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Document Title:	Petition to Amend to Increase the Output of Previously Approved Battery Energy Storage System
Description:	Ok to file per George Piantka
Filer:	Patty Paul
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Marsh Landing LLC
Marsh Landing Generating Station
3201-C Wilbur Avenue
P.O. Box 1687

March 3, 2021

Mr. Keith Winstead
Planner III/Compliance Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Subject: **Marsh Landing Generating Station, Docket No. 08-AFC-3C**
Petition to Amend, Black Start Capability Enhancement
Battery Energy Storage System Capacity and Output Increase

Dear Mr. Winstead:

Please find enclosed Marsh Landing LLC's (Marsh Landing) Petition to Amend (PTA) to increase the output of the previously approved Battery Energy Storage System (BESS) described in the Black Start Capability Enhancement PTA, approved by the Commission on March 12, 2019. The capacity and output increase (i.e., BESS Capacity and Output Increase PTA) is necessary, because the battery manufacturer has changed from LG Chem to CATL. Fluence, the Battery Integrator, has upgraded the battery design to its newest 6th Generation configuration referred to as the Gridstack™, which includes the latest logic, controls and safety features. The new BESS will have a capacity of 11.5 megawatts (MW) and an output of 10.5 MW-hour (MWh), an increase from the original capacity of 7MW and output of 3.6 MWh in the approved Black Start Capability Enhancement PTA and the subsequent nominal change in the battery output from 3.6 MWh to 5.48 MWh approved by CEC Staff in February 2020.

This PTA focuses on changes to project description, which includes the change in BESS manufacturer and corresponding capacity and output of the BESS, and refinement of the BESS layout to accommodate the Fluence Gridstack™ technology, which includes CATL's lithium ferrous phosphate (LFP) battery chemistry. The project description change will not affect the Conditions of Certification that were incorporated into the Marsh Landing Generating Station license (No. 08-AFC-3C) with the approval of the Black Start Capability Enhancement PTA, nor change the original Conditions or add additional Conditions of Certification. Marsh Landing will continue to following the existing Conditions pertaining to pre-construction, construction, commissioning, testing and operation of the BESS as analyzed in the Black Start Capability

Enhancement PTA and in the CEC's Staff Analysis of Petition to Amend to add Black Start Capability, dated February 8, 2019.

With the Commission's approval, Marsh Landing intends to install the BESS onto its foundation in early April 2021. Following the installation of the updated BESS, Marsh Landing will proceed with black start commissioning as outlined in the Air Quality Conditions and in the facility Permit to Operate.

We look forward to working with Compliance and Siting Divisions on this Petition. Please contact me at George.Piantka@nrg.com at (760) 707-6833, or Timothy Leavitt at timothy.leavitt@clearwayenergy.com if you have questions.

Sincerely,
On Behalf of Marsh Landing LLC

George L. Piantka, PE
Senior Director, Environmental

cc: John Heiser, CEC
Eric Knight, CEC
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Tim Leavitt, Clearway
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PETITION TO AMEND

MARSH LANDING GENERATING STATION
(08-AFC-3C)
BLACK START CAPABILITY - BATTERY ENERGY STORAGE SYSTEM (BESS) CAPACITY AND OUTPUT INCREASE

Marsh Landing LLC

Prepared by:

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3201-C Wilbur Avenue
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March 2021

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List of Acronyms and Abbreviations

AC	alternating current
AFC	Application for Certification
Ah	ampere hour
AUSD	Antioch Unified School District
BAAQMD	Bay Area Air Quality Management District
BESS	Battery Energy Storage System
BMP	best management practice
BMS	Battery Management System
CAISO	California Independent System Operator
CAS	Chemical Abstract Service
CCGS	Contra Costa Generating Station
CEC	California Energy Commission
CEMS	Continuous Emission Monitoring System
CH_4	methane
CO	carbon monoxide
COC	Condition of Certification
CPM	Compliance Project Manager
CTG	combustion turbine generator
cy	cubic yards
DC	direct current
DCS	distributed control system
EMS	energy management system
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FSNL	full-speed no-load
GHG	greenhouse gas
HVAC	heating, ventilation, and air conditioning
ISOCH	isochronous
kg	kilogram
kVA	kilovolt-ampere
kWh	kilowatt hours
lb/day	pounds per day
lb/hr	pounds per hour
LI	lithium ion
LORS	laws, ordinances, regulations, and standards
Marsh Landing	Marsh Landing LLC
MECL	minimum emission compliance load
MLGS	Marsh Landing Generating Station
mm	millimeter
MW	megawatt
MVA	mega volt amp
NAAQS	national ambient air quality standards
NO_X	nitrogen oxides
NO_2	nitrogen dioxide
OEM	original equipment manufacturer
PCS	power conversion system
PDC	power distribution center
PG&E	Pacific Gas and Electric Company
PM_{10}	particulate matter 10 microns or less in diameter
POC	precursor organic compounds
PTA	Petition to Amend
SDS	Safety Data Sheet
SO_X	sulfur oxides
SO_2	sulfur dioxide

SR	State Route
SWPPP	stormwater pollution prevention plan
V	volt

Executive Summary

Marsh Landing Generating Station (MLGS) is a 760-megawatt (MW) nominal electricity-generating facility, consisting of four Siemens simple-cycle natural-gas-fired combustion turbines, located at 3201-C Wilbur Avenue, Antioch, CA (Figures 1 and 2). Marsh Landing LLC (Marsh Landing) filed an Application for Certification (docket #08-AFC-03C) in 2008, originally planned as a combined cycle plant. Marsh Landing amended the AFC in 2010, converting the design to peaking plant, which was subsequently built and brought online in April 2013. In March 2019, Marsh received approval of its Petition to Amend (PTA) the California Energy Commission (CEC) license and Bay Area Air Quality Management District (BAAQMD) air permit to add black start capability through the installation of a battery energy storage system (BESS) in response to a California Independent System Operator (CAISO) agreement. Marsh Landing committed to connecting a BESS that would be capable of starting either Unit 3 or Unit 4, each 190 MW in the event of a CAISO declared grid event necessitating grid restoration support from MLGS.

