December 31, 2012

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: NERC Full Notice of Penalty regarding Duke Energy Carolinas, FERC Docket No. NP13-_-000

Dear Ms. Bose:

The North American Electric Reliability Corporation (NERC) hereby provides this Notice of Penalty[1] regarding Duke Energy Carolinas (Duke), NERC Registry ID# NCR01219,[2] in accordance with the Federal Energy Regulatory Commission's (Commission or FERC) rules, regulations and orders, as well as NERC's Rules of Procedure including Appendix 4C (NERC Compliance Monitoring and Enforcement Program (CMEP)).[3]

Duke is one of six franchised public utility subsidiaries of Duke Energy Corporation. Duke's service territory encompasses the central and western-most portion of North Carolina, and the northwestern portion of South Carolina. It supplies electric service to more than two million residential, commercial, and industrial customers.

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[1] *Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards* (Order No. 672), III FERC Stats. & Regs. ¶ 31,204 (2006); *Notice of New Docket Prefix "NP" for Notices of Penalty Filed by the North American Electric Reliability Corporation*, Docket No. RM05-30-000 (February 7, 2008). *See also* 18 C.F.R. Part 39 (2011). *Mandatory Reliability Standards for the Bulk-Power System*, FERC Stats. & Regs. ¶ 31,242 (2007) (Order No. 693), *reh'g denied*, 120 FERC ¶ 61,053 (2007) (Order No. 693-A). *See* 18 C.F.R § 39.7(c)(2).

[2] SERC Reliability Corporation (SERC) confirmed that Duke was included on the NERC Compliance Registry as a Balancing Authority (BA), Distribution Provider (DP), Generator Operator (GOP), Generator Owner (GO), Load Serving Entity (LSE), Planning Authority (PA), Purchasing-Selling Entity (PSE), Reserve Sharing Group (RSG), Resource Planner (RP), Transmission Operator (TOP), Transmission Owner (TO), Transmission Planner (TP) and Transmission Service Provider (TSP) on May 31, 2007 and as an Interchange Authority (IA) on March 20, 2008. As a TOP, Duke is subject to the requirements of NERC Reliability Standard PRC-001-1 R1 and R4. As a GO and TO, Duke is subject to the requirements of NERC Reliability Standard PRC-005-1 R1.

[3] *See* 18 C.F.R § 39.7(c)(2).

Duke's generation fleet is made up of seven nuclear units at three nuclear generating stations with a total capacity of 6,996 MW, 30 units at eight coal-fired stations with a combined capacity of 7,722 MW, 51 units at eight combustion turbine plants, and 95 hydro-electric units at 30 hydro-electric stations, including two pumped-storage facilities with a total capacity of 3,218 MW. Duke's electrical system consists of 13,066 miles of transmission line, broken down by the following voltage levels: 577 miles of 525 kV, 2,664 miles of 230 kV, 165 miles of 161 kV, 7 miles of 138 kV, 43 miles of 115 kV, 6,511 miles of 100 kV, 116 miles of 66 kV and 69 kV, 2,817 miles of 44 kV and 166 miles below 44 kV.

Duke has approximately 200 transmission stations with nearly 3,250 circuit breakers and over 800 transformers. Duke has 24 interconnections that tie its transmission system to eight other utilities.

Duke is a summer peaking entity. Duke's Balancing Authority (BA) system peak load was 20,628 MW on August 8, 2007. The all-time peak total net generation for Duke's BA was 20,846 MW.

This Notice of Penalty is being filed with the Commission because SERC Reliability Corporation (SERC) and Duke have entered into a Settlement Agreement to resolve all outstanding issues arising from SERC's determination and findings of the violations[4] of PRC-001-1 R1, PRC-001-1 R4 and PRC-005-1 R1. According to the Settlement Agreement, Duke neither admits nor denies the violations, but has agreed to the assessed penalty of seventeen thousand dollars ($17,000), in addition to other remedies and actions to mitigate the instant violations and to facilitate future compliance under the terms and conditions of the Settlement Agreement. Accordingly, the violations identified as NERC Violation Tracking Identification Numbers SERC2011008227, SERC2011008228 and SERC2011008229 are being filed in accordance with the NERC Rules of Procedure and the CMEP.

Statement of Findings Underlying the Violations

This Notice of Penalty incorporates the findings and justifications set forth in the Settlement Agreement executed on December 19, 2012, by and between SERC and Duke, which is included as Attachment a. The details of the findings and basis for the penalty are set forth in the Settlement Agreement and herein. This Notice of Penalty filing contains the basis for approval of the Settlement Agreement by the NERC Board of Trustees Compliance Committee (NERC

[4] For purposes of this document, each violation at issue is described as a "violation," regardless of its procedural posture and whether it was a possible, alleged or confirmed violation.

BOTCC). In accordance with Section 39.7 of the Commission's regulations, 18 C.F.R. § 39.7 (2012), NERC provides the following summary table identifying each violation of a Reliability Standard resolved by the Settlement Agreement, as discussed in greater detail below.

Region	Registered Entity	NOC ID	NERC Violation ID	Reliability Std.	Req. (R)	VRF	Total Penalty
SERC Reliability Corporation	Duke Energy Carolinas	NOC-1712	SERC2011008227	PRC-001-1	1	High[5]	$17,000
			SERC2011008228		4	High	
			SERC2011008229	PRC-005-1	1	High[6]	

PRC-001-1 R1 (SERC2011008227)

The purpose statement of Reliability Standard PRC-001-1 provides: "To ensure system protection is coordinated among operating entities."

PRC-001-1 R1 provides: "Each Transmission Operator, Balancing Authority, and Generator Operator shall be familiar with the purpose and limitations of protection system schemes applied in its area."

PRC-001-1 R1 has a "High" Violation Risk Factor (VRF) and a "High" Violation Severity Level (VSL). The subject violation applies to Duke's TOP function.

On August 25, 2007, Duke experienced a disturbance on its portion of the Bulk Power System (BPS). The disturbance initiated at the Broad River Energy Center (BREC), which is owned and operated by a subsidiary of Calpine Corporation and also interconnected to the Riverview

[5] When NERC filed Violation Risk Factors (VRFs) for PRC-001-1, NERC originally assigned a "Medium" VRF to PRC-001-1 R1. In the Commission's May 18, 2007 Order on Violation Risk Factors, the Commission approved the VRF as filed but directed modifications. On June 1, 2007, NERC filed a modified "High" VRF for PRC-001-1 R1 for approval. On August 9, 2007, the Commission issued an Order approving the modified VRF. Therefore, the "Medium" VRF was in effect from June 18, 2007 until August 9, 2007 and the "High" VRF has been in effect since August 9, 2007.

[6] When NERC filed VRFs for PRC-005-1, NERC originally assigned a "Medium" VRF to PRC-005-1 R1. In the Commission's May 18, 2007 Order on Violation Risk Factors, the Commission approved the VRF as filed but directed modifications. On June 1, 2007, NERC filed a modified "High" VRF for PRC-005 R1 for approval. On August 9, 2007, the Commission issued an Order approving the modified VRF. Therefore, the "Medium" VRF was in effect from June 18, 2007 until August 9, 2007 and the "High" VRF has been in effect since August 9, 2007.

Substation (Riverview) owned and operated by Duke. The disturbance did not involve a loss of load, but did involve the tripping offline of eight generation units (a loss of approximately 900 MW of generation) and the temporary outages of five 230 kV transmission lines (collectively, the Event), as described below.

The Event began just before 1100 hours Eastern Prevailing Time (EPT) on a Saturday. A transformer bushing, an insulation device on the "high side" of an 18 kV-to-230 kV step-up transformer at a generation unit inside BREC, cracked and caused a single-line-to-ground fault. BREC's Protection System[7] response for the transformer relies on a single lockout relay. The relay signals the breaker nearest the transformer, which is the primary or first layer of Protection System response. The same relay also, through the breaker failure scheme, signals the next-nearest breakers at Riverview that operate as the secondary layer of Protection System response. When breakers receive a signal, they open after a preset time period to isolate the area affected by the fault from the rest of the transmission system.

During the Event, the lockout relay failed to send the signals to the primary breaker and the breaker failure scheme; thus, the Protection System designed to contain a fault at the transformer and protect the interconnected transmission was unable to do so. This Protection System design failed because the lockout relay became a "single point of Protection System failure." As a result of the relay's failure to signal the first and second layers of protection, the fault endured, graduating to a three-phase fault, until a remote Protection System device opened breakers and thereby de-energized four 230 kV transmission lines to isolate the fault. Remote clearing resulted in a sustained low voltage condition throughout the Event that endured long enough to initiate other responses on the system: two generation units at a nearby coal-fired generation station powered down, and relays at an interconnected nuclear power plant activated and initiated the process of isolating the plant. The fault also triggered the misoperation of nearby relays on Duke's system because Duke had improperly maintained one relay and failed to coordinate the other two relays with transmission Protection Systems, as described in greater detail below. The misoperations resulted in the loss of two additional generation units at a nearby combustion turbine generation station and the temporary de-energizing of a transmission line – outages that did not contribute to the fault's isolation and should not have occurred.

[7] The *NERC Glossary of Terms Used in Reliability Standards* defines Protection System as "Protective relays, associated communication systems, voltage and current sensing devices, station batteries and DC control circuitry."

In summary, the system should have isolated the fault using the primary and secondary levels of system protection. This scheme would have first opened the breaker nearest to the transformer followed by the next-nearest breakers at Riverview. Either scheme would have isolated the fault quickly after its initiation by tripping off a minimal number of BPS elements. Because both of these layers of protection relied upon the same lockout relay, the relay's failure necessitated that the system isolate the fault through remote breakers operating after a time delay. The system, therefore, isolated the fault by tripping off four transmission lines, all four units in operation at BREC where the fault initiated, and a substation. Relays at another generation station responded to the fault and tripped off an additional two generating units. A nearby coal-fired generation station responded to the low voltage condition and began to power down. The loss of all of these BPS elements should have been unnecessary to contain the fault.

The system's remote Protection System responses to the Event, described above, isolated the fault and concluded the Event in less than five seconds – by which time all transmission lines and the Riverview substation that tripped off had returned to service. Yet, six generation units at two generation stations remained offline, and two more generation units at a third generation station were powering down – a total generation loss of nearly 900 MW. Duke restored its portion of the lost generation to balance generation with scheduled demand levels within two minutes, using spinning reserves. Later that day, the system operators were able to return to service three of the generation units that tripped during the Event. Although the Event endured only a few seconds and did not involve the dropping of load or injury to persons or property, it revealed conditions on Duke's system that could have led to more serious consequences, if generation and load were higher at that time or the system was stressed in other ways.

FERC staff opened an investigation to determine whether Duke or others committed violations of Reliability Standards in connection with the Event. Through agreement between FERC staff and SERC staff, the violations are being adjudicated through existing NERC and Regional processes. On February 22, 2008, SERC initiated a Compliance Investigation of Duke to address reliability concerns surrounding the Event.

Duke was not familiar with the limitations of the generation station Protection Systems connected to Duke's system, as required by PRC-001-1 R1. The Protection System inside BREC relied exclusively on the non-redundant 86T lockout relay to isolate a fault at the transformer. Duke was also not aware of the limitation of the generation-side Protection System at BREC – specifically, that it included a single point of failure that disabled both the primary and

secondary layers of protection. Consequently, Duke did not design the relevant transmission-side Protection System to provide timely Protection System response in the event of the lockout relay's failure inside BREC. Rather, Duke's Protection System design relied upon the breakers at the remote ends of the transmission lines extending from Riverview. This design cleared the fault by isolating the four transmission lines extending from Riverview, all of Riverview, and all of BREC, requiring a prolonged time to do so.

Because Duke was not familiar with the limitation of the BREC Protection System design, it did not anticipate the delayed clearing of the fault and the resultant effect of a prolonged low voltage condition on Duke's system, which resulted in additional and unnecessary Protection System responses.

Duke's Protection System response to the fault at BREC was contrary to Duke's stated coordination philosophy, which states, "Relays closest to the fault are expected to operate first and then upstream or remote relays are set to operate after an appropriate coordinating time margin." This philosophy reflects best practices for Protection System design and coordination, in that the nearest backup protection works in few enough cycles to clear the fault before the fault creates system instability or a prolonged period of low voltage. Duke's stability studies identified that faults at BREC should be isolated in no more than 17.5 cycles in order to keep the BREC units from separating from the system. However, Duke's Protection System design and coordination failed to do so, instead clearing the fault in 0.490 seconds from fault inception, or 29.4 cycles, and creating a circumstance of low voltage. This fact shows that Duke was not familiar with the purpose and limitations of the BREC Protection System interconnected to its transmission system. Had Duke known of the limitations of the BREC Protection System, it should have designed its transmission Protection System to account for the single point of failure at BREC.

Furthermore, Duke discovered after the Event that six other generation stations within its Balancing Authority Area and connected to its transmission system also had Protection Systems limited by a single point of failure. Duke failed to account for these limitations in its transmission-side Protection System design as well.

SERC determined that Duke had a violation of PRC-001-1 R1 because it failed to be familiar with the limitations of Protection System schemes applied in its area.

SERC determined the duration of the violation to be from June 18, 2007, the date the Standard became mandatory and enforceable, through June 1, 2014, when Duke expects to complete its Mitigation Plan.

SERC determined that this violation posed a moderate risk to the reliability of the BPS, but did not pose a serious or substantial risk. Specifically, Duke's lack of familiarity with Protection Systems in its area could lead to design or operational mistakes that have the potential for substantial impact on the bulk power system under certain circumstances. For example, if a design was not coordinated with existing Protection Systems, then tripping may not occur as expected. Operationally, system operators could have made switching decisions based on incomplete or incorrect information, resulting in unanticipated results. However, the risk was mitigated by the fact that Duke provides its Real-Time System Operators with training to be familiar with the Protection System schemes, *i.e.* relay elements and associated zones of protection, applied in the Duke TOP area. The training is completed upon hiring, and there are often annual refresher classes. Additionally, there was no permanent damage to any equipment and Interconnection Reliability Operating Limits (IROLs) were not exceeded. There was also no loss of load and this Event was not a Disturbance Control Standard (DCS) event. Lastly, Duke restored its portion of the lost generation within two minutes using spinning reserves.

<u>PRC-001-1 R4 (SERC2011008228)</u>
PRC-001-1 R4 provides: "Each Transmission Operator shall coordinate protection systems on major transmission lines and interconnections with neighboring Generator Operators, Transmission Operators, and Balancing Authorities."

PRC-001-1 R4 has a "High" VRF and a "Lower" VSL. The subject violation applies to Duke's TOP function.

As shown during the Event described above, Duke failed to coordinate specific relay functions when it installed its Protection Systems at the Mill Creek Generation Station (Mill Creek), as required by PRC-001-1 R4. The Protection System at Mill Creek includes a phase distance relay function to protect each of the generation units there. This relay function misoperated in response to the Event because Duke never fully assessed the Protection System design at this generation station to ensure proper calculation and setting of that function in coordination with the transmission system.

