

# White Paper on NERC's Set of Organization Standards

## ***Background***

NERC's Operating Policies and Planning Standards were developed for vertically integrated utilities and were structured around the concept of the control area. Control areas were responsible for following these Operating Policies and Planning Standards. Recognizing that many utilities have restructured and are no longer associated with a defined control area, NERC unbundled the responsibilities assigned to the control area. The result of that unbundling was the "Functional Reliability Model" (Functional Model). This model links reliability-related responsibilities to industry functions, regardless of corporate or industry structure. (The Functional Model can be downloaded from the NERC Web site at <http://www.nerc.com/~filez/cactfminutes.html>.)

Development of the new Functional Model was just the first step in NERC's effort to realign itself to better meet the needs of the changing industry structure. The next step is to develop a new set of reliability-related standards, called Organization Standards. These new standards will replace existing Operating Policies and Planning Standards, and link reliability-related performance requirements to the functions in the Functional Model.

NERC Organization Standards will define a level of performance that must be met to ensure the reliability of the interconnected electric systems in North America. To the extent possible, these standards will define *what* performance must be achieved, without providing restrictive measures on *how* to achieve that performance. This is a significant change from the existing Operating Policies and Planning Standards that were developed to meet a wider range of applications.

## ***Kick-starting the Transition to Organization Standards***

Implementing the NERC Standards Development Process is straightforward, however making the transition to this new process poses start-up challenges, including filling the information vacuum caused by starting without any Organization Standards in place.

NERC is working to kick-start the transition to Organization Standards by sharing the following:

- A vision of what is contained within a complete set of Organization Standards
- A vision of the potential content of that set of Organization Standards
- A framework for participating in the refinement of each of the proposed Organization Standards

***What is Likely to be Contained Within a Complete Set of Organization Standards?***

Attachment 1 provides a brief description of each of the 11 Proposed Organization Standards:

