



September 8, 2003

Preliminary IMO Board Report to Market Participants Following the August 14, 2003 Market Suspension

This report is provided to market participants in accordance with the market rule requirement that the IMO Board publish a preliminary report to market participants within 10 business days of market resumption following a market suspension.

Overview

On Thursday, August 14, 2003 at approximately 4:11 p.m., the power system of Northeastern United States and portions of Canada lost major portions of load, generation and transmission. The effects of this event were felt throughout the Eastern Interconnection with the areas centered around the Great Lakes most affected. Approximately 61,800 MW of customer load was lost affecting 50 million people. The IMO administered markets were suspended for 9 days.

Market Suspension is unavoidable during a blackout of the power system of this magnitude. While it is clear that the disturbance did not originate in Ontario, a number of investigations are underway and any conclusions regarding the precise cause of the blackout or any detailed recommendations on how to prevent future events are premature.

The IMO considers it essential that the investigation fully consider the lessons to be taken from this occurrence at all levels, including generation and transmission adequacy, operations between jurisdictions, and compliance procedures. The conclusions and recommendations must be designed to avoid a re-occurrence. That will be the objective of the IMO as we participate in the ongoing investigations.

This preliminary report provides a brief description of the conditions in Ontario prior to and immediately following the blackout and the actions taken to restore electricity service and the market to Ontarians.

1. System Conditions Before The Blackout – August 14, 2003, 4:06 p.m.

Temperature: 31degrees Celsius
Ontario Demand: 24,050 MW
Imports: 2,300 MW (New York, Michigan, Quebec, Manitoba, Minnesota)

All flows on the transmission system were within limits prior to the event. Demand was within expectations at the time of the event, with all reserve criteria being met. All power system conditions were normal. Sufficient resources were scheduled to meet the demand and reserve obligations for the expected evening peak of 24,400 MW.

2. The Blackout

Large power swings occurred at the Michigan and New York interfaces at approximately 4:11 p.m.

Records show that at approximately 4:09 p.m. an initial power swing resulted in a changed flow of about 700 MW from New York through Ontario toward Michigan. All other conditions were normal at the time.

Approximately 90 seconds later there were several power swings ranging between 2,000 MW and 4,000 MW over a 12-second period between New York, Ontario and Michigan. During this time, at approximately 4:11 p.m. the Ontario power system began to shut down.

3. Impact on Ontario

Nearly all of the load in Ontario east of Wawa was interrupted. The area west of Wawa was not affected and remained connected to the Manitoba and Minnesota systems. Two notable islands of load and generation were formed in the Niagara area and the Cornwall area. Two smaller islands of local load and generation were formed, one north of the Timmins area and another along the Ottawa River near Deep River stretching along the bottom of Algonquin Park.

4. Market Suspension

Due to the major blackout of the power system, the IMO declared the suspension of all of the IMO administered markets at 4:20 p.m. Notification to market participants was issued from the IMO Help Centre at 5:15 p.m. The Transmission Rights Auction Round that was cancelled as part of the suspension was rescheduled for September 2 and 3, 2003. Administered prices during the market suspension were published to market participants on the afternoon of the day previous to which the prices applied, with the exception of the first few days.

5. Restoration of Electrical Service

The overall goal of the IMO's restoration effort was to return reliable electrical service to Ontario consumers as quickly as practical and return to normal system and market operation. The following provides a brief description of the actions taken to achieve this goal.

As a result of the blackout, the IMO implemented control actions as outlined in the Ontario Power System Restoration Plan (OPSRP- Market Manual 7.8). The primary objective of the OPSRP is to regain a reliable integrated power system via restoration of the IMO-controlled grid to the maximum extent possible based on the equipment available after a partial or complete system blackout.

Throughout the restoration process it is imperative that deviations in voltage and frequency be kept, to the greatest extent possible, to magnitudes that do not adversely affect customer and

power system equipment that is able to operate. It is also critical that during the process of restoration the system is protected against further collapse (i.e. additional system disturbances).

The priorities of the OPSRP are:

- Restoration of power to all nuclear sites as soon as possible to maintain the integrity of nuclear units and to make them available as soon as possible to assist in subsequent restoration of the power system.
- Restoration of power to critical transmission station and generating station service loads that supply equipment necessary to facilitate the rapid restoration of the power system.
- Restoration of power to critical utility-owned telecommunications facilities throughout the province.
- Restoration of customer loads to the extent necessary to control voltages and frequency and secure those operating generation units during the early stages of system restoration.
- Synchronization of stable and balanced islands of generation and load with other parts of the IMO-controlled grid, or to adjacent power systems, at the earliest opportunity in a controlled fashion.

