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State of California **California Natural Resources Agency**

M e m o r a n d u m

To: Commissioner Andrew McAllister, Presiding Member
Commissioner Noemi Gallardo, Associate Member

Date: August 9, 2024

From: **California Energy Commission**
715 P Street
Sacramento, CA 95814-5512

Leonidas Payne
Project Manager
(916) 838-2124

Subject: ISSUES IDENTIFICATION STATEMENT AND PROPOSED SCHEDULE FOR THE WILLOW ROCK ENERGY STORAGE CENTER (21-AFC-02)

In its *Order Terminating the Suspension of the Willow Rock Energy Storage Center Proceeding 21-AFC-02* filed July 26, 2024 (TN 258022), the Willow Rock Energy Storage Center Committee ordered California Energy Commission (CEC) staff to file no later than August 9, 2022, "an Issues Identification Statement summarizing the major issues presented by the SAFC [Supplemental Application for Certification] for the reconfigured and relocated Willow Rock project" and further clarified that the Issues Identification Statement "shall also include a proposed schedule for the following pre-hearing and evidentiary events and include a certification that the parties met and conferred regarding the proposed schedule."

Project Description

The Willow Rock Energy Storage Center (WRESC) is a proposed compressed air storage energy storage facility by Gem A-CAES LLC (applicant), a wholly owned subsidiary of Hydrostor, Inc. On December 3, 2021, the applicant filed its original Application for Certification (AFC) for the project located at 8684 Sweetser Road in Rosamond, Kern County. In March 2024, the applicant filed a Supplemental AFC for the project, changing the location to 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated Kern County, California, approximately 4 miles north of Rosamond, California. The new project site is on undeveloped land in an area zoned Limited Agriculture (A-1) District. The area surrounding the project boundary is largely undeveloped with very sparse residential development; the nearest residence is approximately 0.8 mile northwest of the northwest corner of the WRESC site.

WRESC would be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s proprietary, advanced compressed air energy storage (A-CAES) technology. The overall facility would consist of four nominal 130 MW (gross) power turbine trains, outputting a total of 500 MW net at the point of interconnection. Each train would contain an electric

motor-driven air compressor drivetrain, heat exchangers, an air turbine generator, air exhaust stacks, and ancillary equipment. Each train would share a common set of thermal storage tanks (hot and cold water), as well as the air storage cavern. The WRESC would interconnect to Southern California Edison's Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line.

Staff Discovery Efforts

Staff commenced its renewed discovery efforts immediately following the Executive Director's recommendation (TN 257763, docketed July 16, 2024) that the supplemental application be considered complete. Staff filed Data Request Set 1 on July 26, 2024, which included data requests covering the following technical areas: Alternatives, Cultural and Tribal Cultural Resources, and Socioeconomics. Staff has also started drafting additional data requests which will cover additional technical areas.

Issues Identification

Based on staff's analysis of the project as it is presently described in the applicant's supplemental application materials filed in the docket, staff would like to draw the Committee's attention to potential issues in the technical areas of Biological Resources, Cultural and Tribal Cultural Resources, Power Plant Reliability, and Water Resources that could significantly affect staff's schedule for preparing its Preliminary Staff Assessment (PSA). Given the status of the discovery effort, staff is unable to make definitive statements regarding the time required to gather all relevant information needed to assess all impacts of the project. Although the applicant filed a *Supplemental* AFC, the project has been relocated and reconfigured such that prior analysis and information is for the most part no longer relevant, except for in the most superficial facility concept sense of being a large energy storage facility using compressed air technology. For this reason, staff has not identified any facts that could support a determination that good cause exists to shorten the time allotted for data requests in title 20, California Code Regulations, section 1716. As requested, this issues statement identifies preliminarily known issues, including knowledge of numerous issues within the domain of the Regional Water Quality Control Board (RWQCB) with whom staff has begun coordination efforts.

Biological Resources

A total of 3,196 western Joshua trees are present throughout the entire project footprint (WSP 2024a and 2024b). Those on the project's gen-tie route are anticipated to be avoided. The vast majority (over 90 percent) of the western Joshua trees occur in the eastern area of the facility site which includes the project's construction laydown/staging and parking areas (Figure 4, WSP 2024a). A large percentage are

anticipated to be removed while a portion, 325 or more trees, would be relocated (WSP 2024c).

If a Western Joshua Tree Relocation Plan (Plan) is required for this project, it must be approved by California Department of Fish and Wildlife (CDFW) and California Energy Commission staff prior to CDFW providing incidental take permit language for inclusion as a condition of certification to staff's Preliminary Staff Assessment. In addition, this Plan must include proposed parcels for relocation of western Joshua trees.

