CONTEXT

- The Pathways to Decarbonization Report (P2D) has provided context as to how Ontario can protect its already low emitting electricity sector while identifying the actions required to leverage our clean grid to achieve deeper, economy-wide emissions reductions. With incentives to electrify greater segments of the economy such as transportation, industry and housing, load growth is expected to grow significantly over the planning period.
- A concerning number of Ontario's critical assets are reaching end-of-life as early as 2026, further exacerbating the scarcity of both current and future resources. Though the deficiency is expected to initially fall under 5 GW, it is forecasted to reach nearly 20 GW by the end of the 2030s. This imminent shortfall marks an urgent need to acquire significantly more energy capacity which simultaneously decarbonizes the provincial energy grid to meet net-zero targets. To overcome this urgent challenge, the IESO has forecasted the need for nearly 70 GW of new and/or repowered non-emitting assets.
- As markets around the world are discovering, the decarbonization of our electricity grid to support broader economy-wide emissions reductions will require the adoption of new, longer duration tools that can replace the function that fossil fuels currently fulfill in the market. Increasingly, markets across North America are adopting storage targets, and some are adopting long duration storage targets specifically, in order to support system reliability through the energy transition.
- Ontario has launched a series of procurements targeting storage. However, the procurement design taken to date at the IESO limits the fulsome participation of certain technologies, as the one-size-fits-all approach they have chosen does not, in fact, fit the broad range of technologies available. Providing additional options on critical design features such as development timelines, contract and revenue structure, and contract term, for example, could help facilitate more diverse participation of technologies to meet Ontario's needs. Procuring energy storage and renewable generation assets will be crucial in accelerating decarbonization efforts in Ontario. For its part, Malta is actively advancing early-stage development activities for projects that will utilize the Malta Pumped Heat Long Duration Energy Storage technology (Malta LDES) to meet system needs in the upcoming procurements. To this end, Malta and Ontario Power Generation (OPG) have signed a Memorandum of Understanding (MOU) to ensure the technology is considered for application within Ontario.
- It is also important to consider the domestic and international policy environment. Major advancements in Europe and North America, such as the U.S. Inflation Reduction Act, are driving massive investments in wind, solar, and energy storage projects across the world. To compete in this active, global market as a relatively small jurisdiction, Ontario needs to establish clear, firm policy objectives, combined with investment-friendly inducement mechanisms while lowering the province's risk profile for investment.
- As a leading LDES company, Malta appreciates the opportunity to help guide the province of Ontario on decarbonizing its energy grid, while simultaneously expanding its capacity to keep up with future demand. We believe that such guidance can also help Ontario be proactive in developing the proper supply chain infrastructure to positioning itself as an attractive hub for renewable energy investment.

ERO POSTING QUESTIONS

1. **The IESO's Pathways Study recommends streamlining regulatory, approval and permitting processes, citing that it can take five to 10 years to site new clean generation and transmission infrastructure.**

   What are your thoughts on the appropriate regulatory requirements to achieve accelerated infrastructure buildout? Do you have specific ideas on how to streamline these processes?

   The permitting process for Malta LDES is comparable to that of a small-scale thermal power plant. The environmental impact is very small as Malta LDES is not expected to generate hazardous waste and does not have emissions like that of a gas plant. The system also does not pose the high fire hazard associated with lithium-ion batteries. To date, four CSP plants with molten salt storage have been permitted in North America, which use the same molten salt as the Malta LDES system and utilize the same nitrates as used for agricultural fertilizers. In addition, every North American CSP project has undergone a public environmental permitting process and created public acceptance of this technology. We do not expect any permitting risks for the Malta LDES molten salt storage system with turbomachinery heat pumps. For projects such as this with a minimal impact, Ontario should ensure expedited timelines and simplified approvals.[1]

2. **The IESO's Pathways Study recommends beginning planning and siting for new resources like new long-lived energy storage (e.g., pump storage), nuclear generation and waterpower facilities.**

   What are your expectations for early engagement and public or Indigenous consultations regarding the planning and siting of new generation and storage facilities?

   Malta would like to note the following points on this topic:

   - Malta's LDES does not have the long lead times of the other technologies mentioned in this category, and therefore it is important for the IESO to understand this distinction. When an LDES target is set, it must be understood that projects like Malta's would have shorter development timelines than others and therefore can provide that advantage and flexibility of earlier in-service potential.
   - With respect to LDES, it is important to recognize that there are several technologies in this category, and not all technologies have geographic limitations for siting capability. A Malta facility is site agnostic, and a Malta facility can be located at a brownfield site with the ability to utilize the interconnection and provide jobs to the local transitioning workforce. Therefore, giving due consideration to the specific technologies within the LDES category can ensure that the full value of deploying LDES resources is understood and realized.
   - Technologies that can provide multiple clean energy benefits—in addition to electricity system benefits—should be considered for their full value. For example, Malta's technology, which provides the obvious electricity storage benefits, also produces a discharge heat product that can be used for industrial processes and district heating. While electricity storage and clean heat span multiple industries, the aggregated benefit of both products from the Malta system can

[1] In New Brunswick, for example, it was determined by the Department of Environment and Local Government (NBDELG) that a Malta facility did not require an Environmental Impact Assessment. Further context can be provided on this if requested.

ultimately be realized by the province and stakeholders/communities. This is a highly important consideration for the planning and siting of new LDES facilities. This added benefit to the province should be given consideration when evaluating any decarbonization scenario.

