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CANADIAN WIND ENERGY ASSOCIATION | ASSOCIATION CANADIENNE DE L'ÉNERGIE ÉOLIENNE

April 8, 2016

Michael Lyle
Vice-President
Planning, Law and Aboriginal Relations
Independent Electricity System Operator
120 Adelaide St. W Suite 1600
Toronto ON M5H 1T1

Dear Mr. Lyle,

The following comments have been prepared by Power Advisory LLC on behalf of the Canadian Wind Energy Association (CanWEA). On March 23, 2016, the Independent Electricity System Operator's (IESO's) Stakeholder Advisory Committee (SAC) was presented a power system planning document, *Ontario Power Outlook 2016: Ontario Supply/Demand Balance to 2035* (OPO 2016). The IESO requested stakeholder comments on the OPO 2016 and CanWEA is pleased to provide feedback. CanWEA's members are Canada's wind energy leaders, and the Association serves as the representative of the wind energy industry in Canada. Our members are wind energy generation owners and operators, manufacturers, project developers, consultants, service providers, and other organizations and individuals that support Canada's wind energy industry.

Background on New Framework and Governance for Electricity Planning

In late 2015, the Ontario Government introduced Bill 135, the *Energy Statute Law Amendment Act, 2015*, and is expected to achieve Royal Assent (i.e., become law) in 2016. Bill 135 will formalize an electricity planning framework for the Ontario Government to produce a Long-Term Energy Plan (LTEP) by receiving technical input from the IESO and input from stakeholders through a formal consultation. In addition, the IESO is no longer required to produce an Integrated Power System Plan (IPSP) where the Ontario Energy Board (OEB) was to decide on the approval of the IPSP. The OPO 2016 is IESO's technical input to the Ontario Government towards development of the LTEP. As such, the OPO 2016 is the important technical foundation for the production of the next LTEP and benefits from stakeholder engagement with electricity industry representatives to seek feedback on the OPO 2016's assumptions and conclusions.

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Growing Benefits of Wind Generation

Wind generation is a highly flexible supply resource that can provide a wide variety of cost-effective benefits to Ontario's electricity system. Wind generation has no fuel price risk or constraints allowing the resource to provide security of supply, supply mix diversity, and a hedge against price volatility which leads to long term price stability. As a renewable resource, wind generation can assist Ontario in meeting and maintaining its long-term climate change goals.

Wind generation has become a low cost supply resource option. A recently completed study by investment firm Lazard found that wind energy is among the lowest cost options for any new supply without any subsidies. Lazard estimates in 2015 the levelized cost of energy (LCOE) for wind generation currently is in the range of $32/MWh to $77/MWh[1], lower than new coal, hydro, and nuclear power**.** Wind generation creates a range of job opportunities at both the construction stage and when wind generation sites are operational. For every MW of wind energy, the number of jobs generated ranges from approximately 10 to 14 full-time equivalent (FTE) jobs for one year. Ontario's past and future investments in wind energy are estimated to result in 73,000 direct and indirect FTEs[2].

A primary reason for the increased cost-effectiveness of wind generation is the rapid advancement in technology attributes. Innovations in wind turbine tower design and construction methods have allowed wind generation hub heights to increase. Higher hub heights allow wind generation projects to access higher average wind speeds which result in increased output capabilities for projects[3]. As tower design and construction methods evolve, new wind generation sites are becoming increasingly and economically competitive relative to other supply resources, and therefore increasingly available as a future supply resource for Ontario.

[1] Lazard's Levelized Cost of Energy Analysis – Version 9.0 – Lazard - https://www.lazard.com/media/2390/lazards-levelized-cost-of-energy-analysis-90.pdf

[2] Wind Dividends: An Analysis of the Economic Impacts from Ontario's Wind Procurements - Compass Renewable Energy Consulting - http://canwea.ca/wp-content/uploads/2015/12/FINAL-CanWEA-Economic-Analysis-Report-Nov_25-2015_PUBLIC.pdf

[3] Enabling Wind Power Nationwide – US Department of Energy - http://www.energy.gov/sites/prod/files/2015/05/f22/Enabling-Wind-Power-Nationwide_18MAY2015_FINAL.pdf

