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Independent Electricity System Operator
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Via email to **engagement@ieso.ca**

BACKGROUND

TC Energy is pleased at the opportunity to provide feedback to the Independent Electricity System Operator (IESO) on the Resource Adequacy engagement.[1] TC Energy commends the IESO for launching the engagement and outlining the complex challenges facing the Ontario electricity sector. As the IESO is aware, TC Energy is proposing to construct a large-scale Pumped Storage Generation project in Meaford, Ontario ("Meaford Project" or "Meaford PSG"). The Meaford Project is designed for up to 1,000 megawatts (MW) for pumping and providing 1,000 MW of capacity for eight hours – or up to 8,000 MWh of energy storage per cycle. It will be designed as a fast-start facility, capable of operating over a range of outputs – helping to reduce energy, operating reserve (OR), ancillary and capacity costs for Ontario ratepayers. The Meaford Project is expected to provide a net benefit of billions of dollars to Ontario ratepayers over a 40-year period.[2]

Our feedback to the Resource Adequacy engagement is informed, in part, by the development and operational requirements for the Meaford Project. More specifically, the Meaford Project will have four 250 MW turbines providing pumping or generation, capable of responding in less than five minutes to start in either pump or generation dispatch. It will also be able to start and stop multiple times per hour with no restrictions on switching from pumping to generating. As currently designed, once online, it will be able to fully ramp within 40 seconds, with no dead-bands.

We can observe from other jurisdictions that assets that have longer lives than market reference technologies are difficult to procure and even maintain in deregulated capacity markets (for example, hydroelectric, pumped storage and nuclear assets, which have longer lives than capacity market net CONE technologies which tend to be combustion turbines). This is not a contentious viewpoint, and the IESO has stated that capacity auctions are not expected to underpin new large hydro or nuclear assets. Long-life assets face unique risks in Energy and Capacity markets.

Value of Pumped Storage Generation

PSG facilities can provide many services to the Ontario electricity system. The Meaford project can shift low cost energy from off-peak hours to on-peak hours. Ontario's unique issue with surplus baseload generation, for example, will be partially addressed by the Meaford Project by the time-shifting of energy from times of excess supply to times of need, reducing the waste of spilled low-cost energy. A primary objective of the resource adequacy engagement is to secure capacity for peak demand hours, capacity the Meaford project can offer. The electricity grid is a dynamic system that must maintain balance between supply and demand consistently through both normal operating conditions and abnormal conditions. The Meaford project can offer ancillary services, such

[1] **http://www.ieso.ca/en/Sector-Participants/Engagement-Initiatives/Engagements/Resource-Adequacy-Engagement**
[2] See the most recent Navigant report. Note that these figures may be subject to change based on updated designs of the project: **https://www.tcenergy.com/siteassets/pdfs/power/pumped-storage-project/tc-energy-value-of-pumped-storage-project-report.pdf**

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as operating reserve, regulation and inertia, to support the IESO in maintaining the reliability and stability of the power system.

Pumped storage is recognized as an enabler of renewable and nuclear generation. As such, the Meaford project can provide environmental and societal benefits broadly to Ontario. For example, the Meaford project can support the integration of more renewable and new nuclear generation (such as Small Modular Reactors) leading to lower greenhouse gas emissions through a lower dispatch of thermal generation for energy and ramp. In the long run, fuel switching (e.g., space heating in buildings and electrification in transportation) will require an increase in non-emitting resources to meet demand. With an operating life of 40 to 50 years or longer, the Meaford project can be a core foundation for the IESO and Ontario to meet the challenges of shifting to a low carbon economy over the long term.

TC Energy commissioned a study by Guidehouse (formerly Navigant) that estimated net ratepayer benefits could be $12.1 billion over the 40-year project life.[3] To show the robustness of the conclusions, Guidehouse tested the assumptions over a range of future scenarios of the Ontario electricity system, which showed the net ratepayer benefits could range from $7.8 billion to $30 billion.

