PJM – SERTP Interregional

PJM – SERTP

Order 1000 Biennial Regional Transmission Plan Review Meeting

April 26th, 2016 Georgia Power Headquarters Atlanta, GA

PJM – SERTP Interregional

Agenda

• SERTP – Process Overview

- Background
- SERTP Region Scope
- Processes and Timelines
- 2015 SERTP Regional Transmission Plan PJM Seam
- SERTP Modeling Input Assumptions

SERTP Overview

SERTP

Process Overview

SERTP Overview

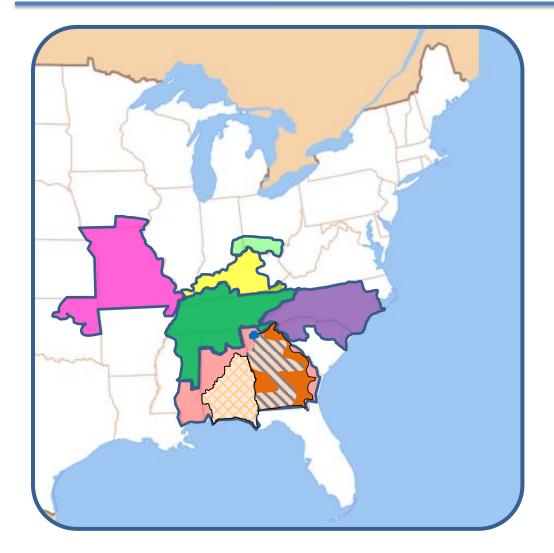
SERTP Background

Southeastern Regional Transmission Planning Process (SERTP)

- Originally formed in 2007 to comply with FERC Order 890
- Provides open and transparent transmission planning forum for transmission providers to engage with stakeholders regarding transmission plans in the region
- Region has expanded several times in both size and scope since formation (most recently in 2014) to currently include 10 Sponsor utilities
- Began regional implementation of Order 1000 requirements on June 1, 2014
- Began interregional implementation of Order 1000 on January 1, 2015

SERTP Overview

SERTP Region



SERTP Sponsors

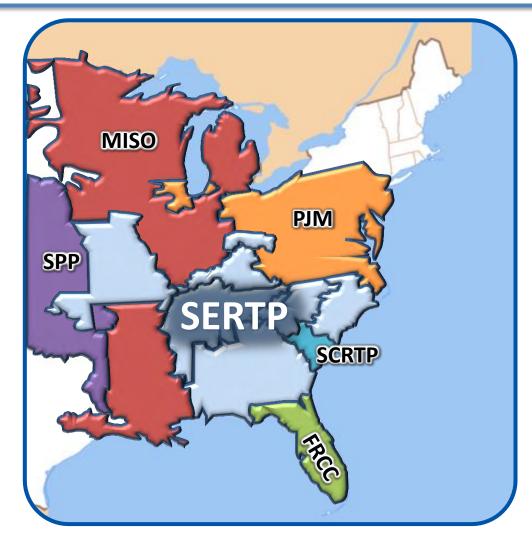


- Spans portions of 14 states
- Includes 9 BAAs
- ~ 90,000 miles of transmission lines

SERTP Overview

Interregional Seams

234



SERTP Regional Models

- SERTP Sponsors develop 12 coordinated regional models
- Models include latest transmission planning model information within the SERTP region
- Typically 3 versions created annually
- Available on the <u>Secure Area</u> of the SERTP website upon satisfying access requirements

No.	Season	Year		
1		2017		
2		2019		
3	Summer	2021		
4	Summer	2022		
5		2024		
6		2026		
7		2019		
8	Shoulder	2021		
9	Shoulder	2024		
10		2026		
11	\\/intor	2021		
12	Winter	2026		

Economic Planning Studies

- SERTP stakeholders can request up to five economic planning studies be performed annually
- These studies represent analyses of hypothetical scenarios requested by the stakeholders and do not represent an actual transmission need or commitment to build
- SERTP Sponsors identify the transmission requirements needed to move large amounts of power above and beyond existing long-term, firm transmission service commitments
 - Analysis is consistent with NERC standards and company-specific planning criteria
- 2015 SERTP Economic Planning Study Report

Regional Transmission Analyses

- Regional Transmission Analyses are performed during the course of each transmission planning cycle in order to:
 - 1) Assess if the then current regional transmission plan addresses the Transmission Provider's transmission needs
 - 2) Assess whether there may be more efficient or cost effective transmission projects to address transmission needs
- 2015 SERTP Regional Analyses Summary



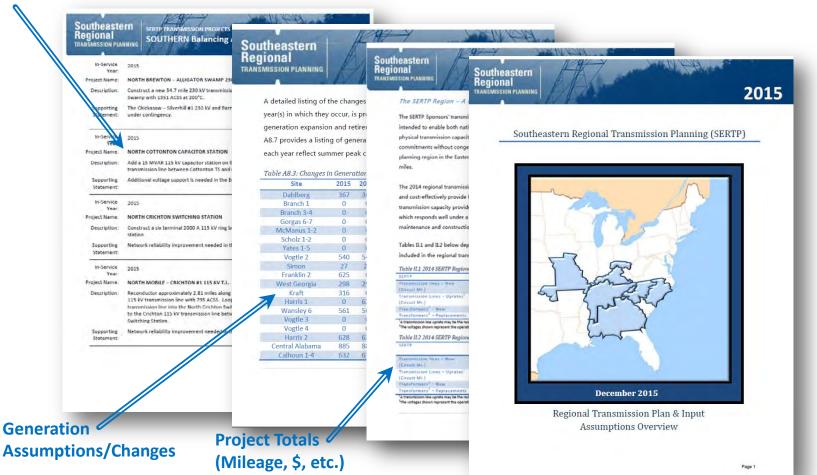
2015 Regional Transmission Analyses

Choctaw – Midway – S. Bessemer 500 kV T.L. Choctaw – Midway – Greene County 500 kV T.L. North Brewton – Billingsley 500 kV T.L. South Hall – Oconee 500 kV T.L. (2nd Circuit) Oconee – McGrau Ford 500 kV T.L. Widow's Creek – Mostellar Springs 500 kV T.L. Wadley – Hatch 500 kV T.L. Shawnee – West New Madrid 500 kV T.L. Pleasant Garden – Person 500 kV T.L.

