# Beyond Smart Meters: Ontario Smart Grid Policy Development

Mark Winfield

Scott Weiler

Faculty of Environmental Studies

York University

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# Defining Smart Grids

For the purposes of this Act, the smart grid means the advanced information exchange systems and equipment that when utilized together improve the flexibility, security, reliability, efficiency and safety of the integrated power system and distribution systems, particularly for the purposes of,

(a) enabling the increased use of renewable energy sources and technology, including generation facilities connected to the distribution system;

(b) expanding opportunities to provide demand response, price information and load control to electricity customers;

(c) accommodating the use of emerging, innovative and energy-saving technologies and system control applications; or

(d) supporting other objectives that may be prescribed by regulation.

*Green Energy and Green Economy Act, 2009*

# Smart Grids and Transitions

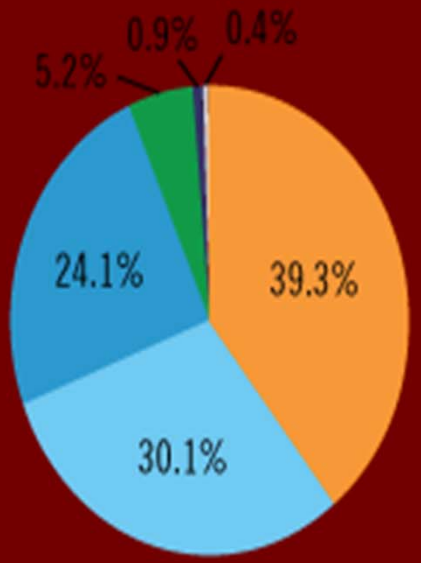
## *Evolution* vs. *Revolution*

| ***Table 1*** | | |
|---|---|---|
| *Hard infrastructure* | *Soft infrastructure* | *Characteristics of Smart Grid* |
| • Smart meters | • Interoperability standards | • Demand response |
| • Networked devices | • Cyber security protocols | • Facilitation of distributed generation |
| • Energy storage | • 1.8 Ghz spectrum | • Facilitation of electric vehicles |
| • Smart appliances | • Stakeholder engagement | • Optimization of asset use |
| • Centralized Generation | • Planning Models | • Problem detection |
| • Renewable Generation | • Information Control | • Self healing |
| • Electric Vehicles | | • Two-way flow of information and energy |
| • Smart Chargers | | |
| | | *Source: Canadian Electricity Association*[10] |

# Ontario System Characteristics

- High Jurisdictional Policy Autonomy
- 33,000 MW Installed Capacity

| | |
|---|---|
| Nuclear | 12,947 MW |
| Gas | 9,920 MW |
| Hydro | 7,939 MW |
| Wind | 1,725 MW |
| Coal | 306 MW |
| Other | 124 MW |



# Ontario System Characteristics

- Key Institutions
  - Ministry of Energy
  - Ontario Power Generation (OPG)
  - Ontario Power Authority (OPA)
  - Independent Electricity System Operator (IESO)
  - Hydro One Networks
  - Local Distribution Companies (LDCs)
  - Ontario Energy Board (OEB)
  - Information and Privacy Commissioner (IPC)

# Ontario System Characteristics: Interconnections

| *Table 2: Ontario Interconnection Limits* | | | | |
|---|---|---|---|---|
| ***Interconnection*** | ***Flows out of Ontario*** | | ***Flows into Ontario*** | |
| | Summer | Winter | Summer | Winter |
| Manitoba | 288 | 300 | 288 | 300 |
| Minnesota | 150 | 150 | 100 | 100 |
| Michigan | 1,900 | 1,910 | 1,600 | 1,650 |
| New York | 2,060 | 2,390 | 1,620 | 1,870 |
| Quebec | 2,135 | 2,170 | 2,775 | 2,795 |
| *Source: IESO, Ontario Transmission System, May 24, 2013* | | | | |

# Smart Grid Policy Drivers

- Smart Meters
  - February 2005 Directive to OEB
    - 4.7 million Smart Meters installed by 2012
  - Demand Response/TOU pricing
- Green Energy and Green Economy Act
  - Renewables Integration

# 2010 Ministerial Directive to OEB

- Efficiency
- Customer Value
- Coordination
- Interoperability
- Security
- Privacy
- Safety
- Economic Development
- Environmental Benefits
- Reliability

# Ministerial Directive

- Customer Control
  - Data access
  - Visibility of information
  - Control of consumption
  - Participation in renewable generation
  - Customer choice
  - Education
- Power System Flexibility
  - Promote distributed renewable generation
  - Visibility of grid conditions
  - Control and Automation
  - Improve power quality

# Ministerial Directive – Adaptive Infrastructure

- Flexibility
  - e.g. accommodate storage and electric vehicles
- Forward compatibility
  - Protect against technological lock-in
- Encourage innovation
- Maintain pulse on innovation

# OEB Response

- "…no distinction will be made for regulatory purposes between "Smart grid" and more traditional investments undertaken by distributors and transmitters"
- “The board will not approve expenditures that are not otherwise cost-effective, prudent long-term investments."
- “The Board has ruled that BTM services and applications are a non-utility activity to be preformed only by non-regulated entities and concluded that customer control is best served by market competition

