

Summary Report of the
2008
Wide Area Restoration Exercise
(10/29/08)

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D) Overview

This restoration exercise was part of a region wide restoration event and incorporated a number of first time innovations to the New York restoration simulation experience. Some of the innovations went well, and others provided areas for continued improvement.

The major enhancements included in this exercise were:

- 1) Participation of external Reliability Coordinators and Transmission Operators to provide real time interaction with the NYISO restoration activity.
- 2) Implementation and use of a pseudo NERC hotline capability via a NYISO sponsored conference calls
- 3) Implementation and use of a pseudo NERC Reliability Coordinator Information System (RCIS) via an email exploder between Reliability Coordinators
- 4) Participation of transmission and distribution functions as separate entities with the associated procedures and communications exercised.
- 5) Deployment of four new operator consoles in the NYISO training control room, to permit each team of TO operators there own visibility and functionality.
- 6) Deployment of phones to each operator console allowing more realistic phone communications with the outside world, with NYISO staff, and between transmission and distribution functions within individual TOs.
- 7) Exercise of the Con Edison restoration from blackstart with the associated interconnection to the NYISO backbone. A “900 Diagram” one-line provided the operator interface.
- 8) Exercise of the Con Edison restoration plan energizing from the Eastern Interconnection via ties from PSE&G in New Jersey

The enhancements were successful.

Some of the issues that need to be addressed prior to the next execution of such a wide area exercise include:

- A) Identify and resolve the issues that caused the simulator solution to fail. The solution failures caused considerable credibility dissatisfaction with the voltage and equipment status indications. (The simultaneous restoration had been successfully exercised repeatedly on previous occasions.)
- B) Communicate the scope of the exercise, the initial conditions, and the expectations of participants prior to the event. Pre-drill documentation in this exercise was minimal.
- C) Develop a two-way communication between the two remote simulators being employed. NYISO should maintain at least an open conference call between the simulator consoles to insure that the systems stay in sync, and provide a common point of contact participants. In this event the director’s conference call was frequently shut down or unattended at the NYISO end.
- D) Provide one NYISO simulator operator to support activity in each island.
- E) Duplicate the pseudo NERC Hotline process to provide a pseudo NYISO hot line capability.

Participating New York System Operators

NYISO, Con Ed, NYPA, and N.Grid operators participated at the NYISO Training control room. NYSEG and RGE staff participated from their home offices. Participants with system operational roles were NYISO(7), Con Ed(4), N.Grid(6), NYPA(2), NYSEG(2), RGE(1). The Simulator engineer filled the role of the generator operators and any other transmission entities

New York Initial Conditions at 0845

An unknown disturbance caused the opening of all NYISO ties and a partial system collapse. There were conflicting indications on the status of the Robert Moses-Niagara hydroelectric facility. A surviving island of internal New York transmission, generation and load survived, centered around northeastern New York. The Blenheim-Gilboa and Moses-St. Lawrence facilities survived the event. A screen shot of the Webex broadcast overview of the NYISO system status, and a local NYISO tabular display of the NYISO system are shown on the next page.

