BACKGROUNDER:

ETNO Report on Structural Options for Ontario's Electricity System in a High-DER Future

A reliable, affordable and resilient electricity system is essential to Ontario's prosperity and to the quality of life enjoyed by its residents. Like many other sectors, electricity is undergoing significant disruption and evolution as the combined forces of decentralization, digitization, and democratization take hold with the promise of a smarter, more dynamic grid.

Drivers of DER Growth

One of the most significant changes to electricity systems around the world has been the rapid expansion of distributed energy resources (DERs), such as small-scale generation, storage and demand response at the distribution level,[1] including resources owned by individual customers.

In Ontario, more than 4,000 megawatts (MW) of DERs have been contracted or installed over the past 10 years. Coupled with this known amount of DERs is an unquantifiable amount of load control, behind-the-meter energy storage and demand response capacity that can also be regarded as DERs.

DER deployment is expected to continue to grow in the coming years. If not managed effectively, this growth could adversely affect system reliability and increase costs for consumers. However, if electricity sector decision-makers understand the implications – on reliability, affordability, competition and consumer choice – of different options for allocating roles and responsibilities to accommodate the growth of DERs, they will be better prepared to implement solutions that protect the interests of Ontario consumers.

While DERs increase the complexity of distribution planning, they promise to deliver a broad range of benefits to the consumer and to the electricity system, including greater consumer choice, improved system resilience and flexibility, increased market competition, and the deferral or avoidance of costs associated with large-scale infrastructure development.

Ontario's electricity system (institutions, roles and responsibilities, tools and practices) was established at a time when a few large-scale generating facilities met the province's electricity needs. This system was not set up to accommodate thousands of DERs.

Integrating DERs into Ontario's electricity system in a way that maximizes their benefits and minimizes any negative impacts will require careful coordination and clarity in the allocation of the same types of roles and responsibilities at the distribution level that were established at the transmission level for generation, transmission and market operation.

Roles and responsibilities for DER ownership, operation, and local market administration will need to be assigned in a way that achieves the desired outcomes for competition, affordability, reliability and customer choice. A key question is whether existing regulated utilities should be allowed to expand their businesses to include DER-related services. For example, should a local distribution company in Ontario be allowed to administer a local market for DERs while simultaneously owning resources that compete in that market?

[1] The electricity system is broadly divided into the transmission system and the distribution system. Along with other related infrastructure like towers and stations, the transmission system includes a series of wires that carry high-voltage electricity over long distances from large-scale generating/storage facilities to large customers or the distribution system. The voltage of electricity is reduced to distribution levels at transformer stations and carried across lines owned and managed by local electric utilities to homes and businesses.

Purpose of this Report

The most recent report of the Energy Transformation Network of Ontario (ETNO) explores many of the questions arising from the increased penetration of DERs. It provides an overview of drivers for DER development in Ontario and the roles and responsibilities (some existing, some new) required to integrate DERs into Ontario's electricity system in a way that maintains system reliability and customer affordability.

The report is intended to inform sector decision-makers of key considerations associated with structural options for Ontario's electricity system in a high-DER future, and to raise awareness among potential investors of associated opportunities.

Cost allocation, governance, security and transparency are just a few of the issues that will need to be resolved in order to unlock the full benefits of coordination. There is broad consensus among ETNO members that electricity system reliability, affordability, competition and consumer choice should be the objectives of any public policy decisions for DER integration. Regardless of the policy path, members also agreed that open standards for connecting DERs to the distribution system and open access to DER markets remain essential to the prevention of artificial monopolies that undermine the creation of consumer value.

While much of the discussion about DERs to date has been within the electricity sector and its traditional players, it is essential that the conversation be opened up to include potential new investors in the sector who will be needed to help realize the benefits of a more competitive electricity system.

Next Steps

The report contains a number of potential next steps to inform decision-making with respect to roles and responsibilities for DER integration, including:

- Conducting a cost-benefit analysis to quantify potential consumer/system impacts of different structural options for Ontario's electricity system
- Reviewing existing system costs, options for avoiding stranded assets and ensuring consumers pay their fair share for investments made on their behalf
- Considering financing models to meet future electricity needs that stimulate new sources of investment and competition to optimize outcomes for consumers

About ETNO

The Energy Transformation Network of Ontario (formerly the Ontario Smart Grid Forum) includes member organizations from Ontario's utility sector, industry associations, public agencies and universities working together to develop the smart grid in Ontario and examine the many components it comprises.