At the time of the Mill Creek construction, a contract engineering firm and a Duke engineer worked together to coordinate design and relay settings for the Protection Systems at the station and at the point of interconnection. Neither engineer involved in that process familiarized himself fully with the Protection System on the other side of the interconnection, with the result that the two individuals did not have a common understanding and thereby failed to apply a time setting to certain relay functions for the relays protecting the generating units. Duke did not have a routine process for exchanging information necessary to coordinate interconnecting generation stations with the transmission system.

A review of the Duke Protection System design contractor calculation for Mill Creek indicated that there was intent to provide enough time delay to ride through zone 2 line operations; however, only relay operating, breaker clearing, and breaker failure relay operating times were included in the calculation that developed the 0.3 second delay. There was no statement included in the calculation regarding the possible intention to rely on the pilot protection for clearing zone 2 faults. In other words, the engineers considered the local timing, but did not consider the whole system and surrounding facilities. The engineers did not consider the time delay to allow sufficient time for other zones to operate.

Duke was not aware that the particular relay function triggered by the Event existed, and had not familiarized itself with the proposed generation Protection System design during the interconnection process in a manner that ensured the complete coordination of all interconnected Protection Systems. Duke had uncoordinated Protection System functions on its system as of June 18, 2007, and as of the day of the Event. Until 2008, Duke's coordination process for generation Protection Systems was a one-time exercise completed at the time of the generation station's installation and interconnection. This exercise was conducted without the safeguard of a methodology to ensure complete and comprehensive review by the transmission protection engineers of the proposed interconnecting Protection System.

SERC determined that Duke had a violation of PRC-001-1 R4 because it failed to coordinate Protection Systems on major transmission lines and interconnections with neighboring Generator Operators and Transmission Operators.

SERC determined the duration of the violation to be from June 18, 2007, the date the Standard became mandatory and enforceable, through June 1, 2014, when Duke expects to complete its Mitigation Plan.

SERC determined that this violation posed a moderate risk to the reliability of the BPS, but did not pose a serious or substantial risk. Failure to coordinate Protection Systems on major transmission lines and interconnections with neighboring GOPs and TOPs can cause units to prematurely trip offline, not to trip when they should, or the transmission system to operate unexpectedly. However, the risk was mitigated by the fact that Mill Creek's generation capacity of 640 MW accounts for 3.5% of Duke's total generation capacity of 17,938 MW. Additionally, there was no permanent damage to any equipment and IROLs were not exceeded. There was no loss of load and this Event was not a DCS event. Lastly, Duke restored its portion of the lost generation within two minutes using spinning reserves.

PRC-005-1 R1 (SERC2011008229)

The purpose statement of Reliability Standard PRC-005-1 provides: "To ensure all transmission and generation Protection Systems affecting the reliability of the Bulk Electric System (BES) are maintained and tested."

PRC-005-1 R1 provides:

> Each Transmission Owner and any Distribution Provider that owns a transmission Protection System and each Generator Owner that owns a generation Protection System shall have a Protection System maintenance and testing program for Protection Systems that affect the reliability of the BES. The program shall include:
>
> R1.1. Maintenance and testing intervals and their basis.
>
> R1.2. Summary of maintenance and testing procedures.

PRC-005-1 R1 has a "High" VRF and a "Severe" VSL. The subject violation applies to Duke's GO and TO functions.

As shown during the Event described above, Duke's transmission and generation Protection System maintenance and testing program documents did not contain a satisfactory summary of maintenance and testing procedures, in violation of PRC-005-1 R1.2. Specifically, the documents provided no effective dates, revision number, revision history tables, signatures, Duke logos, nor any other indicia that they reflected corporate policy or were disseminated as corporate documents. The documents provided little information as to testing procedures, and did not reflect program controls that Duke applied to maintenance and testing generally to ensure that relay testing is regular, methodical, and completed successfully. In addition, Duke

informed SERC that each supporting document existed prior to June 18, 2007, but a single document did not exist until "sometime in April 2008" before the SERC audit of Duke that commenced in May 2008.

SERC determined that Duke had a violation of PRC-005-1 R1 because it failed to have a maintenance and testing procedure for Protection System devices in place on June 18, 2007.

SERC determined the duration of the violation to be from June 18, 2007, the date the Standard became mandatory and enforceable, through February 19, 2011, when Duke completed its Mitigation Plan.

SERC determined that this violation posed a minimal and not a serious or substantial risk to the reliability of the BPS. First, Duke properly maintained and tested 98.1% of its Protection System devices despite the lack of a formal documented procedure. Additionally, Duke did have maintenance and testing intervals, their basis, and tested the devices regularly. Third, since the mandatory enforceable date for PRC-005-1, Duke technicians have used a software program with automated testing for relays. The test results are captured and tracked in a database, and any anomalies are noted and addressed. Lastly, Duke, as a TO, has low voltage alarms on all batteries.

Regional Entity's Basis for Penalty

According to the Settlement Agreement, SERC has assessed a penalty of seventeen thousand dollars ($17,000) for the referenced violations. In reaching this determination, SERC considered the following factors:

(1) Duke's previous violations of the same or similar NERC Reliability Standards were not considered to be aggravating factors in the penalty determination.[8] Similarly, SERC did not consider Duke's previous violations of other NERC Reliability Standards to be an aggravating factor in the penalty determination;[9]

[8] SERC determined that the facts and circumstances of Duke's two prior PRC-005-1 R2 violations, which involved missing maintenance and/or testing records, are not related to the instant violation of PRC-005-1 R1, which involves an incomplete maintenance and testing program. A Settlement Agreement covering a violation of PRC-005-1 R2 for Duke (NOC-0378) was filed with FERC under NP10-51-000 on February 12, 2010. On March 12, 2010, FERC issued an order stating it would not engage in further review of the Notice of Penalty. A Settlement Agreement covering a violation of PRC-005-1 R2 for Duke (NOC-1655) was filed with FERC under NP13-8-000 on November 30, 2012.

[9] SERC determined that Duke's other prior violations and its prior issue should not serve as a basis for aggravating the penalty because they involved standards that are not the same or similar to the instant standards. Moreover,

(2) SERC reported that Duke was cooperative throughout the compliance enforcement process;

(3) Duke has had a documented internal compliance program (ICP) since 2008 which SERC considered a mitigating factor in the penalty determination. The ICP has the following characteristics:

a. The ICP consists of multiple processes and procedures for compliance with the NERC Reliability Standards;

b. The ICP is reviewed and updated as needed and is subject to internal audit;

c. Details of Duke's ICP are widely disseminated across the organization and to Duke affiliates via a quarterly newsletter addressing internal and external Reliability Standards information and frequent training and information sessions;

d. Duke's Vice President of Compliance and Service Delivery provides program guidance to Duke compliance personnel, while the Compliance Program Manager supports and coordinates compliance program administration;

e. The Reliability Standards Executive Sponsor Committee, a senior management team made up of senior officers, provides oversight for Duke's ICP;

f. The Vice President of Compliance and Service Delivery and the Compliance Program Manager have independent access to the CEO and the Reliability Standards Executive Sponsor Committee; and

g. Disciplinary action for Reliability Standards issues is consistent with Duke's corporate practice and protocol for any issue requiring discipline of an employee, and extends up to and including termination.

(4) There was no evidence of any attempt to conceal a violation nor evidence of intent to do so;

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there was nothing in the record to suggest that broader corporate issues were implicated. A Settlement Agreement covering violations of FAC-003-1 R2 for Duke (NOC-0095) was filed with FERC under NP09-3-000 on December 19, 2008. On January 16, 2009, FERC issued an order stating it would not engage in further review of the Notice of Penalty. On October 14, 2009, NERC submitted an Omnibus filing under NP10-2-000 which addressed violations for certain registered entities including violations of FAC-008-1 R1 and FAC-009-1 F1 for Duke. On November 13, 2009, FERC issued an order stating it would not engage in further review of the violations addressed in the Omnibus Notice of Penalty. A Find, Fix, Track and Report (FFT) addressing remediated issues for certain registered entities including a violation of VAR-001-1 R6 for Duke (NOC-1427) was filed with FERC under RC12-13-000 on June 29, 2012. On March 15, 2012, FERC issued an order stating it will consider an FFT matter closed sixty days after the FFT informational filing is submitted to the Commission.

(5) There was no evidence that the violations were intentional;

(6) SERC determined that the violation of PRC-005-1 R1 posed a minimal risk and did not pose a serious or substantial risk to the reliability of the BPS, and that the violations of PRC-001-1 R1 and R4 posed a moderate risk and did not pose a serious or substantial risk to the reliability of the BPS, as discussed above;

(7) Duke has made organizational changes and expended corporate funds to increase NERC compliance staffing at the company. Specifically, Duke has added NERC compliance support and oversight groups within both the generation and transmission organizations; and

(8) SERC reported that there were no other mitigating or aggravating factors or extenuating circumstances that would affect the assessed penalty.

After consideration of the above factors, SERC determined that, in this instance, the penalty amount of seventeen thousand dollars ($17,000) is appropriate and bears a reasonable relation to the seriousness and duration of the violations.

Status of Mitigation Plan[10]

PRC-001-1 R1 and R4 (SERC2011008227 and SERC2011008228)
Duke's Mitigation Plan to address its violations of PRC-001-1 R1 and R4 was submitted to SERC on September 7, 2012 with a proposed completion date of June 1, 2014. The Mitigation Plan was accepted by SERC on September 19, 2012 and approved by NERC on October 4, 2012. The Mitigation Plan for this violation is designated as SERCMIT008038 and was submitted as non-public information to FERC on October 5, 2012 in accordance with FERC orders.

Duke's Mitigation Plan required Duke to:

1. Provide training to System Operators to gain familiarity of the purpose and limitations of Protection System schemes;
2. Coordinate generation and transmission Protection Systems using the NERC Technical Reference Document "Power Plant and Transmission System Protection Coordination;"
3. Evaluate other generation stations for potential single points of failure and remedied the ones identified; and

[10] *See* 18 C.F.R § 39.7(d)(7).

4. Correct the time delay settings for distance relays at Mill Creek.

PRC-005-1 R1 (SERC2011008229)

Duke's Mitigation Plan to address its violation of PRC-005-1 R1 was submitted to SERC on August 7, 2012 with a proposed completion date of February 19, 2011. The Mitigation Plan was accepted by SERC on September 7, 2012 and approved by NERC on October 4, 2012. The Mitigation Plan for this violation is designated as SERCMIT007845 and was submitted as non-public information to FERC on October 5, 2012 in accordance with FERC orders.

Duke's Mitigation Plan required Duke to:

1. Revise its maintenance and testing procedures to include the maintenance and testing interval, interval basis and summary of maintenance and testing procedures for all Protection System devices; and,
2. Include dates, approval signatures or names and revision logs in the maintenance and testing procedures.

Duke certified on September 17, 2012 that the above Mitigation Plan requirements were completed on February 19, 2011. As evidence of completion of its Mitigation Plan, Duke submitted the following:

1. *Duke Energy Field Operations Carolinas Power Deliver Summary of Maintenance and Testing Procedures for Protection System Equipment in Substations, revision 0*, dated June 1, 2010;
2. *Duke Energy Fossil/Hydro Generation Protective Systems Work Practices, version 0*, dated February 17, 2011;
3. *Fossil/Hydro Generation Summary of Battery Maintenance Procedures, revision 1*, dated November 23, 2010;
4. Excerpts from *Power Delivery Preventative Maintenance Intervals (North Carolina), revision 6*, dated February 10, 2011;
5. Excerpts from *Power Delivery Preventative Maintenance Intervals (South Carolina), revision 6*, dated February 10, 2011;
6. *Power Delivery Preventative Maintenance Program Summary, revision 0*, dated May 3, 2010;

7. *NERC PRC-005-1 Duke Energy Fossil/Hydro Generation Protection System Maintenance and Testing, revision 2*, dated February 19, 2011.

On October 3, 2012, after reviewing Duke's submitted evidence, SERC verified that Duke's Mitigation Plan was completed on February 19, 2011.

Statement Describing the Assessed Penalty, Sanction or Enforcement Action Imposed[11]

Basis for Determination

Taking into consideration the Commission's direction in Order No. 693, the NERC Sanction Guidelines and the Commission's July 3, 2008, October 26, 2009 and August 27, 2010 Guidance Orders,[12] the NERC BOTCC reviewed the Settlement Agreement and supporting documentation on December 10, 2012. The NERC BOTCC approved the Settlement Agreement, including SERC's assessment of a seventeen thousand dollar ($17,000) financial penalty against Duke and other actions to facilitate future compliance required under the terms and conditions of the Settlement Agreement. In approving the Settlement Agreement, the NERC BOTCC reviewed the applicable requirements of the Commission-approved Reliability Standards and the underlying facts and circumstances of the violations at issue.

In reaching this determination, the NERC BOTCC considered the following factors:

(1) SERC considered Duke's prior violations of the NERC Reliability Standards to be a neutral factor in the penalty determination, as discussed above;[13]

(2) SERC reported that Duke was cooperative throughout the compliance enforcement process;

(3) Duke had a compliance program at the time of the violation which SERC considered a mitigating factor, as discussed above;

(4) there was no evidence of any attempt to conceal a violation nor evidence of intent to do so;

[11] *See* 18 C.F.R. § 39.7(d)(4).
[12] *North American Electric Reliability Corporation*, "Guidance Order on Reliability Notices of Penalty," 124 FERC ¶ 61,015 (2008); *North American Electric Reliability Corporation*, "Further Guidance Order on Reliability Notices of Penalty," 129 FERC ¶ 61,069 (2009); *North American Electric Reliability Corporation*, "Notice of No Further Review and Guidance Order," 132 FERC ¶ 61,182 (2010).
[13] Duke's prior violations are discussed in footnotes 8 and 9, above.

(5) SERC determined that the violation of PRC-005-1 R1 posed a minimal risk and did not pose a serious or substantial risk to the reliability of the BPS, and that the violations of PRC-001-1 R1 and R4 posed a moderate risk and did not pose a serious or substantial risk to the reliability of the BPS, as discussed above;

(6) Duke has made organizational changes and expended corporate funds to increase NERC compliance staffing at the company. Specifically, Duke has added NERC compliance support and oversight groups within both the generation and transmission organizations; and

(7) SERC reported that there were no other mitigating or aggravating factors or extenuating circumstances that would affect the assessed penalty.

For the foregoing reasons, the NERC BOTCC approved the Settlement Agreement and believes that the assessed penalty of seventeen thousand dollars ($17,000) is appropriate for the violations and circumstances at issue, and is consistent with NERC's goal to promote and ensure reliability of the BPS.

Pursuant to 18 C.F.R. § 39.7(e), the penalty will be effective upon expiration of the 30 day period following the filing of this Notice of Penalty with FERC, or, if FERC decides to review the penalty, upon final determination by FERC.

