



TAG Meeting October 12, 2015

**ElectriCities Office
Raleigh, NC**



TAG Meeting Agenda

- 1. Administrative Items – Rich Wodyka**
- 2. Joint Inter-Regional Study Follow-up Report – Sam Waters**
- 3. 2015 Study Report**
 - a. Activities Update – James Manning**
 - b. Study Scope Revision – Lee Adams**
 - c. Preliminary Study Results – Orvane Piper**
- 4. Operations Reliability Coordination Agreement (ORCA) Report – Bob Pierce**
- 5. Regional Studies Update – Bob Pierce**
- 6. 2015 TAG Work Plan Update – Rich Wodyka**
- 7. TAG Open Forum – Rich Wodyka**



Status Report on the Joint NCTPC/MISO/PJM Study of the PJM 2016/17 Base Residual Capacity Auction Results

Presented at the NCTPC Transmission Advisory Group

by

Sam Waters

General Manager, Transmission Planning

Duke Energy

October 12, 2015

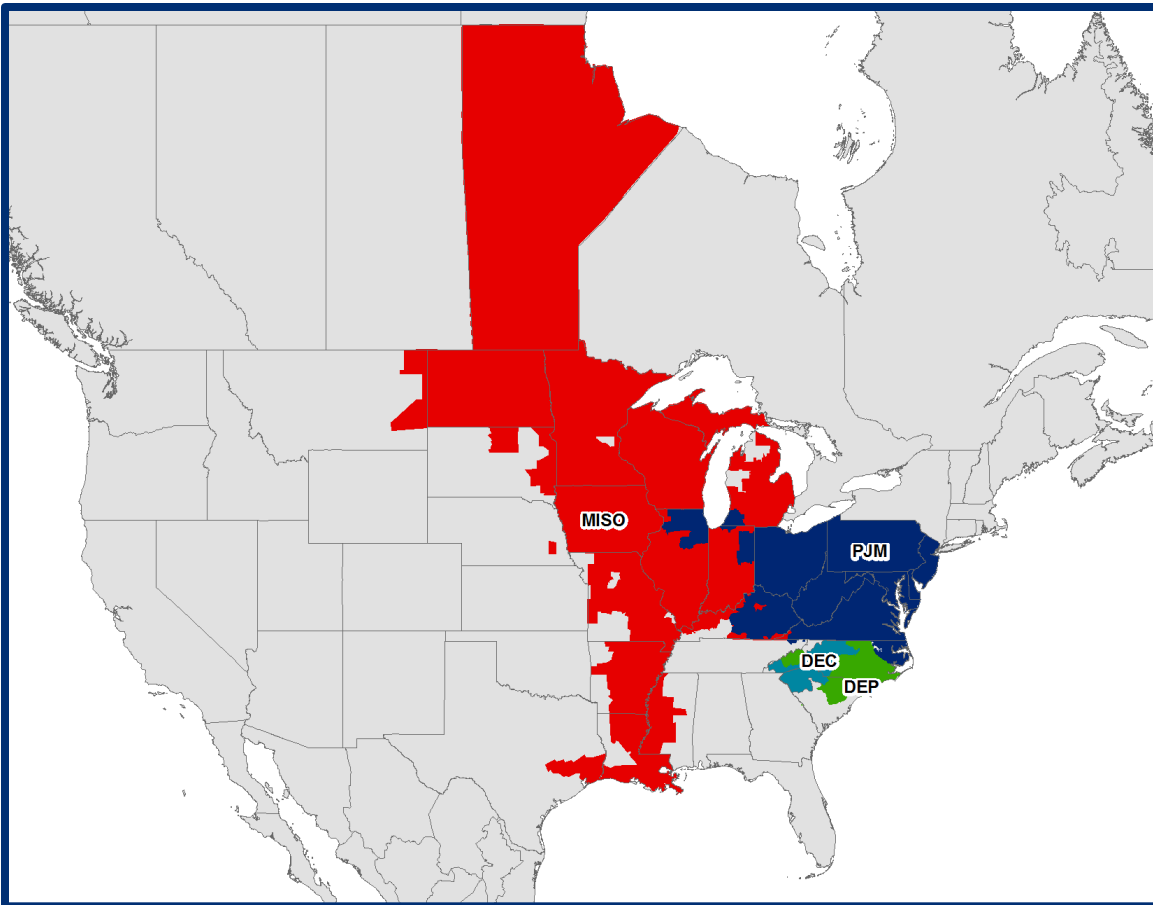


Joint Study

- **In December of 2013, the NCUC requested that the NCTPC, PJM and MISO jointly address whether imports into PJM from MISO resulting from the capacity auction (Base Residual Auction) conducted by PJM for the 2016/17 delivery year would exacerbate loop flows on the transmission grid in North Carolina. Specifically the study participants were asked:**
 - 1. Whether such potential congestion would likely require Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) to alter their joint dispatch in a manner that increases costs for North Carolina customers; and**
 - 2. Whether the planned imports would reduce the reliability of the transmission grid serving North Carolina.**



