

PROJECT OVERVIEW

Oneida Energy Storage Project (OES Project)


The Oneida Energy Storage Project (OES Project) has the potential to draw and inject energy into the power grid to help stabilize Ontario’s electricity sector by providing important grid balancing services. The OES Project can provide clean and reliable power capacity by drawing and storing renewable energy during off-peak periods and releasing it to the Ontario grid when energy demand is at its peak.





The OES Project consists of a 250 Megawatt / 1000 Megawatt-hour energy storage facility to be strategically located on 10 acres of land (the Site). The Site is adjacent to the existing Jarvis Transformer Station and Hydro One Corridor. The Project would be constructed and developed at no cost to Ontario ratepayers. In fact, the Project is designed to lower electricity costs for customers, while creating local employment, driving energy savings, and reducing greenhouse gas emissions.





Project Highlights

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Largest battery storage project in North America and amongst the largest in the world
- 

\$400M to \$760M net savings to Ontario ratepayers*
- 

4.1 Million tonne reduction in CO2*
- 

Over 900,000 hours of local employment*
- 

Significant Indigenous ownership in low carbon infrastructure assets
- *over the 20-year life of the asset, based on an independent study commissioned by OES*

Additional Benefits

The OES Project is aligned with federal and provincial government priorities and will enable over \$400M+ Additional Benefits to Ontario and Canada.

Additional Benefits	Estimated NPV	Rational
CO2 Emission Reduction	\$84M	205,000 tonnes per year CO2 reduction x \$30 per tonne
Economic Spin-off Benefits	\$300M	\$150M Canadian content x 2x multiplier
Job Creation	\$23M	500+ person-years of employment over life of project
Total	\$407M	

Project Capacity: 250 MW / 1000 MWh

Ownership Structure: SNGRDC 50% and NRStor 50% via a special purpose limited partnership called Oneida Energy Storage LP

- A Memorandum of Understanding was signed by SNGRDC and NRStor on November 13, 2018.
- Oneida Energy Storage LP was formed on November 7, 2019.
- SNGRDC and NRStor will hold a 50:50 limited partnership interest in the project until new equity partners invest, which will reduce SNGRDC and NRStor’s equity ownership and investment risk.
- The OES Project would be the first development where SNGRDC is a lead developer.

Project Location: Jarvis, Haldimand Country, Ontario

- 21.1 km from Grand River at nearest point, 16.9 km from Six Nations community boundary.
- Outside Haldimand Tract.
- Outside Plank Rd Claim.

