RP-2004-0196 – Minister's Directive on Implementing Smart Electricity Meters in Ontario

Comments of Optimal Technologies (Canada) Inc. on the Ontario Energy Board Staff Discussion Paper on **Implementation Plan for Smart Meters in Ontario**.

Scope and Background:

The Minister of Energy has directed the Ontario Energy Board to develop and following approval of the Minister, to implement a plan to achieve the government's objectives for the deployment of smart electricity meters. The implementation plan is to be provided to the Minister of Energy by February 15, 2005. The directives under section 27.1 are intended to promote energy conservation, energy efficiency and load management.

The OEB Staff report identifies the scope of the paper is to identify the mandatory technical requirements that will define what a smart meter is for Ontario. The plan will identify the mandatory technical requirements for smart meters and the support operations of distributors; set priorities; identify regulatory mechanisms for the recovery of costs; and identify how barriers can be mitigated. In addition, the report will address the competitive provision and support of smart meters and the need for and effectiveness of non-commodity time of use rates. Consideration of non-commodity time of use rates is part of the 2006 Electricity Distribution Rate process.

The policy of the Government of Ontario is to install 800,00 smart meters by December 31, 2007 and for every Ontario consumer by December 31, 2010. The objective of the policy is to help consumers control the electricity bills though conservation and demand response. The Board had previously noted in the report to the Minister of Energy, "three conditions are needed to make consumers change the amount or timing of their consumption:

- a price that changes over time in response to supply and demand forces;
- the ability of consumers to see and respond to a price signal; and
- measurement of the response so the consumers get credit for their action."

Response to OEB Staff Discussion Paper:

Comments are provided under the section numbers in the paper. Comments are not provided on all sections of this paper however additional comments are expected to be provided in Phase II, Working Group and Phase III, Draft Report of the Board.

Section 3 Essential Elements of an Implementation Plan

3.1 Procurement Strategy

Ontario electricity distribution companies are currently looking to implement their smart meter program and demand management programs. Several utilities do have some experience with non-traditional residential metering and many others have established pilot projects to determine available technologies and the implementation issues associated with these new systems. It is also important that the support systems required for the residential are consistent with the metering and information handling systems for the current interval metered commercial and industrial accounts. It would seem unlikely that a single supplier company would be able to satisfy all Ontario distributors.

A central entity should consult with the electricity distributors on current and proposed programs for smart meters and information handling systems to determine prospective suppliers that they have under consideration. The central entity should review the meter and related technology proposals currently under consideration in Ontario and also seek other interested suppliers for the Ontario market. The timelines of the start date for implementation of the smart meter program on May 1, 2005 suggest that most distribution companies will have limited experience with their pilot programs prior to release for proposals as suggested. The IMO is currently developing a trial demand response program for residential, commercial and industrial sectors to evaluate consumer behaviour to a defined market signal. Bi-directional communication would allow confirmation of consumer response to any requested action of reduced or curtailed consumption.

The central entity could request supply and pricing commitments from approved suppliers. The pricing information would be provided to all distribution companies which would order and schedule deliveries over the implementation timeframe.

Other considerations:

Technology updating:

A smart metering program should be able to evolve as the needs of the Ontario electricity market change. It is expected that technology will improve over the term of the complete implementation period. It is important that the early market participants have all of these capabilities added to their smart meter. This requirement would be possible with bi-directional communication as a component of initial requirements of the smart meter.

Section 4 Cost Recovery

Additi*onal cost category – Advanced metering systems*

The cost categories for meters do not include provision for costs associated with advanced meter systems, advanced feedback and the ability to control the meter and even internal loads. Section 5 on Metering Functions comments that "In considering optional functions, the Board will balance the benefits and additional costs." It seems appropriate that an additional category be added for cost recovery to be consistent so that the Board will consider the benefits and additional costs of advanced metering and communications.