Joint Study



**Geographical
representation of
the study areas**



Joint Study

- **To address the issues raised by the NCUC request, both a reliability (steady state or powerflow) and economic (production cost) study were required.**
- **The economic study was informed by the results of the reliability study, i.e., the limits to the amount of power that could be transferred between DEC and DEP were identified in the reliability analysis, then input into the production cost analysis.**



Joint Study

Study Results

- The economic impacts of the BRA on Duke production costs are relatively insignificant.
- The study did not find any DEP transmission facilities that will need immediate upgrades due to the PJM 2016/2017 BRA.
- There were DEC transmission facilities identified as not meeting transmission planning requirements that cannot be alleviated by upgrades by 2016.

Based on the study results, PJM, MISO and Duke Energy agreed to initiate discussions to discuss possible operating measures to address the issues identified, and planning for future auctions to ensure early identification of issues that may arise out of those auctions.



Joint Study

Current Status

➤ The most recent meeting of the parties was held 9/30/15 at the PJM offices to continue discussions on an operating guide and future actions. From this meeting, the following results:

1. A draft operating guide, based on previous framework development (see following slide) was enhanced to near final status. The parties will review this document and bring to completion, and a trial application exercise will be conducted prior to implementation.
2. An agreement was reached to provide Duke Energy with early notice of new Capacity Import Limit calculations and any limits detected on the Duke Energy system associated with additional PJM capacity auctions.
3. An agreement was reached that PJM will provide, in a timely fashion, the results of future capacity auctions, including identification of cleared resources, to Duke Energy allowing a review for potential issues, and to ensure that the operating guide established will continue to resolve any issues identified.



Joint Study



BRA Dynamic
Transfer
Parallel Flow
Mitigation

Page 1 of 7

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OM#	xxxx	Rev# 0	
Effective:	06/01/2016		
Revise/Review By:	06/01/2017		

Information contained within is market sensitive,
& therefore falls under CEII guidelines.

1.0 PURPOSE / INTENT

This operating guide is designed to provide a proactive approach to managing potential parallel flows through the Duke Energy Carolinas and Duke Energy Progress transmission systems resulting from capacity being sourced from the 2016/17 Base Residual Auction portfolio to sink in PJM via pseudo-tied dynamic transfers.

2.0 PROCEDURE

a. Next Day Studies

- i. By 10:30 EPT each day, PJM RC will estimate which BRA capacity resources are planned to be committed for the next day and will provide this list of planned commitment BRA resources to DEC for DEC next day studies.
- ii. By 13:30 EPT each day, PJM RC will determine which BRA capacity resources will be committed for the next day and will provide this in a revised list of planned commitment BRA resources to DEC.
- iii. PJM RC and DEC will conduct next day studies with the BRA capacity estimated/planned commitment.
- iv. PJM RC and DEC will assess the impact that the increase loading resulting from the commitment of the BRA resources has on the list of DEC and DEP flowgates provided in Appendix A.
- v. For any post contingency loading > 95% of the facility rating identified from the Next Day Study process, a phone conversation will be established between PJM RC, DEC, and DEP to confirm the study results and to discuss and develop a loading relief plan should the facility constraint occur.

b. Current Day Actions

To alleviate contingency overload conditions resulting from BRA capacity dynamic transfers during the Current Day of operation, one or more of the



BRA Dynamic
Transfer
Parallel Flow
Mitigation

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transmission loading relief tools (shown in priority order) may be utilized for transmission loading relief:

- i. DEC, DEP, PJM RC, and VACAR South RC will closely monitor the Next Day Study identified constrained flowgates and will notify PJM RC and VACAR South RC if anticipating a contingency violation on one or more of the identified flowgates to determine a relief plan should a contingency violation occur.
- ii. Request TLR 3A/3B to curtail non-firm transactions impacting constraint(s).
- iii. Local PJM-DEP TLR procedure w/ 3% TDF cutoff – VACAR South RC Operating Limits Procedure #A1-10 / PJM OM # 40.

iv. Re-configuration options:

NOTE: All switching options are to be studied and agreed upon by the DEC TOP, DEP TOP, PJM RC, and VACAR South RC prior to implementation unless switching is emergent and needed to avoid cascading outages.

1. If DEC TOP, DEP TOP, PJM RC, and VACAR South RC agree on a reconfigure option, implement the most effective option.
2. For CPLE/PJM interface constraints, DEP studies reflect that opening all tie-lines with Dominion – PJM will alleviate most loading issues in DEP resulting from BRA capacity dynamic transfers, however, consult Dominion and PJM before implementing this option as some scenarios may influence voltage depression and overloaded equipment impacts resulting from implementing this option.

v. Re-dispatch generation.