Pumped Storage Generation in Similar Wholesale Markets to Ontario

PSG facilities currently operate in wholesale electricity markets across North America and globally. Most notably, in wholesale markets with similar load profiles, geography and installed capacity figures as Ontario – New York and New England – large scale PSG facilities have been in operation for decades and are fully integrated in those regions' respective wholesale markets. The New England wholesale market (overseen by the system operator ISO-NE) currently has three PSG facilities with an installed capacity of more than 1,700 MW – with the two large-scale facilities, Northfield and Bear Swamp, having installed capacities of 1,100 MW and 600 MW, respectively.[4] The New York wholesale market (overseen by the system operator NYISO) has more than 1,400 MW of installed PSG – with the Blenheim-Gilboa PSG having an installed capacity of more than 1,130 MW and the smaller-scale Lewiston PSG having an installed capacity of 240 MW. Ontario currently has one smaller-scale installed PSG facility at the Sir Adam Beck generating complex with an installed capacity of 174 MW.

PSG facilities are viewed as key assets in both the ISO-NE and NYISO markets. The ISO-NE has publicly supported the U.S. Federal Energy Regulatory Commission (FERC) relicensing application[5] for the Bear Swamp facility, noting that it "provides the region with power at times of high energy demand" while also providing a "reliable supply of electricity when supply and production is otherwise limited."[6] In the Blenheim relicensing decision, FERC staff noted "the project's power and contribution to the region's diversified generation mix will help meet need for power in the region".[7]

It should be noted that PSG resources in New York and New England were built under different market structures – vertically integrated utilities as opposed to competitive wholesale markets. While these resources remain competitive in a market-based environment, that was not the basis for which they were built. The proposed approached to Resource Adequacy by the IESO would provide a path to develop PSG in Ontario for the benefit of Ontario ratepayers. Given Ontario's large fleet of variable resources, PSG facilities, particularly the Meaford Project, can likely provide a similar or greater value to the IESO in maintaining reliability and increasing the overall economic efficiency and utilization of the grid through the time-shifting of energy. Notably, the Meaford Project

[3] **https://www.tcenergy.com/siteassets/pdfs/power/pumped-storage-project/tc-energy-value-of-pumped-storage-project-report.pdf**
[4] New England is also home to a much smaller PGS facility (less than 30 MW).
[5] See FERC Docket P-2669-085 – Bear Swamp Relicensing Application (2014)
[6] See the December 16, 2019 letter from ISO-NE letter to FERC: **https://www.iso-ne.com/static-assets/documents/2019/12/ltr_in_support_of_bear_swamp_relicensing.pdf**
[7] See the April 30, 2019 order issued by FERC: Docket P-2685-029 (Accession No: 20190430-3097)

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will time-shift energy from low-value hours of surplus baseload generation (SBG) to high-value peak demand hours. In Ontario, variable renewable generation has benefitted from direct policy-driven support, and legacy hydro, nuclear and pumped storage have benefited from rate regulation and / or long-term contracts. New long-life assets will require long-term commercial underpinnings.

FEEDBACK FOR RESOURCE ADEQUACY ENGAGEMENT

Feedback from TC Energy is organized under two general categories. The first is enhancements to the power system planning process to support the Resource Adequacy undertakings and to inform interested parties of the investment opportunity. The second is consideration for a procurement design to meet resource adequacy needs. At the end of this submission TC Energy responds to the questions raised by the IESO during the Resource Adequacy webinar.

ENHANCED POWER SYSTEM PLANNING PROCESS

Over the past few years, the IESO has taken a number of steps to evolve the power system planning process to meet the challenges facing Ontario's electricity sector as well as broader policy goals (e.g., climate change). As the IESO moves forward with a new approach to meeting resource adequacy needs, the power system planning process must continue to be enhanced for many reasons.