Attachments to be Included as Part of this Notice of Penalty

The attachments to be included as part of this Notice of Penalty are the following documents:

a) Settlement Agreement by and between SERC and Duke executed December 19, 2012, included as Attachment a;

    a. Disposition Document common to all of the instant violations, included as Attachment A to the Settlement Agreement;

    b. Disposition Document regarding the PRC-005-1 R1 violation, which also serves as the Verification of Mitigation Plan completion, included as Attachment B to the Settlement Agreement;

    c. Disposition Document regarding the PRC-001-1 R1 and R4 violations, included as Attachment C to the Settlement Agreement;

b) SERC's Source Documents for PRC-001-1 R1 and R4 and PRC-005-1 R1, included as Attachment b;

c) Duke's Mitigation Plan designated as SERCMIT008308 for PRC-001-1 R1 and R4 submitted September 7, 2012, included as Attachment c;

d) Duke's Mitigation Plan designated as SERCMIT007845 for PRC-005-1 R1 submitted August 7, 2012, included as Attachment d; and

e) Duke's Certification of Mitigation Plan Completion for PRC-005-1 R1 submitted September 17, 2012, included as attachment e.

A Form of Notice Suitable for Publication[14]

A copy of a notice suitable for publication is included in Attachment f.

[14] *See* 18 C.F.R § 39.7(d)(6).

Notices and Communications: Notices and communications with respect to this filing may be addressed to the following:

Gerald W. Cauley President and Chief Executive Officer North American Electric Reliability Corporation 3353 Peachtree Road NE Suite 600, North Tower Atlanta, GA 30326 (404) 446-2560 Charles A. Berardesco* Senior Vice President and General Counsel North American Electric Reliability Corporation 1325 G Street N.W., Suite 600 Washington, DC 20005 (202) 400-3000 (202) 644-8099 – facsimile charles.berardesco@nerc.net Holly Wenger* Director of Ethics and Compliance Duke Energy Corporation 410 S Wilmington St. Raleigh, North Carolina (704) 382-4734 Holly.Wenger@pgnmail.com Ann Warren* Senior Counsel Duke Energy Corporation 550 S. Tryon St., DEC 45A Charlotte, NC 28202 (704) 382-2108 ann.warren@duke-energy.com	Rebecca J. Michael* Associate General Counsel for Corporate and Regulatory Matters Nina H. Jenkins-Johnston* Attorney North American Electric Reliability Corporation 1325 G Street N.W. Suite 600 Washington, DC 20005 (202) 400-3000 (202) 644-8099 – facsimile rebecca.michael@nerc.net nina.johnston@nerc.net John R. Twitchell* VP and Chief Program Officer SERC Reliability Corporation 2815 Coliseum Centre Drive, Suite 500 Charlotte, NC 28217 (704) 940-8205 (704) 357-7914 – facsimile jtwitchell@serc1.org Marisa A. Sifontes* General Counsel James M. McGrane* Legal Counsel SERC Reliability Corporation 2815 Coliseum Centre Drive, Suite 500 Charlotte, NC 28217 (704) 494-7775 (704) 494-7787 (704) 357-7914 – facsimile msifontes@serc1.org jmcgrane@serc1.org

*Persons to be included on the Commission's service list are indicated with an asterisk. NERC requests waiver of the Commission's rules and regulations to permit the inclusion of more than two people on the service list.	Andrea B. Koch* Director of Enforcement SERC Reliability Corporation 2815 Coliseum Centre Drive, Suite 500 Charlotte, NC 28217 (704)940-8219 (704) 357-7914 – facsimile akoch@serc1.org

Conclusion

NERC respectfully requests that the Commission accept this Notice of Penalty as compliant with its rules, regulations and orders.

Respectfully submitted,

/s/ Rebecca J. Michael

Rebecca J. Michael
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cc: Duke Energy Carolinas
SERC Reliability Corporation

Attachments

Attachment a

Settlement Agreement SERC and Duke executed December 19, 2012

SETTLEMENT AGREEMENT

OF

SERC RELIABILITY CORPORATION

AND

DUKE ENERGY CAROLINAS

I. INTRODUCTION

1. SERC Reliability Corporation (SERC) and Duke Energy Carolinas, LLC (Duke) enter into this Settlement Agreement (Settlement Agreement) to resolve all outstanding issues arising from a preliminary and non-public assessment resulting in SERC's determination and findings, pursuant to the North American Electric Reliability Corporation (NERC) Rules of Procedure, of three confirmed violations.

Reliability Standard	Requirement	SERC Tracking No.	NERC Violation ID
PRC-001-1	R1	SERC2011-401151	SERC2011008227
PRC-001-1	R4	SERC2011-401152	SERC2011008228
PRC-005-1	R1	SERC2011-401153	SERC2011008229

2. Duke neither admits nor denies the three violations and has agreed to the proposed penalty of seventeen thousand dollars ($17,000) in addition to other remedies and actions to mitigate the instant violations and to ensure future compliance under the terms and conditions of the Settlement Agreement.

II. STIPULATION

3. The facts stipulated herein are stipulated solely for the purpose of resolving between Duke and SERC the matters discussed herein and do not constitute stipulations or admissions for any other purpose. Duke and SERC hereby stipulate and agree to the following:

Background

4. See Section I of the Common Disposition document (Attachment A) for a description of Duke.

Violations of NERC Reliability Standards

5.See Section I of the relative Disposition documents (Attachments B and C) for the description of the violations.

III. PARTIES' SEPARATE REPRESENTATIONS

Statement of SERC and Summary of Findings

6.SERC determined that Duke, as a Transmission Operator, was in violation of PRC-001-1 R1 because it failed to be familiar with the limitations of protection system schemes applied in its area.

7. SERC determined that Duke, as Transmission Operator, was in violation of PRC-001-1 R4 because it failed to coordinate protection systems on major transmission lines and interconnections with neighboring Generator Operators and Transmission Operators.

8.SERC determined that Duke, as a Transmission Owner and Generator Owner, was in violation of PRC-005-1 R1 because it failed to have a maintenance and testing procedure for Protection System devices in place on June 18, 2007.

9.SERC addresses the risk of each violation to the bulk power system (BPS) in the Disposition documents.

10. SERC agrees that this Settlement Agreement is in the best interest of the parties and in the best interest of BPS reliability.

Statement of Duke

11. Duke neither admits nor denies that the facts set forth and agreed to by the parties for purposes of this Settlement Agreement constitute violations of PRC-001-1 R1, PRC-001-1 R4, and PRC-005-1 R1.

12. Duke has agreed to enter into this Settlement Agreement with SERC to avoid extended litigation with respect to the matters described or referred to herein, to avoid uncertainty, and to effectuate a complete and final resolution of the issues set forth herein. Duke agrees that this Settlement Agreement is in the best interest of the parties and in the best interest of BPS reliability.

13. In addition to the specific mitigating steps taken by Duke to address the concerns identified in this settlement, Duke established a relay testing process administrator role. This administrator revised and generated automated test procedures for NERC identified relays and established processes for the review of relay test results, which ensures proper testing by technicians.

14. The enhancements to Duke's protection system maintenance and testing program include: (1) full implementation of the ENOSERV RTS software which ensures

consistency of test procedures, establishes controls for pass/fail analysis, and documents test results,(2) completion of an organizational change to establish a relay manager position and realign relay maintenance processes and personnel under this manager and (3) documentation of process to assess skills of contractors performing relay calibration activities to ensure skills and experience meet Duke expectations. Additionally, Duke is coordinating generation and transmission Protection Systems using the NERC Technical Reference Document "Power Plant and Transmission System Protection Coordination" as a basis for new and modified Protection Systems. This method is more comprehensive than what was originally used to evaluate Mill Creek and BREC and is intended to ensure proper calculation and settings of critical generator protection functions to coordinate with the transmission system. Part of this review requires an evaluation of potential single points of failure that could impact the reliability of the BES. Duke is involved with industry activities considering single points of failure of Protection Systems to ensure an understanding of the requirements necessary for the reliability of the BES.

15. Duke's electric reliability compliance program improvements include:

    The Transmission Compliance Coordination group is a new group that was recently formed in the Transmission business unit and provides dedicated resources for the oversight and coordination for all operations and planning NERC reliability standards (including PRC-001 and PRC-005). The group works with subject matter experts to identify process improvements and develop recommendations for such improvements, as well as assisting with audit preparation, creating self-reports and mitigation plans, and implementing compliance with new and/or modified NERC reliability standards after they are approved by FERC.

    The position entitled Manager of Reliability Compliance that reports up to the Director of Ethics and Compliance is a new position created recently to provide management, oversight and strategic direction to NERC reliability compliance staff. Additionally, the NERC reliability compliance program is now located within the company in the Office of General Counsel.

IV. MITIGATING ACTIONS, REMEDIES AND SANCTIONS

16. SERC and Duke agree that Duke has completed and SERC has verified the completion of the mitigating actions set forth in Section III of the Disposition document for NERC Violation ID SERC2011008229 (Attachment B). Duke is not scheduled to complete all mitigating actions for NERC Violation IDs SERC2011008227 and SERC2011008228 (Attachment C) until June 1, 2014. The Mitigating Actions, Remedies and Sanctions are discussed in detail in the relative Disposition documents (Attachment B and C).

17. SERC staff also considered the specific facts and circumstances of the violations and Duke's actions in response to the violations in determining a proposed penalty that meets the requirement in Section 215 of the Federal Power Act that "[a]ny penalty imposed under this section shall bear a reasonable relation to the seriousness of the violation and shall take into consideration the efforts of an entity to remedy the violation in a timely manner."[1] The factors considered by SERC staff in the determination of the appropriate penalty are set forth in Section II of the Common Disposition document.

18. Based on the above factors, as well as the mitigation actions and preventative measures taken, Duke shall pay seventeen thousand dollars ($17,000) to SERC as set forth in this Settlement Agreement. Duke shall remit the payment to SERC via check, or by wire transfer to an account to be identified by SERC within thirty days after the Agreement is either approved by the Federal Energy Regulatory Commission (Commission) or by operation of law. SERC shall notify NERC, and NERC shall notify the Commission, if the payment is not timely received. If Duke does not remit the payment by the required date, interest payable to SERC will begin to accrue pursuant to the Commission's regulations at 18 C.F.R. §35.19a(a)(2)(iii) from the date that payment is due, and shall be payable in addition to the payment.

19. Failure to make a timely penalty payment or to comply with any of the terms and conditions agreed to herein, or any other conditions of this Settlement Agreement shall be deemed to be either the same alleged violations that initiated this Settlement Agreement and/or additional violations and may subject Duke to new or additional enforcement, penalty or sanction actions in accordance with the NERC Rules of Procedure. Duke shall retain all rights to defend against such additional enforcement actions in accordance with NERC Rules of Procedure.

V. ADDITIONAL TERMS

20. The signatories to the Settlement Agreement agree that they enter into the Settlement Agreement voluntarily and that, other than the recitations set forth herein, no tender, offer or promise of any kind by any member, employee, officer, director, agent or representative of SERC or Duke has been made to induce the signatories or any other party to enter into the Settlement Agreement. The signatories agree that the terms and conditions of this Settlement Agreement are consistent with the Commission's regulations and orders, and NERC's Rules of Procedure.

21. SERC shall report the terms of all settlements of compliance matters to NERC. NERC will review the settlement for the purpose of evaluating its consistency with other settlements entered into for similar violations or under other, similar

[1] 16 U.S.C. § 824o(e)(6).

circumstances. Based on this review, NERC will either approve the settlement or reject the settlement and notify SERC and Duke of changes to the settlement that would result in approval. If NERC rejects the settlement, NERC will provide specific written reasons for such rejection and SERC will attempt to negotiate a revised settlement agreement with Duke including any changes to the settlement specified by NERC. If a settlement cannot be reached, the enforcement process shall continue to conclusion. If NERC approves the settlement, NERC will (i) report the approved settlement to the Commission for the Commission's review and approval by order or operation of law and (ii) publicly post this Settlement Agreement.

22. This Settlement Agreement shall become effective upon the Commission's approval of the Settlement Agreement by order or operation of law as submitted to it or as modified in a manner acceptable to the parties.

23. Duke agrees that this Settlement Agreement, when approved by NERC and the Commission, shall represent a final settlement of all matters set forth herein and Duke waives its right to further hearings and appeal, unless and only to the extent that Duke contends that any NERC or Commission action on the Settlement Agreement contains one or more material modifications to the Settlement Agreement. SERC reserves all rights to initiate enforcement, penalty or sanction actions against Duke in accordance with the NERC Rules of Procedure in the event that Duke does not comply with the Mitigation Plans and compliance program agreed to in this Settlement Agreement. In the event Duke fails to comply with any of the stipulations, remedies, sanctions or additional terms, as set forth in this Settlement Agreement, SERC will initiate enforcement, penalty, or sanction actions against Duke to the maximum extent allowed by the NERC Rules of Procedure, up to the maximum statutorily allowed penalty. Except as otherwise specified in this Settlement Agreement, Duke shall retain all rights to defend against such enforcement actions, also according to the NERC Rules of Procedure.

24. Duke consents to the use of SERC's determinations, findings, and conclusions set forth in this Settlement Agreement for the purpose of assessing the factors, including the factor of determining the company's history of violations, in accordance with the NERC Sanction Guidelines and applicable Commission orders and policy statements. Such use may be in any enforcement action or compliance proceeding undertaken by NERC and/or any Regional Entity; provided, however, that Duke does not consent to the use of the specific acts set forth in this Settlement Agreement as the sole basis for any other action or proceeding brought by NERC and/or SERC, nor does Duke consent to the use of this Settlement Agreement by any other party in any other action or proceeding.

25. Each of the undersigned warrants that he or she is an authorized representative of the entity designated, is authorized to bind such entity and accepts the Settlement Agreement on the entity's behalf.

26. The undersigned representative of each party affirms that he or she has read the Settlement Agreement, that all of the matters set forth in the Settlement Agreement are true and correct to the best of his or her knowledge, information and belief, and that he or she understands that the Settlement Agreement is entered into by such party in express reliance on those representations, provided, however, that such affirmation by each party's representative shall not apply to the other party's statements of position set forth in Section III of this Settlement Agreement.

27. The Settlement Agreement may be signed in counterparts.

28. If this Settlement Agreement is executed in duplicate, each of which so executed shall be deemed to be an original.

Remainder of page intentionally blank.
Signatures to be affixed to the following page.

Agreed to and accepted:

John R. Twitchell

John R. Twitchell
Vice President and Chief Program Officer
SERC RELIABILITY CORPORATION

12/19/12
Date

Caren B. Anders

Caren B. Anders
Senior Vice President
DUKE ENERGY CAROLINAS, LLC

12/19/12
Date

Disposition Document common to all of the instant violations

DISPOSITION OF VIOLATION[1]

INFORMATION COMMON TO INSTANT VIOLATIONS
Dated December 19, 2012

REGISTERED ENTITY	NERC REGISTRY ID	NOC#
Duke Energy Carolinas	**NCR01219**	**NOC-1712**

REGIONAL ENTITY
SERC Reliability Corporation (SERC)

I. REGISTRATION INFORMATION

ENTITY IS REGISTERED FOR THE FOLLOWING FUNCTIONS IN THE SERC REGION (BOTTOM ROW INDICATES REGISTRATION DATE):

BA	DP	GO	GOP	IA	LSE	PA	PSE	RC	RP	RSG	TO	TOP	TP	TSP
X	X	X	X	X	X	X	X		X	X	X	X	X	X
5/31/2007	**5/31/2007**	**5/31/2007**	**5/31/2007**	**5/31/2007**	**5/31/2007**	**5/31/2007**	**5/31/2007**		**5/31/2007**	**5/31/2007**	**5/31/2007**	**5/31/2007**	**5/31/2007**	**5/31/2007**

DESCRIPTION OF THE REGISTERED ENTITY

Duke Energy Carolinas, LLC (Duke) is one of six franchised public utility subsidiaries of Duke Energy Corporation.