1. For CPLE/PJM tie-line constraints resulting from BRA transfers, PJM may be able to bind the constraint in SCED and allow it to set LMP. This approach will allow re-dispatch of generation



Joint Study

Additional Information

- Working through the current model creation process (Multi-Area Modeling Working Group, MMWG), additional review of transmission reservation information has improved the accuracy of both short and long-term models used in the Eastern Interconnection significantly. This improvement has resulted from an increased emphasis on identifying the transmission arrangements associated with firm power commitments by all parties.



Questions ?






2015 Study Activities Update

**James Manning
NCEMC**



Steps and Status of the Study Process

- 
- A vertical arrow on the left side of the list. The top portion is light blue and contains the word 'Completed' written vertically. The bottom portion is yellow. The arrow points downwards, indicating the progression of the study process.
- 1. Assumptions Selected**
 - 2. Study Criteria Established**
 - 3. Study Methodologies Selected**
 - 4. Models and Cases Developed**
 - 5. Technical Analysis Performed**
 - 6. Problems Identified and Solutions Developed**
 - 7. Collaborative Plan Projects Selected**
 - 8. Study Report Prepared**



Studies for 2015

- **Annual Reliability Study**
 - **Assess DEC and DEP transmission systems' reliability and develop a single Collaborative Transmission Plan**
- **Resource Supply Scenarios**
 - **Assess DEC and DEP interfaces with neighboring systems by modeling hypothetical transfers**
- **Local Economic Study Scenarios**
 - **Assess scenarios submitted by stakeholders**



2025 Hypothetical Import / Export

Resource From	Sink	Test Level (MW)
PJM	DUK ¹	1,000
SOCO	DUK	1,000
SCEG	DUK	1,000
SCPSA	DUK	1,000
CPLE ²	DUK	1,000
TVA	DUK	1,000

1 – DUK is the Balancing Area for DEC

2 – CPLE is the eastern Balancing Area for DEP



2025 Hypothetical Import / Export

Resource From	Sink	Test Level (MW)
PJM	CPLE	1,000
SCEG	CPLE	1,000
SCPSA	CPLE	1,000
DUK	CPLE	1,000
DUK	SOCO	1,000



2025 Hypothetical Import / Export

Resource From	Sink	Test Level (MW)
PJM	DUK / CPLE	1,000 / 1,000
DUK / CPLE	PJM	1,000 / 1,000
CPLE	PJM	1,000
DUK	PJM	1,000
SOCO ³	PJM	1,000

3 – This hypothetical transfer is intended to evaluate the impact of a 1000 MW Southern Co transaction through the DEC/DEP transmission systems into PJM.



Local Economic Study Request #1

- **661 MW transfer from TVA's Shelby 500 kV Sub to DEC/DEP control areas**
 - **Requested by Clean Line Energy**
 - **Studied year 2020 Summer as requested**
 - **Allocated to DEC and DEP based on share of combined load**
 - **397 MW to DEC**
 - **264 MW to DEP**



Local Economic Study Request #2

- **Forced outage(s) of multiple nuclear units on DEC and DEP systems (similar vintage)**
 - Requested by NCEMC
 - Studied year 2020 Summer as requested
 - DEC's McGuire #1 & #2 and Catawba #1 & #2 and DEP's Harris #1 with replacement internally first and then equally from SOCO & PJM (4400 MW)
 - 2200 MW from SOCO, 2200 MW from PJM
 - 3400 MW to DEC, 1000 MW to DEP



Base Case Model Development

- **Started with 2014 series MMWG cases**
- **Latest updates to detailed models for DEC and DEP systems, including the planned transmission additions update from 2014 Plan and Western Carolina Modernization Project**
- **Adjustments made based on additional coordination with neighboring transmission systems**



Technical Analysis

- **Conducted thermal screenings of the 2020 and 2025 base cases**
- **Conducted thermal screenings of 2025 hypothetical transfer scenarios**
- **Conducted thermal screenings of both 2020 Local Economic Study requests**



Problems Identified and Solutions Developed

- **Preliminary results are being presented today along with identified limitations and potential solutions**
 - **Solicit feedback from stakeholders for possible alternative solutions for further testing and evaluation**
- **Estimated project costs and schedule**



Collaborative Plan Projects Selected

- **Compare all alternatives and select preferred solutions**

Study Report Prepared

- **Prepare draft report and distribute to TAG for review and comment**



Questions ?





2015 Study Scope Revision

Lee Adams
Duke Energy Progress



Study Scope Revision

- **Study Assumptions - Revision**
 - DEC and DEP will include the transmission portion of the Western Carolinas Modernization Project that have planned in-service dates of December 1, 2019, that are a result of a 600 MW Transmission Service Request (TSR).
 - DEP will assume that Asheville 1 and 2 coal units will be shut down in all study cases.
 - The summer cases will include a CPLW BA import of 601 MW and the winter case will include a CPLW BA import of 701 MW.
 - Also assumed that the 150 MW DEP purchase from the SOCO Rowan resource will terminate at the end of 2019.



