Meeting Summary

OEB Smart Grid Working Group

Meeting Date: May 10, 2011 **Time:** 9:40 am – 2:00 pm

Location: 2300 Yonge Street, 25th Floor, ADR room

Board Staff: Russ Houldin, Rachel Anderson, Stephen Vetsis

Meeting Topic: Smart Grid Use Cases and Final Thoughts

The purpose of the sixth Smart Grid Working Group Meeting (SGWG) was to discuss use cases presented by Board staff for residential displays, load control, outage management and electric vehicles (EVs). (Staff's presentation is on the Smart Grid Working Group website.) There was also a roundtable discussion during which SGWG members were invited to outline their views on the main issues to be addressed in respect of smart grid.

Use Case 1: Residential Displays

Key observations from the discussion:

a) When enabling behind-the-meter services and providing real-time data, it will be important to balance the following issues:
   i. Customer's current needs versus future needs;
   ii. Different customer groups and their different needs;
   iii. Provision of a 'gateway' as part of distribution service (e.g. rate base) or as a competitive service; and
   iv. The costs and benefits of leveraging existing systems.

Discussion notes:

Utilities	• A 2008 study concluded that only 6% of customers will react to an in-home display; the rest will have to be dealt with differently. It's the plug in appliances we haven't reached yet (e.g. stove etc): how do we get to know the appliances that are causing that baseload? UK etc., have a smart plug (power bar) that could help users control baseload usage. You can jump the meter by putting a second radio in it – maybe we need a smart panel, every circuit monitored? Need to address all options in order to reach that 94% of customers who would rather set it and forget it. • Currently, most Ontario Smart Meters only have the AMI network radio. Newer meters can employ a secondary radio, typically ZigBee, to provide the HAN channel gateway into the home. Existing meters would have to be replaced to

	enable this functionality; you cannot very easily just add a second radio. • LDCs need to be very careful with residential accounts because the backlash will be strong; there is a need to standardize things to avoid backlash. • Upgrading meters with a new radio is only about $100 and not difficult to do. If you allow a second meter, at what point does the homeowner say I am taking responsibility for this product and the LDC is no longer liable? (e.g., if the new meter is not compatible with other behind-the-meter services or devices also purchased by the customer). • The incremental cost of a ZigBee enabled meter is about $15 to $20 over the "standard" meter we use today, plus the labour cost of a meter swap (minimal). Old meter could be returned to inventory for deployment elsewhere if done on a limited basis. Mass changeout would strand a lot of fairly new assets. • Why not use the MDM/R for what it was used for? If people want to access data let them access the MDM/R. • The MDM/R will not provide real-time data. • But who really needs real time data? Could still have alerts etc.; we don't need real time data necessarily; we need to be able to manage use on a real-time basis. • We need to stop thinking within current constraints; what about in the future when appliances will react automatically and autonomously but need real-time data in order to do so? • Obviously opinions are split on what we all believe the customer will want but we still need to provide that "dial tone"(to the house) to allow for future customer wants.
Technology Vendors	• It would be useful to determine the difference in price in terms of the LDC replacing existing meters with one that has a gateway built-in versus the customer essentially purchasing a second meter to enable behind-the-meter services. • Consumers don't currently have enough information to make a decision now or to have us make a decision for them. Consumers need to know about pricing, and the impacts of their behaviour. Once you understand all those concepts (e.g., baseload etc.) a device is still needed to tell you what you're using and when. • Real-time data is necessary for in-home automation etc., such as energy hub management systems. • But if you can do analytics based on historical data combined with forecasting you can provide info to customers through any means (e.g., internet etc.) in order to allow customers to react (or for their pre-programmed devices to react) without providing real-time data to a device that most people are not looking at throughout the day. • Don't really need meter data in real-time to make decisions about how to operate appliances, it's the pricing signal that really matters.
Agencies	• From the consumer perspective, after the smart metering experience if consumers hear they need to buy another meter in order to get real-time data, they're very likely going to be upset.
Consumer Groups	• A key challenge for customers is understanding usage, for example, what is making up your baseload? • Alerts are one item missing on the residential display use case. Would want the

	ability to choose alert (use or price etc.). Whatever you measure you should be able to alert. • The option of a parallel system (with a secondary customer owned meters) would be hugely challenging (e.g. potential customer backlash if there is a discrepancy in the data). • We should be thinking of what other things wecan change that we previously 'settled' for (e.g., estimated billing). Why aren't we billing residential customers for demand on T&D?

