Meeting Summary

OEB Smart Grid Working Group

Meeting Date: March 15, 2010 **Time:** 9:30 am – 4:30 pm

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

Board Staff: Russ Houldin, Ashley Hayle, Rachel Anderson

Meeting Topic: Policy Objectives identified in the Minister's Directive

The purpose of the second Smart Grid Working Group Meeting (SGWG) was to discuss each of the ten policy objectives identified in the Minister's Directive.

Objective i) Efficiency

Key observations from the discussion:

a) There are different 'types' of efficiencies: physical (energy lost), operational (staff processes and resources), and market level. There are also different 'levels' of efficiency (e.g. total grid improvements versus efficiencies at the individual distributor level.)

b) Efficiencies related to smart grid are a result of greater information leading to better decision making and better processes.

c) Efficiency is also a customer benefit and customers can and should be part of making the grid more efficient.

Discussion notes:

Utilities	• Efficiencies lie both in reducing actual losses (line losses etc) but mostly in operational benefits such as truck roll-outs, fault identification, staff resources management etc. Other gains include 'right sizing' a transformer for example, more granular information allows better decision making. • smart grid = smart utilities = lower costs for customers • Efficiency is not new to utilities but is always part of their decision making, therefore in the context of smart grid, there is not much of a difference. • OEB has metrics for measuring intangible efficiencies (e.g. how quickly does the call centre answer a customer's call?). Metrics could be developed to measure other intangible efficiencies such as how quickly a crew finds a fault etc. 'Response Metrics' • With regard to energy losses in the distribution grid, current challenge is

	that the grid owner is impartial to the losses (there is no business case for reducing them aside from maintaining them within a reasonable limit set by the OEB) should the grid owner be made responsible for those losses to incentivise reduction? What level of reliability is sufficient? What is the optimal level of reliability? Law of diminishing returns – what level is acceptable to the consumer? • Right sizing of transformers. Experience with industrial customers is that they are usually sized at 2.5x what is needed. How many of the transformers out there within a service area are loaded to the right limits? Smart grid will allow them to analyze loads. Gives you the ability to upgrade if necessary. • Greater visibility on distribution system will promote a healthier grid – first step should be identifying strategic locations (e.g. for visibility) and collecting information we do have available. • Engaging with the customer's load is strictly for provincial benefit. Conservation and demand management are aimed at lowering the overall province's consumption. LDC has lots of answers to do this, but there is no way for an LDC to engage with customer and ask them to participate in a load management program. • Technical aspects of losses: 80% of customers are residential customers. Can't see what losses they have. If smart grid can help identify those losses, then we can have a better idea of losses. • There is an expectation in Ontario that energy is a right like water. Yet what is the do nothing alternative? Three factors in Ontario drive the necessity for smart grid: o Coal phase out o Aggressive CDM targets (if these targets are not met there could be a major supply problem going forward) o Nuclear renaissance is in jeopardy
Technology Vendors	• There are numerous technical efficiencies to be harnessed; business/operational efficiencies are also important but much harder to quantify
Consumer Groups	• Customers want both an efficient grid and to use the grid efficiently; with the right information (e.g. price signals) customers will use the grid most efficiently over time. Therefore, going forward, the grid will be planned/constructed more efficiently over time. • If definition of grid operation is expanded to the customer side, customer improvements could have benefits for the whole grid. E.g. load management in urban areas may be a desirable alternative to constructing new lines. • What makes smart grid interesting is that it could provide a new tool for the tool box (control over customer load). Demand response should be valued the same as new generation. By thinking outside the box, by looking at a different value proposition might be able to provide an alternative solution that most didn't know was an option. • With more information on losses (line losses etc) utilities will be able to characterise load losses and non-load losses and this will allow distributors to assign different values to different losses. A business case to remedy

	this can be more sophisticated • Fundamental component for a working market is good information and we are a long way from there. Benchmarking buildings and homes is a first step (comparison). Huge capacity for increased conservation but information is key.
Agencies	• The Board should evaluate smart grid investments based on whether the investment is optimal from a total grid perspective (e.g. do you need to invest smart components everywhere, or do you just put them where they are most effective?). • Distributors did not develop a business case for smart meters (Gov't directed industry to deploy meters) but if OEB had to approve smart meters how would they do it? Smart meters are a smart grid technology that has already been deployed therefore if we had to develop a business case for them it could be a useful proxy for other smart grid investments. • Operational efficiency is one aspect, market efficiency is another level to consider and it does not seem to clearly 'fit' into one objective or another. How broadly should the Board look at the question of 'efficiency'?

