Eastern Interconnection Planning Collaborative

EIPC Interconnection-wide Webinar and Stakeholder Discussion

November 17, 2015

Webinar Outline

- Presentation on 2025 Summer Peak (2025S) and 2025 Winter Peak (2025W) Roll-up Case Development
  - Report to be posted soon on eipconline.com
- Q&A and Discussion
- Presentation on Sample Scenarios for Study in 2016
- Discussion and Schedule for Stakeholder Input on Scenarios to be Studied

Background on EIPC Activities

1. DOE Interconnection Studies Grant
   – Study complete
2. EIPC Model Development and Analysis (non-grant) – funded by EIPC members

Focus of today's webinar is on the Model Development and Analysis activity #2

2025S and 2025W Peak Roll-up

- Introduction
  - Responsibilities and Transmission Analysis Process
- Roll-Up Report
  - What is Contained in the Report and Appendices
- 2025 Roll-Up Cases Creation
  - Transmission "Gap" Analysis Results
  - Linear Transfer Analysis and Results
- Questions and Discussion

Introduction 1

- Responsibilities of Steady-State Modeling Load-Flow Working Group (SSMLFWG)
  - Review/Update of procedure manual
  - Create steady-state load-flow models
    - 2025S and 2025W models developed
  - Conduct steady-state load-flow analysis
    - Transmission "gap" analysis
    - Identify potential enhancements
    - Perform linear transfer analysis
  - Prepare roll-up report

Introduction 2

- Process Overview
  - EIPC Planning Coordinators (PCs) provided updates for model assembly
  - SSMLFWG performed gap and transfer analysis
  - PCs reviewed all results and provided suggested enhancements for any identified issues

Participating Planning Coordinators

1. Alcoa Power Generating, Inc.
2. Duke Energy Carolinas (“DEC”)
3. Duke Energy Florida (“DEF”)
4. Duke Energy Progress (“DEP”)
5. Florida Power & Light (“FPL”)
6. Georgia Transmission Corporation (“GTC”)
7. IESO (Ontario, Canada)
8. ISO New England, Inc. (“ISO-NE”)
9. JEA (Jacksonville, Florida)
10. LG&E/KU
11. Mid Continent Independent Transmission System Operator, Inc. (“MISO”)
12. Municipal Electric Authority of Georgia (“MEAG”)
13. New York Independent System Operator, Inc. (“NYISO”)
14. PJM Interconnection (“PJM”)
15. PowerSouth Energy Coop
16. Santee Cooper
17. South Carolina Electric & Gas (“SCE&G”)
18. Southern Company Services Inc. (“Southern”)
19. Southwest Power Pool (“SPP”)
20. Tennessee Valley Authority (“TVA”)

2025S and 2025W Roll-Up Report Assembly

Planning Coordinators provided updates to the following:

Section 2 Integration Plans

- Load Forecast and Growth Rates
- Treatment of Energy Efficiency and Demand-Side Resources
- Interchange Modeled
- Process for Future Transmission Project Inclusion
- Major New and Upgraded Facilities
- Generation Assumptions
- Generation Dispatch Description

Section 3 Interregional Transmission Analysis

- Summary of Thermal Results
- Summary of Voltage Results

Section 4 Potential Enhancements to Section 3 Analysis

- Issues List, Conceptual Upgrades, and Coordinating Entities

Section 5 Linear Transfer Analysis

- Linear Transfer Results Including only Limiting Facility

Roll-Up Report – Appendix A-E

Planning Coordinators provided updates to the following:

Appendix A

- Future Project Map

Appendix B

- New/Upgraded Transmission Projects Included in Cases

Appendix C

- New/Upgraded Generation Included in Cases

Appendix D

- Linear Transfer Analysis Results

Appendix E

- Area Interchange Tables for All PC's

Transmission "Gap" Analysis Process

- Analysis Criteria
  - Consistent with NERC TPL Standards
- NERC Standard requires that "Applicable" thermal and voltage ratings be maintained under "Certain Events"
  - Applicable Ratings:
    - No transmission elements loaded beyond capability
    - No voltages above or below PCs planning criteria
  - Certain Events:
    - No contingency: All facilities in-service
    - N-1 contingency: Event resulting in the loss of a single element

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Transmission "Gap" Analysis Process

