# TAG Meeting
# September 19, 2013

## NCEMC Office
## Raleigh, North Carolina

# TAG Meeting Agenda

1. Administrative Items – Rich Wodyka
2. FERC Order No. 1000 - Rule on Transmission Planning and Cost Allocation – Sam Waters
3. Mid-year update on the NCTPC 2012 Collaborative Transmission Plan – Mark Byrd
4. 2013 Study Activities Update – Orvane Piper
5. Report on the Preliminary 2013 Study Results – Orvane Piper and Lee Adams
6. Regional Studies Update – Bob Pierce
7. 2013 TAG Work Plan Update – Rich Wodyka
8. TAG Open Forum – Rich Wodyka

# FERC Order No. 1000 Rule on Transmission Planning and Cost Allocation Compliance Update

**Sam Waters – Duke Energy**

**on behalf of the North Carolina Transmission Planning Collaborative**

***For the 9/19/13 TAG Meeting***

# Regional Compliance Update

- **Duke Energy Carolinas and Progress Energy Carolinas submitted the Order No. 1000 regional compliance filing on October 11, 2012.**

- **FERC issued an order on February 21, 2013 finding that due to the merger of Duke and Progress, Duke and Progress are no longer separate transmission providers for purposes of Order No. 1000 compliance and therefore the NCTPC no longer qualified as an Order No. 1000 transmission planning region.**

# Regional Compliance Update (cont.)

- **Duke-Progress submitted a request for rehearing/ clarification of the FERC order.**
  - **Rehearing request – Requested that FERC reconsider their finding and find that Duke and Progress are separate transmission providers.**
  - **Clarification request – If FERC does not find that Duke and Progress are separate transmission providers then FERC should clarify that Duke and Progress have a single footprint for Order No. 1000 purposes.**

# Regional Compliance Update (cont.)

- **On May 22, Duke and Progress filed their revised compliance plan with FERC under protest, proposing to join the SERTP.**

- **Duke's revised regional compliance proposal included the following:**
  - **Preservation of the NCTPC as a local transmission planning process**
  - **Use of the SERTP as the regional transmission planning process**

- **FERC issued their order on the SERTP regional compliance filing on July 18, 2013, without ruling on Duke and Progress' Request for Rehearing.**

# Regional Compliance Update (cont.)

- **NCTPC Stakeholder Reminder**

  **The regional planning process for Order 1000 purposes will be through the SERTP (unless FERC reverses their original Order on the NCTPC proposal).**

  **http://www.southeasternrtp.com**

- **The next SERTP stakeholder meeting is:**

  3rd Quarter SERTP Meeting - Thursday, September 26th, Alabama Power Company Headquarters in Birmingham, AL from 9:00 AM - 2:00 PM CST

- **Sign up for email updates:**

  **http://www.southeasternrtp.com/email_signup.asp**

# Regional Compliance Update (cont.)

Key Compliance Changes Required of the SERTP by the FERC Order

- **Transmission Planning**

  FERC is requiring that the transmission planning process include an affirmative obligation to identify more cost efficient or cost-effective transmission projects

- **Cost Allocation**

  FERC rejected the use of a single avoided transmission cost allocation methodology

- **Public Policy & Non-Incumbent Transmission Developer Reforms**

  Numerous changes in these areas

# Regional Compliance Update (cont.)

- Request for rehearing of the order were filed on August 19, 2013.

**Significant issues raised include:**

- FERC did not allow the Order No. 1000 regional differences to compliance which they had promised in the order.
- The original Order No. 1000 compliance proposals were appropriate due to the environment within the Southeast– extensive state laws and Commission responsibilities over transmission, utility vertical integration, state integrated resource planning process, and utilities operate in a non-RTO environment.
- FERC order could interfere with our state IRP processes (cost allocation examples assume an RTO-like environment with regional joint dispatch).
- FERC order does not reflect the realities of the environment in the Southeast which includes a physical transmission service regime, whereby the transmission needs for the region are identified through the IRP process and through transmission requests for long-term transmission service.
- Mandatory cost allocation for non-jurisdictional utilities may jeopardize participation, flexibility is needed on level of participation.

- NARUC and five state commissions (including the NCUC, the SC ORS), filed requests for rehearing of the order with a focus on state jurisdiction issues.

# Interregional Compliance Update

- **SERTP submitted their interregional compliance filing on July 10, 2013.**

  **http://www.southeasternrtp.com/General/2013/Order%20No.%201000%20Interregional%20Compliance%20Filing%20Package.pdf**

- **Duke and Progress continue to participate as if members of the SERTP.**

- **Interventions and Protest of the Order No. 1000 interregional filings were submitted on September 9th. Some protests were filed related to the SERTP Interregional filing.**

**On a somewhat related note:**

**As discussed, the NCTPC process will be considered a "local" process for FERC compliance purposes, with Duke Energy Carolinas and Duke Energy Progress participating in the SERTP for purposes of "regional" planning compliance.**

**The Eastern Interconnection Planning Collaborative (EIPC) Stakeholder process will acquire input through regional stakeholder processes.**

*The EIPC PAs believe that the best approach for building on the considerable work of the interconnection-wide process and the states in forming the EISPC, while ensuring a* ***regional*** *focus, is for the stakeholder process to utilize the existing structure of the Order 890-approved processes of each of the* ***regions*** *to facilitate stakeholder input and PA interaction for non DOE-funded EIPC efforts. (*EIPC Stakeholder Process (05/28/2013)

**NCTPC stakeholders interested in participating in or offering input to the EIPC process should do so by participating in the SERTP**

**Guidelines and principles for submitting suggestions for EIPC studies can be found at:**

**http://www.eipconline.com/uploads/Guidelines_and_Principles_for_EIPC_Stakeholder_Scenario_Development_080813.pdf**

# Questions ?

# NCTPC 2012 Collaborative Transmission Plan Update

## Mark Byrd – Progress

# 2013 Mid-Year Update to the 2012 Collaborative Transmission Plan

- **3** DEP projects were placed in-service
- **2** DEP projects have in-service date changes
- **1** DEP project scope changed (Raeford)
- **1** DEC project removed (London Creek)
- Total Reliability Project Cost changed from $318M to $223M and Merger Projects Cost changed from $59M to $67M

| Reliability Projects in 2012 Plan | | |
|---|---|---|
| Reliability Project | TO | Planned I/S Date |
| Brunswick 1-Castle Hayne 230kV Line, Construct New Cape Fear River Crossing | DEP | In-Service |
| Jacksonville Static VAR Compensator | DEP | In-Service |
| Folkstone 230/115kV Substation | DEP | In-Service |
| Harris-RTP 230 kV line | DEP | June 2014 |

| Reliability Projects in 2012 Plan (continued) | | |
|---|---|---|
| Reliability Project | TO | Planned I/S Date |
| Brunswick 1 - Jacksonville 230 kV Line Loop - in to Folkstone 230 kV substation | DEP | June 2020 |
| Greenville-Kinston Dupont 230 kV line | DEP | June 2014 |
| Raeford 230 kV substation, Loop-In Richmond – Ft Bragg Woodruff St 230 kV Line and add 3rd bank | DEP | June 2018 |
| Durham-RTP 230kV Line, Reconductor | DEP | June 2023 |

| Reliability Projects in 2012 Plan (Continued) | | |
|---|---|---|
| Reliability Project | TO | Planned I/S Date |
| Reconductor Caesar 230 kV Lines (Pisgah Tie-Shiloh Switching Station) | DEC | December 2013 |
| Reconductor London Creek 230 kV Lines (Peach Valley Tie-Riverview Switching Station) | DEC | Removed |

| Merger Projects in 2012 Plan | | |
|---|---|---|
| Merger Project | TO | Planned I/S Date |
| Lilesville-Rockingham 230kV Line #3 – Construct new line | DEP | December 2013 |
| Person-(DVP) Halifax 230kV Line – Reconductor DVP section (DVP work) | DEP | June 2014 |
| Antioch 500/230kV Substation – Replace Two Transformer Banks | DEC | June 2014 |

# Questions ?

# NCTPC 2013 Study Activities Update

Orvane Piper – Duke Energy

# Purpose of Study

- **Assess Duke and Progress transmission systems' reliability and develop a single Collaborative Transmission Plan**

# Steps and Status of the Study Process

Completed

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

# Study Assumptions Selected

- **Study Years for reliability analyses:**
  - **Near-term: 2018 Summer, 2018/2019 Winter**
  - **Longer-term: 2023 Summer**
- **LSEs provided:**
  - **Input for load forecasts and resource supply assumptions**
  - **Dispatch order for their resources**
- **Interchange coordinated between Participants and neighboring systems**

# Study Criteria Established

- **NERC Reliability Standards**
  - Current standards for base study screening
  - Current SERC Requirements
- **Individual company criteria**

# Study Methodologies Selected

- Thermal Power Flow Analysis
- Each system (Duke and Progress) will be tested for impact of other system's contingencies

# Base Case Models Developed

- Started with 2012 series MMWG cases
- Detailed models for Duke and Progress systems
- Adjustments were made based on additional coordination with neighboring transmission systems
- Planned transmission additions from updated 2012 Plan were included in models

# Resource Supply Options Selected

- **Last year**
  - Hypothetical new base load generation
  - NCTPC-PJM inter-regional wind study
- **This year**
  - Hypothetical import/export scenarios (16 total)
  - Coordination with PJM for modeling transfers (7 of 16 scenarios)

# 2023 Hypothetical Import / Export

| Resource From | Sink | Test Level (MW) |
|---|---|---|
| NORTH – PJM | Duke | 1,000 |
| SOUTH – SOCO | Duke | 1,000 |
| SOUTH – SCEG | Duke | 1,000 |
| SOUTH – SCPSA | Duke | 1,000 |
| EAST – Progress (CPLE) | Duke | 1,000 |
| WEST – TVA | Duke | 1,000 |

# 2023 Hypothetical Import / Export

| Resource From | Sink | Test Level (MW) |
|---|---|---|
| NORTH – PJM | Progress (CPLE) | 1,000 |
| SOUTH – SCEG | Progress (CPLE) | 1,000 |
| SOUTH – SCPSA | Progress (CPLE) | 1,000 |
| WEST – Duke | Progress (CPLE) | 1,000 |
| WEST – Duke | SOCO | 1,000 |

# 2023 Hypothetical Import / Export

| Resource From | Sink | Test Level (MW) |
|---|---|---|
| NORTH – PJM | Duke / Progress (CPLE) | 1,000 / 1,000 |
| WEST – Duke / Progress (CPLE) | PJM | 1,000 / 1,000 |
| EAST – Progress (CPLE) | PJM | 1,000 |
| WEST – Duke | PJM | 1,000 |
| SOUTH – SOCO * | PJM | 1,000 |

# NC/SC Joint Wind Study

| Location | Scenario #1 | Scenario #2 | Scenario #3 |
|---|---|---|---|
| | **MWs by Injection Point** | | |
| Wilmington, NC | 1,000 | 2,000 | 0 |
| Myrtle Beach, SC | 1,000 | 0 | 2,000 |
| | **MWs* by Sink Location** | | |
| Duke | 600 | 940 | 940 |
| Progress | 400 | 620 | 620 |
| SCEG | 500 | 220 | 220 |
| SCPSA | 500 | 220 | 220 |

**Assumes 100% capacity factor at each of the injection sites.*

# Technical Analysis

- Conduct thermal screenings of the 2018 and 2023 base cases
- Conduct thermal screenings of the 2023 hypothetical transfer scenarios and coordinate with PJM

# Problems Identified and Solutions Developed

- Identify limitations and develop potential alternative solutions for further testing and evaluation
- Estimate 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 ?