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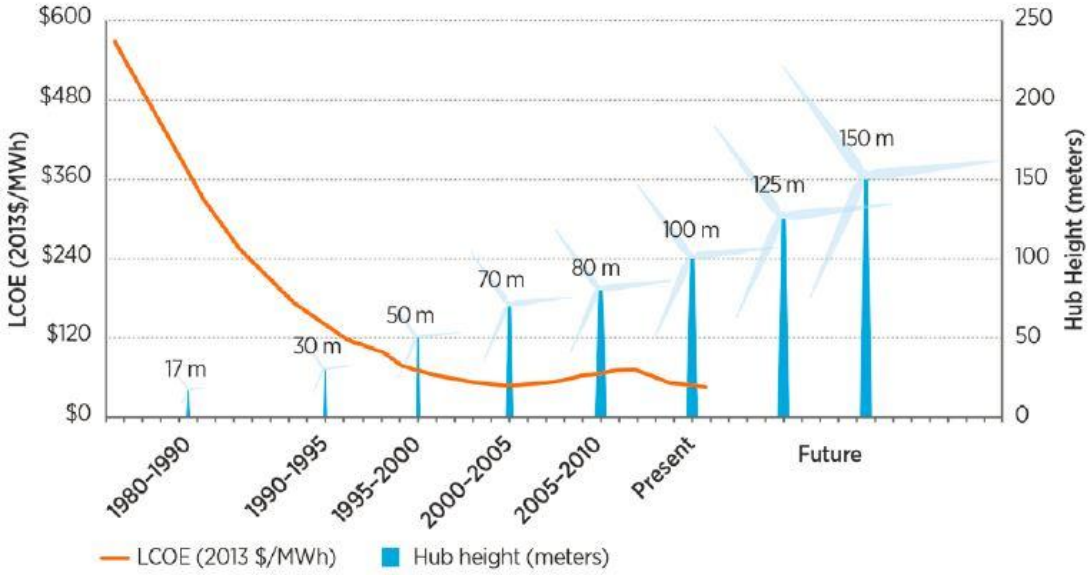

Historical LCOE and Hub Heights for Wind Generation – Source: DOE

Evolution of wind generation technology has not been confined to increasing energy production capability. Power electronic innovations have reduced the expected impact on electricity systems from high penetration of wind generation into the supply mix. Large wind generation facilities in multiple jurisdictions are now required by system operators to behave similarly to conventional generation (e.g., gas-fired generation, etc.) under a variety of system conditions. The use of power converters in wind generation facilities allows wind generation to provide both voltage and frequency control to system operators when needed[4].

One area where wind generation has excelled in recent years is the ability to integrate into real-time electricity markets. Independent system operators, such as the IESO, are dispatching wind generation every five minutes, just as they do with gas-fired and other conventional generation. In Ontario, the IESO concluded a successful stakeholder engagement on renewable generation integration in 2014[5] that

[4] Wind Power Plant Voltage Stability Evaluation – NREL – www.nrel.gov/docs/fy14osti/62568.pdf
[5] Renewable Integration (SE-91) – IESO - http://www.ieso.ca/Pages/Participate/Stakeholder-Engagement/SE-91.aspx

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resulted in transmission-connected wind generation transitioning into full dispatchable market participant status. The capability of wind generation to be a dispatchable market participant means that the IESO can use the same market functions and operational processes as they typically do with other dispatchable generation.

In addition to participating fully in real-time electricity markets, wind generation can be a cost-effective option for long term power system capacity and energy requirements. Wind generation is a highly flexible resource that can be partnered/coupled/bundled with other resources and technologies to meet specific power system needs (e.g., dispatchability, etc.). A recent example of the many different partnerships that wind generation can offer can be found in the responses to the New England Clean Energy RFP[6]. State agencies and electricity distribution companies in Connecticut, Massachusetts, and Rhode Island issued the New England Clean Energy RFP in November 2015 seeking clean energy and transmission to deliver clean energy to the procuring states. Bid submissions were delivered in January 2016 and revealed a long list of wind generation partnerships available to meet the clean energy needs. For example, one proposal submitted included a large wind generation project partnered with hydroelectric imports from Quebec and a new transmission project in Vermont. In another example, multiple new wind generation projects in New York will be bundling with existing hydroelectric generation facilities to provide a diverse and reliable supply of clean energy transported over a new dedicated transmission line. Finally, one proponent has proposed a large wind generation project (450 MW+) combined with battery storage, solar generation, and new transmission construction.

There are various other examples of the flexibility and innovation that wind generation can offer in a cost-effective manner to meet the evolving needs of power systems and government policy objectives. In Ontario, the evolution of the capabilities of wind energy generation to reduce uncertainty and risk in the electricity system is only beginning.

Further Consultation Needed for OPO 2016

As the primary technical input to the LTEP, the OPO 2016 must be sufficiently robust, sound, and technical in scope, analysis, conclusions, and recommendations regarding Ontario's power system and its future

[6] New England Clean Energy RFP - https://cleanenergyrfpdotcom.files.wordpress.com/2015/11/clean-energy-rfp-final-111215.pdf

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needs, similar to Integrated Resource Plans typically produced by electric utilities. The LTEP will convey the Ontario Government's energy policy direction, which will expectedly factor in applicable non-electricity policy objectives. For the Ontario Government to achieve a variety of policy objectives, it is imperative and critical that the OPO 2016 provide a clear and detailed assessment of system needs and risks. The assumptions and conclusions of the OPO 2016 must be sufficiently stakeholdered so that Government policy makers can understand the risks and possible consequences of the electricity policy decisions that will constitute the LTEP. Further, the OPO 2016 should attempt to articulate primarily, decision points that will most heavily influence the future direction of Ontario's electricity sector.

