NORTHLAND POWER

Thorold Peaking Project

Presentation to Thorold City Council

September 19, 2023

Presentation Learning Objectives

- Electricity system requirements and the role of natural gas.
- Thorold Peaking Project important information.
- Northland's Renewable Natural Gas strategy and the value of conventional natural gas displacement.

Why the Thorold Peaking Project?

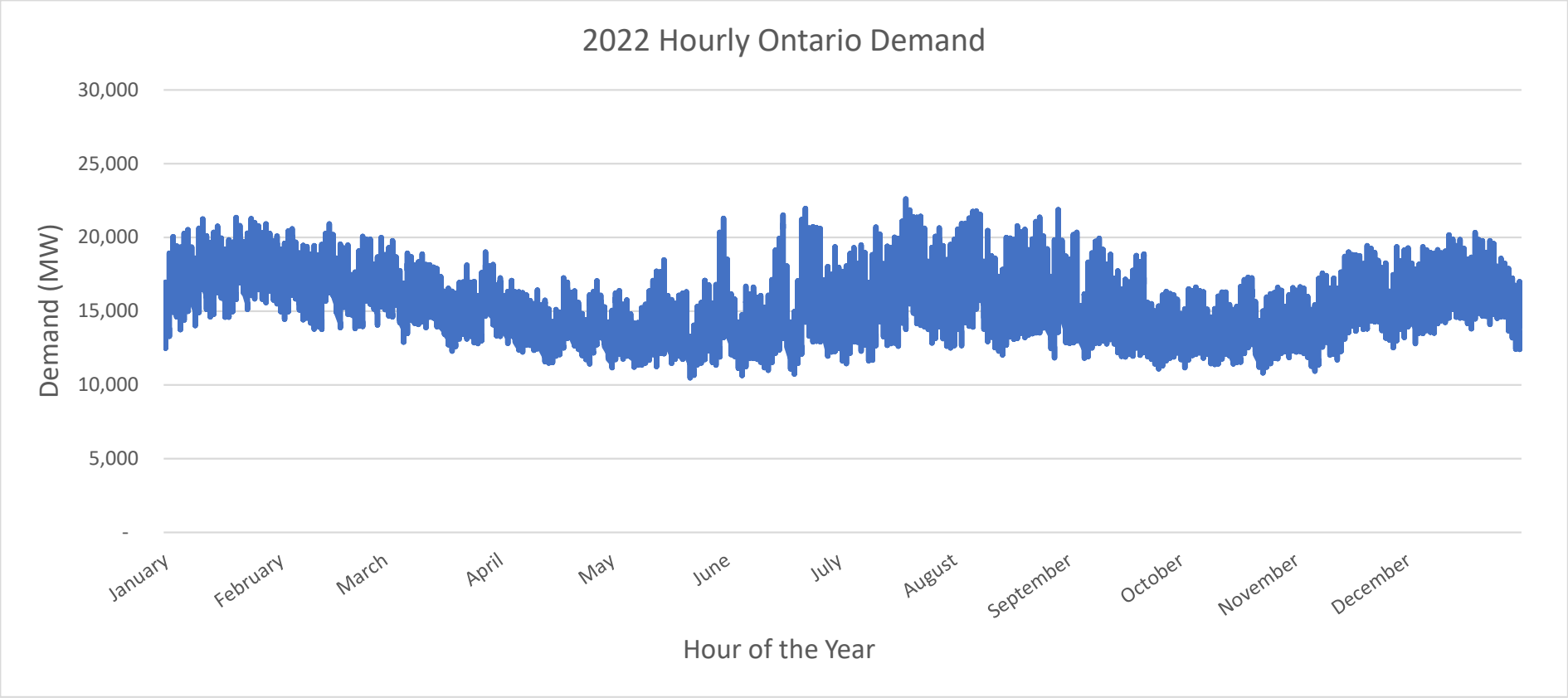
- Northland prides itself on its renewables portfolio and its Environmental Social Governance policy and ambitions, but we are also a responsible member of the Ontario energy sector, supporting a reliable, sustainable and cost-effective electricity system.

- The decision to initiate the Project was not taken lightly, and received corporate approval for three reasons:
  1. the call is for capacity, with the expectation that the Project will produce little energy and emissions;
  2. the Thorold site makes sense given opportunities to leverage existing infrastructure, lowering ratepayer costs, and to continue to work with and build relationships with the City, community and rightsholders; and
  3. the prospect of using a low carbon fuel to displace or lower emissions.

- Northland is also answering the call on the storage side of the IESO's procurement, with plans to submit multiple energy storage projects, and with intentions to participate in future renewable energy procurements.