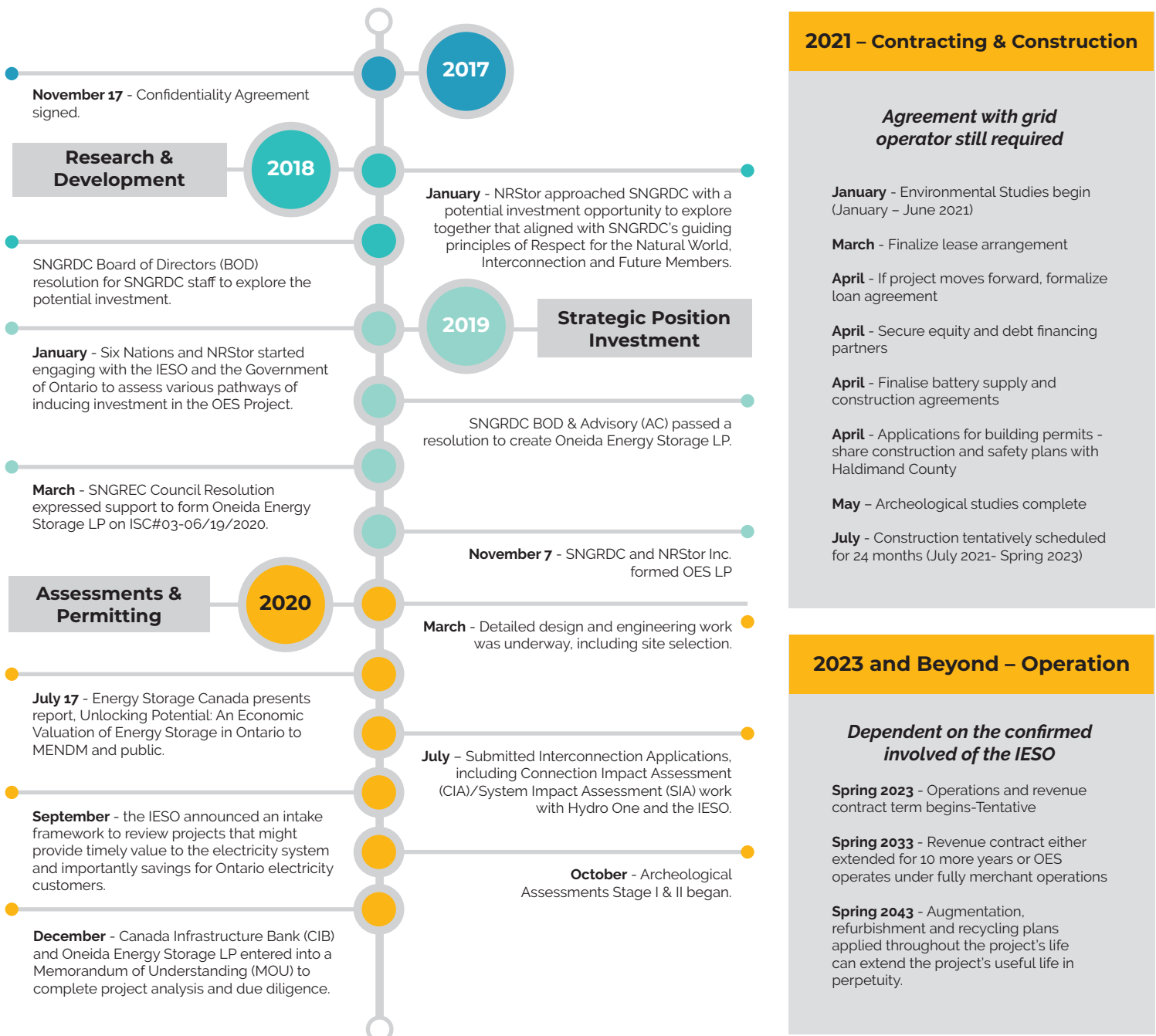
Community Benefit Structure

- Based on current modelling, the OES Project would yield a minimum of \$1M per year over the life of the project (20+ years) for the Six Nations Community.
- A6N to undertake all subcontracting opportunities, wherever possible during construction phase.
- The OES LP will have up to 15 full time employment opportunities during operation phase, and will establish internship opportunities for Six Nations community members to train up and become part of the team.
- A6N to undertake certain ongoing site maintenance work wherever possible during the operations phase.