Objective ii) Customer Value

Key observations from the discussion:

a) Different types of customers derive different benefits from smart grid, but in all customer classes, information is the primary benefit (or primary driver of benefits). Even customers within a specific segment (residential, commercial, or industrial), may derive different benefits from smart grid depending on energy consumption, sophistication, size, etc.

b) Cost can be a significant determinant in customer engagement, depending on the customer and their energy consumption.

c) Current customer engagement in energy is typically low, especially at the residential level. As it is likely that today's customers will become more sophisticated energy consumers in the future – and will therefore be driven by different benefits – this consultation should also consider the smart grid benefits derived by future customers.

Discussion notes:

Utilities	• For residential customers value lies in the information that smart grid can provide • As the grid becomes more and more cost effective and efficient, customers receive value in that the bill, regardless of consumption, will be lower than it otherwise would have been. SG activities can displace/postpone higher cost alternatives, which is an indirect benefit. Other benefits may be more direct such as voltage control which will ultimately lower customer consumption. • Good information is one important aspect. Customer engagement is another, how do we engage? Problem with the mortgage customer

	analogy is that a mortgage is a much greater sum of money and therefore customers care more – with current framework residential it is challenging to engage (different for C&I customers because energy costs are a large expenditure for them). Customers do not call to complain about power quality often, more so with outages. • How do we deliver smart grid information to the customer without alienating them from the technology, most already have a bad taste in their mouths from smart meters. • Customers don't know what they don't know. With the right information customer engagement will take off. • Small commercial customers typically have little interest in electricity usage. On the residential side, we may be experiencing beginning of a trend where residential customers are very curious about their on peak usage and what items/activities specifically are consuming power (more granularity of information behind the behind the meter). • End user and tenant issues (suite and smart sub-metering) are very complex. If this consultation can provide any clarity or offer any solutions in this area that might be a useful thought to consider. • Value of smart meters will increase substantially if distributors are allowed to use them for more applications than they currently are.
Technology Vendors	• Benefits vary among customers as needs and preferences vary among customers. • Similarly, there may be different benefits to customers in different parts of the province. • If in home equipment can respond directly to price signals (e.g. automation and preset responses) this is a benefit for customers • Control is intrinsically valuable but convenience is much more valuable to customers. Convenience is an important intangible value. More carrot than stick needed? Customer benefits must be clear to encourage participation. • Only small portion of population is actually interested in their usage data (learned from pilots etc). Two main drivers are likely to change this: increasing costs and advent of EVs (increasing usage). In both cases the more a customer is spending the more they will pay attention to their usage. The more data is used 'automatically' the better for residential customers • Two types of demand response. Direct control response and time of use pricing. Customers can choose to do things at different times, but price signals can be sent to the home so that equipment could be set to automatically reduce demand. Having pricing information delivered directly to the items in the home. Customer value is giving the user in the home the ability to respond to changes in pricing • Data alone provides little value, the tooling and the manner it's communicated is what will make the difference.
Consumer Groups	• It may be an error to assign different values to different customer classes because you make assumptions about those classes - you never know how sensitive a given customer will be to energy issues and therefore to set deliverables based on customer class could be problematic.