Ontario Demand

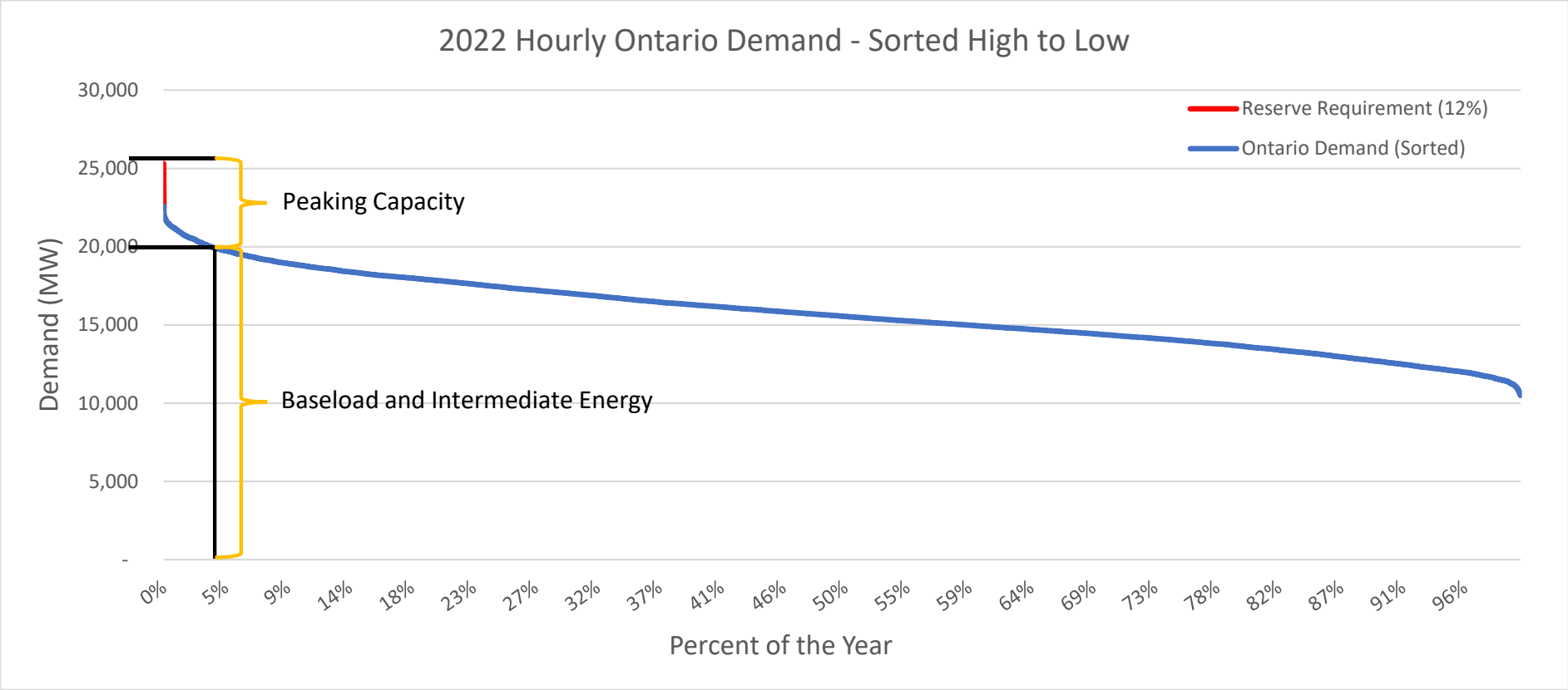
- Ontario supply and demand must be matched second-to-second, and to do so in a cost-effective, reliable and sustainable manner, the electricity system requires careful planning and the procurement of a diverse resource mix to meet a suite of operational needs.



- [IESO - Ontario Zonal Demand]

Capacity and Energy Requirements

- The LT1 procurements are for capacity, flexible resources that will be called on to meet the highest demand hours, back-up the supply-demand balance if there are swift changes, and for emergencies. IESO has said the LT2 procurements will be for energy.



- IESO - 2021 Annual Planning Outlook

The Role of Natural Gas – Technology Comparison

- Natural gas can be used in several technological configurations, each with unique cost and performance characteristics, determining why a configuration is selected and what role it will have in an electricity system.
  - The Thorold Peaking Project is a simple cycle, while the existing Thorold facility is a combined cycle.

Attribute	Combined Cycle	Simple Cycle
Costs	High Capital/Low Variable	Low Capital/High Variable
Start Time	1.33 hours to 4.50 hours (Load to Base)	0.22 hours (Load to Base)
Ramp Rate	2 MW/Min (Synch. to MLP)	15 MW/Min (Synch. to MLP)
Heat Rate	7.500 GJ/MWh	10.400 GJ/MWh
Intended Utilization	Baseload/Inter. Energy (>5%)	Peaking Capacity (1% to 5%)
2023 Utilization Example	Thorold CCGT ~55%	Kirkland Lake Peaker <1%

The Role of Natural Gas – Provincial and Federal Alignment

Ontario

- "To maintain electricity system reliability, the IESO recommends that Ontario procure approximately 2,500 MW of storage, contributions from other non-emitting resources such as hybrids and biofuel, and up to 1,500 MW of additional natural gas generation… Natural gas provides Ontario's electricity system with flexibility, reliability and security as other non-emitting forms of electricity supply are developed."
- Resource Eligibility Interim Report

Canada

- "As natural gas currently plays a critical role in the electricity sector by providing fast-response power, exploration of the continued operation of natural gas assets in special circumstances may be needed. This includes providing flexibility to essential uses of natural gas, such as for emergency events, back-up power to complement variable renewables, and potentially supplying power during seasonal peaks of demand."
- Clean Electricity Standard Discussion Paper