Development of 2025S and 2025/2026W Roll-Up Cases

- Interchange assembled and coordinated
  - To ensure accuracy of modeled interface commitments
- Tie lines coordinated on a RTO / non-RTO defined area basis and verified among PC's
  - Transmission lines >100 kV connecting two areas
- PC's provided updates to modify 2014 series 2025S and 2020/2021W MMWG cases:
    - Load
    - Interchange
    - Generation
    - Transmission

Transmission “Gap” Analysis Process

N-1 Validation / Transmission “Gap” Analysis

- Objective is to identify potential power flow interactions from an interconnection-wide perspective that may result from the effects of plans of one Planning Coordinator on another
  - Power flows and energy exchange (Interchange) may differ from those assessed during local and regional planning activities
  - Possible that additional constraints may be identified
- Contingencies included the following:
  - N-1 outages of all transmission elements 230 kV and above (Included 161 kV and above where appropriate)
  - N-1 outages of all transformers with a high side of 230 kV and above
  - Included NYISO and PJM specific regional contingencies

Transmission “Gap” Analysis Process

- Monitored the following (100 kV and above):
  - N-0 thermal overloads
    - Line rating for normal system conditions
  - N-1 thermal overloads
    - Line rating during the loss of a single element
  - Voltage ranges beyond 0.95 – 1.05 per unit
    - PCs verified against individual criteria
- PCs provided updates throughout year to reflect:
  - Periodically updated plans
  - Errors found within cases

Transmission "Gap" Analysis Results

- NPCC reported
  - 72 overloads in 2025S and 54 overloads in 2025W due to N-1 contingencies
  - 9 overloads in 2025S and 4 overloads in 2025W in the Base Case (no contingencies)
  - Solutions included operating procedures and upgrading facility capacities.
- MISO reported
  - 34 overloads in 2025S and 40 overloads in 2025W due to N-1 contingencies
  - 6 overloads in 2025S in the Base Case (no contingencies)
  - Solutions included generation re-dispatch, upgrading facility capacities and adding additional circuits
- PJM reported
  - 14 overloads in 2025S and 9 overloads in 2025W due to N-1 contingencies

Transmission "Gap" Analysis Results

- SPP reported
  - 30 overloads in 2025S and 9 overloads in 2025W due to N-1 contingencies
  - 4 overloads in 2025S in the Base Case (no contingencies)
- SERC reported
  - 27 overloads in 2025S and 23 overloads in 2025W due to N-1 contingencies
  - 7 overloads in 2025S and 4 overloads in 2025W in the Base Case
  - Solutions included upgrading facility capacities and adding additional circuits.
- FRCC reported
  - 22 overloads in 2025S and 20 overloads in 2025W due to N-1 contingencies
  - 1 overloads in 2025S in the Base Case (no contingencies)

Transmission Enhancements Results

- NPCC reported the following enhancements to resolve the thermal issues identified

PA	Facility Issue	Contingency	Conceptual Upgrades
NYISO	130826 Meyer115 115.00 131345 S.Per115 115.00 1	130764 [Meyer230 230] - 130861 [S Perry 230] Ckt 1	Reconfiguration
NYISO	136052 Wetzel14 115.00 136181 Clay 115.00 1	Sb:Oswe_R985	Upgrade Facility Capacity
NYISO	136052 Wetzel14 115.00 136192 Elect Pk 115.00 1	Sb:Oswe_R985	Upgrade Facility Capacity
NYISO	137229 Kelsey H 115.00 137235 Porter 1 115.00 1	B:Porter115d	Adding a reactor

Transmission Enhancements Results

- SERC reported the following enhancements to resolve the thermal issues identified

PA	Facility Issue	Contingency	Conceptual Upgrades
SERC	317246 3elsnrsw3 115.00 317264 6elsnrsw6 230.00 1	Base Case	Reconfiguration
SERC	381010 3bemiss 115.00 382549 3pine Grv B2115.00 1	381885 [6w Valdosta 230.00] - 381886 [3w Valdosta 115.00] Ckt 1	Upgrade Facility Capacity
SERC	311289 3forsbk 115.00 312820 3pine I 115.00 1	311716 [6bucksvl 230.00] - 311717 [3bucksvl 115.00] Ckt 1	A Second Circuit Added
SERC	311716 6bucksvl 230.00 311717 3bucksvl 115.00 1	Base Case	A Second Circuit Added
SERC	312819 3perry R 115.00 312820 3pine I 115.00 1	311716 [6bucksvl 230.00] - 311717 [3bucksvl 115.00] Ckt 1	A Second Circuit Added
SERC	311323 3campfld 115.00 312776 3greenf 115.00 1	311716 [6bucksvl 230.00] - 312719 [6winyah 230.00] Ckt 1	New Circuit Added
SERC	311609 3ngrnfdt 115.00 312776 3greenf 115.00 1	311716 [6bucksvl 230.00] - 312719 [6winyah 230.00] Ckt 1	New Circuit Added
SERC	311716 6bucksvl 230.00 312717 6perry R 230.00 1	311716 [6bucksvl 230.00] - 312717 [6perry R 230.00] Ckt 2	Reconfiguration