Since March 2019, Marsh Landing received contract approvals for the BESS and further developed the black start capability enhancement project with CAISO, the load serving entity Pacific Gas & Electric (PG&E), battery manufacturer, BESS integrator, and the Engineering, Procurement and Construction (EPC) contractor. During the post-permit phase of the project development, Marsh Landing learned that (1) the original BESS manufacturer, LG Chem, could no longer meet the online schedule of July 2021 for black start capability, and (2) the LG Chem configuration (i.e., 7 MW/ 3.6 MW-hour [MWh]) in the approved project falls short in performance, capability and reliability as compared to the current generation of batteries available, hence CAISO and Marsh Landing mutually agreed that an improvement in battery capacity and output is necessary. This unanticipated turn in the project development led to Marsh Landing modifying the BESS configuration in coordination with its BESS integrator Fluence and its EPC contractor Siemens Consequently, Marsh Landing seeks an amendment of the March 2019 approval of the Black Start Capability Enhancement Project to change the Fluence Gridstack™ BESS with the Contemporary Amperex Technology Co., Limited (CATL) lithium ferrous phosphate (LFP) modules and to increase the BESS capacity and output to 11.5 MW/10.5 MWh, respectively. Marsh Landing has reviewed these changes with CAISO and the Delegate Chief Building Official.

The BESS Capacity and Output Increase PTA contains the information required under the CEC's Siting Regulations for post-certification project modifications (California Code of Regulations Title 20, Section 1769). This PTA, as summarized in Section 1, contains the information necessary for staff to determine that the project will not (a) significantly affect the environment, (b) cause a change or deletion of a Condition of Certification (COC), or (c) cause the project not to comply with applicable laws, ordinances, regulations, and standards.

Details of the proposed project description change are included in Section 2 of this PTA. The project changes are limited to the battery manufacturer and capacity/output and refinement of the BESS layout to accommodate the new BESS manufacturer and configuration. Marsh Landing has estimated that the construction schedule will decrease from 5 to 6 months to 4 to 5 months. The changes to the BESS capacity and output will not result in new sources of emissions, modify the operations of any of the existing emission sources, including Units 3 and 4 which will be connected to the BESS as originally planned, nor change any of the assumptions, analyses and associated permit conditions in either the license or MLGS Title V/Permit to Operate. The refinement of the BESS layout will increase the footprint of the foundation pad from approximately 70 feet (ft) x 80 ft to approximately 60 ft x 240 ft on which the battery modules and inverters will be installed. The project changes will not change the existing Conditions of Certification in the MLGS license, including the conditions upon which Marsh Landing will rely for pre-construction, construction, commissioning, testing and operations of the BESS, which were thoroughly discussed in the approved Black Start Capability Enhancement PTA.

The project change is an improvement to the originally approved Black Start Capability Enhancement PTA by increasing the BESS reliability through an increase in storage capacity for longer sustained power support for turbine startups and turbine turning gear operations and increase in output for delivery of peak voltage for inverter synchronization. The project change will also improve MLGS' operational safety. The CATL battery chemistry, moving to LFP from the standard lithium ion chemistry, is less susceptible to higher battery operating temperatures. Finally, the Fluence Gridstack™ BESS is a visual enhancement as compared to the cargo-container-type look of the LG Chem BESS. Appendix A includes the project layout of the LG Chem BESS. Appendix B includes the technology and safety overview with illustrations of the Fluence Gridstack™ BESS with the CATL modules.

A summary of the environmental resource areas is provided in Section 3 and in Table ES-1. Section 4 provides a discussion of the engineering assessment topics: facility design, power plant efficiency, power plant reliability, transmission system engineering, and transmission line safety and nuisance. With the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential environmental impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