Neighboring System Initial Conditions

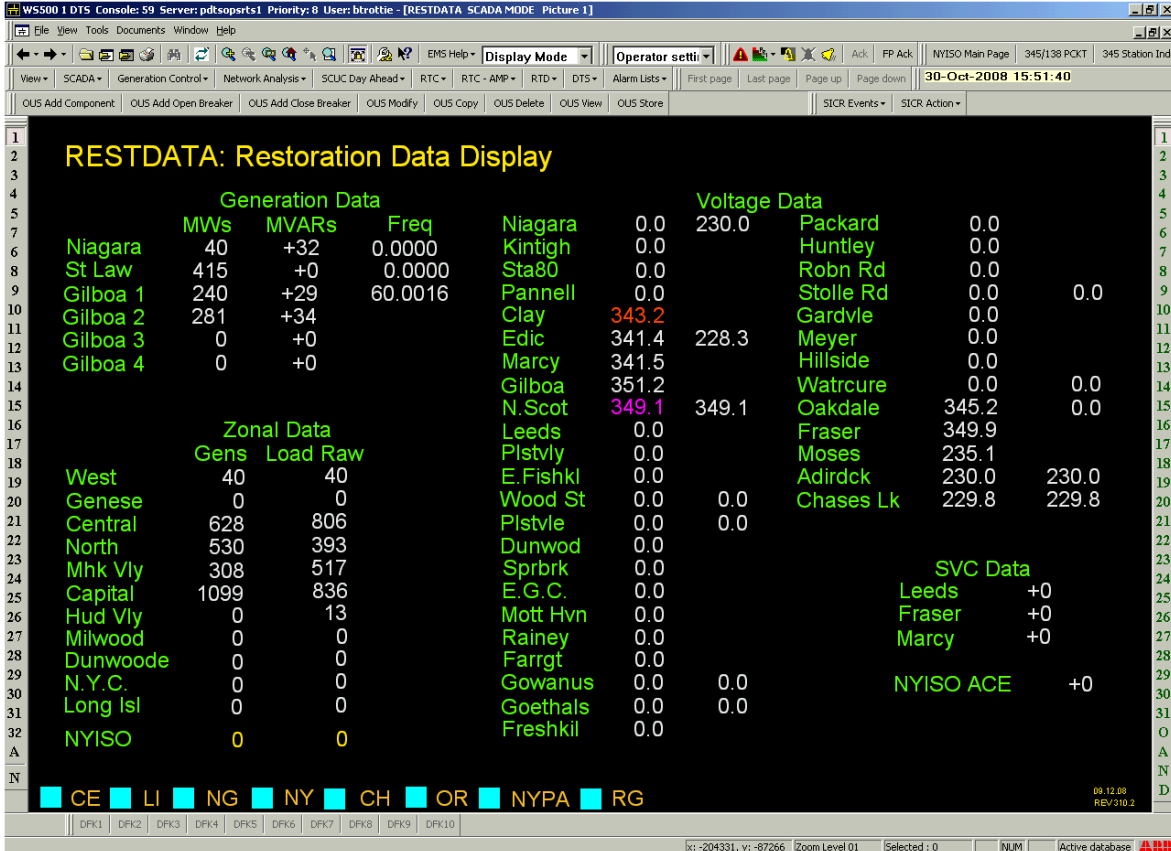
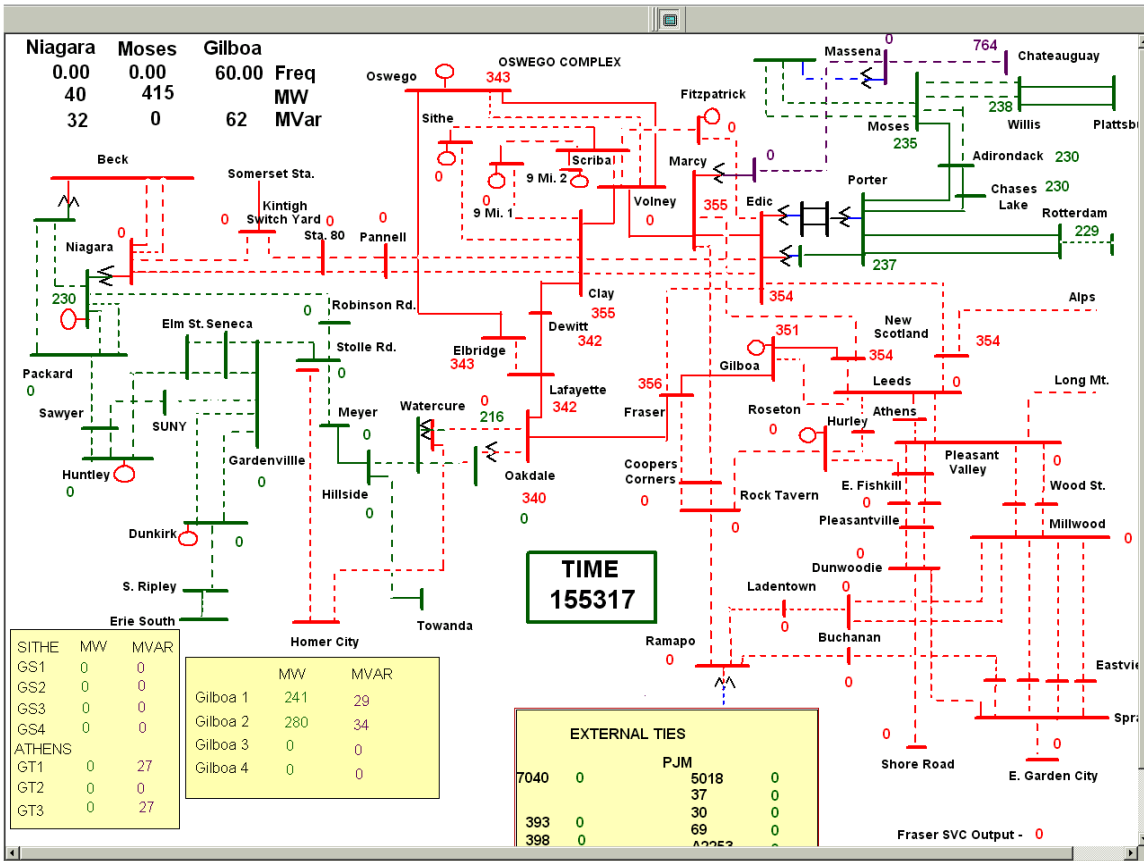
In PJM, the disturbance caused the opening of all ties to New York, NIPS and MECS. PJM remains tied to the rest of the Eastern Interconnection. PJM was available for assistance immediately. In Ontario, all ties opened at 8:45. The Ontario system degraded, and southern Ontario island collapsed at 9:30. In New England, the initial disturbance collapsed the entire system. In Quebec, the main system was unaffected. All the HVDC ties tripped. All the HQ generation isolated onto the Ontario or New York systems, went the way of their host networks.

