



# Optimizing Ottawa's Power Grid:

## The Role of Battery Energy Storage Systems (BESS) in Communities

January 2025





ACCELERATING THE CLEAN ENERGY TRANSITION



ANALYSIS + STRATEGY



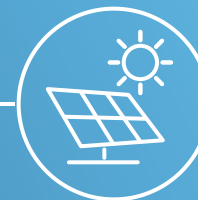
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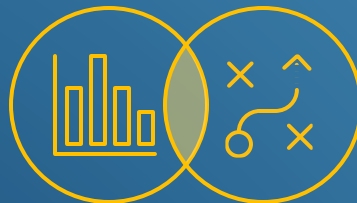


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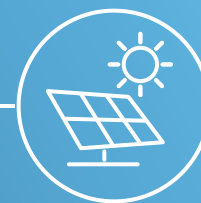
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# Summary of Findings

**Our research found that BESS brings a net value to local communities and the province. Risks can be addressed by following best practices. BESS is a way to maintain grid reliability while also enabling Ottawa and Ontario to meet their economic, environmental, and growth objectives.**

1

## Ottawa Community Benefits

Ottawa benefits from less time without power, economic activity, and funding for local priorities.

2

## Ontario-Wide Benefits

Ontarians benefit from reduced electricity costs, more energy independence, and climate change mitigation.

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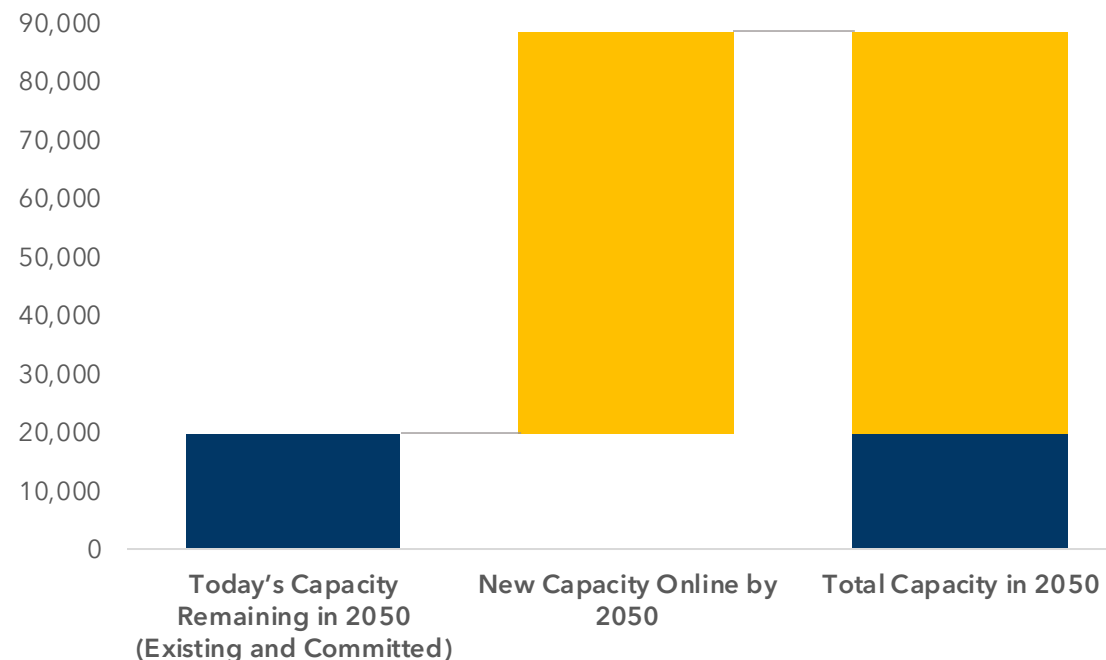
## Concerns & Mitigation Strategies

Safety concerns can be addressed by appropriate technology selection and advanced safety planning.