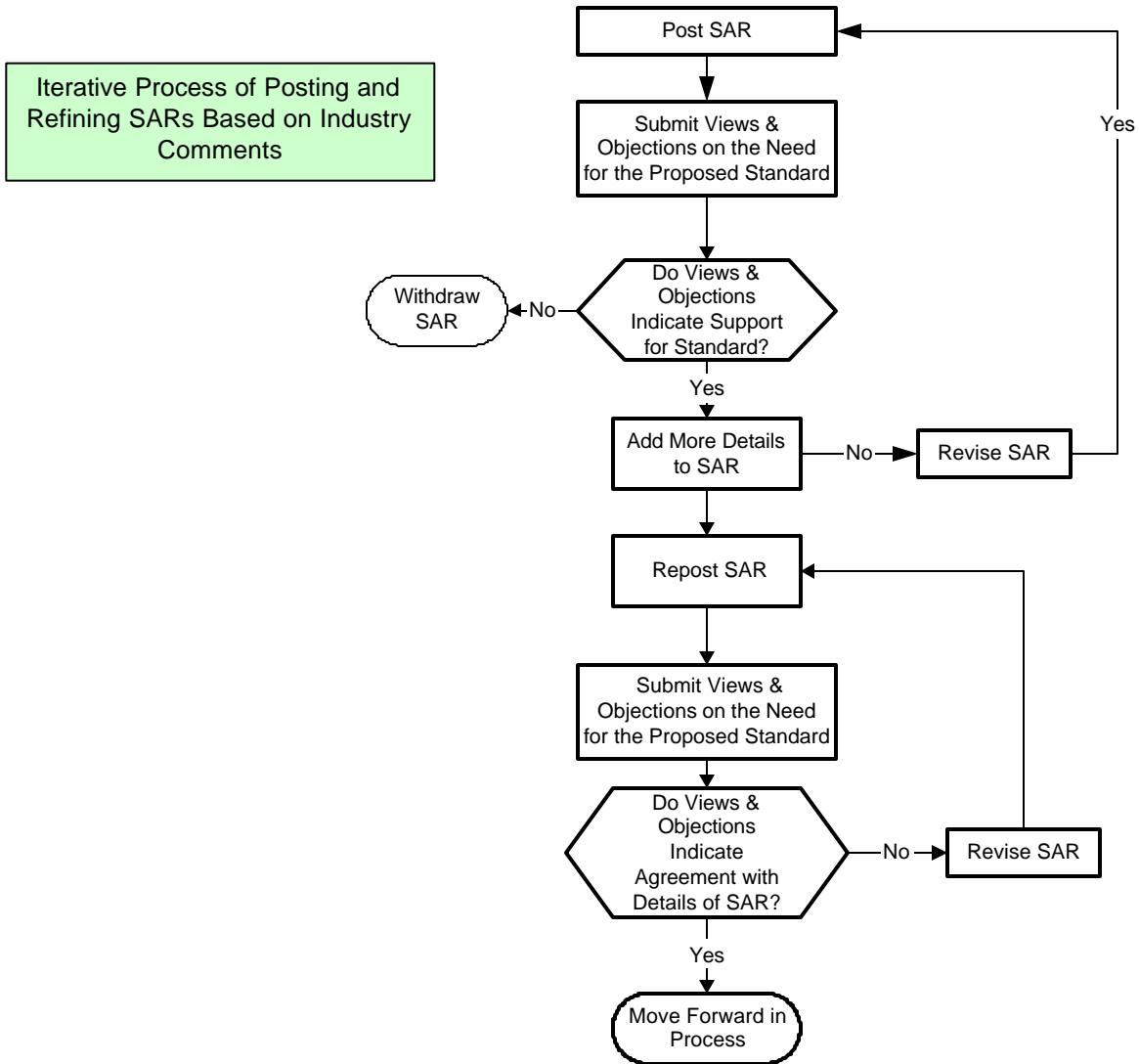
1. Assess Transmission Future Needs and Develop Transmission Plans
2. Determine Facility Ratings, Operating Limits, and Transfer Capabilities
3. Design, Install, and Coordinate Control and Protection Systems
4. Define (Physical) Connection Requirements
5. Balance Resources and Demand
6. Monitor and Assess Short-term Transmission Reliability - Operate Within Limits
7. Coordinate Interchange
8. Coordinate Operations
9. Prepare for and Respond to Abnormal or Emergency Conditions
10. Prepare for and Respond to Blackout or Island Conditions
11. Monitor and Analyze Disturbances, Events, and Conditions

While the NERC Standards Development Process allows anyone to propose an Organization Standard, the Board of Trustees' intent was to focus on reliability-related standards and we believe that the 11 proposed standards may ultimately comprise a complete set of Organization Standards. Collectively, these standards span most, if not all, of the core reliability requirements within the purview of NERC. The set of standards cover planning, operating and analyzing the electric system under varying conditions.

The brief description for each proposed standard seeks to identify *what* performance must be achieved rather than detailing *how* to achieve that performance. We urge you to become familiar with the breadth and scope of each of the proposed standards and develop a sense for both the boundaries envisioned for and the latitude allowed within each proposed standard. Each proposed standard should be reviewed in relation to all of the other proposed standards.

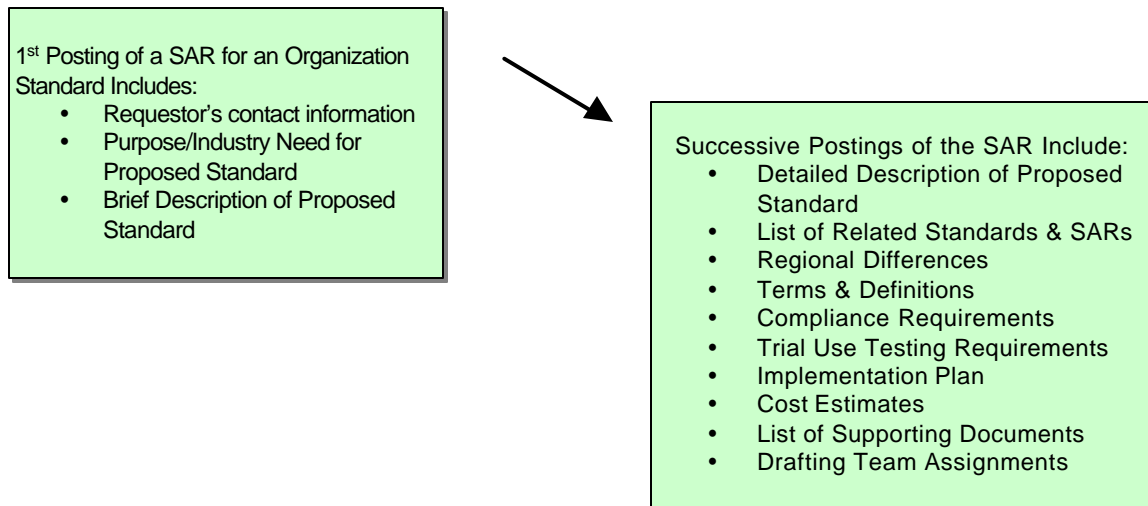
### What is the Framework for Refining Each Proposed Organization Standard?