Simulation Performance

The simulation performed well from the beginning of the exercise until about 11:15. At that time, topology changes entered by the operators (or the simulator engineer) were not being correctly processed through to the SCADA displays. Breaker status would change, but voltage and MW/MVAR indications remained zero. This turned out to be a “known incompatible code” issue which ABB support was able to resolve in short order. It was then necessary to restart the simulation from initial conditions. The simulator engineer quickly restored the upstate system to the stopping point, and the operators then resumed the restoration process. The Con Edison operators restarted the in-city restoration energizing from PSE&G via Hudson Farragut, rather than the original effort to restore from blackstart.

Simulation performed well from the restart until a crash, for reasons unknown, at about 13:15. Again, the simulator engineer quickly rebuilt the upstate system to the stopping point, at which point the operators continued the restoration. The Con Edison operators restarted the in-city restoration energizing from PSE&G via Linden-Goethals.

Simulation performed well from the restart till a crash, for reasons unknown, at about 15:00. At this point the exercise continued without NYISO simulation.



III) Participant Breakdown

The number of attendees from the operating authorities is shown below.

Organization	# of Participants
NYISO	11
Con Edison	6
National Grid	7
NYPA	3
NYSEG	4
RGE	2
NY total	33
ISONE	7
IESO	109
NBSO	3
HQ	3
PJM	3
MISO	12
External total	137
Grand Total: Operator and Director Personnel	158

The Ontario number includes an extensive list of transmission company and generator company participants in their drill.

The MISO numbers reflect only the MISO personnel participating in the IESO exercise. A two-day MISO restoration exercise was simultaneously underway.

VI Participant Evaluations

Included with each participant notebook was an evaluation sheet that invited the attendee to rate each presentation on a scale of 1(worst) to 4(best) in each of six categories:

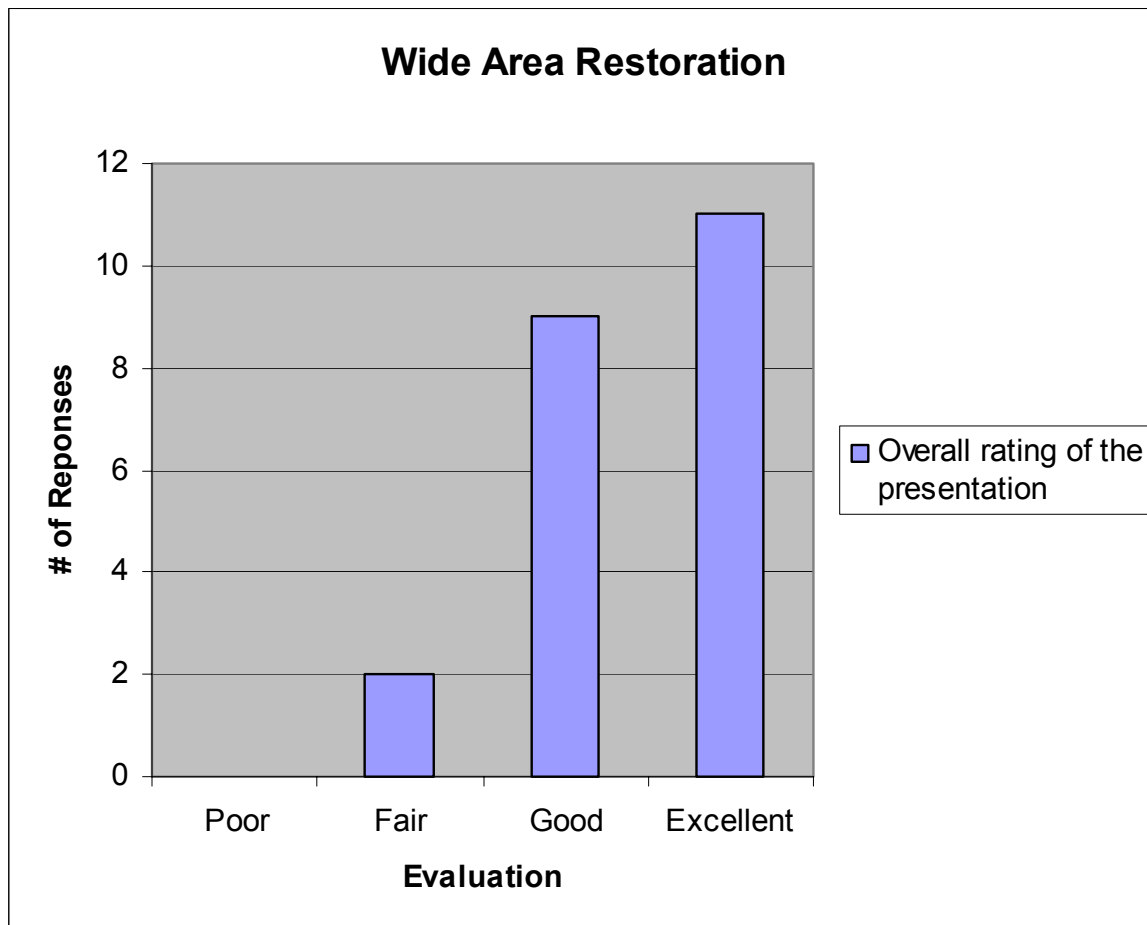
- Instructor Knowledge of the Topic
- Course Organization
- Responsiveness to the audience
- Ability to hold your attention
- Content of the presentation
- Value of the topic to you
- Applicability to your job
- Will you benefit from this presentation

There was also an Overall Rating for the Presentation and question on satisfaction with the course registration process, and a space for comments.

The numeric evaluations results of the Overall Rating of the presentations and activities are listed and plotted below.

Wide Area Restoration Plan Interactive Simulation 2008

	Poor	Fair	Good	Excellent	Responses
Overall rating of the presentation	0	2	9	11	22



IV Individual Topic Feedback

- Simulator did not have a good indication of lines energized (MVARs). Many times would not show line in service while closed at both ends. Many times after closing device, later in restoration the breaker we closed would show open.
- Simulator problems. Don't know why we had to travel to NYISO for this drill.
- Simulator "broke" too much.
- Displays were similar to actual for Con Ed. Simulator crashed which required disconnect switches to be reclosed. Time consuming. This happened at least twice. NYISO and NYPA interaction over the phone made the drill more realistic. Need more voltage and frequency points on displays.
- Excellent - the best so far!!
- Simulation needs work
- Exercise proved to be an excellent supplement to the Annual NYISO Drill(s) [including the Spring SOTS simulations] as well as a step up from the one-on-one drills conducted over the past several years between the NYISO entities and external control areas (IESO, ISONE & PJM)
- Exercise was good. Some questionable results from the simulator. Simulator failures also took away from lessons of restoration, as many breaker operations had to be repeated. Phone turrets and work with TO's helped accommodate and teach good communication skills during emergency operations.
- Fix the simulator, need to verify the modeling. Initial set-up should mimic real time. Feeder disconnects should be closed.
- Would like to see more discussion/interaction as restoration progresses. What is the starting condition of the system? What is the plan of each TO for this condition? Does a TO have recommendations for a different path/procedure.
- Limited use of repeat back, 3 way communication. IESO drill complete at 1415. HQ drill complete at 1440. Unpredictable DTS voltages at times.
- Need to hear from the Exercise Leader on the conference call to kick off the exercise and provide direction throughout. Enhance simulator function. Pre exercise conference call to describe communication protocols and answer questions related to the exercise.
- The exercise did provided RG&E an opportunity to review our local plan in conjunction with the NYISO, NYSEG and NGrid restoration.