The Clean Electricity Regulations – Preserving Flexibility

Exceptions to 30 t/GWh performance standard:

- Limited use and emissions: 450 hours/year (5.1% of the year) and 150,000 tonne of CO2e/year
- Emergency circumstances

Rationale

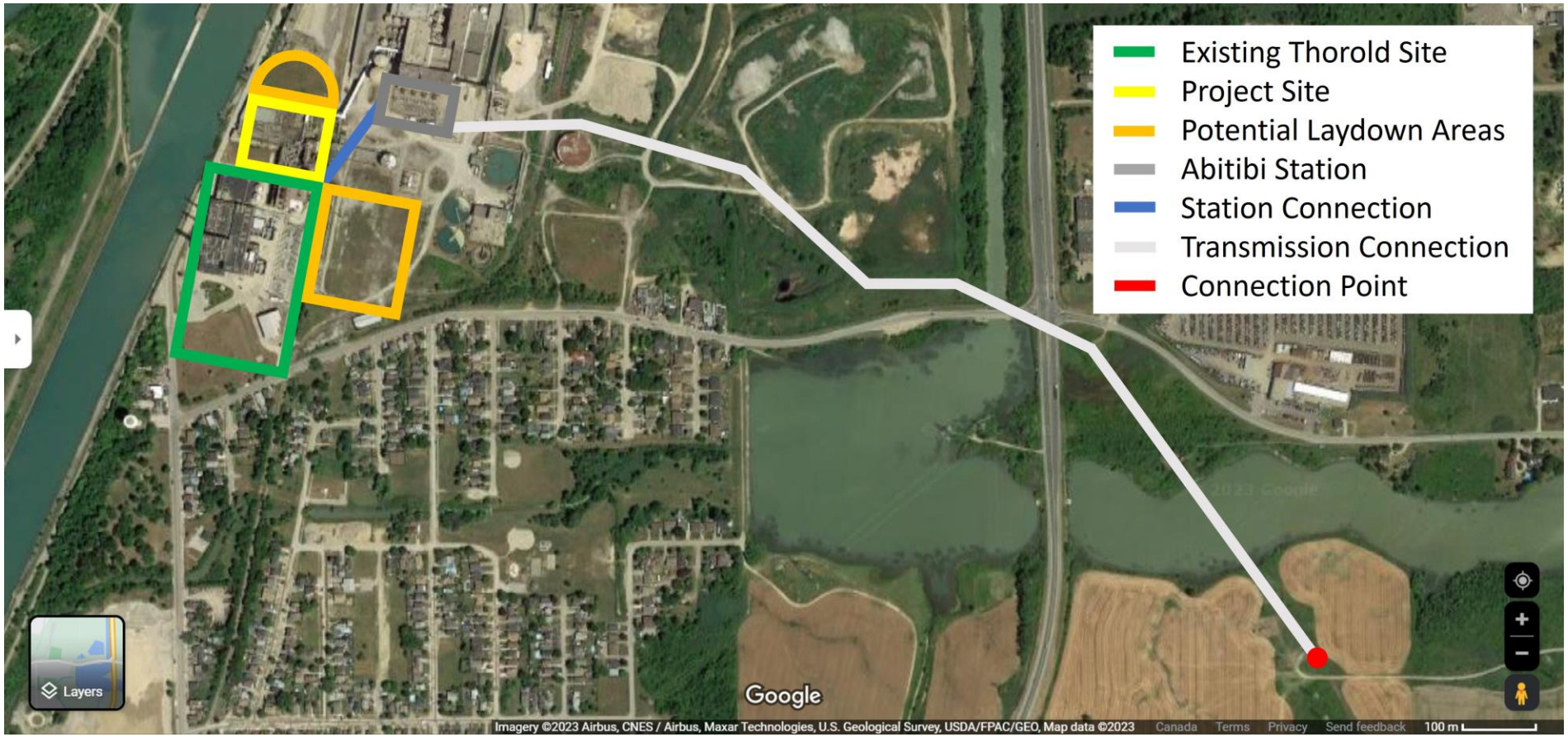
- "Allows units, which are still capable of generating electricity, an emissions constrained role of adding value to the electricity system. For units which require this flexibility, the unit during periods of high demand or in which non-emitting sources are not available. In doing so, the flexibility reduces compliance costs and provides options for reserve power, thus helping to avoid reliability issues and upward pressures on affordability."
- "Allows for greater reliability of the electricity system, with benefits to improved quality of life and safety of Canadians. Additionally, this flexibility reduces costs, as it could allow units that would otherwise not be available in emergency circumstances to provide value in emergencies."
- Draft Clean Electricity Regulations

Key Project Information

- Project Website: https://www.thoroldpeakingproject.com
- Name: Thorold Peaking Project
- Nameplate Capacity: 198 MW ± 7%
- Technology: General Electric 7FA.04 combustion turbine
- Fuel: Natural gas displaced with Renewable Natural Gas (RNG)
- Proponent: Northland Power Inc.
- Contact Information: Web Form – https://www.thoroldpeakingproject.com/contact
  Email – thoroldpeakingproject@northlandpower.com
  Mail – 90 Allanburg Road
  Thorold, Ontario, Canada, L2V 3Y7

Key Project Information – Project Map

- The Thorold Peaking Project will be adjacent to the existing Thorold Combined Cycle Facility, utilizing the same transmission corridor and connection point.