Regional Transmission Plan

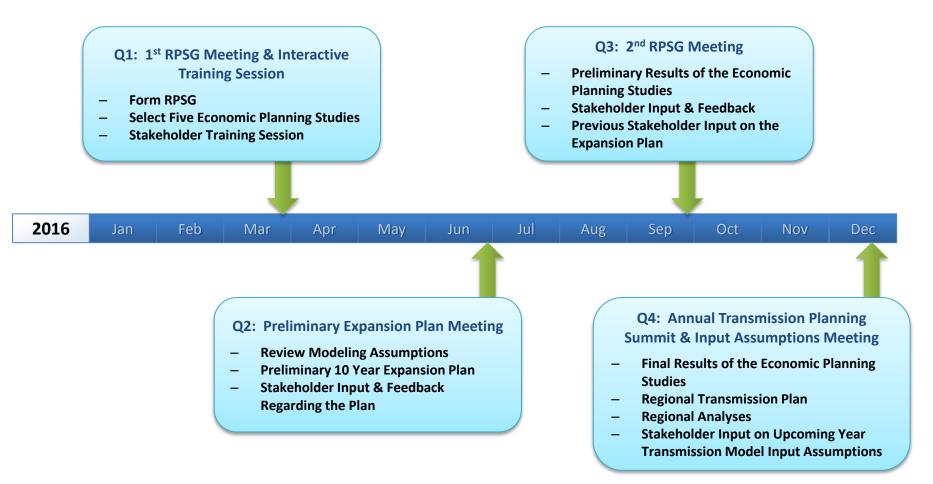
Project Descriptions, Drivers, Contingencies

2015 SERTP Regional Transmission Plan



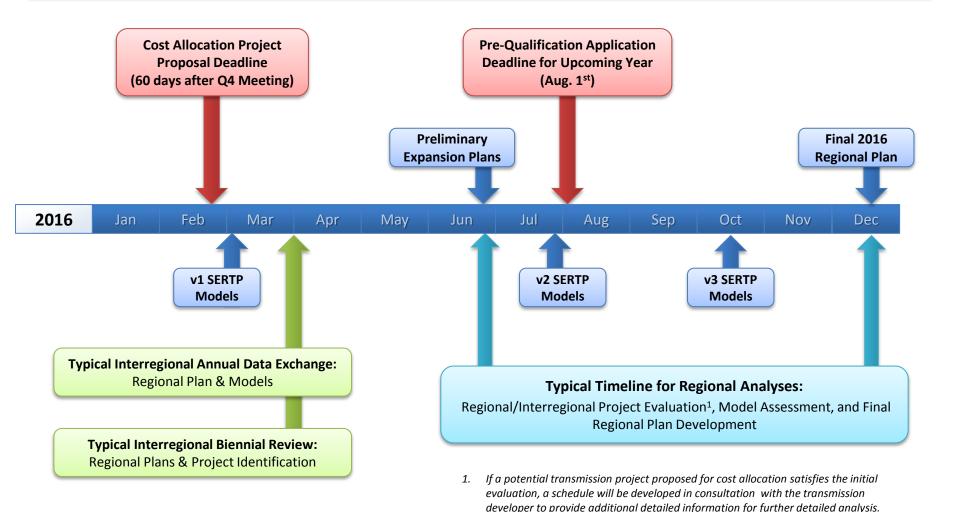
SERTP Processes & Timelines

SERTP Quarterly Stakeholder Meetings





Regional/Interregional Process Timing



Regional Cost Allocation

- Scope of a Regional Project Eligible for Cost Allocation
 - Transmission line located in the SERTP region
 - 300 kV or greater
 - Spans at least 50 miles
 - Must have significant electrical or geographical differences from projects already under consideration
- Benefits Considered
 - Avoided costs of displaced transmission
 - Real power loss savings (regional only)

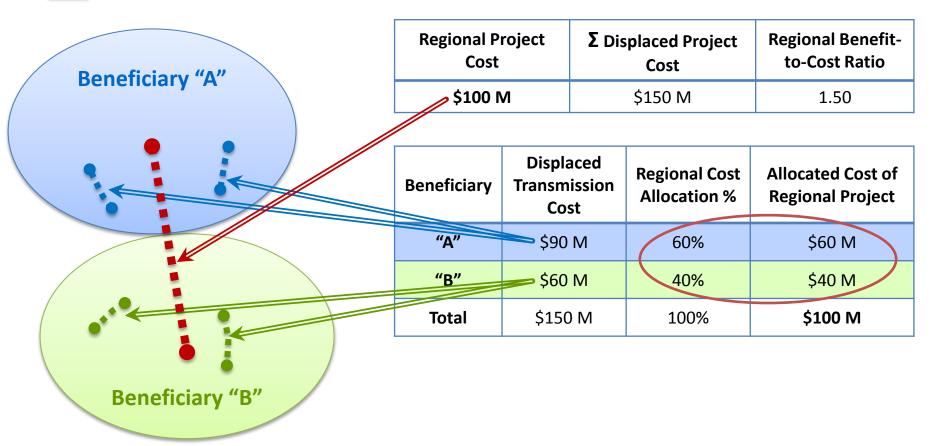
• Evaluations

- Qualitative & Quantitative 1.25 Benefit-to-Cost (BTC) Ratio
- Feasibility
- State jurisdictional and/or governance authorities opportunity for review

Simplified Cost Allocation Example

- Proposed Regional Facility
- Displaced Transmission Facility Beneficiary "A"

Displaced Transmission Facility – Beneficiary "B"



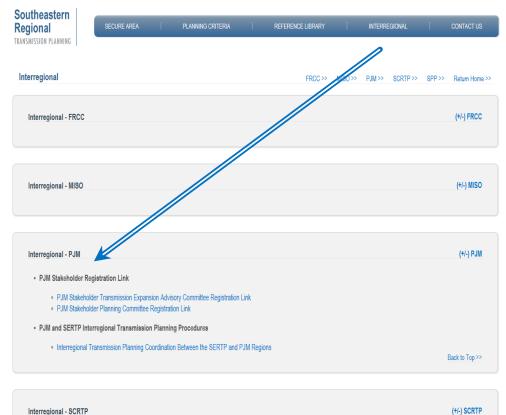
Interregional Cost Allocation

Interregional Project for Cost Allocation Must:

- Interconnect to facilities in both the SERTP and PJM regions
- Meet regional qualifications
- Be proposed in both regional processes

Interregional Coordination

- Meet annually to facilitate coordination procedures
- Website postings
- Annually exchange power-flow models
- Annually exchange regional transmission plans
- Meet biennially to review regional transmission plans
- Coordinate on any joint evaluations of potential interregional transmission projects



