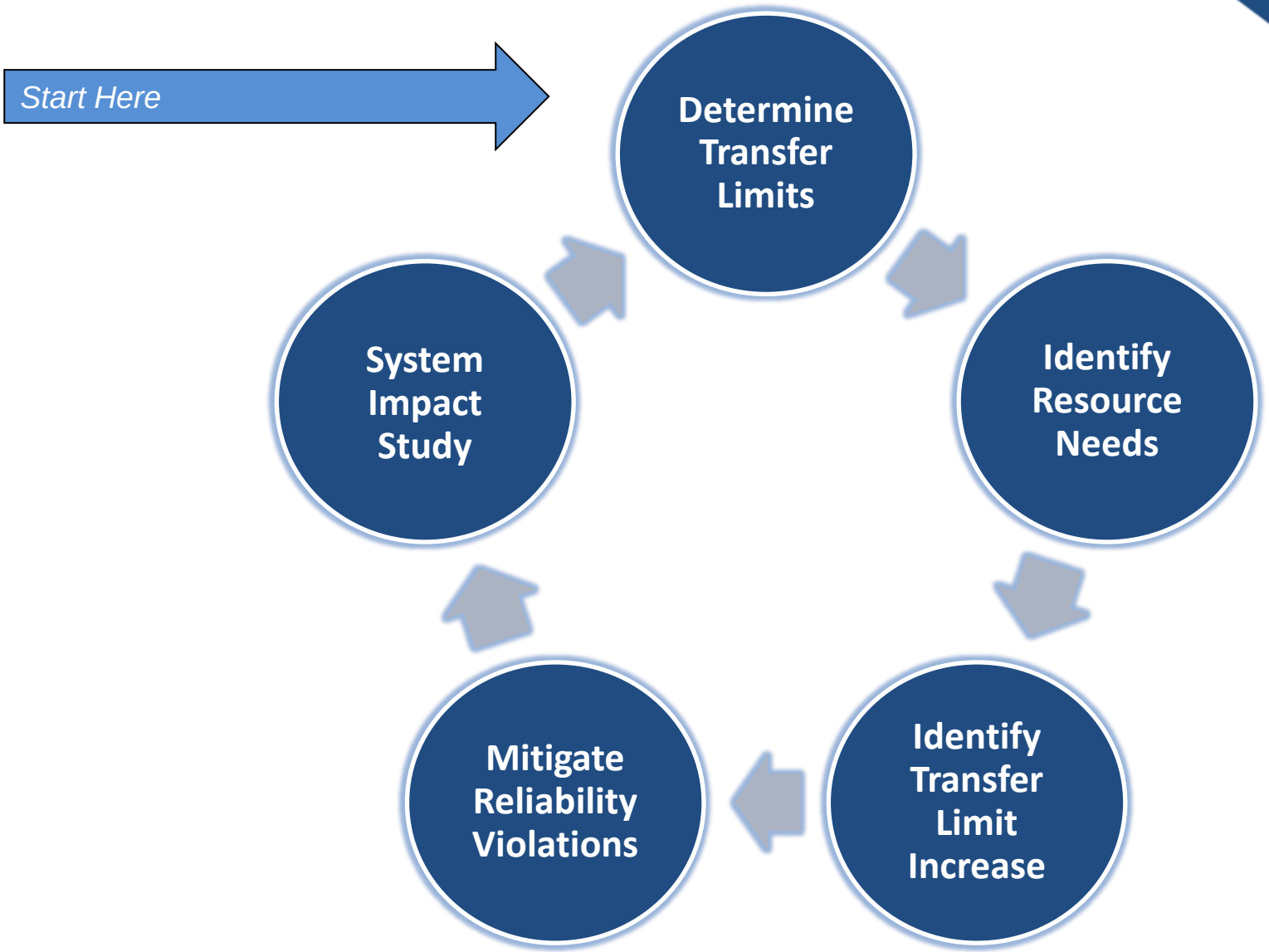
The power transfer capability of sub-areas within a given region has been evaluated by deterministic rather than probabilistic approaches. Specifically, a given generation dispatch along with associated base transfers have been tested using fast linear techniques to determine the approximate transfer capability [1]. Because these techniques are approximate (they ignore a number of important factors such as losses, reactive inadequacy, economics, etc.), the transfer capability values obtained can only be used in a relative way. Namely, the values can be used to compare various years and seasons and identify thermal limitations.

