

NYISO System Restoration Manual

June 2007

NYISO SYSTEM RESTORATION PLAN MANUAL

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Revision History

Revision	Date	Changes
1.0	6/6/07	Initial Release

1. OVERVIEW

This Manual organizes the procedures, documentation, training and testing for the New York Independent System Operator (NYISO) and its Market Participants to assure the NYISO Reliability Coordinator Area capability for reliable system restoration following a major or total blackout.

1.1 References

This Manual was written to adhere and support the following standards:

- [NERC Standard EOP-005-1 – System Restoration Plans](#)
- [NERC Standard EOP-006-1 – Reliability Coordination - System Restoration](#)
- [NERC Standard EOP-007-0 – Establish, Maintain, and Document a Regional Black Start Capability Plan](#)
- [NERC Standard EOP-009-0 – Documentation of Black Start Generating Unit Test Results](#)
- [NPCC Document A-3 – Emergency Operations Criteria](#)
- [NPCC Document A-7 – Glossary of Terms](#)
- [NYSRC Reliability Rules - Section G – System Restoration](#)

1.2 Strategy

The strategy for prompt restoration of the NYISO's Reliability Coordinator Area rests on three main principles:

1. Restoration procedures are based on restoration of a backbone of high voltage lines, but allowing operators flexibility to adjust the restoration path for actual system conditions;
2. Periodic training on restoration concepts and procedures; and
3. Periodic drills on restoration procedures to exercise details of procedures and reinforce restoration concepts and strategy.

The New York Control Area (NYCA) restoration plan calls for the energization of the 345 KV transmission backbone. This transmission backbone consists of three paths: Buffalo to Albany into New York City, the St. Lawrence River to Utica, and Buffalo to Binghamton to Albany. From this backbone there are a multitude of options to restore transmission, access available generation, and coordinate with the restoration efforts with the New York transmission owners and neighboring areas.

1.3 Priorities

The following operations shall have the highest restoration priority:

- Energizing the backbone of the New York State (NYS) Power System
- Synchronizing the NYS Power System with the interconnection; and
- Restoring off-site power supplies to nuclear power plants.

Additional details on priorities for system restoration may be found in the Restoration State section of the NYISO's [*Emergency Operations Manual*](#).

1.4 Coordination

Under normal circumstances, the NYISO will coordinate system restoration among neighboring Reliability Coordinators and Transmission Owners (TOs).

2. RESTORATION PROCEDURES

System restoration will take place at two levels: restoration of the NYISO Reliability Coordinator Area's backbone system in accordance with a NYISO restoration plan and restoration of local areas in accordance with TO restoration plans. Since the exact extent or nature of a disturbance cannot be predicted, the procedures are prepared as general guidelines.

2.1 NYISO Restoration Plan

The NYISO's procedures for the Restoration State and System Restoration are contained in the Restoration State Section 6 of the NYISO's [*Emergency Operations Manual*](#).

2.2 TO Restoration Plans

Transmission Owners within the NYISO's Reliability Coordinator Area must maintain local system restoration plans for their transmission districts consistent with NYSRC, NPCC and NERC standards. The TOs must maintain current copies of these plans at the NYISO.

3. BLACK START CAPABILITY PLAN

The NYISO and the TOs within the NYISO's Reliability Coordinator Area shall secure adequate Black Start resources to meet the requirements of the NYISO's System Restoration Procedure.

3.1 Black Start Resources

3.1.1 Selection of Black Start Service Providers

The NYISO determines the need and adequacy of Black Start system resources for the NYISO's System Restoration Plan (SRP) through operating studies and simulation. Procedures for acquiring the necessary black start resources as identified in NYISO studies are in the Black Start Capability Service section of the NYISO's [Ancillary Services Manual](#).

3.1.2 Testing procedures

Black Start capability tests are to be carried out pursuant to the NYISO Services Tariff Rate Schedule 5 under conditions that demonstrate the unit's ability to perform its intended function as required in the SRP.

Black Start resources must prepare specific testing procedures that are adequate to test the unit's ability to, following a system-wide blackout, startup and fulfill its requirements in the SRP without the availability of an outside electric supply. The most current plan must be provided to the NYISO, and in the case of local black start resources, to the appropriate TO upon request.

3.1.3 Testing frequency

At least once each capability year each Black Start resource in the NYISO's Reliability Coordinator Area must test or demonstrate the ability of their Black Start unit(s) to perform their intended function as required by the NYISO's or local TO's SRP. Tests must be coordinated with the NYISO and the TO in whose service territory the unit is located.

3.1.4 Documentation of testing

Generator Operators of Black Start units shall document the date, start-time, and duration of all tests, and indicate if the test met the criteria in the unit's Black Start test plan. This documentation must be provided to the NYISO within 30 calendar days of completion of the test. Testing will be documented using [Attachment B](#).