CanWEA has concluded that the information on OPO 2016 presented to the SAC is a promising first step, but must go further to ensure Ontario's electricity sector is prepared for an increasingly uncertain future. To properly determine the technical requirements of the Ontario electricity system and assess the adequacy under different supply plans, the OPO 2016 should involve further stakeholder engagement outside of the SAC process. The next round of stakeholder engagement on the OPO 2016 should involve the following activities:

- **OPO 2016 Data Release** - The data and information (e.g., assumptions, etc.) used to develop the OPO 2016 document presented to the SAC should be shared with stakeholders. The data provides information that allows stakeholders, such as CanWEA, to review and understand clearly, the basis for conclusions reached by the IESO and to help wind generation developers and owners/operators plan their businesses. As a result, the discussions on the current and future status of the Ontario electricity system should become more focused as a common understanding between the IESO and stakeholders is hopefully established.

- **Impact of Ontario's Climate Change Initiatives** – The most significant policy action of the current mandate of this Government is the adoption of carbon pricing within the Ontario economy. The OPO 2016 does not adequately describe the impacts of climate change policy on the Ontario electricity sector and has not undergone adequate analysis as this point. Further consultation of the OPO 2016 should include discussions and analysis on how Ontario's climate change initiatives (e.g., cap-and-trade) will influence the future Ontario electricity sector. At a minimum, a clear understanding of the possible areas where climate change initiatives will have the most impact

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should be discussed with stakeholders so that all parties can agree to what signals in the near future may need to trigger action on behalf of the electricity sector.

- **Consider Alternative Scenarios** - A realistic combination of demand forecasts and supply resource options should be investigated to understand the possible range of future scenarios that the Ontario electricity sector could evolve instead of the status quo outlook currently presented in OPO 2016. Alternative scenarios will inform stakeholders of the different opportunities and barriers that may exist in the Ontario electricity sector and provide important guidance on key milestones and/or activities that could influence the ability to act on potential future opportunities. Further, common system needs across different scenarios will be a valuable input to stakeholders, such as wind generators, in helping them determine what characteristics new and re-powered generation assets may have to meet given the possible range of future Ontario power system needs.

- **Describe Depth of Analysis** - The OPO 2016 consultation process thus far has not adequately identified the depth of analysis that will be completed by the IESO for the final OPO 2016 report. The IESO should describe the depth and boundaries of analysis that will be considered part of the OPO 2016 stakeholder engagement. For example, it is important to understand how gross demand forecasts were developed and what amount of sensitivity analysis was completed. This information will allow stakeholders and the IESO to focus discussions on the results and risks of the gross demand forecast modelling approach versus providing comments from internal or different stakeholder approaches.

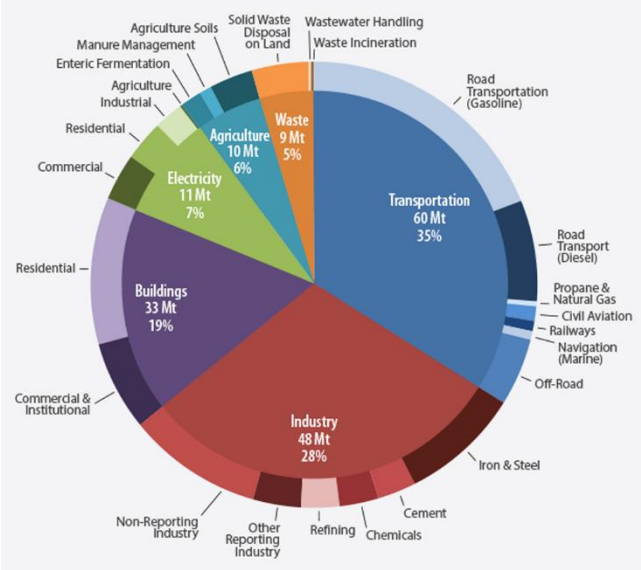
Risks with the OPO 2016 Presented at the SAC

The OPO 2016 presented by the IESO at the March 23 SAC meeting provides, in CanWEA's opinion, a "status quo outlook" for Ontario based on current IESO commitments, government policies, and certain future assumptions (i.e., flat net electricity demand over the next 20 years). Given the importance of the OPO 2016 as the technical planning analysis used in the next LTEP, CanWEA believes that the OPO 2016 should be robust, transparent, and fact-based. The status quo outlook presented at the SAC meeting raises questions and considerations that the IESO should address as part of continued OPO 2016

stakeholder engagement. CanWEA suggests that the following risks and issues be part of the next round of stakeholder engagement for the OPO 2016.