Increase Transparency

To support the development of new resources to meet Ontario's resource adequacy needs in addition to other power system requirements, investors must have confidence in the system need to deploy capital required to prepare projects. As the power system planner for the Ontario electricity market, the IESO must continue to increase transparency in the planning process. Transparency provides two key foundations for resource development. First, stakeholders can gain a clear understanding of the drivers for system need that underpin the value of their potential investment. Second, transparency can allow stakeholders to vet and test conclusions of power system planning studies to determine the robustness of power system needs. For example, the future is inherently uncertain and predicting electricity demand that drives the need for new supply can be volatile. Providing information, assumptions, and methodology for stakeholders to test different hypotheses and future outcomes will help convince investors to begin development of projects. A key added benefit of transparency in the planning process is offering stakeholders the ability to identify any errors and omissions that can be addressed by the IESO for the benefit of the entire sector.

To assist stakeholders in understanding system needs and to provide adequate information for vetting power system planning conclusions, the IESO should include various scenarios. Scenarios should reflect different views of what the future could hold compared to a base case view (e.g., low carbon, fast technology adoption, etc.). At the same time, the IESO should perform sensitivity analysis on the base analysis to demonstrate how widely the outcomes could oscillate and what inputs have the largest impact on system need outcomes.

Expanding the Scope of Power System Planning

Through the evolution of the planning process, the IESO has stated that the analysis undertaken will expand to include a wider scope of power system needs. For example, the IESO has indicated they will investigate operability, zonal adequacy, and ancillary services through the Annual Planning Outlook over time (see figure below).

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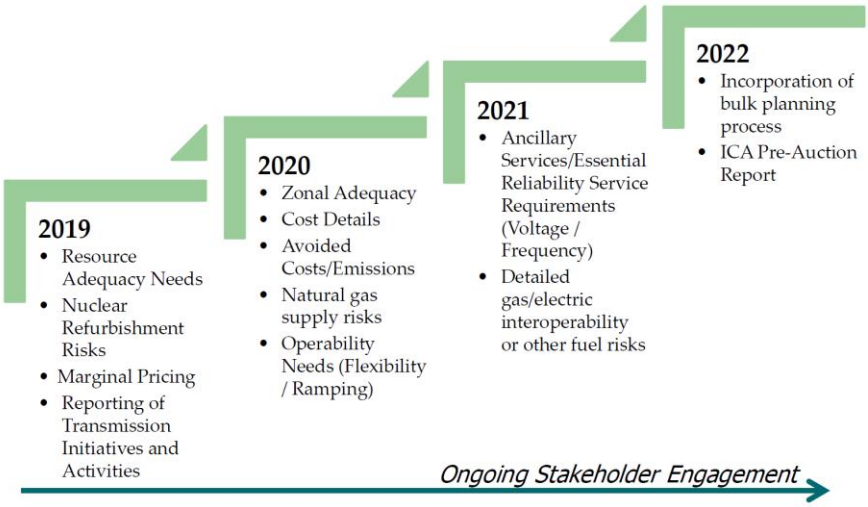

Figure 1: Enhancing Long Term Planning Processes and Products - IESO -Jan 2019

TC Energy supports expanding the planning process scope and believes it is critical to include market and non-market services in the resource adequacy assessment. Climate change policy is changing the supply mix to include more variable renewable energy resources (e.g., wind and solar). At the same time, emerging technologies such as electric vehicles and smart appliances are rapidly changing the demand patterns observed in the past. Overall, balancing supply with demand is becoming more difficult and is leading to a shift in value of different electricity services to the Ontario power system. The planning process should assess the potential shifts and provide detailed information on the needs of the future system to inform stakeholders. For example, operability issues are expected to grow with more variable renewable energy resources in the supply mix.