SERTP Website / Interregional

SERTP Regional Transmission Plan

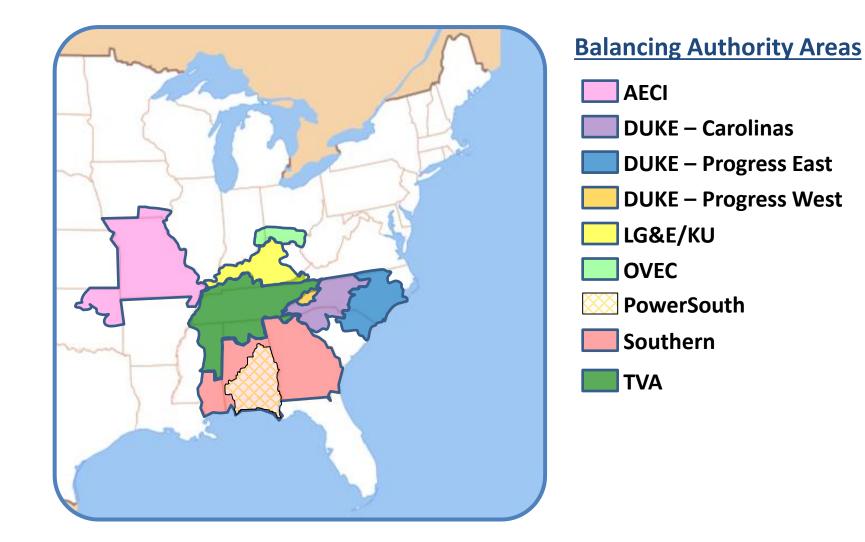
SERTP Regional Modeling Assumptions

SERTP Regional Transmission Plan



SERTP Regional Transmission Plan

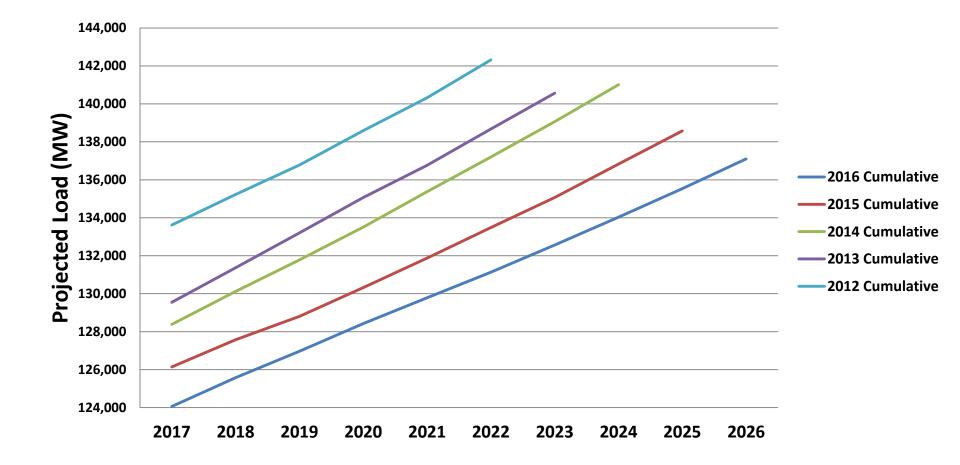
SERTP Regional Modeling Assumptions





SERTP Regional Transmission Plan

SERTP Cumulative Summer Peak Load Forecast



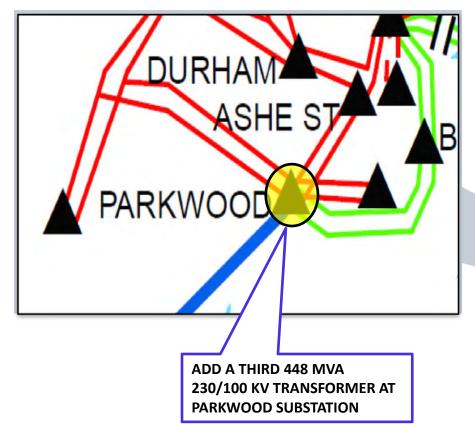
DUKE CAROLINAS Balancing Authority

DUKE CAROLINAS Balancing Authority SERTP Regional Transmission Plan

DUKE CAROLINAS – 1

2016

PARKWOOD 230/100 KV SUBSTATION

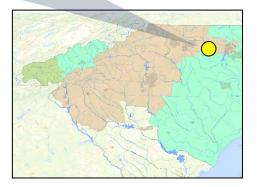


DESCRIPTION:

Add a third 448 MVA 230/100 kV transformer at Parkwood substation.

SUPPORTING STATEMENT:

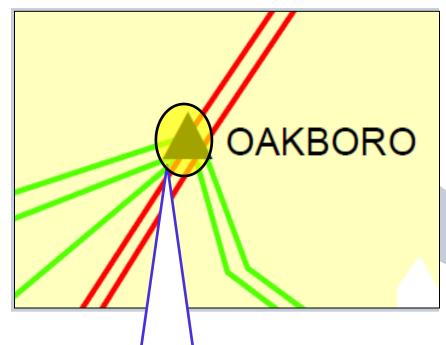
The Parkwood 230/ 100 kV transformer overloads under contingency.



DUKE CAROLINAS – 3

2017

OAKBORO 230/100 KV TIE



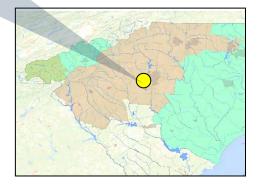
DESCRIPTION:

Add a fourth 448 MVA 230/100 kV transformer at Oakboro Tie.

SUPPORTING STATEMENT:

The Oakboro 230/100 kV transformer overloads under contingency.

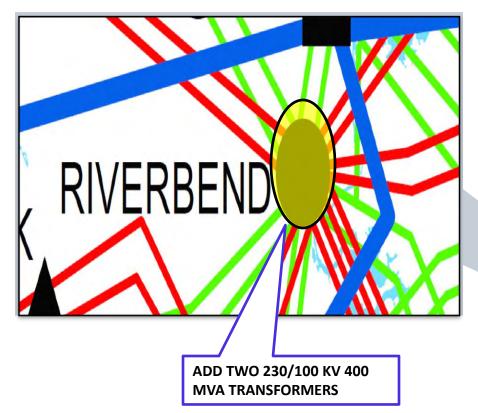
ADD A FOURTH 448 MVA 230/100 KV TRANSFORMER AT OAKBORO TIE



DUKE CAROLINAS – 4

2017

RIVERBEND STEAM STATION

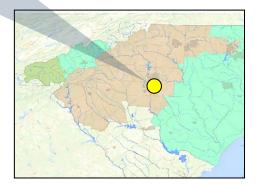


DESCRIPTION:

Add two 230/100 kV 400 MVA transformers at Riverbend Steam Station.

SUPPORTING STATEMENT:

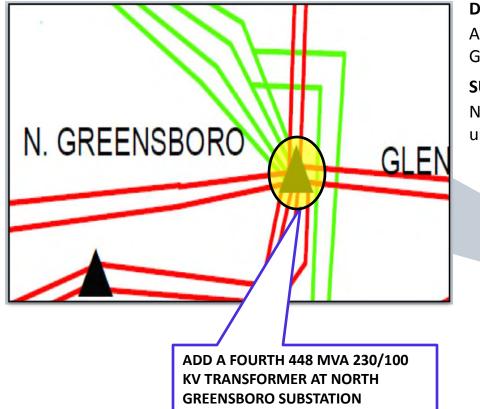
Retirement of Riverbend Steam Station generation causes multiple transmission lines to overload under contingency and causes the need for additional voltage support in the Riverbend area.



DUKE CAROLINAS – 5

2018

NORTH GREENSBORO SUBSTATION

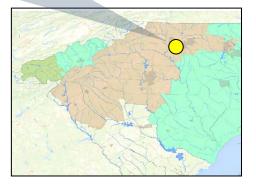


DESCRIPTION:

Add a fourth 448 MVA 230/100 kV transformer at North Greensboro substation.