Website Content – Stay Up-to-Date

- Project Benefits
  - Continued employment of staff and contractors to 2040 and up to 200 construction opportunities.
  - Local generation capable of serving over 100,000 homes at peak, as well as provincial and regional grids.
  - RNG industry stimulus, potential for local emissions reductions and continued tax revenue to the City.

- Engagement Activities and Opportunities
  - Recordings of presentations to Thorold City Council and Niagara Region
  - Meeting Minutes from the In-Person and Virtual Community Meetings
  - Interview with NewsTalk 610 CKTB to respond to claims from 50by30 Niagara

- Project Documents
  - Community and Indigenous Engagement Plan
  - Labour Study
  - RNG Brief
  - Project Q&A

Assessments and Permits (1/2)

- Federal
  - Initial Project Description (IAAC)
  - Environmental Assessment and Determination (CEAA)
  - Pollution Prevention Plan (CEPA)

- Provincial
  - Environmental Impact Assessment (MECP)
  - Brownfield Record of Site Conditions (MECP)
  - On-Site Excess Soil Management (MECP)
  - Stormwater Management Plan (MECP)
  - Sewage Works ECA (MECP)
  - Air and Noise ECA (MECP)
  - Oversize/Overweight Permit (MTO)

Assessments and Permits (2/2)

- Regional
  - Wetlands, Shorelines and Watercourse (NPCA)
  - Oversized/Overweighted Load Permit (NR)

- City
  - Pre-Application Consultation Planning Meeting Form (P&DSD)
  - Application for the Approval of Site Plan Agreement (P&DSD)
  - Building Permit/Application for a Permit to Construct or Demolish (P&DSD)
  - Temporary Noise Permit (BD)

- Sector
  - System Impact Assessment (IESO)
  - Customer/Connection Impact Assessment (HONI)
  - Generator Licence (OEB)

Greenhouse Gases vs. Air Pollutants

- It's important to understand how different emissions impact the globe and its inhabitants, where the emissions come from and what steps can be taken to mitigate their effects.

Characteristic	GHG Emissions	Air Pollutants
Main Compounds	CO_2, CH_4, N_2O, HFCs	CO, NO_x, SO_x, VOCs, $PM_{2.5}$
Direct Effects	Climate Change	Smog/Health
Impact Time	Months/Years	Immediate/Days
Impact Area	Global	Local/Regional

- MECP - Air Quality Ontario; US EPA - GHG versus Smog

Compound	Electricity	Road Transport	Leading Source	Ontario Total (2021)
CO_2e GHGs	2.6%	25.8%	Transportation	150,562 kt
CO	0.7%	31.2%	Transportation	981 kt
NO_x	2.7%	22.5%	Transportation	189 kt
SO_x	0.3%	0.2%	Ore and Minerals	96 kt
VOC	0.2%	5.7%	Paints and Solvents	288 kt
$PM_{2.5}$	0.1%	0.8%	Construction Operations	172 kt

- Canada's GHG Inventory; Canada's Air Pollutant Inventory

Project Emissions

- Under the expected utilization of 1% to 5%, the Project will emit CO_2 equivalent emissions between 10,000 and 50,000 tonnes per year.

- In response to corporate, community and rightsholders concerns over emissions, the Project Team developed a Renewable Natural Gas (RNG) strategy that will prevent incremental carbon from entering the atmosphere (more on this strategy on the following slide).
  - Without this strategy, charging vehicles directly from the Project would emit at a rate of 9.62 kg of CO_2 equivalent per 100 km, but still 44% less than vehicles operating on gasoline.

- As part of facility design, the Project will be fitted with a Dry Low NO_x combustion system to limit both CO and NO_x air pollutants to 60% below the regulatory limit of 25 ppm.
  - Regulatory compliance is stringent, requiring a Continuous Emissions Monitoring system and access to data for audit.

- IESO - Natural Gas Phase Out Study

Displacing Natural Gas with RNG

- RNG is a carbon-neutral fuel that reduces greenhouse gas emissions, by capturing otherwise released methane from decaying organic feedstocks, and adding utility to its combustion.
  - RNG is carbon-neutral because the amount of carbon absorbed during feedstock growth and then released into the atmosphere during feedstock decay is constant and cyclic. Alternatively, fossil fuels introduce new carbon into the atmosphere from underground, which is not returned after combustion unless captured and stored.

- To be carbon-neutral, Northland will purchase and inject RNG into Enbridge's distribution network at volumes identical to, or greater than, the amount of conventional natural gas consumed by the Thorold Peaking Project.
  - Northland, working with Tidal Energy, will prioritise RNG purchases from the Thorold/Niagara area.

- The premise is that a consumer that injects RNG into a natural gas distribution network need not be the one to combust those exact RNG molecules, nor combust those molecules at the same time they are injected, to have the same environmental impact. The important point is to displace conventional natural gas from underground, and avoid the incremental emissions and costs associated with RNG transport to a facility for direct combustion.

Appendix

Northland Overview

- A leading global power producer at the forefront of the global energy transition, with over 35 years of success developing, constructing and operating power projects across a range of technologies, and a strong environmental and health & safety record.

