A SUSTAINABLE ELECTRICITY POLICY FOR ONTARIO

By Charles Park

The following paper is the winning entry of the Ontario Centre for Engineering and Public Policy's 2015 Student Essay Competition in the undergraduate category.

Park mentions the Ontario Power Authority (OPA), which was still in existence when his paper was written. In January 2015, the OPA merged with the Independent Electricity System Operator (IESO).

This paper has been edited for length. To view the original, please visit www.peo.on.ca/index.php/ci_id/29079/la_id/1.htm.

ELECTRICITY IS THE LIFEBLOOD of our civilization. The generation, transmission and distribution of electricity to consume in daily activities together mark one of our greatest endeavours in both scale and impact. Ontario's electricity policy should be grounded in sustainability, which balances the social, economic and environmental consequences of any initiative.

Electricity is consumed in a just-in-time manner. It is more expensive to store than to manufacture on a large scale because of the equipment and materials involved and due to losses in the energy-conversion process. Despite the research into, and technological advancements with, storage technologies, Ontario's electricity system is primarily planned, designed and operated to respond to varying demand by dispatching various types of generators at an equilibrium quantity of energy in a provincial energy market.

DEMAND-SIDE LESSONS

To reduce demand and flatten the peaks in energy usage, the Ontario government has implemented policies incorporating conservation and measures aimed at changing customer behaviour. We can draw three general lessons from a review of these initiatives. The first lesson is the need for meticulous benchmarking and commitment to cost-benefit analysis prior to project implementation–something the Ministry of Energy did not address, despite cost concerns raised by the Ontario Energy Board (OEB) in its implementation plan and requests from the Independent Electicity System Operator (IESO) for a business case.

The second lesson is the establishment of stronger governance and project-management structures to facilitate the oversight and coordination of all relevant industry stakeholders' efforts to minimize redundant and costly operations, as seen in the case of functional overlap between data centres at the distribution and provincial levels.

The third lesson is to communicate carefully to ratepayers about these program structures and related costs, as well as to commit to customer service. Ratepayers are, ultimately, the beneficiaries of a government initiative.

SUPPLY-SIDE LESSONS

Nuclear energy generates the majority of Ontario's energy–in fact, 61.5 per cent of all energy generated in Ontario (excluding imports) from October 2013 to December 2014. Hydroelectric resources follow nuclear at 24 per cent of energy generated, followed by gas and oil, and wind and biofuel, all beneath 10 per cent. Coal is no longer a component of Ontario's supply mix, having been phased out starting in April 2014. Ontario's existing capacity exceeds maximum demand by at least 8 GW.

Nuclear power generation is highly inflexible and energy from renewables is unpredictable. Hydroelectric and gas-power generation are highly flexible and can cater to both base load and peaking needs. Ontario's supply-side policies have focused on removing coal from the energy mix, introducing the *Green Energy and Green Economy Act* (GEGEA) to support renewable technologies, and energy pricing strategies.

Based on the rollout of Ontario's supply-side policies, there are three practical lessons for the future. The first is to have as independent an advisory body as possible to ensure policy decisions are made with sufficient cost-benefit analysis in mind, as seen by the interplay among the Ontario Power Authority (OPA), the OEB, and the ministry during renewable procurement.

The second is to implement contract structures that better reflect market conditions (like the OPA's recommendation on degression rates for the solar feed-in tariff program) to encourage more competitive procurement between renewable generators and bring downward pressure on system costs.

The third lesson is to engage in public consultation and education prior to policy implementation. This way, the public can have a realistic expectation of the consequences of any policy initiative, green or not, prior to the long-term supply commitment.

LOOKING FORWARD

Ontario's electricity sector will have to undergo many iterations of modernization to address our future needs. By applying the previous lessons from policy implementation on the demand and supply sides, Ontario can work towards a more sustainable electricity policy for the future. The following sections explore promising opportunities to do so.

Ontario capacity auction

Ontario's previous method of procuring supply through long-term (typically 20-year) contracts with generators has been effective in placing us in a strong supply situation, but all too often at the loss of cost-effectiveness, as illustrated in the previous review of supply-side policy. Ontario's demand situation also highlights how economic and technological changes influence the consumption of electricity. Long-term contracts, as currently structured, cannot provide the cost-effective flexibility to match yearly changes in supply and demand.

A capacity auction would be an innovative way to streamline cost-effectively the energy procurement process. Neighbouring jurisdictions have implemented open auctions that allow supply and demand resources to provide capacity. In such markets, system operators secure capacity for only three to five years ahead. This leaner approach to procurement will facilitate greater competition in the existing system. Over the next few years, the IESO will move forward with the design of a capacity auction by engaging various stakeholders in the sector.

Strategic carbon pricing

In line with the GEGEA, pricing carbon to curtail its use is another powerful way to combat climate change. The government could adopt a more market-oriented approach to pricing carbon as opposed to direct taxation, thereby letting the consumers of carbon decide how much they value it. For instance, the biggest use of fossil fuels is in the transportation sector, not electricity generation. By capping greenhouse gas emissions and allowing an industry with lower emissions (like the electricity sector) to sell their extra allowances to larger emitters (like transportation), emission reductions can take place within a specified timeframe and a true market price. Ideally, revenues from selling carbon credits could then be channelled into investments that spur technological innovation. Opponents to cap-and-trade may argue that the ubiquitous nature of carbon makes it difficult to silo different industries and, thus, effectively raises costs for everything. Nevertheless, like the capacity auction, careful design consideration and consultation with affected stakeholders may lead to a more efficient, market-based solution.

