



NRStor Goderich CAES Market Rule Exemption Request Supporting Documentation

The NRStor Goderich compressed air energy storage (CAES) facility is the first of its kind in Ontario. Contracted by the IESO for energy storage services as a part of the 2015 Phase II Energy Storage Procurement, it was the only CAES facility awarded a contract. It was the first CAES facility to be built in Ontario and connected to the electrical grid, and one of the first contracted energy storage facilities overall, only preceded by the Alternative Technologies for Regulation (ATR) and Energy Storage Phase I projects. As a result, there have been a multitude of “firsts” that the development team have encountered along the way, and as an early pioneer navigating all the connection and registration processes, we would like to request an exemption to the proposed Interim Market Rule coming into effect for energy storage facilities connected to the IESO-controlled electrical grid regarding registration: **Chapter 7, Section 21.2.4b**

21.2.4 An *electricity storage participant* wishing to register an *electricity storage facility* as a dispatchable *electricity storage facility*, in addition to the requirements for market registration outlined elsewhere in the *market rules* pertaining to the facility types referenced below, shall:

21.2.4a register all *electricity storage units* associated with that *electricity storage facility* as dispatchable *generation units* to inject electricity;

21.2.4b register all *electricity storage units* associated with the same *electricity storage facility* as *dispatchable loads* to withdraw electricity;

Reasoning for the exemption request is presented below.

Facility Pre-Dates Interim Rules

The NRStor Goderich CAES facility was developed, constructed, connected, registered, and commissioned all prior to the knowledge of any Interim Market Rule changes that could result in a different required setup. Key facility dates:

Interconnection request submitted (CIA):	8 March 2017
CIA passed and DTCA received:	21 April 2017
Start of construction:	17 October 2017
Registration process initiated:	14 February 2018
SIA and NOCA issued:	31 January 2019
IESO registration approval:	22 October 2019
End construction, begin commissioning:	1 August 2019
Commercial operation date:	1 August 2020



As a part of the business case used to build the initial bid for the 2015 procurement, we built in three separate revenue streams: contract revenue from the IESO Energy Storage Facility Agreement, arbitrage revenue from real-time HOEP prices, and operating reserve (OR) revenue from offering OR services during periods when not actively charging or discharging. It has been the assumption that all three of these revenue streams will remain achievable in order for the project's business case to remain solvent, as this was allowed by the Market Rules in place and supported by IESO staff at the time the project was bid.

IESO Advice

To be able to provide OR, the facility must be registered as Dispatchable. The NRStor development team worked closely with the IESO registration team in a highly collaborative manner to ensure the facility was registered properly, and followed all the IESO recommendations and proper procedures to complete registration. The IESO recommended to NRStor to only register the generation as dispatchable and not the load. NRStor followed this recommendation.

As part of this collaboration, IESO provided the NRStor team with the Draft Energy Storage Operating Reserve Instructions, dated September 2018. The document was reviewed and discussed with IESO in the fall of 2018 in parallel with the SIA process. The registration decisions were made with an understanding of OR obligations that aligns with the draft market rules, including restrictions on the charging required to provide OR on the injection side.

While the process was collaborative and effective, from start to finish the registration process took 20 months of back and forth between the IESO and NRStor. The quantity of information exchanged, the effort and time invested by both parties, and the investment required to achieve a successful registration was significant. Re-registering this facility would be highly burdensome for both parties.

Project Economics

The energy storage Contract we have for the facility requires the facility to discharge during times of high electricity prices (during the day) and to charge during times of low electricity prices (at night). As it is only economic to provide OR during periods of high OR prices, we only wished to register the CAES facility as dispatchable for discharge. Providing OR as a load during times of very low prices (when we will be charging) is not economic. A storage facility cannot make enough money from load OR at night to cover the costs of adding an additional operator that would be required to manage the facility.

Therefore, there is no economic benefit for our energy storage facility to provide OR services as a load, and forcing the facility to register as dispatchable on load only causes ongoing operational complexity, thereby significantly affecting project economics.

Conversely, if the project were to register as fully self-scheduling, one of the key revenue streams for the facility, OR from generation, would be removed.

Ratepayer Benefit

There is extra effort needed to switch from a self-scheduling to a dispatchable load both from the IESO and from NRStor, both for the initial set up as well as continued dispatch management. Re-registering this small 1.75MW facility would be creating unnecessary and non-beneficial work both for the team at the IESO as well as NRStor.



Extending from the initial re-registration, there would also be continued non-beneficial operational complexity caused daily from the IESO and NRStor teams, significantly impacting our project economics. In self-scheduling mode, NRStor can simply decide when the optimal hours are to charge the system, and adjust accordingly based on a multitude of factors: electricity price, facility state of charge, facility energy balance, and facility maintenance, among others. The operation of a CAES facility and the determination of state of charge is substantially more complex than other energy storage devices such as batteries. The state of charge (SOC) is dependant on highly variable factors such as ambient temperature, ambient humidity, and time between charges and discharges, among others.

Predicting exactly how long each system discharge and recharge will take to get the facility to and from 100% state of charge is not possible. To account for this on discharge, we build in a buffer into the system to ensure that we will always have enough energy to fully complete the discharge that is offered, whether for OR or for energy. This means that each recharge each night will be slightly different in length based on the complex variables listed above. It is important that the facility is able to recharge fully each night in preparation for contract operation and OR during peak hours, but precisely how much time it takes to return to 100% state of charge cannot be accurately offered into the dispatchable market. This would mean that instead of allowing the facility to shut itself off when 100% SOC is achieved, NRStor Goderich CAES would need to employ an additional staff person to actively monitor and manage the dispatch, submitting outage slips potentially on a daily basis. This is not part of our business case. It would also result in additional exposure and uncertainty on dispatch given the factors described above. The combination of these factors significantly impair the financial business case upon which the facility was built.

Because the timing of charge is not solely based on price, a dispatchable setup is not optimal and would result in additional time, effort, and work from the NRStor schedulers as well as the IESO dispatchers, resulting in a negative outcome for ratepayers, particularly for a facility that is small enough to be well within the market dead band.

Summary

As laid out above, the requested exemption would not negatively affect grid reliability in any way nor would it restrict non-discriminatory access to the grid. It would increase operational efficiency, decrease costs to NRStor as a market participant, and decrease costs to the IESO in the form of administrative burden.

Because of all these factors, we at NRStor believe it is in the best interest of the CAES facility, the IESO, and Ontario ratepayers to provide an exemption for the interim energy storage Market Rules.

Sincerely,

A handwritten signature in black ink, appearing to read "Curtis VanWalleghem", written in a cursive style.

Curtis VanWalleghem

President

NRStor Goderich CAES L.P.