SUPPORTING STATEMENT:

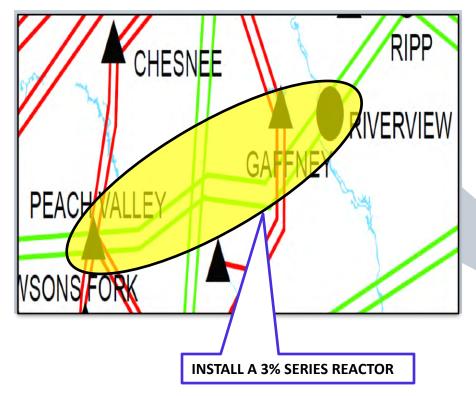
North Greensboro 230/100 kV transformers overload under contingency.



DUKE CAROLINAS – 6

2018

PEACH VALLEY - RIVERVIEW 230 KV T.L.

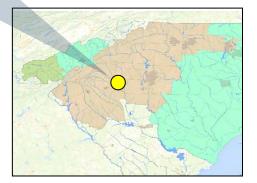


DESCRIPTION:

Install a 3% series reactor on the Peach Valley – Riverview 230 kV transmission line.

SUPPORTING STATEMENT:

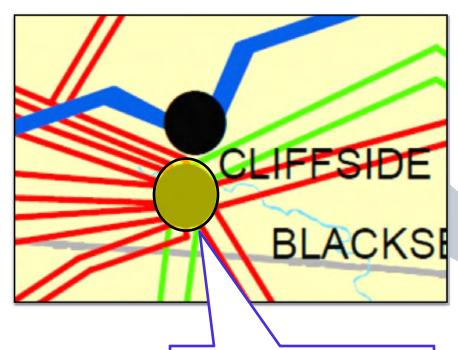
The Peach Valley – Riverview 230 kV transmission line overloads under contingency.



DUKE CAROLINAS – 7

2020

CLIFFSIDE STEAM STATION



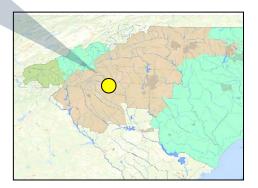
DESCRIPTION:

Add a third 448 MVA 230/100 kV transformer at Cliffside Steam Station.

SUPPORTING STATEMENT:

Cliffside Steam Station 230/100 kV transformers overload under contingency.

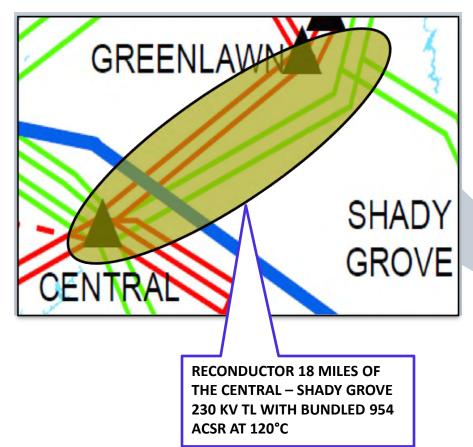
ADD A THIRD 448 MVA 230/100 KV TRANSFORMER AT CLIFFSIDE STEAM STATION



DUKE CAROLINAS – 8

2022

CENTRAL – SHADY GROVE 230 KV T.L.



DESCRIPTION:

Reconductor approximately 18 miles of the Central – Shady Grove 230 kV transmission line with bundled 954 ACSR at 120°C.

SUPPORTING STATEMENT:

The Central – Shady Grove 230 kV transmission line overloads under contingency.

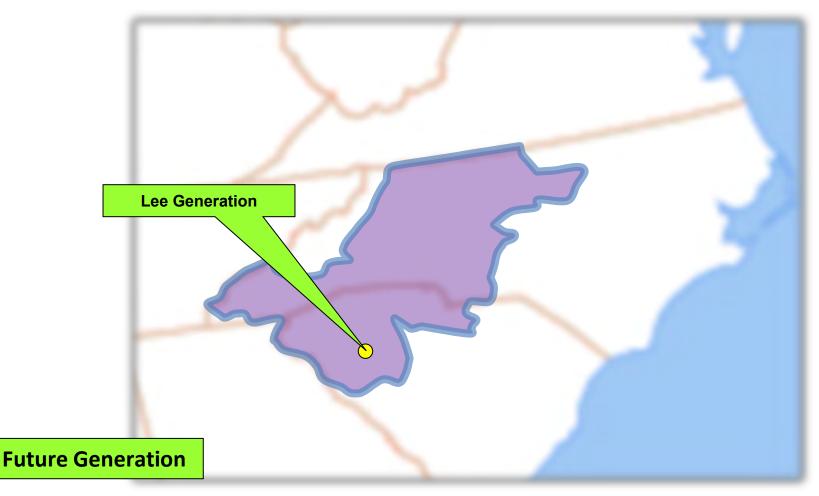
DUKE CAROLINAS Balancing Authority

DUKE CAROLINAS Balancing Authority Upcoming 2016 Generation Assumptions



DUKE CAROLINAS – Generation Assumptions

The following diagram depicts the location of generation assumptions <u>that change</u> throughout the ten year planning horizon for the 2016 SERTP Process.





DUKE CAROLINAS – Generation Assumptions

The following table depicts the generation assumptions <u>that change</u> throughout the ten year planning horizon for the 2016 SERTP Process. The years shown represent Summer Peak conditions.

SITE	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
LEE CC		776	776	776	776	776	776	776	776	776

DUKE PROGRESS EAST/WEST Balancing Authorities

DUKE PROGRESS EAST/WEST

Balancing Authorities

2015 Generation Assumptions

DUKE PROGRESS EAST Balancing Authority

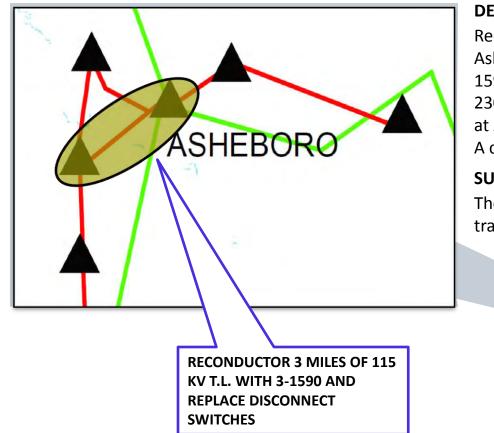
DUKE PROGRESS EAST Balancing Authority SERTP Regional Transmission Plan

DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 1

2016

ASHEBORO – ASHEBORO EAST (SOUTH) 115 KV T.L.

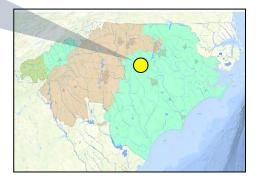


DESCRIPTION:

Reconductor approximately 3 miles of the Asheboro – Asheboro East (South) 115 kV transmission line using 3-1590 ACSR. Replace disconnect switches at Asheboro 230 kV and both the breaker and the disconnect switches at Asheboro East 115 kV with equipment of at least 2000 A capability.

