



Ontario

MINISTRY OF ENERGY AND INFRASTRUCTURE

The title slide features a background image of a wind turbine against a blue sky. The turbine's blades are white and extend from a central hub. The background is a gradient of blue, with a green horizontal bar at the top. Overlaid on the image are white, rounded rectangular shapes that resemble a circuit board or a network diagram. The title text is centered in a large, bold, blue font.

Smart Grid Working Group Preliminary Findings

Smart Grid Forum

November 24, 2009

Smart Grid Working Group Overview

- In July 2009, a small “smart grid” working group was struck by MEI Transmission and Distribution Policy staff to gather data with the purpose of informing smart grid related policy and advice for the Minister, including:
 - Ontario Energy Board (observer)
 - Independent Electricity System Operator
 - Electrical Safety Authority
 - Toronto Hydro
 - Hydro One Networks
 - Ontario Power Authority

- The purpose of the exercise was to better understand possible objectives and technologies in each focus area of the smart grid and identify where further research or advice might be required.
- The intent of the work was to inform discussion at this point, rather than define policy.
- A summary of some key findings for continued discussion and potential areas of further research are included here. A draft report is under development.

Consumer Control Findings

Increased visibility contributes to conservation	<ul style="list-style-type: none"> ▪ Increased visibility to electricity consumption and price appears to contribute to consumer awareness and conservation. <ul style="list-style-type: none"> ▪ TOU Pricing pilots have shown some of the conservation potential of combining TOU rates with price visibility through IHDs. Pilots were relatively small in scale. ▪ Customers on TOU pricing on average reduced their consumption by 3%; with TOU and IHDs, this figure increased to 7%.
Is visibility sufficient?	<ul style="list-style-type: none"> ▪ Utilities indicate that visibility may not be enough in the long-term to encourage significant behavioural changes in electricity consumption. <ul style="list-style-type: none"> ▪ The ability for consumers to “set-and-forget” conservation triggers is needed to leverage the benefit of the hardware investment. ▪ Adding this control functionality can increase the cost of the device by anywhere from \$100 to \$600 for a home energy management system.
Delivery Mechanisms	<ul style="list-style-type: none"> ▪ There is currently a lack of data regarding delivery mechanisms of visibility and control. Large IT companies such as Google and Microsoft are entering this space by offering online services. ▪ We stand on the cusp of even more widespread adoption of smartphones and the connectivity they provide
Gaps for Small Businesses	<ul style="list-style-type: none"> ▪ There are challenges uniquely associated with small to medium-sized businesses that may limit their empowerment through smart grid technologies. <ul style="list-style-type: none"> ▪ Technical and regulatory hurdles exist and the costs and benefits of installing smart meters for these firms are not well understood.

Some Key Questions	<ul style="list-style-type: none"> ▪ What is the cost-benefit for a province-wide roll-out of these devices (price visibility, control)? ▪ How do we ensure that the consumer continues to retain the right to control devices within their home and to control the collection, use, disclosure and retention of their personal information? ▪ Will smart phones leapfrog the IHD market and make these devices obsolete? ▪ How do we best enable access to timely usage information and price signals for small business customers?
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Utility Flexibility Findings

DG will drive a smart distribution system	<ul style="list-style-type: none"> ▪ Incorporation of distributed generation (DG) and efficient utility operations are potential key drivers for building a smart distribution system. <ul style="list-style-type: none"> ▪ Advanced Metering Infrastructure (AMI) systems can provide access to consumer load for utility efficiencies. It can also facilitate CDM initiatives that provide for either Customer Control of equipment or utility control of consumer equipment. ▪ The 1.8GHz spectrum can facilitate the monitoring, control and protection of both utility equipment and DG in the next five to ten years. ▪ This is likely an expanding area that Ontario companies can exploit.
Collector systems	<ul style="list-style-type: none"> ▪ In order to meet the demands of the GEA, some utilities may have to consider interim measures such as “collector systems” in order to incorporate the amounts of distributed generation expected. <ul style="list-style-type: none"> ▪ Consideration should be given to building stations “smart grid ready” to avoid stranding assets as the SG evolves.
Leveraging existing investments	<ul style="list-style-type: none"> ▪ Utility flexibility improvements under a smart grid can leverage off investment already made by the province. For example, through the existing AMI system used by the smart meter initiative, utility programs can: <ul style="list-style-type: none"> ▪ Empower consumers through price visibility or Customer Control of equipment. ▪ Carry out utility objectives in demand response through utility control programs (e.g. Peaksaver type programs). ▪ Increase utility efficiency through the use of remote disconnects, or receive information about outages through “last gasp” technology.
Some Key Questions	<ul style="list-style-type: none"> ▪ Recognizing that not all LDCs will require the same tools, what are the “must haves” vs the “nice to have”? ▪ How do we ensure that best practices are shared so that we minimize duplication of effort in testing technology? ▪ There will be an incremental cost to making the collector stations smart grid ready – what are the requirements and how much will it cost?

Adaptive Infrastructure/EV Findings

Capacity of distribution system	<ul style="list-style-type: none"> ▪ Distribution infrastructure needs to be evaluated to determine capacity for increased load from recharging EVs. <ul style="list-style-type: none"> ▪ Pad-mount and overhead transformers are typically sized to handle the load of 8 to 10 households without EVs. ▪ There are “quick charge” and “slow charge” methods to recharge EV batteries which differ by the required electrical service: 240V/30A and 120V/15A respectively.
EV recharging models	<ul style="list-style-type: none"> ▪ EV recharging may take the form of three non-mutually exclusive models: (1) Home-based recharging; (2) Recharging stations; and, (3) Battery swap depots. <ul style="list-style-type: none"> ▪ In order to drive EV penetration, recharging must be economical, convenient and expedient. ▪ Consumers will have varying recharging needs based on driving patterns, battery capacity and type of EV (i.e. BEV, PHEV, etc.). ▪ Each model comes with a unique suite of regulatory, safety and theft concerns.
Billing infrastructure	<ul style="list-style-type: none"> ▪ Billing infrastructure for each recharging model would need to be in place. <ul style="list-style-type: none"> ▪ Home-based recharging will simply add to the consumer’s electricity bill. ▪ Battery swap depots and recharging stations are likely to take a point-of-sale approach in the early stages.
Electricity storage	<ul style="list-style-type: none"> ▪ Using EVs as electricity storage is not yet on the road map of the large automotive manufacturers. <ul style="list-style-type: none"> ▪ Industry expectations are that EVs will offer the ability to store power and send it back to the grid at on-peak times. ▪ Some EV manufacturers are beginning include vehicle-to-grid (V2G) technologies onboard to support economically optimal recharging (i.e. coordinated recharging at off-peak times).

Some Key Questions	<ul style="list-style-type: none"> ▪ What are the consumer load profiles, when will they typically charge their vehicles? ▪ What will the impact of the additional load of EVs be on the distribution infrastructure? ▪ What are the impacts to the home wiring requirements (in terms of service size to the home)?
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A possible path to implementation