	• Directive speaks about *enabling* customers. Access to price data goes a long way to enablement and with prices rising as they are, customers will naturally become more engaged (programs are a poor proxy for price signals). • There is customer value that can be ascribed to reliability (for a business case). California looks both at the customer cost and utility cost of outages, body of work of cost around unreliability is not great but a useful jumping point. • C&I customers do want access to their usage information and they want to stay informed. We need to look forward, not back, and need to anticipate where the sector is going (in terms of customer behaviour). • Most people did not pay attention to gas until the price increased significantly, then customers become sophisticated quickly. Residential customers tend to over invest while Industrial tend to under invest in energy efficiency? We want to promote a system where ultimately customers have access to real-time information – should not plan system based on today's current time of use framework.
Agencies	• Market operators are seeking active participation from players not typically involved; this is an important aspect of smart grid. Value for customers could come from new revenue streams (demand response or DG) or savings etc. • Customers will evolve and become more sophisticated (e.g. evolution of banking and mortgages, more products available now for more customers) smart grid is taking electricity the same way.

Objective iii) Co-ordination

Key observations from the discussion:

a) Many distributors are already coordinating with one another with respect to smart grid and other initiatives. The challenge in future efforts is finding a way to formalize this coordination so that everyone is included at the right levels.

b) It may be necessary to establish a central body of some type to ensure coordination. A central body would likely be more effective than a system of multiple regional coordinating bodies. Coordinators need to be involved not only on the hardware level, but also in an integration role to assist with deployment and implementation of smart grid investments. The coordinating body must also consider that different utilities have different investment maturity curves, capabilities, and interests.

c) Coordination between distributors and transmitters is required to achieve the full benefits of smart grid. For example, a transmitter could introduce a smart grid technology for which the benefits can only be realized if the distributors make investments in compatible technology.

Discussion notes:

Utilities	• Within the Ontario context the point is please don't duplicate costs. Three levels • Anything not available on market gets classified as R&D

	• If market available the risks comes with integrating lots of these devices • Should not be one hundred smart grid plans and should not be just one smart grid plan, but in the Ontario context it would be useful to have a central body to promote coordination. A regional approach? Similar to smart metering? • What does regional mean? Varying sizes among distributors and therefore smart grid means different things to different LDCs. Sometimes it is difficult align plans. 7 distributors of similar size and interest meet every two months about smart grid initiatives. Not clear how this can be translated into a formal process/OEB ability to coordinate. Regional based on geography alone may not be optimal based on difference in relative sizes etc. • OPA is involved in some pilot project, but would argue that OPA is not the route we want to go in terms of coordination. Utilities do already work together (smart meter pilots). Perhaps the process needs to be formalized and cost equalization among all benefactors needs to be determined.
Technology Vendors	• Under its Technology Fund, the OPA is trying to test some products for applicability across the province. In regards to coordination, does that fund appropriately consider the voices of distributors?
Consumer Groups	• Smart grid is a lot more complex than smart meters. If you are going to have integration, you need an integrator. Not just at hardware level, it is how it is deployed/implemented.
Agencies	• Coordination among distributors – perhaps a panel who looks at different distributor plans and looks for commonalities etc. By what process can we promote coordination? • Need to establish province-wide coordination mechanism to assist with achieving shared cost and understanding of deliverables.

Objective iv) Interoperability

Key observations from the discussion:

a) Three key issues related to interoperability are:
   - Legacy: new smart grid investments must be interoperable with existing systems
   - Interoperability at the distribution system level (not yet crystallized)
   - Interoperability of devices within Home Area Networks (HANs)

b) Interoperability refers not only to the ability of devices to communicate with one another, but also to the organizational interoperability among market participants

c) A key challenge in interoperable systems is latency: it's not enough that systems communicate, they must also be able to communicate within time constraints. Different data frequency needs – real-time, monthly, etc. – for consumers complicate ensuring interoperability.

d) The Board should monitor standards development in other jurisdictions, especially the US, and also exercise caution when considering codifying standards.

e) Interoperability is complicated by the fact that multiple ways of communicating with the home exist: wired, wireless solutions, and using the meter as a gateway.

f) Interoperability must be considered both in front of and behind the meter.