- Significant depth of management experience across disciplines, including renewable power project development, project finance, construction and operations.

- Well-diversified portfolio of high-quality power infrastructure assets, including 1.9 GW of renewable and 0.7 GW of thermal operating capacity, with most revenues under long-term contracts with highly creditworthy government counterparties.

- Significant development opportunities across multiple markets and technologies with a 20 GW development pipeline to support growth.

Planning/Operating Reserve and Other System Services

- North American Electric Reliability Corporation (NERC)/Northeast Power Coordinating Council (NPCC)
  - Planning Reserve Criteria = 0.1 days per year loss of load expectation (LOLE)

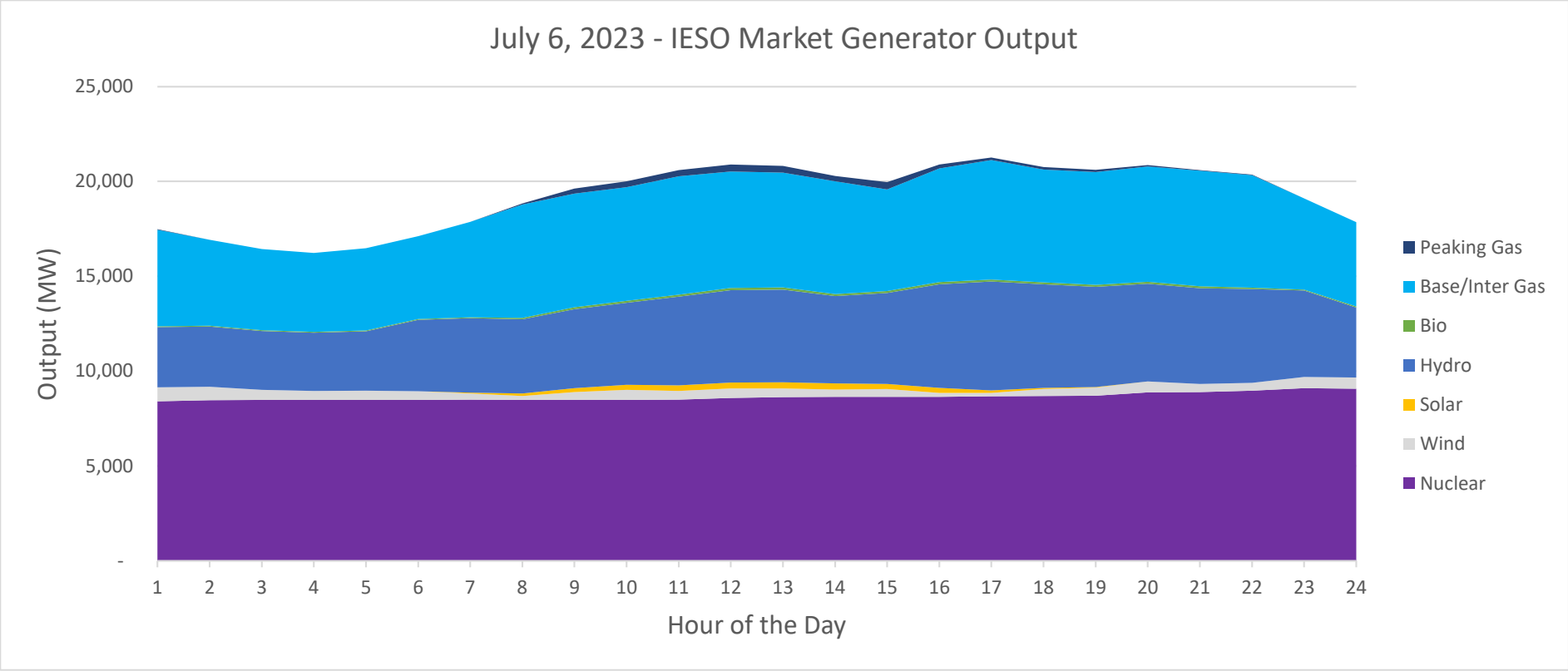
- Operating Reserve
  - 10-minute spin and non-spin
  - 30-minute non-spin

- Ancillary Services
  - Certified Black Start
  - Frequency Regulation
  - Reactive Support and Voltage Control

