North Carolina Transmission Planning Collaborative

Report on the NCTPC 2023 Public Policy Study

June 13, 2024
DRAFT REPORT

2023 NCTPC Public Policy Study

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I. Executive Summary

Each year, the Oversight Steering Committee (OSC) of the North Carolina Transmission Planning Collaborative (NCTPC) will determine if there are any public policies that may drive the need for local transmission projects. Through this process, the OSC will seek input from Transmission Advisory Group (TAG) participants, as well as from members of the OSC itself, to identify any public policies to be evaluated as part of the Local Planning Process. The OSC will use the criteria below to determine if there are any public policies that may drive the need for local transmission upgrades:

- The public policy must be reflected in state, federal, or local law or regulation (including order of a state, federal, or local agency).

- There must be existence of facts showing that the identified need cannot be met absent the construction of additional transmission facilities.

Two Public Policy requests were received from TAG stakeholders by the February 8th deadline for the 2023 study year.

The first Public Policy Study request was submitted on behalf of the Carolinas Clean Energy Business Association, the Clean Power Suppliers Association, the North Carolina Sustainable Energy Association, the Southern Alliance for Clean Energy, the Southern Environmental Law Center (including non-TAG interested party Natural Resources Defense Council), and the Sierra Club (collectively, the Participants). This Public Policy Request proposed an analysis of high volumes of solar and solar paired with storage to determine DEC and DEP transmission system impacts and possible strategic transmission implications for local transmission projects. Specifically, the TAG Participants Public Policy Request is for a study of 9.3GW and 12.5GW of additional solar and solar paired with storage with a 2033 Summer case with resource additions and generation retirements to be aligned with the 2022 Carbon Plan P1 Portfolio.

The second Public Policy Study request was submitted on behalf of the Public Staff and proposed an analysis to evaluate transmission impacts from generation retirements and resource supply additions as provided in the 2022 Carbon Plan Portfolios. In the Public Staff's view, at some point in the future, the integration of new supply resources and retirement of older generation would probably require greenfield 230 kV and/or 500 kV transmission lines to be constructed and placed in service to support economic bulk energy transfers and to maintain or improve reliability. This study is intended to identify the future year(s) that it is projected that greenfield 230 kV and/or 500 kV transmission lines would be needed. This study would also utilize the 2033 Summer case and 2033/2034 Winter case with resource additions and generation retirements to be aligned with the 2022 Carbon Plan P1 Portfolio.

After careful consideration and discussion with the sponsors of the Public Policy Study requests, the OSC settled on the Public Policy Study scope as documented on the NCTPC.org website.[1]

As part of the original study scope, it was agreed that the 12.5 GW analysis was to be performed first. As the study analysis proceeded, the OSC recognized that the value of performing the additional 9.3 GW analysis would not provide much additional benefit for the amount of additional time and analysis required to finish this portion of the study. Additionally, in the Supplemental IRP testimony filed with the NCUC in January 2024, Duke is already anticipating even more than 12.5 GW being added by 2033. Based on this position, the OSC discussed completing the 12.5 GW analysis and proposed to forgo doing the 9.3 GW analysis with the Public Policy Study sponsors. As a result of this discussion, it

[1]See the **2023 Study Scope Document** in the Reference Documents on the NCTPC website - Document List (nctpc.org)

was agreed to focus on completing the 2023 Public Policy Request Study for 12.5 GW of incremental solar/solar paired with storage, identify transmission needs and associated solutions, and prepare a report. This 2023 NCTPC Public Policy Study report reflects the complete analysis of the 12.5 GW study.

Portfolio P1 was modified to reflect 12.5 GW of incremental solar and solar paired with storage by 2033 Summer (DEC/DEP split = 30%/70%).

II. 2023 Public Policy Study Scope and Methodology

II.A. Assumptions

The 2023 Public Policy study analyzed the transmission impacts associated with coal retirements and incremental resource additions to the Base Reliability models. Table 1 provides a DEC/DEP breakdown of the incremental MW per resource type.

Table 1: Resource Changes for the 2023 Public Policy Study

2033 S 2033/2034 W	Coal Retirements	Standalone Solar	SPS[2]	Onshore Wind	Standalone Battery	CC	CT	Offshore Wind	SMR	PSH
DEC	-3050	2900	850	200	1063	1216	752	0	285	1680
DEP	-3175	2100	6650	1000	1013	1216	752	800	0	0

Resource abbreviations

SPS – Solar Paired with Storage
CC – Combined Cycle
CT – Combustion Turbine
SMR – Small Modular (Nuclear) Reactor
PSH – Pumped Storage Hydro

[2] The target MW is solar. Assumes storage capacity equal to 40% of solar nameplate MW.

Figure 1: Proportional view of the incremental resource additions (by resource type) in the combined DEC/DEP footprint.