Use Case 2: Load Control

Key observations from the discussion:

a) The enablement of load control faces similar challenges to those related to providing a residential display as well the additional challenges of:
   i. Variable AMI and smart meter capabilities across the province; and
   ii. How and whether to set a demarcation point for behind-the-meter services.

b) Going forward, care should be taken to avoid losing any existing functionality.

Discussion notes:

Utilities	• Many ofOntario's smart meters can provide pulse outputs (with an additional device that relays the message into the home through infrared signal). It would be real-time information. The caveat is that 1/3 of the meters in Ontario can't do this. Instead, one would have to strap a device on the outside of the meter (which is not preferred over actually retrofitting the meter).Whilediffering capabilities create implementation issues a basic issue is that retrofit meters would be rate-based wherasa 'strap on device' would be at the customer's expense. Would an LDC allow a third party to attach something to a meter (i.e. an LDC asset)? • The "strap-on" device is required on the 2/3 of Ontario meters that do enable an optical pulse output. The 1/3 that don't have the optical output wouldn't work with this model. (The "strap-on" device reads the optical pulse and converts to RF for transmission into the home).This is NOT a preferred solution. • Two-way communication is possible and being used for a specific purpose. But the reality for real-time data or two-way communication is that the system wasn't designed and cannot currently accommodate it.It'salso a bandwidth issue: need more bandwidth to accommodate more data flow. Whether real-time or two-way flow. • As long as customer understands that if they must pay for the upgrade than they own the asset (while LDC still owns meter) and therefore takes responsibility for that device. Demarcation point must be clear.
Agencies	• MDM/R data is used for forecasting and maybe forecasting a day ahead. Need to think about the role for real-time and near real-time and which investment gives you that access. A key question is, how do you best leverage public investments to get real-time? • We can't leverage existing infrastructure to get real-time data. We should be

	talking about that reality.
Consumer Groups	• It's important to ensure that we enable everybody to participate (possibly through their own investment). Pulse outputs,for example, enable many things for customers. Customers want confidence that those options are out there. Make smart grid transparent so that people know what's there. • Board's staff's diagram is missing a lot of options; we just don't know what they are. May have a situation where 3 or 4 houses want to aggregate and put a box in. • Something the OEB should respond to isthe LDC owns meter but the meters are a provincial asset. So, how much access to the meter should third parties have? • Most LDCs are cooperative in terms of providing pulse outputs to customers. Want to make sure that an LDC will maintain pulse outputs when replacing GS interval meters with smart meters. Don't want to lose existing functionality. Want to ensure that LDCs are required to enable pulse outputs.

Use Case 3: Outage Management

Key observations from the discussion:

a) The Board's Guidance should consider the substantial variability among LDCs both in terms of outage management capabilities and the challenges faced in handling outages (e.g. travel time, frequency of severe weather etc.).

Discussion notes:

Utilities	• An issue with the "last gasp" meter function is if one meter goes out, the message probably gets through the network but if a bunch of meters go out at once then the messages collide. LDCs can make educated guesses based on the last gasp messages which do make it through to the utility. This issue exists regardless of technology. • Last gasp message is needed at a higher level in the system hierarchy (higher level than individual meter). • Regardless of the last gasp with SCADA etc., LDCs will know where outages are. • Not all LDCs have residential meters with last gasp capabilities in their meters. • Some LDCs still do not have that capability (to know where outages are). Because travel time is so short in some areas (urban) it doesn't matter if you send staff to the wrong location first. Rurally speaking, communications systems are not there, travel time is much longer. Smart grid is not ubiquitously smart for everyone, will have different capabilities and investments. • The smart meter's last gasp allows operators to be more surgical in outage management but backflow of data may not be as useful. If you get a signal from another part of the network you'll ignore the smart meter messages. • As many small LDCs do not have SCADA or sensors, smart meters are an excellent "poor man's" outage management system. • Meters can also check voltage and verify whether outages are internal problems

	or not. • May end up with mini MDM/Rs for LDC purposes with the main one for billing. • Some automation can be used to deal with outages (with crews dispatched to handle what automatized systems cannot) but there is a need to filter out planned versus unplanned outages with this type of automated system. • Many small LDCs do not have SCADA. They just wait for customer calls. • Service Quality Indicators are going to get worse with smart grid. Now we wait until the person calls before the clock starts. Soon it will start automatically. There should be improvement later.
Technology Vendors	• Not all residential meters have last gasp capability. • There is the integration/back office side of things that's important. All of those other aspects like integrating with CIS etc. should not be overlooked. By linking the outage management systems tothe CIS system when a customer calls,the utility can know how many outages they've experienced etc. It is important that the OEB recognize other ancillary costs to enable all of this. • For small LDCs who still rely on customer phone calls to identify outages, once a customer calls with outage you can 'ping' all the meters to find out the location of the outage. In general there will be varying levels of integration depending on size of LDC, smart grid means different things to different people. • Metrics will probably get worse before they get better because you have more data. But there will be improvement later.