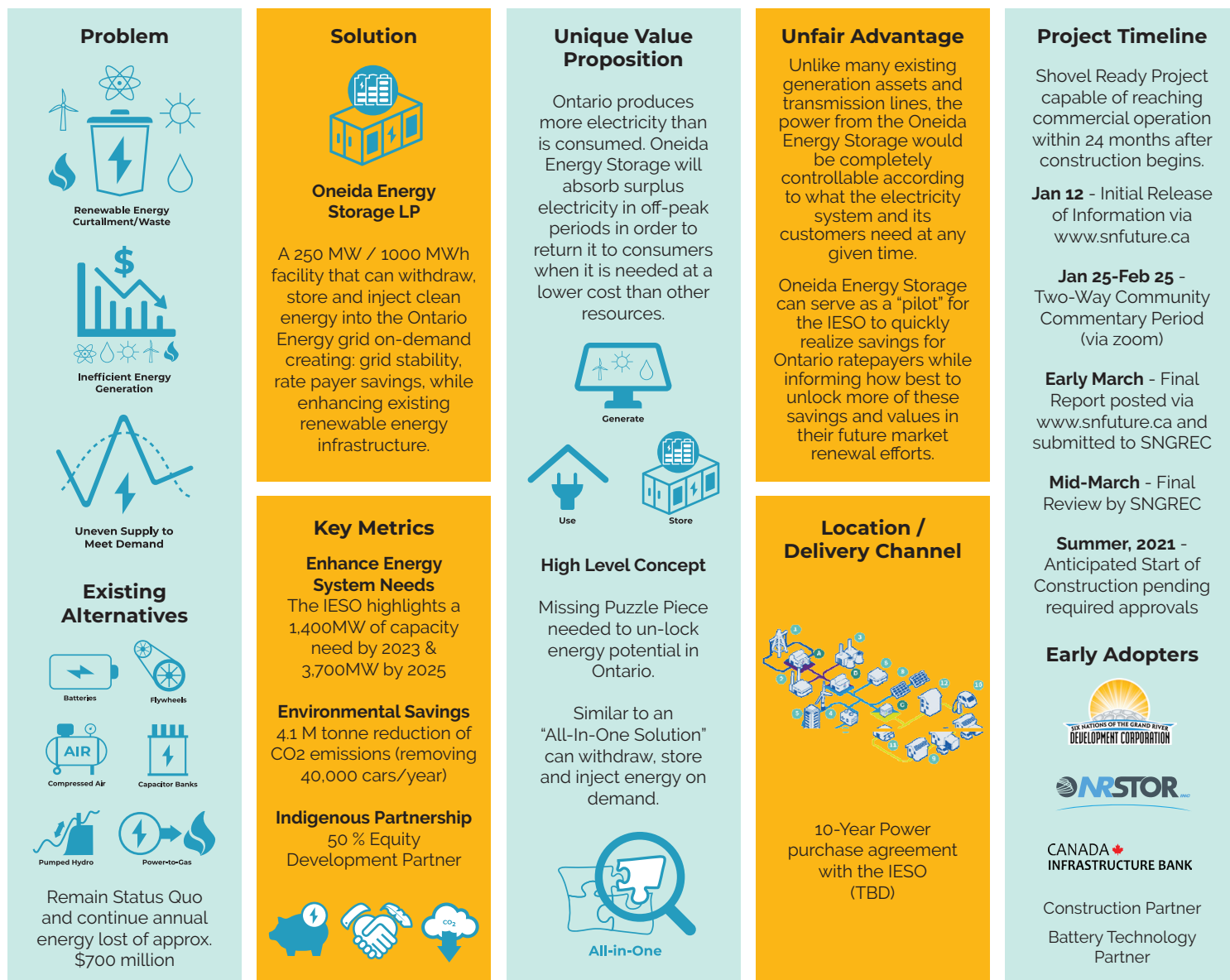
ONEIDA ENERGY STORAGE PROJECT TIMELINE

Like many large scale developments, the OES Project has undergone extensive research and consideration to get to this stage. SNGRDC has been exploring this project and a relationship with NRStor since Nov 2017 and is now ready to present this shovel-ready opportunity to the Six Nations Community.

The project will require a 24 month permitting and construction schedule, if NRStor and SNGRDC are able to secure a commercial agreement to provide energy services to the Ontario Independent Electricity System Operator (IESO).



LEAN MODEL CANVAS & COST STRUCTURE



Cost Structure

- No cost to Ontario ratepayers to construct, and net incremental electricity system savings will be achieved from operations.
- Equity investors – SNGRDC, NRStor, and others TBD
- Depending on partners, SNGRDC may need to invest as much as 20% of our own equity

Revenue Structure

- Ratepayer savings \$400M to \$760M over expected 20-year life of the project as assessed by third-party experts.
- Over \$400M in additional benefits- economic development, job creation, and greenhouse gas reduction.
- Six Nations will yield a minimum of \$1M per year over 20+ years based on current project plans and projections.

PARTNER INVOLVEMENT

Oneida Energy Storage Project Partners

NRStor and Six Nations of the Grand River Development Corporation (SNGRDC) are 50:50 owners of the Oneida Energy Storage (OES Project) and will together take on development, construction and operations risk, earning a risk-adjusted commercial rate of return on their ownership.