Discussion notes:

Utilities	• Interoperability is not only an issue for HANs. For power system products there are also interoperability issues. • There are still big issues and concerns about interoperability upstream (CIS, SCADA, outage management). It is better than it has been but it's still a problem and for LDCs it's a much bigger problem than interoperability for behind the meter products. • Important issue is interoperability with legacy systems. Some expenditures must be incurred to correct some issues involved with legacy systems if the regulator is understanding and open to this that would be help. • Interoperability both encompasses the ability to communicate and the rate at which devices are able to communicate. Latency involved with certain solutions can be problematic especially where fast acting systems are involved. These problems are not insurmountable but may have to consider 'leaner' methods of communicating data. • Per regulation, distributors are only allowed to keep 60 days worth of information. The MDM/R should handle the rest. Distributors seem to generally have two data collections: one for MDM/R and telemetry for their internal use. • Within the home there are lots of different options. 3 platforms wired, wireless solutions, and using the meter as a gateway. Which way will it go? • Should look to US market for interoperability standards because it will drive products and standards. If it's widely adopted in the US, why would we go a different direction now? • Should be very careful about what standards become codified • If we are going to enable things like EVs etc (thinking about future needs) we need to think about a certain level of intelligence within the home. A smart home becomes necessary. Interoperability among appliances and EVs etc could be necessary. • Demand response can happen through AMR networks (e.g. signal to curtail load and signal back to distributor that it has happened) but needs to be connected at appliance level. • Customers will always go to the utilities for answers, so in terms of data and in home devices we must be honest with customers and set the right expectations for customers. E.g. must define real-time in a way that residential customers can understand. • Real-time information is useful but providing pricing information could become too complex (it would be sufficient to know that they are in a peak or off peak pricing timeframe). Perhaps there is a middle ground. Reconciling price signals and real-time usage will be problematic. • Working with the OPA and other LDCs on pilot to move forward with an in-home display there are two solutions

	o Service panel transmitter (cost of getting electrician to install). o Replace meter with zigbee enabled meter ($15 incremental cost plus labour total $30). o Best solution depends on how many customers want which technology. • Would only have to retrofit meters for customers who want it. This also provides the option of user pay. • Eventually dispatchability may become necessary, running back units in a large wind and solar plant may be an important tool in the future. We have an obligation to manage wires and therefore sometimes it becomes necessary for distributors to have some dispatch capability. We will likely come to a time when either a distributor or system operator will need more control over distributed generation.
Technology Vendors	• Attempted to frame interoperability – behind the meter (consumer devices); distributor chain, meter to substation automation to back office; integration of systems at enterprise level; integration and interoperability among distributors (what about using AMI data? E.g. MDM/R to plan better for smart grid – access to data and expanded mandate for that data is important). Important to target each on its own? • Many uses for all of that data. Therefore LDCs need to interface with data so that it becomes useable. How can LDCs use smart meter data for operational benefits? • In-home items are really about consumer electronics. Let the market drive these standards. • Not necessarily as cut and dry as identifying one vendor's standard/product. E.g. Zigbee has different software protocols for different meters. Many utilities are bypassing the meter for HANs for security reasons (do not want to expose themselves to cyber threats). • How can leveraging AMI be balanced for HANs to the market to drive behind the meter and not let it be restricted by standards that allow communication with meters? To provide real-time data, must info come from the meter itself? • Most consumers don't actually need real-time data. Customers could watch data monthly and annually rather than real-time. • Meter is not crucial to two-way communication with devices within the home – broadband could be another alternative. • Price conveys more meaning to customers than kWhs. • Zigbee taking the lead in terms of viable products but there are many other options. • Does the policy have to specify zigbee or can it simply require a gateway that enables to meter to communicate with consumer electronics? • Issue is that meters in Ontario have already been deployed. Some meters would have to be reinstalled to accommodate a requirement for meters to 'be interoperable'. • Spent a lot of time discussing interoperability on consumer side, it seems we may have overlooked the upstream of the meter. Distributors at different levels of technological maturity there is a large cost involved in getting