- IESO - Markets and Related Programs

Resource Mix Contributions

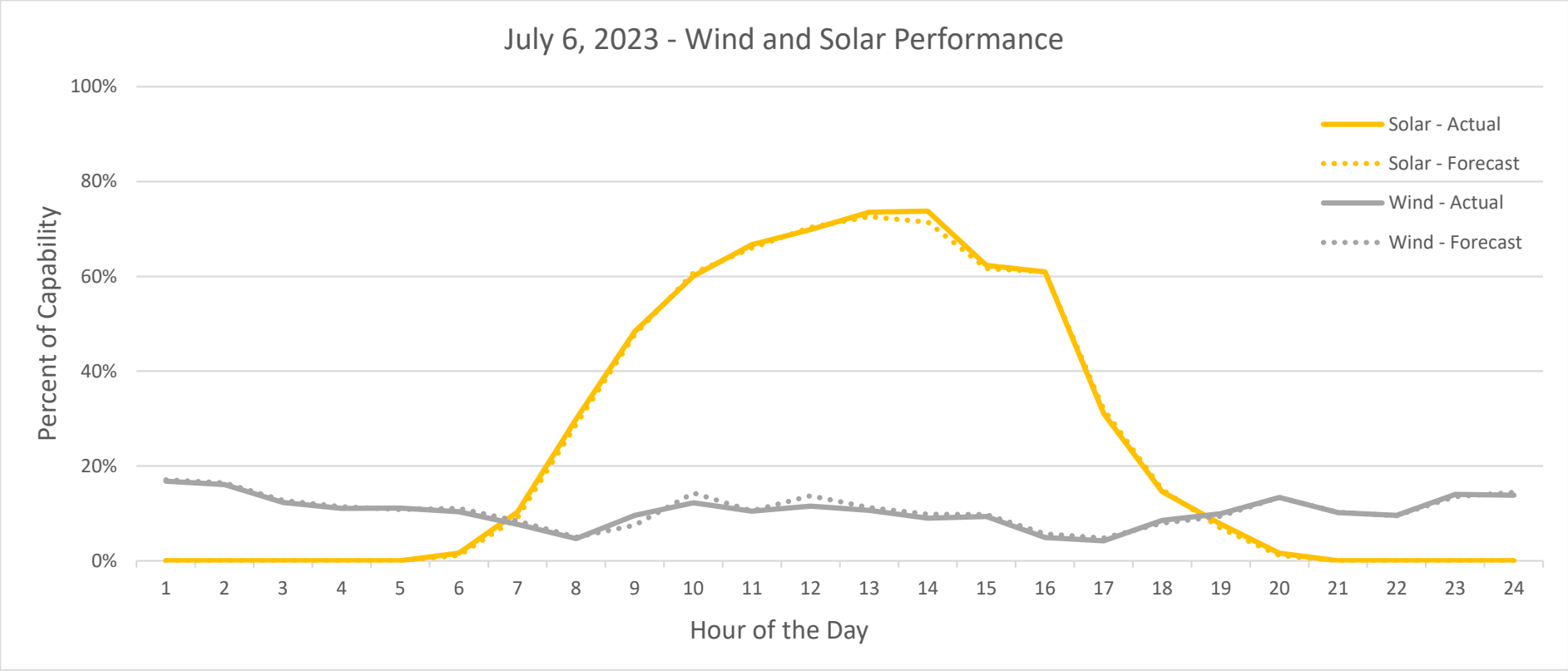
- Every resource has its place, and the electricity system needs to be planned for resource capabilities and limitations. Below are the resource contributions to the IESO-controlled grid on the day of Northland's In-Person Community Meeting.



- [IESO - July 6, 2023, Generator Output and Capability Report]

The Role of Wind and Solar – Energy Producers

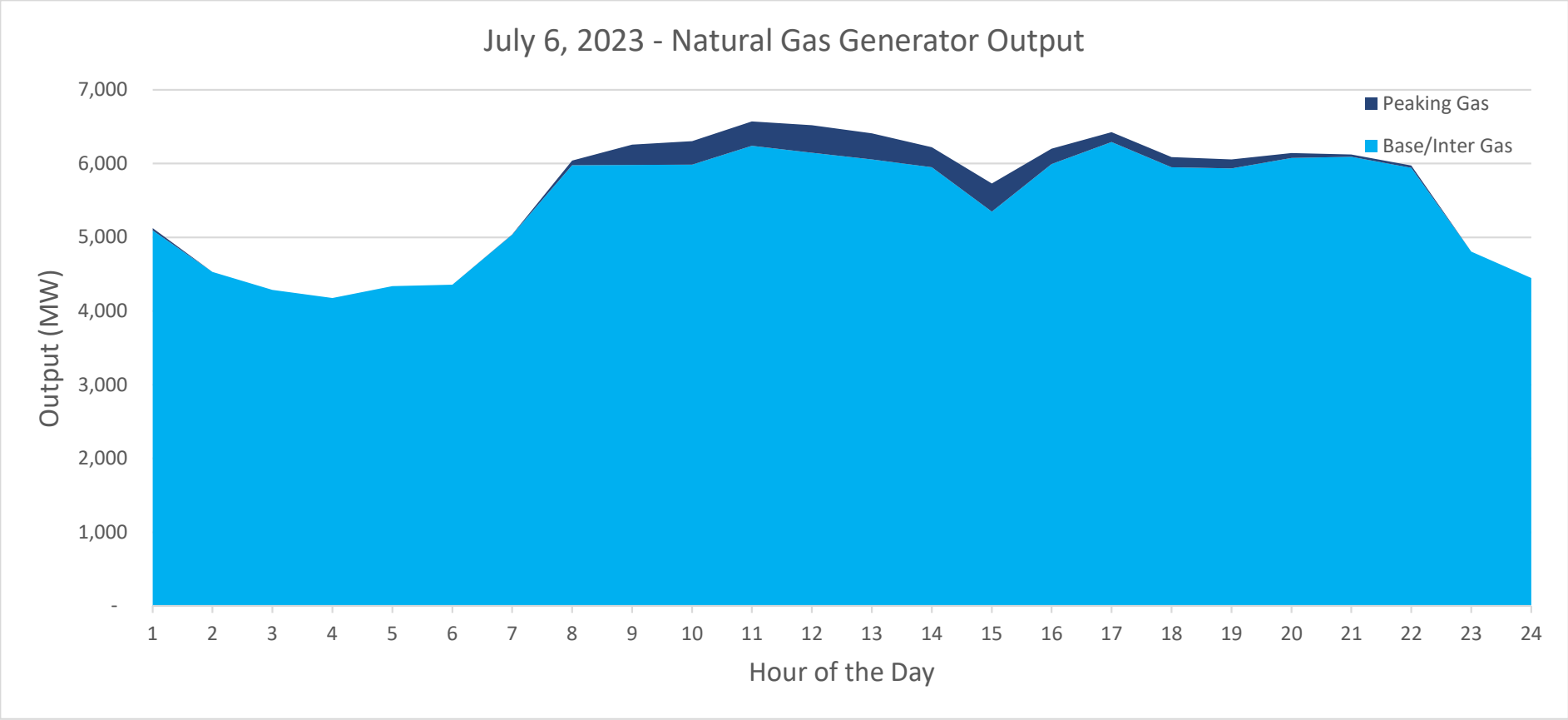
- Although wind and solar are not relied upon for capacity, they still provide some summer/winter capacity value, 15%/40% for wind and 14%/0% for solar, respectively, and are important contributors to system energy.