NRStor's Involvement

As principal partner and industry expert, NRStor will lead the development, construction and operations with equal input from SNGRDC.

About NRStor

NRStor is an industry-leading energy storage project developer, providing innovative energy storage technologies and solutions. NRStor is focused on developing, owning and operating industry-leading energy storage projects in partnership with Indigenous communities, progressive stakeholders and leading technology providers.



SNGRDC's Involvement

As a development partner, SNGRDC will be able to provide input on the development, construction and operation of the OES Project.

About Six Nations of the Grand River Development Corporation (SNGRDC)

The Six Nations is a leading Indigenous development corporation delivering economic impact within Ontario, having participated in the construction of over \$2.4 Billion of infrastructure assets; including 892 MW of energy assets. Six Nations is the most populated First Nation in Canada with over 28,000 Band Members.



IESO's Involvement (TBD)

The IESO acts on behalf of all Ontario electricity customers to maintain grid reliability and resilience, while finding cost savings to achieve more affordable outcomes. It is proposed that the IESO will be the contractual counter-party for OES, and will pay the project for electricity products and services the facility will provide.

About Independent Electricity System Operator (IESO)

The Independent Electricity System Operator (IESO) works at the heart of Ontario's power system. The IESO delivers key services across the electricity sector including: managing the power system in real time, planning for the province's future energy needs, enabling conservation and designing a more efficient electricity marketplace to support sector evolution.

CIB's Involvement

CIB will collaborate with a team of industry-leading advisors to analyze financing options, complete project analysis and financial due diligence. The CIB will also provide the project with financing to assist with building and operating the project over its life, pending decision-making by its Board in Spring 2021.

About Canada Infrastructure Bank (CIB)

The purpose of the CIB is to invest, and seek to attract investment from private sector and institutional investors, in infrastructure projects in Canada. Its team of infrastructure experts conduct market analysis and provide specialized commercial and investment expertise, including innovative financial modelling, project structuring and procurement options to support project sponsors.

INDUSTRY OVERVIEW

DISTRIBUTED ENERGY RESOURCES: HOW THEY WORK

1. SMART HOMES

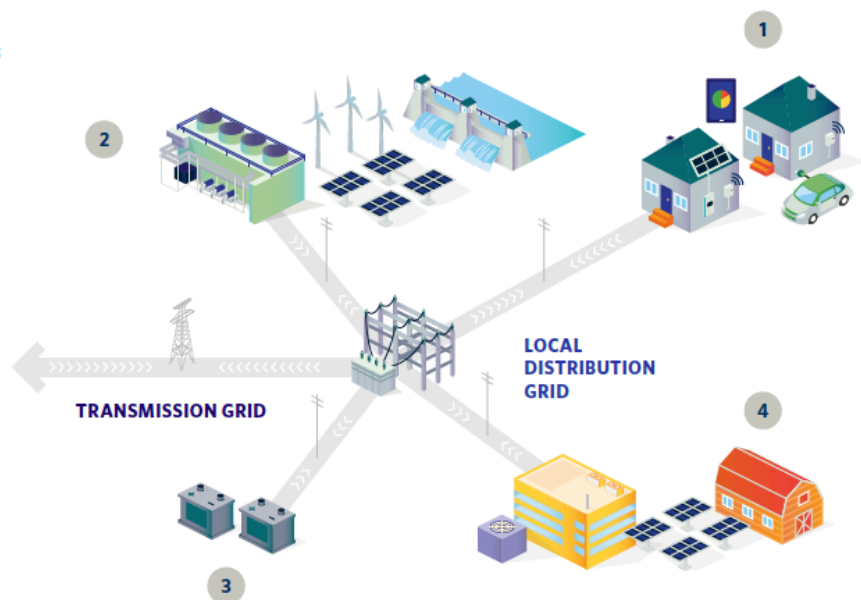
Consumers can better control their energy use at home with smart lighting and appliances. On-site generation and energy storage can help shift energy use at home or enable consumers to sell to the grid. Several homes can even be aggregated to provide electricity services back into the grid.

