

Technical Feasibility of Compressed Air Energy Storage (CAES) Utilizing a Porous Rock Reservoir

Final Report Appendix — Chapter 4

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Abstract

Pacific Gas & Electric Company (PG&E) conducted a project to explore the viability of underground compressed air energy storage (CAES) technology.

CAES uses low-cost, off-peak electricity to compress air into a storage system in an underground space such as a rock formation or salt cavern. When electricity is needed, the air is withdrawn and used to drive a generator for electricity production.

The project screened potential sites in California and selected two locations: King Island, near Stockton, and East Island in San Joaquin County. All necessary rights were acquired at both sites to conduct tests and develop a CAES facility. Core drilling provided information on reservoir rock properties, caprock properties, reservoir pressure, and reservoir fluid. Results found the conditions at the King Island site to be more favorable than East Island. Air injection testing at King Island produced data on flow dynamics, rock mechanics, and other factors. Finally, the project team developed a conceptual engineering design for a CAES facility and reservoir infrastructure, and analyzed the environmental impacts and permitting requirements.

To determine the interest and qualifications of potential third parties, the project issued a Request for Offer (RFO), which required applicants to describe their technical qualifications to develop, construct, own, operate, and maintain a CAES facility at the King Island site, and to estimate their costs for participation in the project. Offers were received, but the best offer was not economically competitive with alternative storage technologies.

The project demonstrated the technical feasibility of using an abandoned natural gas reservoir for storing high-pressure compressed air for a 300-MW-by-10-hour CAES facility. The reservoir at the King Island site was shown to be capable of accommodating the flow rates and pressures necessary for the operation of the facility. However, the estimated high cost of a CAES facility will have to be addressed in the context of the cost of alternative energy storage technologies.

Chapter 4 Attachment

A401: SmartCAES Suggested General Arrangement