The NYISO shall maintain a database of all units identified as Black Start resources for use in the SRP. This database shall include the name, location, megawatt capacity, type of unit, latest date of test, and starting method for each unit.

3.1.5 Local Black Start resources

Transmission Owners within the NYISO's Reliability Coordinator Area are responsible for determining the need and adequacy of Black Start resources to meet the requirements of their local Restoration Plan. These units are not subject to NPCC or NERC testing requirements; however, local TOs shall develop test procedures to ensure resources able to perform their intended function. Transmission Owners are responsible for procuring any required local Black Start resources.

Testing criteria for Black Start and restoration services for resources in the Consolidated Edison Transmission District are found in [Rate Schedule 5 of the NYISO's Services Tariff](#).

3.2 Key Facilities, Critical Components and Basic Minimum Power System

The Northeast Power Coordinating Council's (NPCC's) Document A-3, [Emergency Operation Criteria](#), specifies the testing requirements for key facilities and critical components for system restoration. NPCC Document A-7, [Glossary of Terms](#), defines the Basic Minimum Power System required for system restoration.

3.2.1 Identification

The Restoration Procedure attachment to the NYISO's [Emergency Operations Manual](#) identifies the NYISO's Basic Minimum Power System.

3.2.2 Testing requirements for critical components associated with key facilities

The four categories of key facilities subject to testing are:

- Black Start generating stations;
- Underground transmission cables;
- Substation and Telecommunication sites; and
- Control Center and Telecommunication Center facilities

The NPCC Document A-3, Table 1 provides test procedures, test frequency and duration, criteria for success, and required reports for testing critical components associated with key facilities. NYISO Critical Facilities and Key Components are listed in [Attachment A](#).

3.2.3 Failure of critical components

Loss of functionality at a key facility is defined as the loss of control of the facility or the loss of AC or DC service. Where multi-redundant systems are installed for a critical component, all redundant systems must fail to result in loss of functionality. An example of this is a battery system with both A and B batteries. In this case, both the A and the B battery systems must fail to lose functionality.

The failure of critical components associated with key facilities discovered during a test or otherwise that would result in the loss of functionality of the key facility shall be communicated to the NYISO within 24 hours.

4. COMMUNICATIONS DURING RESTORATION

4.1 Normal and Emergency Communications Procedures

Normal and emergency communications procedures and protocols for use during Restoration State recovery actions are found in the Communications Section 1.5 of the NYISO's [Emergency Operations Manual](#).

4.2 Loss of communications with the NYISO

If all communication is lost between the Power Control Center and TOs, the TOs shall proceed to restore the NYS Power System using inter-company communication facilities to coordinate all aspects of the restoration according to the procedures in the Restoration State section of the NYISO's [Emergency Operations Manual](#).

4.3 Incident Command Structure (ICS) Protocol

The NYISO has developed an internal procedure for establishing an Incident Command Structure protocol in order to manage and prioritize off-floor communications during bulk power disturbances. Key elements of this protocol have been shared with appropriate entities for coordination of communication during system recovery.

5. REVIEW AND UPDATING THE SYSTEM RESTORATION PLAN

NYISO's SRP review is conducted annually by the NYISO and TOs. This review will normally be accomplished via simulation, training and an annual restoration drill, and should verify the adequacy of the plan. Review and testing of telecommunication facilities and protocols necessary to implement this plan should be performed in the annual review.

During this review, operators will verify that the bulk-power and transmission district Black Start resources included in the Black Start Capability Plan are adequate to achieve restoration of the New York system. Additional reviews of this plan should be performed if the NYISO's System and Resource Planning group or TOs deem it necessary due to significant changes to the power system network or modeling. Following the review, the NYISO and TOs will update the Black Start Capability Plan if required.

Feedback and recommended updates to the NYISO Restoration Plan should be documented on the form provided in [Attachment C](#).

Attachment A - List of Key Facilities and Critical Components

This document is confidential and is maintained at the NYISO.

Attachment B - Report of Black Start Testing

[Name of Generator Owner] hereby certifies that the **[name/location of generation equipment]** successfully performed a Black Start and System Restoration Services test on **[date]** in accordance with the ISO Procedures.

Signature of Officer

Attachment C - NYISO Restoration Plan Feedback Form

Name: _____

Organization: _____

Contact Information: Phone: _____

 Email: _____

Type of Review – Date ____ / ____ / ____ *

- NYISO Restoration Training – Turn in to NYISO Dispatch Training
- NYISO Restoration Drill/Exercise – Turn in to NYISO Exercise Coordinator
- NYISO Restoration Simulation – Turn in to NYISO Dispatch Training
- Other: _____ – Fax to NYISO Operations - 518-356-6327

*** If reporting the failure of critical components associated with key facilities, which would result in the loss of functionality of the key facility per the NPCC criteria, inform the NYISO Shift Supervisor via the local Transmission Operator control center.**

Details:

Use additional sheets as necessary.