2. GENERATION

Small scale generation such as solar, wind, hydro, bioenergy and combined heat and power are connected to the distribution grid.

3. STORAGE

Storage technologies such as batteries can withdraw electricity from the grid when prices are low, store it, and release the energy back into the grid when prices are higher.



4. CUSTOMERS WITH GENERATION AND CONTROLLABLE EQUIPMENT

Some businesses use a combination of energy efficiency, demand response techniques, as well as on-site generation to manage their energy use and costs. Equipment such as heating and cooling pumps can be controlled to ramp up or down depending on electricity prices. They can also generate and/or store their own electricity to use or sell to the grid.

Source: Power Perspectives, 2018

The amount of electricity fed into the electricity grid must always be balanced to the amount of electricity consumed, otherwise there's a black out. In Ontario, grid stability is regulated and controlled by the Independent Electricity Systems Operator (IESO).

The IESO must ensure frequency remains **stable** 24 hours a day, 7 days a week.



How does energy work in Ontario?

The IESO secures electricity products and services on behalf of all grid-connected residential and business customers. It also manages the Ontario market to secure resources in a diverse supply mix, including nuclear, gas-fired, and renewable generation, imports from other markets, as well as demand response and energy efficiency.

The IESO secures the following three services.

1. Energy, which is the availability of electricity over time, as measured in megawatt-hours (MWh). Each of us consumes or uses energy. When you turn on a light, plug in a computer or cool a home, you consume energy.
2. Capacity is the maximum output an electricity generator can physically produce, or the capacity of resources to reduce demand, as measured in megawatts (MW). Capacity is required to match demand at certain times of the day and different times of the year.
3. Ancillary services help to support the real-time management of the electricity system. In particular, regulation service, which is sometimes referred to as frequency regulation, acts to match total system generation to total system load and helps correct variations in power system frequency. This service corrects for short-term changes in electricity use that might affect the stability of the power system.

While most electricity generators can only provide some of these services, battery storage has the ability to provide all three of these valuable products.



Why must we maintain energy grid stability?

The supply and consumption of electricity is a careful balancing act. Traditionally electricity cannot be easily stored, and the system buys not only electricity but also services to ensure that power is available on-demand as it is required. This means that generation has to be available when you turn on a light, or power up a factory, and that the supply is turned down when the electricity is not needed. However, the capability of various resources does not always align well with demand. For example, nuclear reactors like to be on all the time, while wind and solar resources can only generate when the wind blows or the sun shines, even when the power is not needed. If grid stability is not achieved, it could result in brown-outs or even black-outs.

The Oneida Energy Storage (OES Project) would provide the IESO an important on-demand option to aid Ontario's grid stability.



How does Ontario currently manage grid stability?

There are multiple ways the IESO balances grid stability, however the current available options result in approx. \$700 million in annual energy loss.

Load shedding consists of temporarily depriving some electricity consumers of supply to avoid widespread power cuts. This solution is only used as a last resort.

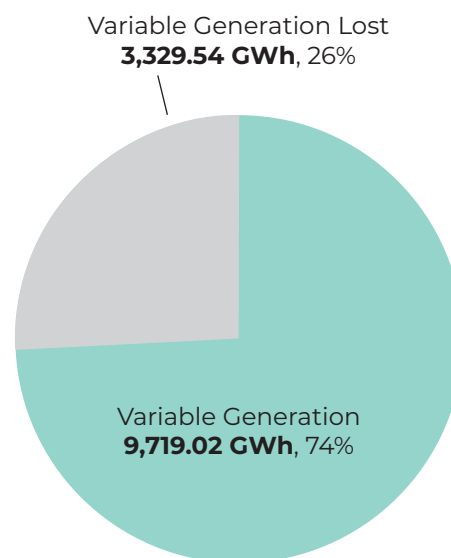
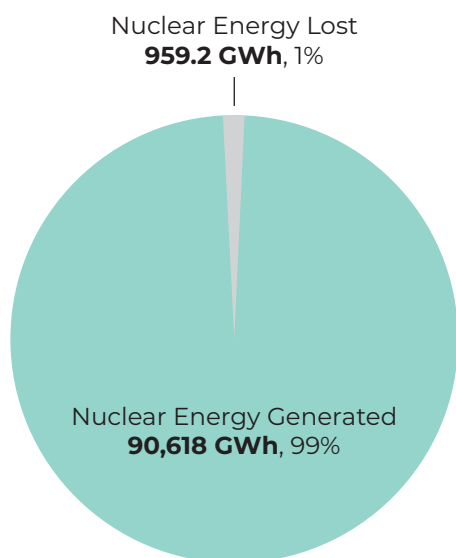
Agreements are made with certain professional customers who agree to regulate their consumption and/or their production (curtailment) for a certain time period.

