

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Facility Interconnection Studies and Requirements

Technical Rationale and Justification for
Reliability Standards FAC-001 and FAC-002

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RELIABILITY | RESILIENCE | SECURITY



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Preface

Electricity is a key component of the fabric of modern society and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of the North American Electric Reliability Corporation (NERC) and the six Regional Entities (REs), is a highly reliable and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security
Because nearly 400 million citizens in North America are counting on us

The North American BPS is made up of six RE boundaries as shown in the map and corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one RE while associated Transmission Owners (TOs)/Operators (TOPs) participate in another.



MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	WECC

Introduction

This document explains the technical rationale and justification for the proposed Reliability Standards FAC-001-4 and FAC-002-4. It provides stakeholders and the ERO Enterprise with an understanding of the technology and technical requirements in the Reliability Standard. This Technical Rationale and Justifications document is not a Reliability Standard and should not be considered mandatory and enforceable.

Updates to this document now include the Project 2020-05 Modifications to FAC-001 and FAC-002 standard drafting team's (SDT's) intent in the requirement changes.

Background

This project modifies FAC-001-3 and FAC-002-3 to clarify the use of "materially modifying", particularly as it relates to compliance with the standards.

FAC-001-3 and FAC-002-3 imply that the term "materially modified" should be used to distinguish between facility changes that are required to be studied and those that need not be studied. While the existing standards do require coordination and cooperation between a Facility owner and the Transmission Planner (TP) or Planning Coordinator (PC) when a new or materially modified interconnection Facility is connected to their system, neither standard specifies what entity is responsible for determining what is considered a material modification. Further, the existing language is unclear about whether these requirements only apply when a different entity is proposing to interconnect to a Facility owner's Facility or if they also apply to the Facility owner's new or modified Facility.

Additionally, in FERC-jurisdictional areas, the term "Material Modification" means "those modifications that have a material impact on the cost or timing of any Interconnection Request with a later queue priority date."¹ This has led to widespread confusion across the industry regarding the correct application of these terms related to the FERC Open Access Transmission Tariff (OATT) implementation and the NERC Reliability Standards requirements.

¹ [LGIA-agreement.pdf \(ferc.gov\)](#)

General Considerations

Qualified Change

The NERC Inverter-Based Resource Performance Task Force (IRPTF) identified several issues, which are documented in the white paper “IRPTF Review of NERC Reliability Standards” approved by the NERC Operating and Planning Committees in March 2020. The white paper identified issues in the FAC-001 and FAC-002 NERC Reliability Standards when using the term “materially modified”. The IRPTF white paper points out that the term “materially modifying” in the FAC standards may cause confusion because of the FERC pro forma OATT using the same “materially modifying” term. In FERC-jurisdictional areas, the term “Material Modification” means “those modifications that have a material impact on the cost or timing of any Interconnection Request with a later queue priority date.”² Also quoting from the IRPTF white paper “Both standards (*i.e. FAC-001 and FAC-002*) imply that the term “materially modified” should be used to distinguish between facility changes that are required to be studied and those that need not be studied.”³ Per the white paper, “This has led to confusion and potential reliability issues within industry. For example, a TP may consider an Inverter Based Resource (IBR) control system software change to be materially modifying, but if the Generator Owner (GO) does not consider such a change to be materially modifying they will not notify the TP of the change.”³

The IRPTF White Paper recommends:

“FAC-001-3 and FAC-002-2 should be revised to: (a) clarify which entity is responsible for determining which facility changes are materially modifying, and therefore require study, (b) clarify that a Generator Owner should notify the affected entities before making a change that is considered materially modifying and (c) revise the term “materially modifying” so as to not cause confusion between the FAC standards and the FERC interconnection process.”⁴

The Project 2020-05 SDT researched existing language in current NERC standards and FERC pro forma language and concluded that the term “qualified change” was not used. Therefore, changing the term in FAC-001 and FAC-002 to “qualified change” should not cause confusion in the industry. The SDT proposes that the terms “materially modified”, “material modification” and “materially modifying” in FAC-001 and FAC-002 be changed to “qualified change”. As discussed below, the PC shall be required to post a publicly available definition of “qualified change” for the purposes of facility interconnection.