References Cited

WSP 2024a – WSP USA Inc. (TN254820). WRESC Western Joshua Tree Report 1 of 2. March 2024. Available online at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=254820&DocumentContentId=90468

WSP 2024b – WSP USA Inc. (TN254816). WRESC Biological Resources Assessment Report. March 2024. Available online at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=254816&DocumentContentId=90465

WSP 2024c – WSP USA Inc. (TN254806). Willow Rock Energy Storage Center SAFC Volume 1, Part A. March 2024. Available online at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=254806&DocumentContentId=90427

Cultural Resources/Tribal Cultural Resources

There are substantial information gaps concerning cultural and tribal cultural resources that could delay the project schedule. The CEC staff have data requests concerning the cultural resources survey reported in the Supplemental AFC and confidential cultural resources technical report (WSP 2024a, 2024b). Specifically, significant portions of the project area and gen-tie routes have not been surveyed because property owners denied access to surveyors, and a substantial number of built environment resources were not described in the confidential cultural resources report or shown on the survey report maps. CEC staff has asked for additional survey data and other information in Data Request Set 1.

Pursuant to the CEC's Tribal Consultation Policy and the California Environmental Quality Act (CEQA), the CEC staff initiated consultation with California Native American tribes. While a query of the California Native American Heritage Commission's Sacred Lands Files has not identified the presence of tribal cultural resources documented in the Project Area of Analysis, tribal consultation could result in the identification of significant tribal cultural resources.

Several archaeological resources within the project area were not evaluated in the confidential cultural resources assessment. The applicant developed a Cultural Resources Testing Plan to satisfy the CEC staff's data adequacy requests associated with the project application and to evaluate sites subject to potential impact for significance under CEQA (WSP 2024c).

The applicant has determined that potential impacts to the 11 as-yet-unevaluated archaeological resources within the WRESC facility footprint and along the preferred gen-tie route can be minimized but cannot be avoided fully through project redesign (WSP 2024c, p. 1). Thus, the project could encounter challenges should the archaeological investigation conclude that one or more archaeological resources are significant under CEQA. Without complete baseline data, staff cannot definitively say whether project impacts are significant or can be mitigated to a less than significant level.

References Cited

WSP 2024a – WSP USA Inc. (TN 254806). Willow Rock Energy Storage Center SAFC Volume 1, Part A. March 2024. Available online at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=21-AFC-02

WSP 2024b – WSP USA Inc. Cultural Resources Assessment of Willow Rock Energy Storage Center (WRESC) Advanced Compressed Air Energy System (A-CAES) Project. March 1, 2024. Confidential filing.

WSP 2024c – WSP USA Inc. (TN 257813). Willow Rock Energy Storage Center Cultural Resources Phase II Testing Plan. Confidential filing. June 17, 2024

Power Plant Reliability

Power plant systems must be able to operate for extended periods without shutting down for maintenance or repairs and must achieve an availability factor similar to existing power plant facilities in the California electricity grid system. The applicant has not provided adequate information regarding the operational reliability of the proposed WRESC.

The project would produce a total of 520 MW of electricity, with a discharge time of 8 hours. The project would excavate a large underground cavern, approximately 2,500 feet below ground surface, with an approximate volume of 900,000 cubic yards to store compressed air. Storage pressure would be between 870 to 1,100 psig (Section 2.1.11, WSP 2024).

The WRESC would not be the first large scale CAES facility—there are historical operational data that supports the expectation that implementation of this technology again may be successful, but possibly with some operational challenges.

Two of the oldest operational CAES facilities are the Huntorf plant in Germany (1978) and the McIntosh plant in Alabama (1991). Huntorf has a capacity of 290 MW with a discharge time of approximately 2 hours, while McIntosh has a capacity of 110 MW with a discharge time of approximately 26 hours. Huntorf stores approximately 405,000 cubic yards of compressed air in two caverns, and McIntosh approximately 704,000 cubic yards in one cavern. Both plants cycle pressure between approximately 650 and 1,100 psig (Huntorf 2001, and CAES 2016). Both plants continue to provide grid support and balance renewable energy sources.

While these CAES facilities have operated for a long time, they have faced some operational and maintenance challenges. These challenges include corrosion issues with the steel piping systems, maintenance challenges associated with the single-cavern facility, and inspection issues due to the large diameter of the outermost cemented casing in the wellbore.