Dispel Surplus Energy to neighbouring grid operators (export to USA, Quebec) at a loss. These operators can also be called upon to import electricity in lieu of on-demand supply in Ontario.

In 2017, Ontario wasted:

- 959.2 GWh of nuclear energy
 - » Assume cost is \$60/MWh
 - » \$58 M per year lost energy
- 3,329.54 GWh of solar and wind energy
 - » Assume average cost is \$135/MWh
 - » \$450 M per year in lost energy
- Estimated over ~4 TWh of hydro spillage (actuals not disclosed by OPG)
 - » Assume rate regulated rate of \$47/MWh
 - » \$188 M per year in lost energy
- Inefficient gas plant operations (actuals not disclosed by IESO)

Over \$700M in lost energy in 2017



Source: <http://ieso.ca/corporate-ieso/media/year-end-data#yearenddata>



What is Curtailment?

Curtailment is when we tell our dams to let the water spill over top, our nuclear generators to release their steam, and our wind turbines and solar panels not to produce energy, even when it's windy/sunny. It is an industry term that means the power was not needed in Ontario, and could not be exported, so it was dumped.

Gas

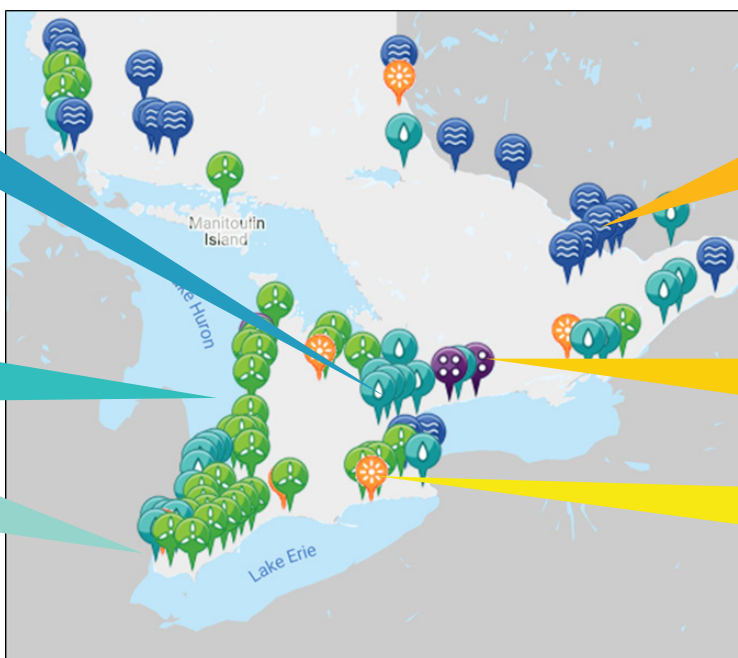
- Avoid turning on gas plants for 1 to 2 hour needs (typical minimum run times are 5-6 hours)
- Reduce gas costs and GHG emissions

Wind

- Reduce wind curtailment during surplus periods
- Provide fast responding ramp to address wind forecast errors

Solar

- Reduce solar curtailment during surplus periods
- Smooth solar variability caused by passing cloud cover



Hydro

- Reduce hydro spillage
- Operate hydro generators at their optimal efficiency point more frequently

Nuclear

- Reduce nuclear 'maneuvering' at Bruce that dumps heat into the lake and increases operational complexity and risk of costly outages

Interties

- Reduce the amount of energy exported by capturing energy we produce for Ontario's needs first



How could we use Energy Storage to aid in grid stability?