I. Impact of Ontario's Climate Change Strategy

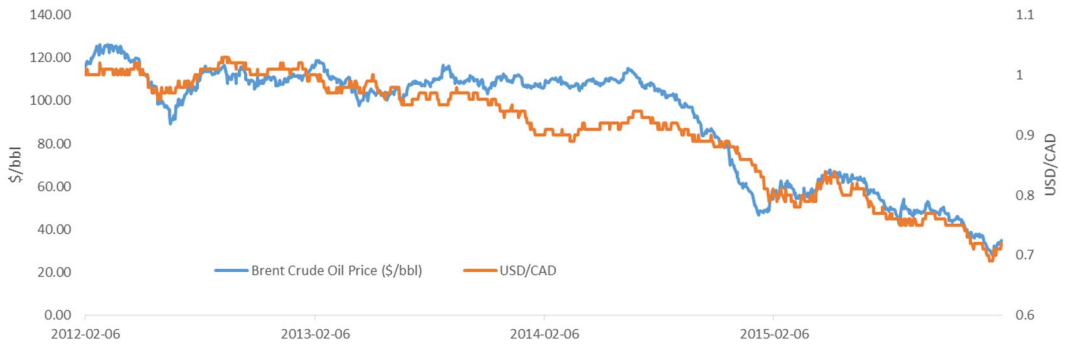
The Government has recently committed to carbon pricing and proposed legislation to adopt a cap-and-trade system in Ontario. The OPO 2016 makes very little reference to cap-and-trade impacts on the Ontario electricity market along with the potential impacts on electricity demand growth. The OPO 2016 should articulate the potential impact of carbon pricing on electricity demand growth and discuss the level of certainty of the current gross demand forecast. Although the electricity sector has been a relatively small contributor to greenhouse gas (GHG) emissions in Ontario, significant uncertainty may lie within the actions of the other economic sectors, specifically buildings and transportation. Therefore, future efforts by those sectors to meet GHG emissions reductions through electrification (e.g., electric vehicles for transportation, heat pumps and high-efficiency electric space heating for buildings, etc.) may have a direct impact on future electricity demand.



Source: Ontario Climate Strategy – 2013 GHG Emissions by sector

II. Changing Economic Factors

Since the end of 2014, the price of oil has decreased significantly along with the Canadian/U.S. exchange rate. Based on historical trends, the Ontario economy could benefit from increased domestic investment resulting from a weaker Canadian dollar (e.g., increased manufacturing investment). However, while it is not clear whether this historic trend may repeat itself during this period of low commodity prices and a weak Canadian dollar, these dynamics should be explored carefully and could prove to have a meaningful effect on electricity demand.



Historic Brent Crude Oil Price and USD/CAD Exchange Rate - Source: SNL Financial and Bank of Canada

III. Conservation and Demand Management Target Achievability

The expectation for conservation and demand management (CDM) over the 20-year planning horizon is to effectively flat line net electricity demand growth. The OPO 2016 lacks details regarding future CDM activities and programs, including the potential efficacy of future codes and standards that are projected to provide contributions to meeting overall CDM targets post 2015. Almost half of the future savings in the long-term come from new programs yet to be planned. It is not clear how the OPO 2016 has considered the continued long-term success of CDM activities/programs, and/or if the IESO has considered the risk of existing and future CDM activities/programs not being cost-effective in meeting future demand growth and other power system needs relative to other resource options (e.g., generation, emerging technologies, etc.).

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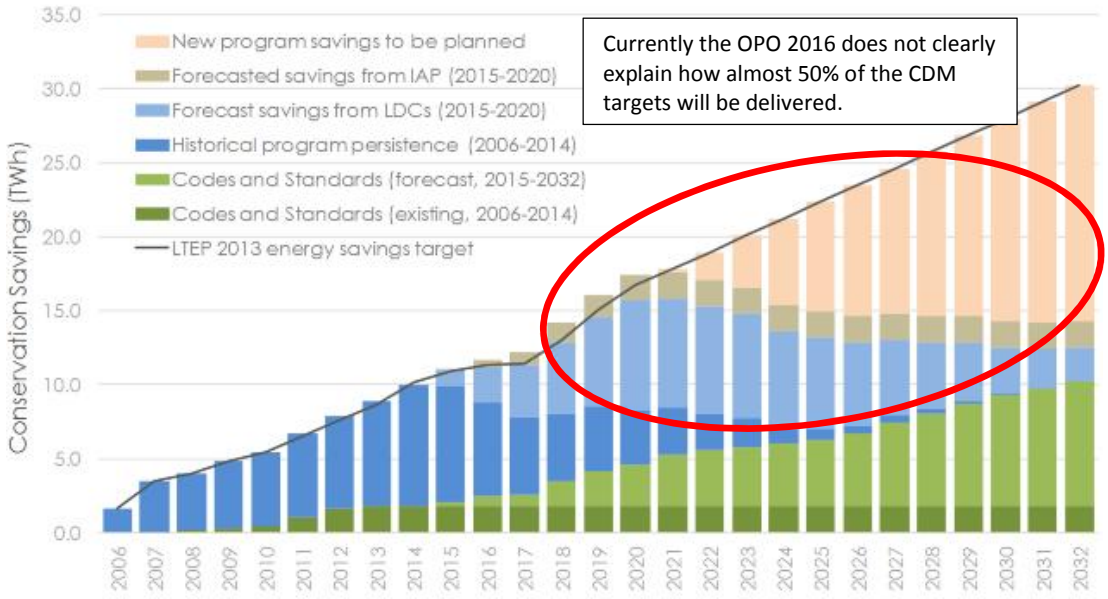