Governance Structure

Planning the electricity system is complex and involves many different viewpoints from diverse stakeholders. There are many pitfalls that can hinder the planning process from delivering its core objective of determining system need and acting in the best interest of Ontario ratepayers. History in Ontario demonstrates the risks to planning processes that do not have a robust governance and engagement process (e.g., IPSP 1.0, IPSP 2.0). To avoid future pitfalls, the IESO should enhance the planning process, stakeholder engagement and governance structure. The process should have clear deliverables and timelines for planning analysis and the IESO should be motivated to deliver analysis and conclusions on time. Stakeholders should be given the opportunity to present alternative viewpoints so that the IESO can incorporate knowledge and preferences from across the electricity sector and public at large. The alternative viewpoints should be presented in an open engagement session where the IESO facilitates discussion between stakeholders about benefits and drawbacks. In addition, the IESO should consider a quasi-adjudication process to allow stakeholders to vet planning assumptions, inputs, methodology and conclusions in a formal setting. To avoid unwanted delays or wasted resources, the quasi-adjudication process should clearly define the obligations and responsibilities for stakeholders and the IESO. There should be defined timelines that extract optimal value for the effort of all involved. For example, length of submissions from stakeholders could be reasonably restricted and/or stakeholder speaking time shared fairly between different groups. Stakeholders should be encouraged to collaborate prior to engaging with the IESO to minimize repetitive questions. The benefit of a quasi-adjudication process for key power system planning conclusions is to bring to bear a very robust and transparent vetting and review of key assumptions, surfacing a broader range of knowledge and viewpoints, incorporating where warranted novel or emerging insights from stakeholders, eliminating any

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incidental errors or omissions, all of which will foster buy-in and support from stakeholders on the power system planning conclusions.

PROCUREMENT DESIGN CONSIDERATIONS

The Resource Adequacy engagement has proposed a procurement process to meet mid- and long-term Ontario power system needs. TC Energy supports the use of a procurement process, especially to support long-life resources that can provide multiple value streams to Ontario's electricity grid. Similar to the reasoning for considering resource adequacy options beyond the capacity auction, the procurement processes the IESO adopts should be flexible and adaptive to different system needs and changing future conditions.

Bundled Value Assessment

Future resource adequacy procurements should perform a full value assessment of proposed resources to determine the lowest overall costs for ratepayers. Full value assessments consider all the services a resource could provide against the total cost of the resource. This will ensure that the IESO is not procuring multiple resources to meet multiple needs when a mixture of different resources could provide the same suite of services at a lower cost. Effectively, we are advocating a process that allows for finding global optimum solutions for multiple services rather than locking in a process designed to find a series of local optimum solutions for individual services that may collectively provide less value. This is especially important given that most technologies have the ability to provide more than one service.

The full value assessment should also consider different future scenarios and sensitivity of the power system planning conclusions. To reduce the risk to ratepayers from long-term service agreements, the Resource Adequacy procurement should reflect the benefits and costs of resources under different future scenarios. For example, a project may be the lowest cost option under one future scenario but be prohibitively expensive under a reasonable alternative scenario. Projects that can adapt and provide value under different scenarios should be prioritized in the Resource Adequacy procurement.

The IESO should study matching lowest-cost long-life assets that provide multiple value streams to fundamental long-term base level resource adequacy needs (under conservative assumptions) to procure resources over the long term that have the highest certainty of use during that period. Once long-term gaps are satisfied, shorter-duration needs could be sourced via capacity markets. One analogy that reflects this view would be a trucking company that buys vehicles for its base-level demand because that offers the lowest total cost of ownership and uses short-term leases or subcontracting to fill surge demand the duration of which is uncertain. The shorter-term trucks cost more per day but can be returned when no longer needed. The optimal mix is neither all long-term nor all short-term. In this example, the most efficient entry and exit (short-term) is associated with higher unitary cost.

Out-of-Market Value

A core issue of Ontario's resource adequacy concerns is the barriers to new resource development from Ontario's unique hybrid market situation. Almost all the supply resources in Ontario are either rate-regulated (i.e., Ontario Power Generation assets), or are under long-term contract with the IESO. Partially as a result, Ontario's wholesale electricity price (i.e., Hourly Ontario Energy Price) does not reflect the total cost of supply resources. This creates a barrier to entry for new supply resources and logically requires out-of-market support. TC Energy believes a key objective of the Resource Adequacy engagement is addressing this barrier to entry and appropriately designing out-of-market support for new resources procured to meet system needs.