Use Case 4: Electric Vehicles

Key observations from the discussion:

a) While it is important to acknowledge that EVs have the potential to impact some distribution systems (particularly in urban areas), it is also important to recognize that EV penetration in the market will happen over a long period of time and that many grid issues identified by the group may not be as problematic as they currently appear.

b) The addition of EVs to the grid will also affect LDCs at differing levels based on urbanization level, capabilities, demographics of customer-base, and other factors.

Discussion notes:

Utilities	• EVs and chargers are a bit of a red herring. EVs are not as concerning as we think they might be. Adoption will be slow. It's just another appliance and doesn't use as much power as a water heater. • From an urban perspective, lots of buildings/condos are already looking at charging stations.Therefore,an urban LDC is already looking into this. LDCs need to at least be aware of what's happening. • Last year Canadian and American LDCs got together to look at EVs. For some neighbourhoods with limited capacity, one or two EVs could be a problem. There is an educational component, we need to warn people about the potential impact. • EVs are really a demand response issue. Therefore we need to look at TOU

	rates. And people timing and adapting their behaviour. Load shifting will have a bigger impact on the grid than EVs will. • We have all the technology needed to deal with this. Look to other examples such as paying for parking and Zipcar. • Metering costs for putting in a Measurement Canada-compliant meter will be more than the cost of the power used. Likely, public charging stations will charge a flat rate fee and not measure consumption due to the costly Measurement Canada issues. • Settlement of EVs is not a smart grid issue, it's a commercial issue. • Must look at EVs (especially given rising cost of gas) but EVs are basically only going to affect urban areas and within that they will be concentrated. But people will manage charging to mitigate system impacts. • Issue in use case is thatthere is no need to overcomplicate settlement: just pay as you go instead of charging usage accumulated during travel to home LDC account (eliminates jurisdictional issue). • Someone could aggregate a bunch of storage; this could become part of the market mechanism that will evolve. I think there will be a big discussion on how to do this. Sometime the most complex solutions emanate from California, and we listen to them. Also, already the world has standardized to the 240v Level 2 charger. And now there is a push to get to Level 3 or another type of Level 2 charger (more advanced).
Vendors	• Goes back to the differences among LDCs. EVs are only relevant for some. • EVs are a bit of a special case because they are mobile. Not like other stationary loads. There are other issues related to travel, such as settlement, charging away from home etc.
Consumer Groups	• EVs are probably not as much of a concern as we may think. But is still a useful use case. Inherent problem in this use case is that someone at an LDC 'controls' the EV charging. This is not customer empowerment. If a peak issue from an LDC has implications for a customer, send them a signal and allow them to react. At the end of the day you must give the customer all the information needed to make the smart grid smart. It comes down to usage, actions and reactions. Reluctant to accept a use case that shows a signal going into a device. There are a lot of resources out there that need to be integrated, EV batteries will probably not be LDC's storage solution. • There is no rate for stored power to be sold back to the grid(e.g. missing FIT/micro-FIT for storage. • There are some options for storage currently available: heat and cold are the two biggest opportunities. • We shouldn't assume that the system will peak on summer afternoons forever (we used to peak in winter); we need to be able to adapt. • Based on GM's presentation I agree EVs are a bit of a red herring.There are other issues that should be looked at as case studies. Such as datacentres. If we're concerned about loads disrupting the system datacentres are one we should think about. Other case studies such as this should be looked at.

Roundtable: Final thoughts and key issues

Key observations from the discussion:

a) Smart grid is about information and using it to better manage the grid, not simply newer and better technology (e.g., automated systems).

b) It is important to specify the 'what' but not the 'how':
   i. Focus on functionality not technology;
   ii. Acknowledge varying capabilities and 'baselines' among LDCs; and,
   iii. Acknowledge that smart grid will mean different things to different people and ensure that there is clarity around the messaging of what smart grid is

c) Direct consumer benefits of smart grid are critical. Strong educational programs and information sharing are necessary to convey these benefits and generate consumer engagement with smart grid technologies.