Transmission Enhancements Results

- MISO reported the following enhancements to resolve the thermal issues identified

PA	Facility Issue	Contingency	Conceptual Upgrades
MISO	615560 Gre-Wst Cld7115.00 3wndtr 115/69 Wnd 2 1	619975 [Gre-Willmar4230.00] - 652550 [Granitf4 230.00] Ckt 1	Reconfiguration
MISO	603018 Sheynne7 115.00 620203 Mapltn 7 115.00 1	601067 [Bison 3 345.00] - 620358 [Buffalo3 345.00] Ckt 1	Line Rebuild
MISO	652452 Rugby 7 115.00 659665 Rugby Tap 7115.00 Z	615335 [Gre-Ramsey 4230.0] - 615903 [Gre-Balta 4230.0] Ckt 1	Reconfiguration

- Remaining PCs did not provide any specific transmission enhancements for the issues identified in their areas.

Transmission "Gap" Analysis Results

- Numerous high and low voltage issues were identified in 2025S and in 2025W roll-up cases due to N-1 contingencies and in the Base Case (no contingencies) in all the participating PC areas.
- These issues should be further analyzed and validated by the concerned PCs.

Linear Transfer Analysis

- Objective is to demonstrate how much power can be reliably moved between areas
  - Analyzed 5,000 MW transfers between selected areas
- Monitored the following (100 kV and above):
  - N-0 branch overloads
  - N-1 branch overloads
    - Also included NYISO specific regional contingencies
- PCs provided updates to address limiting facilities if enhancement identified during normal planning process

Linear Transfer Analysis

- Additional base cases with high base transfers were developed for analysis of import/export transfers from/to the Northeast Power Coordinating Council (NPCC) region. The incremental transfer MWs presented in the results for all the NPCC transfers include these base transfers.

From\To	NPCC	MISO	PJM
NPCC		1800	1600
MISO	1800		
PJM	3000		

Defined Areas and Transfers Analyzed

Planning Coordinators in Each Area

A	B	C	D	E	F
FPL	MAPPCOR	New York ISO	PJM	Duke Energy Carolinas	SPP
JEA	MISO	ISO New England		Duke Energy Progress	
Duke Energy Florida	ATC	Ontario IESO		LGE/KU	
	ITC	NBSO		GTC	
	Entergy			Power South	
				SCEG	
				SC	
				Southern Company	
				MEAG	
				Alcoa Power Generating, Inc.	
				TVA	
				Electric Energy, Inc.	

Transfers Performed

	Sink					
Source	**A**	**B**	**C**	**D**	**E**	**F**
A					Y	
B			Y	Y	Y	Y
C		Y		Y		
D		Y	Y		Y	
E	Y	Y		Y		Y
F		Y			Y	

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Transfer Analysis Results - Summer

Source	Sink	FCITC (MW)	Limiting Element	Lim. PA	Contingency / Outaged Facility	Con. PA
A	E	343	403528 MARTIN WEST230 407120 SLV_SP_N 230 1	DEF-SEC	403173 BRNSNDUK 230 403522 CRYSTVRPL 230	DEF
B	C	2183	200674 26TOWANDA 115 200676 26E.SAYRE 115 1	PJM	SB:HILL_B412	NYISO
B	D	4419	346809 7CASEY 345 347830 7NEWTON 345 1	AMIL	Base case	N/A
B	E	>5000	N/A	N/A	N/A	N/A
B	F	404	337904 5RUSSELVL.S 161 505508 DARDANE5 161 1	EES-EAI	337909 8ANO% 500 515305 FTSMITH8 500 1	EES-EAI
C	B	1969	135460 PACK(N)E 115 147850 NIAG115E 115 2	NYISO	T:61&191	NYISO
C	D	760	135460 PACK(N)E 115 147850 NIAG115E 115 2	NYISO	T:61&191	NYISO
D	B	>5000	N/A	N/A	N/A	N/A
D	C	1630	200674 26TOWANDA 115 200675 26ETWANDA 230 4	PJM	R:C398/NWES	NYISO
D	E	>5000	N/A	N/A	N/A	N/A
E	A	2356	400398 HUDSONFL 230 407119 SEMINOLE230 1	FPL	400477 RICE 500 400484 ROBERTS 500 1	FPL
E	B	>5000	N/A	N/A	N/A	N/A
E	D	4337	346809 7CASEY 345 347830 7NEWTON 345 1	DVP	Base case	N/A
E	F	336	337904 5RUSSELVL.S 161 505508 DARDANE5 161 1	EES-EAI	337909 8ANO% 500 515305 FTSMITH8 500 1	EES-MISO / OKGE-SPP
F	B	927	645456 S3456 3 345 645458 S3458 3 345 1	OPPD	645455 S3455 3 345 645740 S3740 3 345 1	OPPD
F	E	1397	645456 S3456 3 345 645458 S3458 3 345 1	OPPD	645455 S3455 3 345 645740 S3740 3 345 1	OPPD