SUPPORTING STATEMENT:

The Asheboro – Asheboro East (South) 115 kV transmission line overloads under contingency.

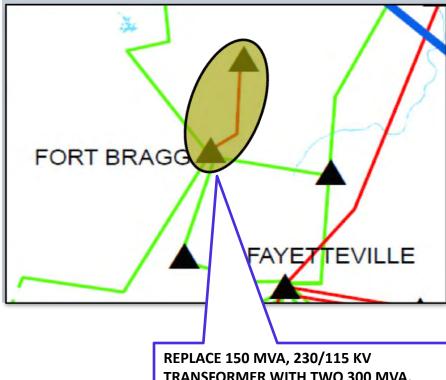


DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 2

2016

FT. BRAGG WOODRUFF STREET 230 KV SUBSTATION



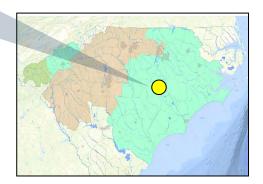
TRANSFORMER WITH TWO 300 MVA, 230/115 KV TRANSFORMERS. RECONDUCTOR 4.42 MILES OF 115 KV T.L. WITH 3-1590 ACSR

DESCRIPTION:

Replace the existing 150 MVA, 230/115 kV transformer at the Ft. Bragg Woodruff Street 230 kV substation with two 300 MVA, 230/115 kV transformers. Reconductor approximately 4.42 miles along the Ft. Bragg Woodruff Street – Manchester 115 kV transmission line with 3-1590 ACSR.

SUPPORTING STATEMENT:

The Manchester 115 kV transmission line and Ft. Bragg Woodruff Street 230/115 kV transformer overloads under contingency.

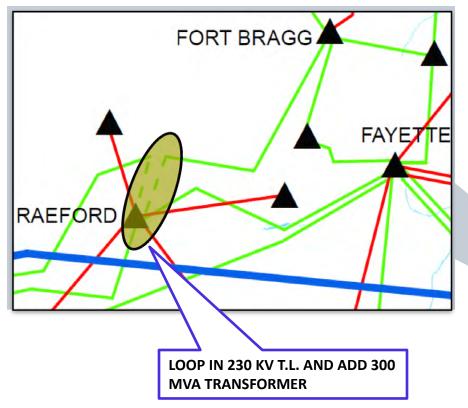


DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 3

2018

RAEFORD 230 KV SUBSTATION

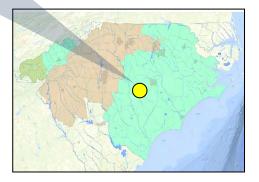


DESCRIPTION:

Loop in the Richmond – Ft. Bragg Woodruff St. 230 kV transmission line at Raeford 230/115 kV substation and add a 300 MVA transformer.

SUPPORTING STATEMENT:

The Raeford 230/115 kV transformers and Weatherspoon – Raeford 115 kV transmission line overload under contingency.



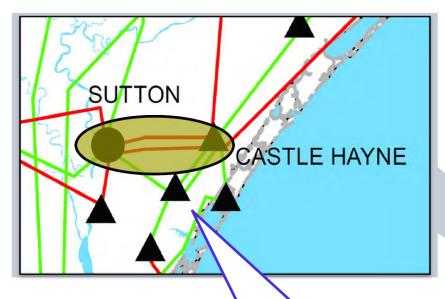


DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 4

2018

SUTTON PLANT – CASTLE HAYNE 115 KV NORTH T.L.



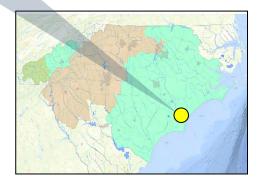
DESCRIPTION:

Rebuild approximately 8 miles of the Sutton Plant – Castle Hayne 115 kV North transmission line using 1272 ACSR rated for 239 MVA.

SUPPORTING STATEMENT:

The Sutton Plant – Castle Hayne 115 kV North transmission line overloads under contingency.

REBUILD THE SUTTON PLANT-CASTLE HAYNE 115KV NORTH T.L.

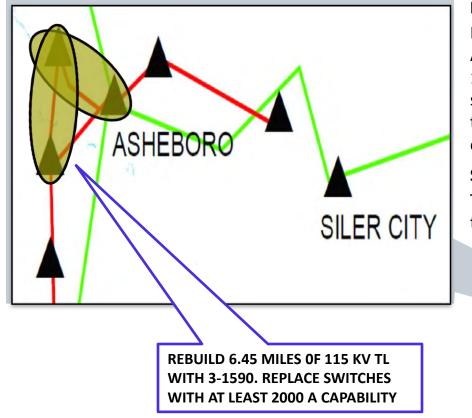


DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 5

2019

ASHEBORO – ASHEBORO EAST (NORTH) 115 KV T.L.

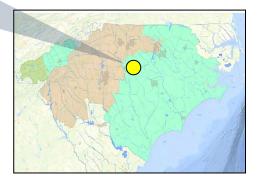


DESCRIPTION:

Rebuild approximately 6.45 miles of the Asheboro – Asheboro East (North) 115 kV transmission line using 3-1590 ACSR rated for 307 MVA. Replace disconnect switches at Asheboro 230 kV and both the breaker and the disconnect switches at Asheboro East 115 kV with equipment of at least 2000 A capability.

SUPPORTING STATEMENT:

The Asheboro – Asheboro East (North) 115 kV transmission line overloads under contingency.

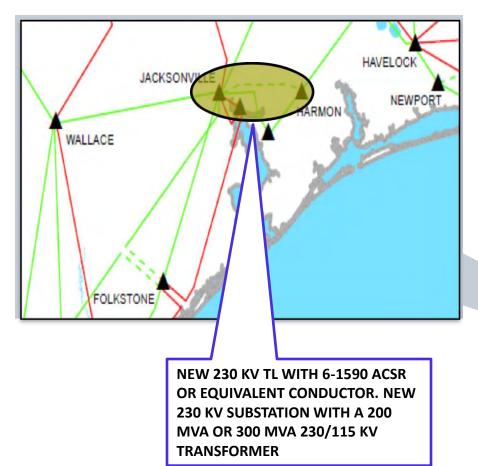


DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 6

2020

GRANT'S CREEK - JACKSONVILLE 230 KV T.L.

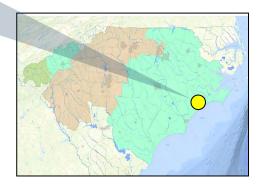


DESCRIPTION:

Construct approximately 12 miles of new 230 kV transmission line from Jacksonville 230 kV substation to a new 230 kV substation at Grant's Creek with bundled 6-1590 ACSR rated for 1195 MVA. Build the new 230 kV Grant's Creek substation with four 230 kV breakers and a new 300 MVA 230/115 kV transformer.

SUPPORTING STATEMENT:

The Havelock – Jacksonville 230 kV transmission line overloads under contingency and voltage support is needed in the Jacksonville area.