It is supported by the Corporate Partners Committee, which represents more than 30 private sector organizations active in the smart grid space, including electric car makers, retailers, energy management companies, systems integrators and equipment manufacturers.

Since 2009, ETNO has released a series of papers collectively containing 53 public policy recommendations, which include:

- Maximizing consumer choice through competition
- Developing success metrics for innovation in the utilities sector
- Open access to markets and data for third parties
- Integration of DERs into the electricity system and markets
- Open interoperability standards
- Formalized, rigorous cybersecurity standards
- Physical resilience and safety of new smart grid equipment

About the IESO

The Independent Electricity System Operator (IESO) works at the heart of Ontario's power system to ensure reliable, affordable electricity is available when and where it's needed. The IESO delivers key services across the electricity sector including: managing the power system in real time, planning for the province's future energy needs, enabling energy efficiency, and designing a more efficient electricity marketplace to support sector evolution.

The IESO is a not-for-profit entity established by the Government of Ontario, and whose fees and licences to operate are set by the Ontario Energy Board.

About Distributed Energy Resources (DERs)

The National Association of Regulatory Utility Commissioners defines a DER as "a resource sited close to customers that can provide all or some of their immediate electric and power needs and can also be used by the system to either reduce demand (such as energy efficiency) or provide supply to satisfy the energy, capacity, or ancillary service needs of the distribution grid. The resources, if providing electricity or thermal energy, are small in scale, connected to the distribution system, and close to load. Examples of different types of DER include solar photovoltaic, wind, combined heat and power, energy storage, demand response, electric vehicles, microgrids and energy efficiency."

ETNO Report Findings

- The overall customer experience should be prioritized in any discussion of roles and accountabilities for managing DER growth. With this in mind, and to realize the potential economic and social benefits of planning for a high-DER future, divergent viewpoints on the "best" approach to facilitating system operations will need to be reconciled.
- All stakeholders in Ontario's electricity industry should have a vested interest in realizing the benefits of optimal coordination. Ultimately, however, the consumer experiences the benefits or consequences of strategic coordination decisions – or the failure to make them.
- If Ontario maintains the current model for local distribution companies (LDCs),[2] regulators will need to consider whether new functional requirements should be added to LDC responsibilities and capabilities or whether another entity should be responsible for certain distribution system operator (DSO) functions, particularly if regulated DER markets are expected to form over the longer term.
- While load-serving entities (LSEs), which arrange for delivery of energy to end-use customers but do not include distribution services ("wires"), could offer an important source of liquidity to the growth of DER markets, the multiple variants on this model[3] warrant further examination before Ontario considers regulatory changes to allow LSEs.
- Community choice aggregations (CCAs), LSEs and other types of "buying consortiums" challenge regulators to ensure they are enabling – rather than inhibiting – competition. Any activities that allow consumers to "beat the cost curve" associated with the grid also require an examination of how costs for existing assets are managed to avoid creating stranded assets or shifting the burden of those costs to other customers.
- While some organizations, including the Electricity Distributors Association, have advocated for the transition of LDCs to fully integrated network orchestrators (FINOs) – bodies that serve the functions of an LDC and a DSO, and own and operate DERs – regulated and non-regulated groups differ sharply on the merits of this approach. This model could be a stepping stone to establishing a distribution-level DER market; however, policy-makers will need to consider how it can:
  - Support competition in industry segments that do not have a natural monopoly
  - Ensure fair and open access to local markets for non-regulated third parties
  - Prevent unfair treatment/conflict of interest regarding non-LDC owned DER connections
  - Enforce interoperability standards to avoid the deliberate or accidental creation of artificial monopolies through technological lock-in.
- The policy spectrum ranges at one end from a strict separation of DSO, distribution owner (DO) and trading functions to maximize competition and open access to markets, to FINOs which, in fulfilling those functions and participating in DER operations and commercial undertakings, act as natural monopolies. Even if a fully independent distribution market for DERs becomes the ultimate goal, regulators would need to consider the intermediate steps required, and the associated timeline for design and implementation.
- Achieving consensus on the models at either end of the spectrum – or an intermediate option between the two – is one of the most divisive issues in the debate over the future of the distribution sector. Distributors, generators and sustainability groups are generally more supportive of LDCs being allowed to participate in distribution-level markets with a regulated separation of functions, while customers, energy-related businesses and academics are less favourable.
- In addition to examining conceptual models for distribution evolution, ETNO has explored a wide range of emerging technological concepts for harnessing the aggregated capabilities of DERs. The ETNO/Smart Grid Forum has advocated for open interoperability standards since 2011. These are even more pressing today, as without open standards and rules of access, each interface in the increasingly complex system environment offers an opportunity for the creation of artificial monopolies.