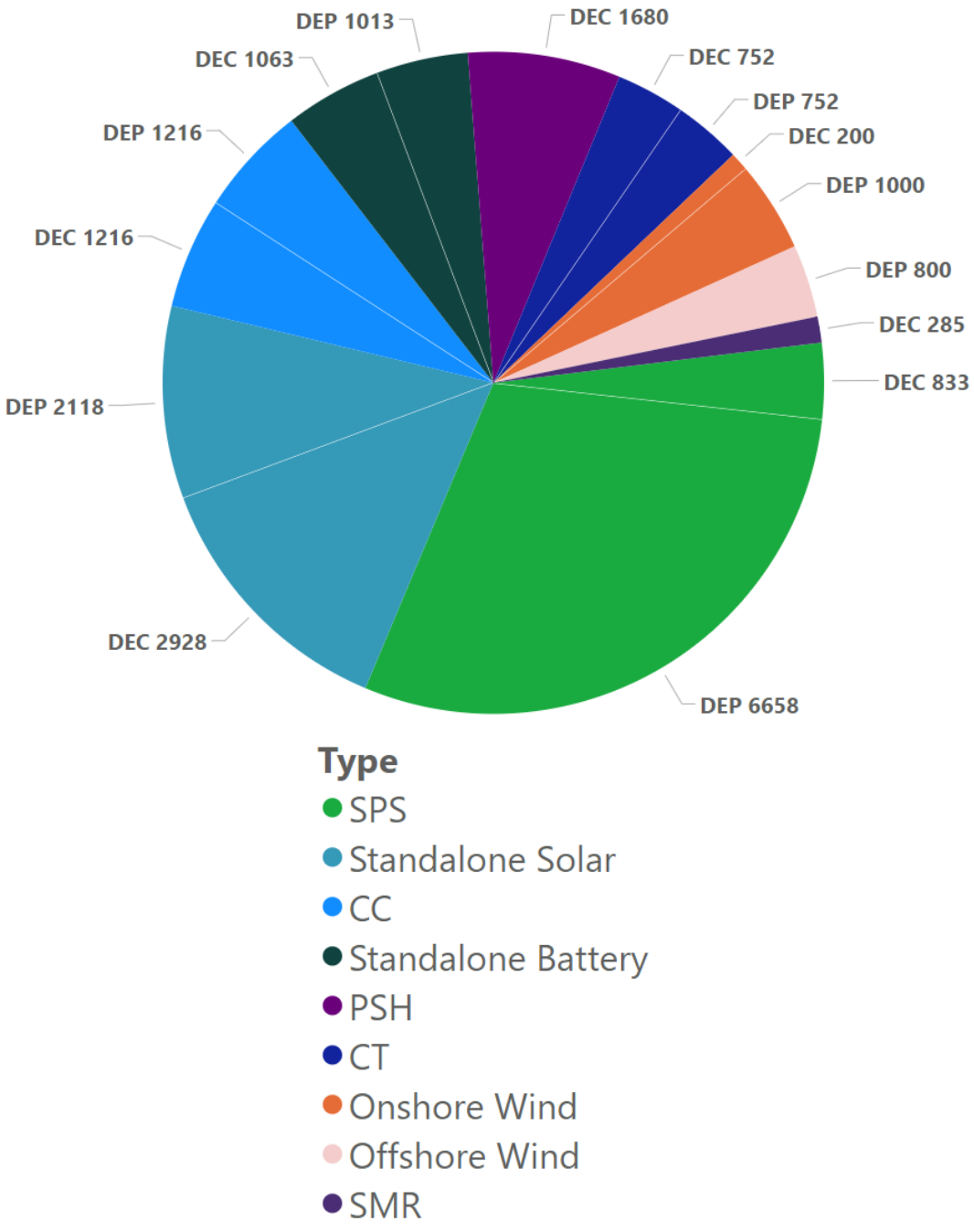
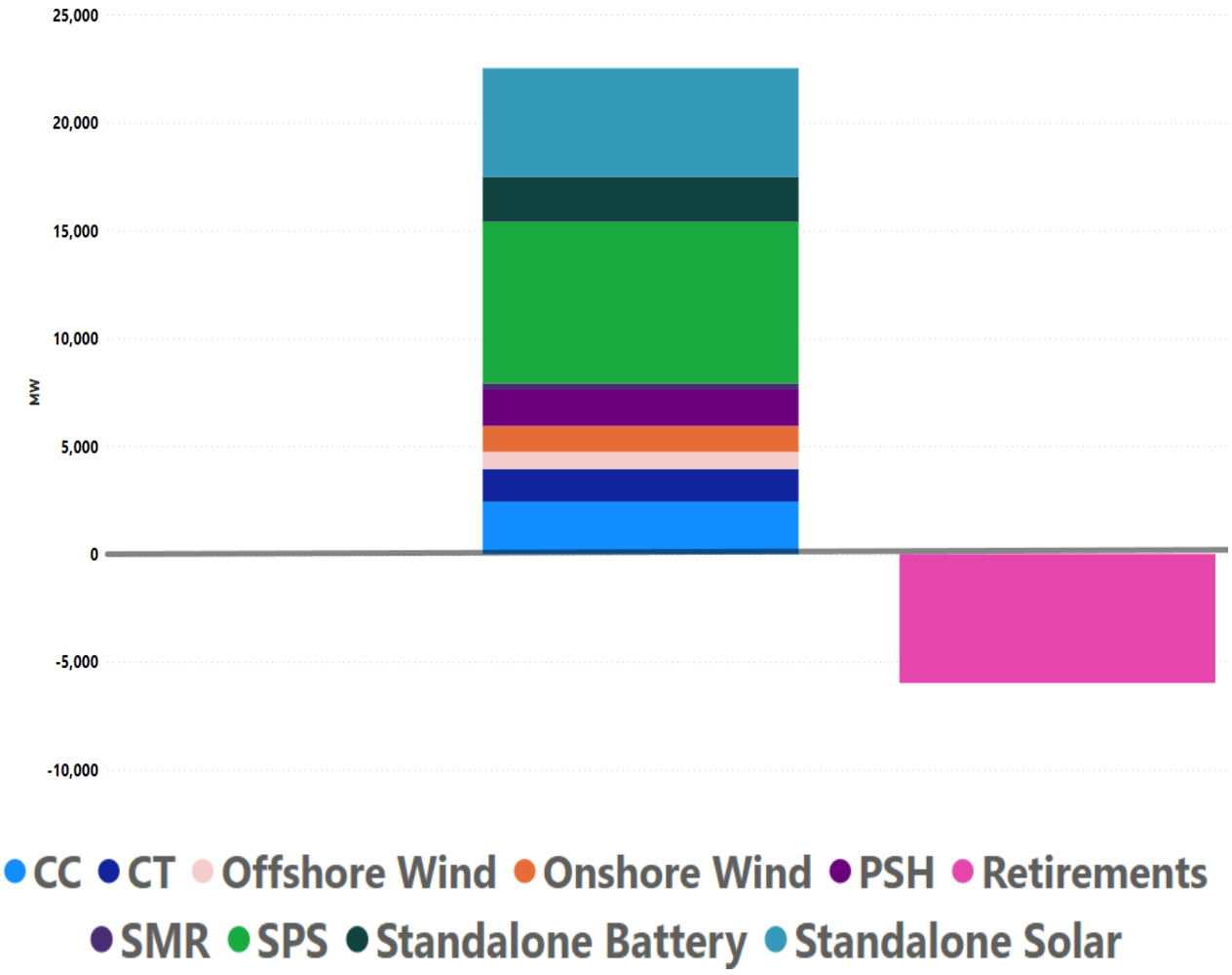


Figure 2: Incremental resource additions in the combined DEC/DEP footprint relative to the retirements in the combined DEC/DEP footprint.



II.B. Site Selection

Appendix A has more detailed information on each site. To reach the targets in the study scope, sites in each jurisdiction were selected as follows:

Coal Retirements[3]

Coal generation at the following sites was assumed to be retired:

Company	Generation Facility	2033S	2033/34 W
DEC	Cliffside 5 (574 MW)	Retired	Retired
DEC	Marshall 1,2 (760 MW)	Retired	Retired
DEC	Marshall 3,4 (1318 MW)	Retired	Retired
DEP	Roxboro Units 1-4 (2462 MW)	Retired	Retired
DEP	Mayo Unit 1 (746 MW)	Retired	Retired

[3] The Base Reliability Study already included coal retirements at Allen (DEC), and CT retirements at Lee 3 (DEC), Blewett (DEP) and Weatherspoon (DEP).

SPS (Solar Paired with Storage)

SPS sites were selected from previous queue requests from 2022 DISIS and earlier (transitional cluster & serial queue). SPS sites were selected newest to oldest from 2022 DISIS back and withdrawn as of 7/10/2023. Storage at SPS sites was modeled as 40% of solar nameplate.

Figure 3: Incremental DEC Solar Paired with Storage by County

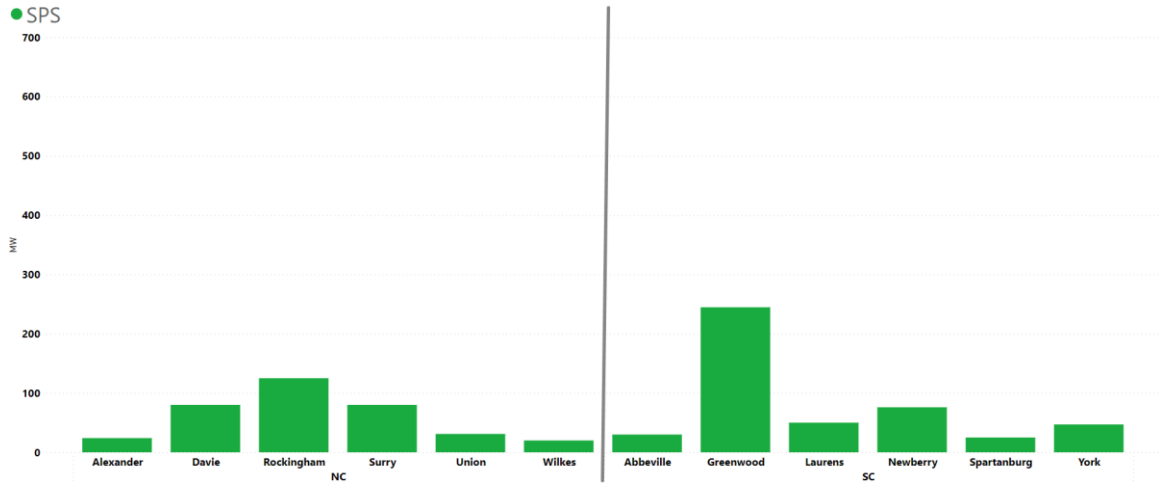
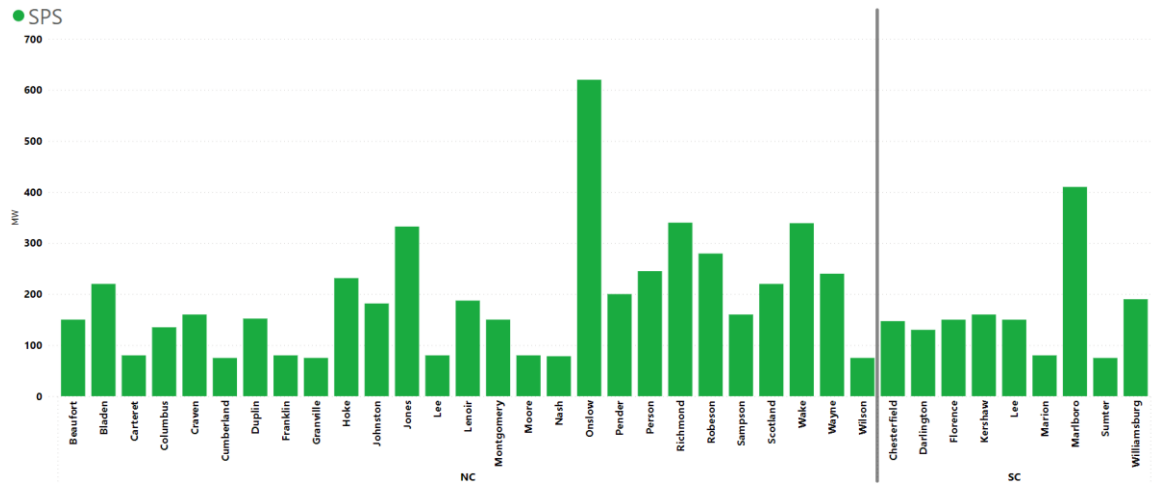


Figure 4: Incremental DEP Solar Paired with Storage by County



Standalone Solar

Standalone Solar sites were selected using 2022 DISIS (or earlier) sites that are not in the Base Reliability models and are not being used for SPS. These sites were selected newest to oldest and include both active and withdrawn sites.

