

A. Introduction

1. **Title:** Nuclear Plant Interface Coordination
2. **Number:** NUC-001-4
3. **Purpose:** This standard requires coordination between Nuclear Plant Generator Operators and Transmission Entities for the purpose of ensuring nuclear plant safe operation and shutdown.
4. **Applicability:**
 - 4.1. **Functional Entities:**
 - 4.1.1 Nuclear Plant Generator Operators.
 - 4.2. Transmission Entities shall mean all entities that are responsible for providing services related to Nuclear Plant Interface Requirements (NPIRs). Such entities may include one or more of the following:
 - 4.2.1 Transmission Operators.
 - 4.2.2 Transmission Owners.
 - 4.2.3 Transmission Planners.
 - 4.2.4 Transmission Service Providers.
 - 4.2.5 Balancing Authorities.
 - 4.2.6 Reliability Coordinators.
 - 4.2.7 Planning Coordinators.
 - 4.2.8 Distribution Providers.
 - 4.2.9 Generator Owners.
 - 4.2.10 Generator Operators.
5. **Effective Date:** See Implementation Plan.

B. Requirements and Measures

- R1.** The Nuclear Plant Generator Operator shall provide the proposed NPIRs in writing to the applicable Transmission Entities and shall verify receipt. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- M1.** The Nuclear Plant Generator Operator shall, upon request of the Compliance Enforcement Authority, provide a copy of the transmittal and receipt of transmittal of the proposed NPIRs to the responsible Transmission Entities.
- R2.** The Nuclear Plant Generator Operator and the applicable Transmission Entities shall have in effect one or more Agreements¹ that include mutually agreed to NPIRs and document how the Nuclear Plant Generator Operator and the applicable Transmission Entities shall address and implement these NPIRs. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- M2.** The Nuclear Plant Generator Operator and each Transmission Entity shall each have a copy of the currently effective Agreement(s) which document how the Nuclear Plant Generator Operator and the applicable Transmission Entities address and implement the NPIRs available for inspection upon request of the Compliance Enforcement Authority.
- R3.** Per the Agreements developed in accordance with this standard, the applicable Transmission Entities shall incorporate the NPIRs into their planning analyses of the electric system and shall communicate the results of these analyses to the Nuclear Plant Generator Operator.: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- M3.** Each Transmission Entity responsible for planning analyses in accordance with the Agreement shall, upon request of the Compliance Enforcement Authority, provide a copy of the planning analyses results transmitted to the Nuclear Plant Generator Operator, showing incorporation of the NPIRs. The Compliance Enforcement Authority shall refer to the Agreements developed in accordance with this standard for specific requirements.
- R4.** Per the Agreements developed in accordance with this standard, the applicable Transmission Entities shall *[Violation Risk Factor: High] [Time Horizon: Operations Planning and Real-time Operations]*
- 4.1.** Incorporate the NPIRs into their operating analyses of the electric system.
- 4.2.** Operate the electric system to meet the NPIRs.

¹ Agreements may include mutually agreed upon procedures or protocols in effect between entities or between departments of a vertically integrated system.