# Report on the Preliminary 2013 Study Results

Orvane Piper – Duke

Lee Adams – Progress

# Preliminary Base Case Results - Duke

## 2018 and 2023 Summer

- 3 New Issues Identified
  - Fisher 230 kV (Central-Shady Grove Tap) [2023]
  - Harrisburg 230 kV (Harrisburg-Oakboro) [2021]
  - Sandy Ridge 230 kV (Newport-Morning Star) [2023]

- 1 Project Removed
  - London Creek 230 kV (Peach Valley – Riverview)

# Preliminary Base Case Results – Progress

## 2018 and 2023 Summer

- Sumter-SCE&G Wateree Plant 230kV Line (98% in 2023)
  - Coordinate ancillary equipment upgrades with SCE&G (<$10M)
- Darlington Co. Plant-SCPSA South Bethune 230kV Line (103% in 2023)
  - Coordinate ancillary equipment upgrades with SCPSA (<$10M)
- Camden-Camden Invista 115kV Line (91% in 2023)
  - Continue to monitor

# Preliminary Base Case Results – Progress

**2018-19 Winter**

- No Issues identified in Western Area

# Questions ?

# Regional Studies Reports

**Bob Pierce - Duke**

# Carolinas Offshore Wind Integration Case Study (COWICS)

# COWICS

- Duke Energy Carolinas, NREL, UNC-CH, AWS Truepower, ABB

- Objective - To provide a thorough and detailed analysis of specific issues, impacts, and costs associated with integrating various amounts of offshore wind generation into the DEC system. The information provided by the study will inform policy decision-makers, industry participants, and utility planners as they evaluate the positives & negatives of offshore wind development.

# COWICS

## Wind Site Selection

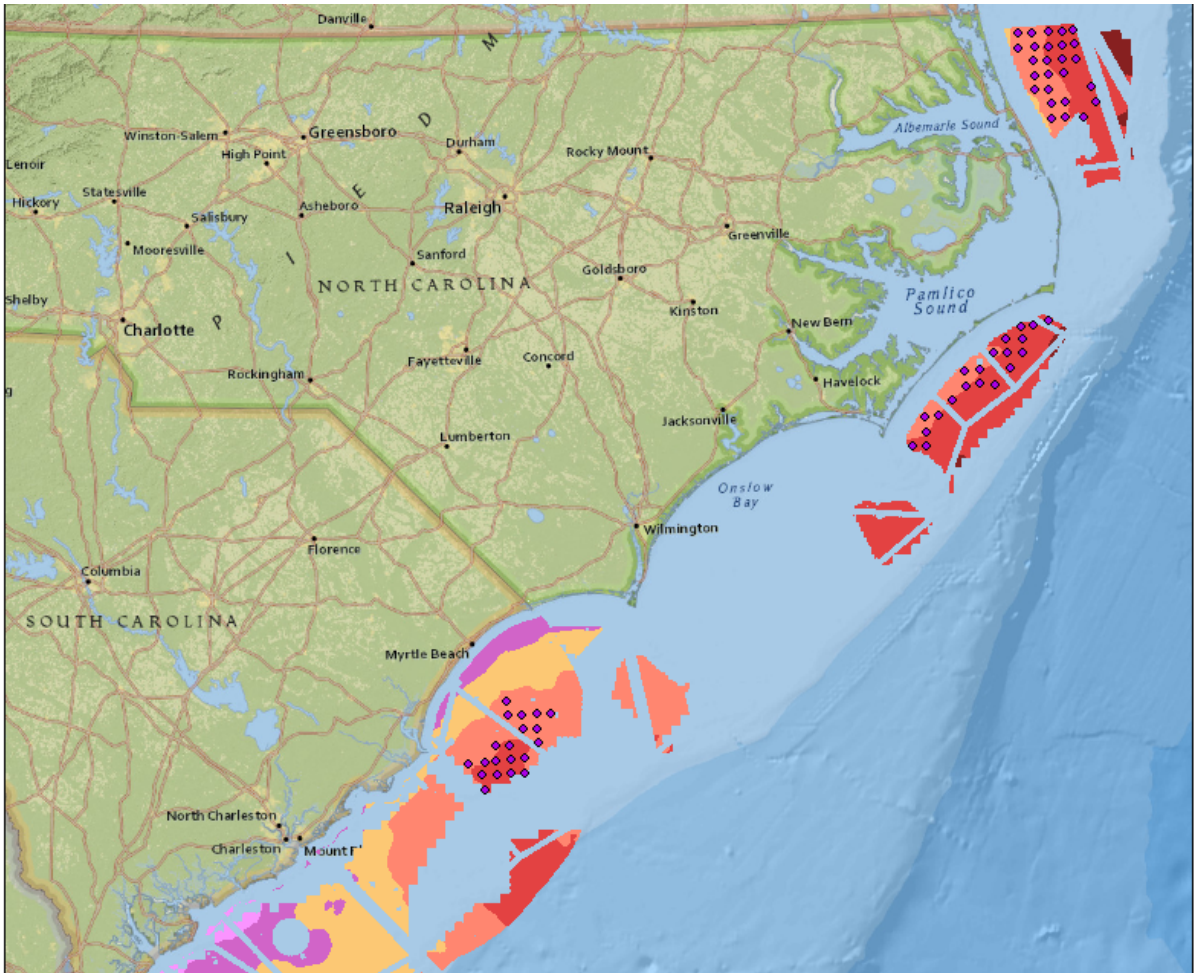
- Analyze wind resource data for the coast of NC/SC
- Project team used proprietary wind models
- GIS based site screening algorithm to select likely locations and associated amounts of capacity for commercially viable offshore wind projects
- Systematic evaluation of quantifiable factors considered
  - wind resource and predicted plant output,
  - distance to potential interconnection points,
  - proximity to sensitive or protected areas

# COWICS

## Areas excluded from development

| Constraint | Offset | Source |
|---|---|---|
| Anchorage Area | 300 m | NOAA |
| Beacon | 30 m | NOAA |
| Buoy | 30 m | NOAA |
| Cables | 1100 m | NOAA |
| Cables (International) | 1500 m | NOAA |
| Coastline | 5 km | NOAA |
| Dumping Ground | 300 m | NOAA |
| Fairway Shipping Channel | 1 nm | NOAA |
| Fog Signal | 30 m | NOAA |
| Lights | 30 m | NOAA |
| Military Practice Area | Layer Extent | NOAA |
| Obstruction | 30 m | NOAA |
| Offshore Platform | 30 m | NOAA |
| Precautionary Area | Layer Extent | NOAA |
| Shipping Lane | 1 nm | NOAA |
| Wreck | 30 m | NOAA |
| National Marine Sanctuaries | 1 mile | NREL |
| Marine Protected Areas | 1 mile | NREL |
| Shipping Lane | 1 mile | NREL |
| Sanctuary Preservation Area | 1 mile | NREL |
| Significant Natural Heritage Areas (NC) | 1 mile | NREL |
| Sea Turtle Sanctuaries (NC) | 1 mile | NREL |
| Crab Spawning Sanctuaries (NC) | 1 mile | NREL |
| Refuges (SC) | 1 mile | NREL |
| Ocean & Coastal Resource Management Critical Area (SC) | 1 mile | NREL |
| Wind Energy Exclusion Area | Layer Extent | DoD |

# COWICS


Danville
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High Point
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Lenoir
Statesville
Hickory
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Raleigh
Salisbury
Greenville
Mooresville
Sanford
Goldsboro
NORTH CAROLINA
Shelby
Charlotte
Kinston
New Bern
Pamlico Sound
Fayetteville
Concord
Rockingham
Havelock
Jacksonville
Lumberton
Onslow Bay
Wilmington
Florence
Columbia
SOUTH CAROLINA
Myrtle Beach
North Charleston
Charleston

# COWICS

**Percentage of nameplate capacity by state for each scenario**

| | NC | SC |
|---|---|---|
| **1000 MW** | 100% | 0% |
| **3000 MW** | 78% | 22% |
| **5600 MW** | 69% | 31% |

# COWICS

## Average output for selected seasons by scenario and zone

| WINTER | | | |
|---|---|---|---|
| | **1000 MW** | **3000 MW** | **5600 MW** |
| **North** | 376 | 688 | 1150 |
| **Central** | 161 | 557 | 867 |
| **South** | N/A | 368 | 957 |

| SHOULDER | | | |
|---|---|---|---|
| | **1000 MW** | **3000 MW** | **5600 MW** |
| **North** | 308 | 572 | 946 |
| **Central** | 164 | 571 | 880 |
| **South** | N/A | 329 | 845 |

| SUMMER | | | |
|---|---|---|---|
| | **1000 MW** | **3000 MW** | **5600 MW** |
| **North** | 243 | 454 | 775 |
| **Central** | 97 | 326 | 518 |
| **South** | N/A | 219 | 582 |

# COWICS

## Capacity & Energy Profile

- Chosen sites were evaluated to determine the amount of capacity that could feasibly be developed
- Detailed analyses of selected sites performed to determine the capacity & energy profile and variability of the resource
- Ran a proprietary numerical weather prediction model, to create time series of wind speed and direction, air density, and turbulence kinetic energy at 100-m above ground level

# COWICS

## Capacity & Energy Profile

- One time series was created for each wind farm location
- 10-km horizontal resolution to capture spatial variations in the wind resource over the ocean
- Simulations were used to generate 10-year time series (1999-2008) of hourly and 10-minute wind power output
- Converted the model wind output to electricity generation time series
- A frequency distribution of hourly and 10-minute wind and power ramps was examined to characterize the variability of the offshore wind resource

# COWICS

## Interconnection & Delivery

- Capacity and energy profiles of the selected sites were used in the transmission system modeling
- Assessed transmission system needs in order to interconnect and deliver the wind energy to load centers
- Used MMWG model with a detailed representation of all of DEC's transmission resources as well as those throughout the Carolinas and the surrounding states