Figure 5: Incremental DEC Standalone Solar by County

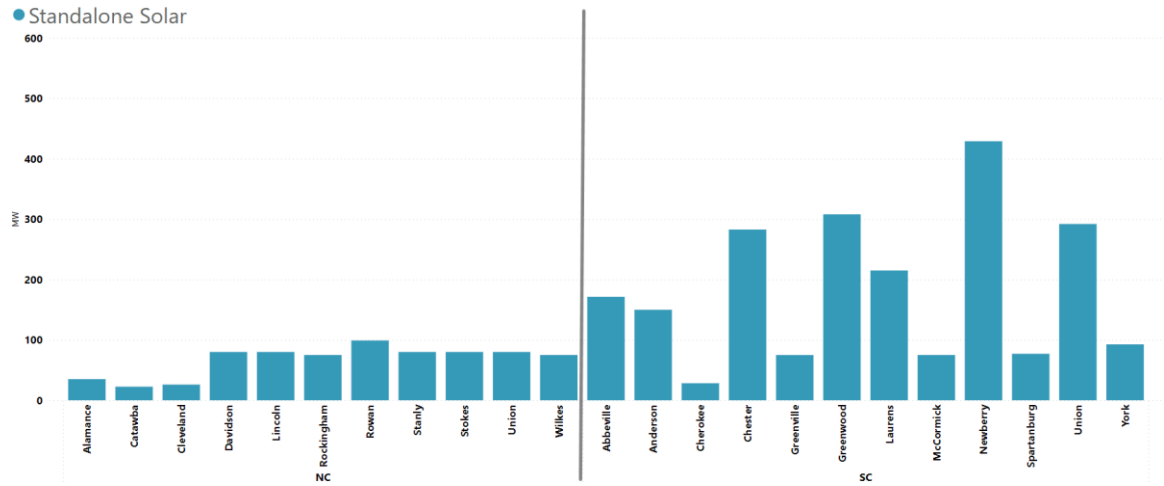


Figure 6: Incremental DEP Standalone Solar by County

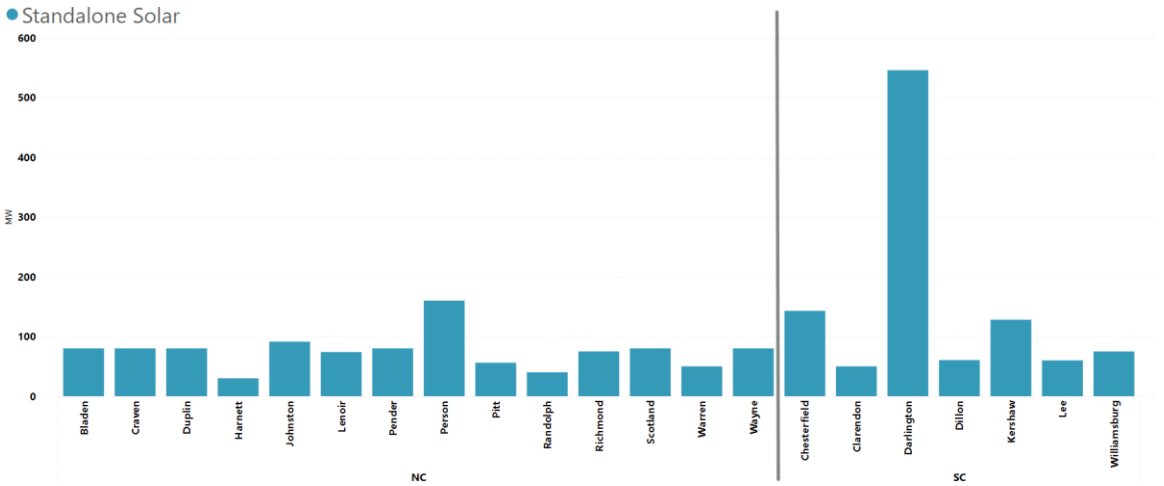


Figure 7: DEC Standalone Solar and Solar Paired with Storage Site Selection by County

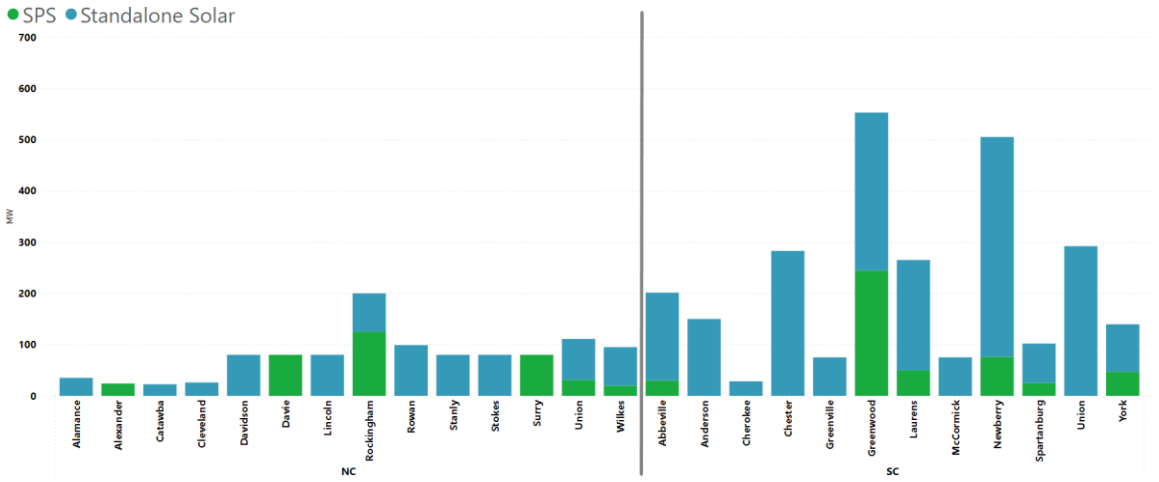
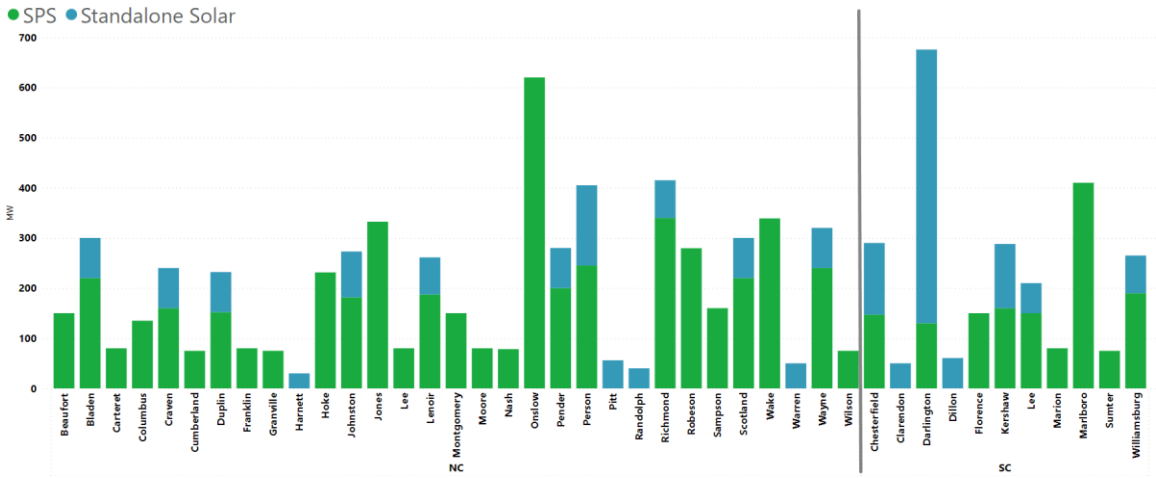


Figure 8: DEP Standalone Solar and Solar Paired with Storage Site Selection by County



Onshore Wind

The DEC and DEP sites were selected based on wind resource and land viability. Twelve 100 MW sites were chosen. Ten of these sites were in DEP and two of these sites were in DEC.