OPO 2016 CDM Plan - Source: IESO

Within a shorter planning horizon, a large percentage of CDM achievements in the OPO 2016 are expected to be delivered by local distribution companies (LDCs). The latest results published by the Ontario Energy Board (OEB)regarding the success (or lack thereof) of LDCs in achieving their respective CDM targets shows that as little as 8% of the LDCs were able to meet their peak demand savings between 2011 and 2014[7]. While LDCs may increase their abilities to achieving their respective CDM targets as they gain more experience over time, it is difficult and problematic for the OPO 2016 to dismiss the need for a planning scenario where CDM activities/programs have difficulty in meeting the current targets and policy objectives.

[7] CDM Report 2011-2014 – OEB - http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/515795/view/

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IV. Complexity Risks of Nuclear Generation Refurbishments

The supply outlook in OPO 2016 is heavily influenced by recent Government announcements regarding retirement and refurbishment plans for applicable nuclear generating units. The generating units at the Pickering generation station (GS), despite not having received the required approvals are reflected within the OPO as scheduled to be retired between 2022 and 2024, and the schedule to refurbish applicable units at both Darlington GS and Bruce GS has been revised from the LTEP 2013 schedule. With over 11 GW of generation to be retired and refurbed, any disruptions to the complex and coordinated schedule for nuclear generation investments are significant risks to Ontario's future supply needs. CanWEA believes there are three key risks associated with nuclear generation that the IESO should investigate in detail in the OPO 2016.

a) **Pickering GS Life Extension Regulatory Approvals** - Pickering GS' operating license from the Canadian Nuclear Safety Commission is currently only valid until 2018 and the funding for life extension will need to be reviewed as part of applicable OEB rate filing by Ontario Power Generation (OPG). In both instances, there is likely regulatory risk that OPG may not be approved to operate Pickering GS to the 2022/2024 timeframe. The impact on supply need from a shorter operating life of Pickering GS should at the very least be discussed in the OPO 2016.

b) **Complex Coordination of Refurbishment Schedule** – The tightly coordinated refurbishment schedule for the generation units at Darlington GS and Bruce GS presented in the OPO 2016 is complex. Between 2020 and 2026 at least two and as many as four nuclear generating units will be off-line for refurbishments at the same time. History has shown that refurbishment of CANDU technology generating units have resulted in cost overruns and delays (e.g., Bruce, Point Lapreau). Cost overruns and delays may also be exacerbated by the limited availability of highly skilled nuclear professionals and tradespeople. These skilled staffing resources will likely be spread thin across refurbishment projects on multiple generating units at Darlington GS and Bruce GS combined with the close to and retirement age of these staffing resources. The OPO 2016 should assess the impact of scheduling delays and determine additional, non-carbon emitting resources that may be required due to additional shortfalls resulting from scheduling issues.

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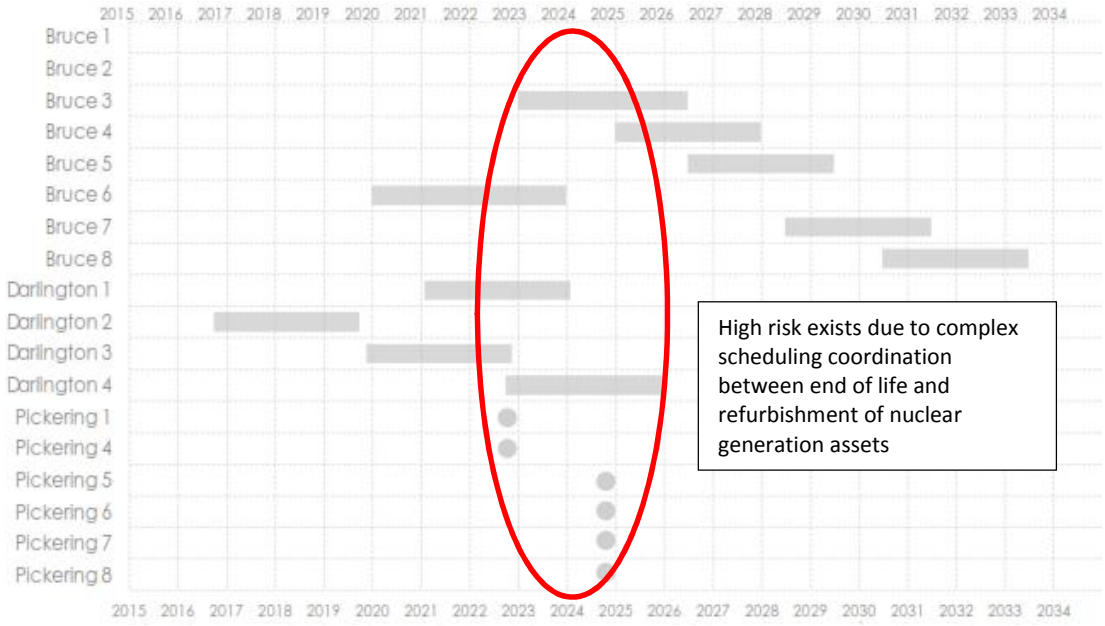