Reliability Projects to be Added to 2015 Plan

Reliability Project	TO	Planned I/S Date
Brunswick #1 – Jacksonville 230 kV Line Loop-In to Folkstone 230 kV substation	DEP	June 2024
Asheville Plant, Replace 2-300 MVA 230/115 kV banks with 2-400 MVA banks and reconductor 115 kV ties to switchyard	DEP	December 2019
Craggy-Enka 230 kV Line, Construct	DEP	December 2019



Reliability Projects to be Added to 2015 Plan		
Reliability Project	TO	Planned I/S Date
Norman 230 kV Lines, Rebuild	DEC	December 2015
Foothills 500/230 kV Substation, Construct	DEC	December 2019
Asheville Plant(DEP)-Foothills(DEC) B&W 230 kV Lines, Construct	DEC	December 2019
Davidson River 100 kV Lines, Partial Rebuild	DEC	December 2019



Questions ?





2015 Study Preliminary Results

Orvane Piper – Duke Energy Carolinas



Technical Analysis Base Reliability

- **Conducted thermal screenings of the 2020 and 2025 base cases**
- **No new issues were observed that do not have planned mitigation**



Technical Analysis

Local Economic Study - Request #1

- **A 661 MW transfer from TVA to DEC/DEP was studied.**
- **No new projects were identified in either DEC or DEP.**



Technical Analysis

Local Economic Study - Request #2

- **Forced outage(s) of multiple nuclear units on DEC and DEP systems was studied.**
- **Transmission projects would be required on both DEC and DEP**



Technical Analysis Local Economic Study - Request #2

Reliability Project	TO	Estimated Cost
Fisher 230 kV (Central-Shady Grove Tap)	DEC	\$35 M
Parr 230 kV (VC Summer-Newport)	SCEG/ DEC	\$85 M
Newport 500/230 kV	DEC	\$20 M
		\$140 M



Technical Analysis

Local Economic Study – Request #2

Reliability Project	TO	Estimated Cost
Darlington-(SCPSA)S. Bethune 230 kV Line – Coordinate upgrade with SCPSA	DEP/ SCPSA	\$10 M
Convert Camden Jct to a 230 kV Sub and Construct Camden Jct-(SCPSA)Camden 230 kV Line (~5 miles)	DEP/ SCPSA	\$18 M
		\$28 M



Technical Analysis Hypothetical Transfers

- **No new issues were observed that do not have planned mitigation**



TAG Input Request

- **TAG is requested to provide any input to the OSC on the preliminary study results as well as proposing alternative solutions to the problems identified.**
- **Provide input by **November 2, 2015** to Rich Wodyka (rawodyka@aol.com)**



Questions ?





**MISO/Entergy Integration
Operations Reliability Coordination
Agreement (ORCA)**

**Bob Pierce
Duke Energy Carolinas**



MISO/Entergy Integration

- **No news on ORCA or settlement meetings**



Questions ?





Regional Studies Reports

Bob Pierce
Duke Energy Carolinas



SERC Long Term Study Group Update



SERC Long Term Study Group

- Nearing completion of work on 2015 series of MMWG cases
- 2020 Summer study report is nearly complete – will be publicly available in April 2016



Eastern Interconnection Planning Collaborative (EIPC)



EIPC

Planning Activities

- Have screened 2025 Summer and Winter models
- No notable issues identified
- Will be looking for input on scenarios to screen