## Ontario electricity demand is growing by 75% and significant resource build-out is needed.<sup>1</sup>

- Experts identify energy storage as the most cost-effective way to meet peak demand. It is also the lowest-emissions option.
- Ontario's system operator (IESO) estimates that **2,500 MW of storage will be in service by 2027, rising to 4,500 MW by 2050** and is actively procuring it.<sup>2</sup>
- Across Ontario BESS is being deployed in:
  - Spencerville: 390 MW
  - Jarvis: 250 MW
  - York Region: 120 MW
  - Almonte: 9.5 MW

Ontario's Pathway Scenario - Installed Capacity in 2050<sup>2</sup>



"Ontario needs to generate more power, and our government has the plan to build out affordable, reliable and clean energy for our families and future generations."

- Hon. Stephen Lecce, Minister of Energy and Electrification

# Context – Ottawa Region

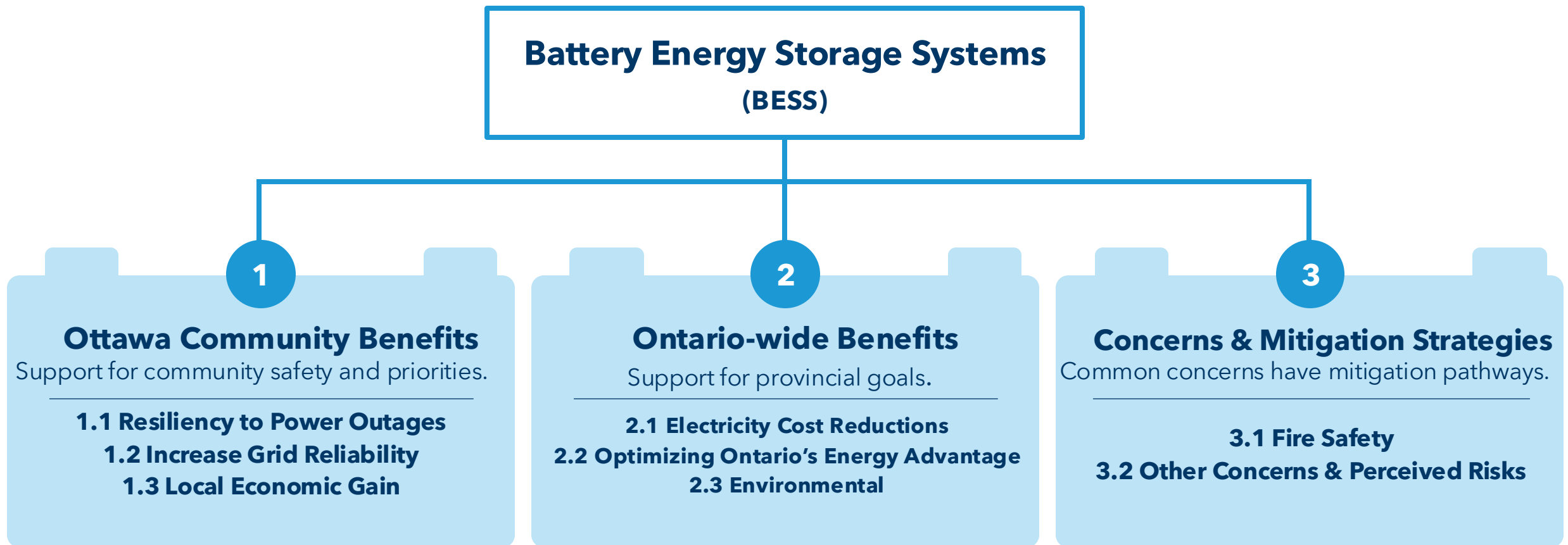
## Beyond provincial-wide needs, the Ottawa region also has emerging needs