- [IESO - Reliability Outlook]

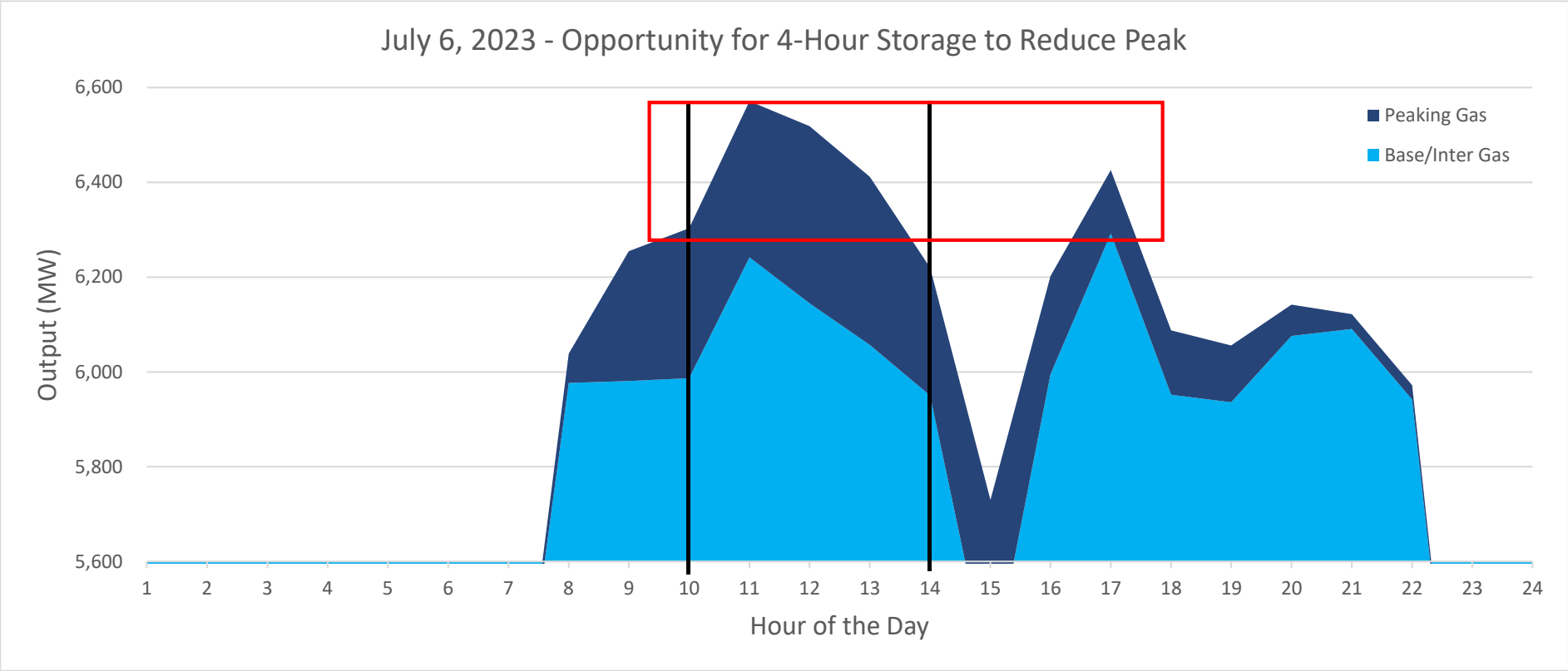
The Role of Natural Gas – Different Technologies

- Natural gas Combined Cycle (CC) and Combined Heat and Power (CHP) technology configurations provide baseload and intermediate energy, while natural gas Simple Cycle (SC) and Boiler technology configurations provide peaking capacity.