<http://www.eipconline.com/>



SERTP



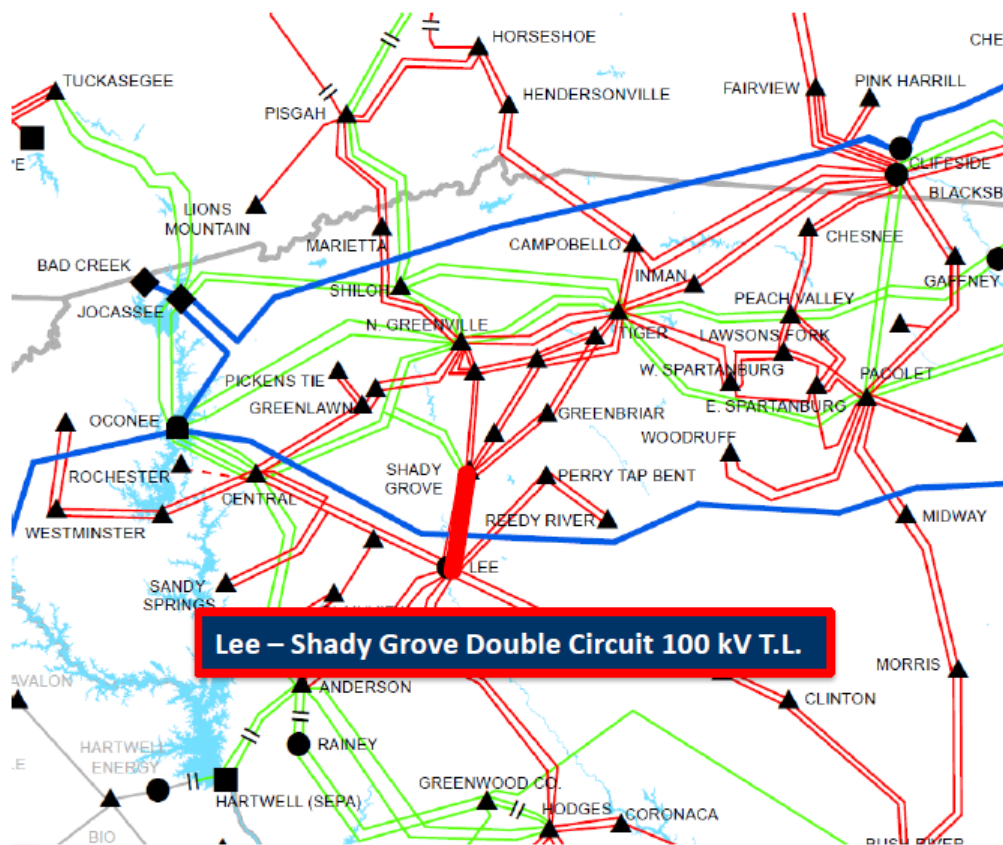
SERTP

- Economic Planning Study results presented

Economic Planning Studies

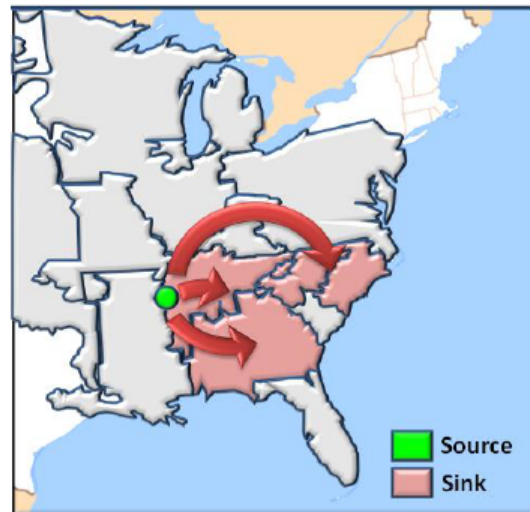
- **Santee Cooper Border to Duke**
 - 500 MW (2018 Summer Peak)
- **TVA (Shelby) to Southern/TVA/Duke**
 - 3500 MW (2020 Summer Peak)
- **Southern & SCEG to PJM Border**
 - 500 MW (2020 Summer Peak)