- **Grid infrastructure needs replacement to maintain reliability:** Hydro Ottawa says 40% of their infrastructure is in need of replacement within a decade<sup>3</sup>, with known grid constraints today in Kanata North and Downtown.
- **Population growth necessitates more power infrastructure:** Ottawa's population is expected to grow by >40% by 2050. Housing and business growth requires more electricity generation, storage, and distribution/transmission.
- **Ottawa is experiencing and expecting more storms:** Wind and ice storms resulting in power outages are expected to increase in the region.
- **Customers support action on climate change:** Polls find that Hydro Ottawa customers support investments in green energy and sustainability.<sup>4</sup> Hydro Ottawa has committed to net zero by 2030<sup>5</sup> and the City has set a community-wide target of net zero by 2050.<sup>6</sup>

The Ottawa region risks more outages, limitations on growth, and electricity cost increases if investments in generation, storage and grid updates are delayed.<sup>3</sup>



The findings from this study are organized into the following 3 sections:



# 1. Local Community Benefits

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Battery storage projects are found to bring benefits to the hosting community including:

**1.1 Resiliency**

**1.2 Reliability**

**1.3 Economic**

# 1.1 Resiliency to Power Outages

## Public Safety During Outages

- Outages of more than a few hours pose a risk to public safety, communication, water supply, fuel supply, transportation, refrigeration, food distribution, and medical services.
- Batteries can provide power to public refuge centres during extreme weather.
- Batteries can charge vehicles during outages, which can facilitate evacuation or powering critical loads at home.
  - Example: A full 1000MWh battery can fast-charge ~20,000 cars in an outage.<sup>7</sup>

### CASE STUDIES

- In Parent, QC, a battery provides power to a remote community during planned and unplanned outages.<sup>8</sup>
- In California, BESS is used provide power to the region during widespread grid outages.<sup>9</sup>
- In Florida during hurricane Milton, mobile batteries kept EV charging stations open.<sup>10</sup>



## 1.2 Reliability

### Reduced Outages and Capacity Shortfalls

- Batteries can re-energize the area around them quickly in a widespread power outage.
- Batteries can be built more quickly than any other form of new generation to meet rapidly growing demand.
- Batteries contribute to grid reliability by backing up variable sources, enhancing reserve margins, regulating frequencies, demand response and black start functions.<sup>11</sup>

“Batteries have ultra-rapid responses to [grid] disruptions and can add or subtract power from the grid within milliseconds to keep the grid stable.”

- Roger Dargaville, Director of the Monash Energy Institute

#### CASE STUDIES

- In 2023, an outage at Ottawa’s wastewater facility resulted in the dumping of poorly treated sewage in the river.<sup>12</sup>
- In 2020 in California, a heatwave caused a blackout from a surge in electricity use. By 2022, BESS installations prevented a blackout during a hotter heatwave.<sup>13</sup>
- In Stratford ON a 9 MW battery system was built in 4 months.<sup>14</sup>



# 1.2 Reliability Saves Money

## Outages are Costly

- Every kilowatt hour of electricity NOT delivered (during an outage) has an approximate cost to the economy of \$12 to \$50/kWh. This is known as the "Value of Lost Load".<sup>15</sup>
- Businesses lose revenue during outages and homes can suffer damages.
- Hydro Ottawa service area experienced 1,152 outages in 2023.<sup>16</sup>
- In 2024, Hydro One found a BESS in rural Ontario reduced power outage duration by ~75%.<sup>17</sup>

### CASE STUDIES

- **2003:** North America Blackout cost Ontario \$18.9M in lost staff hours and \$2.3B in lost manufacturing.<sup>18</sup>
- **2013:** Eastern Canada Ice Storm caused \$200M worth of insured damages.<sup>19</sup>
- **2022:** Derecho in Ontario and Quebec outage caused \$875M in insured damages.<sup>20</sup>



## Increased Funds for Local Priorities

- Often, battery projects provide a community development fund worth approximately \$1,000/MW/year for local initiatives over 20 years. Numbers vary between projects.
- Additionally, municipalities receive ~\$30,000/MW in taxes and development charges over 20 years, which fund local services. Rates are defined by each municipality.
- The two BESS projects proposed for Ottawa would deliver \$8 million in Community Development Funding, as well as approximately \$10 million in property taxes and development charges.
- Additionally, the two BESS projects proposed for Ottawa are being developed in a 50% equity partnership with the Algonquins of Pikwàkanagàn First Nation.