Alignment of Timelines

Securing new resources to meet Ontario's resource adequacy needs takes time. Development requires ample planning to determine appropriate location, technology type, and initiating community engagement. Projects must

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undergo detailed analysis to determine the social and environmental impacts. Economic analysis is reviewed and updated as new details and design features of the project are determined. Formal development activities such as seeking permits and requesting government approvals must be initiated with the appropriate lead times available for government agencies to complete their review, stakeholders to provide their feedback, and community members to vet the project. In many cases, government approval processes are not initiated until a clear system need is determined and attributes desired in potential solutions described to assist in project design. With all approvals and permits in place, projects can begin construction and major equipment procurement. Finally, commissioning and energization can occur. All these activities take time, and many activities are not initiated until certain components are in place. Deployment of capital cannot commence without appropriate financial backing either through a contract or regulatory support for the investment. The IESO resource adequacy process must assess the required timelines to develop new resources and back-date procurement stages from those timelines. For example, new generation projects can spend 12 to 18 months preparing to participate in a procurement process and a further 36 to 48 months developing and constructing the resource. Certain types of resources take longer to develop. Roughly, this could mean that the IESO may need to indicate to the market that new resources are required and initiate a procurement process 5 or more years prior to a system need.

Eligibility

Providing resource adequacy to the Ontario electricity system is a critical service. As part of providing the service, entities proposing solutions to the IESO should be capable of demonstrating the ability to develop, construct and operate the resource over the life of the service agreement, and potentially beyond depending on the procurement attributes. The IESO will need to balance between competing objectives in the Resource Adequacy procurement. On one hand, the IESO should be open to novel and innovative technologies that could meet Ontario's power system needs. This is especially true for large scale deployment of proven technologies in other jurisdictions that could be applied in Ontario. On the other hand, the IESO should ensure that the technology has a proven track record or that the provisions of the procurement provide adequate protection for the IESO. The entity offering the resource should have the technical and financial capability to deliver the project on-time and operate the facility for the life of the project. Ensuring the resource procurement can accept a wide range of resources while maintain appropriate eligibility requirements will be a core component of success for future resource adequacy procurements.

Procurement Options

Selecting a one-size-fits-all procurement process for different resources and system needs may not be possible. The IESO has recognized this difficulty and is a key reason for the Resource Adequacy engagement. The IESO has concluded that short-term system needs for a manageable amount of capacity can be addressed by the voluntary auction process (i.e., the Capacity Auction). For longer term resource needs, procurement processes deployed by the IESO must be capable of assessing the multiple value streams new resources may be able to offer. Traditional requests for proposals with weighted evaluation criteria may be appropriate.

In some select cases, where it is very clear over the long-term that a resource can provide significant benefits to the Ontario electricity system, the IESO may need to consider a specialized procurement process with limited participation options or undertake a sole source negotiation. In the event of a sole source negotiation or narrow competition, it is even more important than usual for decisions to be made with public transparency, and that cost-benefit analyses are made public and verified by independent third parties, such that stakeholders can have confidence that the public good is being served and that the integrity of the decision-making process is protected. One way to assure full transparency in this situation would be a full public adjudicated process.

Given the potential over a long-term contract that the risks are not adequately balanced between the parties, the IESO should consider options to procure resources that will become rate-regulated by the Ontario Energy Board.

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The IESO already performs this function for long life assets such as bulk transmission investments. Resource development and operation under regulatory oversight would provide a regulated rate of return to the project developer and appropriate oversight for ratepayers throughout the life of the resource.

Aligning Procurement Process and Service Agreements

For each procurement process, an associated service agreement will be offered to successful proponents. The procurement process and service agreement should be aligned in their objectives for the IESO at the time of the procurement and provide clear and fair allocation of risks between the parties. For example, in exchange for price certainty from the IESO it is reasonable that resource developers would need to absorb the burden of construction and operating risks.