The Huntorf plant faced shutdowns due to severe corrosion of the steel piping causing rust particles to clog the air filter upstream of the gas turbine. These issues were mitigated by replacing steel piping with fiber-reinforced plastic (FRP) piping (Huntorf 2001).

Furthermore, the decision to construct two independent caverns has proven beneficial in the Huntorf plant, allowing one cavern to remain operational during maintenance of the other. Inspection difficulties due to the large diameter of the outermost cemented casing required specialized tools for accurate corrosion detection. Effective monitoring and corrosion prevention are essential to maintaining the wellbore's structural integrity in a high-pressure environment.

In 2022, a province in China began commissioning the first of three large-scale CAES power plants. As of 2024, all three have been commissioned totaling approximately 460 MW and 2,400 MWh of capacity. These plants are: 1) a 300 MW/1,800 MWh CAES facility in Feicheng, China's Shandong province (PV 2024); 2) a 100 MW/400 MWh CAES facility in Zhangiakou, China's Hebei province (PV 2022) and 3) a 60 MW/300 MWh CAES facility in Changzhou, China's Jiangsu province (PV 2022a). These plants have faced technical issues that could impact their operational reliability. These issues include procuring a compressor/turbine designed for cyclical loading (high pressure cycles and/or changes in pressure), encountering corrosion in piping materials, and maintenance challenges related to having only a single air-storage cavern.

A power plant must be available to serve the electricity grid when needed, without frequent shutdowns and operational failure. The CAES technology is new to California and staff is concerned that Willow Rock may not be able to achieve

an availability factor similar to the existing power plants in the California electricity grid system.

This potential issue calls for further exploration before staff can properly evaluate the project's projected operational reliability, and staff intends to issue Data Requests in future sets to seek relevant information. The applicant should identify and resolve any technical/operational issues related to the CAES technology, including any lessons learned from Hydrostor's existing projects, that could otherwise hinder reliable operation of WRESC throughout its projected life span. Without adequately addressing this issue, staff would not be able to properly evaluate the project's projected operational reliability.

References Cited

CAES 2016 – A review on compressed air energy storage: Basic principles, past milestones and recent developments. Dated March 7, 2016. Accessed online at: https://www.sciencedirect.com/science/article/abs/pii/S0306261916302641

Huntorf 2001 – Huntorf CAES: More than 20 years of successful operation. Dated April 18, 2001. Accessed online at: http://www.fze.uni-saarland.de/AKE_Archiv/AKE2003H/AKE2003H_Vortraege/AKE2003H03c_Crotogino_ea_HuntorfCAES_CompressedAirEnergyStorage.pdf

PV 2024 – PV Magazine (2024). World's largest compressed air energy storage project comes online in China. Dated May 16, 2024. Accessed online at: https://www.pv-magazine.com/2024/05/16/worlds-largest-compressed-air-energy-storage-project-comes-online-in-china/

PV 2022 – PV Magazine (2022). World's largest compressed air energy storage project comes online in China. Dated October 6, 2022. Accessed online at: https://www.pv-magazine.com/2022/10/06/worlds-largest-compressed-air-energy-storage-project-goes-online-in-china/

PV 2022a – PV Magazine (2022). China's first salt cavern for compressed air energy storage goes online. Dated May 30, 2022. Accessed online at: https://www.pv-magazine.com/2022/05/30/chinas-first-salt-cavern-for-compressed-air-energy-storage-comes-online/

WSP 2024 – WSP (TN 254806). Willow Rock Energy Storage Center SAFC, Volume 1, Part A, dated March 1, 2024. Accessed online at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=21-AFC-02

Water Resources

Staff has identified two issues related to Water Resources, specifically dealing with permitting requirements for waste discharge.

The first issue relates to the handling of brine reject from the reverse osmosis system. The Supplemental AFC states brine waste is proposed to be evaporated in a zero-discharge, lined, evaporation pond. The Supplemental AFC also states that there will be no waste discharge to the ground during the construction or operation phases and that a permit is not anticipated. A water balance diagram provided indicates an estimated discharge of 20,000 gallons per year (55 gallons per day) to the evaporation pond. (WSP 2024b). During Data Adequacy, staff requested the applicant resolve the perceived inconsistency related to the stated process of a proposed zero waste discharge and discharge to the pond. In response, the applicant reiterated that there would be no waste discharge (TN256622). Based on past experience, whenever wastewater is discharged to a surface pond, Waste Discharge Requirements would need to be issued by the RWQCB to regulate the discharge. RWQCB staff informed staff that a Report of Waste Discharge is required for land disposal regulated under California Code of Regulations, Title 27, and indicated a 401 Water Quality Certification application would be required. (TN 257954)