Duke's service territory encompasses the central and western most portion of North Carolina, and the northwestern portion of South Carolina. It supplies electric service to more than two million residential, commercial, and industrial customers.

Duke's generation fleet is made up of seven nuclear units at three nuclear generating stations with a total capacity of 6,996 megawatts (MW), 30 units at eight coal-fired stations with a combined capacity of 7,722 MW, 51 units at eight combustion turbine plants, and 95 hydro-electric units at 30 hydro-electric stations, including two pumped-storage facilities with a total capacity of 3,218 MW. Duke's electrical system consists of 13,066 miles of transmission line, broken down by the following voltage levels: 577 miles of 525 kV, 2,664 miles of 230 kV, 165 miles of 161 kV, 7 miles of 138 kV, 43 miles of 115 kV, 6,511 miles of 100 kV, 116 miles of 66 kV and 69 kV, 2,817 miles of 44 kV and 166 miles below 44 kV.

[1] For purposes of this document and attachments hereto, each violation at issue is described as a "violation," regardless of its procedural posture and whether it was a possible, alleged or confirmed violation.

Duke has approximately 200 transmission stations with nearly 3,250 circuit breakers and over 800 transformers. Duke has 24 interconnections that tie its transmission system to eight other utilities.

Duke is a summer peaking entity. Duke's Balancing Authority system peak load was 20,628 MWh on August 8, 2007. The all-time peak total net generation for Duke's Balancing Authority was 20,846 MWh.

IS THERE A SETTLEMENT AGREEMENT YES ☒ NO ☐

WITH RESPECT TO THE VIOLATION(S), REGISTERED ENTITY

NEITHER ADMITS NOR DENIES IT (SETTLEMENT ONLY) YES ☒
ADMITS TO IT YES ☐
DOES NOT CONTEST IT (INCLUDING WITHIN 30 DAYS) YES ☐

WITH RESPECT TO THE ASSESSED PENALTY OR SANCTION, REGISTERED ENTITY

ACCEPTS IT/ DOES NOT CONTEST IT YES ☒

II. PENALTY INFORMATION

TOTAL ASSESSED PENALTY OR SANCTION OF **SEVENTEEN THOUSAND DOLLARS ($17,000)** FOR **THREE** VIOLATIONS OF RELIABILITY STANDARDS.

In addition to paying the monetary penalty, Duke has made organizational changes and expended corporate funds to increase NERC compliance staffing at the company. Specifically, Duke has added NERC compliance support and oversight groups within both the Generation and Transmission organizations.

(1) REGISTERED ENTITY'S COMPLIANCE HISTORY

PREVIOUSLY FILED VIOLATIONS OF ANY OF THE INSTANT RELIABILITY STANDARD(S) OR REQUIREMENT(S) THEREUNDER IN THE SERC REGION
YES ☒ NO ☐

LIST VIOLATIONS AND STATUS

Duke had a previous violation of PRC-005-1 R2, which was filed with FERC in Notice of Penalty (NP) 10-51-000 on February 12, 2010. FERC issued a Notice on March 12, 2010, stating it would take no further action.

Duke had a previous violation of PRC-005-1 R2, which was filed with FERC in NP13-8-000 on November 30, 2012.

ADDITIONAL COMMENTS

Duke's previous violations of PRC-005-1 R2 were not considered to be aggravating factors in determining the penalty. The facts and circumstances of the PRC-005-1 R2 violations, which involved missing maintenance and/or testing records, were not related to the instant violation of PRC-005-1 R1 in this filing, which involved an incomplete maintenance and testing program.

PREVIOUSLY FILED VIOLATIONS OF OTHER RELIABILITY STANDARD(S) OR REQUIREMENTS THEREUNDER IN THE SERC REGION
YES ☒ NO ☐

LIST VIOLATIONS AND STATUS

Duke had a previous violation of FAC-003-1 R2, which was filed with FERC in NP09-3-000 on December 19, 2008. FERC issued a Notice on January 16, 2009, stating it would take no further action.

Duke had previous violations of FAC-008-1 R1 and FAC-009-1 R1, which were filed with FERC in NP10-2-000 on October 14, 2009. FERC issued a Notice on November 13, 2009, stating it would take no further action.

Duke had a previous issue with VAR-001-1 R6, which was filed with FERC in RC12-13-000 on June 29, 2012. FERC took no action to review the issue by August 28, 2012 (60 days after the informational filing).

ADDITIONAL COMMENTS

(2) THE DEGREE AND QUALITY OF COOPERATION BY THE REGISTERED ENTITY (IF THE RESPONSE TO FULL COOPERATION IS "NO," THE ABBREVIATED NOP FORM MAY NOT BE USED.)

FULL COOPERATION YES ☒ NO ☐
IF NO, EXPLAIN

(3) THE PRESENCE AND QUALITY OF THE REGISTERED ENTITY'S COMPLIANCE PROGRAM

IS THERE A DOCUMENTED COMPLIANCE PROGRAM
YES ☒ NO ☐

Based on Duke's November 11, 2011 responses to SERC's Compliance Culture Questionnaire (CCQ), Duke has had a documented internal compliance program (ICP), which consists of multiple processes and procedures for compliance with the NERC Reliability Standards, since 2008. The ICP is reviewed and updated as needed and the ICP is subject to internal audit. Details of Duke's ICP are widely disseminated across the organization and to Duke affiliates via a quarterly newsletter addressing internal and external Reliability Standards information and frequent training and information sessions.

EXPLAIN SENIOR MANAGEMENT'S ROLE AND INVOLVEMENT WITH RESPECT TO THE REGISTERED ENTITY'S COMPLIANCE PROGRAM, INCLUDING WHETHER SENIOR MANAGEMENT TAKES ACTIONS THAT SUPPORT THE COMPLIANCE PROGRAM, SUCH AS TRAINING, COMPLIANCE AS A FACTOR IN EMPLOYEE EVALUATIONS, OR OTHERWISE.

Based on Duke's November 11, 2011 responses to SERC's CCQ, the Vice President Compliance and Service Delivery provides program guidance to Duke compliance personnel while the Compliance Program Manager supports and coordinates compliance program administration. The Reliability Standards Executive Sponsor Committee, a senior management team made up of senior officers, provides oversight for Duke's ICP. The Vice President Compliance and Service Delivery and the Compliance Program Manager have independent access to the CEO and the Reliability Standards Executive Sponsor Committee. Disciplinary action for Reliability Standards issues is consistent with Duke's corporate practice and protocol for any issue requiring discipline of an employee, and extends up to and including termination. The existence of Duke's ICP was a mitigating factor in determining the penalty.

(4) ANY ATTEMPT BY THE REGISTERED ENTITY TO CONCEAL THE VIOLATION(S) OR INFORMATION NEEDED TO REVIEW, EVALUATE OR INVESTIGATE THE VIOLATION.

YES ☐ NO ☒

(5) ANY EVIDENCE THE VIOLATION(S) WERE INTENTIONAL (IF THE RESPONSE IS "YES," THE ABBREVIATED NOP FORM MAY NOT BE USED.)

YES ☐ NO ☒

(6) ANY OTHER MITIGATING FACTORS FOR CONSIDERATION

YES ☐ NO ☒
IF YES, EXPLAIN

(7) ANY OTHER AGGRAVATING FACTORS FOR CONSIDERATION

YES ☐ NO ☒
IF YES, EXPLAIN

(8) ANY OTHER EXTENUATING CIRCUMSTANCES

YES ☐ NO ☒
IF YES, EXPLAIN

OTHER RELEVANT INFORMATION:

NOTICE OF ALLEGED VIOLATION AND PROPOSED PENALTY OR SANCTION ISSUED
DATE: OR N/A ☒

SETTLEMENT DISCUSSIONS COMMENCED
DATE: 7/13/2012 OR N/A ☐

NOTICE OF CONFIRMED VIOLATION ISSUED
DATE: OR N/A ☒

SUPPLEMENTAL RECORD INFORMATION
DATE(S) OR N/A ☒

REGISTERED ENTITY RESPONSE CONTESTED
FINDINGS ☐ PENALTY ☐ BOTH ☐ NO CONTEST ☒

HEARING REQUESTED
YES ☐ NO ☒
DATE
OUTCOME
APPEAL REQUESTED

SETTLEMENT AGREEMENT BETWEEN SERC AND Duke, executed December 19, 2012

Disposition Document regarding the PRC-005-1 R1 violation, which also serves as the Verification of Mitigation Plan completion

DISPOSITION OF VIOLATION[1]
Dated December 19, 2012

NERC TRACKING NO. **SERC2011008229**

SERC TRACKING NO. **SERC2011-401153**

I. VIOLATION INFORMATION

RELIABILITY STANDARD	REQUIREMENT(S)	SUB-REQUIREMENT(S)	VRF(S)	VSL(S)
PRC-005-1	**1**		**High**	**Severe**

VIOLATION(S) APPLIES TO THE FOLLOWING FUNCTIONS IN THE SERC REGION:

BA	DP	GO	GOP	IA	LSE	PA	PSE	RC	RP	RSG	TO	TOP	TP	TSP
		X									X			

PURPOSE OF THE RELIABILITY STANDARD AND TEXT OF RELIABILITY STANDARD AND REQUIREMENT(S)/SUB-REQUIREMENT(S)

The purpose statement of PRC-005-1 provides:

"To ensure all transmission and generation Protection Systems affecting the reliability of the Bulk Electric System (BES) are maintained and tested."

PRC-005-1 R1 provides:

R1. Each Transmission Owner and any Distribution Provider that owns a transmission Protection System and each Generator Owner that owns a generation Protection System shall have a Protection System maintenance and testing program for Protection Systems that affect the reliability of the BES. The program shall include:

R1.1. Maintenance and testing intervals and their basis.

R1.2. Summary of maintenance and testing procedures.

VIOLATION DESCRIPTION

On August 25, 2007, Duke experienced a disturbance on its portion of the Bulk Power System (BPS). The disturbance initiated at the Broad River Energy Center (BREC), which is owned and operated by a subsidiary of Calpine Corporation and also interconnected to the

[1] For purposes of this document and attachments hereto, each violation at issue is described as a "violation," regardless of its procedural posture and whether it was a possible, alleged or confirmed violation.

Riverview Substation (Riverview) owned and operated by Duke. The disturbance did not involve a loss of load, but did involve the tripping offline of eight generation units (a loss of approximately 900 MW of generation) and the temporary outages of five 230 kV transmission lines (collectively, the Event), as described below.

The Event began just before 1100 hours Eastern Prevailing Time (EPT) on a Saturday. A transformer bushing, an insulation device on the "high side" of an 18 kV-to-230 kV step-up transformer at a generation unit inside BREC, cracked and caused a single-line-to-ground fault. BREC's Protection System response for the transformer relies on a single lockout relay. The relay signals the breaker nearest the transformer, which is the primary or first layer of Protection System response. The same relay also, through the breaker failure scheme, signals the next-nearest breakers at Riverview that operate as the secondary layer of Protection System response. When breakers receive a signal, they open after a preset time period to isolate the area affected by the fault from the rest of the transmission system.

During the Event, the lockout relay failed to send the signals to the primary breaker and the breaker failure scheme; thus, the Protection System designed to contain a fault at the transformer and protect the interconnected transmission was unable to do so. This Protection System design failed because the lockout relay became a "single point of Protection System failure." As a result of the relay's failure to signal the first and second layers of protection, the fault endured, graduating to a three-phase fault, until a remote Protection System device opened breakers and thereby de-energized four 230 kV transmission lines to isolate the fault. Remote clearing resulted in a sustained low voltage condition throughout the Event that endured long enough to initiate other responses on the system: two generation units at a nearby coal-fired generation station powered down, and relays at an interconnected nuclear power plant activated and initiated the process of isolating the plant. The fault also triggered the misoperation of nearby relays on Duke's system because Duke had improperly maintained one relay and failed to coordinate the other two relays with transmission Protection Systems, as described in greater detail below. The misoperations resulted in the loss of two additional generation units at a nearby combustion turbine generation station and the temporary de-energizing of a transmission line – outages that did not contribute to the fault's isolation and should not have occurred.

In summary, the system should have isolated the fault using the primary and secondary levels of system protection. This scheme would have first opened the breaker nearest to the transformer followed by the next nearest breakers at Riverview. Either scheme would have isolated the fault quickly after its initiation by tripping off a minimal number of BPS elements. Because both of these layers of protection relied upon the same lockout relay, the relay's failure necessitated that the system isolate the fault through remote breakers operating after a time delay. The system, therefore, isolated the fault by tripping off four transmission lines, all four units in operation at BREC where the fault initiated, and a substation. Relays at another generation station responded to the fault and tripped off an additional two generating units. A nearby coal-fired generation station responded to the low voltage condition and began to power down. The loss of all of these BPS elements should have been unnecessary to contain the fault.

The system's remote Protection System responses to the Event, described above, isolated the fault and concluded the Event in less than five seconds – by which time all transmission lines and the Riverview substation that tripped off had returned to service. Yet, six generation

units at two generation stations remained offline, and two more generation units at a third generation station were powering down – a total generation loss of nearly 900 MW. Duke restored its portion of the lost generation to balance generation with scheduled demand levels within two minutes using spinning reserves. Later that day, the system operators were able to return to service three of the generation units that tripped during the Event. Although the Event endured only a few seconds and did not involve the dropping of load or injury to persons or property, it revealed conditions on Duke's system that could have led to more serious consequences, if generation and load were higher at that time or the system was stressed in other ways.

FERC staff opened an investigation to determine whether Duke or others committed violations of Reliability Standards in connection with the Event. Through agreement between FERC staff and SERC staff, the violations are being adjudicated through existing NERC and Regional processes. On February 22, 2008, SERC initiated a Compliance Violation Investigation (CVI) of Duke to address reliability concerns surrounding the Event.

PRC-005-1 R1 (SERC2011008229)

SERC determined that Duke's transmission and generation Protection System maintenance and testing program documents did not contain a satisfactory summary of maintenance and testing procedures, in violation of PRC-005-1 R1.2. Specifically, the documents provided no effective dates, revision number, revision history tables, signatures, Duke logos, nor any other indicia that they reflected corporate policy or were disseminated as corporate documents. The documents provided little information as to testing procedure, and did not reflect program controls that Duke applied to maintenance and testing generally to ensure that relay testing is regular, methodical, and completed successfully. In addition, Duke also informed SERC that each supporting document existed prior to June 18, 2007 but a single document did not exist until "sometime in April 2008" before the SERC audit of Duke that commenced in May 2008.

SERC determined that Duke, as a Transmission Owner and Generator Owner, was in violation of PRC-005-1 R1 because it failed to have a maintenance and testing procedure for Protection System devices in place on June 18, 2007.