- 4.3. Inform the Nuclear Plant Generator Operator when the ability to assess the operation of the electric system affecting NPIRs is lost.
- M4.** Each Transmission Entity responsible for operating the electric system in accordance with the Agreement shall demonstrate or provide evidence of the following, upon request of the Compliance Enforcement Authority:
- The NPIRs have been incorporated into the current operating analysis of the electric system. (Requirement 4.1)
 - The electric system was operated to meet the NPIRs. (Requirement 4.2)
 - The Transmission Entity informed the Nuclear Plant Generator Operator when it became aware it lost the capability to assess the operation of the electric system affecting the NPIRs
- R5.** Per the Agreements developed in accordance with this standard, the Nuclear Plant Generator Operator shall operate the nuclear plant to meet the NPIRs. *[Violation Risk Factor: High] [Time Horizon: Operations Planning and Real-time Operations]*
- M5.** The Nuclear Plant Generator Operator shall, upon request of the Compliance Enforcement Authority, demonstrate or provide evidence that the nuclear power plant is being operated consistent with the NPIRs.
- R6.** Per the Agreements developed in accordance with this standard, the applicable Transmission Entities and the Nuclear Plant Generator Operator shall coordinate outages and maintenance activities which affect the NPIRs. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*
- M6.** The Transmission Entities and Nuclear Plant Generator Operator shall, upon request of the Compliance Enforcement Authority, provide evidence of the coordination between the Transmission Entities and the Nuclear Plant Generator Operator regarding outages and maintenance activities which affect the NPIRs.
- R7.** Per the Agreements developed in accordance with this standard, the Nuclear Plant Generator Operator shall inform the applicable Transmission Entities of actual or proposed changes to nuclear plant design (e.g., protective relay setpoints), configuration, operations, limits, or capabilities that may impact the ability of the electric system to meet the NPIRs. *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*
- M7.** The Nuclear Plant Generator Operator shall provide evidence that it informed the applicable Transmission Entities of changes to nuclear plant design (e.g., protective relay setpoints), configuration, operations, limits, or capabilities that may impact the ability of the Transmission Entities to meet the NPIRs.

- R8.** Per the Agreements developed in accordance with this standard, the applicable Transmission Entities shall inform the Nuclear Plant Generator Operator of actual or proposed changes to electric system design (e.g., protective relay setpoints), configuration, operations, limits, or capabilities that may impact the ability of the electric system to meet the NPIRs. *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*
- M8.** The Transmission Entities shall each provide evidence that the entities informed the Nuclear Plant Generator Operator of changes to electric system design (e.g., protective relay setpoints), configuration, operations, limits, or capabilities that may impact the ability of the Nuclear Plant Generator Operator to meet the NPIRs.
- R9.** The Nuclear Plant Generator Operator and the applicable Transmission Entities shall include the following elements in aggregate within the Agreement(s) identified in R2.
- Where multiple Agreements with a single Transmission Entity are put into effect, the R9 elements must be addressed in aggregate within the Agreements; however, each Agreement does not have to contain each element. The Nuclear Plant Generator Operator and the Transmission Entity are responsible for ensuring all the R9 elements are addressed in aggregate within the Agreements.
 - Where Agreements with multiple Transmission Entities are required, the Nuclear Plant Generator Operator is responsible for ensuring all the R9 elements are addressed in aggregate within the Agreements with the Transmission Entities. The Agreements with each Transmission Entity do not have to contain each element; however, the Agreements with the multiple Transmission Entities, in the aggregate, must address all R9 elements. For each Agreement(s), the Nuclear Plant Generator Operator and the Transmission Entity are responsible to ensure the Agreement(s) contain(s) the elements of R9 applicable to that Transmission Entity. : *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- 9.1.** Retired. *[Note: Part 9.1 was retired under the Paragraph 81 project. The NUC SDT proposes to leave this Part blank to avoid renumbering Requirement parts that would impact existing agreements throughout the industry.]*
- 9.2.** Technical requirements and analysis:
- 9.2.1.** Identification of parameters, limits, configurations, and operating scenarios included in the NPIRs and, as applicable, procedures for providing any specific data not provided within the Agreement.
 - 9.2.2.** Identification of facilities, components, and configuration restrictions that are essential for meeting the NPIRs.
 - 9.2.3.** Types of planning and operational analyses performed specifically to support the NPIRs, including the frequency of studies and types of Contingencies and scenarios required.