Significant Constraints – *DEC*



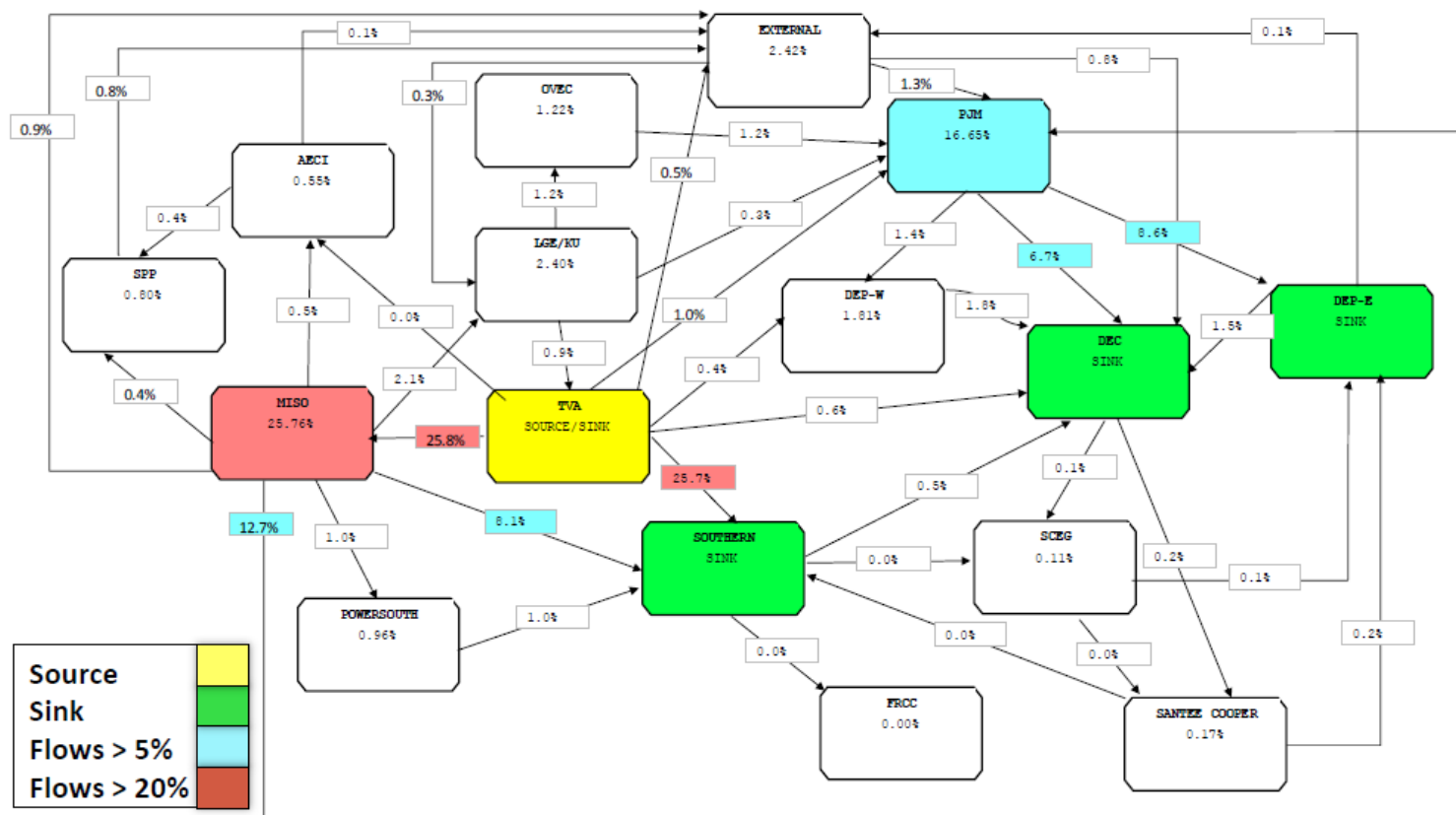
Study Assumptions

- **Transfer Type**: Generation to Generation (2020 Summer Peak)
- **Source**: A new generator interconnection to the existing Shelby 500 kV substation (TVA)
- **Sink**: Generation within Southern Company (1200MW), TVA (1639MW), Duke Energy Carolinas (407MW), and Duke Energy Progress (254MW)



➤ No upgrades in DEC or DEP

Transfer Flows with the SERTP



Transmission System Impacts – *SERTP*

- **Thermal Constraints Identified:**
 - One (1) 500 kV T.L.
 - One (1) 500/161 kV Transformer Bank
 - Six (6) 230 kV T.L.
 - Two (2) 161 kV T.L.
 - Three (3) 115 kV T.L.
- **Transmission Project Included in the Economic Study Assessment per RPSG Request:**
 - One (1) 500 kV T.L.

Total (\$2015) = \$322,500,000⁽¹⁾

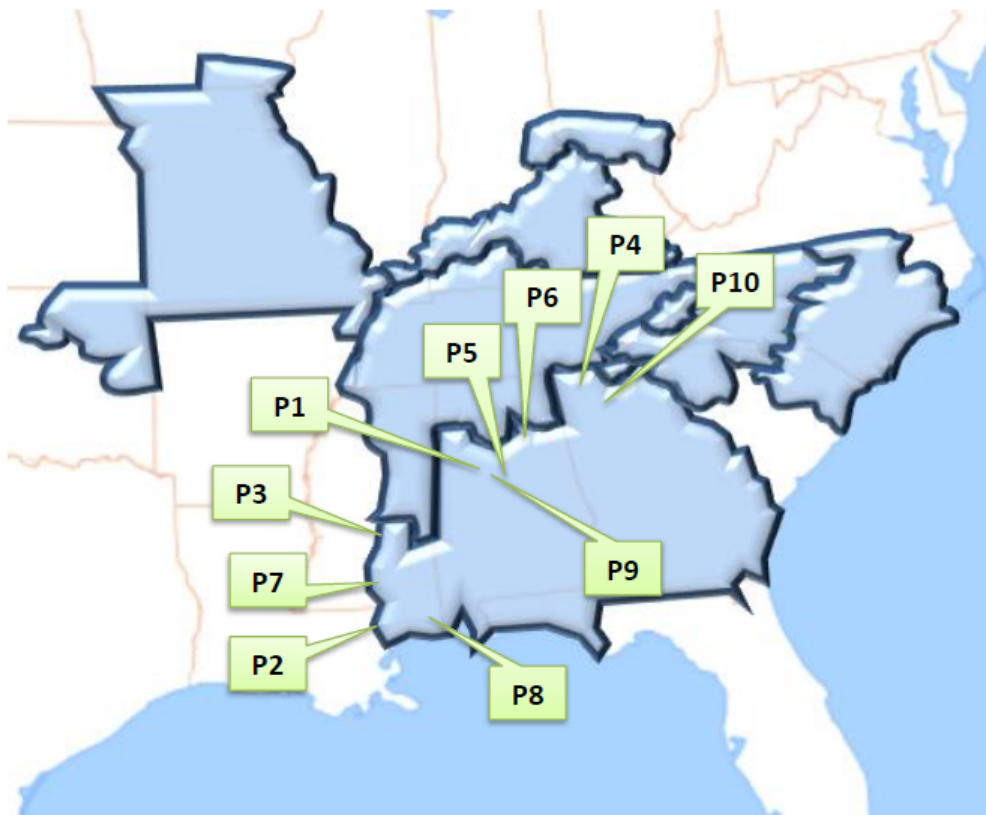
⁽¹⁾ This cost includes the Lagoon Creek – Jackson 500 kV T.L. project, which has been modeled within the SERTP economic study at the request of the RPSG and is not a part of TVA's expansion plan. The estimated cost of this project has been included in the total project cost of the economic study.