Table ES-1
Environmental Analysis Summary: BESS Capacity/Output Change

Resource Area	Analysis
3.1 Air Quality	The increase in capacity and output of the BESS with the change in battery manufacturer from LG Chem to CATL will not change the Air Quality Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA, approved in March 2019. Commissioning, testing and black start operations of Units 3 and 4 will not change due to the project changes in this PTA. The increase in battery capacity and output is expected to increase the performance and reliability of the BESS in enabling Units 3 and 4 to respond to grid event necessitating black start capability. Refinement of the BESS layout which will change the dimensions of the BESS foundation. Conclusion - No impact.
3.2 Biological Resources	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Biological Resources Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The BESS will continue to be constructed in same general footprint. Pre-construction biological surveys will continue to be conducted as per the adopted project. The construction activities will not be near biological sensitive areas, i.e., not near the river or trees along the western property boundary. During construction, the project will comply with the existing COCs. Conclusion - No impact.
3.3 Cultural Resources	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Cultural Resources Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The BESS foundation will be constructed within previously disturbed areas of the MLGS property within the same general footprint of the original PTA. Conclusion - No Impact.
3.4 Geology and Paleontology	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Geology and Paleontology Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The BESS will be placed on engineered fill, and foundations will meet seismic requirements. The proposed modifications will require minimal ground-disturbing activities in previously disturbed areas of the MLGS property. Conclusion - No Impact.
3.5 Hazardous Materials	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Hazardous Materials Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The batteries will be delivered in accordance with United States Department of Transportation requirements. The MLGS Safety Data Sheets and Business Plan will be updated to incorporate the CATL battery modules. Conclusion - No impact.
3.6 Land Use	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Land Use Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The proposed modifications will not require any changes to land use. Conclusion - No impact.
3.7 Noise and Vibration	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Noise and Vibration Resources Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. Noise impacts associated with construction will be temporary and of short duration. The proposed modifications will continue to comply with existing noise and vibration COCs. Conclusion - No impact.
3.8 Public Health	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Public Health Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The BESS will incorporate safety features and be designed to industry standards. There will be no additional emission units added to MLGS. Black start operations will only be initiated during a grid event and for periodic BESS testing as required by CAISO and/or PG&E. Conclusion - No impact.
3.9 Socioeconomic Resources	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Socioeconomic Resources Staff Analysis nor Conditions of Certification adopted in the

	Black Start Capability Enhancement PTA. The analysis concluded that the proposed project would not induce substantial growth or concentration of population; induce substantial increases in demand for public service and utilities; displace a large number of people; disrupt or divide an established community; or result in disproportionate adverse effects on minority or low-income populations. Conclusion - No impact.
3.10 Soils and Water Resources	The increase in capacity and output of the BESS and refinement of the BESS layout will not significantly change the Soils and Water Resources Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. Excess soil from the original MLGS construction piled south of Unit 1 will be used in the site preparation and grading for BESS foundation construction. There will be minimal trenching for cable installation in previously disturbed areas. The refinement of the BESS layout will result in a change in the dimensions of the foundation pad from approximately 70ft x 80 ft to 60 ft x 240 ft. Soil underlying the BESS layout (up to 3 feet deep) will be assessed and engineered as needed to meet geotechnical design purposes. Soil management for grading and geotechnical purposes has been assumed for the Black Start Capability Enhancement PTA and is assumed for the project modifications. Marsh Landing will continue to adhere to the existing Conditions of Certification pertaining to Soils and Water Resources. Marsh Landing has prepared a Storm Water Pollution Prevention Plan (SWPPP) and obtained a Construction General Storm Water National Pollution Discharge Elimination System (NPDES) Permit for the construction activities (WDID# 5S07C392994). The project will fall under a Level 1 risk, lowest risk level. The proposed modifications will not require additional City of Antioch water and will not generate additional wastewater. The BESS site will be raised to match the MLGS ground elevation, so that the BESS will be outside the 1 percent and 0.2 percent annual flood hazard areas. Conclusion - No impact.
3.11 Traffic and Transportation	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Traffic and Transportation Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The proposed modifications will not require offsite staging, laydown, or parking. Traffic associated with deliveries of the BESS components or materials will be temporary and short in duration and will follow the approved route per the Commission Decision. Conclusion - No impact.
3.12 Visual Resources	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Visual Resources Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The proposed modifications will not substantially change the physical appearance of MLGS, as the BESS is significantly smaller than the predominant features (emission stack and combustion turbine power blocks) of MLGS. The Fluence Gridstack™ configuration with Fluence Cubes which will enclosure the battery racks and modules will be a visual improvement to the cargo-container style enclosures planned for the LG Chem BESS configuration. Conclusion - No impact.
3.13 Waste Management	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Waste Management Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. The proposed modifications are not expected to cause change to the level of waste production at the facility during plant operations, nor cause significant change to the site preparation and construction activities associated with the proposed modifications. The refinement of the BESS layout will increase the dimension of the foundation from approximately 70 ft x 80 ft to 60 ft x 220 ft and increase the soil management during preparation of the BESS layout for geotechnical design purposes, but the waste management associated impacts will continue to be less than significant. Conclusion - No impact.
3.14 Worker Safety and Fire Protection	The increase in capacity and output of the BESS and refinement of the BESS layout will not change the Worker Safety and Fire Protection Staff Analysis nor Conditions of Certification adopted in the Black Start Capability Enhancement PTA. Construction and operation associated with the BESS will comply with the existing worker safety and fire protection requirements. The change in battery manufacturer from LB Chem to CATL and the corresponding change in battery chemistry to lithium ferrous phosphate is anticipated to improve the safety of the battery operations as compared with standard lithium ion (nickel or cobalt) battery technology used by the LB Chem battery in the previously approved project. Conclusion - No impact.

Notes:

BAAQMD = Bay Area Air Quality Management District
BESS = battery energy storage system
CAISO = California Independent System Operator
CATL = Contemporary Amperex Technology Co., Limited
COC = Condition of Certification
MLGS = Marsh Landing Generating Station
PG&E = Pacific Gas and Electric Company

1. Introduction

In accordance with Title 20 California Code of Regulations, Section 1769 (Section 1769), Marsh Landing LLC (Marsh Landing) submits this Petition to Amend (PTA) the Marsh Landing Generating Station (MLGS) license to change the project description of the Black Start Capability Enhancement Project PTA, as approved on March 12, 2019. MLGS is a nominal 760-megawatt (MW) electricity-generating facility, consisting of four Siemens simple-cycle natural-gas-fired combustion turbines, located at 3201-C Wilbur Avenue, Antioch, CA (Figures 1 and 2). Changes to the project description are necessary due to the change in the Battery Energy Storage System (BESS) capacity and output resulting from a change in the battery manufacturer. This PTA, referred to as the BESS Capacity and Output Increase PTA, also addresses necessary refinement of the BESS layout.