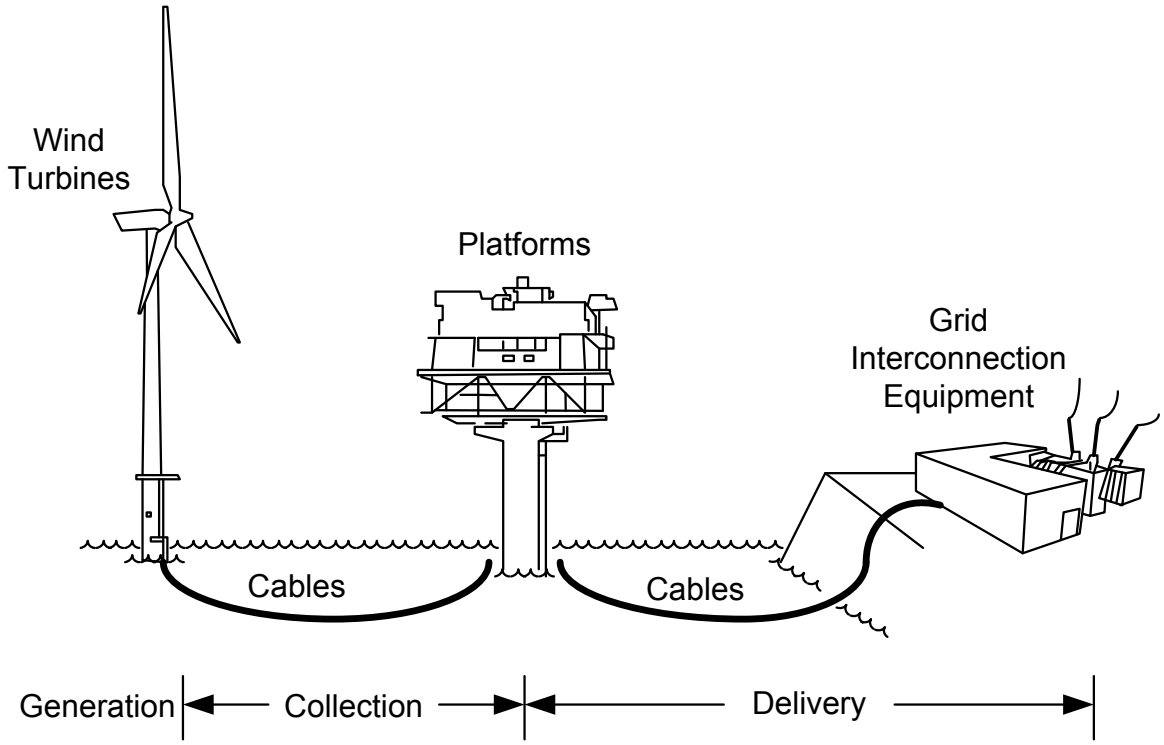
# COWICS

## Interconnection & Delivery

- Probable locations for the injection of the wind to the onshore transmission system determined using the wind plant proximity to onshore substations, transmission path ratings in the vicinity of these substations and similar considerations
- Studies evaluated NERC TPL Standard Category A & B contingencies to identify areas prone to transmission loadings and voltage limitation that will hamper the transmission of offshore wind

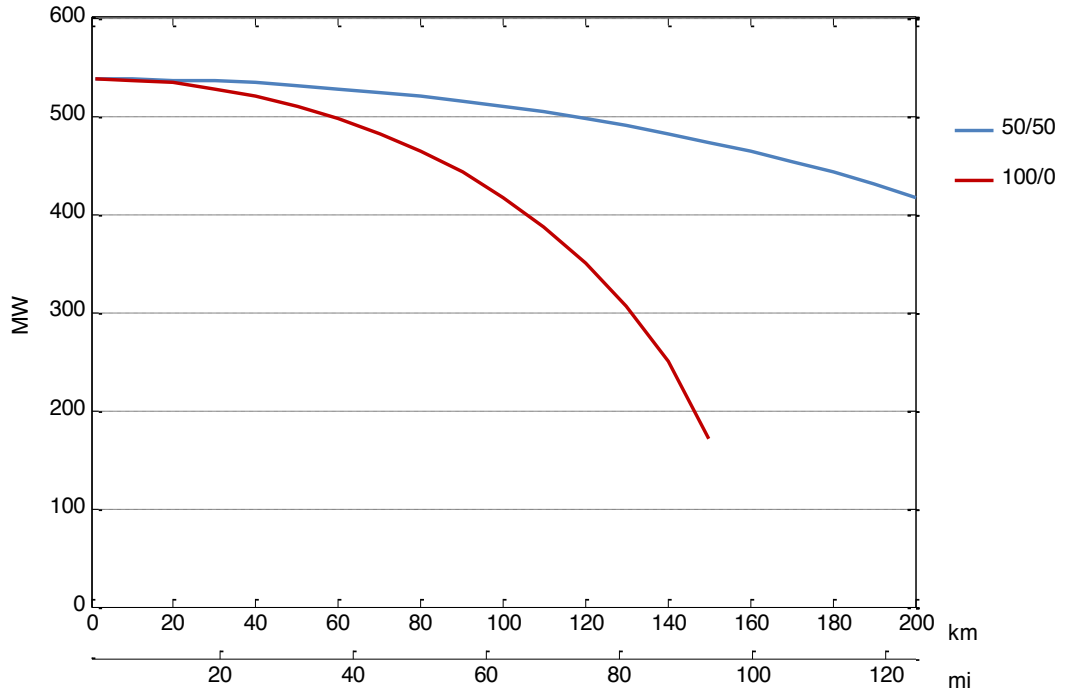
# COWICS

## Generalized concept for an offshore wind energy system



# COWICS

Maximum, real power transfer for 230 kV cables with onshore/offshore reactive compensation splits of 100/0 and 50/50 (2000 kcmil copper cross section)




Economic cross-over from the HVAC systems to the HVDC system tends to occur at approximately 50 miles

# COWICS

## Interconnection & Delivery

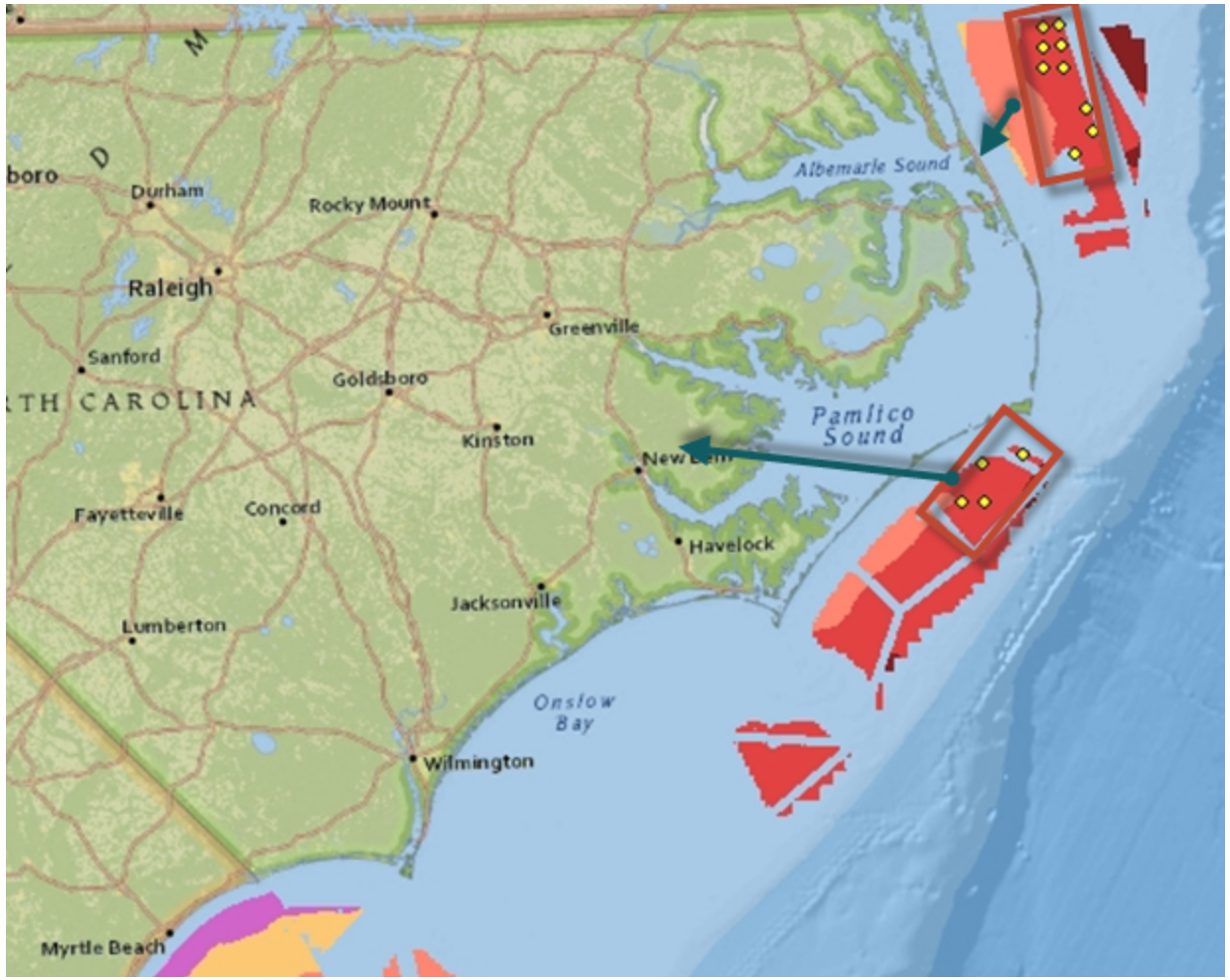
- DVP
  - Kitty Hawk, NC
  - Landstown, VA
- CPLE
  - Silver Hill
  - New Bern
  - Morehead-Wildwood
- SCPSA
  - Bucksville, SC

# COWICS

## Interconnection & Delivery

| 1000 MW Scenario | | | | |
|---|---|---|---|---|
| **ZONE** | **ONSHORE LOCATION** | **ONSHORE DESIGN** | **OFFSHORE DESIGN** | **CHARACTERISTICS** |
| **North** | Kitty Hawk | AC connection to 230 kV | 34.5 kV AC collector to 230 kV platform | Connects to PJM market. |
| **Central** | Silver Hill (Bayboro area) | DC/AC converter to 230 kV | 34.5 kV AC collector to AC/DC converter | Bayboro location requires a DC cable across the Pamlico Sound. |
| **South** | N/A | N/A | N/A | N/A |