Figure 9: Incremental DEC Onshore Wind by County

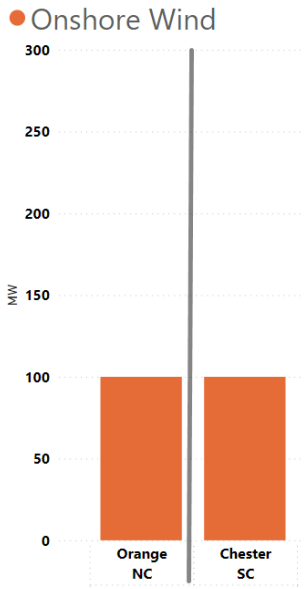
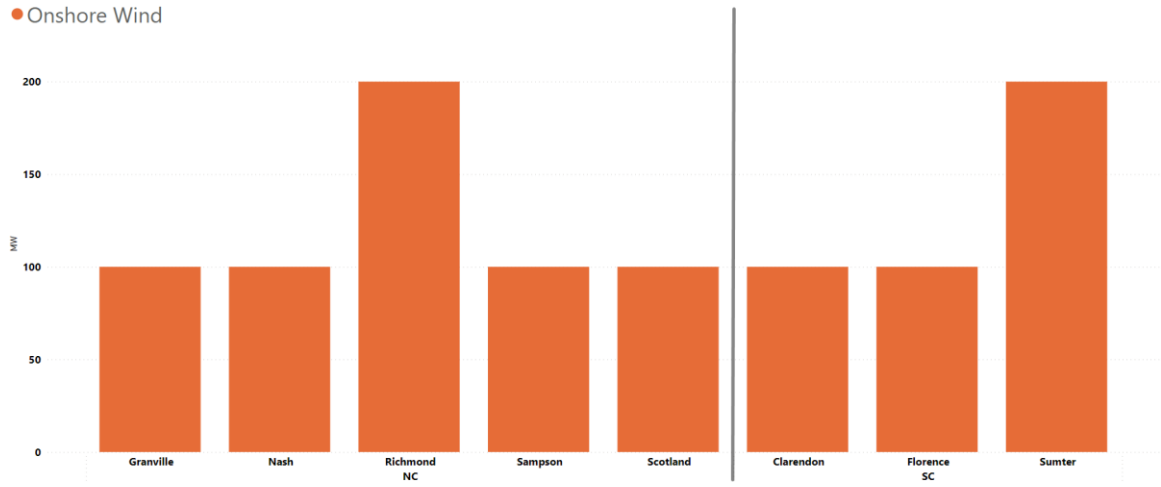


Figure 10: Incremental DEP Onshore Wind by County



Standalone Battery

Standalone battery sites were selected using 2022 DISIS (or earlier) standalone battery sites (active and withdrawn) that are not in the Base Reliability models. Both DEC and DEP were unable to reach the target MW, so the remaining MW came from 2023 DISIS standalone storage sites (scaled down to reach final target MW).

Figure 11: Incremental DEC Standalone Batteries by County

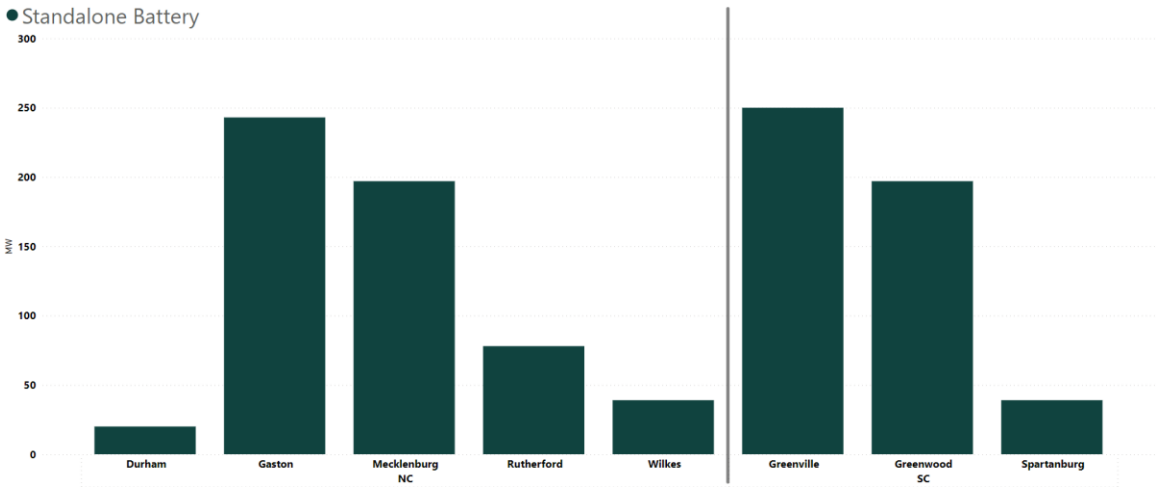
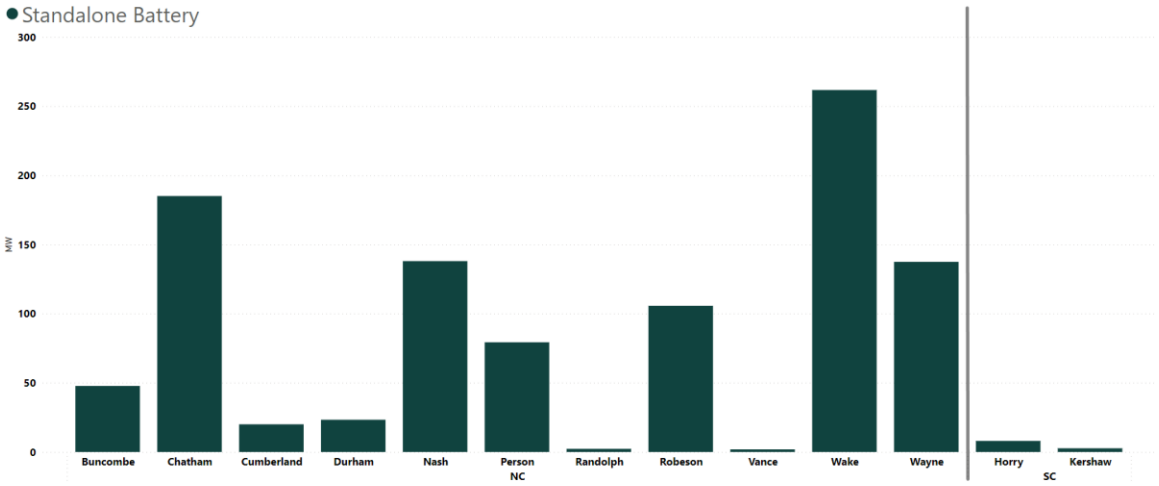


Figure 12: Incremental DEP Standalone Batteries by County



CC

New CC generation was modeled at the following sites:

Company	Generation Facility	2033S	2033/34 W
DEC	Marshall Plant CC (1216 MW)	Included	Included
DEP	Roxboro CC Unit 1 (1216 MW)	Not Included	Included

CT

New CT generation was modeled at the following sites:

Company	Generation Facility	2033S	2033/34 W
DEC	Marshall Plant CT (752 MW)	Included	Included
DEP	Roxboro CT (752 MW)	Not Included	Included

Offshore Wind

The offshore wind (800 MW) injection point was chosen as New Bern (DEP).