As background, in August 2010, the California Energy Commission (CEC) issued the Commission Decision approving the MLGS Application for Certification (AFC), which was adopted by Order No. 10-0825-03 in Docket 08-AFC-3C (CEC, 2010b). The Bay Area Air Quality Management District (BAAQMD) issued the Authority to Construct for MLGS in August 2010, and the amended Final Major Facility Review Permit and the Title V permit in November 2015 (BAAQMD, 2015). Construction commenced in February 2011. In January 2012, a PTA was submitted to cover certain refinements to the design of the project's fuel gas preheater system, water supply and treatment processes, and other project components (URS, 2012). CEC approved this PTA on May 1, 2012 (CEC, 2012a). On May 1, 2013, MLGS commenced commercial operations.

In June 2014, a petition was submitted to modify the MLGS fire protection system to be independent of the neighboring Contra Costa Generating Station's (CCGS) fire protection system (i.e., water supply and fire loop piping system). That petition included the installation of a diesel backup generator (for the MLGS gas turbines) and a new diesel fire pump engine; disconnection from CCGS' fire loop; and completion of MLGS' independent fire loop, which is supplied by an independent water supply (URS, 2014). In December 2014, the CEC approved this PTA (CEC, 2014). The commissioning of the diesel backup generator was completed by November 2015. The diesel fire pump engine and independent fire loop system will be installed by December 2018. Additional project modifications were addressed in petitions submitted and approved for the addition of a modular building for document storage and staff training purposes in 2015, and the addition of asphalt paving in 2017 on the access roads within the licensed project boundaries that lead to the MLGS warehouse building (CEC, 2015; CEC, 2017).

On December 1, 2017, the California Independent System Operator (CAISO) selected Marsh Landing for "black start" capability for MLGS (CAISO, 2017), based on a competitive solicitation. Black start capability refers to the ability of a generating unit or facility to begin operating and delivering electric power without external assistance from the electric system. Black start resources are essential to restart other generation and to restore power to the grid in the event of a widespread system outage (CAISO, 2017). The restoration of power to the grid ensures restoration of essential public services for public safety and convenience and helps curb the use and associated emissions of diesel backup generators in response to a widespread system outage. The CAISO contracted with Marsh Landing to provide black start resources to enhance the system restoration time in the greater San Francisco Bay Area, to ensure that the area's service restoration following a widespread system outage is reasonably consistent with service restoration for other major population centers in the state. The CAISO tariff requires black start resources to have a number of attributes; they must have necessary communication/control equipment, and the abilities to start without external aid from the grid, make a minimum number of starts, operate in stand-alone and parallel modes, have start-up load pickup capability, and produce and absorb reactive power (CAISO, 2017).

Marsh Landing contracted AECOM to prepare the Black Start Capability PTA in 2018. (AECOM, 2018). Accordingly, the Black Start Capability Enhancement PTA addressed the modifications necessary to ensure that the project will fulfill the requirements of the CAISO tariff, including the modification of the MLGS Permit to Operate to enable commissioning, testing and operations of Units 3 and 4 in order to provide black start capability. CEC issued its Staff Analysis on February 8, 2019 and concluded "that all potential impacts associated with the installation of black start capability, as well as the operating and testing scenarios associated with black start capability, would be less than significant with the implementation of the offset mitigation, and, with the new and revised air quality and worker safety and fire protection conditions of certification, the project would remain in compliance with applicable LORS (CEC,2019a)." The Black Start Capability Enhancement PTA was presented before the full Commission on March 12, 2019 and approved without public comments on the Staff Analysis nor during the Business Meeting (CEC, 2019b). On December 20, 2019, Marsh Landing informed CEC Staff that it was necessary to increase output of the BESS

from 3.6 MWh to 5.48 MWh as an outcome of design review with CAISO. The CEC staff approved this change on February 26, 2020, noting that the change did not necessitate a post-certification petition as the project change would not change the project design, operation, or performance requirements of the MLGS Final Commission Decision, as amended (CEC, 2020).

The modifications and refinements of the Black Start Capability Enhancement PTA, referred to as the BESS Capacity and Output Increase PTA, demonstrate that the project will remain within the 27-acre project site, will not result in significant changes to the previously disturbed areas resulting from the 2010 to 2013 construction of MLGS, and will be constructed at the same location (east of Unit 4) planned for the BESS per the approved Black Start Capability Enhancement PTA. This PTA describes the project modifications and analyzes whether they could result in any environmental consequences not previously analyzed as part of the March 2019 approval of black start capability at MLGS, or result in significant impacts that could not otherwise be mitigated to be less than significant. As described in this PTA, the lack of timely availability of the LG Chem configuration, the technology improvements leading to increased capacity and output that will improve reliability, and availability of safer battery chemistry have led to the proposed modification of the project. The change in battery technology to Contemporary Amperex Technology Co., Limited (CATL) integrated in Fluence's 6th Generation Gridstack^{TM} BESS and the corresponding change in capacity and output have led to a refinement of the layout of the battery east of Unit 4. The BESS will occupy a larger, but not significantly larger, footprint orientated more north-south in a rectangular layout as compared to the square layout of the approved BESS. Based on the preliminary design, the project modifications do not materially change the potential environmental impacts of the MLGS and the associated potential environmental impacts associated with the installation, commissioning, testing and operation of black start capability at MLGS, as analyzed in the 2008 AFC, 2010 Amended AFC, and the subsequent amendments including the 2018 Black Start Capability Enhancement PTA. No changes to operating units and the associated emissions are expected; hence, no modifications to the MLGS Major Facility Review Permit are necessary for the modifications of the BESS capacity and output.