# COWICS


Albemarle Sound
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Sanford
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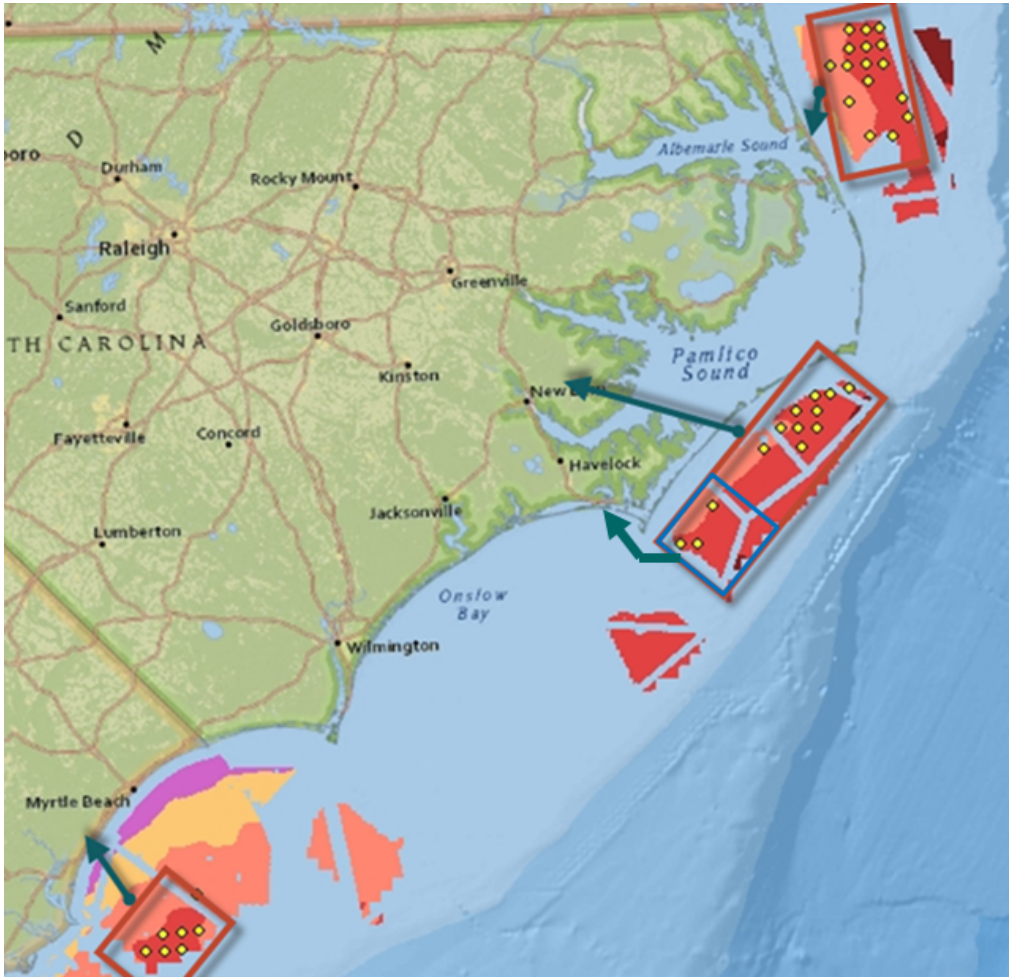
Kinston
Pamlico Sound
Fayetteville
Concord
Havelock
Jacksonville
Lumberton
Onslow Bay
Wilmington
Myrtle Beach

# COWICS

| 3000 MW Scenario | | | | |
|---|---|---|---|---|
| **ZONE** | **ONSHORE LOCATION** | **ONSHORE DESIGN** | **OFFSHORE DESIGN** | **CHARACTERISTICS** |
| **North** | Kitty Hawk | AC connection to 230 kV | 34.5 kV AC collector to 230 kV platform | Connects to PJM market. |
| **Central** | Silver Hill (Bayboro area) | DC/AC converter to 230 kV | 34.5 kV AC collector to AC/ DC converter | Bayboro location requires a DC cable across the Pamlico Sound. |
| **Central** | Morehead-Wildwood (Morehead City) | AC connection to 230 kV | 34.5 kV AC collector to 230 kV platform | Sites located too far south to connect to Bayboro area. |
| **South** | Bucksville | AC connection to 230 kV | 34.5 kV AC collector to 230 kV platform | Reactive compensation likely to be required or DC connection to onshore system. |

# COWICS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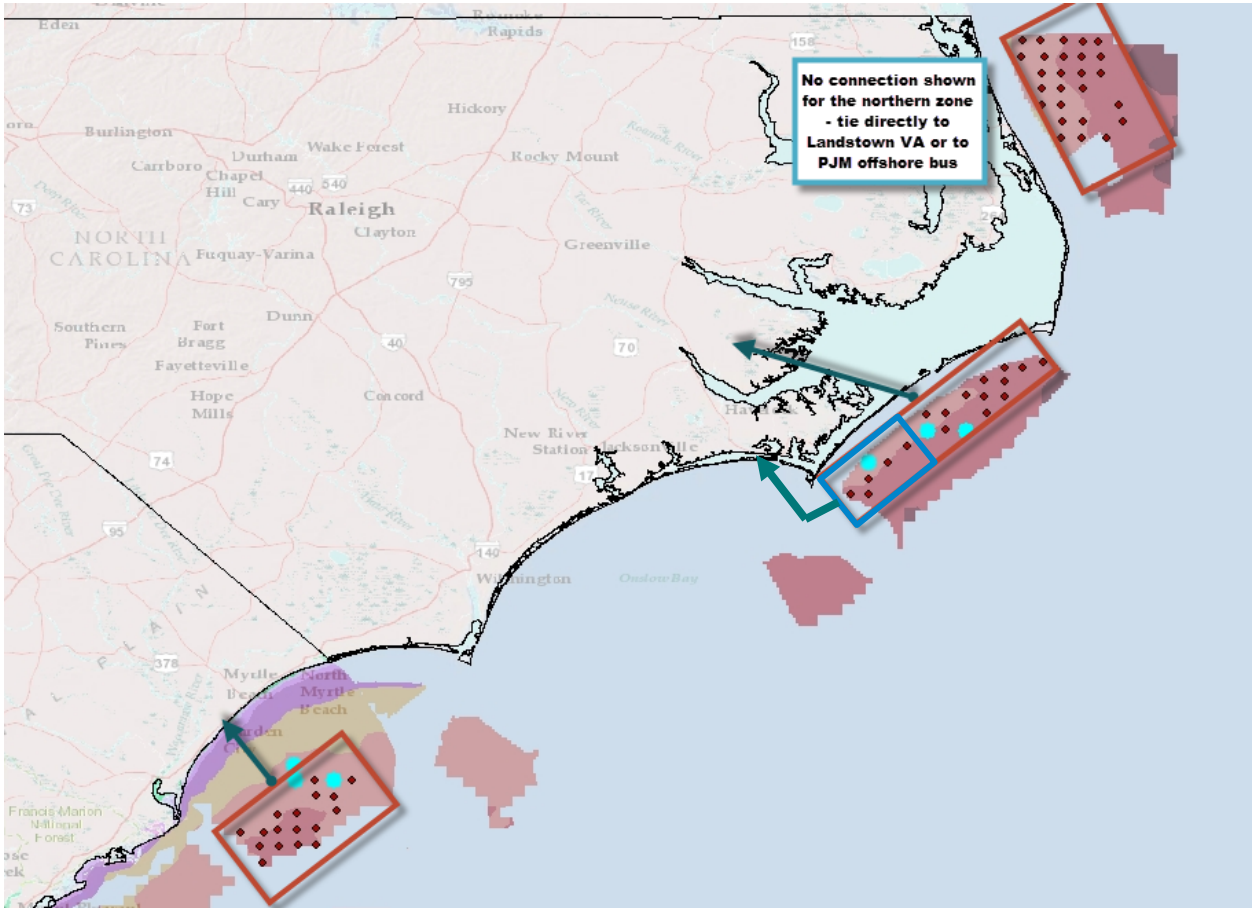
Kinston
Pamlico Sound
Fayetteville
Concord
Havelock
Jacksonville
Lumberton
Onslow Bay
Wilmington
Myrtle Beach

# COWICS

| 5600 MW Scenario | | | | |
|---|---|---|---|---|
| **ZONE** | **ONSHORE LOCATION** | **ONSHORE DESIGN** | **OFFSHORE DESIGN** | **ISSUES** |
| **North** | Landstown (Virginia Beach area) | DC/AC converter to 230 kV | 34.5 kV AC collector to AC/DC converter or DC collector to DC bus | Connects to PJM market. Requires connection to Virginia Beach, VA area substation or directly to PJM offshore DC bus. |
| **Central** | Morehead-Wildwood (Morehead City area) | AC connection to 230 kV | 34.5 kV AC collector to 230 kV platform | Sites located too far south to connect to Bayboro area. |
| **Central** | New Bern | DC/AC converter to 230 kV | 34.5 kV AC collector to AC/DC converter | New Bern location requires a DC cable across the Pamlico Sound. |
| **South** | Bucksville | DC/AC converter to 230 kV | 34.5 kV AC collector to AC/DC converter | Required removing 6 outlier wind sites that were too far from the main body of wind sites to reasonably connect. Next 6 “less preferable” sites (blue dots on map) were selected – 3 Central zone & 3 South zone to reach the full 5600 MW study level. |

# COWICS


No connection shown for the northern zone - tie directly to Landstown VA or to PJM offshore bus
Eden
Roanoke Rapids
Hickory
Burlington
Wake Forest
Durham
Carrboro
Chapel Hill
Cary
Raleigh
Rocky Mount
Clayton
Greenville
Fuquay-Varina
NORTH CAROLINA
Dunn
Southern Pines
Fort Bragg
Fayetteville
Hope Mills
Concord
New River Station
Jacksonville
Wilmington
Myrtle Beach
North Myrtle Beach
Francis Marion National Forest

# COWICS

## Powerflow Results – Northern Zone

- Existing 230 kV transmission infrastructure primarily serving load in the Kitty Hawk area
- Capable of supporting injection of offshore wind in the 1000 MW and 3000 MW scenarios
- Injection of offshore wind serves the load in the radial load pocket south of Kitty Hawk and the remaining energy reverses the existing flow back into the DVP transmission network.