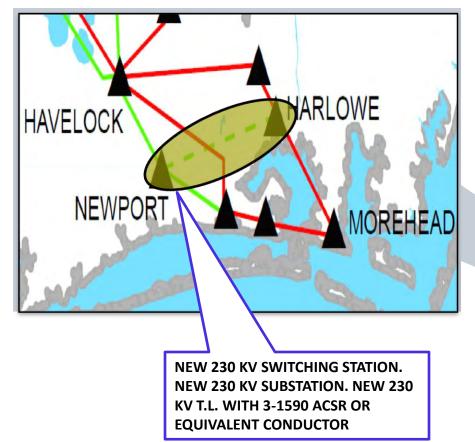


DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 7

2020

HARLOWE – NEWPORT 230 KV T.L.



DESCRIPTION:

Construct a new 230 kV switching station at Newport, construct a new 230 kV substation in the Harlowe Area, and construct approximately 10 miles of new 230 kV transmission line from the Harlowe Area – Newport Area with 3-1590 ACSR rated for 680 MVA.

SUPPORTING STATEMENT:

Voltage support is needed in Havelock – Morehead area.

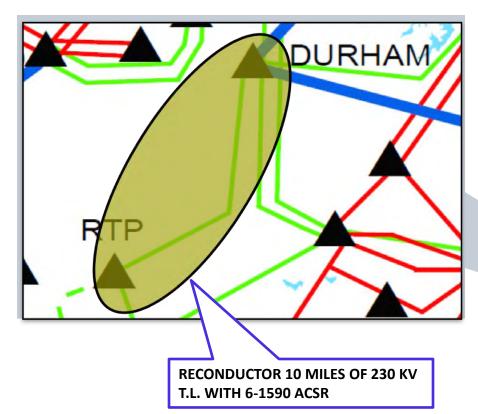


DUKE PROGRESS EAST Balancing Authority

DUKE PROGRESS EAST – 8

2023

DURHAM – RTP 230 KV T.L.



DESCRIPTION:

Reconductor approximately 10 miles of the Durham – RTP 230 kV transmission line with bundled 6-1590 ACSR rated for 1195 MVA.

SUPPORTING STATEMENT:

The Durham – RTP 230 kV transmission line overloads under contingency.



DUKE PROGRESS WEST Balancing Authority

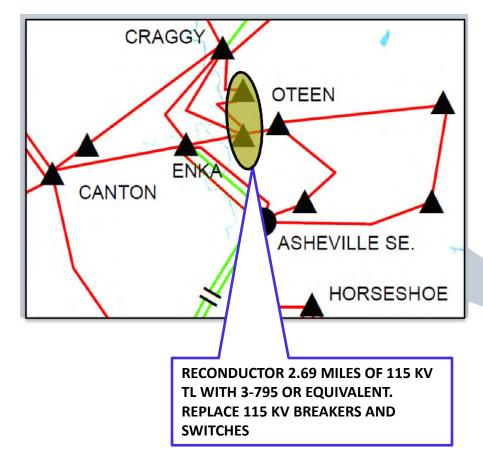
DUKE PROGRESS WEST Balancing Authority SERTP Regional Transmission Plan

DUKE PROGRESS WEST Balancing Authority

DUKE PROGRESS WEST – 1

2018

VANDERBILT – WEST ASHEVILLE 115 KV T.L.

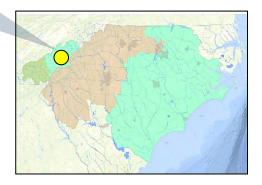


DESCRIPTION:

Reconductor approximately 2.69 miles of the Vanderbilt – West Asheville 115 kV transmission line with 3-795 ACSR rated for 300 MVA. Replace one 115 kV breaker, two 115 kV disconnect switches, and one 115 kV switch at Vanderbilt.

SUPPORTING STATEMENT:

The Vanderbilt – West Asheville 115 kV transmission line overloads under contingency.



DUKE PROGRESS EAST/WEST Balancing Authorities

DUKE PROGRESS EAST/WEST

Balancing Authorities

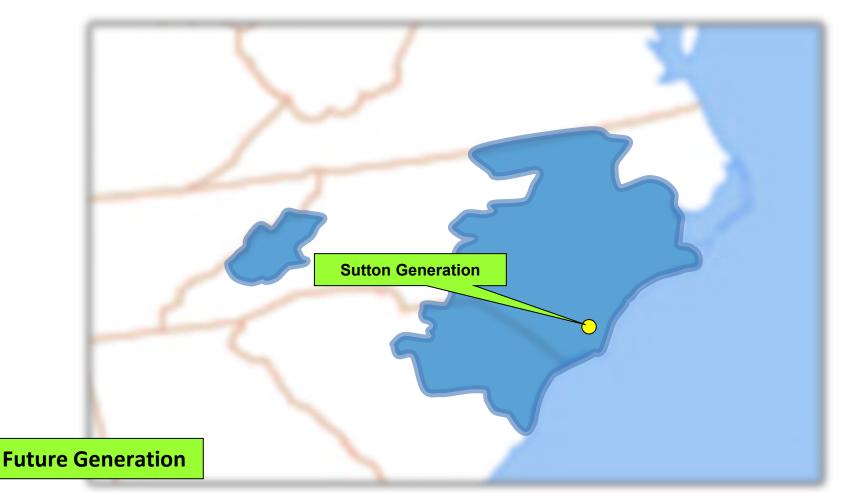
Upcoming 2016 Generation Assumptions



DUKE PROGRESS EAST/WEST Balancing Authorities

DUKE PROGRESS – Generation Assumptions

The following diagram depicts the location of generation assumptions <u>that change</u> throughout the ten year planning horizon for the 2016 SERTP Process.





DUKE PROGRESS EAST/WEST Balancing Authorities

DUKE PROGRESS – Generation Assumptions

The following table depicts the generation assumptions <u>that change</u> throughout the ten year planning horizon for the 2016 SERTP Process. The years shown represent Summer Peak conditions.

SITE	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
SUTTON IC#1	0	0	0	0	0	0	0	0	0	0
SUTTON IC#2A	0	0	0	0	0	0	0	0	0	0
SUTTON IC#2B	0	0	0	0	0	0	0	0	0	0
SUTTON CC#1	42	42	42	42	42	42	42	42	42	42
SUTTON CC#2	42	42	42	42	42	42	42	42	42	42

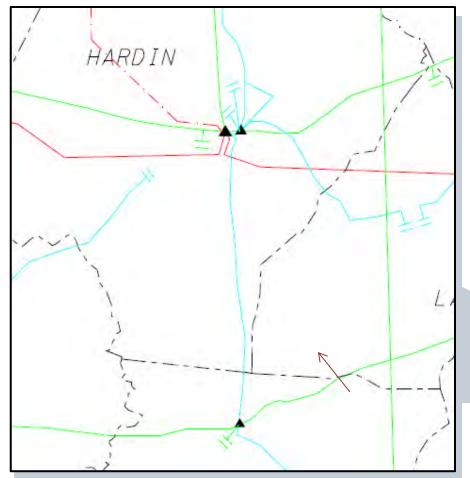
LG&E/KU Balancing Authority

LG&E/KU Balancing Authority SERTP Regional Transmission Plan

LG&E/KU – 1

2017

ELIZABETHTOWN – HARDIN COUNTY 138 KV T.L.