SMR

A new SMR was planned to be modeled at Marshall (DEC); however, it was later revised to Belews Creek (DEC):

Company	Generation Facility	2033S	2033/ 2034 W
DEC	Belews Creek SMR (285 MW)	Included	Included

PSH

Incremental PSH was modeled at Bad Creek:

Company	Generation Facility	2033S	2033/ 2034 W
DEC	Bad Creek Phase II (1680 MW)	Included	Included

II.C. Dispatch

Dispatch assumptions for how incremental resources were studied are shown below:

	DEC		**DEP**	
	Summer	**Winter**	**Summer**	**Winter**
Standalone Solar	100%	0%	100%	0%
SPS	Solar: 100% Battery: 0%	Solar: 0% Battery: 100% Discharge	Solar: 100% Battery: 0%	Solar: 0% Battery: 100% Discharge
Onshore Wind	40%	85%	60%	100%
Offshore Wind	-	-	100%	100%
SMR	100%	100%	-	-
CC	100%	100%	0%	100%
CT	0%	0%	0%	100%
PSH	0%	100% Generating	-	-
Standalone Batteries	0%	100% Discharge	0%	100% Discharge

II.D. Interchange [4] [5]

Summer

The summer model required the following interchange modifications:

- DEP East import from PJM reduced from 175 MW to 0 MW
- DEP East import from DEC reduced by 875 MW
    - Broad River transfer not included as a base condition
- DEP East export to DEP West increased from 0 MW to 400 MW
- DEP East export to DEC increased by 3975 MW

Compared to the Base Reliability Study, net interchange in the 2033 summer model for the Public Policy Study is shown below:

	Base Reliability (MW)	**Public Policy (MW)**
DEC	1201	-3649
DEP (East)	-1209	4216
DEP (West)	-36	-436

Winter

The winter model did not require any interchange modifications. Compared to the Base Reliability Study, net interchange in the 2033/2034 winter model for the Public Policy Study is shown below:

	Base Reliability (MW)	**Public Policy (MW)**
DEC	1317	1317
DEP (East)	-1009	-1009
DEP (West)	-236	-236

[4] See Appendix B of 2023 NCTPC Collaborative Transmission Plan Report for detailed interchange table in the Base Reliability Study.

[5] Positive net interchange indicates an export and negative interchange an import.

II.E. Case Development

Two cases were developed for this Public Policy study. One case was based off a 2033 Summer Peak Model, and one was based off a 2033/2034 Winter Peak Model. The details of Case 1 (Summer) & Case 2 (Winter) are provided below:

Unless otherwise noted, retirements and generation mix in external systems is reflective of the 2022 Multiregional Modeling Working Group (MMWG) series of cases.

Summer

Case 1 was a summer peak load case. The load was set to 100% of summer peak load. The previous coal retirements specified in the Assumptions section of this report were made. Solar was set to 100% of nameplate for both DEC & DEP. The standalone batteries and batteries associated with SPS were set to 0% (neither charging nor discharging). Wind resources have the potential to peak at any time of the day, which required assumptions to be made based on factors such as time of day, type of wind (offshore vs onshore), and jurisdiction. Onshore wind was set to 40% of nameplate for DEC and 60% of nameplate for DEP. Offshore wind of 800 MW at New Bern (DEP) was set to 100% of nameplate. The remaining generating units in each Balancing Authority Area (BAA) were economically dispatched after the additional renewable generation was added and the coal units were retired. Section II.C. can be referenced for additional resource dispatch information.

Winter

Case 2 was a winter peak load case. The load was set to 100% of winter peak load. The previous coal retirements specified in the Assumptions section of this report were made. As typical for most Winter Peak studies Solar was set to 0% of nameplate. The standalone batteries and batteries associated with SPS were set to 100% discharge (acting as a generator). Wind resources have the potential to peak at any time of the

day, which required assumptions to be made based on factors such as time of day, type of wind (offshore vs onshore), and jurisdiction. Onshore wind was set to 85% of nameplate for DEC and 100% of nameplate for DEP. Offshore wind was set to 100% of nameplate. The CC natural gas generation was dispatched at 100% for both DEP and DEC. The CT natural gas generation was dispatched at 100% for DEP. This is needed to serve the winter peak. The remaining generating units in each BAA were economically dispatched after the additional renewable generation was added and the coal units were retired. Section II.C. can be referenced for additional resource dispatch information.

II.F. Study Methodology

The study results are based on contingency analysis of on-peak load conditions for 2033 summer and 2033/2034 winter.

Results are reported based on thermal loading >= 95% for NERC TPL-001-5 Table 1 events, consistent with Generator Interconnection study practices.

The study results are focused exclusively on DEC and DEP. Potential impacts to external systems must be evaluated through the Affected System Study process.

III. 2023 Public Policy Study Results[6]

III.A. DEC Results

Major component overloads (i.e. conductor or transformer) are shown below. Estimated upgrade costs are for a standard reconductor for transmission lines or replacement with a larger size for transformers.

Major Component Overload	Mileage[7]	Estimated Cost ($M)
Newport Tie 500/230 kV	-	62
Fisher BL/WH 230 kV (Central-Shady Grove Tap)	17.8	18[8]
Flint BL/WH 230 kV (N Greenville-Tiger)	18.4	92
Lilesville BL/WH 230 kV (Oakboro-DEP Lilesville)[9]	5.3	27
Moser BL/WH 230 kV (Allen-Catawba)	10.9	19[8]
Parr BL 230 kV (Newport-DESC VC Summer)	56.3	57
Bush River Tie 230/100/44 kV	-	5
Bush River Tie 115/100 kV[9]	-	10
Clark Hill Tie 115/100 kV	-	5
Clark Hill 115 kV (Clark Hill-SEPA Thurmond)	35.7	143
Avon WH 100 kV (E Spartanburg-Pacolet)	16.6	67
Bainbridge BL/WH 100 kV (Bainbridge Retail-Oakvale)	4.5	19

[6] Network upgrades at the POI are not included.

[7] Point to point mileage. Circuit mileage for double circuit lines would be twice this value.

[8] Assumes installation of a series switchable reactor.

[9] Proposed RZEP 2.0 upgrade

Major Component Overload	Mileage[7]	Estimated Cost ($M)
Beulah BL/WH 100 kV (Lookout-Energy United Del 18)	5.4	21
Bond BL/WH 100 kV (Clark Hill-Greenwood)	1	8
Broadway BL/WH 100 kV (Belton-WS Lee)[9]	6.4	20
Champion BL/WH 100 kV (Bush River-Customer Delivery)[99]	6.3	20
Champion BL/WH 100 kV (Buzzard Roost-Creto)	6.4	26
Coronaca (Creto-Customer Delivery)	1	3
Cypress BL/WH 100 kV (Cypress-Hodges)	12.1	49
Duncan BL/WH 100 kV (Tiger-Mud Creek Retail)	11.8	48
Edgemoor BL&WH South	12	48
Greenwood BL/WH 100 kV (Greenwood-Hodges)	12.4	50
Harley BL/WH 100 kV (Tiger-Campobello)	11.8	44
Hodges BL/WH 100 kV (Belton-Hodges)	20.5	83
Jordan 100 kV (Lockhart Del 6-Midway Tap)	0.9	4
Lawsons Fork BL/WH East 100 kV (E Spartanburg-Lawsons Fork)	1.4	6
Lockhart BL/WH 100 kV (Lockhart-Morris)	3.7	15
Lookout BL/WH 100 kV	7.4	30
Mauldin BL/WH 100 kV (Greenbriar-Laurens EC Del 28)	5.6	23
Midway BL/WH 100 kV (Bush River-Newberry Main)	3.1	13
Oakvale BL/WH 100 kV (Oakvale-Shady Grove)	4.1	13

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Major Component Overload	Mileage[7]	Estimated Cost ($M)
Pacway BL/WH 100 kV (Midway-Pacolet)	18.9	76
Perry BL/WH 100 kV (Lee-Perry Tap)	8.5	34
Rabon BL/WH 100 kV (Lee-Laurens EC Del 32)	18.7	75
Sevier BL/WH 100 kV (Oakvale-August Tap)	1.5	7
Tiger BL/WH 100 kV (Walden Tap-W Spartanburg)	1.3	6
Toxaway BL/WH 100 kV (Lee-Toxaway)	13.5	57
Wateree BL&WH 100 kV (Great Falls-Wateree)	19.8	80
Cypress Tie 100/44 kV (x2)	-	10
Belfast 44 kV (Buzzard Roost-Joanna)	15	45
Copeland 44 kV (Clinton-Joanna)	5.6	17
Hooker 44 kV (Clinton-Laurens EC Del 12)	0.2	1
Estimated Cost Total		**1438.0**

Ancillary equipment upgrades are shown below.