Energy storage

Exploring competitive methods to procure grid-level storage technologies is another potential game changer in future electricity policy, on both the supply and demand sides. It can smooth out fluctuations of intermittent resources like solar and wind to help mitigate surplus base-load generation, provide critical system reliability services like voltage and frequency support, and defer the need for long-term supply investment. Currently, the only large-scale, grid-connected storage facility is the 174-MW-capacity Sir Adam Beck Pump Generating Station that flows water for energy during peak hours and pumps water to a reservoir during off-peak hours. The IESO plans to procure an additional 50 MW of storage capacity across a wide portfolio of privately owned technologies, including flywheels, hydrogen-fuel-powered cells, large-scale lithium ion batteries, and many more. Like any novel technology, there are regulatory hurdles to its widespread adoption in the energy market, which must be addressed through effective, private-public partnerships and meticulous cost-benefit analysis unaffected by a political agenda.

Microgrids

Microgrids are islanded, small-scale versions of a centralized electricity system that service a local and, typically, remote community. Microgrids have a limited presence in Ontario, but it is a grid development worth considering for future power system needs. Microgrids have a proven case for reliability. During Hurricane Sandy, key buildings in New York remained lit due to a self-sufficient microgrid system.

Motivating the potential benefits of a microgrid merits a brief discussion about Ontario's transmission system. The increased penetration of renewables in the next decade will require a commensurate investment in updating and expanding transmission and distribution systems to connect loads with remote and widely dispersed renewable energy generators. These investments can soar to several billions of dollars based on cost estimates provided in the 2013 Long-Term Energy Plan. Such costs would again be borne by the ratepayer via increased delivery charges–an add-on to the steep increase in the costs recovered through the Global Adjustment.

FUTURE POLICIES SHOULD BE GROUNDED IN METICULOUS, COST-BENEFIT ANALYSIS; STRONGER GOVERNANCE AND PROJECT-MANAGEMENT STRUCTURES ARE NEEDED TO FACILITATE THE OVERSIGHT AND COORDINATION OF STAKEHOLDERS; AND COMMUNICATION TO RATEPAYERS ABOUT PROGRAM STRUCTURES AND A COMMITMENT TO CUSTOMER SERVICE ARE IMPERATIVE.

While these grid developments progress, there are three technological innovations, which over a similar timeframe may challenge ratepayers, especially in remote communities, to consider disconnecting from the grid and subscribing to a potentially more cost-effective microgrid implementation. The first is the declining cost of solar: from 1977 to 2014, solar panels declined in cost from $77 per watt to just under $1 per watt, with grid parity in reach within a decade. The second development is cheaper storage solutions. According to Navigant Research, revenue from advanced batteries for utility-scale, energy-storage applications will grow from $228 million in 2014 to $17.8 billion in 2023. The third advancement concerns the development of low-voltage DC power networks offering alternative ways to distribute home-grown energy sources to household devices. The convergence of these three developments allows for a more consumer-centric paradigm of electricity consumption that may influence the direction of traditional electricity policy, which is modelled after centralized generation. As noted in the previous demand-side policy review, these trends relate to the need for future policy implementations to prioritize customer service.

Evolution to a consumer-centric smart grid

A consumer-centric paradigm shift aligns with Ontario's efforts to promote conservation and demand management by providing ratepayers transparent access to their energy consumption data, which enables them to monitor and control their electricity demand proactively. This stance requires Ontario to develop its position as an innovation leader. Through Ministry of Energy initiatives like the $50-million Smart Grid Fund launched in 2011 and a second round of funding in July 2013, Ontario aims to commercialize smart grid ventures in the areas of data management, grid automation and behind-the-meter services, and to help foster interoperability among communication devices. Another key initiative to further build on is the Green Button (www.greenbuttondata.org). This provides customers with access to their electricity consumption information in a standardized format and also facilitates third-party data access to developers to provide innovative software solutions that add value to the consumer experience.

CONCLUSION

Ontario is at a crucial point in time, promising many changes to the sector over the next few decades. On the demand side, we developed a culture of conservation and energy efficiency, which curbed demand levels despite increases in economic activity. The government's implementation of the Smart Metering Inititative highlights three lessons: future policies should be grounded in meticulous, cost-benefit analysis; stronger governance and project-management structures are needed to facilitate the oversight and coordination of stakeholders; and communication to ratepayers about program structures and a commitment to customer service are imperative.

On the supply side, we phased out coal and decided to integrate renewable energy into the generation mix at a large scale. This has contributed to high electricity costs and technical challenges with surplus baseload generation, which may be mitigated by the shortfall in energy generation through nuclear refurbishment. The government's implementation of supply-side policies illustrates another three lessons: an independent and apolitical advisory body would ensure policy decisions are backed by objective analysis rather than biased political directives; procurement methodologies should reflect changing market conditions and enhance competition among participants; and public consultation and education prior to policy implementation is crucial.

Only by interdisciplinary co-operation among various fields of expertise in both private and public sectors–engineering, economics, social sciences, information technology, business, and law and regulatory development–can Ontario survive with a sustainable electricity policy. Σ

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