The consideration of non-commodity time of use rates is to be considered as part of the 2006 Electricity Distribution Rate process. Advanced metering and bi-directional communications will enable participating loads to provide demand response and allow the aggregation of load to provide demand based operating reserve to the IMO. The revenue streams from this process could flow to the load aggregator or distribution service provider. Either party would provide a revenue stream to offset the higher costs of the bi-directional communications.

The revenue stream from the IMO operating reserve market is not expected to match the incremental cost of the new meter and communications systems. However, they can be expected to replace the lost distribution revenues that the respective distributors can expect to lose due to the reduced demand and other conservation efforts. To the extent that a demand charge component is introduced as a non-commodity component of time of use rates, the distribution utilities have another incentive to manage their system load factor to higher levels using demand response. This requires a bi-directional communication system capable of multiple objectives.

Section 5 Metering Functions

5.4 Bi-directional communication

The paper states "Bi-directional communication allows the distributor (or others with access to the system) to send messages to the meter in order to change the parameters of the meter (e.g. to change price for prepay systems), to signal the user (e.g. for critical peak pricing or for emergency conditions), and ultimately for load control." The paper goes on to states "The Minister's directive emphasizes consideration of bi-directional communication and directs the Board to identify mandatory technical requirements except where the Board finds the options are impractical."

Optimal Technologies supports the development of bi-directional communications as a key component of a smart meter program. Optimal has developed SUREFAST^{TM}, a product that goes far beyond bi-directional thermostat and other simple control methods. SUREFAST^{TM} provides entirely new and complete levels of low cost, highly automated sensor-based, data acquisition and bi-directional supervisory control via the Internet."

Optimal combines SUREFAST™ with their grid optimization algorithm, AEMPFAST™ to provide SmartGrid™. The bi-directional communication of SUREFAST™ allows consumer response to a number of prospective inputs and provides feedback to the distributor, a service provider or the grid operator (IMO) of actual response in near real time.

Optimal believes that not only is bi-directional communication practical to the residential level, but they have developed a system to allow electricity users or their service providers to be active participants in demand response programs in Ontario. SUREFAST™ is able to function with existing metering systems for all classes of customers. Components of SUREFAST™ are able to provide demand response and can provide a minimum level of load change confirmation without interval meters. This would allow for load management initiatives with residential users prior to the installation of improved metering.

Forbes Magazine covered new electricity technology in an article entitled “Smarter Juice” in their June 07, 2004 edition. The article identifies Optimal Technologies under the Software (references SmartGrid) and Meters (references SUREFAST) sections of the article. The article suggests that innovative solutions abound. Will the industry choose to fund them?

Optimal has developed a system able to communicate with current technologies for consumer metering and electricity grid operations. Standardization of bi-directional communications would simplify the implementation of improved grid management even as more market participants are involved in generation and active load management programs. Load response programs are of more value to grid operations when the grid operator is able to predict and confirm the actions of all loads in response to price, demand management programs or other specific action requests.

Forbes.com

Technology

Smarter Juice
Rob Wherry, 06.07.04

Another megablackout threatens to darken the summer of 2004. Innovative solutions abound. Will the industry choose to fund them?

Last month California utility officials began their annual warnings to residents about cutting back on power usage. And in April a joint task force finally released its report on the causes of the summer 2003 blackout that left most of the northeastern U.S. sweltering in the dark. The committee placed blame on several clumsy utilities and a weak transmission grid. While the task force did suggest ways to fix the problems, Secretary of Energy Spencer Abraham left the industry with these dire words: "Improvements are urgently needed. Failure to implement [the report's] recommendations could threaten the reliability of the electricity supply." In other words: Get ready for the lights to go out again.

Now, at least, utilities are spending again on transmission, after 20 years of benign neglect. A recent poll of 70 utility executives by GF Energy, a Washington, D.C. consultancy, found that the industry planned to spend an additional $4 billion to $7 billion annually over the next five years on high-voltage transmission. That's not much, but it's a start. "The grid has been overlooked," says Maurice Gunderson, cofounder of $250 million (assets) energy venture firm Nth Power. "We have to catch up."