Transfer Analysis Results - Winter

Source	Sink	FCITC (MW)	Limiting Element	Lim. PA	Contingency / Outaged Facility	Con. PA
A	E	1130	400461 CAPE K 230 400494 TULSA 230 1	FPL	400476 POINSETT 500 400484 ROBERTS 500 1	FPL
B	C	2246	200674 26TOWANDA 115 200675 26E.TWAND 230 4	PJM	R:C398/NWES	NYISO
B	D	>5000	N/A	N/A	N/A	N/A
B	E	>5000	N/A	N/A	N/A	N/A
B	F	1275	337904 5RUSSELVL.S 161 505508 DARDANE5 161 1	EES-EAI	337909 8ANO% 500 515305 FTSMITH8 500 1	EES-EAI
C	B	2551	200004 CNASTONE 500 200013 PEACHBTM 500 1	PJM	SB:OAKD345_32-B222	NYISO
C	D	-4276	200004 CNASTONE 500 200013 PEACHBTM 500 1	PJM	Base case	N/A
D	B	1310	200004 CNASTONE 500 200013 PEACHBTM 500 1	PJM	Base case	N/A
D	C	2109	200674 26TOWANDA 115 200676 26E.SAYRE 115 1	PJM	SB:HILL_B412	NYISO
D	E	1249	200004 CNASTONE 500 200013 PEACHBTM 500 1	PJM	Base case	N/A
E	A	2592	380015 8THALMANN 500 400356 DUVAL 500 1	SOCO	380014 8HATCH 500 400356 DUVAL 500 1	SOCO
E	B	>5000	N/A	N/A	N/A	N/A
E	D	>5000	N/A	N/A	N/A	N/A
E	F	1046	337905 5RUSSELVL.E! 161 337906 5RUSSELVLN 161 1	EES-EAI	337909 8ANO% 500 515305 FTSMITH8 500 1	EES-MISO / OKGE-SPP
F	B	4836	532765 HOYT 7 345 532766 JEC N 7 345 1	OPPD	532766 JEC N 7 345 532770 MORRIS 7 345 1	OPPD
F	E	5257	532765 HOYT 7 345 532766 JEC N 7 345 1	OPPD	532766 JEC N 7 345 532770 MORRIS 7 345 1	OPPD

Linear Transfer Analysis

Results Summary:

- Currently planned future transmission system is capable of transferring power on area basis, except for the transfers between NPCC → PJM areas.
- Incremental transfer capabilities ranged from 336 MW to over 5,000 MW
- Limits identified should be further analyzed and validated by the limiting PC

Questions and Discussion

Sample Scenarios for Study in 2016

- Principles and Guidelines Document
- Sample Scenarios Posted on EIPC Website
- Schedule for Stakeholder Input on Scenarios to be Studied
- Q&A and Discussion

Principles and Guidelines for Scenarios

- Document posted on EIPC website
- Describes the types of scenarios that will be analyzed in 2016
- Provides a sample format for stakeholders to use in providing their ideas on possible scenarios to be studied

Principles and Guidelines Document (1)

- All scenarios will be run as changes to a Base Plan – aka the Roll-up Cases
- Purpose is to develop high-level transmission build-outs that provide information relevant to the scenarios suggested such as Federal and/or regional policy development
- Scenarios should not be duplicative of any other local or regional planning efforts or transmission requests subject to analysis under the OATT provisions of any party