SERC assessed a Violation Severity Level (VSL) of "Severe" in accordance with the May 3, 2012 VSL Matrix because Duke failed to have Protection System maintenance and testing program for Protection Systems that affect the reliability of the BES.

RELIABILITY IMPACT STATEMENT- POTENTIAL AND ACTUAL

SERC determined that this violation posed a minimal risk and did not pose a serious or substantial risk to the reliability of the bulk power system because:

1. Duke properly maintained and tested 98.1% of its Protection System devices despite the lack of a formal documented procedure;
2. Duke did have maintenance and testing intervals, their basis, and tested the devices regularly;

3. Since the mandatory enforceable date for PRC-005-1, Duke technicians have used a software program with automated testing for relays. The test results are captured and tracked in a database and any anomalies are noted and followed up on; and
4. Duke, as a TO, has low voltage alarms on all batteries.

II. DISCOVERY INFORMATION

METHOD OF DISCOVERY

SELF-REPORT	☐
SELF-CERTIFICATION	☐
COMPLIANCE AUDIT	☐
COMPLIANCE VIOLATION INVESTIGATION	☒
SPOT CHECK	☐
COMPLAINT	☐
PERIODIC DATA SUBMITTAL	☐
EXCEPTION REPORTING	☐

DURATION DATE(S)

6/18/07 (the enforceable date of the standard) until 2/19/11 (Mitigation Plan completion)

DATE DISCOVERED BY OR REPORTED TO REGIONAL ENTITY
9/27/11

IS THE VIOLATION STILL OCCURRING	YES	☐	NO	☒
IF YES, EXPLAIN				
REMEDIAL ACTION DIRECTIVE ISSUED	YES	☐	NO	☒
PRE TO POST JUNE 18, 2007 VIOLATION	YES	☐	NO	☒

III. MITIGATION INFORMATION

FOR FINAL ACCEPTED MITIGATION PLAN: SERC2011008229

MITIGATION PLAN NO.	SERCMIT007845
DATE SUBMITTED TO REGIONAL ENTITY	8/7/12
DATE ACCEPTED BY REGIONAL ENTITY	9/7/12
DATE APPROVED BY NERC	10/4/12
DATE PROVIDED TO FERC	10/5/12

IDENTIFY AND EXPLAIN ALL PRIOR VERSIONS THAT WERE ACCEPTED OR REJECTED, IF APPLICABLE: N/A

MITIGATION PLAN COMPLETED YES ☒ NO ☐

EXPECTED COMPLETION DATE 2/19/2011
EXTENSIONS GRANTED
ACTUAL COMPLETION DATE 2/19/2011

DATE OF CERTIFICATION LETTER 9/17/2012

CERTIFIED COMPLETE BY REGISTERED ENTITY AS OF 2/19/2011

VERIFIED COMPLETE BY REGIONAL ENTITY AS OF[2] 10/3/2012

ACTIONS TAKEN TO MITIGATE THE ISSUE AND PREVENT RECURRENCE

To correct the violation of PRC-005-1 R1, Duke completed the following actions in its Mitigation Plan:

1. Revised its maintenance and testing procedures to include the maintenance and testing interval, interval basis and summary of maintenance and testing procedures for all Protection System devices; and,
2. Included dates, approval signatures or names and revision logs in the maintenance and testing procedures.

LIST OF EVIDENCE REVIEWED BY REGIONAL ENTITY TO EVALUATE COMPLETION OF MITIGATION PLAN OR MILESTONES (FOR CASES IN WHICH MITIGATION IS NOT YET COMPLETED, LIST EVIDENCE REVIEWED FOR COMPLETED MILESTONES)

1. Duke Energy Field Operations Carolinas Power Deliver Summary of Maintenance and Testing Procedures for Protection System Equipment in Substations, revision 0, dated June 1, 2010.
2. Duke Energy Fossil/Hydro Generation Protective Systems Work Practices, version 0, dated February 17, 2011.
3. Fossil/Hydro Generation Summary of Battery Maintenance Procedures, revision 1, dated November 23, 2010.
4. Excerpts from Power Delivery Preventative Maintenance Intervals (North Carolina), revision 6, dated February 10, 2011.
5. Excerpts from Power Delivery Preventative Maintenance Intervals (South Carolina), revision 6, dated February 10, 2011.
6. Power Delivery Preventative Maintenance Program Summary, revision 0, dated May 3, 2010.

[2] This Disposition Document serves as SERC's Verification of Mitigation Plan Completion.

7. NERC PRC-005-1 Duke Energy Fossil/Hydro Generation Protection System Maintenance and Testing, revision 2, dated February 19, 2011.

EXHIBITS:

SOURCE DOCUMENT
CVI Screening Sheet dated 9/28/11

MITIGATION PLAN
Duke Mitigation Plan submitted on 8/7/12

CERTIFICATION BY REGISTERED ENTITY
Duke Certification of Completed Mitigation Plan dated 9/17/12

VERIFICATION BY REGIONAL ENTITY
This Disposition document serves as SERC's Verification of Mitigation Plan Completion.

Disposition Document regarding the PRC-001-1 R1 and R4 violations

DISPOSITION OF VIOLATION[1]
Dated December 19, 2012

NERC TRACKING NO.	SERC TRACKING NO.
SERC2011008227	**SERC2011-401151**
SERC2011008228	**SERC2011-401152**

I. VIOLATION INFORMATION

RELIABILITY STANDARD	REQUIREMENT(S)	SUB-REQUIREMENT(S)	VRF(S)	VSL(S)
PRC-001-1	**1**		**High**	**High**
PRC-001-1	**4**		**High**	**Lower**

VIOLATION(S) APPLIES TO THE FOLLOWING FUNCTIONS IN THE SERC REGION:

BA	DP	GO	GOP	IA	LSE	PA	PSE	RC	RP	RSG	TO	TOP	TP	TSP
												X		

PURPOSE OF THE RELIABILITY STANDARD AND TEXT OF RELIABILITY STANDARD AND REQUIREMENT(S)/SUB-REQUIREMENT(S)

The purpose statement of PRC-001-1 provides:

"To ensure system protection is coordinated among operating entities."

PRC-001-1 R1 provides:

R1. Each Transmission Operator, Balancing Authority, and Generator Operator shall be familiar with the purpose and limitations of protection system schemes applied in its area.

PRC-001-1 R4 provides:

R4. Each Transmission Operator shall coordinate protection systems on major transmission lines and interconnections with neighboring Generator Operators, Transmission Operators, and Balancing Authorities.

VIOLATION DESCRIPTION

On August 25, 2007, Duke experienced a disturbance on its portion of the Bulk Power System (BPS). The disturbance initiated at the Broad River Energy Center (BREC), which is owned and operated by a subsidiary of Calpine Corporation and also interconnected to the

[1] For purposes of this document and attachments hereto, each violation at issue is described as a "violation," regardless of its procedural posture and whether it was a possible, alleged or confirmed violation.

Riverview Substation (Riverview) owned and operated by Duke. The disturbance did not involve a loss of load, but did involve the tripping offline of eight generation units (a loss of approximately 900 MW of generation) and the temporary outages of five 230 kV transmission lines (collectively, the Event), as described below.

The Event began just before 1100 hours Eastern Prevailing Time (EPT) on a Saturday. A transformer bushing, an insulation device on the "high side" of an 18 kV-to-230 kV step-up transformer at a generation unit inside BREC, cracked and caused a single-line-to-ground fault. BREC's Protection System response for the transformer relies on a single lockout relay. The relay signals the breaker nearest the transformer, which is the primary or first layer of Protection System response. The same relay also, through the breaker failure scheme, signals the next-nearest breakers at Riverview that operate as the secondary layer of Protection System response. When breakers receive a signal, they open after a preset time period to isolate the area affected by the fault from the rest of the transmission system.

During the Event, the lockout relay failed to send the signals to the primary breaker and the breaker failure scheme; thus, the Protection System designed to contain a fault at the transformer and protect the interconnected transmission was unable to do so. This Protection System design failed because the lockout relay became a "single point of Protection System failure." As a result of the relay's failure to signal the first and second layers of protection, the fault endured, graduating to a three-phase fault, until a remote Protection System device opened breakers and thereby de-energized four 230 kV transmission lines to isolate the fault. Remote clearing resulted in a sustained low voltage condition throughout the Event that endured long enough to initiate other responses on the system: two generation units at a nearby coal-fired generation station powered down, and relays at an interconnected nuclear power plant activated and initiated the process of isolating the plant. The fault also triggered the misoperation of nearby relays on Duke's system because Duke had improperly maintained one relay and failed to coordinate the other two relays with transmission Protection Systems, as described in greater detail below. The misoperations resulted in the loss of two additional generation units at a nearby combustion turbine generation station and the temporary de-energizing of a transmission line – outages that did not contribute to the fault's isolation and should not have occurred.

In summary, the system should have isolated the fault using the primary and secondary levels of system protection. This scheme would have first opened the breaker nearest to the transformer followed by the next nearest breakers at Riverview. Either scheme would have isolated the fault quickly after its initiation by tripping off a minimal number of BPS elements. Because both of these layers of protection relied upon the same lockout relay, the relay's failure necessitated that the system isolate the fault through remote breakers operating after a time delay. The system, therefore, isolated the fault by tripping off four transmission lines, all four units in operation at BREC where the fault initiated, and a substation. Relays at another generation station responded to the fault and tripped off an additional two generating units. A nearby coal-fired generation station responded to the low voltage condition and began to power down. The loss of all of these BPS elements should have been unnecessary to contain the fault.

The system's remote Protection System responses to the Event, described above, isolated the fault and concluded the Event in less than five seconds – by which time all transmission lines and the Riverview substation that tripped off had returned to service. Yet, six generation

units at two generation stations remained offline, and two more generation units at a third generation station were powering down – a total generation loss of nearly 900 MW. Duke restored its portion of the lost generation to balance generation with scheduled demand levels within two minutes using spinning reserves. Later that day, the system operators were able to return to service three of the generation units that tripped during the Event. Although the Event endured only a few seconds and did not involve the dropping of load or injury to persons or property, it revealed conditions on Duke's system that could have led to more serious consequences, if generation and load were higher at that time or the system was stressed in other ways.

FERC staff opened an investigation to determine whether Duke or others committed violations of Reliability Standards in connection with the Event. Through agreement between FERC staff and SERC staff, the violations are being adjudicated through existing NERC and Regional processes. On February 22, 2008, SERC initiated a Compliance Violation Investigation (CVI) of Duke to address reliability concerns surrounding the Event.

PRC-001-1 R1 (SERC2011008227):

Duke was not familiar with the limitations of the generation station Protection Systems connected to Duke's system, as required by PRC-001-1 R1. The Protection System inside BREC relied exclusively on the non-redundant 86T lockout relay to isolate a fault at the transformer. Duke was not aware of the limitation of the generation-side Protection System at BREC – specifically, that it included a single point of failure that disabled both the primary and secondary layers of protection. Consequently, Duke did not design the relevant transmission-side Protection System to provide timely Protection System response in the event of the lockout relay's failure inside BREC. Rather, Duke's Protection System design relied upon the breakers at the remote ends of the transmission lines extending from Riverview. This design cleared the fault by isolating the four transmission lines extending from Riverview, all of Riverview, and all of BREC, requiring a prolonged time to do so.

Because Duke was not familiar with the limitation of the BREC Protection System design, it did not anticipate the delayed clearing of the fault and the resultant effect of a prolonged low voltage condition on Duke's system, which resulted in additional and unnecessary Protection System responses.

Duke's Protection System response to the fault at BREC was contrary to Duke's stated coordination philosophy, which states, "Relays closest to the fault are expected to operate first and then upstream or remote relays are set to operate after an appropriate coordinating time margin." This philosophy reflects best practices for Protection System design and coordination, in that the nearest backup protection works in few enough cycles to clear the fault before the fault creates system instability or a prolonged period of low voltage. Duke's stability studies identified that faults at BREC should be isolated in no more than 17.5 cycles in order to keep the BREC units from separating from the system. Yet Duke's Protection System design and coordination failed to do so, instead clearing the fault in 0.490 seconds, or 29.4 cycles, from fault inception and creating a circumstance of low voltage. This fact shows that Duke was not familiar with the

purpose and limitations of the BREC Protection System interconnected to its transmission system. Had Duke known of the limitations of the BREC Protection System, it would have designed its transmission Protection System to account for the single point of failure at BREC.

Furthermore, Duke discovered after the Event that six other generation stations within its Balancing Authority Area and connected to its transmission system also had Protection Systems limited by a single point of failure. Duke failed to account for these limitations in its transmission-side Protection System design as well.

SERC determined that Duke, as a Transmission Operator, was in violation of PRC-001-1 R1 because it failed to be familiar with the limitations of Protection System schemes applied in its area.

SERC assessed a Violation Severity Level (VSL) of "High" in accordance with the April 2, 2012 VSL Matrix because Duke failed to be familiar with the limitations of Protection System schemes applied in its area.

PRC-001-1 R4 (SERC2011008228):

Duke failed to coordinate specific relay functions when it installed its Protection Systems at the Mill Creek Generation Station (Mill Creek). The Protection System at Mill Creek includes a phase distance relay function to protect each of the generation units there. This relay function misoperated in response to the Event because Duke never fully assessed the Protection System design at this generation station to ensure proper calculation and setting of that function in coordination with the transmission system.

At the time of the Mill Creek construction, a contract engineering firm and a Duke engineer worked together to coordinate design and relay settings for the Protection Systems at the station and at the point of interconnection. Neither engineer involved in that process familiarized himself fully with the Protection System on the other side of the interconnection, with the result that the two individuals did not have a common understanding and thereby failed to apply a time setting to certain relay functions for the relays protecting the generating units. Duke did not have a routine process for exchanging information necessary to coordinate interconnecting generation stations with the transmission system.

A review of the Duke Protection System design contractor calculation for Mill Creek indicated there was intent to provide enough time delay to ride through zone 2 line operations. However, only relay operating time, breaker clearing time, and breaker failure relay operating times were included in the calculation that developed the 0.3 second delay. There was no statement included in the calculation regarding the possible intention to rely on the pilot protection for clearing zone 2 faults. In other words, the engineers considered the local timing but did not consider the whole system and surrounding facilities. The engineers did not consider the time delay to allow sufficient time for other zones to operate.

Duke was not aware that the particular relay function triggered by the Event existed, and had not familiarized itself with the proposed generation Protection System design during the interconnection process in a manner that ensured the complete coordination of all interconnected Protection Systems. Duke had uncoordinated Protection System functions on its system as of June 18, 2007, and as of the day of the Event. Until 2008, Duke's coordination process for generation Protection Systems was a one-time exercise completed at the time of the generation station's installation and interconnection, and was conducted without the safeguard of a methodology to ensure complete and comprehensive review by the transmission protection engineers of the proposed interconnecting Protection System.

SERC determined that Duke, as a Transmission Operator, was in violation of PRC-001-1 R4 because it failed to coordinate Protection Systems on major transmission lines and interconnections with neighboring Generator Operators and Transmission Operators.

SERC assessed a Violation Severity Level (VSL) of "Lower" in accordance with the April 2, 2012 VSL Matrix because Duke failed to coordinate protection systems on major transmission lines and interconnections with one of its neighboring Generator Operators and Transmission Operators.

