

Project Connection Assessment

P2845 Marguerite Lake Compressed Air Energy Storage Project

Cache Power Corp.

Date: August 26, 2026

Version: V2

Classification: Public

Role	Name	Date	Signature
Prepared	Ehsan Abbasi, P. Eng.		
Reviewed	Yasaman Mozafari Jovein, P. Eng.		
Approved	Nima Safari, P. Eng.		

1 Introduction

This Project Connection Assessment evaluates the connection alternatives using the study results and other considerations, and identifies the AESO's preferred connection alternative for the approved Marguerite Lake Compressed Air Energy Storage Project (the Facility) which includes the Osbourne Creek 1146S substation.¹ The conclusions in this report are based on the documents listed below which were prepared by the AESO in accordance with the AESO's Cluster Assessment Process:

- Detailed Assessment Report titled "Detailed Assessment Report Central Cluster" dated May 26, 2025, Version 3.
- Detailed Re-Assessment Study Scope titled "Detailed Re-Assessment Study Scope Central Cluster" dated May 14, 2025, Version 1.

1.1 Overview

Cache Power Corp. (Market Participant) has submitted a request for system access service to the AESO to connect its approved Facility to the Alberta Interconnected Electric System (AIES). The Market Participant's request includes: a request for a new system access service in the area, with a Rate STS, *Supply Transmission Service*, contract capacity of 320 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 125 MW; and a request for transmission development (collectively, the Project). The scheduled in-service date (ISD) for the Project is March 31, 2029.

The Project was studied as part of the Central Cluster, which includes the Vegreville (Area 56), Lloydminster (Area 13), Wainwright (Area 32), Provost (Area 37), Alliance/Battle River (Area 36), Hanna (Area 42), Red Deer (Area 35), Didsbury (Area 39), Caroline (Area 38), Drayton Valley (Area 30), Hinton/Edson (Area 29), Abraham Lake (Area 34), and Cold Lake (Area 28) AESO planning areas. A total of 18 new generation and energy storage projects were studied as part of the Central cluster.

Power flow and short circuit studies were performed in the assessment for both the pre-Cluster and post-Cluster scenarios. Transient stability studies were performed for only the post-Cluster high generation scenarios and voltage stability studies were performed for only the post-Cluster low generation scenarios.

2 Connection Alternatives

The AESO, in consultation with the Transmission Facility Owner (TFO) in the Study Area and the Market Participant (MP), examined 5 transmission alternatives to meet the MP's request for system access service for the Project.

¹ Decision 30276-D01-2025 Marguerite Lake Compressed Air Energy Storage Project Approvals Transfer, Proceeding 30276, Applications 30276-A001, September 26, 2025.

2.1 Connection Alternatives Examined

Below is a description of the developments associated with the transmission alternatives that were examined for the Project.

Alternative 1 – Radial connection to the existing 240 kV Marguerite Lake 826S substation

This alternative includes the following developments:

- Add one 240 kV circuit, approximately 0.8 km² in length, to connect the Facility to the existing Marguerite Lake 826S substation using a radial configuration;
- Modify Marguerite Lake 826S substation, including adding one 240 kV circuit breaker; and
- Add or modify associated equipment as required for the above transmission developments.

Alternative 2a – T-tap connection to the existing 240 kV transmission line 9L36

This alternative includes the following developments:

- Add one 240 kV circuit, approximately 1 km³ in length, to connect the Facility to the existing 240 kV transmission line 9L36 (between Marguerite Lake 826S and Whitefish Lake 825S) using a T-tap configuration, which would require crossing the 240 kV transmission line 9L37; and
- Add or modify associated equipment as required for the above transmission developments.

Alternative 2b – In-and-out connection to the existing 240 kV transmission line 9L36

This alternative includes the following developments:

- Add one 240 kV switching substation, including three 240 kV circuit breakers, connected to the existing 240 kV transmission line 9L36 (between Marguerite Lake 826S and Whitefish Lake 825S) using an in-and-out configuration, which would require crossing the 240 kV transmission line 9L37;
- Add one 240 kV circuit, approximately 1 km⁴ in length, to connect the Facility to the proposed switching substation; and
- Add or modify associated equipment as required for the above transmission developments.