In the past, transfer capability analysis has also been confined to on-peak conditions because there were over-riding concerns of system adequacy during these conditions. Transmission facility additions were then justified based on system adequacy. The generation support. This concern resulted in a study initiated in 1982 which would consider transmission limitations to economy transactions and the cost/benefits associated with alleviation of these limitations.

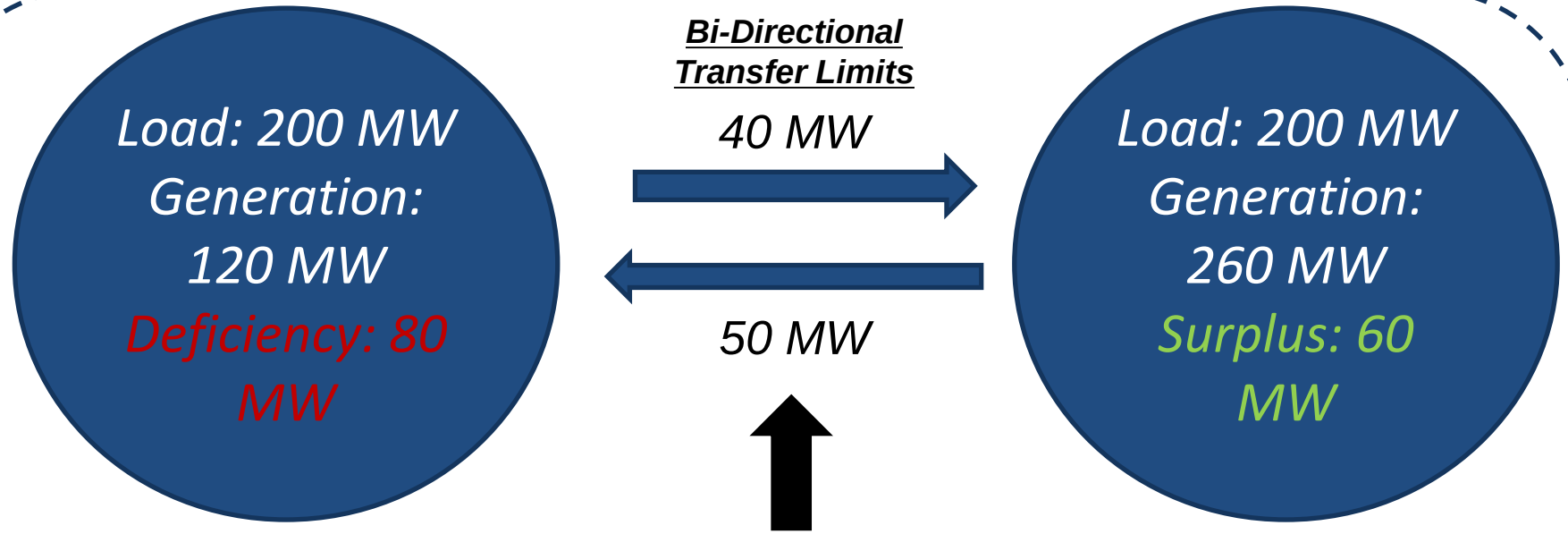
Study cases for a number of years, seasons and load levels were economically dispatched on a regional basis using an AC powerflow program. An overload contingency analysis program [2-4] was used to identify the transmission facility contingencies which required remedial action to relieve overloads and quantified these actions. Generally, generation re-dispatching and/or system re-configuration were the sole actions needed to eliminate overloaded conditions. However, load shedding could be used if there was no reasonable solution implementing the aforementioned techniques. The resulting generation shift, which includes both location of the affected generating units and changes in their produced power, was subsequently used to quantify the expected potential benefits that could be realized by the addition of transmission capacity.

This paper focuses on the experience using transmission adequacy analysis techniques to evaluate the transmission system on an economic basis. The procedure developed during this study is presented and the assumptions made in order to perform the study are outlined. Finally, realistic examples of results are given and a numerical calculation is demonstrated.

# General Approach



# ITCS Summary




**TASK 1:**

- What is the transfer capability?