### CASE STUDY

- A Napanee generating station with BESS provides \$2 million over 20 years to a community development fund.<sup>21</sup>
  - Funding supports hospitals, sports, heritage, food banks, legions, Salvation Army, etc.
  - The County Hospital used the funds for critical medical equipment and the Women's Hockey League subsidized spots to girls from low-income families.<sup>22</sup>



## 2. Ontario-wide Benefits

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Battery storage projects benefit all Ontarians, ratepayers and the provincial grid in the following ways:

**2.1 Electricity Cost Reductions**

**2.2 Optimizing Ontario's Energy Advantage**

**2.3 Environmental**

## 2.1 Electricity Cost Reductions

### Batteries Keep Electricity Bills Low for Ontarians by reducing electricity system costs.

- In recent Ontario procurements, BESS was 60% cheaper than gas-fired generation. In 2024, 80% of power capacity procured in ON was BESS as the lowest cost.<sup>23</sup>
- Energy storage also contributes to reducing on-peak price increases and grid regulation costs.
- When close to load, BESS helps reduce transmission and distribution line losses.
- Energy storage can avoid or defer the need for local transmission and distribution wires.
- BESS shields Ontario ratepayers from impact of carbon pricing on gas generation.

#### CASE STUDY

- 1,000 MW of storage saves Ontario ratepayers \$2.7 to \$4 billion by reducing system costs.<sup>24</sup>
- In two years, a 100 MW BESS in South Australia, Hornsdale Power Reserve, saved energy consumers \$150 million.<sup>25</sup>



"By enabling greater use of renewable energy, reducing emissions, stabilizing the grid, and empowering customers, battery storage is poised to help Ontario create a cleaner, more resilient, and equitable energy system."

- Trevor Freeman, Manager, Hydro Ottawa

## 2.2 Optimizing Ontario's Energy Advantage

### Energy System Optimization and Leadership

- Energy storage allows Ontario to shift energy imports and exports to times where economic value can be maximized.
- Batteries are also scalable and quick-to-deploy relative to other resources; meaning they can be deployed quickly in response to growing demand.
- Ontario is a national leader in BESS development and increased deployments contribute to local industry expertise for export.

#### CASE STUDIES

- 87,000 Canadians work in the BESS industry.<sup>26</sup>
- In 2019, Ontario earned \$0/MWh or less for 20% of its generating hours.<sup>24</sup>
- In 2019, Ontario also curtailed 18% of the total energy output from wind and solar due to excess generation.<sup>24</sup>



"Ontario can export clean energy technology to the world, where it is in the best interests of Ontarians to drive revenue and jobs to our province."<sup>27</sup>