Principles and Guidelines Document (2)

- The assumptions defining a scenario should be provided by the stakeholder sponsors in sufficient detail to allow analysis by EIPC
- EIPC members will work with stakeholders to identify any restrictions, exceptions or gaps in the definition of assumptions
- Changes to the Roll-up Cases resulting from the scenario assumptions will be determined by the EIPC members based on their individual assessments and input from Stakeholders

Number of Scenarios to be Studied

- Up to 3 scenarios per biennial study cycle, with a 10 year study horizon
- A scenario is a consistent set of input assumptions defining a future state which may vary from the base roll-up case
  - May require additional sensitivities
  - May include seasonal analyses using a different roll-up model (e.g. off-peak or shoulder peak model)
- The magnitude of the effort involved to analyze the scenario may reduce the number of scenarios that can be considered in each study cycle

Sample Scenario 1

- Scenario Title: Inter-Regional Capabilities and Constraints during Winter Peak Conditions
- Scenario Submitted by: Example Scenario 1
- Study Case: 2025 Winter Peak

Sample Scenario 1

- General Description and Premise
  - This scenario would assess the Eastern Interconnection's ability to transfer large amounts of power among regions of interest during winter peak conditions when natural gas supplies for electric generation may become limited.
  - This scenario would provide both an assessment of inter-regional capabilities and constraints for 2025 winter conditions, and also would provide suitable modeling to enable independent analysis by transmission planners and other industry analysts.
  - Starting point is the 2025 roll-up winter peak steady state load-flow model.
  - Up to 5000MW of natural gas fired generation that is on-line in the 2025 base case will be removed from service and transfers into the region will be simulated.
  - Regional gas limitations will be simulated in the following areas of the Eastern Interconnection: northeast (Zone C), central (Zone D), southeast (Zone A and E), midwest (Zone B), southwest (Zone F).

Sample Scenario 1

- Question to be Answered Based on Power Flow Analysis:
  - "What constraints arise when natural gas fired generation becomes regionally limited during winter conditions?"

Sample Scenario 2

- Scenario Title: Inter-Regional Capabilities and Constraints during Summer Peak Conditions
- Scenario Submitted by: Example Scenario 1
- Study Case: 2025 Summer Peak

Sample Scenario 2

- General Description and Premise
  - This scenario would assess the Eastern Interconnection's ability to transfer large amounts of power among regions of interest during summer peak conditions with large amounts of coal generation off-line.
  - Many factors come in to play during summer conditions. Generation resource margins are critical during summer periods. Wind resources generally have higher capacity factors and solar resources have longer production hours than in winter.
  - This scenario would provide both an assessment of inter-regional capabilities and constraints for 2025 summer conditions, and also would provide suitable modeling to enable independent analysis by transmission planners and other industry analysts.
  - In this scenario, the EIPC SSMLFWG planners would utilize the 2025 Summer Peak Roll-up Case of the Eastern Interconnection developed in 2015.
  - The EIPC SSMLFWG would then assess the ability of the system to move power among specific regions of interest where large portions of coal fired generation are assumed to be off-line during summer peak conditions and identify associated transmission constraints.

Sample Scenario 2

- Question to be Answered Based on Power Flow Analysis:
  – "What constraints arise when coal fired generation becomes regionally limited during summer conditions?"

Schedule for Stakeholder Input

15	EIPC Webinar on Status of Roll-up Case Development and Possible Scenarios for 2016	November 17, 2015 11:00am Eastern start	
16	Post Draft Roll-up Report	December 11, 2015	
17	**Regional Meetings**:	December - February	
	a. Present 2025S and 2025W roll-up base cases		
	a. Present results of roll-up case contingency and transfer testing		
	a. Additional discussion on possible scenarios		
	a. Stakeholder feedback on possible scenarios and which scenarios to select		
18	Stakeholder Written Input on Possible Scenarios and the Draft Roll-up Report Due	January 29, 2016	
19	EIPC Webinar to discuss stakeholder feedback on scenario options and prioritize scenarios to be studied in 2016	February 26, 2016	
20	Stakeholder final comments on the scenarios due to regional process or to EIPC@tva.gov	March 2, 2016	
21	EIPC Consideration of comments on scenario selection and final determination of scenarios	March, 2016	
22	Final scenario descriptions & 2016 Schedule posted	March 21, 2016	
23	SSMLFWG Begins Work on Scenarios	March 31, 2016	

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Questions and Discussion