**TASK 2:**

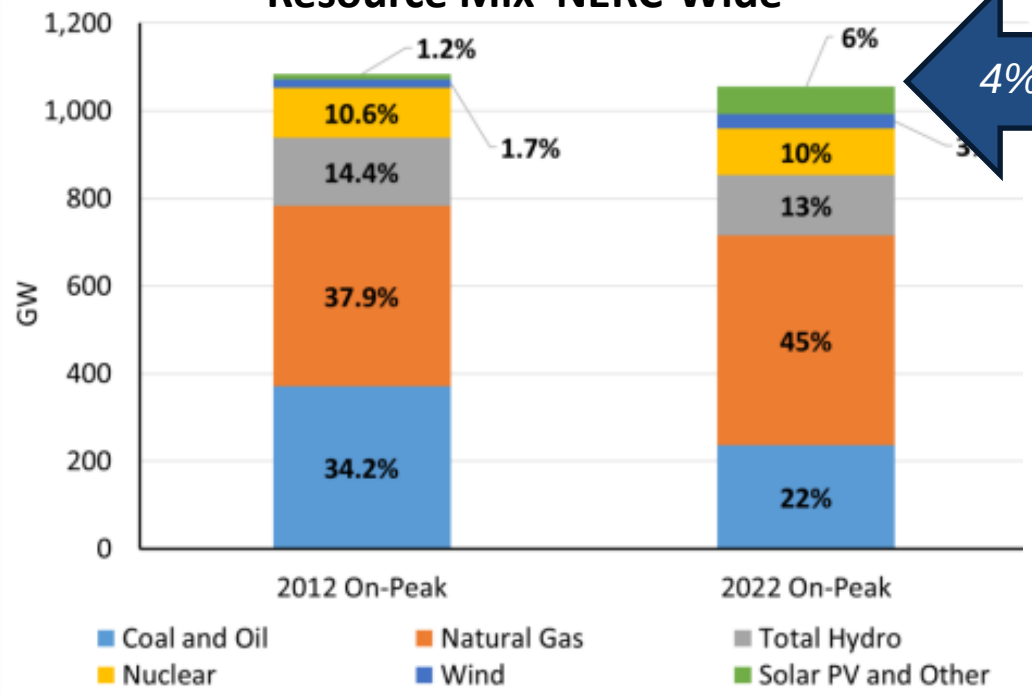
- What is the deficiency?
- Is there sufficient capability?
- If not, how much is needed to maintain reliability?

**TASK 3:**

- What is needed to meet and maintain these transfer limits
- Does the increase require other reliability reinforcements or considerations?

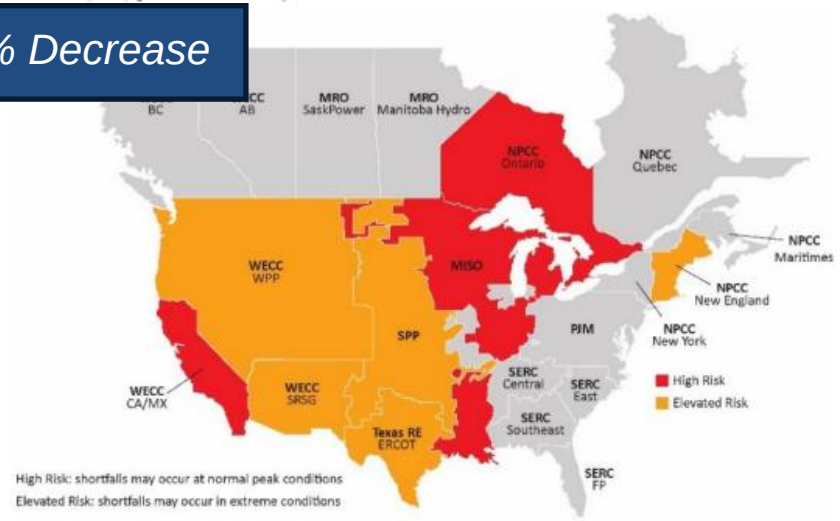
# Across an Interconnected System: Less Resources, More Reliance on Neighbors

