

**Note: an Interpretation cannot be used to change a standard.**

Request for an Interpretation of a Reliability Standard	
Date submitted:	September 29, 2009
Date accepted:	October 5, 2009
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<b>Identify the standard that needs clarification:</b>	
<b>Standard Number (include version number):</b>	EOP-005-1
<b>Standard Title:</b>	System Restoration Plans
<b>Identify specifically what requirement needs clarification:</b>	
<b>Requirement Number and Text of Requirement:</b>	
<p><b>R7.</b> Each Transmission Operator and Balancing Authority shall verify the restoration procedure by actual testing or by simulation.</p>	
<b>Clarification needed:</b>	
<p>What is meant by the phrase “verify the restoration procedure” and by the term “simulation” in requirement R7?</p> <p>For a TOP without any blackstart facilities in its restoration plan, can exercises and tabletop drills be used to meet Requirement R7 by “verifying the restoration procedure” through tabletop “simulations?”</p>	
<b>Background:</b>	
<p>The phrase “verify the restoration procedure” can be interpreted in at least two ways:</p> <ol style="list-style-type: none"> <li>1) to verify the actual procedure, e.g., step by step process of who to call, what actions to take, etc., in other words, verify the procedure through tabletop drills or the like; or</li> <li>2) to verify the technical feasibility of the procedure, e.g., is the restoration plan technically feasible.</li> </ol> <p>The word “simulation” can also be interpreted in at least two ways.</p> <p style="text-align: center;">One way is as defined in the NERC Blackout Report (“August 14, 2003</p>	

Blackout NERC Actions to Prevent and Mitigate the Impacts of Future Cascading Blackouts”, February 10, 2004, page 10, footnote 5) for “realistic simulations”: “(t)he term ‘realistic simulations’ includes a variety of tools and methods that present operating personnel with situations to improve and test diagnostic and decision-making skills in an environment that resembles expected conditions during a particular type of system emergency. Although a full replica training simulator is one approach, lower cost alternatives such as PC-based simulators, tabletop drills, and simulated communications can be effective training aids if used properly”.

A second way of interpreting “simulation” is power flow studies and dynamic stability studies.

For small Transmission Operators (TOPs) (e.g., one substation), it seems that exercises and tabletop drills are sufficient to meet the reliability-related intent of Requirement R7 of the standard – which is to “verify” the TOP’s restoration procedure. The system restoration plan of these small TOPs is to wait for the large neighboring utility to restore themselves and then to connect to them and restore power one distribution circuit at a time. We believe that for such a case, power flow analysis and stability studies are not necessary since the total load of each distribution circuit is quite small in comparison to the large neighboring TOP’s system, and we know that the Ferranti Effect will be de minimis since they are connected by short lines at voltages 230 kV and below.

Similarly, for a TOP with a system restoration plan that includes one or more black start components, it seems that stability simulations would be expected to verify the TOP’s restoration procedure since a system starting from black will be vulnerable to instability. It is also understandable for the case of black start to simulate power flow due to high voltages caused by the Ferranti Effect. The Measures of the standard specifically refer to black-start and the cranking path and do not address another type of restoration plan.

**Identify the material impact associated with this interpretation:**

**Identify the material impact to your organization or others caused by the lack of clarity or an incorrect interpretation of this standard.**

The material impact is that small TOPs need to know if drills and exercises to simulate the restoration plan are sufficient in meeting this requirement. If power flow and stability studies are necessary for TOPs without blackout facilities in their restoration plans, these TOPs will need to allocate additional resources to perform these studies.

**Project 2009-24: Response to Request for an Interpretation of NERC Standard EOP-005-1 R7 for Florida Municipal Power Agency**

The following interpretation of EOP-005-1 – System Restoration Plans, Requirement R7, was developed by the System Restoration and Blackstart drafting team.

**Requirement Number and Text of Requirement**

R7. Each Transmission Operator and Balancing Authority shall verify the restoration procedure by actual testing or by simulation.

**Question #1**

What is meant by the phrase “verify the restoration procedure” and by the term “simulation” in requirement R7?