Planned nuclear refurbishment programme – Source: IESO

c) **Framework for Execution of Nuclear Refurbishment Off-Ramps** - Both Darlington GS and Bruce GS have partial commitments from the Ontario Government to complete the refurbishment of all applicable generating units. The Amended and Restated Bruce Power Refurbishment Implementation Agreement includes off-ramp provisions for the termination of the refurbishment of applicable units if costs exceed specific thresholds or if the refurbishment schedule is delayed, including the assessment of alternate supply resources that are determined to be economic. For Darlington GS, the Minister of Energy has only committed to commencing refurbishment of the first unit in 2016 and will subsequently assess each unit before granting commitments to move forward with refurbishment. Therefore, these publically disclosed off-ramps indicate significant uncertainties regarding the efficacy of the planned refurbishments. The OPO 2016 should explore alternate scenarios where applicable off-ramps are exercised and therefore determine alternative supply outlooks under multiple scenarios.

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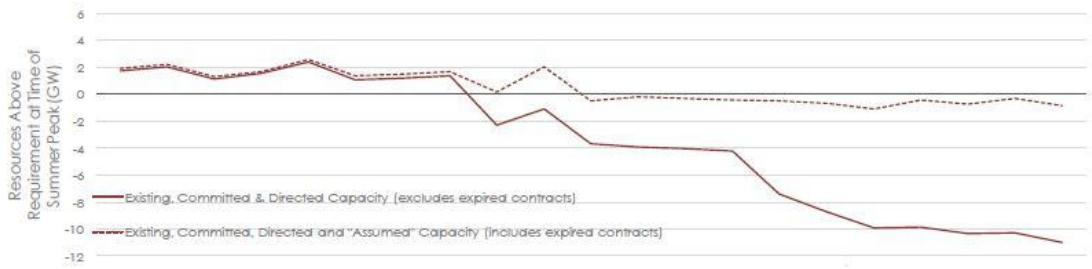
V. Lack of Clarity for Expiring Contracts

By the mid-2020s a large portion of Ontario's existing supply will begin reaching end of life or end of their existing contract terms. The IESO recently published the engagement plan for a Market Renewal Initiative which will work with stakeholders in 2016 to develop a multi-year work plan for market development and reform. Areas where potential market design changes have been identified include: two-schedule pricing; day-ahead market; real-time unit commitment; intertie scheduling; capacity; demand-response capacity auction and portfolio; and, intertie capacity with transactions. The Market Renewal Initiative process and results will influence the opportunities for new and existing resources in Ontario's electricity market, but does include risks.



Ontario Supply Need With and Without Expired Contracts – Source: IESO

If there is a lack of clarity and/or leadership in addressing issues that arise through the Market Renewal Initiative process, existing and new resources may decide to exit the market. If existing resources do not extend operation after contract expiries, the supply gap in Ontario as conveyed in the OPO 2016 will occur earlier and will be more significant over the long-term. Further, it is not certain that existing resources will be the most cost-effective or have the attributes the future Ontario electricity market will need and/or desire, and therefore the IESO may wish to secure new generation resources for the evolving power system needs and/or consumer preferences. The OPO 2016 should recognize the risk related to Market Renewal Initiative and consider planning scenarios where not all generation resources remain in-service after contracts expiration.

Overall, the OPO 2016 should attempt to clearly articulate risks and contingencies regarding Ontario's electricity sector. As drafted, the OPO 2016 may not provide an accurate outlook for Ontario's future

supply needs. Therefore, alternative supply scenarios should be developed and conveyed, so as to provide better information to stakeholders and Government policy makers.

How Wind Generation Can Support the OPO 2016

CanWEA agrees with the IESO's assessment that Ontario's electricity sector is entering a period of significant uncertainty. A large portion of the existing supply resources are reaching end of life/end of contract terms while over the same period electricity demand expectations will be influenced by new climate change initiatives. Wind generation is a valuable resource that can mitigate risks associated with the uncertainty facing Ontario.

