FEDERATION
ENGINEERING & CONSTRUCTION

COMPRESSED AIR ENERGY STORAGE PROJECT

Marguerite Lake
(La Corey), Alberta

Federation Group is developing a Compressed Air Energy Storage (CAES) Project north of La Corey, Alberta. The Marguerite Lake CAES Project is a two-phase initiative that provides a highly dispatchable resource, with a total of 250 MW load capacity and 640 MW generation capacity.

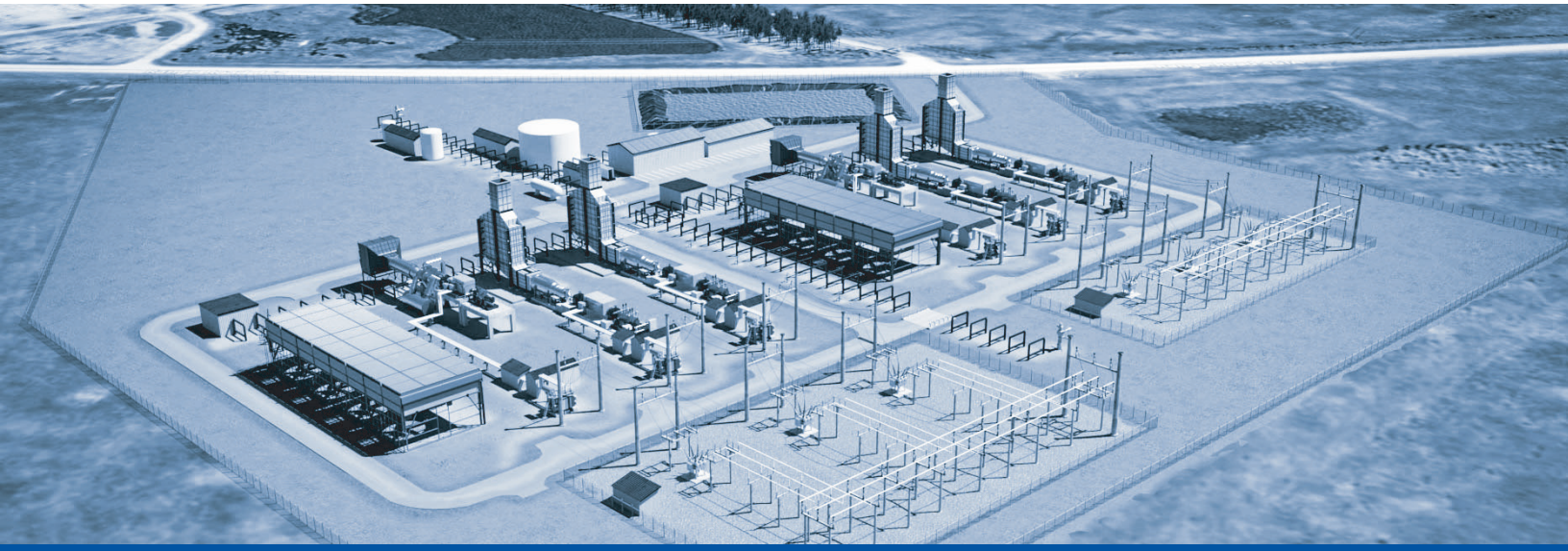
The Project is strategically situated adjacent to the underutilized high-voltage Marguerite Lake substation and sits directly above salt formations, ideal for underground energy storage caverns.

The innovative CAES system stores surplus renewable electricity by compressing air into solution-mined salt caverns. During peak demand, stored air powers expander turbines, offering dispatchable, low-emission electricity to the grid.

The Project supports the province's net-zero strategies by seamlessly integrating with the Alberta Interconnected Electric System (AIES). It enhances the grid's capacity for renewable generation by ensuring a dispatchable and stable energy supply with a 30.72 GWh-scale energy storage solution. The CAES plant's adaptability to grid requirements and economical operation at varying loads makes it ideal for grid-scale energy storage and renewable energy integration.

By storing excess energy during periods of low demand, the Project maximizes clean energy utilization, avoids curtailment, and supports decarbonization efforts. With regulatory processes well underway and extensive technical and environmental studies conducted, the Project's first phase, with 125 MW load and 320 MW generation, is on track for commercial operations by Q1 2028.

Solution mined salt caverns will be sized to provide a minimum of 48 hours of generation and will be located in the 200-meter-thick Lotsberg halite of the Elk Point Group at a depth of 1100 meters below the surface. The depth and thickness of the Lotsberg halite at the Marguerite Lake CAES project location provide perfect conditions for utilizing the Siemens Energy compressor and expander technology.



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The system provides energy and ancillary services, such as rotating inertia and black start capability, with low fuel consumption and a low and stable heat rate of 4067 kJ/kWh. Each phase consists of a 125 MW compressor capable of reaching full load in 4 minutes with 30% turndown and two 160 MW expanders capable of achieving full energy generation in 10 minutes with 90% turndown - which means each expander can provide from 16 to 160 MW to the grid.

Fast start-up times displace the need for new peaker plants while reducing CO_2 emissions per kilowatt-hour of electricity generated by 67% when compared to simple cycle combustion turbines. The CAES plant has a round trip efficiency of up to approximately 60% (power to power) and highly flexible operating modes, including simultaneous charging and discharging (with storage bypassed the system efficiency is 5% higher than traditional peaker plants).

The Marguerite Lake CAES Project's potential for hydrogen co-firing and carbon capture and storage further solidifies its role in driving decarbonization efforts. With no CO_2 emissions during operation with H_2 and an expected design life of 30+ years, the Project stands as an opportunity for sustainable energy transition.


Compressor train

Federation has partnered with Babcock & Wilcox (B&W) to deploy the innovative BrightLoop™ technology for hydrogen production. The BrightLoop™ technology utilizes an innovative chemical looping process to generate near-pure hydrogen and CO_2 streams, using various fuel feedstocks. The Marguerite Lake Project will utilize natural gas as the primary fuel for the BrightLoop™ facility.

The Project will start co-firing with 50% hydrogen by 2030 and achieve 100% by 2035, ultimately enabling net-zero electricity production by 2035. H_2 storage will be done on-site in salt caverns within the Prairie Evaporite. Close access to the Pathways Alliance Carbon Capture and Storage network will provide an efficient, cost-effective solution that captures over 99% of carbon emissions.

Expander trains

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