**Response to Question #1**

~~In the reference document that accompanied the operating guide used to develop this standard (*Electric System Restoration Reference Document*), the following are provided as necessary plan elements:~~

~~Actions required for system restoration include identifying resources that will likely be needed during restoration, determining their relationship with each other, and training personnel in their proper application. Actual testing of the use of the strategies is seldom practical. Simulation testing of plan elements, major plan sections, or the overall plan are essential preparations toward readiness for implementation on short notice.~~

~~Control area restoration plans include the following elements:~~

- ~~1.—Philosophies and strategies for control area restoration~~
- ~~2.—Selection of critical alarms from the alarm information available~~
- ~~3.—Identification of the relationships and responsibilities of the personnel necessary to the restoration~~
- ~~4.—Identification of blackstart resources including:
 
  - ~~a.—generating unit resources~~
  - ~~b.—sufficient fuel resources~~
  - ~~c.—transmission resources~~
  - ~~d.—communication resources and power supplies~~
  - ~~e.—mutual assistance arrangements~~~~

- ~~5.—Contingency plans for failed resources~~
- ~~6.—Identification of critical load requirements~~
- ~~7.—Provisions for training of personnel~~
- ~~8.—Provisions for simulating and, where practical, actual testing and verification of the resources and procedures~~
- ~~9.—General instructions and guidelines for:~~
  - ~~a.—system operators~~
  - ~~b.—plant operators~~
  - ~~c.—communications personnel~~
  - ~~d.—transmission and distribution personnel~~
- ~~10.—Provisions for public information~~

~~Verifying the restoration procedure means establishing that the restoration procedure is technically sound and can progress as planned. A restoration plan is typically broken down to its restoration levels, tasks, and basic operating actions (opening/closing breakers, raising/lowering transformer taps, adjusting voltage and frequency set points, starting motors, etc). Usually, some activities cannot begin until others have been completed, so the restoration procedure lists the predecessor of each activity. The purpose of verifying the restoration procedure is to determine that the entire plan is broken down into some logical order that reduces the risk of overlooking any essential operation.~~

#### Verifying the Restoration Procedure:

The phase "verify the restoration procedure" means establishing that the restoration procedure will produce the desired results and can progress as planned. The requirement allows two ways to verify the restoration procedure. The first option is for a Transmission Operator or Balancing Authority to actually demonstrate that the procedure is verified through a physical test of the procedure (i.e. operate Bulk Electric System Elements in order to demonstrate the ability to establish a Cranking Path and start a generating unit using that Cranking Path). The other option is by simulation, which is an engineering analysis, using industry-accepted engineering analytical methods and practices to verify the restoration plan. The level of simulation required is dependent upon the nature of the restoration plan and may consider load flows to verify steady state conditions, transient stability analysis to verify the dynamic performance, and electromagnetic transient analysis to verify switching operations. Whichever method is chosen by the Transmission Operator or the Balancing Authority to verify the procedure, the desired outcome of the verification is to demonstrate that the restoration procedure will produce the desired results and can progress as planned.

#### ~~Verifying Restoration by Simulation:~~

NERC standard EOP-005-1 uses two different terms related to "simulation." In Requirement R6, the term "simulated exercises" is used. It is apparent to the drafting team that simulated exercise refers to a walk through of the restoration plan (and its associated procedures) by operating personnel in order to train them on the plan and familiarize them

with various procedures. In Requirement R10, the term “simulation” is used in the context of providing an engineering analysis of the ability of blackstart generating units in a Transmission Operator’s restoration plan to perform their intended functions as required in the regional restoration plan. The same term, “simulation,” is used in Requirement R7, so that context would dictate that simulation refers to an engineering analysis and not a walk through or exercise.

~~With each significant restoration action, concerns are with exceeding high/low operating limits. Various analytical tools are used to verify safe operations by engineers, operators, and instructors/trainees during different operating conditions, such as pre-disturbance condition, post-disturbance status, and actual emergency operating condition. These tools include power flow, transient stability, long-term dynamics, voltage transients, short circuit, electromagnetic transient programs, etc.~~

~~For a small TOP with no blackstart capability, the technical aspects of the smaller TOP’s restoration plan may be incorporated into the plan of a larger TOP and may be included in the larger TOP’s testing or simulation. The requirement does not state that every TOP has to physically perform simulation or testing; the requirement only mandates verifying the plan with simulation or testing. Another TOP, the Reliability Coordinator, or a contractor could perform testing or simulation on behalf of the smaller TOP.~~

#### **Question #2**

For a TOP without any blackstart facilities in its restoration plan, can exercises and tabletop drills be used to meet Requirement R7 by “verifying the restoration procedure” through tabletop “simulations?”

#### **Response to Question #2**

Based on the definition of “simulation” provided in the response to question #1~~reference document quoted above,~~ the drafting team interprets that tabletop exercises ~~can meet some of the requirements but~~ cannot be used to meet the simulation option in Requirement R7~~requirements.~~