As stated above, this PTA is submitted in accordance with Section 1769. Section 1769 specifies that after the final decision approving a project is effective, the applicant must file with the CEC a petition for any modifications it proposes to the project design, operation, or performance requirements. Section 1769 specifies that the petition must contain the following information:

(A) A complete description of the proposed modifications, including new language for any conditions that will be affected.

Section 2.0 below provides a complete description of the proposed project modifications to the BESS. No new Conditions of Certification (COCs) or modification of existing COCs in response to this PTA are required.

(B) A discussion of the necessity for the proposed modifications.

The proposed project modifications associated with the BESS and black start operations are in response to the need, identified by CAISO, for black start capability for the San Francisco Greater Bay Area to restore electrical generation and distribution. This need resulted in the selection of Marsh Landing in December 2017. This project amendment to increase the capacity and output of the BESS is necessary since the battery technology originally described in the Black Start Capability Enhancement Project approved in March 2019 changed from LG Chem to CATL due to the lack of timely availability of the LG Chem BESS configuration and the necessity for an increase in battery capacity and output for reliability and performance purposes. These circumstances led to the change to the CATL technology which will provide MLGS with greater storage capacity and output in response to grid event in which black start capability is necessary. The CATL battery modules will consist of lithium ferrous phosphate (LFP) chemistry, which is safer, providing a more consistent output/rate of discharge and without the toxicity attributable to lithium cobalt-based or lithium nickel-based ion batteries.

(C) If the modification is based on information that was known by the petitioner during the certification proceeding, an explanation why the issue was not raised at that time.

The proposed modification in this PTA is based on information that was not known at the time of original approval of the Black Start Capability Enhancement Project PTA, namely the unavailability of the LG Chem BESS configuration and necessary improvements identified by CAISO after the March 2019 Commission Decision.

(D) If the modification is based on new information that changes or undermines the assumptions, rationale, findings, or other bases of the final decision, an explanation of why the change should be permitted.

The proposed project modifications do not materially change or undermine the assumptions, rationale, findings, or other bases of the Commission Decision.

(E) An analysis of the impacts the modification may have on the environment and proposed measures to mitigate any significant adverse impacts.

An analysis of the potential impacts from the proposed modifications of the BESS capacity and output increase is included. The proposed project modifications will not result in significant environmental impacts, and the existing COCs and associated mitigation measures will continue to ensure that any potential impacts associated with the construction of the modifications and black start operations will be less than significant.

(F) A discussion of the impact of the modifications on the facility's ability to comply with applicable laws, ordinances, regulations, and standards.

A discussion of the proposed modifications with respect to compliance with applicable laws, ordinances, regulations, and standards (LORS) is included. The proposed project modifications will not affect the project's ability to comply with applicable LORS.

(G) A discussion of how the modification affects the public.

The proposed project modifications will not have any material adverse effect on the public.

(H) A list of property owners potentially affected by the modification.

The proposed project modifications will not have any material adverse effect on any property owners. The list of property owners within 1,000 feet of the project is provided in Appendix B.

(I) A discussion of the potential effect on nearby property owners, the public, and the parties in the application proceedings.

The proposed project modifications will not have a material adverse effect on nearby property owners, the public, or the parties to the application proceeding.

Based on the information and analysis provided in support of this BESS Capacity and Output Increase PTA, Marsh Landing believes that Staff can determine that: (1) there is no possibility that the proposed project modifications may have a significant effect on the environment; (2) the proposed project modifications will not make changes that would cause the project not to comply with any applicable LORS; and (3) the project modifications will not result in modification of existing COCs nor add additional COCs. Furthermore, this PTA will not result in changes to the commissioning, testing and black start operations of the BESS.

2. Project Modifications

2.1 Black Start Capability Enhancement: BESS Capacity and Output Increase

The Black Start Capability Enhancement Project, as approved in March 2019, entailed adding "black start" capability to MLGS' Units 3 and 4. Lithium-ion (LI) BESS manufactured by LG Chem had been specified in the approved project, and consisted of 7 MW/3.6 MWh capacity/output consisting of seven battery banks within metal cargo-container-type enclosures. In December 2019, Marsh Landing refined the LG Chem BESS design, increasing the output to 5.48 MWh. CEC Staff approved this refinement of the LG Chem BESS design in February 2020 (CEC, 2020).

Marsh Landing and CAISO continued project coordination and design review during 2020. Marsh Landing became aware that the LG Chem technology would not be available timely to meet a summer 2021 online date, and furthermore, Marsh Landing and CAISO recognized technology improvements that would improve the performance

and reliability of the BESS, as well as improve the safety of the BESS by transitioning to the Fluence Gridstack™ technology package with the CATL's lithium ferrous phosphate (LFP) battery chemistry. Marsh Landing communicated the necessary project changes with the California Energy Commission and Delegated Chief Building Official, which has led to preparation of this requested project change. The project changes are limited to the BESS technology and layout to accommodate the Fluence Gridstack™ with the CATL battery modules.