- Ontario Ministry of Energy and Electrification

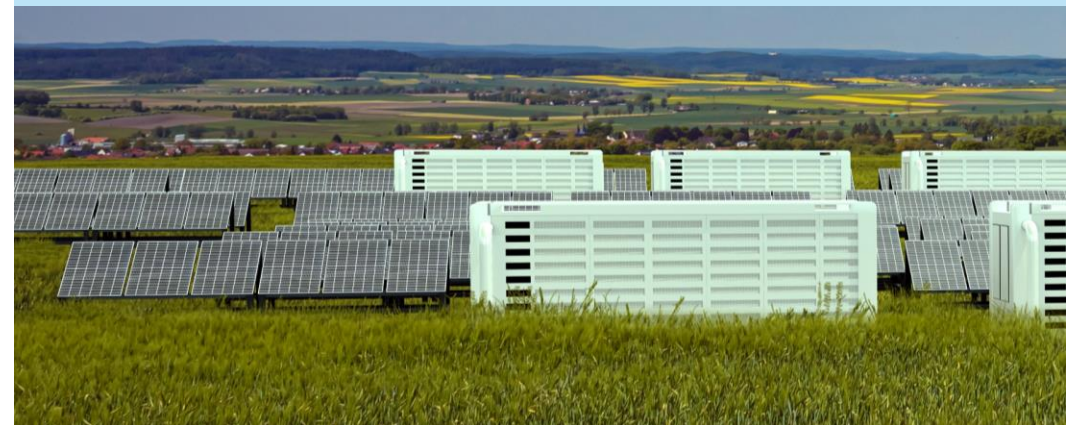
## 2.3 Environmental

### Fewer Gas Plants, Less Emissions

- Battery systems reduce the need for new gas plants for meeting peak demand.
- Increasing renewable energy generation in Ontario is important to keep electricity costs and GHG emissions down.
- Despite their low cost, solar and wind generation are intermittent resources, and batteries provide stability for these variable energy forms by storing excess energy for use during peak demand.

#### CASE STUDY

- Each 2,500 MW of battery storage will save 260 kTCO<sub>2</sub> per year.<sup>28 + 29</sup>
  - This is equivalent to taking 60,000 gas cars off the road.
- South Australia now operates at 75% net annual variable renewable energy and is on track to reach 100% by 2027, with BESS playing a key role in the transition.<sup>25</sup>



# 3. Concerns & Mitigation Strategies

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Commonly-raised concerns have mitigation pathways.

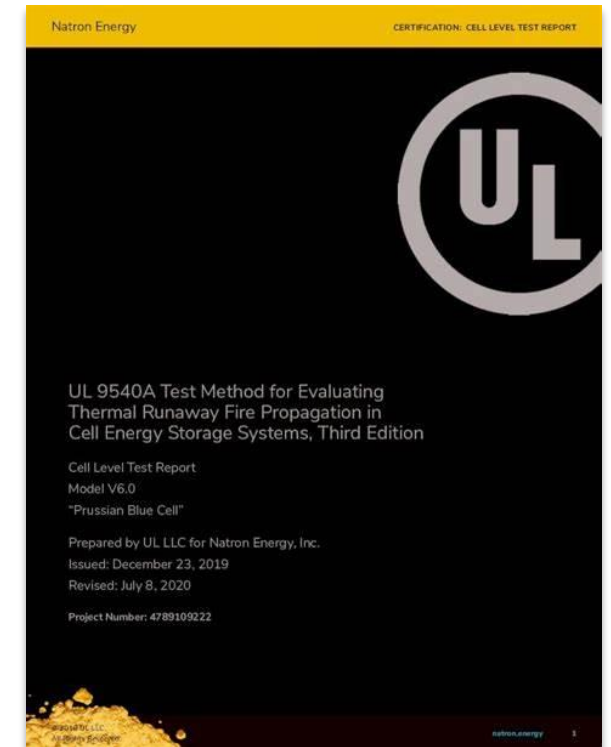
**3.1 Fire Safety**

**3.2 Other Concerns and Perceived Risks**

## 3.1 Fire Safety

## Safety Improvements in Battery Technology

- Most battery fires have been linked to **Nickel Manganese Cobalt** (NMC) batteries. **Lithium Iron Phosphate** (LFP) batteries are more stable at higher temperatures and cycles. They are now the industry preference.<sup>30</sup>
- Updated safety practices now include:<sup>31</sup>
  - **Enhanced safety standards:** Adoption of UL 9540A standards to prevent thermal runaway and ensure safe site design.
  - **Comprehensive monitoring and detection:** 24/7 site monitoring, malfunction isolation, and advanced sensors for smoke, humidity, and particulates.
  - **Proactive safety measures:** Outdoor installation in secure containers with water access, fluid collection systems, regular inspections, software updates, and collaboration with emergency response teams.