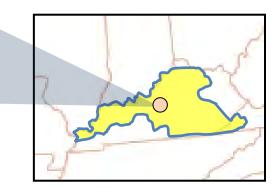


DESCRIPTION:

Construct a second Elizabethtown – Hardin Co 138 kV transmission line by overbuilding the existing Elizabethtown – Hardin Co 69 kV transmission line and install a 138 kV breaker on the Elizabethtown 138/69 kV transformer.

SUPPORTING STATEMENT:

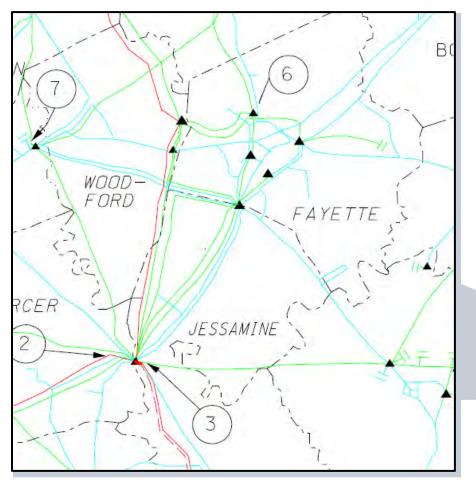
The Hardin County 138/69 kV transformer overloads under contingency.



LG&E/KU – 2

2017

WEST LEXINGTON - VILEY ROAD 138 KV T.L.

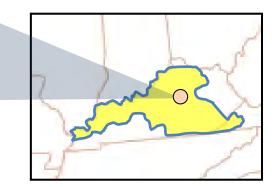


DESCRIPTION:

Reconductor approximately 5.19 miles of 795 ACSR conductor in the West Lexington – Viley Road section of the West Lexington – Viley Road – Haefling 138 kV transmission line, using high temperature conductor capable of at least 358 MVA.

SUPPORTING STATEMENT:

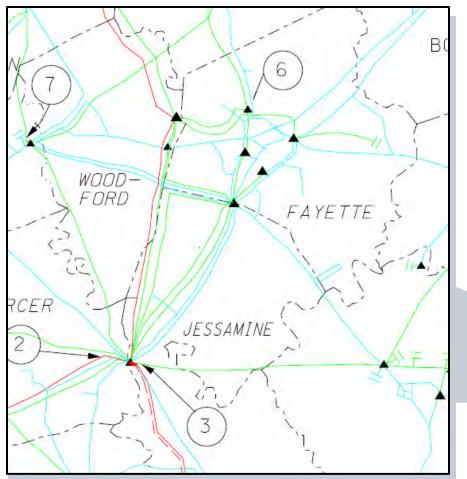
The West Lexington – Viley Road 138 kV transmission line overloads under contingency.



LG&E/KU – 3

2019

WEST LEXINGTON – HAEFLING 138 KV T.L.

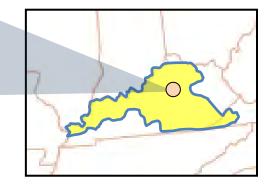


DESCRIPTION:

Reconductor 7.34 miles of 795 ACSR conductor on the West Lexington – Haefling 138 kV line, using high temperature conductor capable of at least 358 MVA.

SUPPORTING STATEMENT:

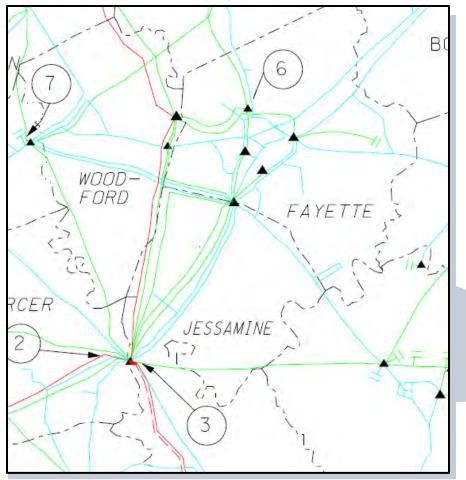
The West Lexington – Haefling 138 kV transmission line overloads under contingency.



LG&E/KU – 4

2021

HIGBY MILL – REYNOLDS 138 KV T.L.

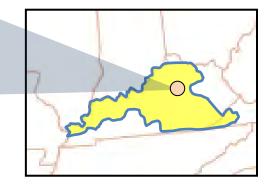


DESCRIPTION:

Upgrade approximately 1.67 miles of 795 ACSR conductor on the Higby Mill – Reynolds 138 kV transmission line to 100°C operation.

SUPPORTING STATEMENT:

The Higby Mill – Reynolds 138 kV transmission line overloads under contingency.



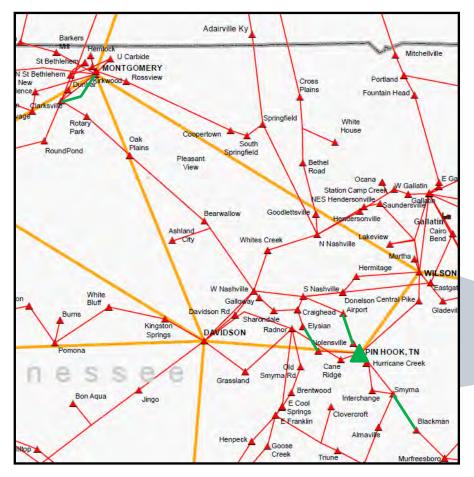
TVA Balancing Authority

TVA Balancing Authority SERTP Regional Transmission Plan

TVA – 6

2018

NASHVILLE AREA IMPROVEMENT PLAN

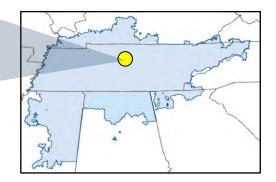


DESCRIPTION:

Install an additional 1344 MVA, 500/161 kV transformer bank at the Pin Hook 500 kV substation. Reconductor the Nolensville Road – Elysian Fields 161 kV T.L. with 636 ACSS at 150°C. Reconductor the Murfreesboro Road – Airport 161 kV T.L. with 636 ACSS at 150°C. Reconductor the Blackman Tap – Smyrna 161 kV T.L. with 636 ACSS at 150°C. Construct the Montgomery – Clarksville #3 161 kV T.L. with 1590 ACSS at 150°C.

