

EXPERTS SPECULATE ON BLACKOUT CAUSES AND POSSIBLE REMEDIES

By Phill Feltham

While a final detailed report is expected to be published by year's end, the North American Electric Reliability Council (NERC) is preparing an interim report regarding the August 14th blackout, outlining some details from the on-going investigation.

It took a major blackout that knocked out much of Southern Ontario and the Northeastern U.S. to make regulators realize that the serious issues in the energy industry can no longer be ignored, according to industry experts.

And while the joint U.S./Canadian taskforce continues its investigation, electrical experts and industry professionals are already speculating about the problems with electricity reliability.

Ontario's Independent Electricity Market Operator (IMO) recently released a report identifying a number of problems that, if not dealt with soon, can cause more massive blackouts. The IMO is a member of the taskforce and the organization responsible for regulating electricity in Ontario, a province hit hard by the August 14th blackout.

In the IMO's 18-month forecast, released earlier this year, it says electrical reliability is satisfactory, but Ontario is faced with tight demand/supply balances with periods of negative reserve margins.

This, according to the 18-month-forecast will have several potential market impacts. "These include upward pressure on wholesale market prices during peak demand periods and limited opportunities for the IMO to approve the release of generators for planned maintenance. Various responses can be anticipated in these circumstances, including: for Ontario generators, maximizing their availability to offer into the Ontario market; for marketers, arranging imports to help meet anticipated Ontario requirements; and for large consumers, taking measures to reduce their electricity consumption. The importance of demand reductions was demonstrated during the period following the blackout on August 14, 2003, when conservation appeals led

to demand reductions of up to 4,500 MW."

The IMO warned that if Ontario continues to have high generator unavailability, caused by higher forced outage rates, delays in commissioning new units or returning generators to service, then it could again rely extensively on imports as was the case during 2002."

NERC has presented numerous reports to the U.S. Congress on the importance of increasing the speed of new energy legislation that has been put on the backburner for two years.

The NERC Reliability Assessment Subcommittee (RAS) annually reviews the overall reliability of existing and planned electric generation and transmission systems of the ten NERC Regional Reliability Councils (Regions). In the executive summary of that report published in 2002, it states that: "For the first time in several years, starting in fall 2001, the magnitude of new generation projects being announced each day was exceeded by the amount being delayed or canceled. The majority of the project delays and cancellations are for projects identified for initial service in 2003 and 2004. Significant amounts of new capacity are still projected for 2005 and beyond."

The report further reads that, "Uncertainty surrounds future capacity additions, including the ability to obtain suitable transmission arrangements, the ability to obtain necessary siting and environmental permits, the ability to obtain financial backing, and fuel prices and supply. In addition, political and regulatory actions could influence the amount of new generation built over the next ten years. The Federal Energy Regulatory Commission's (FERC) institution of wholesale electricity price caps in the western United States, reserve requirements proposed in FERC's

"I view (the blackout) as a wake up call. I've been concerned that our infrastructure — the delivery system is old and antiquated. And I think this is an indication of the fact that we need to modernize the electricity grid."

— US President George W. Bush,
August 15, 2003.



Standard Market Design Notice of Proposed Rulemaking (SMD NOPR), and state-mandated moratoriums on the construction of new generating facilities within their borders are recent examples."

Mr. John Sullivan, President of the Power Technologies Division for ABB Inc. in the United States said utilities have not been quick to invest money for new projects or update the aging infrastructure for the past twenty years.

"In the last few years in the United States, the industry has invested in transmission at about half the rate it did in 1985," he said. "If you read most analyses now, it would take \$50 or \$60 billion to get the electrical grid up to spec. If done over ten years, it would mean doubling the rate of transmission investment."

But the lack of investment by utilities is not the only problem. Most industry professionals point the finger at the regulators for causing market uncertainty due to deregulation. The US Congress has taken their time passing the proposed energy bill that promises to bring stability to the US electricity market. And in Canada, Alberta is trying to make deregulation work, while Ontario, has ruled out deregulation, at least for now.