Ancillary Equipment Upgrades	Upgrade Type	Estimated Cost ($M)
Pleasant Garden 500/230 kV	Relay	0.025
Katoma 500 kV (Jocassee-Oconee)	Relay	0.025
South Mountain 500 kV (Cliffside-McGuire)	Meter, Breaker	2.0
Akens B/W 230 kV (Anderson-Central)	Switch	0.5
Goose Creek Bl 230 kV (Morning Star-Oakboro)	Relay	0.025

Ancillary Equipment Upgrades	Upgrade Type	Estimated Cost ($M)
E Durham Tie 230/100 kV	Relay	0.025
Buck Steam-Buck Tie 100 kV	Switch	0.1
Chester Wh 100 kV (Chester-Chester Tap)	Bus conductor	1.0
Monroe Bl/Wh 100 kV (Roughedge Tie Tap)	Bus conductor, Switch	0.5
Skybrook Bl/Wh 100 kV (Poplar Tent Retail-Winecoff)	Bus conductor	1.0
Clinton Tie	CT, Relay	0.05
Westbrook 44 kV (Cypress-Customer Delivery)	Relay	0.025
Estimated Cost Total		**5.275**

No RZEP 1.0 upgrades were identified as being loaded >= 95% in this study.

No 500 kV lines were observed to be at 95% or greater of their major component rating.

The results provided support for the proposed RZEP 2.0 projects: Broadway B/W 100 kV, Champion B/W 100 kV, Lilesville B/W 100 kV, and Bush River 115/100 kV. Each of these facilities were loaded >= 95% in the Public Policy study and have also shown up in past generator interconnection studies.

A greenfield 230kV transmission network was identified as a potential long-term solution for multiple resource types desiring to interconnect in the southwest DEC transmission system and is planned to be studied in the 2024 MVST study to determine if this solution needs to be included in the local transmission plan.

III.B. DEP Results

Major component overloads (i.e. conductor or transformer) are shown below. Estimated upgrade costs are for a standard reconductor for transmission lines or replacement with a larger size for transformers.

Major Component Overload	Mileage[10]	Estimated Cost ($M)
Asheboro East - Biscoe 115kV line (Biscoe-Ether & Seagrove-Ulah)	8.04	19.3
Aurora-Greenville 230kV line (Str.72-Str.#1-1 section of Chocowinity-Greenville)	8.82	21.2
Badin 115/100kV Transformers	-	15.6
Blewett - Tillery 115kV line (Tillery-ID_569168)	4.91	11.8
Camden - Camden Junction 115kV line	11.13	26.7
Camden DuPont - DPC Wateree 115 kV line	8.45	20.3
Clayton Industrial - Selma 115 kV line[11]	9.38	22.5
Clinton - Wallace 230kV line (Clinton-Warsaw Tap)	12.6	30.2
Cumberland - Delco 230kV line (Cumberland-Turnbull, Turnbull-Garland, & Garland-Baytree Solar)	25.67	61.6
Fayetteville - Fayetteville Dupont SS 115kV line (Fay Dupont SS-SREMC Gray's Creek POD & Gray's Creek-Roslin Solar Tap)	4	9.6
Franklinton - Spring Hope SS 115kV line (Franklinton-Novozymes, Novozymes-WEMC Louisburg, WEMC Louisburg-Louisburg Cap Bank, Louisburg Cap Bank-ID_570306, Louisburg-Fox Creek Solar, Sapony Creek Solar-Spring Hope SS)	12.5	30.0
Jacksonville - Wommack 115kV line	33.26	79.8

[10] Point to point mileage. Circuit mileage for double circuit lines would be twice this value.

[11] Proposed RZEP 2.0 upgrade

Major Component Overload	Mileage[10]	Estimated Cost ($M)
Laurinburg - Raeford 115kV line (Richmond-ID_569986 & ID_569986-Q393)	14.75	35.4
Laurinburg - Richmond 230kV line	9.14	21.9
Lee - Selma 230kV line (Section of line near Selma limited by 2515 ACSR conductor)	0.04	0.1
Lee - Wallace 115 kV line (Lee-Tri County EMC Friendship TAP & Wallace-Q514)	31.42	75.4
Lee Plant - Selma 115kV line	17.66	42.4
Lee Sub - Milburnie 230kV line[11]	40.18	96.4
Lee Sub - Tri County EMC Grantham 115kV Feeder (Lee-ID_569890)	1.64	3.9
Lilesville - DPC Oakboro 230kV Black line[11]	24.7	59.3
Lilesville - DPC Oakboro 230kV White line[11]	24.7	59.3
Method - Milburnie 115kV South line (Garner-Garner Perstorp & Garner Perstorp-Milburnie 115kV)	9.91	23.8
Robinson - Camden Junction 115kV line (Camden Junction-ID_569014, Bethune Tap-Q407, & Bethune Tap-Robinson)	15.28	36.7
Robinson - Rockingham 115kV line (Chesterfield-Sneedsboro Solar & Hartsville Tap-ID_564942)	10.93	26.2
Robinson - Rockingham 230kV line (Robinson-Cheraw Tap)	29.02	69.6
Tillery - Alcoa Badin 115kV Black & White lines (Reconductor entire Tillery - Alcoa Badin 115kV Black & White lines)	14.57	35.0
Weatherspoon - Fayetteville 230kV line (Fayetteville-County Line Solar)	13.71	32.9
Weatherspoon - Fayetteville Dupont SS 15kV line	19.18	46.0
Weatherspoon - Raeford 115kV line	27.3	65.5
Estimated Cost Total		**1078.0**

No RZEP 1.0 upgrades were identified as being loaded >= 95% in this study.

No 500 kV lines were observed to be at 95% or greater of their major component rating.

The results provided support for the proposed RZEP 2.0 projects. Lilesville – DPC Oakboro 230kV Black & White lines, Clayton Industrial – Selma 115kV line, and Lee – Milburnie 230kV line are the current proposed RZEP 2.0 DEP upgrades. Each of these facilities were loaded >= 95% in the Public Policy study and have also shown up in past generator interconnection studies.

Ancillary equipment upgrades are shown below:

Ancillary Equipment Upgrades	Upgrade Type	Estimated Cost ($M)
Asheboro East - Biscoe 115kV line (Ash Oliv Tap-Ulah & Seagrove-Ether)	Raise	0.5
Aurora-Greenville 230kV line (City of Washington-Chocowinity & Chocowinity-Greenville)	Raise & Relay Settings	0.5
Bennettsville - Laurinburg 230kV line (Laurinburg-ID_568988)	Relay Settings, CTs, & Switch	1.0
Blewett - Rockingham 115kV line (Blewett-Rockingham West section)	CT and Relay Settings	0.25
Clinton - Mount Olive 115kV (South River EMC Hargrove POD-Faison Hwy Ind & Mt Olive-ID_568978)	Raise	0.5
Clinton - Wallace 230kV line (Four County EMC Beverage POD-Wallace)	CT, Relay Settings, & Switch	1.0
Cumberland - Whiteville 230kV line (Four County EMC Powell-Bladenboro)	Raise	0.5
Falls - Franklinton 115kV West line (Wake EMC Pocomoke POD-Franklinton)	Raise	0.5
Grants Creek - Jacksonville City 115kV line (Str#120-JOEMC Piney Green)	Raise	0.5
Kingstree - Andrews 115kV Feeder	Raise	0.5

Ancillary Equipment Upgrades	Upgrade Type	Estimated Cost ($M)
Kinston DuPont - New Bern 115kV line	Raise	0.5
Milburnie - Wake 230kV line (Rolesville Tap-Wake)	Raise	0.5
New Bern - Wommack 230kV North line (Wommack 230-Dover & Dover-Q408)	Raise, CT, & Relay Settings	0.75
New Bern 230/115 kV Transformers	CT & Relay Settings	0.25
Sutton - Delco 115kV South line (Leland Industrial-Delco)	Relay Settings	0.1
Wateree Transformers	CT, Relay Settings, & Emergency Rating	0.5
Florence DuPont-Marion 115kV line (Marion Bypass-Marion)	Ancillary Equipment & Relay Settings	0.3
Estimated Cost Total		**10.15**

III.C. Summary of Results

Table 5: Cost Summary

Balancing Authority	Estimated Cost ($ M)
DEC	$1,443
DEP	$1,088
Total	**$2,531**

IV. Conclusions

The conclusions of this study are driven by the assumptions used for the study. The results of this Public Policy Study Report do not represent a commitment to build all or any of the upgrades identified in this Study. In this study, approximately 22 GW of new generation were added to the base reliability models and 6 GW retired for a net increase of 16 GW. Resources included in this study that have yet to be approved will require Generator Interconnection Requests and/or Transmission Service Requests. The upgrades identified by this study are based on the assumed size and locations of the future resources that were modeled. Since multiple solar and solar paired with storage and standalone storage resources were modeled based on prior interconnection requests, and since many of the upgrades identified in this study were identified in prior DISIS reports, the developers submitting these requests may resubmit many of these interconnection requests into a future interconnection queue. The proposed RZEP 2.0 upgrades were validated through the results of this study. Since transmission planning is an iterative process, the impacts from changing resource plans and economic development load additions will need to continue to be studied through the CTPC (previously NCTPC) local transmission planning process.