	'fundamental' systems and technologies in place to enable further smart grid which becomes what is and is not smart grid? Emerging DG distributors and IESO's are going to eventually want greater control and visibility over DG which relates to interoperability among organizations.
Consumer Groups	• Any data not related to billing (information from AMI not needed for billing) does not get sent to the IESO because it would overwhelm them. Therefore, distributors are developing in-house systems to retain and use that additional data. • End use customer does not have access to that data – it's technically available but extremely difficult to access in practice. • It seems that we have landed far from what was intended in terms of access and usage of data with the MDM/R. This is a good lesson for smart grid deployment. • There is already a market for software that provides pricing data so is there no need for distributors to provide this for consumers? Do we need to get back to the basics on smart meters and make sure they are providing the value we had initially anticipated? • Very important to distinguish customer needs by customer class because they will all have different needs. C&I customers need access to the meter data because the meter is always correct. The OEB's guidelines should pick the functionality, not the technology to give customers control. Looking for standards based on allowing the customers to choose. Pulse-outputs from meters owned by customers and meters owned by utility are available.
Agencies	• In the wholesale market, consumers reconcile price with quantity. Perhaps we need to revisit how we bill customers as a result of smart grid development? To what extent does the number of distributors in Ontario determine the level of standardization required? • Focus on visibility. What is the impact of DG on grid? Focus on getting a good forecast on whether DG ever becomes dispatchable is another issue.

Objectives v) Security and vi) Privacy (Discussed in tandem)

Key observations from the discussion:

a) The energy sector can learn from experiences of other sectors as long as the significant differences between sectors - such as time constraints and latency – are addressed. Cellular phone and internet security and privacy issues are good examples.

b) The Board can draw upon the significant body of work on security and privacy that already exists when developing Guidance. (E.g. NIST's Guidelines For Smart Grid Cyber Security, Ontario Privacy Commissioner's Privacy By Design framework).

c) As privacy and security concerns encompass all aspects of smart grid, an end-to-end view of the grid must be considered.

Discussion notes:

Utilities	• Within the context of 'Privacy By Design', is there any thing special we need

	to do? • Four major communications systems: each have been tested for security and privacy but have not looked at the *interface* between the four. It is important to identify the boundaries to find any existing gaps. • Should have something in a code acknowledging that if distributor in some capacity has to pick up costs related to security they should be recoverable.
Technology Vendors	• As a group need to consider the complete SG (e.g DG etc). Grid stability and reliability is important. Significant work on NIST's IR document may be relevant to us. • If smart grid is enabled by broadband it eliminates a lot of concerns about point of entry for hackers. • Some aspects of SG mean that distributors may extend control centre capability to field crews with a mobile device. Therefore, it is important to have an end-to-end view to ensure security across the entire organization. Latency is a huge challenge in this area – layering security over something that must react/respond in seconds. Authenticating devices is important but this also slows things down. • Existing protection techniques for internet not necessarily applicable to utilities because latency becomes problematic. • Be cautious about over complicating the issue.
Consumer Groups	• Security is already happening – protections exist today.

Objective vii) Safety

Key observations from the discussion:

a) Safety is already good utility practice. Smart grid will provide some new tools to improve safety (reduced time in the field and in transit, advanced monitoring of equipment).

Discussion notes:

Utilities	• Some equipment is treated differently depending on location (public vs. private locations etc); issue of distributor staff or private electricians having sole access? • Definition of smart grid does not include DG (it enables DG), so are safety issues around connection out of the context? • Safety concerns related to fact that consumers will begin using many different types of new technologies from different manufacturers • Unclear how the Board can improve physical safety. Exception is that smart grid gives more information, meaning you may be more capable of averting unsafe situations.
Agencies	• ESA regulations and codes for both behind-the-meter and upstream exist. All roads lead back to ESA – participating in group to make changes where

	necessary make sure we're both in step with one another. • Most worker safety events relate to workers being in auto accidents. Smart grid will lessen time workers spend driving around, thereby lessening the risk. Remote operations could also provide practical safety benefits by avoiding having crews onsite in a potentially dangerous situation.

Objective viii) Economic Development

Discussion notes:

Utilities	• Two sides: regulated and unregulated. To achieve certain objectives on the retail side, do regulated entities need to be allowed to delve into it? Perhaps some sort of branding/domestic content rules.
Consumer Groups	• Ties in with pilot projects, back to the checklist. E.g. does this project use an Ontario based supplier, manufacturer etc?

