Eastern Interconnection Planning Collaborative

EIPC Interconnection-wide Webinar and Stakeholder Discussion

December 13, 2013

Webinar Outline

- Presentation on 2018 and 2023 Roll-up Report
  - Report posted December 6, 2013 (eipconline.com)
- Q&A and Discussion on Roll-up Report
- Presentation on Sample Scenarios for Study in 2014
- Discussion and Schedule for Stakeholder Input on Scenarios to be Studied

Background on EIPC Activities

1. DOE Interconnection Studies Grant
   - ARRA funded
   - Study continues through 2014
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

2018 and 2023 Roll-up - Agenda

- Introduction
  - Transmission Analysis Process
- Roll-Up Report
  - What is Contained in the Report and Appendices
- 2018 & 2023 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
    - 2018 and 2023 summer peak 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
  - Participating Planning Coordinators (PC) 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. American Transmission Company (“ATC”)
3. Duke Energy Carolinas (“DEC”)
4. Duke Energy Florida (“DEF”)
5. Duke Energy Progress (“DEP”)
6. Electric Energy Inc.
7. Entergy Services, Inc. on behalf of the Entergy Corporation Utility Operating Companies (“Entergy”)
8. LG&E and KU Energy LLC (Louisville/Kentucky Utilities)
9. Florida Power & Light (“FPL”)
10. Georgia Transmission Corporation (“GTC”)
11. IESO (Ontario, Canada)
12. International Transmission Company (“ITC”)
13. ISO New England, Inc. (“ISO-NE”)
14. JEA (Jacksonville, Florida)
15. Mid-Continent Area Power Pool, by and through its agent, MAPPCOR
16. Mid-Continent Independent Transmission System Operator, Inc. (“MISO”)
17. Municipal Electric Authority of Georgia (“MEAG”)
18. New York Independent System Operator, Inc. (“NYISO”)
19. PJM Interconnection, L.L.C. (“PJM”)
20. PowerSouth Energy Coop
21. Santee Cooper (“SCPSA”)
22. South Carolina Electric & Gas (“SCE&G”)
23. Southern Company Services Inc. (“Southern”), as agent for
    a. Alabama Power Company
    b. Georgia Power Company
    c. Gulf Power Company
    d. Mississippi Power Company
24. Southwest Power Pool (“SPP”)
25. Tennessee Valley Authority (“TVA”)

2018 & 2023 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 Coordinator 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

Transmission "Gap" Analysis Process

Development of 2018 & 2023 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 2012 series 2018 and 2023 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 low-side voltage rating of 110 kV and above

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
  - To correct errors found within cases

Transmission "Gap" Analysis Results

- MISO reported
  - Five overloads in 2018 and four overloads in 2023 due to N-1 contingencies
  - Four overloads in 2023 in the Base Case (no contingencies)
  - Solutions included upgrading facility capacities and adding additional circuits
- PJM reported
  - Three overloads in 2018 and one overload in 2023 due to N-1 contingencies
  - Seven voltage issues in 2018 and six issues in 2023 due to N-1 contingencies
  - Solutions included generation re-dispatch
- SPP reported
  - Four overloads in 2018 and two overloads in 2023 due to N-1 contingencies
  - Two voltage issues in 2018 and one issue in 2023 due to N-1 contingencies
  - Solutions include approved projects, pending projects, and system re-dispatch
- Remaining PCs did not identify any issues

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

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	

Linear Transfer Analysis

Results Summary:

- Currently planned future transmission system capable of transferring power on area basis
- Incremental transfer capabilities ranged from 550 MW to over 5,000 MW
- Limits identified were analyzed and validated by limiting PC

Questions and Discussion

Sample Scenarios for Study in 2014

- 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 2014
- 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 Conditions
- Scenario Submitted by: Example Scenario 1
- Study Case: 2018 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
  - The 2018 model year would incorporate the generation retirements and other system changes associated with the implementation of the EPA MATS rules.
  - Winter operations are growing in complexity as gas-fired generation, renewables, and demand-side options continue to increase as percentage of the overall generation mix.
  - This scenario would provide both an assessment of inter-regional capabilities and constraints for 2018 winter conditions, and also would provide suitable modeling to enable independent analysis by transmission planners and other industry analysts.

Sample Scenario 1

- Questions to be Answered Based on Power Flow Analysis:
  - "What constraints arise when renewables, gas generation, etc. are transferred during winter conditions?"
  - These are important so the EIPC can understand the objective of the study
- Modeling Parameters:
  - Provides the details of what is to be studied
- Resource Modifications:
  - Details how resources change in the scenario to be studied

Sample Scenario 2

- Scenario Title: Inter-Regional Capabilities and Constraints during Spring Peak Conditions
- Scenario Submitted by: Example Scenario 2
- Study Case: 2018 Spring 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 spring peak conditions.
  - The 2018 model year would incorporate the generation retirements and other system changes associated with the implementation of the EPA MATS rules.
  - Spring operations are growing in complexity as gas-fired generation, renewables, and demand-side options continue to increase as percentage of the overall generation mix.
  - Generation resources are more likely to be off-line due to lower loads and due to maintenance outages. Wind resources generally have higher capacity factors while solar resources have shorter production hours than summer but higher than winter.

Sample Scenario 2

- Questions to be Answered Based on Power Flow Analysis:
  - "What constraints arise when renewables, gas generation, etc. are transferred during spring conditions?"
- Modeling Parameters:
  - Provides the details of what is to be studied
- Resource Modifications:
  - Details how resources change in the scenario to be studied

Schedule for Stakeholder Input

15	EIPC Webinar on Possible Scenarios & Roll-Up Case Report	December 13, 2013 9:30am Eastern start	
16	**Regional Meetings**:	December - February	
	a. Present 2018 and 2023 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		
17	Stakeholder Input on Possible Scenarios and the Draft Roll-up Report Due	January 31, 2014	
18	EIPC Webinar to discuss stakeholder feedback on scenario options and finalize scenarios to be studied in 2014	February 26, 2014	
19	Stakeholder final comments on the scenarios due to regional process and in the alternative EIPC@tva.gov	March 7, 2014	
20	EIPC Consideration of comments on scenario selection and final determination of scenarios	March, 2014	
21	Final scenario descriptions & 2014 Schedule posted	March 28, 2014	
22	SSMLFWG Begins Work on Scenarios	March 31, 2014	

Questions and Discussion