This BESS Capacity and Output Increase PTA entails the following changes:

- Replace the battery manufacturer and lithium ion type chemistry from LG Chem (lithium cobalt oxide chemistry) to CATL (LFP chemistry), module LFP-280LC;
- Increase the BESS capacity and output to the CATL 11.5 MW/10.5 MWh configuration from the previously approved LG Chem 7 MW/5.48 MWh configuration, which increases the peak kilovolt-ampere (kVA) demand to improve inverter performance through synchronization; and
- Upgrade the BESS design, moving to Fluence's Gridstack™ configuration depicted in Appendix A, which provides improved logic, controls, and fire safety in a visually enhanced battery package with the Fluence Cube design as compared to the cargo-container style enclosures of the LG Chem battery package.

Changes are not needed to the following equipment/configurations specified in the Black Start Capability Enhancement PTA, as outlined in Section 2.1:

- 4,160-V switchgear which will be tied into the Units 3 and 4 4,160-V station service bus;
- Switchyard;
- Siemens T-3000 distributed control system (DCS) logic to ensure Units 3 and 4 meet the CAISO Tariff and North American Electric Reliability Corporation reliability requirement to support black start service;
- Isochronous (ISOCH) frequency control; and
- Construction laydown and parking.

The outcome of these design improvements will enable the BESS to achieve higher peak voltage and improve inverter performance through synchronization with the switchgear and the station service bus serving either Units 3 or 4. Higher battery storage capacity will support more turbine restarts and longer turning gears during restoration of station power and will support longer turning gear operations, as needed, in response to a grid event. Improved output, performance, reliability, visual aesthetics, and fire safety enhances the project benefits of the Black Start Capability Enhancement project.

2.2 Battery Energy Storage System Layout

Refinement of the BESS layout is necessary due to the BESS Capacity and Output Increase PTA. The BESS layout in the Black Start Capability Enhancement PTA was a square-like orientation, approximately 70ft x 80ft, east of Unit 4; see Appendix A for excerpts of the project layout in the 2019 PTA approval. The BESS layout was subsequently planned for approximately 60ft x 170ft, in a north-south rectangular orientation in the same general footprint as the 2019 PTA, with the increase in output to 5.48 MWh. For this PTA, the layout of the Fluence Gridstack™ with CATL battery technology will increase slightly to 60ft x 240ft in the same north-south orientation in the same footprint as the prior 7 MW/5.48 MWh LG Chem battery technology; however, the capacity and output will increase to 11.5 WM/10.5 MWh. The BESS layout is shown in Figure 3; depictions of the Fluence Gridstack™ and associated logic (Fluence IQ), operating system (Fluence OS), configuration (Fluence Cubes) and safety features are detailed in Appendix A and briefly summarized below.

2.2.1 Battery, Racks and Inverters

The Fluence Gridstack™ will consist of 33 battery racks with 8 LFP-280LC modules per rack. Battery modules produce 46.6 kilowatt-hour (kWh) of output or 372.7 kWh of output per rack. The battery racks will be in the Fluence Cubes (i.e., Enclosures), up to per two racks per Cube. The battery racks feed up to ~1,500-V DC buses. The racks and DC buses will be segregated into up to 18 Cubes that will feed up to five Power Conversion System (PCSs) (i.e., Inverters).

2.2.2 Controls

Appendix A includes descriptions of the Fluence Gridstack™ configuration, including the logic, hardware, software, controls, and output (i.e., Fluence IQ, OS, and Cube).

The BESS energy management system (EMS) is a multi-level control system designed to monitor temperature, voltage, current, state of charge, and health/safety of the BESS by identifying abnormal battery conditions or deviations from normal operations. Fluence's EMS includes the Emergency Stop (E-Stop) which can be triggered by the fire suppression system, core emergency shutdown signal, smoke detector, carbon oxide detector, sudden change in voltage, or Cube emergency shutdown button.

2.2.3 Control System Modifications

The gas turbine original equipment manufacturer (OEM), Siemens, serves as the Engineering, Procurement and Construction (EPC) lead for the BESS. Siemens will configure the BESS into the MLGS T-3000 control system to support the Units 3 and 4 black start functionalities. Siemens will also integrate the new BESS to provide all required capability to support electric grid recovery from a black emergency event. MLGS operator training will be provided prior to commissioning and testing of the system.

2.2.4 Fire Suppression System

A self-contained fire suppression system will be installed in each enclosure. Heat and smoke detectors will be installed to monitor the enclosure. There are fire suppression control panels in each enclosure that control alarm functions as well as the dispersion of aerosol suppression agent. The system is also designed with a manual actuation function. If the fire suppression system is actuated, the BESS controls are designed to deploy E-Stop to automatically shut down the BESS.

2.2.5 Redundancy Features

The BESS Capacity and Output Increase will not change the planned integration of the BESS with Units 3 and 4. One gas turbine is required to provide black start service to support recovery from a Greater San Francisco Bay Area electrical grid blackout. Units 3 and 4 are being converted to black start capability to provide redundancy if a grid blackout occurs simultaneous with a unit (either Unit 3 or 4) being unavailable due to a planned or forced outage.

2.3 Construction

The location of the BESS and ancillary equipment is shown on Figure 3, Project Location. The construction approach has not changed from the Black Start Capability Enhancement project as outlined below. Refinement of the footprint has occurred from the original 7 MW/3.6 MWh configuration to the 11.5 MW/10.5 MWh configuration for the BESS Capacity and Output Increase PTA, increasing the footprint to 60ft x 240ft.