Transmission System Impacts – SBA

- **Thermal Constraints Identified:**
 - Six (6) 230 kV T.L.
 - Two (2) 161 kV T.L.
 - Three (3) 115 kV T.L.

Total (\$2015) = \$181,500,000

Significant Constraints – *SBA*



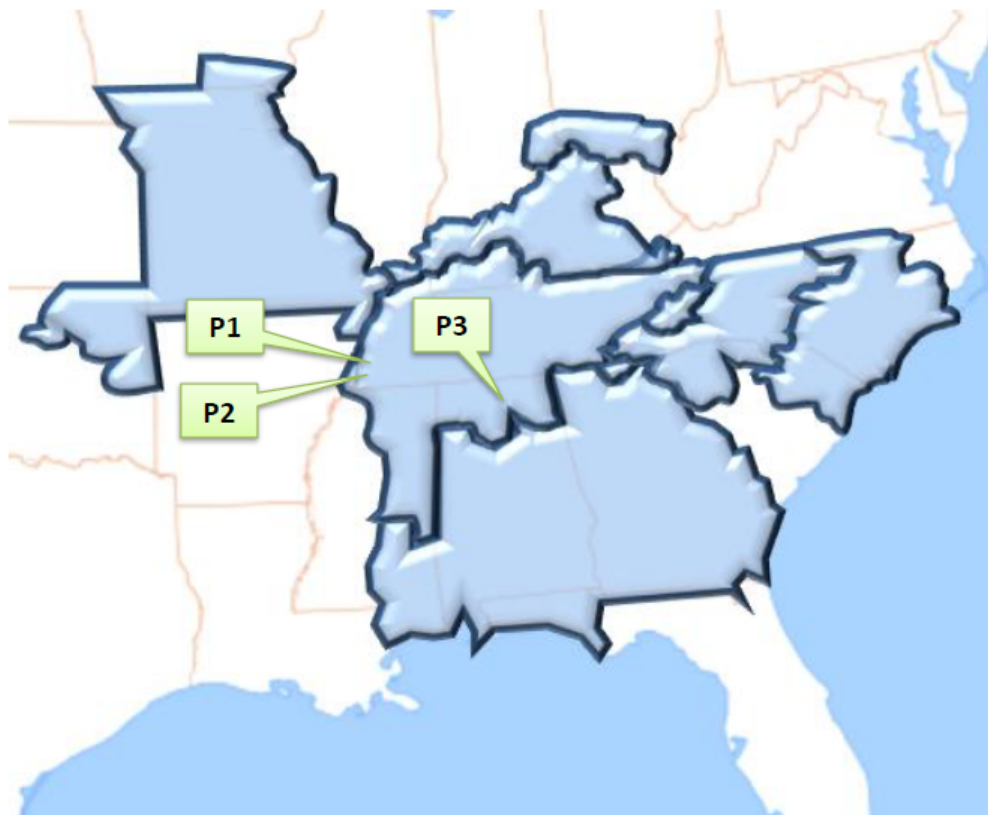
Transmission System Impacts – TVA

- **Thermal Constraints Identified:**
 - One (1) 500 kV T.L.
 - One (1) 500/161 kV Transformer Bank
- **Transmission Project to be Included in the Economic Study Assessment per RPSG Request:**
 - One (1) 500 kV T.L.

Total (\$2015) = \$141,000,000⁽¹⁾

⁽¹⁾ This cost includes the Lagoon Creek – Jackson 500 kV T.L. project, which has been modeled within the SERTP economic study at the request of the RPSG and is not a part of TVA's expansion plan. The estimated cost of this project has been included in the total project cost of the economic study.

Significant Constraints – TVA





Next Meeting Activities

- **2015 SERTP 4th Quarter Meeting** – *Annual Transmission Planning Summit & Input Assumptions Meeting*
 - **Location:** TBD
 - **Date:** December 2015
 - **Purpose:**
 - Final Economic Planning Study Results
 - Regional Transmission Plan
 - Regional Analyses
 - Assumptions Input Session



<http://www.southeasternrtp.com/>



NERC Reliability Standards Update



- CIP-014 Physical Security
- TPL-001-4
- Order 754 update



➤ Order 754 Data Request

Table 1.6: Buses Evaluated by the Transmission Planner

Row	Description	100-199 kV	200-299 kV	300-399 kV	400-599 kV	≥600 kV
3	Total number of buses evaluated by the Transmission Planner based on actual clearing times	716	813	356	164	44
4	Total number of buses evaluated by the Transmission Planner based on actual clearing times that resulted in system performance exhibiting any adverse impact defined in Table C, "Performance Measures"	160	316	212	101	43
	Percentage of buses evaluated by the Transmission Planner based on actual clearing times that resulted in system performance exhibiting any adverse impact defined in Table C, "Performance Measures"	22%	39%	60%	62%	98%