SUPPORTING STATEMENT:

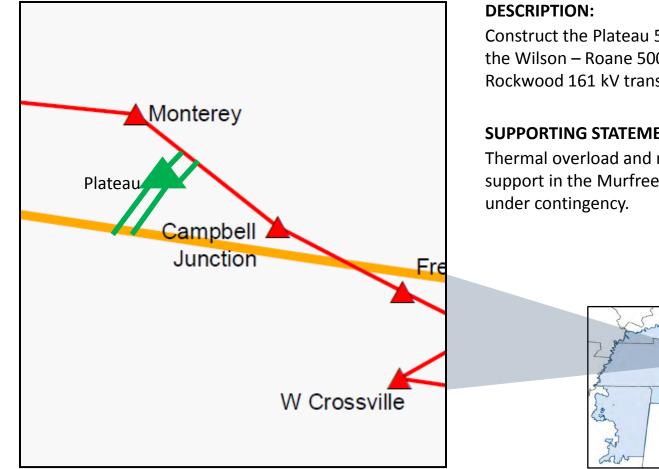
Thermal overloads and additional voltage support needed in the Nashville area under contingency.



TVA – 7

2018

PLATEAU 500 KV SUBSTATION



Construct the Plateau 500 kV substation by looping in the Wilson – Roane 500 kV and West Cookeville – Rockwood 161 kV transmission lines.

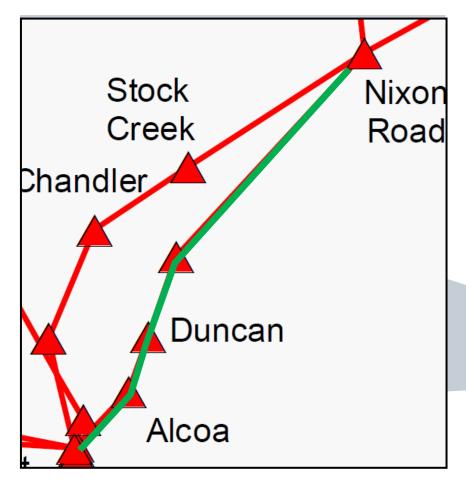
SUPPORTING STATEMENT:

Thermal overload and need for additional voltage support in the Murfreesboro, TN and Knoxville, TN areas

TVA – 8

2019

ALCOA SS – NIXON ROAD 161 KV T.L.

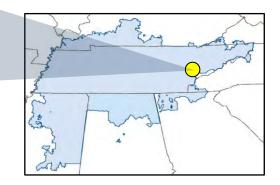


DESCRIPTION:

Rebuild approximately 12 miles of the Alcoa North – Nixon Road 161 kV transmission line with 1590 ACSR at 100°C and construct approximately 2 miles of new transmission line to create the Alcoa SS – Nixon Rd 161 kV #2 transmission line.

SUPPORTING STATEMENT:

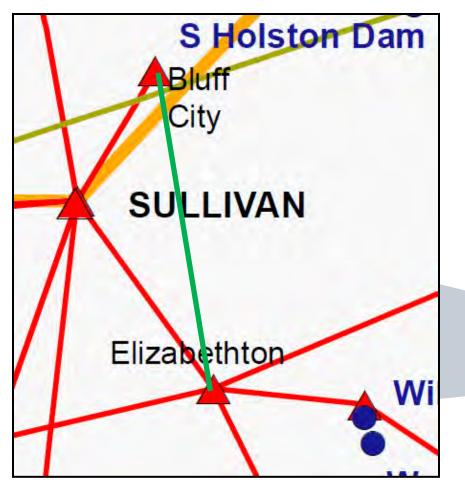
The Alcoa Switching Station – Nixon Road 161 kV transmission line overloads under contingency.



TVA – 11

2020

BLUFF CITY – ELIZABETHTON 161 KV T.L.

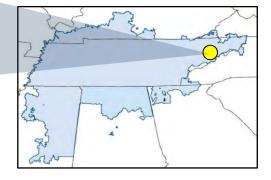


DESCRIPTION:

Construct approximately 12 miles of 161 kV transmission line from Bluff City to Elizabethton with 954 ACSR at 100°C.

SUPPORTING STATEMENT:

Additional voltage support is needed in the Elizabethton, TN area under contingency.



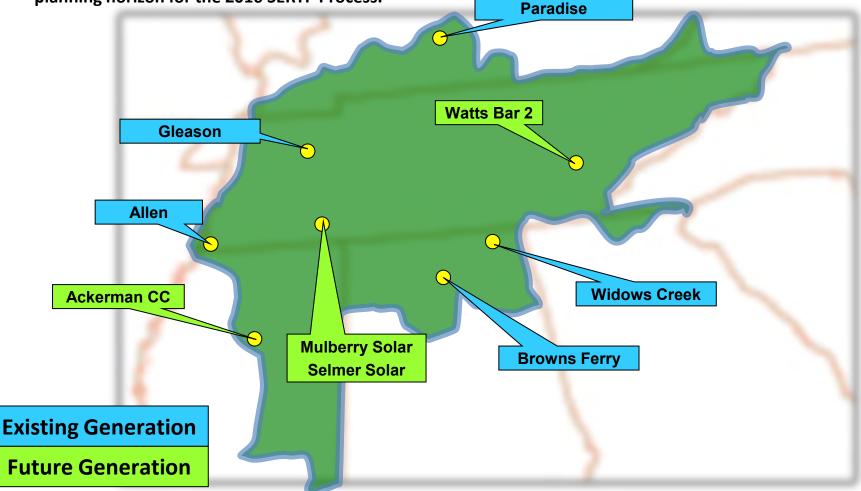
TVA Balancing Authority

TVA Balancing Authority Upcoming 2016 Generation Assumptions



TVA – Generation Assumptions

The following diagram depicts the location of generation assumptions <u>that change</u> throughout the ten year planning horizon for the 2016 SERTP Process.



TVA – Generation Assumptions

The following table depicts the generation assumptions <u>that change</u> throughout the ten year planning horizon for the 2016 SERTP Process. The years shown represent Summer Peak conditions.

SITE	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
WATTS BAR UNIT 2	1155	1155	1155	1155	1155	1155	1155	1155	1155	1155
GLEASON 1	173	173	173	173	173	173	173	173	173	173
GLEASON 2	173	173	173	173	173	173	173	173	173	173
GLEASON 3	174	174	174	174	174	174	174	174	174	174
PARADISE 1-2	0									
PARADISE CC	1015	1015	1015	1015	1015	1015	1015	1015	1015	1015
WIDOWS CREEK 7	0									
SELMER SOLAR	16	16	16	16	16	16	16	16	16	16
MULBERRY SOLAR	16	16	16	16	16	16	16	16	16	16
ACKERMAN CC	673	673	673	673	673	673	673	673	673	673

SOUTHERN Balancing Authority

TVA – Generation Assumptions

SITE	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
BROWNS FERRY UNIT 3	1108	1242	1242	1242	1242	1242	1242	1242	1242	1242
ALLEN 1-3	741	0								
ALLEN CC		1082	1082	1082	1082	1082	1082	1082	1082	1082
BROWNS FERRY UNIT 1	1103	1103	1237	1237	1237	1237	1237	1237	1237	1237
BROWNS FERRY UNIT 2	1108	1108	1242	1242	1242	1242	1242	1242	1242	1242

SERTP Regional Transmission Plan

Questions?

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