CanWEA believes there are significant risks to the status quo outlook presented in the OPO 2016. The primary risk to the timing of supply need in the OPO 2016 is the capability of life-extension of Pickering GS to 2022/2024. Wind generation can be a cost-effective resource and risk mitigation option should Pickering GS life extension suffer any setbacks. Continued investment in wind generation resources can also mitigate risks associated with nuclear refurbishment delays or cost overruns at Darlington GS and Bruce GS. As the operation of wind generation assets evolve in the Ontario electricity system, reassessments are required to ensure the expected contributions are adequately determined. Recently, the IESO published results for capacity contribution during summer peak and wind generation in Ontario was able to significantly surpass the capacity contribution expectations from LTEP 2013.

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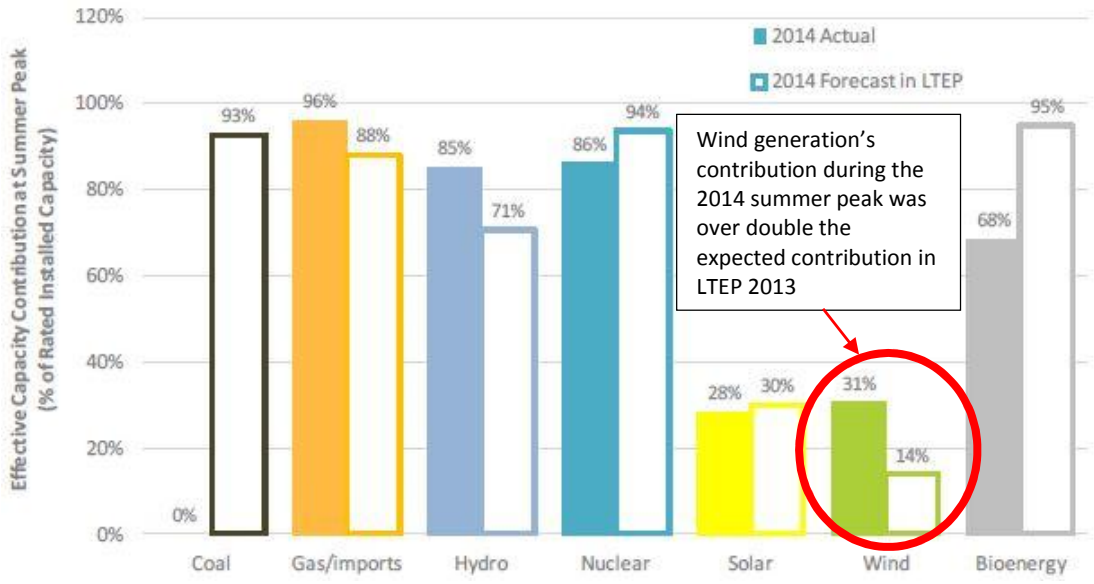

LTEP: Comparison of 2014 Forecast vs. 2014 Actual Results – Source: IESO

The OPO 2016 describes a supply need in the mid-2020s but could go further in articulating the characteristics of that supply need along with presenting other power system shortfalls (i.e., dispatchability, ramping capability, regional system needs, firm capacity versus energy, etc.). The flexibility offered by wind generation partnerships with other technologies can be tailored to specific issues facing the Ontario electricity system, while providing clean energy. The OPO 2016 should be open to innovative solutions and not be restricted by current system constraints. For example, transmission system constraints may limit the amount of generation that can connect at certain locations in the province. Transmission developed in partnership with wind generation (and in some cases other resources) can bypass the current transmission system constraints and deliver energy where it is needed most in the power system.

As a cost-effective renewable resource, wind generation can support Ontario in meeting its GHG emission reduction targets. In particular, the OPO 2016 expects the utilization (i.e., intensity of use) of gas-fired generation in Ontario to increase over the next 20 years primarily due to nuclear refurbishment. Increased utilization of gas-fired generation leads to higher GHG emissions. Wind generation could be an

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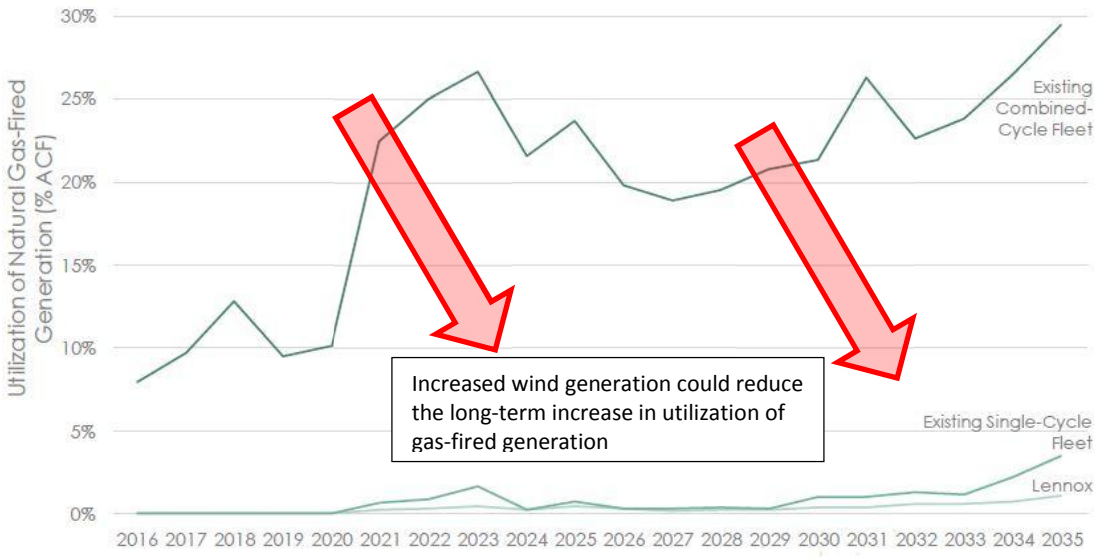
optimal hedge against growing GHG emissions from increased use of existing gas-fired generation resources in Ontario.