The duration of the service agreement should be adjusted to align with the system need or with the potential benefits a resource could offer the service. The IESO should ensure there is flexibility in the contract provisions to allow different service arrangements to be considered. For example, providing the option for various term lengths and payment arrangement could offer unique benefits to Ontario.

RESPONSE TO IESO QUESTIONS FOR STAKEHOLDERS

In addition to the submission above, TC Energy has provided high-level answers to the questions posed by the IESO below.

- *Question 1: Are there other principles that should be considered throughout this discussion?*
    - The IESO has used the principles put forward in the Resource Adequacy engagement for the past few years to guide development of the Market Renewal Program. In general, TC Energy supports the principles and believe they are appropriate for the Resource Adequacy engagement. TC Energy does caution the IESO that maintaining a balance between the different principles is important and one principle should not be prioritized over others for convenience in addressing short-term decision making.

- *Question 2: Do these three capacity acquisition timeframes (commitment and forward periods) provide sufficient options for meeting the needs of your resource type?*
    - A long-term commitment period will be required for long-life capital-intensive new builds.

- *Question 3: Which option(s) are most suited to your resource type?*
    - With an operating life expected to be 40 years+, the long-term timeframe is best suited for the Meaford Project.

- *Question 4: Based on timing when various mechanisms are going to be available, do you see timing gaps when a resource needs a mechanism before that mechanism is ready?*
    - The IESO resource adequacy process must assess the required timelines to develop new resources and back-date procurement stages from those timelines. For example, new generation projects can spend 12 to 18 months preparing to participate in a procurement process and a further 36 to 48 months developing and constructing the resource. Certain types of resources and in particular emission-free resources such as large hydro, pumped hydro or nuclear, take longer to develop. Roughly, this could mean that the IESO may need to indicate to the market

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that new resources are required and initiate a procurement process 5 or more years prior to a system need, depending on the resource mix the IESO plans to induce to participate. It was not clear from the presentation on September 28 (as per the "Timeline to 2028" slide) if mechanisms for resources with 5+ year forward period would be available in time to allow such resources to compete to fill the 2028/29 capacity need. Given the advantages to allowing the widest range of resources to compete on a bundled value assessment basis, it would be suboptimal from a ratepayer value perspective to prevent 5+ year forward period asset types from competing for the 2028/29 capacity need.

- *Question 5: What else needs to be considered in discussions on the high-level framework?*
  - The submission provided above outlines the high-level framework the IESO should consider for Resource Adequacy.

- *Question 6: What needs to be considered in future engagement phases to develop the details of the mechanisms in the framework?*
  - As mentioned, more detailed planning information is required to clearly establish the needs of the power system. The IESO should describe potential procurement options that are under consideration along with associated service agreement provisions.

- *Question 7: What other areas need to be discussed with stakeholders to operationalize the framework?*
  - In conclusion, the IESO has made an excellent start with the Resource Adequacy Stakeholder Engagement. Our principal suggestions to build on this are:
    - Increase transparency to continue building support
    - Consider a quasi-adjudicative process for Resource Adequacy to ensure a robust foundation in terms of assumptions and processes, and help developers pursue projects with confidence
    - Ensure mechanisms are in place to allow 5+ year forward period resource types to compete for the 2028/29 capacity need
    - Look to assess value on a bundled-services basis to determine the lowest overall costs for ratepayers
    - When procuring new-build assets, provide long-term commitments to long-life assets which are determined on a bundled-services basis to provide good ratepayer value
    - In the event of a sole source negotiation or narrow competition (whether under the auspices of Resource Adequacy or under a Government-directed process), it is even more important than usual for decisions to be made with public transparency, and that cost-benefit analyses are made public and verified by independent third parties, such that stakeholders can have confidence that the public good is being served.

Sincerely,
Charles Conrad
Manager, Corporate Evaluations