Each proposed standard entered the Standards Development Process with a Standard Authorization Request (SAR). On March 20, 2002, the Standards Authorization Committee (SAC) authorized posting of these SARs for your review. We expect you to be an active participant in the Standards Development Process by submitting your views and objections on the appropriateness of the set of organization standards as well as on each of the individual proposed organization standards.



### **First Posting of SARs**

During the first posting of a SAR, we are looking for confirmation on the need for the proposed standard. If the views submitted indicate that there is industry support for the development of that standard, then successive postings will be used to refine the scope and then the technical details of each of the proposed standards. This is an iterative process and your views and objections are essential at each step to determine whether or not there is consensus on a standard that best meets the needs of the industry as a whole. If the only comments we receive are negative, we will never know if the majority of you believe the proposed standard is appropriate!

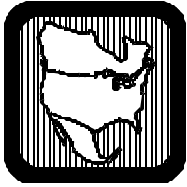


The brief descriptions in the set of Proposed Organization Standards do not include measures for evaluating compliance – that comes later during the development of the details of the content of the standard. The short descriptions should provide sufficient information on the potential content and measures to allow you to respond to each proposed standard when it is officially entered into the Organization Standards Development Process. The short descriptions should provide a framework for you to submit comments indicating whether or not you agree that the proposed organization standard is needed, and for identifying whether or not you agree with the scope of the proposed standard.

### **Comments on SARs**

During the posting of this set of SARs, we are looking for comments on the appropriateness of the set of proposed Organization Standards as well as on the individual proposed Organization Standards. We want you to:

- Look at the Set of Proposed Organization Standards:
  - Tell us what is missing
  - Tell us what is not needed
- Look at each of the individual Proposed Organization Standards
  - Tell us if you believe it is needed for reliability
  - Tell us if you think the scope is appropriate or if it should be more narrowly defined or broadened



# **NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL**

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## **Set of Proposed NERC Organization Standards**

**Revised March 29, 2002**

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## Introduction

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The Standards Transition Implementation Group recently completed developing a list of Proposed Organization Standards. In developing this list of proposed standards, the members of the group tried to identify those things that are essential to the reliable operation of the interconnected electric systems. Their list is subdivided into the following categories

- Transmission Adequacy
- Transmission Reliability and Resource Balance
- Recovery – Return to Normal Operations
- Analysis

A SAR Drafting Team was then assembled to be adding more structure to the description of the proposed standards. The title, description and purpose of each proposed Organization Standard is presented in this document. A Standard Authorization Request (SAR) has been or will be developed for each of these proposed standards.

### ***What is an Organization Standard?***

The criteria for Organization Standards is identified in the Organization Standards Process Manual, and includes the following criteria and characteristics:

Organization Standards may include standards for the operation and planning of interconnected systems and market interface practices, consistent with the Reliability and Market Interface Principles.

An Organization Standard shall have the following characteristics:

**Material to Reliability** – An Organization Standard shall be material to the reliability of bulk electric systems of North America. If the reliability of the bulk electric system could be compromised without a particular standard or by a failure to comply with that standard, then the standard is material to reliability.

**Measurable** – An Organization Standard shall establish technical or performance requirements that can be practically measured.