## 3.1 Fire Safety

### CASE STUDY

#### Battery System funds fire department in Mass.

- In Medway, MA, a 250 MW BESS project agreement includes the following provisions:<sup>32</sup>
  - Consulting the fire department in the design, construction, and operation.
  - Annual emergency preparedness training.
  - Procedures for site access and fire suppression.
  - Funding for safety and training staff.
  - Funding for fire suppression materials and tools.

“The main fire risk from batteries we are concerned with are primarily damaged or defective batteries used in e-bikes or e-scooters that are charged inside of homes. With utility battery systems, there is an internal battery management system that reduces the possibility of a thermal runaway event. If we respond to a utility battery system fire, we need site access for fire vehicles and large water volume for suppression.”<sup>33</sup>

- Gerry Gill, Division Chief, Emergency Protective Services, City of Ottawa



## 3.2 Other Concerns & Perceived Risks

### Noise

- Noise is generated predominantly from cooling fans and inverters. Oversizing fans, noise silencers, and sound barriers have all worked to ensure noise meets local bylaws (similar to a refrigerator).<sup>34</sup>

### Chemical Exposure

- In the case of a high temperature fire, the main gases of concern are irritants, HF and SOs.<sup>35</sup> Emergency practices should require appropriate protective equipment and maintain a safe distance for responders.

### Leachate

- LFP batteries installed in sealed containers have minimal leachate risk. During a fire event, if water is pumped into the affected container, leachate is retained. Spraying water on the adjacent equipment prevents spread.

### Visual Impact

- Best practice is to surround the site with natural screenings such as trees and hedges such that the battery system is obscured from view.

## Conclusion

- Ontario and Ottawa's electricity demand are growing, and significant investment is needed to meet future needs.
- BESS offers a cost-effective and low emissions way to optimize current generation, meet peak demand and optimize infrastructure deployment.
- The efforts of Ontario Ministry of Energy and IESO to procure BESS are in support of the province's energy needs, climate change plans, and economic goals.
- Beyond benefits to the broader provincial electricity system, BESS can bring several local benefits to hosting communities.
- Municipalities should consider the various benefits BESS projects bring to their local communities and support local capacity building.

# Contact

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# Appendix

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**A.1 Study Scope**

**A.2 Definitions**

**A.3 References**

# A.1 Study Scope

## Scope

- Evolugen engaged Dunsky to articulate the needs and benefits of BESS to the local community, specifically the Ottawa region, and to Ontario as a whole

## Objective

- The objective of the report was to create a report and supporting visual materials for a public audience to raise awareness of the findings and support community education via communications strategies such as in person events and publicly accessible websites.

## Approach

- **Identify benefits and concerns and their risk mitigation strategies of BESS in Ontario using the following methods:**
  - Literature review
  - Identify intersects with key policy, market and local considerations for the Ottawa region
  - Expert interviews for a local lens
- **Case studies and tangible examples**
  - Illustrate each relevant benefit through a case study or tangible example. Ontario case studies were preferred and complemented by international examples where needed.

## A.2 Definitions

- **Black start:** electricity generation equipment that can re-energize itself and send a stable frequency signal to a wide area to enable re-energizing of the grid after a widespread power outage.
- **Demand response:** technology to release stored energy during peak demand, reducing strain on the grid.
- **Frequency regulation:** maintaining stable frequency by quickly adjusting output in response to changes in supply and demand.
- **Reliability:** maintaining power delivery during challenging conditions, which shortens outage durations and affects less customers.
- **Reserve margin:** the amount of unused capacity in an electric power system compared to its total capacity, expressed as a percentage of demand. Reserve margin is used to measure how well a power system can meet unexpected increases in demand and handle unexpected outages of generating units.
- **Resiliency:** adapting to and recovering from rare and disruptive events that affect a wide area and/or for a long time.

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