# COWICS

## Powerflow Results – Northern Zone

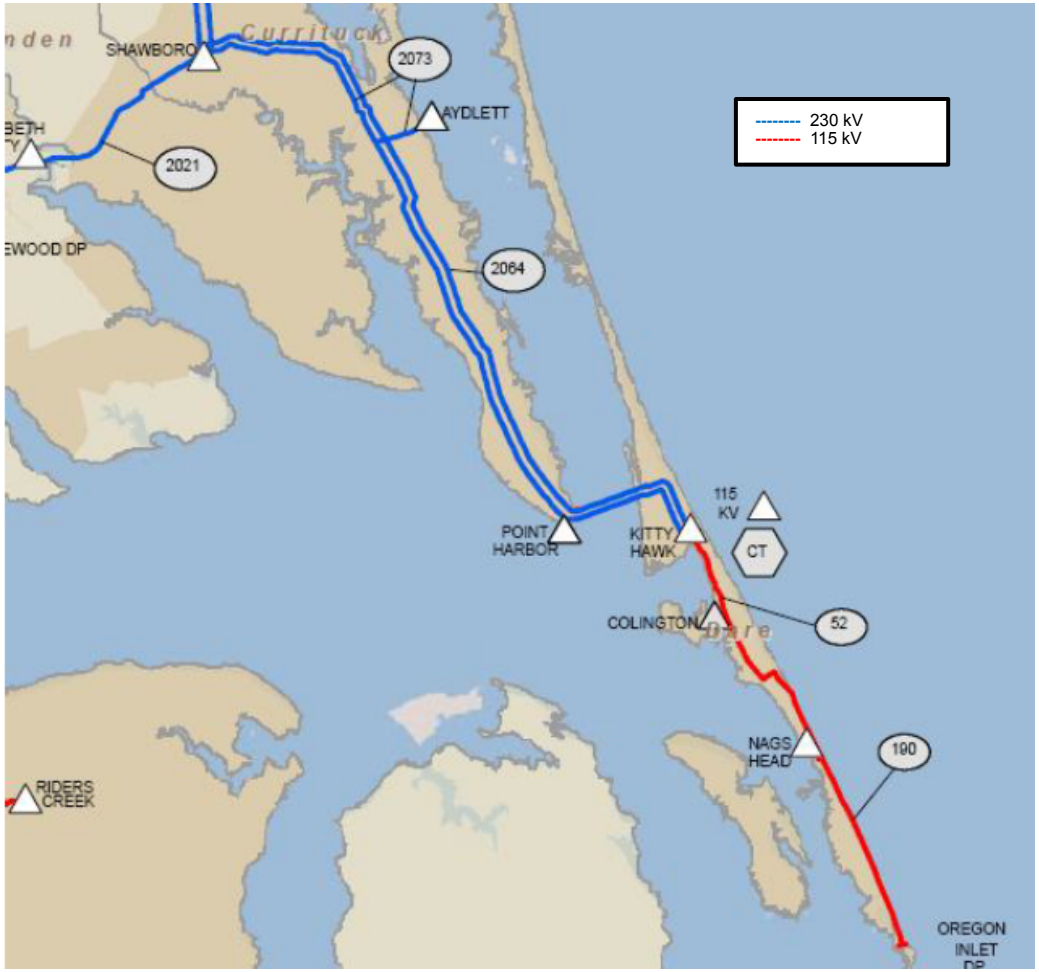
- Flow back into the system is not significant enough to cause overloads under the contingency conditions studied

- If future loads in the Hawk area are less than forecasted in the models, two transmission upgrades will be required as a result of the increased flow back into the system

  – Kitty Hawk – Shawboro 230 kV: increase capacity of existing line, $37 M

  – Kitty Hawk – Point Harbor 230 kV: increase capacity of existing line, $8 M (assuming $1 M/mile)

# COWICS


SHAWBORO
2073
AYDLETT
2021
2064
230 kV
115 kV
POINT HARBOR
KITTY HAWK
115 KV
CT
COLINGTON
52
NAGS HEAD
190
RIDERS CREEK
OREGON INLET

# COWICS

## Powerflow Results – Northern Zone

- In the 5600 MW scenario an onshore connection to either DVP or PEC in NC was not recommended because of the lack of any transmission infrastructure near the NC coastline

- "2012 NCTPC – PJM Joint Interregional Reliability Study" report determined DVP's Landstown station could accept up to 2000 MW of offshore injection if a second 230 kV circuit was added between Landstown & Stumpy Lake substations at an estimated cost of $4 M

# COWICS

## Powerflow Results – Central Zone

- Bayboro, NC area at the Silver Hill 230 kV station, near the NC outer banks, is where generation was assumed to connect for the 1000 MW & 3000 MW scenarios

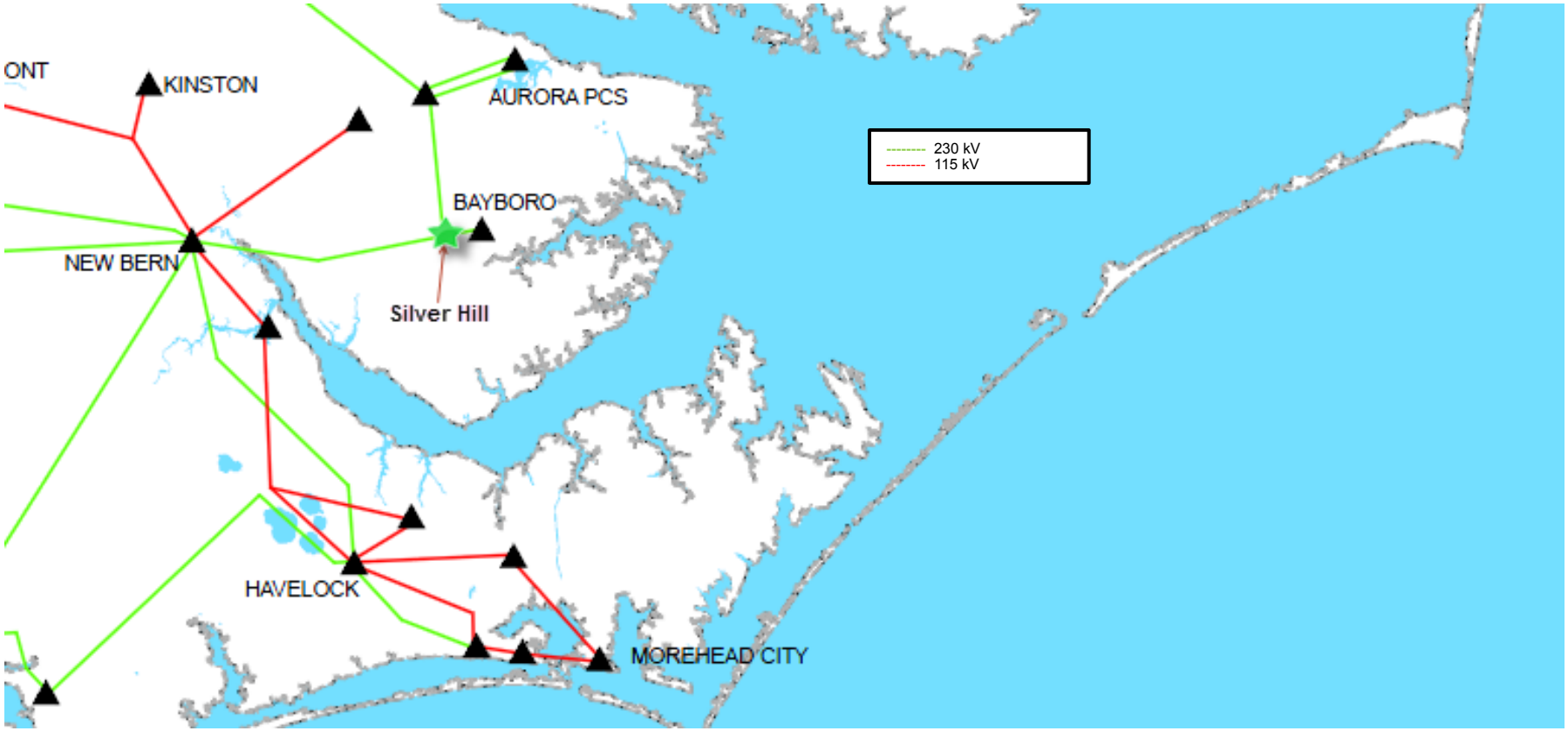
- 5600 MW scenario required injection at PEC's New Bern 230 kV station, located in New Bern, NC bypassing the Silver Hill station with a double circuit 230 kV line from the onshore converter station to New Bern

# COWICS

## Powerflow Results – Central Zone

- The generators' distance from shore required that DC cable with associated converter stations would be required for integration at Silver Hill and New Bern; however, integration at Morehead-Wildwood can be accomplished with a 230 kV AC connection

# COWICS


ONT
KINSTON
AURORA PCS
230 kV
115 kV
BAYBORO
NEW BERN
Silver Hill
HAVELOCK
MOREHEAD CITY

# COWICS

## Power injection – Central Zone

| WINTER | | | |
|---|---|---|---|
| | 1000 MW | 3000 MW | 5600 MW |
| Morehead-Wildwood | N/A | 140 | 273 |
| New Bern | N/A | N/A | 594 |
| Silver Hill | 161 | 417 | N/A |

| SHOULDER | | | |
|---|---|---|---|
| | 1000 MW | 3000 MW | 5600 MW |
| Morehead-Wildwood | N/A | 143 | 277 |
| New Bern | N/A | N/A | 603 |
| Silver Hill | 164 | 428 | N/A |

| SUMMER | | | |
|---|---|---|---|
| | 1000 MW | 3000 MW | 5600 MW |
| Morehead-Wildwood | N/A | 82 | 163 |
| New Bern | N/A | N/A | 355 |
| Silver Hill | 97 | 244 | N/A |

# COWICS

## Powerflow Results – Central Zone

- Injections at Silver Hill required converting the station from a tap station to a switching station
- The 1000 MW and 3000 MW scenarios did not require additional transmission system modifications

# COWICS

## Powerflow Results – Central Zone

- 3000 MW and 5600 scenarios included several offshore wind sites that were located much farther south and were not feasible to connect to either Silver Hill or New Bern, so an additional injection site was selected

- These scenarios analyzed an additional offshore wind injection west of Morehead City, NC at PEC's Morehead-Wildwood 230 kV station

# COWICS

## Powerflow Results – Central Zone

- With the connection at New Bern for the 5600 MW scenario, no additional transmission system modifications were necessary to satisfy the contingency conditions studied
- Prior to including the second injection site at Morehead-Wildwood, all of the central zone generation was integrated at New Bern without any upgrades. This shows that the New Bern area can accommodate an injection of at least 880 MW. In the 5600 MW scenario, no additional upgrades are required in the Morehead-Wildwood area.

# COWICS

## Powerflow Results – Southern Zone

- No offshore generation was identified in the southern zone in the 1000 MW scenario

- In the 3000 MW and 5600 MW scenario, generation was assumed to connect onshore at SCPSA's Bucksville 230 kV station. Bucksville is a new station scheduled to be completed in 2014 in the Myrtle Beach area of South Carolina.

# COWICS


PERRY
ROAD
DUNES
MYRTLE BEACH
BUCKSVILLE
GARDEN CITY
230 kV
115 kV

# COWICS

## Powerflow Results – Southern Zone

- Transmission system upgrades in the area near Bucksville would be necessary to satisfy contingency conditions
  - Bucksville - Perry Road 230 kV Lines: increase capacity of existing lines by adding a second set of conductors per phase (bundling), $12 M
  - Perry Road 230/115 kV transformer bank #3: replace 150 MVA bank with 250 MVA bank, $4 M
  - Perry Road - Myrtle Beach 115 kV Lines: upgrade conductor from 556 ACSR to bundled 556 ACSR, $8 M (assuming $1.5 M / mile)

# COWICS

## Powerflow Results – Southern Zone

- These issues and potential solutions have appeared in previous transmission studies in the area. No additional transmission system modifications are necessary to integrate offshore wind generation in the southern zone under N-1 conditions studied.