The BESS will be located east of Unit 4 in a moderately sloped area. Construction of the proposed project will include over-excavating approximately 3-5 feet within the footprint of the BESS foundation for geotechnical purposes and raising the surrounding elevation in other portions of the BESS foundation as much as 6 feet in places to match MLGS' existing grade. Approximately 2,000 cubic yards (cy) would be over-excavated and approximately 1,500 cy of fill will be required to raise the site. Onsite excess soil from the original MLGS grading activities south of Unit 1 (see Figure 3) will be used in part as fill for the BESS area. The suitability of the excess soil for structural fill will be evaluated prior to the start of construction. Based on the soil evaluation results and the quantity of available soil, imported fill from an offsite commercial supplier may be needed. For planning purposes, 75 to 100 truck trips of imported fill will be needed to supplement the available onsite fill – no change to import soil assumptions in the Black Start Capability Enhancement PTA.

During detailed design, the size and shape of the footprint for the BESS may change and could interfere with the existing drainage swale east of the project site. Efforts will be made to minimize any interference; in the event it is unavoidable, the swale will be rerouted around the interference caused by the BESS to redirect surface runoff to existing drainage outlets.

Concrete pads with appropriate support systems will be installed for the BESS equipment, PCS, and the switchgear cabinet. The pads will be 6 inches above finished grade. An electrical and communication duct bank approximately will be installed from the BESS to the switchgear cabinet. A trench approximately 2 feet wide and 2 feet deep will be opened to facilitate installation of the duct bank.

Minimal water will be required for grading, compaction, and dust control. City of Antioch water stored in the MLGS' onsite water storage tank will be used and applied by water trucks or by pump/hose connections. Stormwater runoff during construction activities will be managed in accordance with the Construction SWPPP prepared for the black start capability project, which incorporates best management practices (BMPs) for runoff and erosion control. Site-specific BMPs have been developed in the SWPPP which will ensure compliance with all applicable regulations and COCs. Nonstormwater discharges, if applicable, will be discharged to the industrial sewer in accordance with the MLGS' existing industrial discharge permit, or will be temporarily stored in appropriate tanks and discharged offsite at a permitted wastewater disposal facility.

2.3.1 Construction Schedule

Construction is scheduled to begin as soon as the end of first quarter of 2021 with the preparation of the switchgear foundation and BESS layout, as described and approved in the Black Start Capability Enhancement PTA. Pre-construction through commissioning is estimated to take 4 to 5 months.

The Fluence Gridstack™ BESS is anticipated to arrive at MLGS at the beginning of second quarter of 2021. Installation of the BESS is anticipated during April and May 2021. Construction should be completed in June 2021, followed by a testing and commissioning period of approximately 4 weeks. The commercial online date is required by July 2, 2021.

Construction activities for the proposed project would occur in the following general sequence:

1. Pre-construction survey to confirm avoidance of any sensitive resources and demarcation of existing utilities/subsurface features (scope previously approved by the Black Start Capability Enhancement PTA);
2. Installation of stormwater BMPs, such as silt fence and gravel bags to ensure that soil and runoff is contained onsite in accordance with project Storm Water Pollution Prevention Plan (scope previously approved by the Black Start Capability Enhancement PTA and Construction Storm Water NPDES Permit);
3. Preparation of the 4,160-V switchgear foundation and tie-in ((scope previously approved by the Black Start Capability Enhancement PTA)
4. Preparation of the foundation layout in accordance with geotechnical requirements per the DCBO (scope previously approved by the Black Start Capability Enhancement PTA)
5. Installation of the BESS foundation;
6. Installation of duct banks;
7. Delivery and installation of battery enclosures (Fluence Cubes), PCS, and switchgear to foundations/footers;
8. Installation of batteries in racks, electric, and communication cables;
9. Modification of MLGS DCS control logic for black start functionality;
10. MLGS operator training;
11. Performance of BESS commissioning, start up, and testing activities; and
12. Cleanup and demobilization of the project site.

2.3.2 Construction Personnel and Equipment

The construction work force of laborers, electricians, supervisory personnel, and construction management personnel and equipment/vehicles are unchanged per the approved Black Start Capability Enhancement PTA. It is estimated that the construction personnel would consist of an average of approximately 15 to 20 craft workers and supervisors at any given time, depending on the construction activities. The onsite workforce would be expected to reach a maximum of 30 workers.

It is anticipated that the following mix of equipment may be used during construction and commissioning of the proposed project:

- Excavator (1)

- Vacuum truck (1)
- Trencher/ditch witch (1)
- Backhoe or dozer (1)
- Dump truck (3)
- Soil compactor (1)
- Concrete pumper (1)
- Boom truck crane (1)
- Portable generator and welding equipment (1)
- Forklift (1)
- Pickup trucks (4)
- Dust control water truck (1)
- Pile driver (1)

Construction would generally occur between 7:00 a.m. and 6:00 p.m., 10 hours per day and 50 hours per week.[1] Additional work hours and days may be necessary to make up for unanticipated schedule delays or to perform certain testing and checkout activities. All construction work performed outside of the normal work schedule would be coordinated with the CEC's Construction Project Manager and conform to City of Antioch Ordinances.