The IMO direction to Market Participants was guided by these priorities throughout the restoration of the power system.

The following is a summary of the chronology of the restoration. This summary does not cover those operations and events that occurred outside of Ontario. Times may be revised as disturbance analysis continues.

At the time of the blackout, back-up battery/diesel systems worked seamlessly at the IMO's Control Centre, providing electrical power to enable the IMO to direct the restoration of Ontario's power system. With the exception of cell phones that were overloaded early in the event, the public telephone network was generally available to the Control Centre. Subsequently, the heavy traffic made arranging large conference calls difficult.

Immediately following the blackout, the IMO activated its internal Emergency Response Team and the industry wide Crisis Management Support Team. Media communications and a Government Decision Support process were initiated. Additional operating staff beyond those currently on-shift were seconded to assist in the restoration. Contact was established with generators and transmitters within the province and with control area operators beyond Ontario to assess initial conditions. An overall restoration strategy was developed and operating staff were assigned to achieve restoration objectives concurrently along four major paths. Plans were adapted to changing circumstances as the restoration proceeded, with approaches being modified as necessary to achieve objectives. Each of the four paths is described very briefly.

5.1. Restoration From The Niagara Area

The first circuits were energized out of the Niagara Island at 4:42 p.m. with a goal of bringing power to the Bruce Nuclear generating units. The three Bruce "B" generating units that were available returned to service between 7:13 p.m. and 9:14 p.m. Energizing the circuits towards

the Bruce Nuclear complex also allowed the IMO to return potential to Nanticoke generating station.

Restoration then proceeded toward the Greater Toronto Area, the Pickering Nuclear Station, the Lambton Generating Station and TransAlta - Sarnia.

Other transmission circuits in the area bounded by London in the west and Toronto in the east then had to be reconnected quickly to support the reloading of the Bruce generation. To achieve this, customers' power was restored in a controlled manner at many locations throughout the area covered by the initially restored transmission corridors.

5.2. Restoration From The Cornwall Area

The period from 4:11 p.m. to 5:15 p.m. was used to assess the conditions in the area, stabilize available generation, and secure transmission that was operating near its limits. At 5:15 p.m. the first circuit was energized out from the Cornwall area westward toward the Pickering, Darlington and Lennox Generating stations. Generating units from Quebec were synchronized to the system at 8:17 p.m. to add additional stability to the area. The Darlington generating unit that was available returned to service at 9:18 p.m.

With the transmission system that was restored across the GTA from Niagara supplying power to Pickering, a link between the Cornwall area and the GTA was completed at 10:37 p.m. forming a complete loop around Lake Ontario and adding to the strength of the restored transmission system.

While the transmission system was being restored toward Darlington, another restoration effort from Cornwall towards Ottawa began at 6:40 p.m. in order to restore critical telecommunications facilities.

5.3. Restoration From The Chats Falls Area

Chats Falls generating station units (Northwest of Ottawa) were successfully started from power supplied by Quebec at 5:15 p.m. Restoration from this area, initially directed to reinforce the Cornwall path, was redirected toward Pickering to support the effort to return power to Pickering as early as practicable. After considerable switching efforts and with the aid of additional units from Quebec, circuits were energized from Chats Falls towards Pickering at 8:21 p.m.

Power arrived for Pickering from Niagara and Chats Falls at nearly the same time. Pickering was energized from the Niagara sources at 9:15 p.m. Chats Falls generation was connected to the remainder of the system early Friday.

5.4. Restoration From The Northeastern Area

Several hydroelectric generators remained spinning but not connected to the island north of Timmins. A number of the generators at various facilities were synchronized together and by 7:41 p.m. the transmission system was energized south to Timmins. When sufficient Timmins

area load was restored, the transmission system was energized south to the Sudbury area. From Sudbury the transmission system was energized in both an eastward direction towards the pocket of load along the Ottawa River that survived the initial event and westward towards Wawa.

The connection between the northeastern area with southern Ontario, was completed at 3:43 a.m. Friday morning. The connection of northwestern Ontario to the rest of the Province was completed at Wawa at 5:20 a.m. Friday morning.