# COWICS

## PHASE II under way

# SERC Long Term Study Group Update

# SERC Long Term Study Group

- Finishing report on 2017 Summer Study
  Report available with 2014 FERC 715 filings

- 2013 MMWG model building is in progress.
  Working with PJM & MISO to get a more representative dispatch of their markets

# Carolinas Transmission Collaborative Arrangement (CTCA)

# 2013 Joint Study - Reliability

- 2019 Summer peak conditions
- VCS 2 and 3 included
- Participants expansion plans included

# 2013 Joint Study

**DUKE ENERGY PROGRESS**
**SUMMARY OF POTENTIAL RELIABILITY ISSUES**
**2019 SUMMER PEAK**

| | Element | Contingency | Potential Issue | Potential Solution |
|---|---|---|---|---|
| P01 | West End-Central EMC Center Church 230 kV Line 1 (Cape Fear-West End) | Harris Gd (TRM) Cumberland-Richmond 500 kV Line 1 | Loading (92.5 %) | Existing Operating Procedure to Open West End Terminal [2025] |
| P02 | Chestnut Hills-Milburnie 115 kV Line 1 | Harris Gd (TRM) Falls-Honeycutt and Falls-Neuse 230 kV Lines | Loading (92.3 %) | Relocate Neuse 115 kV Substation to Falls-Method 115 kV Line [2025] |
| P03 | Raeford-Red Springs 115 kV Line 1 (Weatherspoon Plant-Raeford) | Brunswick 1 Gd (TRM) Fayetteville-Hamlet and Raeford-Rockfish 230 kV Lines | Loading (91.0 %) | Loop Richmond-Ft Bragg Woodruff St 230 kV Line Into Raeford 230 kV Sub [Revised Project - 2018] |

# 2013 Joint Study

**DUKE ENERGY CAROLINAS**
**SUMMARY OF POTENTIAL RELIABILITY ISSUES**
**2019 SUMMER PEAK**

| | Element | Contingency | Potential Issue | Potential Solution |
|---|---|---|---|---|
| D01 | Cane Creek-Pelham Retail B/W 100 kV Line 1 (Mauldin) | Cliffside 5 Gm<br>Cane Creek-Laurens EC 28 W/B 100 kV Line 1 (Mauldin) | Loading (128.6 %) | Block Swapovers [2019]<br>Accelerated 13 Years |
| D02 | Daniels Retail-Blue Ridge EC 25 Black 100 kV Line 1 (Davidson River) | Belews 1 Gm<br>Pisgah-Shiloh 230 kV Lines Commontower Loss (Caesar) | Loading (102.2 %) | 4.66 miles 250 Cu Reconductor [2019]<br>Accelerated 16 Years |
| D03 | Harrisburg-Oakboro B/W 230 kV Line 1/2 (Harrisburg) | Robinson 2 Gd (TRM)<br>Harrisburg-Oakboro W/B 230 kV Line 2/1 (Harrisburg) | Loading (92.8 %) | 21.63 miles 954 ACSR Reconductor [2024]<br>Accelerated 12 Years |
| D04 | Pisgah-Blantyre Retail B/W 100 kV Line 1 (Rugby) | Cliffside 5 Gm<br>Asheville-Mills River 115 kV Line 1 | Loading (91.5 %) | 4.63 miles 477 ACSR Reconductor [2025]<br>Accelerated 7 Years |

# 2013 Joint Study

**DUKE ENERGY CAROLINAS**
**SUMMARY OF POTENTIAL RELIABILITY ISSUES**
**2019 SUMMER PEAK**

| | Element | Contingency | Potential Issue | Potential Solution |
|---|---|---|---|---|
| D05 | Parkwood 500/230 kV Transformer 5 | Harris Gd (TRM) Parkwood 500/230 kV Transformer 6 | Loading (101.2 %) | New Operating Procedure [2019] Trips Parallel Bank Accelerated 6 Years |
| D06 | Ashe St-Durham 100 kV Line 1 (Ashe St White) | Harris Gd (TRM) Parkwood-Pleasant Garden 500 kV Line 1 (Parkwood) | Loading (94.3 %) | 3.26 miles 477 ACSR Reconductor [2023] Accelerated 5 Years |
| D07 | Morning Star-Newport 230 kV Line 1 (Sandy Ridge) | McGuire 1 Gm Richmond-Richmond Reactor 500 kV Line (Richmond) | Loading (98.7 %) | 33.59 miles 954 ACSR Add Second Circuit [2026] Accelerated 5 Years |
| D08 | Glen Raven-Burlington Tap B/W 100 kV Line 1 (Alamance) | Harris Gd (TRM) Glen Raven-Mebane W/B 100 kV Line 1 (Alamance) | Loading (100.9 %) | 3.15 miles 2-477 ACSR Reconductor [2022] Accelerated 3 Years |

# 2013 Joint Study

DUKE ENERGY CAROLINAS
SUMMARY OF POTENTIAL RELIABILITY ISSUES
2019 SUMMER PEAK

| | Element | Contingency | Potential Issue | Potential Solution |
|---|---|---|---|---|
| D09 | Horseshoe-Asheville Hwy White 100 kV Line 1 (Echo) | Cliffside 5 Gm Horseshoe-Hendersonville Black 100 kV Line 1 (Echo) | Loading (95.6 %) | 5.38 miles 477 ACSR Reconductor [2022] Accelerated 3 Years |
| D10 | Morning Star-Union EMC 9 B/W 100 kV Line 1 (Indian Trail) | Robinson 2 Gd (TRM) Monroe-Morning Star W/B 100 kV Line 1 (Indian Trail) | Loading (90.1 %) | 5.40 miles 2-366 ACSR Reconductor or New Switching Station [2026] Accelerated 2 Years |
| D11 | Harrisburg-McGuire White 230 kV Line 4 (Mecklenburg) | Robinson 2 Gd (TRM) Harrisburg-McGuire Black 230 kV Line 3 (Mecklenburg) | Loading (103.0 %) | 16.98 miles 1272 ACSR Reconductor or Line Reactors [2027] Accelerated 2 Years |
| D12 | Wylie Hydro-York EC 16 100 kV Line 1 (Weddington) | McGuire 1 Gm Morning Star 230/100 kV Transformer and Morning Star-Newport 230 kV Line 1 (Sandy Ridge) | Loading (90.1 %) | 1.47 miles 2-477 ACSR Reconductor or New Switching Station [2026] Accelerated 2 Years |

# 2013 Joint Study

**DUKE ENERGY CAROLINAS**
**SUMMARY OF POTENTIAL RELIABILITY ISSUES**
**2019 SUMMER PEAK**

| | Element | Contingency | Potential Issue | Potential Solution |
|---|---|---|---|---|
| D13 | North Greensboro-Kildare Tap Black 100 kV Line 1 (Graham) | Dan River CC Gm North Greensboro-Glen Raven White 100 kV Line 1 (Graham) | Loading (105.7 %) | 3.38 miles 954 ACSR Reconductor [2028] |

# 2013 Joint Study

SOUTH CAROLINA ELECTRIC AND GAS
SUMMARY OF POTENTIAL RELIABILITY ISSUES
2019 SUMMER PEAK

| Element | Contingency | Potential Issue | Potential Solution |
|---|---|---|---|
| No Issues Found | - | - | - |

# 2013 Joint Study

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
SUMMARY OF POTENTIAL RELIABILITY ISSUES
2019 SUMMER PEAK

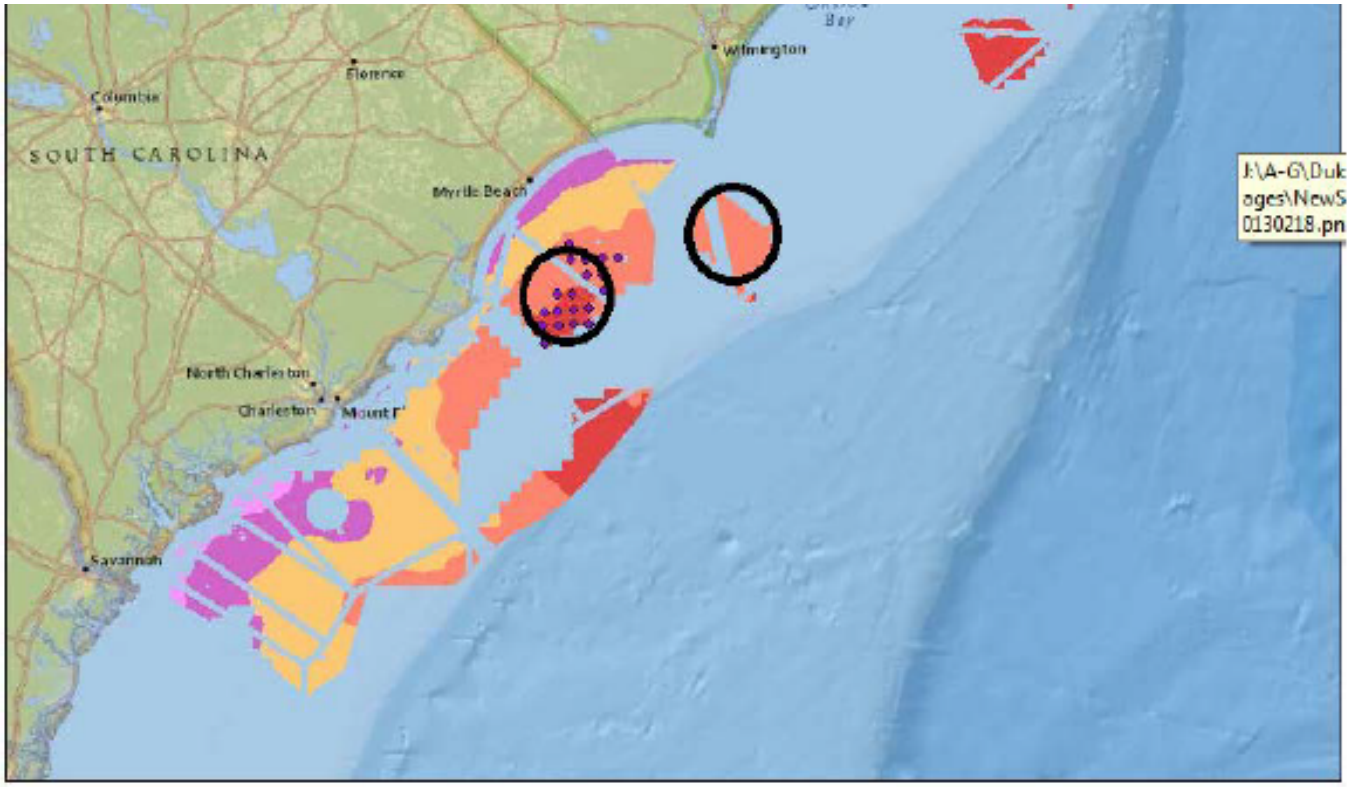
| | Element | Contingency | Potential Issue | Potential Solution |
|---|---|---|---|---|
| C01 | Perry Road-Myrtle Beach 115 kV Line 1 | Base Case<br>Perry Road-Myrtle Beach 115 kV Line 2 | Loading (92.5%) | 5.40 miles 556 ACSR Reconductor [2022] |