- Due to the uncertainties surrounding the P2D forecasts around 15 GW of imported Blue Hydrogen and the longevity of fossil fuel generation due to Federal Standards and ESG priorities, we recommend that the IESO set a target for LDES and provide a procurement pathway for such projects.

3. **The IESO's Pathways Study shows that natural gas-fired generation will need to continue to play an important role in the system for reliability in the short to medium term. The IESO's assessment shows that most of the projected Ontario demand in 2035 can be met with the build out of non-emitting sources, but some natural gas will still be required to address local needs and provide the services necessary to operate the system reliably.**

   Do you believe additional investment in clean energy resources should be made in the short term to reduce the energy production of natural gas plants, even if this will increase costs to the electricity system and ratepayers?

   What are your expectations for the total cost of energy to customers (i.e., electricity and other fuels) because of electrification and fuel switching?

   As an alternative to natural gas, the IESO should give strong consideration to LDES projects that provide the duration of service that would be required from a reliability perspective. This will ensure the province is realizing the full benefits of both the Federal Investment Tax Credit for clean technology and the ability to involve the Canada Infrastructure Bank. Procuring new natural gas projects would limit the ability to realize the benefits of these funding mechanisms while they are available and create the risk of stranded investments. To help procure alternatives to natural gas, the IESO should specify the attributes and capabilities of the few natural gas resources identified as being needed and retained to address local reliability.

   Experience with renewable generation and other clean energy resources in other jurisdictions suggests additional investments in clean energy resources in the near-term are required to lower costs of electricity for the system and ratepayers. Additional renewable generation investments would also provide the zero-carbon charging energy needed for LDES systems to decarbonize the electric grid and support grid reliability. With federal government carbon pricing expected to increase to $170/tonne by 2030, LDES projects that can reduce the amount of energy from gas-fired generation are critical to maintaining a cost-effective energy system.

4. **The IESO's Pathways Study highlights emerging investment needs in new electricity infrastructure due to increasing electricity demand over the outlook of the study. The IESO pathway assessment illustrates a system designed to meet projected demand peaks almost three times the size of today by 2050, at an estimated capital cost of $375 billion to $425 billion, in addition to the current system and committed procurements. Please see supporting materials for illustrative charts on capacity factor and cost by resource type.**

   Are you concerned with potential cost impacts associated with the investments needed? Do you have any specific ideas on how to reduce costs of new clean electricity infrastructure?

Ontario should consider the following to ensure costs of new clean energy infrastructure are reasonable and just for consumers:

- It is important that Ontario and the IESO continue to focus on diversity of the resource mix to ensure that the portfolio is not focused in the extreme to one particular technology or fuel source. Concentration of the resource portfolio to one particular technology or fuel source creates the risk of price/market shocks (*e.g.*, natural gas price spikes, rising lithium carbonate prices) and limits optionality to pursue different "futures."
- For peaking needs, Ontario should include LDES as a realistic and valuable option in a more meaningful way than what was included in the P2D report. It is recommended that the assumption for blue hydrogen be adjusted downward to ensure the IESO has considered the value of LDES to its full extent.
- With respect to LDES, it is important to recognize that there are several technologies in this category, and not all technologies have geographic limitations for siting capability. A Malta facility is site agnostic, and Malta facility can be located at a brownfield site with the ability to utilize the interconnection and provide jobs to the transitioning workforce. Therefore, giving due consideration to the specific technologies within the LDES category can ensure that the full value of deploying LDES resources is understood and realized.
- Technologies that can provide multiple clean energy benefits—in addition to electricity system benefits—should be considered as per their full value. For example, Malta's technology, which provides the obvious electricity storage benefits, also produces a discharge heat product that can be used for industrial processes and district heating. While electricity storage and clean heat span multiple industries, the aggregated benefit of both products from the Malta system can ultimately be realized by the province, and this added benefit to consumers should be given consideration when evaluating any pathway to decarbonization scenario.

5. **The IESO's Pathways Study recommends that for a zero-emissions grid by 2050, investment and innovation in hydrogen (or other low-carbon fuels) capacity could be required to replace the flexibility that natural gas currently provides the electricity system.**

   Do you have any comments or concerns regarding the development and adoption of hydrogen or other low-carbon fuels for use in electricity generation? What are your thoughts on balancing the need for investments in these emerging technologies and potential cost increases for electricity consumers?