- 9.3. Operations and maintenance coordination**
 - 9.3.1.** Designation of ownership of electrical facilities at the interface between the electric system and the nuclear plant and responsibilities for operational control coordination and maintenance of these facilities.
 - 9.3.2.** Identification of any maintenance requirements for equipment not owned or controlled by the Nuclear Plant Generator Operator that are necessary to meet the NPIRs.
 - 9.3.3.** Coordination of testing, calibration and maintenance of on-site and off-site power supply systems and related components.
 - 9.3.4.** Provisions to address mitigating actions needed to avoid violating NPIRs and to address periods when responsible Transmission Entity loses the ability to assess the capability of the electric system to meet the NPIRs. These provisions shall include responsibility to notify the Nuclear Plant Generator Operator within a specified time frame.
 - 9.3.5.** Provision for considering, within the restoration process, the requirements and urgency of a nuclear plant that has lost all off-site and on-site AC power.
 - 9.3.6.** Coordination of physical and cyber security protection at the nuclear plant interface to ensure each asset is covered under at least one entity's plan.
 - 9.3.7.** Coordination of the NPIRs with transmission system Remedial Action Schemes and any programs that reduce or shed load based on underfrequency or undervoltage.
- 9.4. Communications and training Administrative elements:**
 - 9.4.1.** Provisions for communications affecting the NPIRs between the Nuclear Plant Generator Operator and Transmission Entities, including communications protocols, notification time requirements, and definitions of applicable unique terms.
 - 9.4.2.** Provisions for coordination during an off-normal or emergency event affecting the NPIRs, including the need to provide timely information explaining the event, an estimate of when the system will be returned to a normal state, and the actual time the system is returned to normal.
 - 9.4.3.** Provisions for coordinating investigations of causes of unplanned events affecting the NPIRs and developing solutions to minimize future risk of such events.
 - 9.4.4.** Provisions for supplying information necessary to report to government agencies, as related to NPIRs.
 - 9.4.5.** Provisions for personnel training, as related to NPIRs.

M9. The Nuclear Plant Generator Operator shall have a copy of the Agreement(s) addressing the elements in Requirement 9 available for inspection upon request of the Compliance Enforcement Authority. Each Transmission Entity shall have a copy of the Agreement(s) addressing the elements in Requirement 9 for which it is responsible available for inspection upon request of the Compliance Enforcement Authority.

C. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

Regional Entity

1.2. Compliance Monitoring and Assessment Processes:

Compliance Audits

Self-Certifications

Spot Checking

Compliance Violation Investigations

Self-Reporting

Complaints Text

1.3. Data Retention

The Responsible Entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation:

- For Measure 1, the Nuclear Plant Generator Operator shall keep its latest transmittals and receipts.
- For Measure 2, the Nuclear Plant Generator Operator and each Transmission Entity shall have its current, in-force Agreement.
- For Measure 3, the Transmission Entity shall have the latest planning analysis results.
- For Measures 4, 6 and 8, the Transmission Entity shall keep evidence for two years plus current.
- For Measures 5, 6 and 7, the Nuclear Plant Generator Operator shall keep evidence for two years plus current.

If a Responsible Entity is found non-compliant it shall keep information related to the noncompliance until found compliant.

The Compliance Enforcement Authority shall keep the last audit records and all requested and submitted subsequent audit records.

1.4. Additional Compliance Information

None

Table of Compliance Elements

| R # | Time Horizon | VRF | Violation Severity Levels | | | |
|-----------|--------------|---------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | Lower VSL | Moderate VSL | High VSL | Severe VSL |
| R1 | | Medium | The Nuclear Plant Generator Operator provided the NPIRs to the applicable entities but did not verify receipt. | The Nuclear Plant Generator Operator did not provide the proposed NPIR to one of the applicable entities unless there was only one entity. | The Nuclear Plant Generator Operator did not provide the proposed NPIRs to two of the applicable entities unless there were only two entities. | The Nuclear Plant Generator Operator did not provide the proposed NPIRs to more than two of applicable entities. OR For a particular nuclear power plant, if the number of possible applicable transmission entities is equal to the number of applicable transmission entities not provided NPIRs |
| R2 | | Medium | N/A | N/A | N/A | The Nuclear Plant Generator Operator or the applicable Transmission Entity does not have in effect one or more agreements that include mutually agreed to NPIRs and |