RELIABILITY IMPACT STATEMENT- POTENTIAL AND ACTUAL

PRC-001-1 R1 (SERC2011008227):
SERC determined that this violation posed a moderate risk and did not pose a serious or substantial risk to the reliability of the BPS because:

1. Duke's lack of familiarity with Protection Systems in its area could lead to design or operational mistakes that have the potential for substantial impact under certain circumstances;
2. However, Duke provides its Real-time System Operators with training to be familiar with the Protection System schemes, i.e. relay elements and associated zones of protection applied in the Duke Transmission Operator Area. The training is completed upon hiring and there are refresher classes typically on an annual basis;
3. There was no permanent damage to any equipment and IROLs were not exceeded;
4. There was no loss of load and this Event was not a DCS event; and
5. Duke restored its portion of the lost generation within two minutes using spinning reserves.

PRC-001-1 R4 (SERC2011008228):
SERC determined that this violation posed a moderate risk and did not pose a serious or substantial risk to the reliability of the BPS because:

1. Failure to coordinate Protection Systems on major transmission lines and interconnections with neighboring Generator Operators and Transmission Operators can cause units to prematurely trip offline, not to trip when they should, or the transmission system to operate unexpectedly;

2. However, Mill Creek's generation capacity of 640 MW accounts for 3.5% of Duke's total generation capacity of 17,938 MW;
3. There was no permanent damage to any equipment and IROLs were not exceeded;
4. There was no loss of load and this Event was not a DCS event; and
5. Duke restored its portion of the lost generation within two minutes using spinning reserves.

II. DISCOVERY INFORMATION

METHOD OF DISCOVERY	☐
SELF-REPORT	☐
SELF-CERTIFICATION	☐
COMPLIANCE AUDIT	☐
COMPLIANCE VIOLATION INVESTIGATION	☒
SPOT CHECK	☐
COMPLAINT	☐
PERIODIC DATA SUBMITTAL	☐
EXCEPTION REPORTING	☐

DURATION DATE(S)

PRC-001-1 R1 (SERC2011008227): 6/18/07 (when the Standard became mandatory and enforceable) through 6/1/14 (Mitigation Plan completion)

PRC-001-1 R4 (SERC2011008228): 6/18/07 (when the Standard became mandatory and enforceable) through 6/1/14 (Mitigation Plan completion)

DATE DISCOVERED BY OR REPORTED TO REGIONAL ENTITY
PRC-001-1 R1 (SERC2011008227): 9/27/11
PRC-001-1 R4 (SERC2011008228): 9/27/11

IS THE VIOLATION STILL OCCURRING	YES	☐	NO	☒
IF YES, EXPLAIN				
REMEDIAL ACTION DIRECTIVE ISSUED	YES	☐	NO	☒
PRE TO POST JUNE 18, 2007 VIOLATION	YES	☐	NO	☒

III. MITIGATION INFORMATION

FOR FINAL ACCEPTED MITIGATION PLAN: SERC2011008227 and SERC2011008228

MITIGATION PLAN NO.	SERCMIT008038
DATE SUBMITTED TO REGIONAL ENTITY	9/7/12
DATE ACCEPTED BY REGIONAL ENTITY	9/19/12
DATE APPROVED BY NERC	10/4/12
DATE PROVIDED TO FERC	10/5/12

IDENTIFY AND EXPLAIN ALL PRIOR VERSIONS THAT WERE ACCEPTED OR REJECTED, IF APPLICABLE N/A

MITIGATION PLAN COMPLETED YES ☐ NO ☒

EXPECTED COMPLETION DATE 6/1/2014
EXTENSIONS GRANTED
ACTUAL COMPLETION DATE

DATE OF CERTIFICATION LETTER
CERTIFIED COMPLETE BY REGISTERED ENTITY AS OF

DATE OF VERIFICATION LETTER
VERIFIED COMPLETE BY REGIONAL ENTITY AS OF

ACTIONS TAKEN TO MITIGATE THE ISSUE AND PREVENT RECURRENCE

1. Provided training to System Operators to gain familiarity of the purpose and limitations of protection system schemes;
2. Coordinated generation and transmission Protection Systems using the NERC Technical Reference Document "Power Plant and Transmission System Protection Coordination";
3. Evaluated other generation stations for potential single points of failure and remedied the ones identified; and,
4. Corrected the time delay settings for distance relays at Mill Creek.

LIST OF EVIDENCE REVIEWED BY REGIONAL ENTITY TO EVALUATE COMPLETION OF MITIGATION PLAN OR MILESTONES (FOR CASES IN WHICH MITIGATION IS NOT YET COMPLETED, LIST EVIDENCE REVIEWED FOR COMPLETED MILESTONES)

EXHIBITS:

SOURCE DOCUMENT
CVI Screening Sheet dated 9/28/11

MITIGATION PLAN
Duke Mitigation Plan submitted on 9/7/12

CERTIFICATION BY REGISTERED ENTITY

VERIFICATION BY REGIONAL ENTITY

Attachment b

Source Documents for the violations of PRC-001-1 R1 and R4 and PRC-005-1 R1

Post Audit/Spot Check/Investigation Screening Worksheet

Prepared By: Mark Ladrow

Submittal Date: 09/28/11

Compliance Monitoring Method (Audit, Spot-Check, or Investigation): CVI

Registered Entity: Duke Energy Carolinas

NERC Registry ID: NCR01219

Registered Entity Contact Information:
Name: Mike Kuhl
Email: Michael.Kuhl@duke-energy.com

Standard: PRC-001-1

Requirement: R1

Sub Requirement(s):

Function(s) Applicable to Possible Violation:

☒ BA	☒ TOP	☐ TO	☐ GO	☒ GOP	☐ LSE
☐ DP	☐ PSE	☐ TSP	☐ PA	☐ RP	☐ TP
☐ RSG	☐ RC	☐ IA			

Date violation occurred: June 18, 2007

Date violation discovered (End Date of Audit, Spot Check, or Investigation):

Is the violation still occurring? ☐ Yes ☒ No

Detailed explanation and cause of violation:

PRC-001-1 (R1) (mandating that the Transmission Operator, Balancing Authority and Generator Operator be familiar with the purpose and limitations of their protection system schemes). Duke, as Transmission Operator, Balancing Authority, and Generator Operator, must be "familiar with the purpose and limitations of the protection system schemes applied in its area" and "coordinate protection systems on major transmission lines and interconnections". Duke's failure to be familiar with non-redundant protection system devices at generation stations, and to design interconnected transmission

protection systems accordingly, illustrates a deficiency in Duke's relay design and coordination function that undermines the reliability of Duke's protection systems generally.

Duke was not familiar with the purpose and limitations of the generation station protection systems connected to Duke's system, as required by Reliability Standard PRC-001-1 R1. The protection system inside BREC relied exclusively on the non-redundant 86T lockout relay to isolate a fault at the transformer. Duke was not aware of the limitation of the generation-side protection system at BREC – specifically, that it included a single point of failure that disabled both the primary and secondary layers of protection. Consequently, Duke did not design the relevant transmission-side protection system to provide timely protection system response in the event of the lockout relay's failure inside BREC. Rather, Duke's protection system design relied upon the breakers at the remote ends of the transmission lines extending from Riverview. This design cleared the fault by isolating the four transmission lines extending from Riverview, all of Riverview, and all of BREC, requiring a prolonged time period to do so.

Because Duke was not familiar with the limitation of the BREC protection system design, it did not anticipate the delayed clearing of the fault and the resultant effect of a prolonged low voltage condition on Duke's system, which resulted in additional and unnecessary protection system responses. Duke's protection system response to the fault at BREC was contrary to Duke's stated coordination philosophy, which states, "Relays closest to the fault are expected to operate first and then upstream or remote relays are set to operate after an appropriate coordinating time margin."[1] This philosophy reflects best practices for protection system design and coordination, that the nearest backup protection works in few enough cycles to clear the fault before the fault creates system instability or a prolonged period of low voltage. Duke's stability studies identified that faults at BREC should be isolated in no more than 17.5 cycles in order to keep the BREC units from separating from the system.[2] Yet Duke's protection system design and coordination failed to do so, instead clearing the fault in 0.490 seconds, or 29.4 cycles, from fault inception and creating a circumstance of low voltage.[3] This design shows that Duke was not familiar with the purpose and limitations of the BREC protection system interconnected to its transmission system. Had Duke known of the limitations of the BREC protection system, it would have designed the transmission side protection system to account for the single point of failure at BREC.[4]

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[1] *See* Response to Question No. 22 of the Commission's First Set of Data Requests to Duke Energy Carolinas, LLC (Oct. 24, 2008) at 1.

[2] *See* Response to Question No. 40 of the Commission's First Set of Data Requests to Duke Energy Carolinas, LLC (Oct. 24, 2008), Attachment 40-1 at iii.

[3] *SERC Event Analysis*, *supra* note 8, at 21.

[4] *Duke Response Letter*, *supra* note 12, at 29-30. In its preliminary letter of findings, it was alleged that Duke's transmission-side protection system response that cleared the fault also presented a coordination issue in violation of PRC-001 R4. Upon receipt of the Duke Response Letter, in which Duke explained the coordination of the transmission-side protection system in more detail, the CVI Team agrees that the transmission-side protection system was coordinated; and the response that cleared the fault does not present a PRC-001 R4 violation.

Furthermore, Duke discovered after the Event that six other generation stations[5] within its Balancing Authority Area and connected to its transmission system also had protection systems limited by a single point of failure. Duke failed to account for these limitations in its transmission side protection system design as well.

Reliability Impact (Minimal, Moderate, or Severe): Moderate

Reliability Impact Description: Lack of familiarity with protection system could lead to design mistakes that have the potential for substantial impact given the right conditions. In this case, the impact was limited by back-up protection.

Please complete the form as completely as possible and email to serccomply@serc1.org.

[5] Of these six generating stations, five are owned and operated by Duke. *See* Response to Question No. 34 of the Commission's First Set of Data Requests to Duke Energy Carolinas, LLC (Oct. 24, 2008).

Post Audit/Spot Check/Investigation Screening Worksheet

Prepared By: Mark Ladrow

Submittal Date: 09/28/11

Compliance Monitoring Method (Audit, Spot-Check, or Investigation): CVI

Registered Entity: Duke Energy Carolinas

NERC Registry ID: NCR01219

Registered Entity Contact Information:
Name: Mike Kuhl
Email: Michael.Kuhl@duke-energy.com

Standard: PRC-001-1

Requirement: R4

Sub Requirement(s):

Function(s) Applicable to Possible Violation:

☐ BA	☒ TOP	☐ TO	☐ GO	☐ GOP	☐ LSE
☐ DP	☐ PSE	☐ TSP	☐ PA	☐ RP	☐ TP
☐ RSG	☐ RC	☐ IA			

Date violation occurred: June 18, 2007

Date violation discovered (End Date of Audit, Spot Check, or Investigation):

Is the violation still occurring? ☐ Yes ☒ No

Detailed explanation and cause of violation: PRC-001-1 (R4) (requiring each Transmission Operator to coordinate the protection systems on major transmission lines and at the interconnections with neighboring Generator Operators).

Duke failed to coordinate specific relay functions when it installed its protection systems at the Mill Creek Generation Station, which indicates that Duke's coordination "process" during the coordination phase of new generation interconnections is flawed, unstructured, and unreliable.

Pursuant to Reliability Standard PRC-001-1 R4, Duke must coordinate its protection system. The protection system at Mill Creek includes a phase distance relay function protecting each of the generation units there.[1] This relay function misoperated in response to the Event because Duke never fully assessed the protection system design at this generation station to ensure proper calculation and setting of that function in coordination with the transmission system.

At the time of the Mill Creek Generation Station construction, the contract engineering firm and a Duke engineer worked together to coordinate design and relay settings for the protection systems at the station and at the point of interconnection. Neither engineer involved in that process familiarized himself fully with the protection system on the other side of the interconnection, with the result that the two individuals had an exchange of settings in which they misunderstood each other and thereby failed to apply a time setting to certain relay functions for the relays protecting the generating units.[2] The misunderstanding would not have occurred if Duke had a routine process for exchanging information necessary to coordinate interconnecting generation stations with the transmission system.[3] Duke acknowledged that it had not been aware that the particular relay function triggered by the Event existed, arguing that a contractor designed the Mill Creek protection system and did not apply Duke's standard design.[4]

Duke could not explain why it had not familiarized itself with the proposed generation protection system design during the interconnection process in a manner that ensured the complete coordination of all interconnected protection systems. Duke had uncoordinated protection system functions on its system as of June 18, 2007 and as of the day of the Event. Duke's coordination process for generation protection systems was, until 2008, a one-time exercise completed at the time of the generation station's installation and

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[1] *SERC Event Analysis*, *supra* note 8, at 18.

[2] A Duke engineer, James O'Brien, had responsibility for coordinating the Mill Creek protection system with the transmission system. Deposition of James M. O'Brien (Oct. 14, 2008) [hereinafter *O'Brien Deposition*], 45:24-46:3; 60:16-19. Chris Roseman of Duke Fluor Daniels, the contractor building Mill Creek, emailed Mr. O'Brien on July 6, 2002 seeking information for the purpose of coordinating certain relay functions protecting generation units at Mill Creek, including the backup phase distance relay function. *Id*. at 46:14-42 and Exhibit 6. Mr. O'Brien responded with the time delay associated with protection of the bus line connecting Mill Creek to the switching station. *Fountain Deposition*, *supra* note 49, 36:21-38:5. Mr. Roseman did not recognize the miscommunication and subsequently applied the improper time delay to his calculations of the settings for the generation protection relay. *O'Brien Deposition*, 51:15-52:10 and Exhibit 7.

[3] When requested for a copy of Duke's relay coordination procedures, Duke provided a written procedure regarding collection and storage of protection system information at generation interconnections, for the purpose of relay coordination, which it created in early 2008. *See* Response to Question No. 25 of the Commission's First Set of Data Requests to Duke Energy Carolinas, LLC (Oct. 24, 2008) and Attachment 25-1 (the PRC-001-1 Procedure). Duke also provided a document specifying "[i]nformation required by the Protective Relay Engineering Group of Duke Power Co. for extra facilities cost of cogeneration projects", which requires customers with generation to provide Duke "one line drawing of cogeneration power system including generators, breakers, reactors and resistors". *See* Response to Request No. 23 of the Commission's First Set of Data Requests by Duke Energy Carolinas, LLC (Oct. 24, 2008), Attachment 23-4. It does not appear, however, that Duke consistently sought and received this information for every generation station it connected to its transmission system at the time it coordinated Mill Creek's protection system, as of June 18, 2007, at the time of this Event, or at any time prior to creation of the PRC-001-1 Procedure in 2008.