² [LGA-agreement.pdf \(ferc.gov\)](#)

³ IRPTF White Paper, dated March 2020: page 3 second paragraph (italics added)

Requirement R3

- R3.** *Each Transmission Owner shall address the following items in its Facility interconnection requirements: [Violation Risk Factor: Lower] [Time Horizon: Long-Term Planning]*
- 3.1.** *Procedures for coordinated studies and identifying the impacts on affected systems for new interconnections or existing interconnections seeking to make a qualified change as defined by the Planning Coordinator under Reliability Standard FAC-002-4 Requirement R6.*
 - 3.2.** *Procedures for notifying those responsible for the reliability of affected system(s) of new interconnections or existing interconnections seeking to make a qualified change.*
 - 3.3.** *Procedures for confirming with those responsible for the reliability of affected systems that new Facilities or existing Facilities seeking to make a qualified change are within a Balancing Authority Area's metered boundaries.*

General Considerations for Requirement R3

Originally the Parts of R3, with the exception of the first two bullets, which were added by the Project 2010-02 drafting team, this list has been moved to the Guidelines and Technical Basis section to provide entities with the flexibility to determine the Facility interconnection requirements that are technically appropriate for their respective Facilities. Including them as Parts of R3 was deemed too prescriptive, as frequently some items in the list do not apply to all applicable entities – and some applicable entities will have requirements that are not included in this list.

Each TO and applicable GO should consider the following items in the development of Facility interconnection requirements:

- Procedures for requesting a new Facility interconnection or an existing interconnection seeking to make a qualified change
- Data required to properly study the interconnection
- Voltage level and MW and MVAR capacity or demand at the point of interconnection
- Breaker duty and surge protection
- System protection and coordination
- Metering and telecommunications
- Grounding and safety issues
- Insulation and insulation coordination
- Voltage, Reactive Power (including specifications for minimum static and dynamic reactive power requirements), and power factor control
- Power quality impacts
- Equipment ratings
- Synchronizing of Facilities
- Maintenance coordination
- Operational issues (abnormal frequency and voltages)
- Inspection requirements for new or existing interconnections seeking to make a qualified change

- Communications and procedures during normal and emergency operating conditions

Requirement R3, Part 3.3

Consistent with the Functional Model, there cannot be an assumption that the entity owning the transmission will be the same entity providing the BA function. It is the responsibility of the party interconnecting to make appropriate arrangements with a Balancing Authority (BA) to ensure its Facilities are within the BA's metered boundaries, which also serves to facilitate the process of the coordination between the two entities that will be required under numerous other standards upon the start of operation. Under 3.3, the TO is responsible for confirming that the party interconnecting has made appropriate provisions with a BA to operate within its metered boundaries.

Requirement R4

R4. *Each applicable Generator Owner shall address the following items in its Facility interconnection requirements: [Violation Risk Factor: Lower] [Time Horizon: Long-Term Planning]*

- 4.1.** *Procedures for coordinated studies of new interconnections and their impacts on affected system(s).*
- 4.2.** *Procedures for notifying those responsible for the reliability of affected system(s) of new interconnections.*
- 4.3.** *Procedures for confirming with those responsible for the reliability of affected systems that new Facilities or existing Facilities seeking to make a qualified change as defined by the Planning Coordinator under Reliability Standard FAC-002-4 Requirement R6 are within a Balancing Authority Area's metered boundaries.*

Requirement R4, Part 4.3

Consistent with the Functional Model, there cannot be an assumption that the entity owning the generation will be the same entity providing the BA function. It is the responsibility of the interconnecting party to make appropriate arrangements with a BA to ensure its Facilities are within the BA's metered boundaries, which also serves to facilitate the process of the coordination between the two entities that will be required under numerous other standards upon the start of operation. Under 4.3, the GO is responsible for confirming that the interconnecting party has made appropriate provisions with a BA to operate within its metered boundaries.

Requirement R6

R6. *Each Planning Coordinator shall maintain a publicly available definition of qualified change for the purposes of facility interconnection. [Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

General Considerations for Requirement R6

The Project 2020-05 SDT drafted Requirement R6. The PC coordinates regional planning activities. *See, e.g.,* Glossary of Terms used in NERC Reliability Standards, which defines the Planning Authority/PC as “the responsible entity that coordinates and integrates transmission Facilities and service plans, resource plans, and Protection Systems.” Since the PC is responsible for this coordination, the PC is in the best position to ensure that changes to existing interconnections do not have adverse reliability impacts to the PC area as well as the neighboring areas. The PC is the appropriate party to define qualified change and make that definition publicly available. Much of the same justifications for the PC to develop and make that definition publicly available are also applicable for this standard. This will provide consistency and clarity for entities to understand how changes to their interconnections may or may not have adverse reliability impacts.

If an entity is requesting a qualified change of an interconnection, the entity should determine whom the PC is. Entities requesting a qualified change should contact their TO to ascertain the relevant PC. Often the TO and PC are the same entity, or the TO can provide information on contacting the PC.

Factors the PC should consider in developing its definition of “qualified change” for purposes of required studies include how interconnection facility changes affect the steady-state short circuit and dynamic performance of that facility. Not all interconnection changes will necessarily result in changes on steady state, dynamic, or short circuit characteristics of a facility. The PC should also remember that potential qualified changes can have substantially different levels of performance as technology evolves or new technologies become available. Defining adverse reliability impacts calls for careful consideration.