Although Organization Standards have a common format and process, several types of Organization Standards may exist, each with a different approach to measurement:

**Technical standards** related to the provision, maintenance, operation, or state of electric systems will likely contain measures of physical parameters and will often be technical in nature.

**Performance standards** related to the actions of entities providing for or impacting the reliability of bulk electric systems will likely contain measures of the results of such actions, or the nature of the performance of such actions.

**Preparedness standards** related to the actions of entities to be prepared for conditions that are unlikely to occur but are critical to reliability will likely contain measures of such preparations or the state of preparedness, but measurement of actual outcomes may occur infrequently or never.

## List of Proposed Organization Standards

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### ***Transmission Adequacy:***

1. Assess Transmission Future Needs and Develop Transmission Plans
2. Determine Facility Ratings, Operating Limits, and Transfer Capabilities
3. Design, Install, and Coordinate Control and Protection Systems
4. Define (Physical) Connection Requirements

### ***Transmission Reliability and Resource Balance:***

5. Balance Resources and Demand
6. Monitor and Assess Short-term Transmission Reliability - Operate Within Limits
7. Coordinate Interchange
8. Coordinate Operations

### ***Recovery – Return to Normal Operations:***

9. Prepare for and Respond to Abnormal or Emergency Conditions
10. Prepare for and Respond to Blackout or Island Conditions

### ***Analysis:***

11. Monitor and Analyze Disturbances, Events, and Conditions

## 1. Assess Transmission Future Needs and Develop Transmission Plans

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Planning Authority
- Transmission Owners

### ***Purpose/ Industry Need:***

To establish a standard for assessing and planning the transmission systems in North America.

The transmission system must be assessed and planned to ensure that it performs its intended functions in providing reliable delivery of power for the future needs of customers.

### ***Brief Description:***

Requirements shall be established for assessing transmission system performance under a variety of system conditions including system normal conditions, abnormal conditions, and extreme system conditions.

Requirements shall be established for a plan, including a definition of the planning horizon, to address these conditions to ensure that the interconnected transmission systems perform their intended functions and to prevent severe adverse effects such as uncontrolled or cascading interruption of network operation. The plan may utilize operating, construction, market solutions or other components to address these conditions.

### ***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably
- Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions
- The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis

## **2. Determine Facility Ratings, Operating Limits, and Transfer Capabilities**

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Planning Authority
- Generator
- Transmission Owner
- Distribution Provider

### ***Purpose/Industry Need:***

To establish a standard requiring the determination of equipment ratings, system operating limits, and transfer capabilities which are necessary for the reliable operation of the power system.

### ***Brief Description:***

#### **Facility Ratings:**

Requirements shall be established requiring the determination of facility ratings needed to protect system equipment. Facilities included in the standard shall be those that affect reliability such as substation, generation, and transmission equipment. The facility ratings to be addressed in the standard shall include thermal limits, voltage limits, and other limits as applicable to the equipment.

#### **System Operating Limits and Transfer Capabilities**

Requirements shall be established for determining and coordinating system operating limits and transfer capabilities that are consistent with facility ratings in protecting system equipment and in meeting predefined system reliability requirements. Operating limits and transfer capabilities to be addressed in the standard shall be required to adhere to established limits such as voltage limits, frequency limits, power transfer limits (both thermal and stability), etc.

### ***Reliability Principle(s) Supported by This Standard:***

- Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably

### 3. Design, Install, and Coordinate Control and Protection Systems

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***Reliability Function(s) That Would Need to Comply with This Standard:***

- Planning Authority
- Generator
- Transmission Owner
- Transmission Operator
- Distribution Service Provider

***Purpose/Industry Need:***

To establish a standard for designing, coordinating and installing and maintaining automatic control<sup>1</sup> and protection systems to provide for system performance within pre-defined limits.

***Brief Description:***

Requirements shall be established for the design, installation, operation, testing, and maintenance of generation and transmission automatic control and protection systems to meet predefined reliability requirements, prevent deterioration of an event and/or cascading outages, and to prevent equipment damage.