[4] *See* Response to Question No. 2b of the SERC CVI Request for Information No. 1 to Duke Carolinas, LLC (Apr. 11, 2008), at 3; *see* Response to Question No. 2a of the SERC CVI Request for Information No. 1 to Duke Carolinas, LLC (Apr. 11, 2008), at 3.

interconnection, and it was conducted without the safeguard of a methodology to ensure complete and comprehensive review by the transmission protection engineers of the proposed interconnecting protection system. [5]

In summary, Duke failed to coordinate certain relay functions at Mill Creek in violation of PRC-001-1 R4, as a result of a coordination process for new interconnections that was not careful and methodical. The relay design and coordination issues described above, and the fact that Duke was unaware of several locations on its system where the protection system component represented a single point of failure, exemplify a serious deficiency in Duke's approach to relay design and coordination generally. Without a program implementing well-established protocols that ensure methodical and complete coordination and design of protection systems, Duke is potentially unaware of the purpose and limitations of protection systems throughout its control area in violation of PRC-001-1 R4 and to the detriment of BPS reliability. Furthermore, Duke may be in violation of these requirements of PRC-001-1 with respect to other relays and relay functions on its system because it cannot successfully coordinate around protection system designs and relay functions of which it has incomplete knowledge.

Reliability Impact (Minimal, Moderate, or Severe): Moderate

Reliability Impact Description: Given the circumstances the risk here seems to be more likely to occur on units where Duke is not the owner/operator. Since Duke is owner/operator in most of the generation within its system, this seems to minimize the risk to the BES.

Please complete the form as completely as possible and email to serccomply@serc1.org.

[5] *See id.*; *see also* Response to Question No. 12 of the Commission's First Set of Data Requests to Duke Carolinas, LLC (Oct. 24, 2008), Attachment 12-16 (E-mail from Thomas V. Pruitt, Duke, to Victoria L. Bannon, Duke (Dec. 24, 2007) (stating that "Duke did not perform a thorough review of the generator protective settings at the time of [Mill Creek] completion")).

Post Audit/Spot Check/Investigation Screening Worksheet

Prepared By: Mark Ladrow

Submittal Date: 09/28/11

Compliance Monitoring Method (Audit, Spot-Check, or Investigation): CVI

Registered Entity: Duke Energy Carolinas

NERC Registry ID: NCR01219

Registered Entity Contact Information:
Name: Mike Kuhl
Email: Michael.Kuhl@duke-energy.com

Standard: PRC-005-1

Requirement: R1

Sub Requirement(s): R1.2

Function(s) Applicable to Possible Violation:

☐ BA	☐ TOP	☒ TO	☐ GO	☐ GOP	☐ LSE
☐ DP	☐ PSE	☐ TSP	☐ PA	☐ RP	☐ TP
☐ RSG	☐ RC	☐ IA			

Date violation occurred: June 18, 2007

Date violation discovered (End Date of Audit, Spot Check, or Investigation):

Is the violation still occurring? ☐ Yes ☒ No

Detailed explanation and cause of violation:

PRC-005-1 (R1.2) (requiring that the Transmission Owner maintain a summary of maintenance and testing procedures as part of its protection systems maintenance and testing program).

Duke did not maintain an adequate summary of its maintenance and testing program and procedures pursuant to PRC-005-1 R1.2, which requires that Duke have a maintenance and testing "program" that includes a "summary" of maintenance and testing procedures.

The purpose of this standard is to ensure maintenance and testing of all transmission and generation Protection Systems. PRC-005-1 R1.2 requires summary documents that reflect the practices that ensure regular and proper completion of protection system maintenance.

Duke's "summary" of its maintenance and testing program failed to provide the usefulness envisioned by the standard. The documents provided no dates, no signatures, no revision history, no logo, nor any other indicia that they reflect corporate policy or are otherwise disseminated as corporate documents.[1] These documents provided little information as to testing procedure, and do not reflect program controls that Duke applies to maintenance and testing generally to ensure that relay testing is regular, methodical, and completed successfully. Moreover, Duke also informed CVI Team members that these documents did not exist until "sometime in April 2008" before the SERC audit of Duke that commenced in May 2008.

Duke's program documents indicate that Duke lacked a recognized controlling methodology for maintenance and testing. Testimony by a veteran Duke relay technician established that Duke did not provide its technicians a controlling methodology that could help ensure consistency in implementation of the maintenance and testing procedures. Although Duke provided its technicians with notices of practice changes, it could not demonstrate process or procedure to ensure that each field technician consistently adheres to all applicable procedures governing maintenance of a particular protection device[2] or that technicians follow through with maintenance indicated by test results.[3]

In its response to the preliminary letter of findings, Duke admitted that its program summary was inadequate to meet PRC-005-1 R1.2 of the standard, and committed to redraft the summary documents to make them "more elaborate, formalized, and process-oriented".[4] In advance of a June 13, 2010 phone call with Commission staff, Duke provided its "Power Delivery Preventive Maintenance Program Summary" issued May 3, 2010. This document describes the roles and responsibilities related to the preventive maintenance program and also a general description of the tasks involved and how they

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[1] When asked for its maintenance and testing summary, Duke produced two MS Word documents: a "Summary of Fossil/Hydro Generation and Transmission Maintenance and Testing Procedures" and a "Summary of Fossil/Hydro Generation and Transmission Protection System Maintenance and Testing Guidelines". *See* Deposition of James W. Bowden (Oct. 14, 2008) at Exhibit 1 and Exhibit 3 (Protection Systems Maintenance and Testing Guidelines.doc and Summary of Maintenance and Testing Procedures.doc). Duke did not provide additional documents in response to the preliminary finding that these documents are not sufficient to satisfy the standard.

[2] Deposition of Dennis Richard Stamey (Oct. 15, 2008) [hereinafter *Stamey Deposition*], 21:1-23:4. Duke communicates relay installation and work practice changes, developed through the "relay practice team", through "Power Delivery Letters" that are posted in Duke's intranet and also distributed by email to personnel who work on system protection. *See* Response to Question No. 18 of the Commission's First Set of Data Requests to Duke Energy Carolinas, LLC (Oct. 24, 2008). Mr. Stamey represented, however, that his own approach to testing generally is a matter of personal practice. Stamey Deposition, at 37:7-11. Staff does not find that the Power Delivery Letters adequately substitute for a single written and recognized procedure – either in summary or some other form.

[3] *Id.*, 33:4-15. David Fountain, a relay engineer with Duke for twenty-five years, also testified that he is not aware of procedures relating to accountability of field technicians performing preventative maintenance. Deposition of J. David Fountain [hereinafter *Fountain Deposition*], 31:17-21.

[4] *Duke Response Letter*, *supra* note 12, at 25.

contribute to the program.[5] The CVI Team believes that, with some small revisions, this document will adequately serve as the summary document contemplated by the standard. The document does not eliminate the finding of Possible Violation, however, because Duke did not issue it until May 2010 – almost three years after the Event.

Reliability Impact (Minimal, Moderate, or Severe): Moderate

Reliability Impact Description: Without guiding documentation, persons responsible for carrying out the task of relay maintenance may not comprehend the scope or importance of proper calibration and documentation.

Please complete the form as completely as possible and email to serccomply@serc1.org.

[5] *See* Email from Jeff Trepel, Associate General Counsel, Duke Energy Corp. to Lauren Rosenblatt, Attorney, Federal Energy Regulatory Commission (June 10, 2010), Attachment "Duke Energy Carolinas FERC Follow Up Discussion Items with regard to Broad River Response Letter dated 3/27/09".

Attachment c

Duke's Mitigation Plan designated as SERCMIT008308 for PRC-001-1 R1 and R4 submitted September 7, 2012

Edit - Mitigation Plan

* Required Fields

Status: Saved

Mitigation Plan Summary

Mitigation Plan Status:	Region reviewing Mitigation Plan
NERC Mitigation Plan #:	
Associated Violations:	SERC2011008227 SERC2011008228
Mitigation Plan Due Date:	
Expected Completion Date:	6/1/2014

Section A: Compliance Notices & Mitigation Plan Requirements

A.1 Notices and requirements applicable to Mitigation Plans and this Submittal Form are set forth in "Attachment A - Compliance Notices & Mitigation Plan Requirements" to this form.

A.2 ☐ I have reviewed Attachment A and understand that this Mitigation Plan Submittal Form will not be accepted unless this box is checked.

Section B: Registered Entity Information

B.1 Identify your organization

Company Name: Duke Energy Carolinas

Company Address: 526 S. Church Street, EC02B
Charlotte, North Carolina
28202

NERC Compliance Registry ID: NCR01219

B.2 Identify the individual in your organization who will be the Entity Contact regarding this Mitigation Plan.

Name: * Michael Kuhl

E-Mail: Michael.Kuhl@duke-energy.com

Section C: Identification of Alleged or Confirmed Violation(s) Associated with this Mitigation Plan

C.1 This Mitigation Plan is associated with the following Alleged or Confirmed violation(s) of the reliability standard listed below.

Applicable Standard, Requirement(s) and Date Reported to Region:

Standard: PRC-001-1

☐ PRC-001-1 R1. (09/27/2011)

☐ PRC-001-1 R4. (09/27/2011)

C.2 Identify the cause of the Alleged or Confirmed violation(s) identified above. Additional detailed information may be provided as an attachment:

A transformer bushing on the “high side” of an 18 kV-to-230 kV step-up transformer at a generation unit inside Broad River Energy Center (BREC), cracked and caused a single-line-to-ground fault. BREC’s Protection System response for the transformer relies on a single lockout relay. The relay signals the breaker nearest the transformer, which is the primary or first layer of Protection System response. The same relay also, through the breaker failure scheme, signals the next-nearest breakers at Riverview that operate as the secondary layer of Protection System response. When breakers receive a signal, they open to isolate the area affected by the fault from the rest of the transmission system. During the Event, the lockout relay failed to send the signals to the primary breaker and the breaker failure scheme; thus, the Protection System designed to contain a fault at the transformer and protect the interconnected

transmission was unable to do so. This Protection System design failed because the lockout relay became a “single point of Protection System failure.” As a result of the relay’s failure to signal the first and second layers of protection, the fault endured, graduating to a three-phase fault, until remote Protection System devices opened breakers and thereby de-energized four 230 kV transmission lines to isolate the fault. The fault also triggered the “misoperation” of nearby generator relays because Duke Energy Carolinas (Duke) had failed to correctly coordinate the transmission Protection Systems.

The Protection System inside BREC relied exclusively on the non-redundant 86T lockout relay to isolate a fault at the transformer. Duke was not aware of the limitation of the generation-side Protection System at BREC; specifically, that it included a single point of failure that disabled both the primary and secondary layers of protection.

The Protection System at Mill Creek includes a phase distance relay function to protect its generation units. This relay function misoperated in response to the Event because Duke did not fully assess the Protection System design at the Mill Creek generation station to ensure proper calculation and setting of that function in coordination with the transmission system.

C.3 Provide any additional relevant information regarding the Alleged or Confirmed violations associated with this Mitigation Plan.
Additional detailed information may be provided as an attachment:

See response to C.2

Section D: Details of Proposed Mitigation Plan

D.1 Identify and describe the action plan, including specific tasks and actions that your organization is proposing to undertake, or which it undertook if this Mitigation Plan has been completed, to correct the Alleged or Confirmed violations identified above in Part C.1 of this form.
Additional detailed information may be provided as an attachment:

Duke Energy Carolinas (DEC) provides its Real-time System Operators with training to be familiar with the protection system schemes, i.e. relay elements and associated zones of protection applied in the DEC Transmission Operator Area. Training for the System Operators consists of subject matter experts covering the basics of different types of power system relaying with a focus on the necessity of maintaining adequate relay protection of power system equipment at all times. The training gives operators a familiarity of the purpose and limitations of protection system relaying.

Duke completed activities as a part of earlier mitigation:
1) Ripp Switching Station - remedied potential single point of failure (11/26/2007)
2) Mill Creek - time delay settings for distance relays (1/18/2008)
3) Riverview - remedied potential single point of failure (11/6/2008)
4) Woodleaf - Protection assessment completed on 1/17/2009, no corrective actions were required.
5) Riverbend 6 - remedied potential single point of failure (6/4/2009)
6) Cliffside 5 - remedied potential single point of failure (10/30/2009)
7) Jocasse - remedied potential single point of failure (11/19/2009)
8) Belews Creek - remedied potential single point of failure (10/28/2010)

The single point of failure at BREC was resolved by adding additional protection at Riverview Switching Station on the bus lines to BREC that can detect faults beyond the bus line breakers at BREC. Previous protection only consisted of line differential schemes. These upgrades were completed on 11/6/2008.

In addition to BREC, other generation stations located on Duke’s transmission system were evaluated for potential single points of failure that could impact the reliability of the BES. This review identified single points of failure and corrective actions at six additional locations. All but one of the locations has been remediated. Completed corrective actions including specific locations and the date of completion are listed above. Section D.3 contains information for the location subject to additional remediation.

The misoperation at Mill Creek was due to incorrect time delay settings for distance relays. This was evaluated and corrective action was taken for the Mill Creek relays on 1/14/2008.

In addition to Mill Creek, other generation stations on Duke's transmission system were evaluated for similar coordination issues that could impact the reliability of the BES. There were no other stations found with similar coordination issues.

More recently, Duke is coordinating generation and transmission Protection Systems using the NERC Technical Reference Document "Power Plant and Transmission System Protection Coordination" as a basis for new and modified Protection Systems. This method is more comprehensive than what was originally used to evaluate Mill Creek and BREC and is intended to ensure proper calculation and settings of critical generator protection functions to coordinate with the transmission system.

D.2 Provide the date by which full implementation of the Mitigation Plan will be, or has been, completed with respect to the Alleged or Confirmed violations identified above. State whether the Mitigation Plan has been fully implemented:

* 6/1/2014

D.3 Enter Milestone Activities, with due dates, that your organization is proposing, or has completed, for this Mitigation Plan:

Milestone	Description	Status	Due Date	Completed Date	
Oconee Milestone 1	Unit 1 Engineering Change Package Approval (EC 101903); Unit 1 Work Orders Planned; Unit 1 Implementation Procedures Approved; Unit 1 Readiness Review; Unit 3 Engineering Change Package Approval (EC 101905), and; Unit 3 Work Orders Planned	Milestone Pending	10/15/2012		Detail
Oconee Milestone 2	Unit 1 Field Complete Unit 3 implementation Procedures Approved	Milestone Pending	1/12/2013		Detail
Oconee Milestone 3	Unit 2 Engineering Change Package Approval (EC 101904)	Milestone Pending	4/11/2013		Detail
Oconee Milestone 4	Unit 2 Work Orders Planned Unit 2 Implementation Procedures Approved	Milestone Pending	7/9/2013		Detail
Oconee Milestone 5	Unit 2 Readiness Review	Milestone Pending	10/6/2013		Detail
Oconee Milestone 6	Unit 2 Field Complete	Milestone Pending	1/3/2014		Detail
Oconee Milestone 7	Unit 3 Readiness Review	Milestone Pending	3/7/2014		Detail
Oconee Milestone 8	Unit 3 Field Complete	Milestone Pending	6/1/2014		Detail

Milestone Comment: Milestone Completed Date:

Close Current Milestone

Section E: Interim and Future Reliability Risk

Abatement of Interim BPS Reliability Risk

E.1 While your organization is implementing this Mitigation Plan the reliability of the Bulk Power System (BPS) may remain at higher risk or be otherwise negatively impacted until the plan is successfully completed. To the extent they are, or may be, known or anticipated: (i) identify any such risks or impacts; and (ii) discuss any actions that your organization is planning to take to mitigate this increased risk to the reliability of the BPS.
Additional detailed information may be provided as an attachment:

* Duke remedied single points of failure at six of seven locations. The remaining location involves Oconee Nuclear Station. The completion of engineering changes at Oconee requires removing the primary offsite power path from service to install and test the engineering change. Offsite power is a very important element of the safe operation of a nuclear plant and as a result these engineering changes will be installed during a refueling outage which is the safest condition to remove the primary offsite power path from service for maintenance or modification.