# Smart Grid Fund

- $50 Million administered by Ministry of Energy
- Focus on:
  - Consumer control, Power System Flexibility and Adaptive Infrastructure
  - Creating economic development opportunities
  - Reducing risk and uncertainty in developing, testing and evaluating smart grid technologies

# Smart Grid Forum

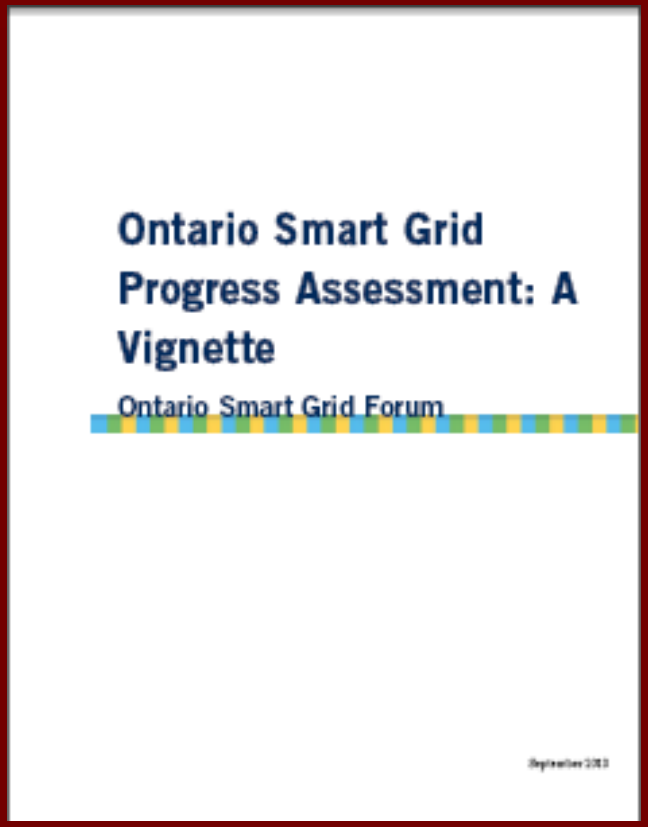
| Table 4: Smart Grid Forum Membership | |
|---|---|
| Bruce Campbell, President and CEO, IESO, and Chair, Ontario Smart Grid Forum | Terry Young, Vice President, Corporate and Employee Relations, IESO |
| Michael Angemeer, President and CEO, Veridian Corporation | Wayne Smith, VP, Grid Operations, Hydro One Inc. |
| David Collie, President and CEO, Electrical Safety Authority | Joe Van Schaik, Electric Power Market Manager at Tormont Cat |
| Jonathan Dogterom, Practice Lead, Cleantech, MaRS Discovery District | Jac Vanderbaan, Chief Operating Officer, Festival Hydro Inc. |
| Norm Fraser, Chief Operating Officer, Hydro Ottawa Limited | Julia McNally, Director, Market Transformation, Ontario Power Authority |
| Anthony Haines, President, Toronto Hydro-Electric System Limited | Ken Nakahara, Director of the Transmission and Distribution Branch, Ontario Ministry of Energy |
| Keith Major, Senior Vice President, Property Management, Bentall Real Estate Services | Dr. Jatin Nathwani, Professor and Ontario Research Chair in Public Policy and Sustainable Energy Management, Faculties of Engineering and Environmental Studies, University of Waterloo |
| David McFadden, Chair, Ontario Centres of Excellence | |

# Smart Grid Forum - Reports

- 2009 – Interoperability standards
- 2011 “Modernizing Ontario’s Electricity System: Next Steps”
  - Surveys to assess consumer interest in smart home technologies
  - Smart Grid economic development task force
  - Track electric vehicle registration
  - Framework to promote the deployment of energy storage
  - third party access to electricity consumers and their consumption information.
  - IPC and personal electricity consumption information
  - smart metering initiative
  - greater technological standardization

# Smart Grid Forum

- August 2013
  - Implementation of Smart meters and time of use pricing
  - Smart Grid as “enabling investment”
  - The Smart Grid and:
    - the “internet of things”
    - “smart” homes and energy networks
    - CC Impacts and adaptation
    - Energy and Transportation
    - DG and the disruption of traditional roles and relationships



# The Politics of Smart Grids

- Opposition criticism of smart meters overwhelmed by other electricity sector issues
- Smart Meters and Privacy Issues
  - IPC/IESO Protocol – *Privacy by Design*
  - *Green Button* Initiative

# Smart Grids and New Entrants

- Energy/load management and other ‘Behind the Meter’ services
  - No natural monopoly
  - Outside of OEB regulatory framework, IESO, LDC oversight or control
  - New service providers
    - May not conceive of their roles as energy managers
  - Role in CDM, distributed generation

# Conclusions

- Smart meter phase now complete
- Expansion of policy goals re: smart grid
  - Renewables integration
  - Flexibility, adaptive capacity, resilience
  - Economic development
  - Security, reliability
- Major effort to address data security and privacy issues prompted by IPC

# Conclusions

- Smart grid as disruptive technology
  - Behind the meter activity as focal point for ‘revolution’
    - Outside of existing regulatory, policy and institutional framework
    - New energy services and service providers
    - Role of distributed generation
  - Grid relegated to back-up vs. primary energy provider?