## 2012 and 2022 Peak Capacity Resource Mix NERC-Wide

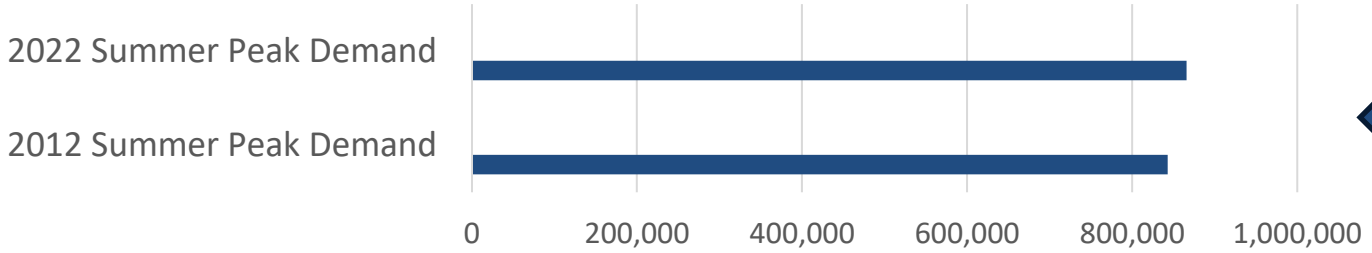



*4% Decrease*

## 2025 Risk Areas

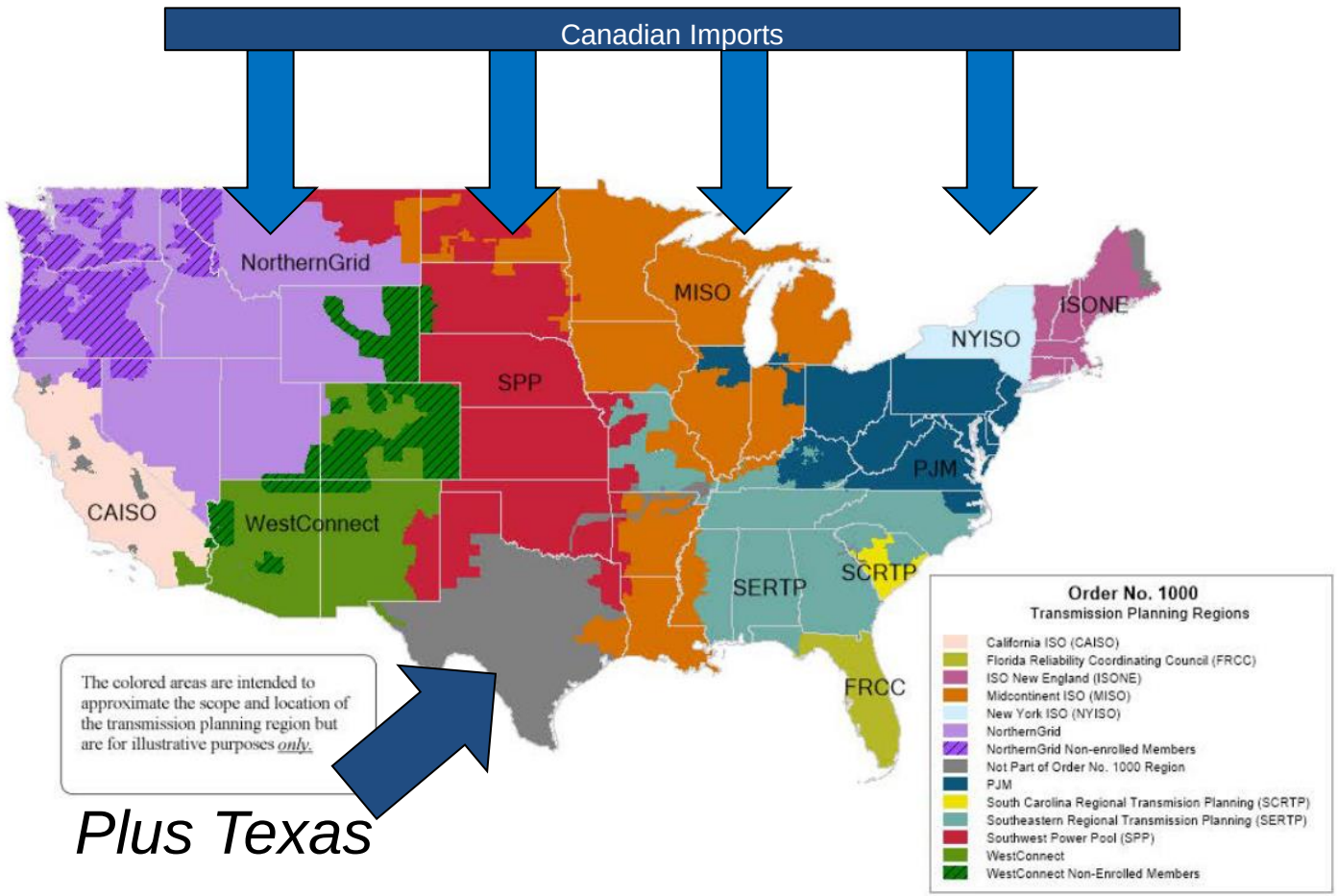



## *NERC-Wide Summer Peak Demand Changes 2012 and 2022*




*3% Increase*

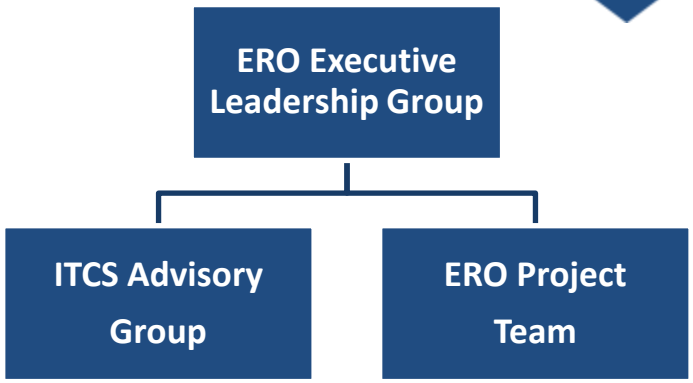
# ITCS - Areas of Study




- Legislation identified "Transmission Planning Regions" as identified in FERC Order 1000
- Texas Interconnection DC Ties included
- Canadian transfer capability and possible increases also assessed

# Study Group and Project Management

- **ERO Executive Leadership Group:** Serves as the executive project sponsor
- **ERO Project Team:** ERO Staff Team (NERC and Regional Entity Staff) will oversee, coordinate, and conduct the required studies
- **ITCS Advisory Group:** Stakeholder advisory group provides advice and input on the study scope, approach, results, and recommendations




| NERC Staff | Regional Entity Staff | Industry |
|---|---|---|
| • Study design and oversight<br>• Identify common assumptions, scenarios, and case creation parameters<br>• Compile study results for cross-interconnection wide study | • Leverage technical study groups and data collection processes<br>• Run power flow simulations | • Support scenario development<br>• Support capacity and transmission expansion assumptions<br>• Coordinate with study groups and Regional Entity staff |

# Phased Approach

## Phase 0: Study Prep

- Define study scope, assumptions, scenarios
- Stakeholder engagement
- Data requests
- Build study cases & scenarios for transfer capability analysis

## Phase 1 : Analysis

- Leverage LTRA to identify generation deficient and surplus areas
- Perform transfer capability analysis
- Identify thermal, voltage & stability limits (Total Transfer Capability)

## Phase 2 : Recommendations

- Define metrics for identification of “prudent transmission additions” based on reliability