- Analysis of the data has identified a reliability risk that warrants further action
- Risk-based assessment was used to identify protection systems of concern
 - Not all failures equally affect reliable operation of the Bulk-Power System
 - Reliability effect varies based on which component fails
- Assessments should address, at a minimum, single points of failure in protective relays, single-station dc supply, and dc control circuitry



- For TPL-001-4, Table 1 – Steady State & Stability Performance Planning Events, Category P5:
 - Replace “relay” with “component of Protection System”
 - Continue to reference footnote 13
- For TPL-001-4, Table 1 – Steady State & Stability Performance Extreme Events, under the “Stability” column, No. 2:
 - Remove the phrase “or a relay failure¹³” from items a, b, c, and d to create distinct events only for stuck breaker.



- Replace footnote 13 in TPL-001-4 with,
The components from the definition of “Protection System” for the purposes of this standard include:
 - (1) Protective relays which respond to electrical quantities;
 - (2) single station dc supply that is not monitored for both low voltage and open circuit, with alarms centrally monitored; i.e., reported within 24 hours of detecting an abnormal condition to a location where corrective action can be initiated, and
 - (3) dc control circuitry associated with protective functions through the trip coil(s) of the circuit breakers or other interrupting devices.



- Modify TPL-001-4 (e.g. , in Part 4.5) so that extreme event assessments must include evaluation of the three-phase faults with described component failure of a Protection System that produce the more severe system impacts.

For example, add a new second sentence stating, “The list shall consider each of the extreme events in Table 1 – Steady State & Stability Performance Extreme Events; Stability column item number 2.”



Questions ?





2015 TAG Work Plan

Rich Wodyka
Administrator



2015 NCTPC Overview Schedule

Reliability Planning Process

- Evaluate current reliability problems and transmission upgrade plans
 - Perform analysis, identify problems, and develop solutions
 - Review Reliability Study Results

Local Economic Planning Process

- Propose and select Local Economic Study scenarios and interface
 - Perform analysis, identify problems, and develop solutions
 - Review Local Economic Study Results

Coordinated Plan Development

- Combine Reliability and Local Economic Study Results
 - OSC publishes DRAFT Plan
- TAG review and comment

TAG Meetings

1st Quarter

2nd Quarter

3rd Quarter

4th Quarter

70



2015 TAG Work Plan

January – February

- **2015 Study – Finalize Study Scope of Work**
 - ✓ **Receive final 2015 Reliability Study Scope for comment**
 - ✓ **Review and provide comments to the OSC on the final 2015 Study Scope**
 - ✓ **Receive request from OSC to provide input on proposed Economic Study scenarios and interfaces for study**
 - ✓ **Provide input to the OSC on proposed Local Economic Study scenarios and interfaces for study**



March

TAG Meeting – March 10th

➤ 2015 Study Update

- ✓ Receive a progress report on the Reliability Planning study activities
- ✓ Receive a report on the Local Economic Study scope

➤ Operations Reliability Coordination Agreement (ORCA)

- ✓ Receive an update on the ORCA activities



April - May - June

TAG Meeting – June 8th

- **2015 Study Update**
 - ✓ Receive a progress report on the Reliability and Local Economic Planning study activities
 - ✓ Receive update status of the upgrades in the 2014 Collaborative Plan

- **Operations Reliability Coordination Agreement (ORCA)**
 - ✓ Receive an update on the ORCA activities



July - October

➤ 2015 Study Update

- ✓ **Receive a progress report on the Reliability and Local Economic Planning study activities and preliminary results**
- ✓ **TAG will be requested to provide input to the OSC and PWG on the technical analysis performed, the problems identified as well as proposing alternative solutions to the problems identified**

➤ 2015 Selection of Solutions

- **TAG will receive feedback from the OSC on any alternative solutions that were proposed by TAG members**



July - October

TAG Meeting – October 12, 2015

➤ 2015 Study Update

- ✓ **Receive a progress report on the Reliability and Local Economic Planning study activities and preliminary results**

➤ Operations Reliability Coordination Agreement (ORCA)

- ✓ **Receive an update on the ORCA activities**



November - December

➤ 2015 Study Update

- Receive and comment on final draft of the 2015 Collaborative Transmission Plan report**
- Discuss potential study scope for 2016 studies**



October - November - December

TAG Meeting – December 7th at ElectriCities Office

➤ 2015 Study Update

- Receive presentation on the draft report of 2015 Collaborative Transmission Plan**
- Discuss potential study scope for 2016 studies**

➤ Operations Reliability Coordination Agreement (ORCA)

- Receive an update on the ORCA activities**



Questions ?





TAG

Open Forum Discussion

Comments or Questions?