Gas-fired Generation Utilization Forecast – Source: IESO

Finally, the long-term supply need in Ontario is influenced by what happens to existing contracts at the end of their contract terms. Almost 5 GW of wind generation contracts are expected to expire between 2025 and 2035. The removal of these wind generation resources from service will increase the long-term supply gap described in the OPO 2016. Re-powering these wind generation resources will reduce the supply gap needed in the long-term and could also allow an opportunity to change the characteristics of the wind generation assets to fit with the specific needs of the electricity market in the future. The IESO has discussed many different market reform options to address future supply needs. With operating wind generation supply resources under contract for the first part of the OPO 2016 planning horizon, there is time available for the IESO and industry to work on establishing what market reforms should be adopted in Ontario. The market reforms adopted must provide certainty on the value threshold existing resources will need to achieve to provide certainty for asset owners to consider continued operation after the expiry

of the existing contract. The OPO 2016 should discuss a framework engagement on repowering existing assets and outline milestones for action based on stakeholder feedback.

Summary

Ontario's electricity sector is entering a period of significant uncertainty. Complex decisions are required to coordinate investments in existing and new supply resources. These difficult supply decisions are compounded by uncertainty from external forces, mainly the unknown impact of climate change initiatives at multiple levels of Government. These external forces are outside the control of planners and policy makers. The OPO 2016 provides an important forum to discuss the risks and alternatives to Ontario's electricity sector that should be considered in a technical assessment that will ultimately inform the next LTEP.

There are a growing number of benefits that wind generation can offer to address electricity system needs and meet Government policy objectives. As wind generation technology evolves, the LCOE of wind generation projects is expected to continue to decrease. Wind generation is able to participate as a dispatchable market participant in the Ontario real-time electricity market, which provides additional flexibility to the IESO as the system operator. Wind generation is a flexible resource that can partner with a variety of different technologies to meet a wide range of future system needs while producing clean energy.

The OPO 2016 presented by the IESO to the SAC on March 23, 2016, provides an adequate initial outlook for Ontario. As the primary technical planning document, the OPO 2016 must be rigorous and transparent in assessing the risks and determining possible outcomes from different decisions. CanWEA believes that further stakeholder engagement is required beyond the SAC process to assess the impact of planning risks such as climate change initiatives, CDM achievability, nuclear refurbishment coordination and repowering of generation assets at end of their contract terms.

To ensure further consultation is effective the IESO should share data related to the OPO 2016 assumptions and conclusion. Stakeholder engagement should consider the impact of climate change initiatives that have not been studied in detail in the OPO 2016 thus far. Alternative planning scenarios should be considered to understand the impact of certain risks with the baseline plan presented currently

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in the OPO 2016. The IESO should establish a framework for the depth of analysis to focus the discussion with stakeholders.

Wind generation can be a valuable resource for the Ontario electricity system. Increased investment in wind generation can help Ontario meet its climate change goals by reducing the possible increase in utilization of existing gas-fired generation. The complex nuclear refurbishment at Darlington GS and Bruce GS along with Pickering GS end of life extension to 2022/2024 involve a significant amount of uncertainty. Wind generation, alone or in partnership with other technologies, can provide a flexible alternative to address uncertainty in the current OPO 2016 plan. Finally, the IESO should begin to discuss in the OPO 2016 how best to approach the generation assets that will reach end of life/contract term in the next decade. Re-powering of existing wind generation resources can be a cost-effective option in the future. With the possible adoption of market reforms which would change the approach to contracting or securing resources in the future, the IESO should ensure that the time between today and the first round of contract expiry is utilized proactively.

CanWEA thanks the IESO for the opportunity to provide our comments as part of the OPO 2016 SAC engagement process and we look forward to additional engagement on this topic. If there are any questions on the contents of this submission, please do not hesitate to contact me directly.

Sincerely,

Brandy Giannetta
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CanWEA
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cc:
Bruce Campbell
Terry Young
Andrew Pietrewicz
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