



# Developing the Ontario Smart Grid Plan

Draft Principles for Discussion

## Smart Grid Principles Introduction

- The following document outlines a **draft** set of principles to guide the implementation of Ontario's smart grid.
- It is understood that many of the principles present competing objectives. The intent is that consideration should be given to each of the principles while maintaining an appropriate balance that ensures the optimal outcome.
- These principles are targeted at all smart grid stakeholders, and in particular:
  - The Ontario Energy Board
  - Electrical Safety Authority
  - Ontario Power Authority
  - Local Distribution Companies
  - Generators / Transmitters
  - Smart Grid Vendors / Solution Providers

## FOR DISCUSSION - Broad Principles Of Smart Grid

- For the purpose of implementing an Ontario smart grid plan, a balanced consideration of the following principles shall serve as a guide for its achievement:
  - **CUSTOMER VALUE:** all aspects of the smart grid should enhance value to electricity customers and be cost effective.
  - **COORDINATION:** Wherever practical, distributors should coordinate smart grid implementation efforts by, among other means, sharing results of pilot projects and engaging in common procurements to achieve economies of scale.
  - **INTEROPERABILITY:** Adopt recognized industry standards that support interoperability of systems and enable common protocols for operation. Where no standards exist, actively support the development of new recognized standards.
  - **SECURITY AND PRIVACY:** respect and protect the privacy of customers and improve the security of the electrical grid. Integrate security and privacy into smart grid planning and design from an early stage, in part through the development of security and privacy plans as part of the grid planning process.
  - **SAFETY:** Under all circumstances maintain health and safety protection for customers and utility employees alike, and improve electrical safety wherever practical.
  - **ECONOMIC DEVELOPMENT:** encourage economic growth and job creation within the province of Ontario. Wherever practical, actively encourage the adoption of smart grid products, solutions, and services from Ontario-based sources.
  - **SOCIETAL AND ENVIRONMENTAL BENEFITS:** Promote the integration of cleaner technologies for electricity generation and conservation, and more efficient use of existing technologies to reduce the environmental footprint of the grid.

## FOR DISCUSSION - Customer Control Principles

- For the purpose of providing the customer with increased information and tools to promote conservation of electricity, which will “expand opportunities to provide demand response, price information and load control to electricity customers,” a balanced consideration of the following principles in addition to the broad principles for smart grid shall serve as a guide for its achievement:
  - **CUSTOMER VISIBILITY:** provide increased visibility of electricity consumption and commodity price to both consumers and control mechanisms (e.g. third party users of data who may add value to the consumer).
  - **ACCESS:** Enable the access to real-time or near real-time data on consumption flows and commodity price to customers and other authorized parties, consistent with government policy.
  - **CONTROL:** Enable consumers to better understand and control their level of consumption in order to facilitate active participation in conserving electricity.
  - **PARTICIPATION IN GENERATION:** provide consumers with opportunities to participate in generation and storage of electricity, particularly from cleaner sources.
  - **CUSTOMER CHOICE:** enable more and improved channels through which customers can interact with the electricity grid, consistent with government policy.
  - **EDUCATION:** Actively educate consumers about opportunities for their involvement in generation and conservation associated with a smarter grid, and present customers with easily understood material that explains how to increase their participation in the smart grid and the benefits thereof.
  - **SECURITY:** Ensure non-licensed, third-party service providers keep data safe.
- Coordinated programming to build on smart metering platform, e.g. coordinated roll-out of programming for in-home devices to actively encourage the adoption of a conservation culture in Ontario.

## FOR DISCUSSION - Utility Flexibility Principles

- For the purpose of “enabling the increased use of renewable energy sources and technology, including generation facilities connected to the distribution system,” a balanced consideration of the following principles in addition to the broad principles for smart grid shall serve as a guide for its achievement:
  - **DISTRIBUTED RENEWABLE GENERATION:** enable a flexible distribution infrastructure that facilitates increased levels of distributed renewable generation.
  - **VISIBILITY:** Improve network visibility of grid conditions for grid operators where a demonstrated need exists, including the enablement of distributed renewable generation.
  - **RELIABILITY:** Maintain reliability of electricity grid and improve it wherever practical. Maintain or improve the ability of the grid to reduce unforeseen outages.
  - **CONTROL AND AUTOMATION** – to the extent practical, develop the ability of smart grid infrastructure to automatically anticipate and respond to system disturbances.
  - **EFFICIENCY:** Maximize utilization of the existing grid infrastructure, and improve efficiency of grid operation, including operations and maintenance activities associated with distribution system.
  - **QUALITY:** Maintain or improve the quality of power delivered by the grid, and improve it wherever practical.
  - **OPERATIONAL SECURITY** – ensure security of information systems and distribution systems in accordance with recognized standards.