The second issue relates to permitting requirements related to the Underground Injection Control (UIC) Program, specifically dealing with the classification of the underground compressed air storage cavern. Well class is based on the type and depth of the injection activity and the potential for that injection activity to result in endangerment of an underground source of drinking water. The Supplemental AFC indicates that potential classification may preclude UIC permitting by U.S. Environmental Protection Agency (EPA), but that underground injection is regulated by the RWQCB because it has a potential to impact the quality of the underlying groundwater. The applicant indicated that they expect to be able to provide supplemental information to U.S. EPA to support a determination of non-applicability. (WSP 2024b).

For both issues, the applicant did not submit copies of any preliminary correspondence between the project applicant and state and federal resource agencies regarding whether federal or state permits from those agencies would be required for the proposed project.

In a preliminary discussion, RWQCB staff said they were unaware if the applicant had provided preliminary correspondence, and they had not reviewed the project in sufficient detail to render an opinion regarding permit applicability.

An email from RWQCB staff (TN forthcoming upon docketing) confirmed that an application for the land disposal unit is required. In addition, the Board identified multiple issues in which additional information is required before Board staff can determine if other permit applications are required including waste characterization, water process diagrams, dewatering waste handling, and other various reports and information.

References Cited

WSP 2024b – WSP USA Inc. (TN 254805). Willow Rock Energy Storage Center SAFC Volume 1, Part B. March 2024. Available online at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=21-AFC-02

TN 256622 – WSP USA Inc. (TN 256622). Willow Rock Data Adequacy Response

TN 257954 – RWQCB (TN 257954). Email from Lahontan Water Board re 401 Water Quality Certification Application

TN x – RWQCB (TN x). Lahontan Water Board Staff review and comments

Project Schedule

The Committee should not order a change to the traditional 6-month discovery period because the project is 7 miles from original site, which means that information gathered on the prior application does not necessarily give staff a head start on its analysis.

Staff recommends staggered status reports so that staff and any intervenors can digest and comment upon the information included in applicant's status reports. This allows the committee the benefit of staff's objective evaluation of applicant's information. Staff recommends that staff and intervenor status reports be due 5 working days following the "on or before the 26th" deadline given to applicant.

Staff proposes the following schedule:

Executive Director data completeness memo (complete)	7/16/2024
Data Request Set 1 filed (complete)	7/26/2024
Meet and Confer (complete)	8/2/2024
Issue ID Statement and Proposed Schedule	8/9/2024
Data Request Set 2 filed	anticipated week of 8/12-15/2024
Applicant Responses to Data Request Set 1 due	8/26/2024
All Parties File Status Reports	8/26/2024
Info Hearing and Site Visit	9/3-5/2024
Applicant Responses to Data Request Set 2 due	DR Set 2 +30
Applicant Status Report 2	on or before 26th of each month (to repeat in successive months)

Staff and Intervenor Status Report 2	deadline for Applicant Status Report + 5 working days (to repeat in successive months)
Staff receives all Agency recommendations	on or before 1/13/2025
End of Discovery (unless motion filed to extend)	1/13/2025
Preliminary Staff Assessment (PSA) publication	60 days following receipt of complete and satisfactory responses to all Staff Data Requests (on or before March 10, 2025)
Deadline to intervene	PSA +15*
Deadline for agency/public comments on Staff's PSA	PSA + 30
Written questions from Committee (if any)	on or before PSA commenting deadline
Applicant and Intervenor responses to Committee questions (if sent by Committee)	Qs + 30
Staff files Final Staff Assessment (FSA) including responses to agency/public comments on PSA and response to Committee questions (if sent by Committee)	PSA commenting deadline + 60
Evidentiary hearing (EH)	FSA + 15
Committee proposed decision	EH completion + 30
Commission Decision at Business Meeting	Prop. Dec. + 30**

*By rule the deadline for intervention is 30 days prior to the commencement of Evidentiary Hearings. However, staff recommends that the Committee set an earlier deadline to facilitate substantive participation by intervening parties in the PSA commenting stage.

**The PMPD comment period (30 days) cannot end on the day of the Business Meeting. Also, if committee has to issue a revised PMPD it must be available for a 15-day comment period before being considered at a Business Meeting.

Certification of Meet and Confer

Staff certifies that it met and conferred with the parties to discuss the proposed schedule on Friday August 2, 2024.