Damir Novosel, the Senior Vice President and General Manager for KEMA's T&D Consulting division said regulatory actions need to focus on assuring coordination among control areas and

Continued on page 10

Continued from page 9

enable efficient system planning, permitting and market operations.

"It really starts with making the regulations simpler and more straightforward," he said. "Uncertainties at both the state and Federal levels have prevented investments. It is difficult to get ideal results if it's done half way. What we have now is de-regulated parts of the business coexisting with regulated parts, making it more difficult to define that investments will be adequately returned. For example, investments in transmission have not been in line with investments in generation."

Mr. Novosel said attracting investors would require embracing a different perspective.

"Usually, investors need a 2-3 times return on investment," he said. "As blackouts do not happen that often, it is not possible to achieve this business target and make significant investments to make power system more reliable and secure. However, when disasters such as blackouts, hurricanes or ice storms occur, it costs the economy billions of dollars. To enable proper investments, a different business model is required, including making it clear who is responsible to invest and will get the benefits of the investment," he said.

"Blackouts will happen unless infrastructure investments are made."

Mr. Sullivan said that the technologies in information systems, transmission equipment and power line construction already exist to solve grid problems.

"The technology is there," he said. "We've already done the investment in R&D. We've developed products and we've put them in place in projects across the globe. There are plenty of opportunities for these technologies to do their work if only the utilities would have the incentive to put forth the investment in buying and implementing them."

Mr. Sullivan said information technologies such as real-time monitoring systems and diagnostic technologies should be utilized. Plus technologies that allow utilities, using their current infrastructures, to move more power down those transmission lines should be examined. These transmission system technologies include static VAR compensating systems and series capacitors.

"These technologies allow the existing copper and aluminum lines currently in operation to transmit power most efficiently."

H. Lawrence Cochrane, Vice President, EAI Systems R&D for ALSTOM T&D's Energy Automation & Information business said that within a control system or a control area, a local grid reliability index, a measure that monitors the reliability of the system, would be a good way to take action before any blackouts occur.

"As the (electrical) system becomes more unstable, the index goes up," Mr. Cochrane said. "You can envision it like homeland security. At a very low level, it's at normal operating conditions and at a very high level, it's an emergency."

"If we sensed that we have phase instability, frequency instability or transient instability which increases the overall risk of the system, then, we could take action immediately that would shed load."

But Mr. Cochrane said that the true effectiveness of any new SCADA software depends on the age of the equipment it controls.

"It's straightforward to create the agent technology that sits in the system

assuming it is current technology," Mr. Cochrane said. "The challenge would be to try and put this capability in a twenty year old system." For that, Mr. Cochrane said, an upgrade of some of the control systems would be required.

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was an overload in SCADA and EMS systems. Mr. Novosel said better monitoring control needs to be in place to prevent faults like these from happening.

"The utilities need to invest in their SCADA systems and make sure the information is organized."

Mr. Novosel also suggested increasing investment in automation to prevent human error.

"The operator can't handle all the alarms and all the problems at once," he said. "They have to be filtered and presented in a way either the operator can react or have more automated schemes to ease the pressure on the operator to act. Investments in special system protection schemes can further improve security. For example, during the August 14th disturbance, further voltage decline could have been prevented by an automated scheme that would detect the voltage instability problem and initiate immediate actions to minimize the spread and impact of the disturbance"

He cautioned that new products are not the only way to improve and that utilities should make wise investments in different areas.

Mr. Novosel also outlined two long-term investments. The first is strengthening the transmission network by focusing on building new lines and cables, distributed generation, and increasing transmission power flow control capability by using HVDC links and FACTS.

"If you want to ship and sell power from the remote generators, you may need to invest in transmission lines," Mr. Novosel said.

Mr. Sullivan and Mr. Novosel both suggested that HVDC would solve some of the congestion problems on the grid.

"HVDC proved its worth beyond a shadow of a doubt in the blackout," Mr. Sullivan said. "It was able to bring up Long Island from a black start in less time and we were able to get stabilization of the system sooner." **ET**



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