Alternative 3a – T-tap connection to the existing 240 kV transmission line 9L37

This alternative includes the following developments:

- Add one 240 kV circuit, approximately 1 km⁵ in length, to connect the Facility to the existing 240 kV transmission line 9L37 (between Marguerite Lake 826S and Whitefish Lake 825S) using a T-tap configuration; and
- Add or modify associated equipment as required for the above transmission developments.

² Exact line length to be determined by the TFO.

³ Exact line length to be determined by the TFO.

⁴ Exact line length to be determined by the TFO.

⁵ Exact line length to be determined by the TFO.

Alternative 3b – In-and-out connection to the existing 240 kV transmission line 9L37

This alternative includes the following developments:

- Add one 240 kV switching substation, including three 240 kV circuit breakers, connected to the existing 240 kV transmission line 9L37 (between Marguerite Lake 826S and Whitefish Lake 825S) using an in-and-out configuration;
- Add one 240 kV circuit, approximately 1 km⁶ in length, to connect the Facility to the proposed switching substation; and
- Add or modify associated equipment as required for the above transmission developments

2.2 Connection Alternatives Not Selected

Alternatives 2a, 2b and 3b require more transmission development and hence are more costly compared to Alternative 1. Therefore, Alternatives 2a, 2b, and 3b are ruled out.

Alternative 3a would utilize a T-tap location situated immediately outside the Marguerite Lake 826S substation on the 240 kV transmission line 9L37. Connecting via T-tap would expose the Facility to outages for any faults along the transmission line 9L37. Alternative 1 would have comparable transmission scope and cost to Alternative 3a, but as it utilizes a radial connection to the Marguerite Lake 826S substation there is improved reliability. Therefore, Alternative 3a is ruled out.

2.3 Selection of Preferred Alternative

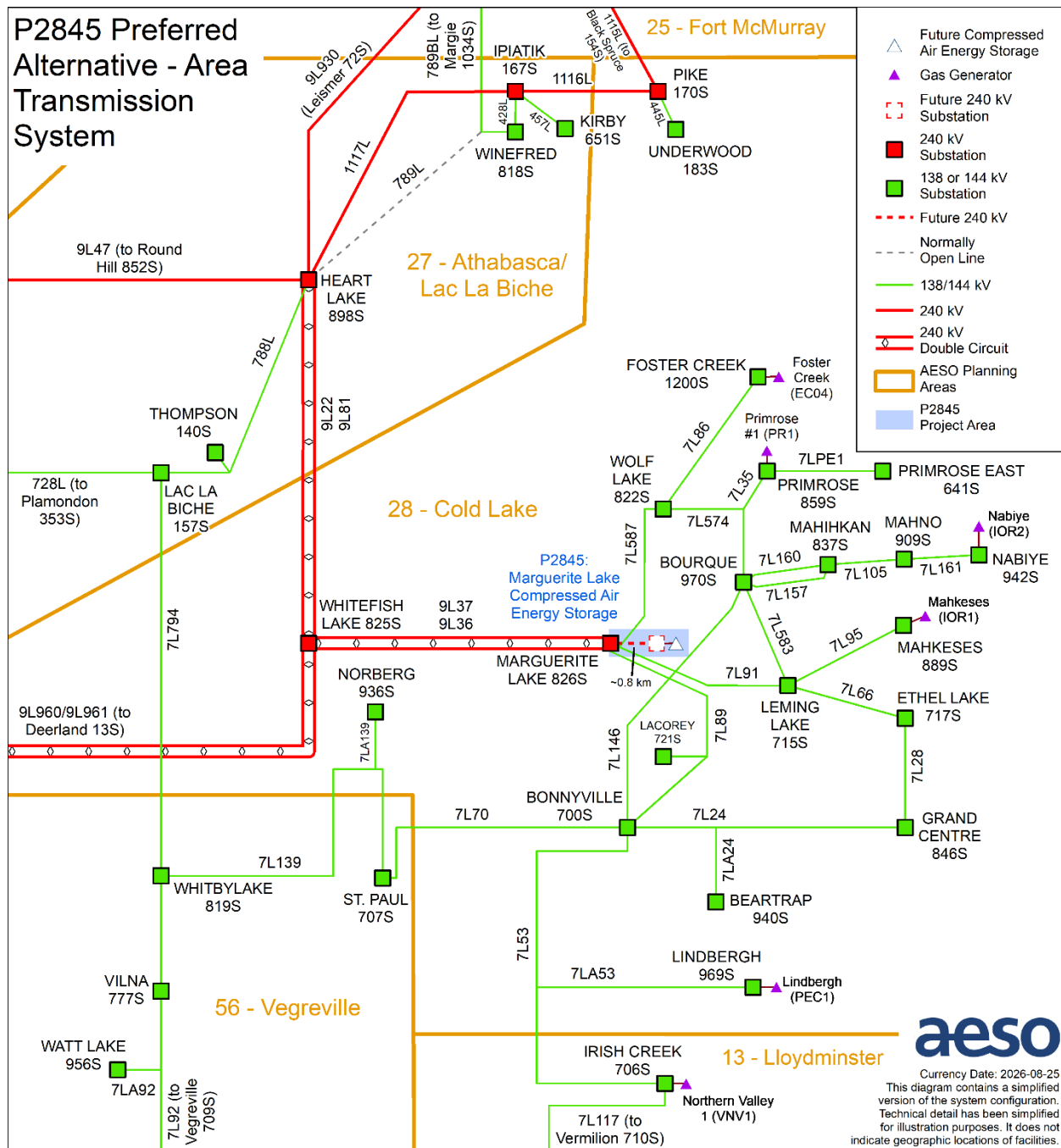
The AESO selected Alternative 1 as the preferred connection Alternative to respond to the Market Participant's request for system access service.