## FOR DISCUSSION - Adaptive Infrastructure Principles

- For the purpose of “accommodating the use of emerging, innovative and energy-saving technologies and system control applications,” a balanced consideration of the following principles in addition to the broad principles for smart grid shall serve as a guide for its achievement :
  - **FLEXIBILITY** – provide flexibility within smart grid infrastructure infrastructure to support the future adoption of smart grid applications that meet the principles outlined herein, such as electric vehicles and energy storage.
  - **FUTURE PROOF** – protect against technical lock-in wherever practical and in balanced consideration of the principles outlined herein.
  - **ENCOURAGE INNOVATION** – Nest within smart grid infrastructure planning and development the ability to adapt to and actively encourage innovation that meets a balanced consideration of the principles outlined herein.
  - **MAINTAIN PULSE ON INNOVATION** – establish programs to encourage innovation in the smart grid and information sharing, including cross-agency, cross-distributor, and government coordination of information and programming.

## Ontario Opportunities Fund

- Criteria for discussion to consider in providing provincial funding for Ontario smart grid opportunities:
  - Alignment with smart grid principles
  - Alignment with open standards
  - Export Markets
  - Commercialization ability
  - Cost-effectiveness
  - Technical growth potential
  - Others?

## Appendix

## DOE Smart Grid “Principal Characteristics”

- **Enables active consumer participation** – The smart grid will give consumers information, control, and options that enable them to engage in new “electricity markets.” Grid operators will treat willing consumers as resources in the day-to-day operation of the grid. Well-informed consumers will modify consumption based on the balancing of their demands and resources with the electric system’s capability to meet those demands.
- **Accommodates all generation and storage options** – It will seamlessly integrate all types and sizes of electrical generation and storage systems using simplified interconnection processes and universal interoperability standards to support a “plug-and-play” level of convenience. Large central power plants including environmentally friendly sources, such as wind and solar farms and advanced nuclear plants, will continue to play a major role even as large numbers of smaller distributed resources, including Plug-in Electric Vehicles, are deployed.
- **Enables new products, services, and markets** – The Smart Grid will link buyers and sellers together – from the consumer to the Regional Transmission Organization. It will support the creation of new electricity markets from the home energy management system at the consumer’s premise to technologies that allow consumers and third parties to bid their energy resources into the electricity market. The Smart Grid will be transactive and will support consistent market operation across regions.
- **Provides power quality for the digital economy** – It will monitor, diagnose, and respond to power quality deficiencies resulting in a dramatic reduction in the business losses currently experienced by consumers due to insufficient power quality.
- **Optimizes asset utilization and operates efficiently** – Operationally, the Smart Grid will improve load factors, lower system losses, and dramatically improve outage management performance. The availability of additional grid intelligence will give planners and engineers the knowledge to build what is needed when it is needed, extend the life of assets, repair equipment before it fails unexpectedly, and more effectively manage the work force. Operational, maintenance and capital costs will be reduced thereby keeping downward pressure on prices.
- **Anticipates and responds to system disturbances** – It will self heal by performing continuous self-assessments to detect and analyze issues, take corrective action to mitigate them and, if needed, rapidly restore grid components or network sections. It will also handle problems too large or too fast-moving for human intervention.
- **Operates resiliently against attack and natural disaster** – The Smart Grid will incorporate a system-wide solution that reduces physical and cyber vulnerabilities and enables a rapid recovery from disruptions. Its resilience will create an image that intimidates would-be attackers. It will also be less vulnerable to natural disasters.

## DOE Characteristics within the Ontario Framework

Customer Control	Utility Flexibility	Adaptive Infrastructure
<ul style="list-style-type: none"> <li>▪ Enables active consumer participation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Optimizes asset utilization and operates efficiently</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enables new products, services, and markets</li> </ul>
<ul style="list-style-type: none"> <li>▪ Accommodates all generation and storage options</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provides power quality for the digital economy</li> <li>▪ Anticipates and responds to system disturbances</li> <li>▪ Operates resiliently against attack and natural disaster</li> </ul>	
<p style="text-align: center;">More Conservation</p>	<p style="text-align: center;">Increased Renewables</p>	<p style="text-align: center;">More Innovation</p>
<p><i>Economic Drivers – Business Development, Global Leadership, Jobs</i></p>		