The companies below think they have some solutions. These small outfits--several trade publicly--make products that when installed at different points along the grid system, can help a utility move power efficiently, save consumers money and alleviate strain on the grid.

Software Optimal Technologies' SmartGrid adds brains to wires. Its algorithms feed off data transmitted wirelessly or through the Web from hardware scattered across the grid. A system operator can see pockets of heavy demand like air conditioners on a hot summer day, outages, congestion or tripped circuits at a substation. The software then determines how the grid should react by, say, rerouting power over a less congested line or by triggering back-up systems. It can also predict possible hot spots, helping the utility decide where to situate new infrastructure. The most basic system starts at $75,000.

Cables A frequent cause of outages is power-line sag. The cables get hot, expand and short out against an errant tree branch. Last year Composite Technology Corp. began marketing a stronger cable consisting of aluminum threads that surround a carbon-and-glass-fiber core. Utilities traditionally use two types of cables: copper and aluminum with a steel core. CTC's composite-core cable, says the company, carries twice the power of traditional aluminum cables and is 25% stronger and only a fourth as heavy. It's also cheaper--$90,000 a mile rather than $550,000. The savings hinge on not having to construct new steel towers to carry the weight of additional aluminum cables to meet demand.

American Superconductor helps make a copper-core cable that's wrapped by two layers of superconducting wire. Liquid nitrogen, a cheaper alternative to traditional oil coolant, courses

around the wire to keep it from overheating. The coolant is 40 cents a gallon compared with $3.20 for oil. The cable can carry three to five times the power of comparable copper lines.

Power Lines National Grid, one of the nation's largest owners of transmission lines, uses a helicopter-borne laser that, flying at 750 feet, emits 50,000 pulses per second toward the towers and lines below and takes 6 million measurements per mile. An onboard computer records the data and translates them into an illustration of the power line. National Grid can calculate to the inch how much sag the line has and how much it might drop on a hot summer's day. The company estimates the technology will save it $1.8 million in the next five years.

Transformers More than $200 billion worth of huge and heavy transformer boxes are laid out across U.S. grid systems, helping to increase generator voltage for transmission, or step it down at the other end. (Most of the nation's transformers are celebrating their 40th birthday.) Internal temperatures can reach 150 degrees or more, so they're cooled and insulated with oil. Utilities spot trouble with these devices by measuring the level of eight gases, including methane and carbon dioxide, that form when the oil's hydrocarbons start to break down. Typically, this procedure is done once a year.

Serveron of Hillsboro, Ore. sells a mini gas chromatograph that mounts beside a transformer, sampling the internal gases every four hours. It sends the data wirelessly to operators who can distinguish between innocent anomalies resulting from weather and signs indicating the brewing of real trouble. Each TrueGas product costs $33,500 plus $3,000 per year for data gathering--cheaper than replacing a transformer at up to $5 million. The company just raised $9 million in venture capital.

Meters Utilities are using wireless meters to monitor home power use remotely. Optimal Technologies has created wireless sensors called Modbots that plug into electrical outlets and connect with appliances or lighting systems. They relay information--room temperature, motion, lighting, power and voltage--back to a central hub. If the $60 Modbot notices no one is around, it may turn off an air conditioner or the lights.

Maximum Performance Group makes a similar product for clients like the P.C. Richard & Son electronics and appliance chain in New York City. It can sense diminishing daylight and turn on outside signage or set off an alarm the instant an HVAC system kicks out.

Comverge, based in East Hanover, N.J., has an experimental load-management project under way in Utah. The company has installed devices on hundreds of residential air conditioners. If the local utility needs megawatts on a hot summer day, Comverge can ratchet down compressors without homeowners knowing.

Distributed Generation The blackout put a lot more oomph behind the idea of creating power directly on the factory floor. Capstone Turbine Corp. makes low-pollution natural gas turbines of 30 to 200 kilowatts whose excess juice can be sold back to the utility. Recently a project in Vermont used a "microgrid" that links residential and commercial buildings into one system to shield them from a massive blackout or power interruption.