The conductor used for the 240 kV circuit should have a minimum thermal rating of 356 MVA to accommodate the MP's requested STS contract capacity. The 240 kV circuit shall be strung on double circuit structures to accommodate the connection of the second phase of the Facility (AESO Project P3046 Marguerite Lake Compressed Air Phase 2).

The proposed connection configuration for this alternative is shown in Figure 2-1.

⁶ Exact line length to be determined by the TFO.

Figure 2-1: Preferred Connection Alternative



2.4 Summary of Cluster Study Results for Alternative 1

This section summarizes the results of the detailed cluster assessment, which is included under separate cover. The study results are based on the forecast, as well as the planned projects (load and generation) that are included in the studies.⁷

Category A Conditions

The pre-Cluster and post-Cluster power flow studies identified a number of thermal criteria violations under Category A conditions in the STS scenario. All of the thermal criteria violations observed were exacerbated in the post-Cluster scenarios compared to the pre-Cluster scenarios. No Category A violations were observed in the DTS scenario.

Post-cluster maximum short-circuit fault levels were not significantly higher than pre-cluster levels and found to be within the typical capabilities of the facilities.

Category B Conditions

The pre-Cluster and post-Cluster power flow studies identified a number of thermal violations under Category B condition for both STS and DTS Scenarios. All of the thermal criteria violations observed were exacerbated in the post-Cluster scenarios compared to the pre-Cluster scenarios. The post-cluster transient stability study results showed transient stability violations under following the loss of 240 kV transmission lines 9L24, 9L29, and 953L.

Mitigation Measures

The most effective generators in the study area were dispatched down to alleviate the thermal criteria violations observed under Category A system conditions.

The Category A violations will be mitigated using real-time operational practices, which include applying the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (the TCM Rule), to curtail generation as required. The need for system developments to address Category A violations will be assessed according to the forthcoming Optimal Transmission Planning (OTP) framework.

Thermal criteria violations under Category B can be mitigated using existing, planned and/or new RASs⁸ in the study area and real-time operational practices, alone or in combination, as appropriate. The transient stability concerns were mitigated by new transient stability RASs for 9L29 and 9L24 and reducing fault clearing times for 953L; none of these transient mitigation measures involve the Project.

The Constraint Summary Table in the Detailed Assessment Report describes the mitigation measures in more detail. At this time, no RASs have been identified in the Functional Specification for the Project. Connecting the Project with the preferred connection alternative does not adversely affect the performance of the AIES.

⁷ As other projects move through the AESO Connection Process, the AESO may conduct additional studies for the Project to determine if new mitigation measures or modifications to the initial mitigation measures specified in the Functional Specification are required. Such mitigation measures, if feasible and required, must be implemented by the in-service date of the Project. The AESO will discuss any proposed changes and/or additions with the market participant and the TFO prior to specifying new or modified mitigation measures.

⁸ No new RAS assigned to P2845