[2] Today, LDCs perform some of the functions of a distribution system operator (DSO) and distribution owner (DO), but are prohibited from owning resources or controlling and operating DER assets.

[3] These options include enabling LSEs, retailers and CCAs to compete for customers; leveraging technology to serve customers across a geographically dispersed area; or expressly separating commercial functions from system operations and asset ownership (see NERC definition).

- When considering intermediate options for creating a DER market in Ontario, policy-makers may have to choose between expedience and design elegance – each with its own risks. On the one hand, interim decisions can become entrenched as permanent solutions, both in terms of dominant market players and technological lock-in. On the other hand, implementing a full DSO platform might delay the creation of a DER market in the province for many years to come – to the detriment of customers, investors, and suppliers of DER technologies. With that in mind, and given the unique position of LDCs in Ontario's electricity system, the province could take one of two approaches:
  - An additive approach, enabling LDCs to assume more roles and responsibilities (e.g., DER commercial functions and DSO functions) over time. In this case, regulators would need to consider the expediency resulting from creating DER markets using today's organizational structures; how to ensure separation of functions are adequate to avoid conflicts of interest; and the widely varying scale, financial resources and capabilities of Ontario's LDCs.
  - An unbundling approach, requiring LDCs to devolve to entities that independently fulfill their constituent roles (e.g., wires ownership, DSO operations), and compete with others for roles that may benefit from greater competition (e.g., LSEs, CCAs, DER ownership and operation). In this scenario, regulators would need to consider the complexity, time and cost of implementation; how to ensure sufficient market depth to warrant the effort, and how to implement the approach uniformly across the province.
- While ETNO's stance on maximizing consumer choice through competition, market access and open reliability standards has remained unchanged over the past decade, there is now a growing body of policy and technical options to facilitate this goal. However, a lack of clear standards may allow some market entrants to undermine the level of competition, necessitating careful choices with respect to allocation of roles and responsibilities, and industry governance of these new marketplaces.
- Policies around structural changes have significant and lasting implications when it comes to competition and access to markets, system reliability, the risks of over- or under-investing, and the rate of change, including how and when structural change might occur, and whether any immediate measures should have a finite lifespan. To help address these considerations, policy-makers should take into account:
  - The growing reliability implications of DERs, which are changing the scope and nature of what existing organizations must do to maintain system reliability
  - The need for clarity of accountabilities when it comes to system reliability, security and resilience
  - Financial accountability for DER investment, which involves ensuring both that the marketplace has the policy flexibility to respond to the signals of DER investors regarding the size of prospective investments and needs, and that there is a clear separation between the entities that administer the markets and those that participate in them.
- In determining how to allocate roles and responsibilities for DERs in the future, the aim should be to maximize benefits for consumers by undertaking an objective cost-benefit analysis of the options outlined, including the potential for stranded assets and cost shifting among consumers. Since the consequences of these structural decisions will be felt by Ontario homes and businesses for decades to come, they must be based on more than the qualitative assessments of entities with vested interests in the outcomes. An exploration of financing models and approaches to stimulating new sources of investment and competition in the sector to optimize consumer benefits of DERs is needed, along with a broadening of the policy dialogue to include potential new investors in discussions on electricity sector evolution.