# Maps removed from Public Material

# 2013 Joint Study – Offshore Wind

- 2024 Summer peak, shoulder and winter conditions
- Offshore – Wilmington & Myrtle Beach areas
- Participants expansion plans included

# 2013 Joint Study – Offshore Wind



# 2013 Joint Study – Offshore Wind

| Scenario | Onshore Collection Site | Nameplate MW into Collection Site | Sink | Nameplate MW | Sink | Nameplate MW | Description |
|---|---|---|---|---|---|---|---|
| 1 | Wilmington | 1000 | DUKE | 600 | PROGRESS | 400 | All output sinks |
| | Myrtle Beach | 1000 | SCEG | 500 | SCPSA | 500 | in host state |
| 2 | Wilmington | 2000 | DUKE | 940 | PROGRESS | 620 | All wind connects |
| | Myrtle Beach | 0 | SCEG | 220 | SCPSA | 220 | in NC |
| 3 | Wilmington | 0 | DUKE | 940 | PROGRESS | 620 | All wind connects |
| | Myrtle Beach | 2000 | SCEG | 220 | SCPSA | 220 | in SC |

# 2013 Joint Study – Offshore Wind

| | Summer Peak | Winter Peak | Shoulder |
|---|---|---|---|
| Wilmington | 30% | 50% | 100% |
| Myrtle Beach | 33% | 56% | 100% |

- Wilmington area injection point - DEP's Sutton North 230 kV
- Myrtle Beach area injection point - SCPSA's Red Bluff 230 kV bus

# 2013 Joint Study – Offshore Wind

**1000 MW in NC and SC**

- Each state's injection of 1000 MW of nameplate wind capacity was split
- SC MW delivered 50% each to SCPSA and SCEG
- NC MW delivered 60% to Duke, and 40% to Progress
- Delivered via firm interchange between systems.

**2000 MW injection into NC and SC individually**

- Split among the four participants' systems according to load ratio share
- 47% to Duke, 31% to Progress, and 11% each to SCPSA and SCEG
- Delivered via firm interchange between systems.

# 2013 Joint Study – Offshore Wind

| Company | Wind Scenario Cost Comparison | | |
|---|---|---|---|
| | Wind Scenario 1 | Wind Scenario 2 | Wind Scenario 3 |
| Duke Energy Progress | $ 10,000,000 | $ 60,000,000 | $ 20,000,000 |
| Duke Energy Carolinas | $ 125,000 | $ 12,325,000 | $ 13,540,000 |
| SCEG | $ 0 | $ 0 | $ 0 |
| SCPSA | $ 0 | $ 33,000,000 | $ 15,200,000 |
| **Total Costs ($2013)** | **$ 10,125,000** | **$ 105,325,000** | **$ 48,740,000** |

# 2013 Joint Study – Offshore Wind

## Duke Energy Progress (DEP)

- Injection point for WS1 and 2 at Sutton North 230 kV Switching Station, loop in 3 existing 230 kV transmission lines - $10 M
- WS2 requires a new 50-mile 230 kV transmission line from the Sutton North 230 kV Switching Station to the Jacksonville 230 kV Substation - $50 M
- WS3 requires a new 30-mile 230 kV transmission line from the Florence 230 kV Substation to the Marion 230 kV Substation – $20 M

# 2013 Joint Study – Offshore Wind

## Duke Energy Carolinas (DEC)

- Fictitious 2x1, 776 MW CC plants at Lee and Buck were selected as the most likely sites for future generation
- Not fully dispatched except for generator maintenance cases
- Real CCs would be fully dispatched in the summer peak base case
- Creates of uncertainty in the study results for facilities in the local areas around DEC's Lee Steam station
  - Toxaway/Clinton/Fiber 100 kV lines
  - Shady Grove/Central 230/100 kV transformers

# 2013 Joint Study – Offshore Wind

## South Carolina Electric & Gas (SCE&G)

- No projects required

# 2013 Joint Study – Offshore Wind

## South Carolina Public Service Authority (SCPSA)

- Results indicate potential transformer loading issues in the vicinity of Red Bluff under certain 230 kV contingencies
- Potential loading issues between the Kingstree and Hemingway 230 kV substations under certain contingencies in WS2. Second 230 kV line needed between stations - not in SCPSA's current construction plan
- Additional 230 kV line between the Red Bluff and Carolina Forest substations needed to alleviate the transformer loading in WS1 & 3
- Base case included Red Bluff-Marion 230 kV line currently planned for completion in 2015

# Maps removed from Public Material

# Maps removed from Public Material

# Maps removed from Public Material

# Eastern Interconnection Planning Collaborative (EIPC)

# EIPC Work Plan 2013-2014

- Create/modify 2018 and 2023 steady-state load-flow models
  - Summer Peak (other seasons as needed)
- Perform AC analysis for model validation
- Working on potential scenario analysis of phase II
- Gas-Electric dependency
  - Comments received on scope of work
  - Gas consultant to be selected
  - SSC meeting in October

**http://www.eipconline.com/**

# SIRPP

# SIRPP ECONOMIC STUDIES

- **Shelby 500 kV Substation (HVDC) to TVA/Southern Company – 3,500 MW (2018, Step 1 Evaluation)**

- **Sullivan 765 kV Substation (HVDC) to PJM/VACAR – 3,500 MW (2018, Step 1 Evaluation)**

- **TVA to LG&E/KU – 500 MW (2015, Step 1 Evaluation)**

# Sullivan 765 kV Substation (HVDC) to PJM/VACAR

## 2018 – Summer Peak & Shoulder

## 3500 MW

- **Type of Transfer:** Generation to Load/Generation
- **Source:** A new generator interconnection to the existing Sullivan 765 kV Substation in AEP (Bus # 243210)
- **Sink:** Load within PJM & Generation within VACAR
  - 2,000 MW - PJM
  - 1,500 MW - VACAR
- **Cases:** Summer Peak & Summer Shoulder

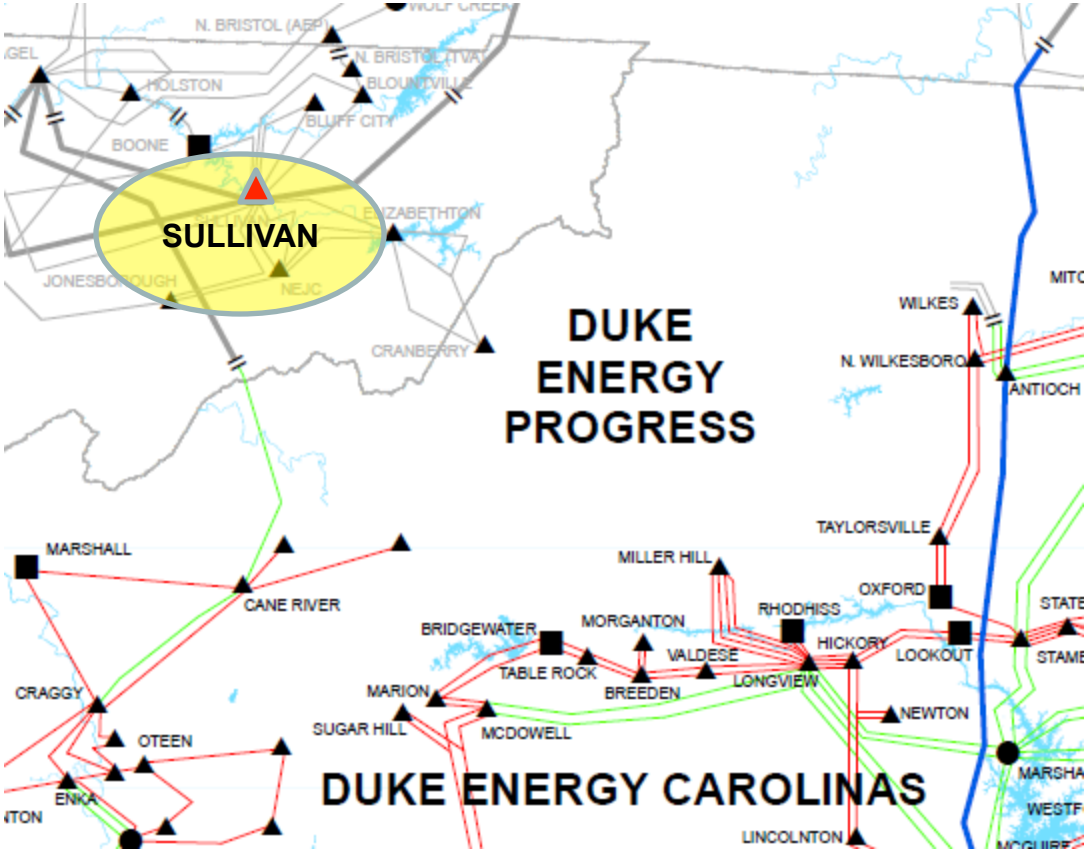

SULLIVAN
DUKE ENERGY PROGRESS
DUKE ENERGY CAROLINAS
N. BRISTOL (AEP)
HOLSTON
BLUFF CITY
BOONE
ELIZABETHTON
JONESBOROUGH
NEJC
CRANBERRY
WILKES
N. WILKESBORO
ANTIOCH
TAYLORSVILLE
MILLER HILL
OXFORD
RHODHISS
HICKORY
LOOKOUT
MARSHALL
CANE RIVER
BRIDGEWATER
MORGANTON
VALDESE
TABLE ROCK
BREEDEN
LONGVIEW
MARION
SUGAR HILL
MCDOWELL
NEWTON
CRAGGY
OTEEN
ENKA
LINCOLNTON

**Table 1: VACAR sink allocation**

| Participating Transmission Owners | Participation Factor (%) | MW Allocation |
|---|---|---|
| Progress Energy Carolinas | 31.0% | 465 |
| Duke Energy | 47.5% | 712.5 |
| South Carolina Electric & Gas | 10.8% | 162 |
| Santee Cooper | 10.7% | 160.5 |
| Total | 100.0% | 1500 |