***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- The frequency of interconnected bulk electric systems shall be controlled within defined limits through the balancing of electric supply and demand
- Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably

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<sup>1</sup> For the purpose of this standard, automatic control devices include such facilities as Power System Stabilizers, Static Var Compensators, HVDC Modulation, Out of Step Relaying, etc.

## 4. Define (Physical) Connection Requirements

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Generator
- Transmission Owner
- Distribution Provider

### ***Purpose/Industry Need:***

To establish a standard for the proper physical connection of generation substations, transmission facilities, and load substations to the transmission systems to maintain reliability.

### ***Brief Description:***

Requirements shall be established for the development and implementation of a plan for the physical connection of generation, transmission, and substation facilities to the transmission systems. Requirements shall be developed to necessitate adherence to applicable standards for maintaining reliability, such as the requirements for determining operating limits and requirements for automatic control and protection systems.

### ***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- **Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably.**
- Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems
- The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis

## 5. Balance Resources and Demand

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Balancing Authority

### ***Purpose/Industry Need:***

To maintain scheduled frequency within an Interconnection.

### ***Brief Description:***

The Load-Resource Balance Standard requires that each Balancing Authority maintain a close match between its loads and resources in real time. The Standard accomplishes this through four measures that cover various time frames and situations:

1. Frequency Response Measure (FRM) – FRM arrests short-term (0-1 minute) frequency deviation following a sudden mismatch between generation and load. Adherence to the FRM ensures there are sufficient frequency responsive resources that quickly (within seconds) stabilize Interconnection frequency whenever load or generation changes rapidly before operator actions. (Note that FRM does not return the Interconnection to its scheduled frequency, only arrest the frequency change.)
2. Control Performance Measure 1 (CPM1) – CPM1 maintains the short-term (1-minute) Interconnection’s frequency error within a statistical bound of historical frequency performance.
3. Control Performance Measure 2 (CPM2) – CPM2 maintains the longer-term (10-minute) Interconnection’s frequency error within a statistical bound of historical frequency performance. Compliance with CPM2 helps minimize unscheduled power flows that can cause transmission operating limit violations.
4. Disturbance Control Measure (DCM) – DCM ensures that the Interconnection returns to its scheduled frequency within a defined period following a sudden generation or load change (a “disturbance.”) This measure requires the responsible Balancing Authority to quickly return its Area Control Error to an acceptable level.

### ***Sample requirement(s) for the proposed standard:***

- Each Balancing Authority shall operate an Automatic Generation Control (AGC) system and calculate an area control error (ACE). Each Balancing Authority shall maintain its ACE within specific limits as defined by four measures:
  1. FRM
  2. CPM1
  3. CPM2
  4. DCM

***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- The frequency of interconnected bulk electric systems shall be controlled within defined limits through the balancing of electric supply and demand

## 6. Operate Within Limits - Monitor and Assess Short-term Transmission Reliability

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Balancing Authority
- Transmission Operator

### ***Purpose/Industry Need:***

To establish a standard that requires the bulk electric transmission system be operated within established limits.

### ***Brief Description:***

Establish a standard that requires adherence to operating limits.

Requirements shall include items such as real time monitoring of system parameters against operating limits, correcting limit violations, performing short-term (e.g., next-day) and real-time transmission reliability analyses, etc.

### ***Reliability Principle(s) Supported by this Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- The frequency of interconnected bulk electric systems shall be controlled within defined limits through the balancing of electric supply and demand
- Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably
- Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems
- Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions
- The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis

## 7. Coordinate Interchange

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Interchange Authority
- Balancing Authority
- Transmission Service Provider
- Purchasing-selling Entity

***Purpose/Industry Need:***

To ensure that the implementation of transactions between balancing authorities are coordinated to maintain system reliability.

***Brief Description:***

Establish requirements for defining, assessing, confirming, and implementing interchange transactions.

This shall include items such as data, communications, and timing requirements among Reliability Functions.

***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- The frequency of interconnected bulk electric systems shall be controlled within defined limits through the balancing of electric supply and demand
- Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably
- Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions
- The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis

## 8. Coordinate Operations

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Transmission Service Provider
- Planning Authority
- Transmission Operator
- Generator
- Distribution System Provider
- Load Serving Entity
- Purchasing-Selling Entity

### ***Purpose/Industry Need:***

To ensure that each entity's operations are coordinated such that they will not have an adverse impact on the reliability of other entities and to preserve the reliability benefits of interconnected operations.