The Role of Storage – Peak Reduction within Capability

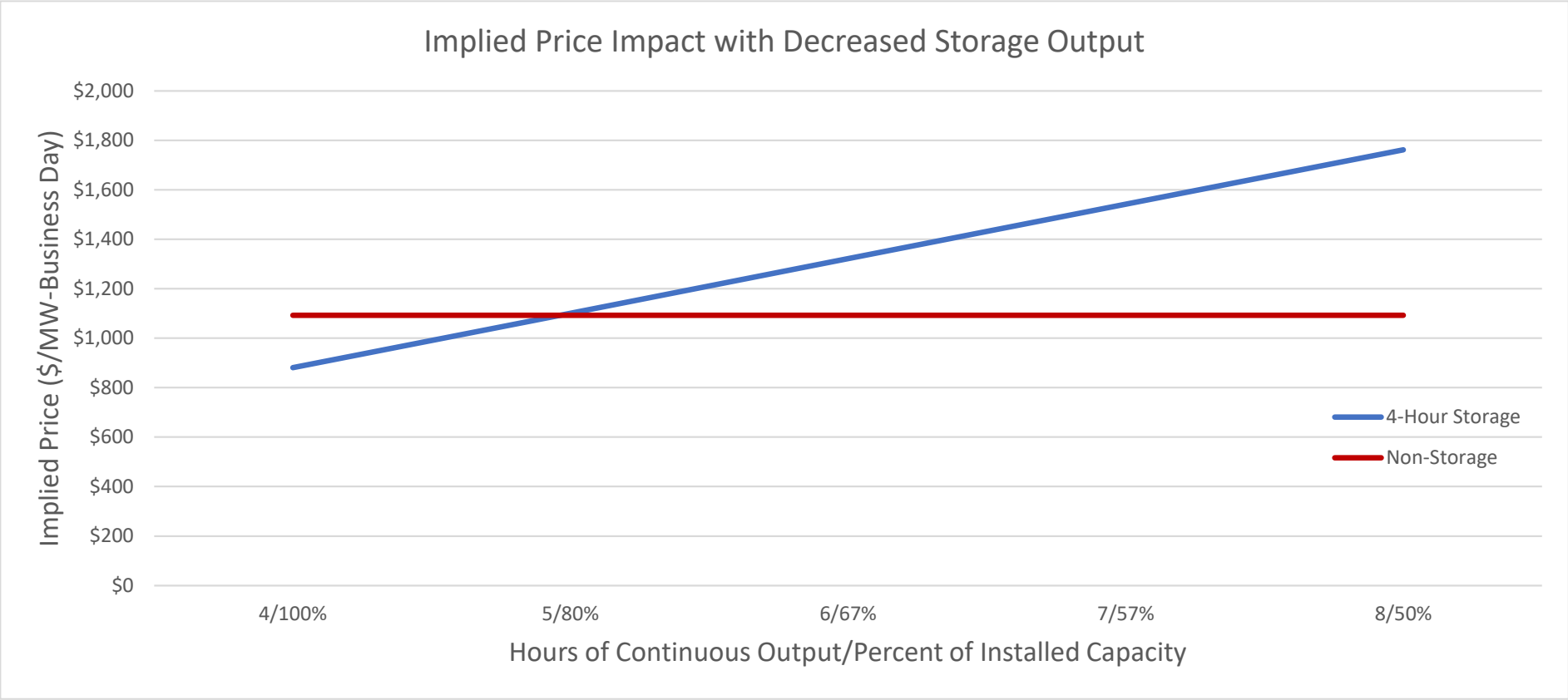
- Under the LT1 procurements, Electricity Storage Facilities must be able to deliver a continuous amount of Electricity for at least four (4) consecutive hours, while Non-Electricity Storage Facilities must deliver a continuous amount of Electricity for at least eight (8) consecutive hours.



- IESO - LT1 RFPs

E-LT1 Results – Changes to Implied Price

- 4-hour storage systems can deliver Electricity longer at lower output levels, but this changes the implied cost of capacity.



Project Timelines

Event	Time Period
IESO Deliverability Results	September 18, 2023
Bid Submission Deadline	December 12, 2023
Continued Preliminary Design, Engineering and Permitting	Q1/Q2 2024
Contract Award	Q2 2024
Assessments and Permitting	2024/2025
Construction	2025/2026
Commissioning	Q4 2026
Target In-Service Date	Q1 2027
IESO's Milestone Commercial Operation Date	May 1, 2028
Contract Expiry	April 30, 2040

Labour Market Assessment

- As part of project due diligence, Northland commissioned a third-party expert familiar with the region to perform a labour market assessment, with a strong presence in the Hamilton and Niagara regions due to their industrial and manufacturing sectors.

- It's anticipated that the project will not experience any skilled trades challenges, or given the specialized nature of the work, diminish available resources for residential housing and related infrastructure.

Type	Craft Peak	Labour Pool	Availability Risk
Carpenters	20 workers in Q2 2026	Non-Residential	Low
Millwrights	22 workers in Q2 2026	Industrial	Low
Ironworkers	26 workers in Q3 2026	Industrial	Low
Boilermakers	20 workers in Q2 2026	Industrial	Neutral
Electricians	26 workers in Q3 2026	Non-Residential	Low
Pipefitters	27 workers in Q3 2026	Industrial	Moderate
Labourers	20 workers in Q2 2026	Industrial	Moderate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