Energy storage can help maintain the balance between supply and demand on an electricity system while enhancing efficiency of systems components.

Energy storage provides an opportunity to add flexibility in how electricity is produced and used in Ontario. The ability to store energy provides an alternative to address peak load demands and enhance the use of renewable electricity services. Batteries can store renewable electricity during low-demand times (when it would otherwise have been curtailed) and deploy it back into the grid during peak-demand times.

The OES Project has the potential to draw and inject energy into the power providing important grid balancing services. The Project would provide clean, reliable power capacity by drawing and storing renewable energy during off peak periods then releasing it to the Ontario grid when energy demand is at its peak.

Energy storage can offer a broad range of services and support to the Ontario electricity system. For example, it can harness wind and solar output and deploy when the system better values the electricity created from those facilities. In this sense we can get more "bang" for the "buck" of what we're already spending as electricity customers. Energy storage can also better utilize transmission and distribution assets, reduce GHGs, increase electricity exports and imports to achieve savings, and improve overall power quality.



OES will absorb surplus electricity in off-peak periods in order to return it to consumers when it is needed at a lower cost than other resources.



How will the Oneida Energy Storage Park change the energy grid efficiency?

The benefits associated with the Oneida Energy Storage will be multi-faceted, providing services to the IESO in one facility which presently are provided by multiple sources. Similar to an all-in-one printer, savings and efficiencies are generated by not having to purchase a printer, scanner, and copier separately. This means real savings for Ontario ratepayers as one site will collectively provide:

- Clean Peaking Capacity
- Non-Hydro Renewable Curtailment / Hydraulic Spill Reduction
- Gas Plant Efficiency Savings
- Demand Response ("DR")
- Fast Responding Operating Reserve ("OR")
- Energy Arbitrage
- Nuclear Maneuver Reduction

Ontario's Auditor General has confirmed using forecast data from the IESO that the province is expected to continue to experience on average 2.8 TWh of Surplus Baseload Generation (SBG) per year from 2022-2032, demonstrating the need for a resource such as the OES Project within the bulk system.

What other energy storage solutions exist?



Batteries are one of the most widely used energy storage technologies and are the most versatile form of energy storage.



Pumped Hydro functions by pumping water from a lower reservoir to an elevated reservoir to store energy in the gravitational potential of the water.



Flywheels function by electrically driving a motor to spin a rotating disc mass (i.e. the flywheel) at high speeds, creating kinetic energy.



Capacitor Banks use the magnetic field between plates as a storage medium and, similar to flywheels, can charge and discharge very quickly.



Compressed Air Energy Storage (CAES) is a form of energy storage that uses a compressor to pressurize atmospheric air and drive it into a vessel for storage (such as caverns, reservoirs and mines).



Power-to-Gas uses the electrolysis of water to convert electrical energy into hydrogen. The hydrogen produced from a Power-to-Gas process can also be blended into natural gas grids or combined with CO₂ to create renewable natural gas by methanation.

Why pursue a battery storage option?

Storage technology is highly varied, and different technologies are suitable for specific purposes.

The OES Project has been designed to:

1. Optimize the use of existing supply and transmission assets.
2. Reduce the Global Adjustment (GA) by reducing the amount of curtailed clean energy that is wasted in Ontario.
3. Strengthen Ontario's energy export position.
4. Secure electricity products such as energy, capacity, and ancillary services when required by the provincial grid.



This will help save costs in multiple ways – including reducing the curtailment of generating assets and avoiding the unnecessary cycling of gas resources and incremental fuel costs. The projected net savings of between \$400 million and \$760 million over the next 20 years is net of the cost that the OES' investors will pay to build the project.

FOR MORE INFORMATION

In order to provide the Six Nations community an opportunity to review the proposed Oneida Energy Storage investment, project information is posted to www.snfuture.ca. Community members are invited to submit questions and comments on the SN Future platform or via email at info@snfuture.ca.
Visit: www.snfuture.ca