**Table C.1. Transmission System Impacts - Duke Energy Carolinas**

| | | | Thermal Loadings % | | | | |
|---|---|---|---|---|---|---|---|
| AREA | Limiting Element | Rating (MVA) | Without Request | With Request | Contingency | Scenario | Project |
| Duke | Horseshoe 115/100 kV 1/2 | 108.3 | 94.9 | 109 | Horseshoe 115/100 kV 2/1 | Cli5Gm | P1 |
| Duke | Horseshoe-Asheville Highway 100 kV 1 | 129 | 91.9 | 102.9 | Horseshoe-Hendersonville 100 kV 1 | Base | P2 |
| Duke | Oneal Retail-Pebble Creek Retail 100 kV 1 | 58 | 90.7 | 95.7 | Tiger 230/100/44 kV 6 | Cli5Gm | P3 |

Scenario Explanations:
Cli5Gm - Cliffside 5 Generator Maintenance, Summer Peak
Base – Base, 2018 Summer Peak

| Item | Potential Solution | Estimated Need Date | Estimated Cost |
|---|---|---|---|
| P1 | Add 115/100 kV Transformer at Horseshoe | 2018 | $2,755,000 |
| P2 | Reconductor (Bundle) 5.38 miles, 477 ACSR Horseshoe-Asheville Highway 100 kV Lines | 2018 | $1,794,000 |
| P3 | Reconductor 3.03 miles, 2/0 Cu Oneal Retail-Pebble Creek Retail 100 kV Lines | 2021 | $461,000 |
| TOTAL ($2013) | | | $5,010,000 (1) |

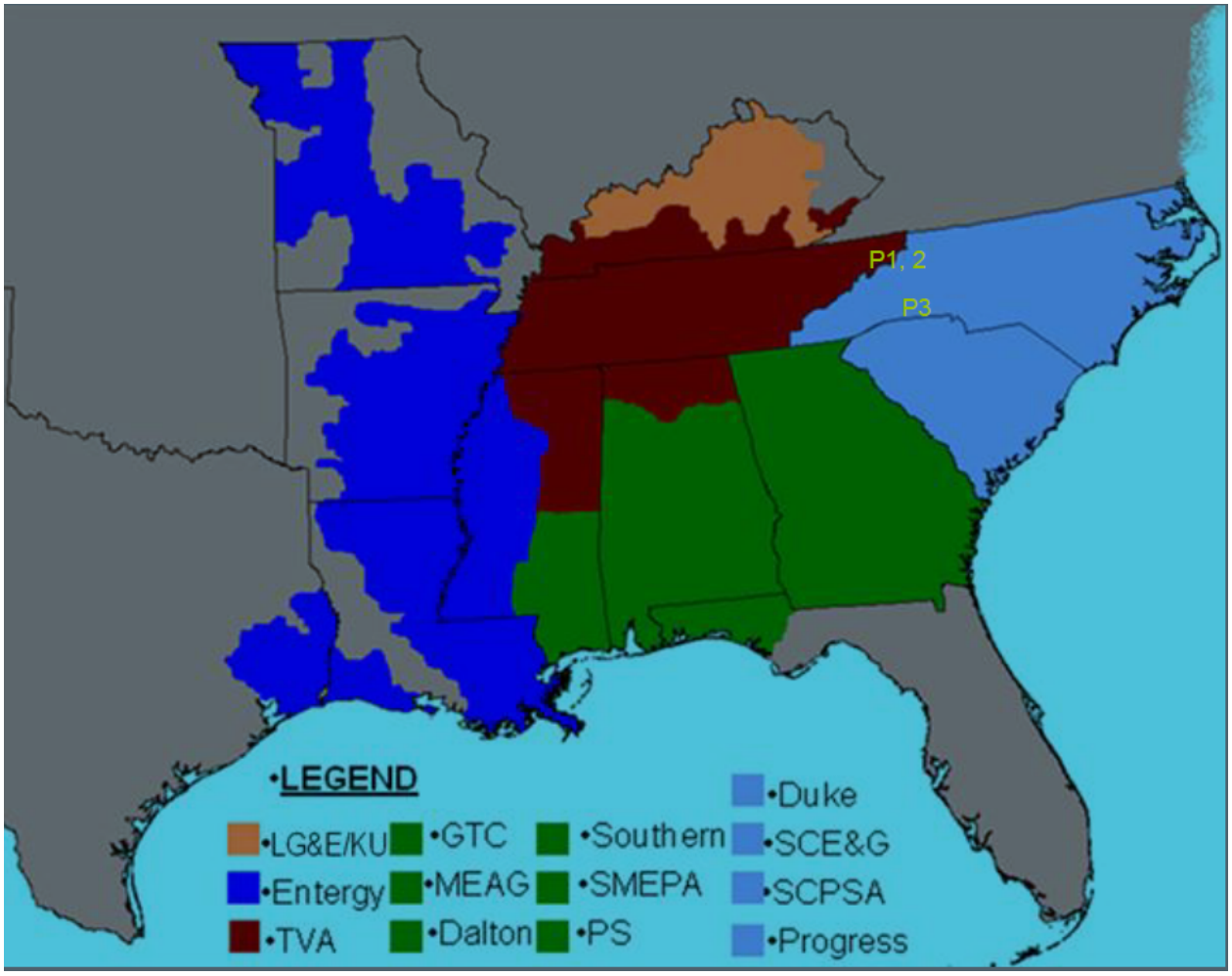

P1, 2
P3
•LEGEND
•LG&E/KU
•Entergy
•TVA
•GTC
•MEAG
•Dalton
•Southern
•SMEPA
•PS
•Duke
•SCE&G
•SCPSA
•Progress

**Table C.34. Total Cost of 18H and 18S Sullivan to PJM/VACAR 3500 MW Transfer**

| Area | Estimated Cost |
|---|---|
| Duke Subtotal | $5,010,000 |
| Entergy Subtotal | $0 |
| LG&E/KU Subtotal | $5,225,000 |
| Progress Subtotal | $0 |
| SCE&G Subtotal | $115,700,000 |
| SCPSA Subtotal | $30,000,000 |
| Southern Subtotal | $77,900,000 |
| TVA Subtotal | $13,775,000 |
| **TOTAL ($2012)** | **$247,610,000** |

$90 M due to issues near Vogtle

# SERTP

# Planning Activities

- Creating processes to facilitate future planning activities
- Building a library of cases for use by stakeholders – approximately 23 cases this year and 46 cases in the future

**http://www.southeasternrtp.com/**

# NERC Reliability Standards Update

- TPL-001-4 expect FERC decision soon
- BES definition – NERC comments/vote on 9/4
- 5 year review teams – NUC, MOD, VAR, FAC…

# Questions ?

# 2013 TAG Work Plan

Rich Wodyka
ITP

# 2013 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

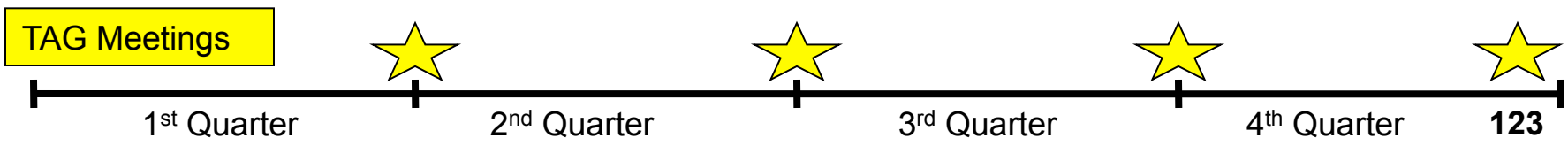
## Enhanced Access Planning Process

- Propose and select enhanced access scenarios and interface
- Perform analysis, identify problems, and develop solutions
- Review Enhanced Access Study Results

## Coordinated Plan Development

- Combine Reliability and Enhanced Results
- OSC publishes DRAFT Plan
- TAG review and comment

## FERC Order 1000 Updates



# *2013 TAG Work Plan*

## January – February

- **2013 Study – Finalize Study Scope of Work**
  - ✓ **Receive final 2013 Reliability Study Scope for comment**
  - ✓ **Review and provide comments to the OSC on the final 2013 Study Scope**
  - ✓ **Receive request from OSC to provide input on proposed Enhanced Transmission Access scenarios and interfaces for study**
  - ✓ **Provide input to the OSC on proposed Enhanced Transmission Access scenarios and interfaces for study**

# *March 14th changed to April 16th*

## *TAG Meeting*

- **2013 Study Update**
  - ✓ **Receive a progress report on the Reliability Planning study activities and preliminary results**
- **Order 1000 Update**
  - ✓ **Receive report on the direction that the NCTPC is heading on the Order 1000 regional compliance**
  - ✓ **Receive an update on the overall Compliance Timeline highlighting when continued stakeholder involvement in the process will occur**

# April - May - June

- **2013 Study - Technical Analysis, Problem Identification, and Solution Development**
  - **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**
  - **TAG will be requested to provide input to the OSC and PWG on any proposed alternative solutions to the problems identified through the technical analysis**

# April - May - June

## *TAG Meeting scheduled for June 10th - Teleconference*

- **2013 Study Update**
  - ✓ **Receive a progress report on the Reliability Planning study activities**
- **Order 1000 Update**
  - ✓ **Receive an update on the Order 1000 regional compliance work and the discuss changes that will be coming in the regional compliance documents**
  - ✓ **Receive an update on the overall Compliance Timeline highlighting when continued stakeholder involvement in the process will occur**

# July - August - September

- **2013 Study - Technical Analysis, Problem Identification, and Solution Development**
  - ✓ **Receive a progress report on the Reliability Planning study activities**
  - ✓ **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**

# July - August - September

## *TAG Meeting*

- **2013 Study Update**
  - ✓ **Receive a progress report on the Reliability Planning study activities and preliminary results**
  - ✓ **Receive update status of the upgrades in the 2012 Collaborative Plan**
- **Order 1000 Update**
  - ✓ **Receive an update on the Order 1000 regional compliance work and discuss the proposed changes that will be coming in the regional compliance documents**
  - ✓ **Receive an update on the overall Compliance Timeline highlighting when continued stakeholder involvement in the process will occur**

# October - November - December

- **2013 Selection of Solutions**
  - **TAG will receive feedback from the OSC on any alternative solutions that were proposed by TAG members**
- **2013 Study Update**
  - **Receive and comment on final draft of the 2013 Collaborative Transmission Plan report**
  - **Discuss potential study scope for 2014 studies**

# October - November - December

*TAG Meeting – December 12, 2013 - Tentative*

- **2013 Study Update**
  - **Receive presentation on the draft report of 2013 Collaborative Transmission Plan**
  - **Discuss potential study scope for 2014 studies**
- **Order 1000 Update**
  - **Receive an update on the Order 1000 regional compliance work**

# Questions ?

# TAG
# Open Forum Discussion

Comments or Questions ?