Additionally, reference D.1 and D.3.

Prevention of Future BPS Reliability Risk

E.2 Describe how successful completion of this Mitigation Plan will prevent or minimize the

probability that your organization incurs further risk of Alleged violations of the same or similar reliability standards requirements in the future.
Additional detailed information may be provided as an attachment:

* Duke is involved with industry activities considering single points of failure of Protection Systems to ensure an understanding of the requirements necessary for the reliability of the BES.

Duke is coordinating generation and transmission Protection Systems using the NERC Technical Reference Document "Power Plant and Transmission System Protection Coordination" as a basis for new and modified Protection Systems. This method is more comprehensive than what was originally used to evaluate Mill Creek and BREC and is intended to ensure proper calculation and settings of critical generator protection functions to coordinate with the transmission system. Part of this review requires an evaluation of potential single points of failure that could impact the reliability of the BES.

Section F: Authorization

An authorized individual must sign and date this Mitigation Plan Submittal Form. By doing so, this individual, on behalf of your organization:

a) Submits this Mitigation Plan for acceptance by **SERC** and approval by NERC, and

b) If applicable, certifies that this Mitigation Plan was completed on or before the date provided as the 'Date of Completion of the Mitigation Plan' on this form, and

c) Acknowledges:

1. I am **Holly Wenger** of **Duke Energy Carolinas**
2. I am qualified to sign this Mitigation Plan on behalf of **Duke Energy Carolinas**
3. I understand **Duke Energy Carolinas's** obligations to comply with Mitigation Plan requirements and ERO remedial action directives as well as ERO documents, including, but not limited to, the NERC Rules of Procedure, including Appendixe 4(C) (Compliance Monitoring and Enforcement Program of the North American Electric Reliability Corporation (NERC CMEP))
4. I have read and am familiar with the contents of this Mitigation Plan
5. **Duke Energy Carolinas** agrees to comply with, this Mitigation Plan, including the timetable completion date, as accepted by **SERC** and approved by NERC

Authorized Signatory Holly Wenger notified on 9/7/2012
Signed By Holly Wenger on 9/7/2012

Section G: Regional Entity Contact

Please direct any questions regarding completion of this form to:

SERC Single Point of Contact (SPOC)

Save PDF | Return to Mit Plan Search

Attachment d

Duke's Mitigation Plan designated as SERCMIT007845 for PRC-005-1 R1 submitted August 7, 2012

Edit - Mitigation Plan

* Required Fields

Status: Saved

Mitigation Plan Summary

Mitigation Plan Status:	**Region reviewing Mitigation Plan**
NERC Mitigation Plan #:	
Associated Violations:	**SERC2011008229**
Mitigation Plan Due Date:	
Expected Completion Date:	**2/19/2011**

Section A: Compliance Notices & Mitigation Plan Requirements

A.1 **Notices and requirements applicable to Mitigation Plans and this Submittal Form are set forth in "Attachment A - Compliance Notices & Mitigation Plan Requirements" to this form.**

A.2 ☐ I have reviewed Attachment A and understand that this Mitigation Plan Submittal Form will not be accepted unless this box is checked.

Section B: Registered Entity Information

B.1 **Identify your organization**

Company Name: Duke Energy Carolinas

Company Address: 526 S. Church Street, EC02B
Charlotte, North Carolina
28202

NERC Compliance Registry ID: NCR01219

B.2 **Identify the individual in your organization who will be the Entity Contact regarding this Mitigation Plan.**

Name: * Michael Kuhl

E-Mail: Michael.Kuhl@duke-energy.com

Section C: Identification of Alleged or Confirmed Violation(s) Associated with this Mitigation Plan

C.1 **This Mitigation Plan is associated with the following Alleged or Confirmed violation(s) of the reliability standard listed below.**

Applicable Standard, Requirement(s) and Date Reported to Region:

Standard: PRC-005-1 6

☐ PRC-005-1 R1.[PRC-005-1 R1.2.][PRC-005-1 R1.1.] (09/27/2011)

C.2 **Identify the cause of the Alleged or Confirmed violation(s) identified above. Additional detailed information may be provided as an attachment:**

* Duke Energy Carolinas, LLC (DE Carolinas) original “Summary of Maintenance and Testing Procedures” document included both Transmission and Fossil/Hydro Generation maintenance and testing procedures. It identified activities associated with the maintenance and testing of all five elements for PRC-001-1 (protective relays, communication systems, batteries, voltage and current sensing devices, and DC control circuitry). However, this document was not formalized with dates, signatures, and a revision log.

C.3 **Provide any additional relevant information regarding the Alleged or Confirmed violations associated with this Mitigation Plan. Additional detailed information may be provided as an attachment:**

* None

Section D: Details of Proposed Mitigation Plan

D.1 Identify and describe the action plan, including specific tasks and actions that your organization is proposing to undertake, or which it undertook if this Mitigation Plan has been completed, to correct the Alleged or Confirmed violations identified above in Part C.1 of this form. Additional detailed information may be provided as an attachment:

The original "Summary of Maintenance and Testing Procedures" document was revised to focus only on DE Carolinas Transmission procedures and to include dates, approval signatures, and a revision log. DE Carolinas Fossil/Hydro Generation created separate maintenance and testing documents which included dates and a revision log. The following is a list of the revised "Summary of Maintenance and Testing Procedures" documents for the TO and GO functions (attached):

TO
Duke Energy Field Operations Carolinas Power Delivery Summary of Maintenance and Testing Procedures for Protection System Equipment in Substations – dated 6/1/2010, Revision 0. (Maintenance and Testing Substation.pdf)

GO
Duke Energy Fossil/Hydro Generation Protective Systems Work Practices – dated 2/17/2011, Version 0. (Duke Energy Fossil-Hydro Generation Protective System Testing Program Work Practices R1.0 (1).docx)
* Fossil/Hydro Generation Summary of Battery Maintenance Procedures – dated 11/23/2010, Revision 1. (Duke Energy Fossil-Hydro Generation Battery and Charger Work Practices1.docx)

The following interval and basis documents are attached to show completeness of documentation for PRC-005-1 Requirement 1:

TO
Excerpts from Power Delivery Preventive Maintenance Intervals (North Carolina) – dated 2/10/11, Revision 6. (Excerpts from Maintenance and Inspection North Carolina.pdf)
Excerpts from Power Delivery Preventive Maintenance Intervals (South Carolina) – dated 2/10/11, Revision 6. (Excerpts from Maintenance and Inspection South Carolina.pdf)
Power Delivery Preventive Maintenance Program Summary – dated 5/3/2010, Revision 0. (PD Duke Preventive Maintenance Program Summary.pdf)

GO
NERC PRC-005-1 Duke Energy Fossil/Hydro Generation Protection System Maintenance and Testing – dated 2/19/2011, Revision 2. (PRC-005-1 Evidence Doc (r2).docx)

D.2 Provide the date by which full implementation of the Mitigation Plan will be, or has been, completed with respect to the Alleged or Confirmed violations identified above. State whether the Mitigation Plan has been fully implemented:

* 2/19/2011

D.3 Enter Milestone Activities, with due dates, that your organization is proposing, or has completed, for this Mitigation Plan:

No Mitigation Milestones Defined for Mitigation Plan

Section E: Interim and Future Reliability Risk

Abatement of Interim BPS Reliability Risk

E.1 While your organization is implementing this Mitigation Plan the reliability of the Bulk Power System (BPS) may remain at higher risk or be otherwise negatively impacted until the plan is successfully completed. To the extent they are, or may be, known or anticipated: (i) identify any such risks or impacts; and (ii) discuss any actions that your organization is planning to take to mitigate this increased risk to the reliability of the BPS. Additional detailed information may be provided as an attachment:

* The Mitigation Plan was completed on 2/19/2011.

Prevention of Future BPS Reliability Risk

E.2 Describe how successful completion of this Mitigation Plan will prevent or minimize the probability that your organization incurs further risk of Alleged violations of the same or similar reliability standards requirements in the future. Additional detailed information may be provided as an attachment:

The completion of the Mitigation Plan minimizes the probability that DEC will incur further risk of alleged violations of the same or similar reliability standard because completion of the

* Mitigation Plan results in an improved “Summary of Maintenance and Testing Procedures” document that reflects the practices that ensure regular and proper maintenance and testing of Protection System elements/devices.

Section F: Authorization

An authorized individual must sign and date this Mitigation Plan Submittal Form. By doing so, this individual, on behalf of your organization:

a) Submits this Mitigation Plan for acceptance by **SERC** and approval by NERC, and

b) If applicable, certifies that this Mitigation Plan was completed on or before the date provided as the 'Date of Completion of the Mitigation Plan' on this form, and

c) Acknowledges:

1. I am **Holly Wenger** of **Duke Energy Carolinas**
2. I am qualified to sign this Mitigation Plan on behalf of **Duke Energy Carolinas**
3. I understand **Duke Energy Carolinas's** obligations to comply with Mitigation Plan requirements and ERO remedial action directives as well as ERO documents, including, but not limited to, the NERC Rules of Procedure, including Appendixe 4(C) (Compliance Monitoring and Enforcement Program of the North American Electric Reliability Corporation (NERC CMEP))
4. I have read and am familiar with the contents of this Mitigation Plan
5. **Duke Energy Carolinas** agrees to comply with, this Mitigation Plan, including the timetable completion date, as accepted by **SERC** and approved by NERC

Authorized Signatory Holly Wenger notified on 8/6/2012
Signed By Holly Wenger on 8/7/2012

Section G: Regional Entity Contact

Please direct any questions regarding completion of this form to:

SERC Single Point of Contact (SPOC)

Save PDF | Return To Search Results | Mitigation Plan Closure

Attachment e

Duke's Certification of Mitigation Plan Completion for PRC-005-1 R1 submitted September 17, 2012

Edit

* Required Fields

Status: Saved

All Mitigation Plan Completion Certification submittals shall include data or information sufficient for SERC to verify completion of the Mitigation Plan. SERC may request such additional data or information and conduct follow-up assessments, on-site or other Spot Checking, or Compliance Audits as it deems necessary to verify that all required actions in the Mitigation Plan have been completed and the Registered Entity is in compliance with the subject Reliability Standard. (CMEP Section 6.6) Data or information submitted may become part of a public record upon final disposition of the possible violation, therefore any confidential information contained therein should be marked as such in accordance with the provisions of Section 1500 of the NERC Rules of Procedure.

Name of Registered Entity submitting certification: **Duke Energy Carolinas**

Date of Certification: 09/17/2012

Name of Standard of mitigation violation(s): PRC-005-1

Mitigated information:

Requirement	Tracking Number	Violation ID
R1.	SERC2011-401153	SERC2011008229

Date of completion of the Mitigation Plan:

2/19/2011

Summary of all actions described in Part D of the releveant mitigation plan:

The original “Summary of Maintenance and Testing Procedures” document was revised to focus only on DE Carolinas Transmission procedures and to include dates, approval signatures, and a revision log. DE Carolinas Fossil/Hydro Generation created separate maintenance and testing documents which included dates and a revision log.

Description of the information provided to SERC for their evaluation:

The following is a list of the
revised “Summary of Maintenance and Testing Procedures” documents for the TO and GO functions (attached to original Mitigation Plan):
TO
Duke Energy Field Operations Carolinas Power Delivery Summary of Maintenance and Testing Procedures for Protection System Equipment in Substations – dated 6/1/2010, Revision 0. (Maintenance and Testing Substation.pdf)
GO
Duke Energy Fossil/Hydro Generation Protective Systems Work Practices – dated 2/17/2011, Version 0. (Duke Energy Fossil-Hydro Generation Protective System Testing Program Work Practices R1.0 (1).docx)
Fossil/Hydro Generation Summary of Battery Maintenance Procedures – dated 11/23/2010, Revision 1. (Duke Energy Fossil-Hydro Generation Battery and Charger Work Practices1.docx)
The following interval and basis documents are attached to show completeness of documentation for PRC-005-1 Requirement 1:
TO
Excerpts from Power Delivery Preventive Maintenance Intervals (North Carolina) – dated 2/10/11, Revision 6. (Excerpts from Maintenance and Inspection North Carolina.pdf)
Excerpts from Power Delivery Preventive Maintenance Intervals (South Carolina) – dated 2/10/11, Revision 6. (Excerpts from Maintenance and Inspection South Carolina.pdf)
Power Delivery Preventive Maintenance Program Summary – dated 5/3/2010, Revision 0. (PD

Duke Preventive Maintenance Program Summary.pdf)
GO
NERC PRC-005-1 Duke Energy Fossil/Hydro Generation Protection System Maintenance and Testing – dated 2/19/2011, Revision 2. (PRC-005-1 Evidence Doc (r2).docx)

I certify that the mitigation plan for the above-named violation has been completed on the date shown above. In doing so, I certify that all required mitigation plan actions described in Part D of the relevant mitigation plan have been completed, compliance has been restored, the above-named entity is currently compliant with all of the requirements of the referenced standard, and that all information submitted is complete, true and correct to the best of my knowledge.

Authorized Signatory Holly Wenger notified on 9/17/2012

Signed By Holly Wenger on 9/17/2012

Attachment f

Notice of Filing

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Duke Energy Carolinas Docket No. NP13-___-000

NOTICE OF FILING
December 31, 2012

Take notice that on December 31, 2012, the North American Electric Reliability Corporation (NERC) filed a Notice of Penalty regarding Duke Energy Carolinas in the SERC Reliability Corporation region.

Any person desiring to intervene or to protest this filing must file in accordance with Rules 211 and 214 of the Commission's Rules of Practice and Procedure (18 CFR 385.211, 385.214). Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to the proceeding. Any person wishing to become a party must file a notice of intervention or motion to intervene, as appropriate. Such notices, motions, or protests must be filed on or before the comment date. On or before the comment date, it is not necessary to serve motions to intervene or protests on persons other than the Applicant.

The Commission encourages electronic submission of protests and interventions in lieu of paper using the "eFiling" link at http://www.ferc.gov. Persons unable to file electronically should submit an original and 14 copies of the protest or intervention to the Federal Energy Regulatory Commission, 888 First Street, N.E., Washington, D.C. 20426.

This filing is accessible on-line at http://www.ferc.gov, using the "eLibrary" link and is available for review in the Commission's Public Reference Room in Washington, D.C. There is an "eSubscription" link on the web site that enables subscribers to receive email notification when a document is added to a subscribed docket(s). For assistance with any FERC Online service, please email FERCOnlineSupport@ferc.gov, or call (866) 208-3676 (toll free). For TTY, call (202) 502-8659.

Comment Date: [BLANK]

Kimberly D. Bose,
Secretary