- Draft final recommendations

July 2023 – August 2024

Stakeholder Engagement | Data Collection | Technical Coordination | Stakeholder Comment

# High-Level Analysis Plan

***The ITCS will follow this high-level analysis plan. The plan is derived from the requirements of the 2023 Fiscal Responsibility Act (FRA). Each part requires a certain level of analysis and engineering skills, and the process must be done in a particular order.***

- ***Part 1 Objective**: Determine the total transfer capability between neighboring transmission planning regions.*
- ***Part 2 Objective**: Identify "prudent" additional transfer capability between neighboring areas to resolve reliability issues in the future.*
- ***Part 3 Objective**: Identify mechanisms to achieve and sustain the identified transfer capability and any recommended enhancements.*

## *Potential Scenarios*

| | | | | |
|---|---|---|---|---|
| Winter cold snap | Regional heat wave | Renewable drought | Wildfire risk | Physical/Cyber Security Attack |

# Final Report, Recommendations, and Outreach

- **Final Report Preparation Phase (Months 13-14):** Compile study results, develop a comprehensive final report, review and validate the report with stakeholders, and address any feedback received
- **Stakeholder Comment Phase (Months 14-17)**
- **Submit to FERC (Month 18): December 2, 2024**
- **FERC Review (Beyond 18 Months):** Provide support to FERC, as needed

# Onward!

- NERC's role as the independent voice for reliability
- Critical assignment supporting the ERO's Reliability Assessment mandate
- Strong transmission system is crucial to a reliable supply and the delivery of electricity
- Rapidly changing resource mix requires greater access and deliverability of resources
- On-going assessment critical to maintaining BPS reliability


# Questions?