5.5. Regional Coordination

Frequently during the initial restoration and regularly through the next week conference calls were held with other NPCC control area operators as well as with NERC Reliability Coordinators. These calls were effective in coordinating initial emergency assessment and response strategies and in assessing ongoing restoration progress and emergency assistance available.

5.6. Load Restoration

Once the primary priorities of re-establishing a reliable network were met, the restoration progressed with the reinforcement of the transmission system and restoring load to match the available generation as it returned to service. In addition to the generation returning to service, a number of emergency control actions were undertaken to maximize the number of customers that could be restored. These included rotational load shedding and voltage reduction (in the very early stages), requests for curtailment and conservation, activation of emergency demand response customers, dispatch of emergency generation and emergency purchases from neighbouring jurisdictions, particularly Quebec. By the evening of August 15, most load was restored although the demand was much lower than would normally have been expected. Rotational load shedding ended and some operating reserve was restored.

Throughout the following week, assessments indicated there was not sufficient available generation and confirmed interconnection support to reliably meet the normal Ontario demand. The Provincial Government declared a Provincial Emergency on August 14. On August 17 the Government requested industrial, commercial and residential customers to reduce their consumption by 50% during peak hours. Customer response to requests for curtailment and conservation together with continued dispatch of emergency generators and emergency purchases from Ontario's neighbours allowed a reliable supply to be maintained for the reduced level of demand.

6. Crisis Management, Communication and Decision Support

The IMO both directly, and through the Crisis Management Support Team¹, maintained regular communication with Market Participants, Government and the Media, informing them of the current and future state of the power system in Ontario.

¹ The purpose of the Crisis Management Support Team (CMST) is to provide a forum for Ontario's electricity industry participants and stakeholders to co-ordinate emergency management initiatives, information and response during a major electricity emergency.

Communication with industry, through the Crisis Management Support Team, and with the Provincial Emergency Management Center was established very early helping to identify and facilitate emergency actions requiring Government support as well as identifying emergent restoration priorities. Frequent coordination took place for the first few days and regular briefings conducted during the following week helped industry representatives understand and convey emergency management initiatives.

A Communications Centre was set up to brief media on the status of system restoration in Ontario and to provide information as to how customers could assist in the restoration effort. Press conferences, scheduled twice daily, were coordinated with Provincial officials.

Through ongoing participation in the decision support process, the IMO provided briefings and advice to Provincial government officials on power restoration priorities to ensure coordination with other government agencies.

The IMO Help Centre expanded its operations from weekdays to 24x7, and successfully handled a 400% increase in call volumes over the 8 days of the declared emergency. During this period significant call volumes came from large industrial consumers, small businesses and the general public. The overriding request was for information to help them ensure that they, as electricity users, were “doing the right thing,” such as implementing conservation measures.

7. Actions of the Market Participants

Generator, Transmitter and Distributor protections intended to isolate equipment from damage worked as designed. There was no significant long-term equipment damage as a result of the disturbance. These protections together with operator actions provided a safe and orderly shut down for generators, transformers, and transmission lines.

Market participants responded capably to IMO direction under the adverse conditions experienced during the black out and the subsequent restoration process with the bulk of the transmission system and generator connections being restored by mid morning on August 15. With the transmission system restored, rotational load shedding was kept to a minimum (and was avoided altogether after the evening of August 15) based on two factors:

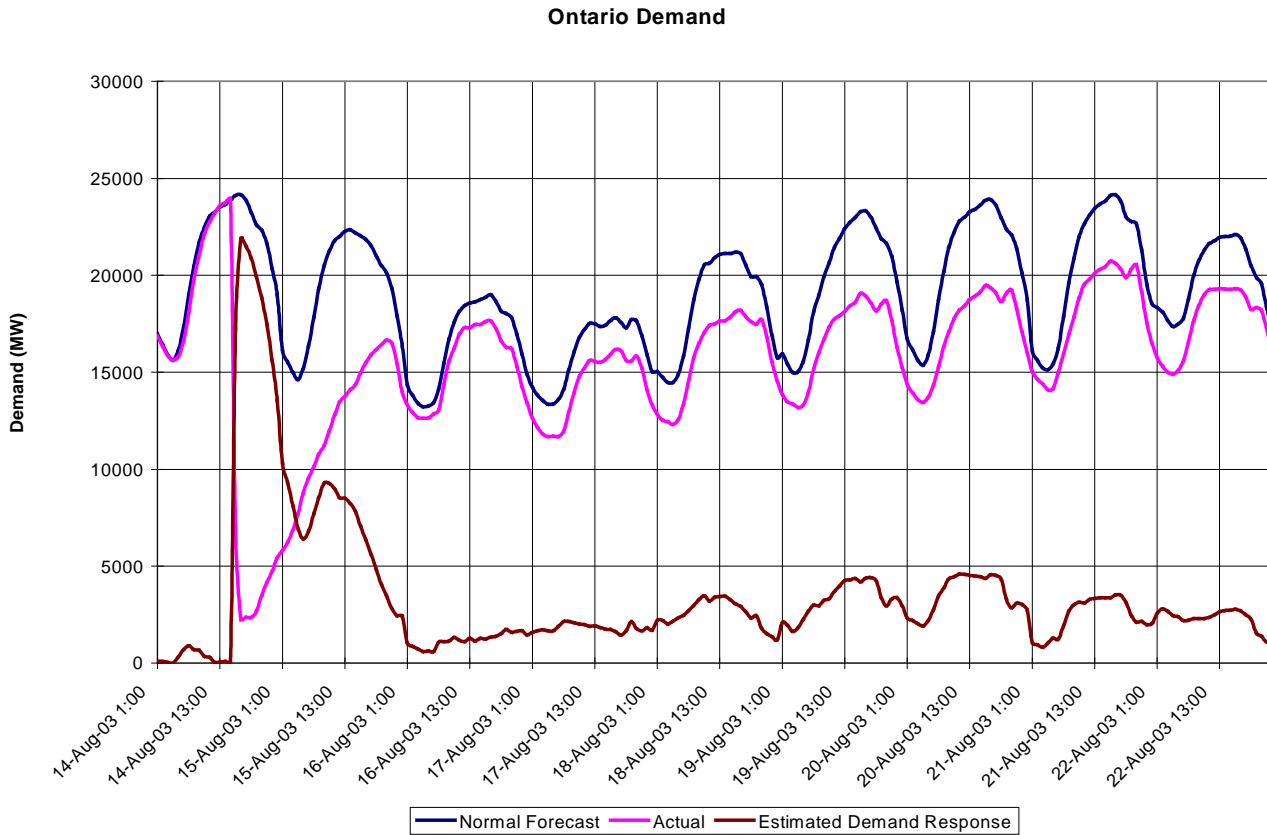
1. The efforts of staff at facilities returning as much generation as quickly as possible upon the restoration of power.

Most generators in the province were shutdown as a result of the blackout. While shutdown, generator operators worked to keep them in a state to return to service. As transmission was reconnected to the generators, many were reloaded such that by Friday evening, August 15 over 15,000 MW of Ontario consumers were reconnected. More generators were returned to service over the weekend but several large generating units remained unavailable into the following week. Based on information updates provided regularly by generators, the IMO assessed the ability to supply Ontario’s customers. While generation returned to service throughout the week, the weather became increasingly hot and electricity demand grew.

However, by Friday, August 22, the forecast of available generation was sufficient to allow a reliable return to normal operation.

2. The response by industrial, commercial and residential customers to the requests for curtailment and conservation made by the Ontario Government. This response led to significant demand reductions over the period of generation recovery.

The graph below indicates the impact of demand reductions based on similar day projections of normal demand.



8. Market Resumption

Preparations for market resumption began with participants being invited on Tuesday, August 19 to begin submitting offers and bids. This allowed the IMO and market participants to verify their market systems and assisted the IMO's reliability assessments. On Wednesday, August 20, market participants were advised to expect publication of pre-dispatch schedules on Thursday, August 21. Automatic generator dispatch based on the market systems commenced at midnight on Thursday.

The provincial emergency ended at 8:00 p.m. on Friday, August 22. Assessments earlier in the day indicated that the generation that had returned to service or was expected to return to service was sufficient to allow reliable supply to the normally expected Ontario demand. A message was sent to all participants anticipating market resumption at midnight. At 6:00 pm the publication of pre-dispatch pricing data re-commenced.

The IMO administered markets, following appropriate notifications, resumed operation at 1:00 a.m. August 23, 2003.