VIII NERC Continuing Education Credits

Activity Code	Total CE Hours	STD Hours	OPER Hours	SIM Hours	EOP Hours	PROF Hours
NYISO_020_Wide_Area_Restor_Sim_08	8	5	8	8	8	8

IX End of Simulation Survey Results

1. Was the exercise realistic? What, if anything, stuck you as significantly bogus?

- Yes
- To a certain degree
- Yes
- Yes/No
- Yes
- Yes
- Not enough incoming phone calls, especially at the beginning
- Yes
- The exercise seemed realistic. It appears the software needs more fine tuning.
- The exercise was realistic
- For the most part. The only “bogus” development was the simulator’s ability to remain intact upon the occurrence of exceptionally high 345 KV voltages (400-450KV)
- NYISO started steps without communicating to appropriate TO UPNY/SENY. Simulator problems – voltages not consistent with adjacent stations
- No, voltage modeling not realistic. Feeder disconnects were open
- Voltage control did not appear realistic
- Yes
- The way Con Ed load is modeled is not specific enough. Otherwise it was wonderful.
- Somewhat. The simulator needs improvement.

2. Were the available operating procedures and their attendant communications protocols sufficient to meet your needs? If not, where were the gaps?

- No. Restoration manuals
- Yes. Some improvisation required
- Need to bring in NYSEG or assign someone to handle their lines.
- Yes (there were 12 survey responses that were merely “yes”)

3. How did this exercise link to the Aug. 14/03 blackout and restoration effort?

- Similar. Did not entirely reproduce the chaos!
- Not really. Less generation on line. Less load on line. More like a blackstart.
- Similar as a partial blackout
- ? Did not link.
- The real 2003 blackout we had several hundred phone calls. Drill - not much phone communication.
- Things in the exercise moved much more quickly
- With 8/03 a partially intact UPNY system was used for a starting point. Having the NY SRP w/ TO plans was very valuable.
- Similar state left for restoration
- Not realistic. We attempted to do a blackstart.
- THIS IS A VERY GOOD EXERCISE!!!
- Simulation of similar event
- Even better

4. Did you communicate with an entity outside of NY? How did the presence of outside entities enhance/detract from the integrated exercise we performed today?

- Yes – enhanced. Forced to think about more than just NY
- Enhanced – they are on the same wavelength that we are
- Yes. Good in terms of communication. Hard to coordinate switching due to the fact we were operating two simulators (NYISO and NYSEG)
- Have externals in the same room
- Yes
- Yes
- Yes. No Effect.
- One Ontario
- Yes enhanced
- River Control – no real impact
- We communicated with River Control at Niagara. They needed information on Niagara generation, to adjust river flows
- Only River Control in Ontario for water level data. This was not critical to the electric system nor to the process in NY.
- Yes, ISONE and Ontario. Did not enhance the drill.
- No, just within the room
- More realistic
- Yes, made it more realistic

5. What could be done to improve this sort of restoration simulation exercise in the future? What information was unavailable, that would have been helpful?