Appendix A Incremental Resources

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEC	186466	800301	50	Gaston	NC	Standalone Battery
DEC	563648	800302	115	Gaston	NC	Standalone Battery
DEC	567168	800303	197	Mecklenburg	NC	Standalone Battery
DEC	568550	800304	197	Greenwood	SC	Standalone Battery
DEC	175902	800305	100	Greenville	SC	Standalone Battery
DEC	175826	800306	150	Greenville	SC	Standalone Battery
DEC	900495	800307	20	Durham	NC	Standalone Battery
DEC	900491	800308	39	Spartanburg	SC	Standalone Battery
DEC	898881	800309	78	Gaston	NC	Standalone Battery
DEC	898997	800310	78	Rutherford	NC	Standalone Battery
DEC	899053	800311	39	Wilkes	NC	Standalone Battery
DEC	Orange	800201	100	Orange	NC	Onshore Wind
DEC	Chester	800202	100	Chester	SC	Onshore Wind
DEC	126046	800127	24	Alexander	NC	SPS
DEC	123318	800125	80	Davie	NC	SPS
DEC	126072	800126	15	Rockingham	NC	SPS
DEC	126040	800130	50	Rockingham	NC	SPS
DEC	126074	800131	60	Rockingham	NC	SPS
DEC	142880	800123	80	Surry	NC	SPS
DEC	174146	800122	31	Union	NC	SPS
DEC	565970	800118	20	Wilkes	NC	SPS
DEC	126028	800129	30	Abbeville	SC	SPS
DEC	566014	800115	20	Greenwood	SC	SPS
DEC	569242	800116	74.9	Greenwood	SC	SPS

[12] Generators with a numerical ID are based on historical generator interconnection requests. Named sites have not yet requested interconnection.

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEC	566468	800117	74.9	Greenwood	SC	SPS
DEC	126026	800132	74.9	Greenwood	SC	SPS
DEC	564376	800120	50	Laurens	SC	SPS
DEC	569756	800119	48	Newberry	SC	SPS
DEC	126068	800128	28	Newberry	SC	SPS
DEC	120022	800124	25	Spartanburg	SC	SPS
DEC	220734	800121	47	York	SC	SPS
DEC	126062	800111	35	Alamance	NC	Standalone Solar
DEC	22466	800143	22.5	Catawba	NC	Standalone Solar
DEC	20078	800166	26	Cleveland	NC	Standalone Solar
DEC	196564	800109	80	Davidson	NC	Standalone Solar
DEC	39390	800140	80	Lincoln	NC	Standalone Solar
DEC	15546	800146	45	Rockingham	NC	Standalone Solar
DEC	20080	800167	30	Rockingham	NC	Standalone Solar
DEC	23290	800145	30	Rowan	NC	Standalone Solar
DEC	65312	800161	69	Rowan	NC	Standalone Solar
DEC	21874	800160	80	Stanly	NC	Standalone Solar
DEC	126042	800135	80	Stokes	NC	Standalone Solar
DEC	15543	800148	58	Union	NC	Standalone Solar
DEC	20079	800165	22	Union	NC	Standalone Solar
DEC	126070	800134	75	Wilkes	NC	Standalone Solar
DEC	55960	800138	25	Abbeville	SC	Standalone Solar
DEC	17801	800152	71.4	Abbeville	SC	Standalone Solar
DEC	20394	800163	75	Abbeville	SC	Standalone Solar
DEC	566202	800103	74.9	Anderson	SC	Standalone Solar
DEC	220662	800108	74.99	Anderson	SC	Standalone Solar
DEC	572354	800101	28.25	Cherokee	SC	Standalone Solar

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEC	48968	800114	69.75	Chester	SC	Standalone Solar
DEC	15376	800142	15	Chester	SC	Standalone Solar
DEC	22644	800147	50	Chester	SC	Standalone Solar
DEC	22154	800149	65	Chester	SC	Standalone Solar
DEC	19909	800168	25	Chester	SC	Standalone Solar
DEC	19189	800169	58	Chester	SC	Standalone Solar
DEC	19228	800170	74.97	Greenville	SC	Standalone Solar
DEC	572280	800105	72	Greenwood	SC	Standalone Solar
DEC	126066	800110	34	Greenwood	SC	Standalone Solar
DEC	69510	800137	40	Greenwood	SC	Standalone Solar
DEC	62472	800141	55	Greenwood	SC	Standalone Solar
DEC	19033	800171	74.97	Greenwood	SC	Standalone Solar
DEC	62756	800172	32	Greenwood	SC	Standalone Solar
DEC	568308	800104	45	Laurens	SC	Standalone Solar
DEC	164382	800112	37.5	Laurens	SC	Standalone Solar
DEC	27093	800113	20	Laurens	SC	Standalone Solar
DEC	165980	800136	37.5	Laurens	SC	Standalone Solar
DEC	20154	800164	74.97	Laurens	SC	Standalone Solar
DEC	126056	800133	75	McCormick	SC	Standalone Solar
DEC	569164	800106	70.7	Newberry	SC	Standalone Solar
DEC	56654	800139	25	Newberry	SC	Standalone Solar
DEC	5515	800151	71.4	Newberry	SC	Standalone Solar
DEC	22084	800154	79.8	Newberry	SC	Standalone Solar
DEC	22150	800155	55	Newberry	SC	Standalone Solar
DEC	22140	800156	75	Newberry	SC	Standalone Solar
DEC	22126	800157	52.136	Newberry	SC	Standalone Solar
DEC	569804	800102	54	Spartanburg	SC	Standalone Solar

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEC	21513	800162	23	Spartanburg	SC	Standalone Solar
DEC	568024	800107	58	Union	SC	Standalone Solar
DEC	23506	800153	74	Union	SC	Standalone Solar
DEC	24029	800158	80	Union	SC	Standalone Solar
DEC	24033	800159	80	Union	SC	Standalone Solar
DEC	23270	800144	22.6	York	SC	Standalone Solar
DEC	22652	800150	70	York	SC	Standalone Solar
DEC	566988	800901	1680	Oconee	SC	PSH
DEC	Belews Creek	800801	285	Forsyth	NC	SMR
DEC	Marshall	800501	1216	Catawba	NC	CC
DEC	Marshall	800601	752	Catawba	NC	CT
DEP	Q479	304190	100	Wake	NC	Standalone Battery
DEP	Q485	304810	17.25	Buncombe	NC	Standalone Battery
DEP	119904	304384	20	Cumberland	NC	Standalone Battery
DEP	186310	305626	23.3	Durham	NC	Standalone Battery
DEP	191894	304769	30.5	Buncombe	NC	Standalone Battery
DEP	561400	900002	2.667	Kershaw	SC	Standalone Battery
DEP	565492	900010	138	Nash	NC	Standalone Battery
DEP	566170	900013	56	Wake	NC	Standalone Battery
DEP	566674	900021	8	Horry	SC	Standalone Battery
DEP	889853	900101	1.8769	Vance	NC	Standalone Battery
DEP	893373	900105	79.305	Person	NC	Standalone Battery
DEP	897163	900109	137.46	Wayne	NC	Standalone Battery
DEP	898287	900116	2.2734	Randolph	NC	Standalone Battery
DEP	898999	900119	105.69	Robeson	NC	Standalone Battery
DEP	899003	900120	185.05	Chatham	NC	Standalone Battery
DEP	899005	900121	105.69	Wake	NC	Standalone Battery

