Energy Storage

Backgrounder

There are many different methods for storing energy, from rechargeable batteries in electric vehicles (EVs) to large facilities that compress air and release it to drive turbines that generate electricity.

Regardless of the method, storage is a very flexible and valuable electricity resource.

Storage can act as a form of both supply and demand, drawing electricity from the system or an individual generator when both demand and electricity prices are low, then releasing it into the grid when demand is high. Storage is particularly useful in supporting the wide-scale integration of renewable resources, like wind and solar, because it can step-in to cover reduced energy output caused by sudden weather changes.

Currently, there is a high demand for lithium-ion (LI) batteries and grid-scale battery systems worldwide. Batteries have a high potential for optimizing supply on electricity systems as they can respond to fluctuations in demand quickly, and are flexible in how and where they are installed. They are also capable of retaining relatively high amounts of energy for their size.

The current global uptake is largely due to a combination of elements, including government policy support and improved battery technology, and is resulting in significant competition and higher costs for materials and labour. In addition, as of 2019, the EV market accounted for more than 50 per cent of global demand for LI batteries, and they are expected to drive overall demand this decade.

Storage in Ontario

The IESO's first long-term procurements, underway in 2023, are intended to result in the development of one of the largest electricity system battery fleets in North America. A further 250 MW of storage is also expected to be available before the summer of 2025 from the newly announced Oneida Battery Storage facility. The IESO estimates that by 2027, Ontario could have a battery capacity of 2,500 MW, compared to California (~2,300 MW of currently installed storage capacity as of 2021 with an additional 9,400 MW of proposed storage by 2024) and Texas (9,400 MW of proposed storage projects by 2024). Preparations are underway to assess the requirements and potential challenges of integrating and operating a storage fleet of this size on Ontario's grid.

However, storage is not new to Ontario's electricity system - pumped storage has been a dependable resource for decades, and the IESO began procuring newer types of energy storage resources in 2012. The competitive energy storage procurement framework in 2014 resulted in a total capacity target of 50 megawatts, including a flywheel storage facility pilot to learn how to safely and effectively add it to the grid.

More storage facilities have been added to the system since - the IESO currently has one compressed air and four battery energy storage facilities under contract, while storage resources also participate in the annual capacity auction, providing support during peak demand as well as specific services that keep voltages on the grid stable.

Decarbonization and the future system

Canada is one of many countries around the world currently developing plans and policies aimed at achieving net-zero greenhouse gas (GHG) emissions economies by 2050. These plans typically involve broad electrification of sectors currency reliant on fossil fuels, as well as non-emitting electricity systems to support them.

Ontario's battery storage fleet will be an important step toward the transition to a non-emitting supply mix, and will support reliability as the grid powers broader electrification efforts across other sectors of the economy.

Last year the IESO produced a Pathways to Decarbonization report that examined potential opportunities and challenges to consider as Ontario's electricity demand and resource mix evolves. It identified the essential role storage technologies have to play in achieving decarbonization goals, including as a support to intermittent generation.