Discussion notes:

Utilities	• Clear requirements are needed for business cases for smart grid. • SG provides a lot of data. Some of which may be useless. Data needs filtering. Utility in San Diego set out SG as sensors first and then the back office and intelligent data handling. Figuring out how to present data to operators to guide them. It would be nice to see this issue highlighted (the data). • SG is more about the information side than hardware side. Much of the automation, etc. is already good utility practice. Information should be the focus here. Not sure LDC should lead behind-the-meter implementations. • 1. Green: clear expectation of green benchmarks. 2. Notion that as LDC become a part of government directives. 3. Network improvements: from substation to home.For us to do anything meaningful, we would have to attack the wires between these points.4. Foundational investments vs. ROI: understanding how SG will be evaluated. 5. SG means different things to different people. Board must be able to recognize differences in needs. 6. Recognize that there is an integration risk with SG: process, change management, etc. Notion of 8% return should change and have greater risk tolerance. • Smaller LDCs are behind the game in automation and hope that the Board will consider these limitations in resources, etc. • Looking for clarity in terms of how to submit investments to OEB. What is prudent? Define boundaries so LDC can deploy. The utility doesn't always have time to do global research/development. Provide direction. Provide more tangible guidance with what is smart grid. Stay away from terminology and go to functionality. • Need to manage message around what a SG is. Means different things to different people. Control that message.We should be pushing towards standards where home systems, business systems, and automation systems talk to one other. We need to work towards the same interoperability with how things interact with the smart grid. • Stick to concepts and not technologies. Bear in mind need for flexibility for high

	speed of technological development. Clarity in utility role with consumer. Dwell on need to have consumers work with LDCs and LDCs as facilitators/enablers. Stick to higher level and use solutions that are already out there. Benchmarks for LDCs and think about expected performance. Re-defining prudence, for example. Think about transition to standard utility practice. • From the LDC perspective, transparency is needed. Rate applications can be a difficult process. Business case background. Make rules flexible to accommodate for different LDC needs. Sometimes overly prescriptive in rules. Need to be cost effective. Need to be able to say to industry that we are moving forward (Board rejecting some investments may contradict that). Encourage innovation. • What are the business cases for smart grid? We need an understanding of that.
Vendors	• 1: Smart meters and AMI network are together only a piece of the smart grid. Keep that in mind as regulation is developed. 2: Real-time data (or near) is important for consumers to understand energy consumption drivers so they can take measures to impact it. 3: Ensure that provisions are made for innovation to take place. Don't be too prescriptive (e.g. apps). • Would be valuable to give more discussion to emerging distribution technologies. Need to ensure that emerging technologies and their accompanying businesses cases are not surprises to the board. Think of technologies that customers, etc. might require to help with case evaluation. • Near-real time access is important. Use cases outlined different access points and there are advantages to each. Encouraging or enabling several options can help foster innovation. Creating level playing field for innovation. • Too early to set things in stone at the moment. EVs are an example where impact is unknown. Make sure to continually review over time. • It's important to specify the what but not the how. Don't tell utilities how they should do things. Education: until provided to industry and consumers, it is difficult to mandate what happens next. May be more important to educate. Customers may not need data, may just need to be taught how to act. SG is broad. Be more specific in what we mean so that it can allow utilities to plan. • Direct customer benefit is crucial.
Agencies	• SG will be driven by power system investment and by making the system more flexible and adaptable. We talked a lot about consumer. What roles should LDC play? Needs of consumer are driven by data. • CT clamps, some rules already in place. Can provide further details. Looks cleaner to leverage existing resources but, there are other options.
Consumer Groups	• The sooner we get to SG as business as usual, the better. But the business as usual must be smart, green and healthy. Looking at issues in isolation is good for development but should think about integration of initiatives. • Smart something is a system that uses information to improve performance. That is the central objective of SG. Smart meters aren't smart. Smart meter spec could have transformed things but wasn't designed to.They are not exactly smart, collecting data on an hourly basis. When you are looking at SG you are going to have to look far ahead. In addition to "dumb" grid there are consumers who may be viewed this way. Need to educate them to take advantage of SG. Any development of SG that does not allow for evolution of smart pricing is not advisable. Believes capacity pricing is the way to go. Look for technology that

	allows for evolution of pricing (real smart meters). Don't second guess where market will go. • 1. Real time data directly from utility meter is key for customer as foundation. 2. Clear concise direction with focus on direct customer benefits. 3. Transparent rules with emphasis on functionality. 4. A lot of people are excited about the smart grid, and if we can release the entrepreneurial spirit, Ontario can benefit