To ensure that each entity's operating information is shared with other entities whose reliability is or could be adversely impacted.

### ***Brief Description:***

Establish requirements for the coordinated planning, operations, and maintenance of the bulk electric system. This standard will include items such as data sharing, system conditions, procedures and studies.

### ***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- The frequency of interconnected bulk electric systems shall be controlled within defined limits through the balancing of electric supply and demand
- Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably
- Plans for emergency operation and system restoration of interconnected bulk electric systems shall be developed, coordinated, maintained and implemented
- Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems
- Personnel responsible for planning and operating interconnected bulk electric systems shall be trained, qualified and have the responsibility and authority to implement actions
- The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis

## 9. Prepare for and Respond to Abnormal or Emergency Conditions

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Interchange Authority
- Balancing Authority
- Planning Authority
- Generator
- Load Serving Entity
- Purchasing-selling Entity
- Transmission Operator
- Distribution Service Provider

### ***Purpose/Industry Need:***

To establish a consistent, uniformly applied standard for the development, coordination, implementation, and maintenance of emergency plans.

To require that an executable plan be in place to provide guidance for appropriate operation following conditions that have disrupted normal system operation.

### ***Brief Description:***

Requirements shall be established for the development, coordination, implementation, and maintenance of an executable operating plan to maintain safe and reliable operation of the power system given abnormal and/or emergency conditions such as the unexpected sudden outages of transmission, generation, or load facilities; capacity and energy shortages; failure of equipment such as communications facilities and control centers; etc. Plan requirements shall include items such as coordination among neighboring systems, load curtailments, notification requirements, restoration procedures, etc.

**Note:** Requirements for the development of procedures that address specifically identified facility outages (e.g. loss of a specific line or transmission element) are not intended to be addressed by this standard and are expected to be covered elsewhere in standard operating procedures rather than by emergency plans.

### ***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- Plans for emergency operation and system restoration of interconnected bulk electric systems shall be developed, coordinated, maintained and implemented.
- Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems

## 10. Prepare for and Respond to Blackout or Island Conditions

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***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Balancing Authority
- Planning Authority
- Generator
- Transmission Operator
- Distribution Service Provider

***Purpose/Industry Need:***

To establish a consistent, uniformly applied standard for the development, coordination, implementation, and maintenance of restoration plans.

To require that an executable plan be in place to provide guidance for restoration of normal system operation following a blackout or island condition.

***Brief Description:***

Requirements shall be established for the development, coordination, implementation, and maintenance of an executable restoration plan to restore normal operation of the power system following blackout or island conditions. Plan requirements shall include items such as coordination among neighboring systems, black-start capability, resynchronization, transmission system restoration, load and generation restoration, etc.

***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- Plans for emergency operation and system restoration of interconnected bulk electric systems shall be developed, coordinated, maintained and implemented
- Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk electric systems

## 11. Monitor and Analyze Disturbances, Events, and Conditions

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### ***Reliability Function(s) That Would Need to Comply with This Standard:***

- Reliability Authority
- Balancing Authority
- Planning Authority
- Generator
- Transmission Owner
- Transmission Operator
- Distribution Service Provider

### ***Purpose/Industry Need:***

To establish a standard for evaluation and reporting of disturbances, events, and conditions on the bulk electric system to determine how the power system responded to the events.

The analysis is needed to make adjustments and/or modifications to the power system, procedures or standards to reduce the likelihood of an impact of future similar disturbances

### ***Brief Description:***

Requirements shall be established for monitoring, reporting and analyzing disturbances, events, and conditions as defined in the standard

### ***Reliability Principle(s) Supported by This Standard:***

- Interconnected bulk electric systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions.
- Information necessary for planning and operation of interconnected bulk electric systems shall be made available to those entities responsible for planning and operating the systems reliably
- The security of the interconnected bulk electric systems shall be assessed, monitored and maintained on a wide area basis