Objective ix) Environmental Benefits

Key observations from the discussion:

a) Smart grid technology inherently provides environmental benefits.

b) Some form of environmental test may be required when evaluating smart grid investments. (E.g. carbon production reduction, power consumption reduction).

Discussion notes:

Utilities	• Is the place for electric vehicles and conservation etc? • Coal phase out planned due to health impacts yet there has been little follow-up on this. Issues such as cost of carbon and health benefits etc should be addressed, distributors should get credit for avoiding these costs? • Is there a tolerance limit on investments? E.g. TRC test in terms of investments enabling certain benefits.
Technology Vendors	• Relates to DR and DG. How to get as much DG as possible on the grid, currently there are barriers in the codes, ability to actively control DG is one example. • Don't only look at environmental benefits, look also environmental impacts as well. • For example, an LDC with 5% losses can knock that back to 4% through smart grid. If you have a carbon tax regime you can monetize that and drive investment. • In other jurisdictions one environmental benefit is sometimes considered to be tracking grow-ops etc. (This may be better suited to safety and reliability section)

Consumer Groups	• Price on carbon to better assess the costs and benefits of deploying a particular technology (like a TRC test but carbon monetized). Noted that OEB 1995 recognized externality costs in gas DSM. • This seems redundant – smart grid in and of itself should yield environmental benefits. • This is about assigning value to environmental benefits but while still avoiding 'double counting'.
Agencies	• Green Energy Act promotes renewable generation because of the environmental benefits. By integrating renewables the environmental benefits are being supported.

Objective x) Reliability

Key observations from the discussion:

a) Information made available through smart grid technologies will improve the reliability of power systems.

b) Certain smart grid technologies like EVs and distributed generation could reduce reliability.

c) The Board may want to consider effects on reliability when evaluating smart grid investments.

Discussion notes:

Utilities	• Substation automation, anything to improve restoration after an outage and techniques to improve metrics (SAIDI etc) belong in this category. Will these metrics start to look worse with smart grid? Now we know before the phone call. • One distributor found that their metrics improved with smart grid. Reliability stats were improving vastly with real-time data (due to people previously over estimating etc.). • Three types of outages exist: sustained outages (> 1 min), momentary outages (< 1 min), and a new class due to smart grid visibility in the form of a slight voltage drop or a 'non-outage' (<8 cycles). Therefore momentary outages should be considered with same importance as sustained outages (especially now that we are looking at 'minor' non-outages). • Since this is being reviewed by the Board in another venue – this objective suggests that if a smart grid activity improves reliability it should be quantified. • In the long term, especially in urban areas, will the utility need more of a role in controlling charging? • Price signals are dubious – it may or may not change the habit. Especially when comparing the price of electricity to the price of gas. Concerned about assets, we spend time 'right sizing' assets and they could easily be

	overloaded by a concentration of EVs etc. • If there are too many EVs (and compared against the price of gas), could EV chargers raise the market price?
Technology Vendors	• Use AMI data as part of outage restoration process. DG will introduce new challenges and technology such as storage (EVs, etc.) will be needed to address those challenges. Pricing signals can help. • How do we deal with the geographic concentration of mobile load (EVs)? If there is randomness in times that EVs are charging, this could be dealt with. Just because an EV is plugged in, doesn't mean that its charging. • Smart grid drives data quality and governance that isn't in place for most utilities. There is business process work and costs that we should expect early on in smart grid deployment and the regulator should be prepared for this. Preparing the fundamental business processes etc for advent of smart grid.
Consumer Groups	• Subsidiary of a utility has a pole mounted solar unit and part of the measuring aspect can stop voltage sag. • Distributors don't currently collect information about momentary outages and for some clients these are the most costly and problematic types of issues. With smart grid, we should be able to better manage customer impact in this area. • What impact will the smart grid have on stray voltage? Should be able to reduce stray voltage because there is more visibility and control, though DG could cause local problems. Balanced systems do not have stray voltage. SG may help identify stray voltage. • Should consider impacts of reduced 'lifetime' of information technology being applied.

Next Scheduled Meeting:

March 29, 2011