| R # | Time Horizon | VRF | Violation Severity Levels | | | |
|-----------|--------------|---------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| | | | Lower VSL | Moderate VSL | High VSL | Severe VSL |
| | | | | | | document the implementation of the NPIRs. |
| R3 | | Medium | N/A | The responsible entity incorporated the NPIRs into its planning analyses but did not communicate the results to the Nuclear Plant Generator Operator. | N/A | The responsible entity did not incorporate the NPIRs into its planning analyses of the electric system. |
| R4 | | High | N/A | The responsible entity did not comply with Requirement R4, Part 4.3. | The responsible entity did not comply with Requirement R4, Part R4.1. | The responsible entity did not comply with Requirement R4, Part R4.2. |
| R5 | | High | N/A | N/A | N/A | The Nuclear Plant Generator Operator failed to operate per the NPIRs developed in accordance with this standard. |
| R6 | | Medium | N/A | The Nuclear Plant Generator Operator or Transmission Entity failed to provide | The Nuclear Plant Generator Operator or Transmission Entity failed to coordinate | N/A |

| R # | Time Horizon | VRF | Violation Severity Levels | | | |
|-----------|--------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | Lower VSL | Moderate VSL | High VSL | Severe VSL |
| | | | | outage or maintenance <u>schedules</u> to the appropriate parties as described in the agreement or on a time period consistent with the agreements. | one or more outages or maintenance activities in accordance the requirements of the agreements. | |
| R7 | | High | The Nuclear Plant Generator Operator did not inform the applicable Transmission Entities of <u>proposed</u> changes to nuclear plant design (e.g. protective relay setpoints), configuration, operations, limits, or capabilities that may impact the ability of the electric system to meet the NPIRs. | N/A | The Nuclear Plant Generator Operator did not inform the applicable Transmission Entities of <u>actual</u> changes to nuclear plant design (e.g. protective relay setpoints), configuration, operations, limits, or capabilities that <u>may</u> impact the ability of the electric system to meet the NPIRs. | The Nuclear Plant Generator Operator did not inform the applicable Transmission Entities of <u>actual</u> changes to nuclear plant design (e.g., protective relay setpoints), configuration, operations, limits or capabilities that <u>directly impact</u> the ability of the electric system to meet the NPIRs. |
| R8 | | High | The applicable Transmission Entities did not inform the | N/A | The applicable Transmission Entities did not inform the | The applicable Transmission Entities did not inform the |

| R # | Time Horizon | VRF | Violation Severity Levels | | | |
|-----------|--------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | Lower VSL | Moderate VSL | High VSL | Severe VSL |
| | | | Nuclear Plant Generator Operator of <u>proposed</u> changes to transmission system design, configuration (e.g. protective relay setpoints), operations, limits, or capabilities that may impact the ability of the electric system to meet the NPIRs. | | Nuclear Plant Generator Operator of <u>actual</u> changes to transmission system design (e.g. protective relay setpoints), configuration, operations, limits, or capabilities that <u>may</u> impact the ability of the electric system to meet the NPIRs. | Nuclear Plant Generator Operator of <u>actual</u> changes to transmission system design (e.g. protective relay setpoints), configuration, operations, limits, or capabilities that <u>directly impacts</u> the ability of the electric system to meet the NPIRs. |
| R9 | | Medium | | The Agreement(s) identified in R2. between the Nuclear Plant Generator Operator and the applicable Transmission Entity failed to include up to 20% of the combined sub-components in Requirement R9 Parts 9.2, 9.3 and 9.4 applicable to that entity. | The Agreement(s) identified in R2. between the Nuclear Plant Generator Operator and the applicable Transmission Entity failed to include greater than 20%, but less than 40% of the combined sub-components in Requirement R9 Parts 9.2, 9.3 and 9.4 | The Agreement(s) identified in R2. between the Nuclear Plant Generator Operator and the applicable Transmission Entity failed to include 40% or more of the combined sub-components in Requirement R9 Parts 9.2, 9.3 and 9.4 |

| R # | Time Horizon | VRF | Violation Severity Levels | | | |
|-----|--------------|-----|---------------------------|--------------|---------------------------|---------------------------|
| | | | Lower VSL | Moderate VSL | High VSL | Severe VSL |
| | | | | | applicable to the entity. | applicable to the entity. |

D. Regional Variances

The design basis for Canadian (CANDU) nuclear power plants (NPPs) does not result in the same licensing requirements as U.S. NPPs. Nuclear Regulatory Commission (NRC) design criteria specifies that in addition to emergency on-site electrical power, electrical power from the electric network also be provided to permit safe shutdown. There are no equivalent Canadian Regulatory requirements for electrical power from the electric network to be provided to permit safe shutdown. Therefore the definition of Nuclear Plant Licensing Requirements (NPLR) for Canadian CANDU NPPs will be as follows:

Canadian Nuclear Plant Licensing Requirements (CNPLR) are requirements included in the design basis of the nuclear plant and are statutorily mandated for the operation of the plant; when used in this standard, NPLR shall mean nuclear power plant licensing requirements for avoiding preventable challenges to nuclear safety as a result of an electric system disturbance, transient, or condition.