   It is recommended that the assumption for blue hydrogen that was used in P2D be adjusted downward, including a sensitivity all the way to 0 GW of hydrogen in the future, to ensure that the risk and uncertainty around the viability of the fuel source and its transportation have been duly considered in future resource mix scenarios.

6. **The IESO's Pathways Study recommends greater investment in new non-emitting supply, including energy efficiency programs.**

   Following the end of the current 2021-2024 energy efficiency framework how could energy efficiency programs be enhanced to help meet electricity system needs and how should this

programming be targeted to better address changing system needs as Ontario's demand forecast and electrification levels grow?

No comment.

7. **The IESO's Pathways Study includes a scenario for over 650 MW of new large hydroelectric capacity to meet system needs in 2050.**

   A recently released assessment estimates that there may be potential to develop 3,000 to 4,000 megawatts of new hydroelectric generation capacity in northern Ontario and 1,000 megawatts in southern Ontario.

   What are your thoughts on the potential for development of new hydroelectric generation in Ontario by private-, Indigenous- and government-owned developers?

   While the capital costs for hydroelectric generation may be higher than nuclear, wind, solar, and natural gas, do you support investing in large scale hydroelectric assets that may operate for over a hundred years?

   No comment.

8. **The IESO's Pathways Study suggest that significant transmission capacity will be needed to help balance intermittent sources of electricity (e.g., wind and solar) and to ensure cost-effective supply can be delivered to meet growing demands from electrification and economic growth. Transmission will also be required to balance intermittent supply with dispatchable supply (such as natural gas and energy storage) and meet demand in regions with retiring assets.**

   What steps should be taken to ensure that transmission corridors can be preserved, and lines can be built as quickly and cost effectively as possible?

   When considering transmission investments, it must be noted that the Malta LDES technology brings transmission benefits. It can allow operators the flexibility to unload or transfer loads to ride through peak events; and, because of this, on a broader scale, it is possible that it will help long-term planners in avoiding recommendations for costly transmission projects, deferring transmission investments, and/or serving as a bridge to long lead-time transmission approvals, permitting, and buildout.

9. **Do you have any additional feedback on the IESO's "no-regret" recommendations?**

   The Malta system is a dispatchable capacity resource for the Ontario system. It is an infrastructure-scale, molten-salt energy storage technology that uses machinery (e.g., heat exchangers, turbomachinery, pumps, etc.), workforces (e.g., thermal plant operators, power plant engineers, maintenance technicians, etc.), and skillsets substantially similar to those used by the fossil energy power generation and oil and gas sectors (i.e., construction, operation, and maintenance), making the clean energy transition more practical for customers and workforces alike. The components and materials are readily and cost-effectively available from reliable, conflict-free supply chains, and the

entire system can be recycled or repurposed at the end of its life avoiding environmental concerns and recycling challenges. With respect to system reliability, Ontario should note the following:

- Malta LDES provides rotating inertia to the grid during both modes, charging and generation. This is important considering that this service is typically provided by traditional baseload and fossil-fired plants, and Ontario will have less of these facilities as it continues with retirements and carbon neutral solutions.
- As mentioned, the system can load follow in both charge and discharge modes to match rates of excess grid capacity during charge, or electricity demand during generation. In addition, the turndown capacity is similar to that of fossil-fueled gas turbines.
- The system has short start-up and shut-down times, as well as short switching time from charge to discharge.
- A Malta system can provide ancillary services including frequency response, reactive power, voltage management and operating reserves including spin and non-spin.

In addition, Ontario should note that Malta LDES projects offer the following key features:

- No dependency on rare earth materials.
- No thermal runaway.
- Small plant footprint.
- Attractive round-trip efficiency for LDES, option to increase with beneficial use for waste heat.
- No storage degradation over time, low fire risk, no toxic materials.
- Utilizes mature components/equipment.
- Long project life.
- Full recyclability of all major components.

Unlike other types of LDES, the construction of a Malta facility is an infrastructure-scale project. It is built on-site, like a hospital, not in a factory, like a battery. As a result, construction requires large amounts of locally-sourced workforces, materials, and equipment (e.g., electricians, welders, masons, concrete, steel, building materials, etc.). An independent analysis of a 10-hour, 100-MW Malta system performed in 2021 (prior to inflationary pressures) determined that each Malta LDES project of this size will generate approximately $2.0 billion of economic activity. Construction requires approximately $91 million of locally-sourced materials, creates $31 million in wages, generates an additional $52 million of economic activity, and results in $9 million of local taxes. Operation and maintenance over a conservative 30-year lifespan would generate $66 million in wages and $110 million of additional economic activity. While these numbers would be different today, the overall message is that a Malta LDES project will provide significant benefits to local goods and services providers and the local tax base.