- NYISO trial run before the TOs participate.
- More simulator operators to take request from TO's for gen, load, closing breakers
- Simulator "broke" several times. Needs better reliability.
- Con Ed personnel way too LOUD!
- Have everyone involved in the drill do more prep before the drill.
- It seemed that some of the voltage conditions should have tripped breakers – assign trip conditions to major equipment
- Have NYSEG and RGE on site for their part of the restoration drill
- Insure that all the major NY TOs are present. Remote coordination with certain TOs proved to be inefficient.
- Let the TOs stay at their own control centers – much more familiar and realistic. Simulator Sucks! Too many problems. Actions in many cases did not show impact in many cases. Travel for the drill was a waste of time. NERC CEH's the only benefit.
- Fix the simulator
- The ability to monitor frequency at the terminals for islands. Also the simulator crashed a number of times, which caused us to have to re-set up the system. This delayed us quite a bit. The system should be able to snapshot and revert back to that point in time.
- Need more time. Possibly if the simulator did not crash twice, there may have been ample time. Need more voltage and frequency points on the displays. PAR Control? Disconnect switches should already be closed, time consuming to close disconnects.
- Just model Con Ed network loading more realistically. Well done!
- The exercise was good. As the simulator improves, the exercise will be more realistic.

IX Exercise Timeline

- 08:45 Begin exercise. NYISO isolated from external Control areas (all ties open) after significant disturbance. NYISO switched from TLB to CF, and request status from TO's. NYISO generation at St.Lawrence and Gilboa online and available. Niagara unavailable.
- 08:58 NYISO Hotline call and RCIS (email) message.
NYISO declares Restoration State, EEA level 3, and requests initiation of Blackstart procedures.
- 09:05 NYISO restoration gameplan is to work West from Clay and SouthEast from Gilboa, utilizing St.Lawrence and Gilboa generation.
- 09:10 NYPA states Niagara plant is available. NYISO restoration gameplan changes to work East from Niagara instead of West from Clay...now that Niagara is available.
- 09:11 PJM reports they are up and ready to TIE.
- 09:12 Fraser SVC energized.
- 09:20 ISONE reports as of 08:50: all NE is black, All ties open, ISONE operating to OP6 (restoration). ISONE declares EEA3.
- 09:30 IESO reports Ontario experienced a blackout, All ties open and islanded.
- 10:15 Leeds SVC energized.
- 10:33 CE reports they are following CE restoration plan 8. They are alive at Freshkills 345/138, Greenwood and Vernon. They are carrying 500 mw of load. They will restore cranking power to Arthur Kill and Linden Co Gen.
- 11:35 NYISO sent RCIS message requesting pseudo NERC hotline Conference call at 11:45 EDST.
- 11:45 NYISO initiates pseudo NERC hotline Conference call
- NBSO: Reports separation from HQ and ISONE. NB is serving Bangor load in NE, and has stabilized following UFLS following l/o 400 mw.
- HQ: Has separated from all other control areas. HQ system is stable.
- IESO: Reports several islands still exist. All nukes have received startup power except Pickering 2.
- MISO: Reports several islands still exist. All nukes have received startup power.
- ISONE and PJM were not on call.
- 12:00 ISONE reports Nuke offsite power restored, System stabilized serving 800mw to multiple islands.

- 13:25 NYISO (Con Ed) Sync with PJM on A2253 Linden-Goethals (230kv).
- 13:45 NYISO and HQ agree to energize 7040 Chateauguay-Massena (765kv)
- 13:52 IESO notifies NYISO that the L33p and L34p Saunders-Moses (230kv) are available.
- 14:25 NYISO and IESO systems tied at L33p Saunders-Moses (230kv)
- 13:55 NYISO sent RCIS message requesting pseudo NERC hotline Conference call at 14:30 EDST.
- 14:30 NYISO initiates pseudo NERC hotline Conference call

NBSO: NB is still serving Bangor load in NE, is stable. Re-established HQ ties and receiving transfers from HQ.

HQ: Is stable and providing assistance to neighboring control areas as needed.

IESO: Reports islands still exist. Tied to Manitoba, Minnesota, and New York.

MISO: Reports East totally reconnected, Michigan, Wisconsin and Minnesota should be connected in ½ hour to 45 minutes.

ISONE: Eastern 345 kv backbone energized...will be ready to connect to NY in ½ hour to 45 minutes.

PJM was not on call

- 15:30 ISONE ready to sync to NY.
- 15:33 NYISO and ISONE sync on 393 Berkshire-Alps (345kv). ISONE also tied to HQ at Sandy Pond