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEP	Sumter1	304728	100	Sumter	SC	Onshore Wind
DEP	Sumter2	304728	100	Sumter	SC	Onshore Wind
DEP	Scotland	304417	100	Scotland	NC	Onshore Wind
DEP	Clarendon	304701	100	Clarendon	SC	Onshore Wind
DEP	Florence	304671	100	Florence	SC	Onshore Wind
DEP	Granville	304079	100	Granville	NC	Onshore Wind
DEP	Nash	304081	100	Nash	NC	Onshore Wind
DEP	Sampson	304266	100	Sampson	NC	Onshore Wind
DEP	Richmond1	304985	100	Richmond	NC	Onshore Wind
DEP	Richmond2	304327	100	Richmond	NC	Onshore Wind
DEP	New Bern	304465	800	Craven	NC	Offshore Wind
DEP	Q423	305523	80	Person	NC	SPS
DEP	Q426	305526	74.5	Chesterfield	SC	SPS
DEP	Q427	305527	65	Person	NC	SPS
DEP	Q429	305529	72.54	Chesterfield	SC	SPS
DEP	Q430	305518	77.53	Robeson	NC	SPS
DEP	Q431	305519	60	Robeson	NC	SPS
DEP	Q432	305732	75	Lee	SC	SPS
DEP	Q433	305733	60	Bladen	NC	SPS
DEP	Q437	305537	80	Marion	SC	SPS
DEP	Q439	305539	72	Robeson	NC	SPS
DEP	Q440	305740	80	Sampson	NC	SPS
DEP	Q441	305741	80	Sampson	NC	SPS
DEP	Q443	305743	60	Scotland	NC	SPS
DEP	Q444	305444	75	Florence	SC	SPS
DEP	Q446	305446	40	Williamsburg	SC	SPS
DEP	Q447	305547	80	Onslow	NC	SPS

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEP	Q448	305548	80	Hoke	NC	SPS
DEP	Q450	305550	80	Craven	NC	SPS
DEP	Q451	305551	80	Craven	NC	SPS
DEP	Q452	305552	75	Beaufort	NC	SPS
DEP	Q453	305553	75	Beaufort	NC	SPS
DEP	Q454	305554	80	Kershaw	SC	SPS
DEP	Q455	305555	80	Carteret	NC	SPS
DEP	Q457	305557	74.9	Florence	SC	SPS
DEP	21764	305558	8	Lenoir	NC	SPS
DEP	21772	305559	8	Lenoir	NC	SPS
DEP	Q460	305560	185	Onslow	NC	SPS
DEP	Q461	305561	80	Person	NC	SPS
DEP	Q462	305562	20	Person	NC	SPS
DEP	22128	305565	80	Lenoir	NC	SPS
DEP	Q469	305569	74.9	Lee	SC	SPS
DEP	Q470	305770	50	Johnston	NC	SPS
DEP	Q471	305771	80	Kershaw	SC	SPS
DEP	Q478	305578	80	Jones	NC	SPS
DEP	Q486	305586	74.9	Sumter	SC	SPS
DEP	126008	305588	75	Wilson	NC	SPS
DEP	Q512	305612	71.3	Hoke	NC	SPS
DEP	Q514	305614	72	Duplin	NC	SPS
DEP	Q516	305616	80	Moore	NC	SPS
DEP	Q517	305617	80	Lee	NC	SPS
DEP	Q521	305621	80	Johnston	NC	SPS
DEP	Q522	305622	275	Onslow	NC	SPS
DEP	179866	305624	150	Williamsburg	SC	SPS

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEP	225140	900001	70	Darlington	SC	SPS
DEP	563066	900003	80	Wayne	NC	SPS
DEP	564034	900004	80	Bladen	NC	SPS
DEP	564638	900006	78.32	Nash	NC	SPS
DEP	565074	900008	75	Marlboro	SC	SPS
DEP	565542	900011	160	Wayne	NC	SPS
DEP	566096	900012	200	Marlboro	SC	SPS
DEP	566240	900014	80	Bladen	NC	SPS
DEP	566356	900015	80	Onslow	NC	SPS
DEP	566734	900023	60	Darlington	SC	SPS
DEP	566856	900024	60	Columbus	NC	SPS
DEP	567240	900025	75	Montgomery	NC	SPS
DEP	568222	900026	74.9	Cumberland	NC	SPS
DEP	568444	900027	75	Marlboro	SC	SPS
DEP	568598	900028	152	Wake	NC	SPS
DEP	568608	900029	187	Wake	NC	SPS
DEP	568778	900030	65	Richmond	NC	SPS
DEP	568988	900034	80	Scotland	NC	SPS
DEP	569030	900036	200	Pender	NC	SPS
DEP	569038	900037	75	Granville	NC	SPS
DEP	569086	900038	80	Jones	NC	SPS
DEP	569144	900039	80	Duplin	NC	SPS
DEP	569168	900040	75	Montgomery	NC	SPS
DEP	569188	900041	75	Columbus	NC	SPS
DEP	569234	900042	51.667	Johnston	NC	SPS
DEP	569290	900045	172.4	Jones	NC	SPS
DEP	569524	900046	60	Marlboro	SC	SPS

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEP	569644	900048	91.3	Lenoir	NC	SPS
DEP	569986	900051	275	Richmond	NC	SPS
DEP	570034	900052	80	Hoke	NC	SPS
DEP	570092	900053	80	Scotland	NC	SPS
DEP	570150	900054	70	Robeson	NC	SPS
DEP	570306	900055	80	Franklin	NC	SPS
DEP	Q393	305493	75	Richmond	NC	Standalone Solar
DEP	Q394	305494	50	Clarendon	SC	Standalone Solar
DEP	Q396	305496	40	Randolph	NC	Standalone Solar
DEP	Q401	305501	56	Pitt	NC	Standalone Solar
DEP	Q405	305505	60.5	Dillon	SC	Standalone Solar
DEP	Q407	305507	80	Kershaw	SC	Standalone Solar
DEP	Q408	305508	80	Craven	NC	Standalone Solar
DEP	Q409	305509	30	Harnett	NC	Standalone Solar
DEP	Q411	305511	50	Warren	NC	Standalone Solar
DEP	Q412	305512	20	Darlington	SC	Standalone Solar
DEP	Q413	305513	20	Chesterfield	SC	Standalone Solar
DEP	Q414	305514	80	Pender	NC	Standalone Solar
DEP	Q422	305522	80	Person	NC	Standalone Solar
DEP	Q525	305625	74.9	Williamsburg	SC	Standalone Solar
DEP	564510	900005	80	Bladen	NC	Standalone Solar
DEP	564942	900007	48	Chesterfield	SC	Standalone Solar
DEP	565080	900009	75	Darlington	SC	Standalone Solar
DEP	566478	900016	74.9	Darlington	SC	Standalone Solar
DEP	566488	900017	74.9	Chesterfield	SC	Standalone Solar
DEP	566518	900018	74.9	Darlington	SC	Standalone Solar
DEP	566542	900019	74.9	Darlington	SC	Standalone Solar

Company	Unique ID / Site[12]	Bus Number	MW	County	State	Type
DEP	566580	900020	60	Lee	SC	Standalone Solar
DEP	566724	900022	74.9	Darlington	SC	Standalone Solar
DEP	568892	900031	76	Darlington	SC	Standalone Solar
DEP	568978	900032	80	Duplin	NC	Standalone Solar
DEP	568986	900033	80	Person	NC	Standalone Solar
DEP	569014	900035	48	Kershaw	SC	Standalone Solar
DEP	569236	900043	73.91	Lenoir	NC	Standalone Solar
DEP	569632	900047	80	Scotland	NC	Standalone Solar
DEP	569766	900049	91.3	Johnston	NC	Standalone Solar
DEP	569890	900050	80	Wayne	NC	Standalone Solar
DEP	570382	900056	75	Darlington	SC	Standalone Solar
DEP	Roxboro	304024	1216	Person	NC	CC
DEP	Roxboro	304024	752	Person	NC	CT