E. Interpretations

None

F. Associated Documents

None

Version History

| Version | Date | Action | Change Tracking |
|---------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | May 2, 2007 | Approved by Board of Trustees | New |
| 2 | August 5, 2009 | Adopted by Board of Trustees | Revised. Modifications for Order 716 to Requirement R9.3.5 and footnote 1; modifications to bring compliance elements into conformance with the latest version of the ERO Rules of Procedure. |
| 2 | January 22, 2010 | Approved by FERC on January 21, 2010. Added Effective Date | Update |
| 2 | February 7, 2013 | R9.1, R9.1.1, R9.1.2, R9.1.3, and R9.1.4 and associated elements approved by NERC Board of Trustees for retirement as part of the Paragraph 81 project (Project 2013-02) pending applicable regulatory approval. | |
| 2 | November 21, 2013 | R9.1, R9.1.1, R9.1.2, R9.1.3, and R9.1.4 and associated elements approved by FERC for retirement as part of the Paragraph 81 project (Project 2013-02) | |
| 2.1 | April 11, 2012 | Errata approved by the Standards Committee; (Capitalized “Protection System” in accordance with Implementation Plan for Project 2007-17 approval of revised definition of “Protection System”) | Errata associated with Project 2007-17 |
| 2.1 | September 9, 2013 | Informational filing submitted to reflect the revised | |

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|---|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| | | definition of Protection System in accordance with the Implementation Plan for the revised term. | |
| 3 | March 2014 | Modifications to implement the recommendations of the five-year review of NUC-001, which was accepted by the Standards Committee on October 17, 2013. | Revision |
| 3 | August 14, 2014 | Adopted by the NERC Board of Trustees | |
| 3 | November 4, 2014 | FERC letter order issued approving NUC-001-3 | |
| 4 | February 6, 2020 | Adopted by NERC Board of Trustees | Revisions under Project 2017-07 |
| 4 | October 30, 2020 | FERC order approving NUC-001-4. Docket No. RD20-4-000 | |
| 4 | April 1, 2021 | Effective Date | |

Rationale

During development of this standard, text boxes were embedded within the standard to explain the rationale for various parts of the standard. Upon BOT approval, the text from the rationale text boxes was moved to this section.

Rationale for R5:

The NUC FYRT recommended R5 be revised for consistency with R4 and to clarify that nuclear plants must be operated to meet the Nuclear Plant Interface Requirements.

Rationale for R7 and R8:

The NUC FYRT recommended deleting “Protection Systems” in Requirements R7 and R8 since it is a subset of the "nuclear plant design" and "electric system design" elements currently contained in R7 and R8 respectively; and adding a parenthetical clause (e.g. protective setpoints) to R7 following "nuclear plant design" and parenthetical clause (e.g. relay setpoints) to R8 following "electric system design."

Rationale for R9:

The NUC FYRT recommended that R9 be revised to clarify that all agreements do not have to discuss each of the elements in R9, but that the sum total of the agreements need to address the elements. In addition, for clarity in Part 9.4.1, the NUC FYRT recommended that "affecting the NPIRs" be inserted following "Provisions for communications" and "applicable unique" be inserted following ""definitions of."

Rationale for R9.3.7:

The term "Special Protection Systems" (SPS) was replaced with "Remedial Action Schemes" (RAS) in order to align with other current NERC standards development work in Project 2010-05.2: Special Protection Systems. Project 2010-05.2 has proposed to replace SPS with RAS throughout all of the NERC Standards in order to move to the use of a single term. RAS and SPS have the same definition in the NERC Glossary of Terms.