2.3.3 Construction Traffic and Parking

Construction traffic, traffic management and parking remain unchanged per the approved Black Start Capability Enhancement PTA. Workers and construction vehicles would access the site via Wilbur Avenue. Vehicles would enter the existing MLGS security gate. Staging of equipment would be limited to the eastern portion of the MLGS property and the project site. All parking of project construction vehicles would be on the MLGS property. See Figure 3 for proposed construction laydown and parking locations. The southern laydown area is covered in asphalt and the northern parking/laydown area is covered in compacted base rock.

2.4 Commissioning and Testing

Commissioning and testing plans remain unchanged per the approved Black Start Capability Enhancement PTA. Controls testing will be done "cold" on the Siemens simulator to minimize the live testing and tuning at MLGS. The present schedule includes approximately 4 weeks for commissioning and testing, or nearly 100 cumulative hours, for the BESS and the designated black start units.

2.5 Operations and Maintenance

Operations and maintenance of MLGS and the BESS remain unchanged per the approved Black Start Capability Enhancement PTA. Adding black start capability to MLGS Units 3 and 4 will not impair, disrupt, or change the current operation and functionality of the existing facility. The BESS would be operated and maintained by the existing MLGS staff.

3. Environmental Analysis

The BESS Capacity and Output Increase PTA will not result in any changes to the environmental consequences of the MLGS. Furthermore, all impacts are expected to remain less than significant with implementation of COCs set forth in the Commission Decision, as amended by the Black Start Capability Enhancement PTA approved on March 12, 2019. The environmental analysis is summarized in Table ES-1 and below.

[1] COC NOISE-6: Heavy equipment operation and noisy construction work relating to any project features shall be restricted to the times delineated below, unless a waiver has been issued by the City of Antioch for alternative construction hour limitations (specified to be Monday through Saturday 6:00 a.m. to 7:00 p.m., and Sundays and holidays 9:00 a.m. to 5:00 p.m.): Mondays through Fridays: 7:00 a.m. to 6:00 p.m. Weekends and holidays: 9:00 a.m. to 5:00 p.m. Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine compression release brake use shall be limited to emergencies.

3.1 Air Quality

The increase in capacity and output of the BESS and increase of the BESS layout with the Fluence Gridstack™ with CATL LFP battery chemistry will not change the Air Quality Staff analysis nor Conditions of Certification adopted from the Black Start Capability Enhancement PTA. Construction and operations of the modified BESS will not change significantly. Commissioning, testing and black start operations of Units 3 and 4 are likewise unchanged with the modifications of the BESS. The increase in battery capacity and output is expected to increase the performance and reliability of the BESS for enabling Units 3 and 4 to respond to grid event necessitating black start capability. With the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including the Black Start Capability Enhancement PTA, potential air quality impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.2 Biological Resources

As described in the Commission Decision for the MLGS Application for Certification and supported by the Staff Analysis for the Black Start Capability Enhancement PTA, no threatened or endangered plant or wildlife species have been observed during biological resource field surveys of the project site. Most of the construction associated with the modified BESS will take place east of the MLGS' turbines. The exception is the removal of soil from the Excess Soils Pile south of Unit 1 that will be used as fill for the BESS area. This Excess Soils Pile was created during site preparation and construction of the MLGS. It currently supports ruderal vegetation and annual grasses, as well as native hedgerows that were planted along its southern and western sides during construction of the MLGS. No special-status plant or wildlife species have been observed on the soil mound, but it is well vegetated, shows signs of recent burrowing activity, attracts birds, and provides potential nesting sites (especially along the hedgerows).

As previously analyzed in Black Start Capability Enhancement PTA, there will be no permanent impact to biological resources from construction of the new BESS, because it would take place in a previously disturbed area in the existing 27-acre MLGS site. Temporary impacts to special-status biological resources will be avoided during construction through Implementation of MLGS' Conditions of Certification. These avoidance measures will include construction monitoring and pre-construction surveys of vegetation, wildlife sign, and nesting birds, with attention to the more biologically active areas in and around the Excess Soils Pile. If special-status species or nesting birds are identified in or around the construction area, appropriate buffers will be established to avoid disturbance.

There will be no new emission sources and there will be no increase in the annual emissions from MLGS. Therefore, the project modifications would not change the Staff Analysis nor Conditions of Certification adopted from the Black Start Capability Enhancement PTA. With the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential biological resources impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.3 Cultural Resources

The project modifications are confined to the 27-acre project site and would not result in any additional disturbed areas beyond the MLGS property. All ground-disturbing activities associated with the construction of the modified BESS will be in previously disturbed areas of the MLGS project site. Fill will be required as part of the construction of the BESS foundation and the raising of the ground elevation of the BESS area. This fill will come either from the excess soil pile on the MLGS site or from a commercial borrow site. As discussed in the Commission Decision and in Black Start Capability Enhancement PTA, no significant archaeological or historic and architectural (built environmental) resources were identified in the project site or vicinity. Therefore, the project modifications would not change the Staff Analysis nor Conditions of Certification analysis of potential impacts to cultural resources. With the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential cultural resources impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.4 Geologic Hazards and Paleontology

3.4.1 Geologic Hazards

The project modifications are confined to the 27-acre project site and would not result in changes to the analysis of geologic hazards. The modular components of the BESS will be placed on a foundation supported by engineered fill that incorporates seismic design. The foundation design has been refined to accommodate the larger footprint. The project modifications would not change the Staff Analysis nor Conditions of Certification analysis of potential impacts due to geologic hazards. With the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential geologic hazards associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.4.2 Paleontological Resources

The project modifications are confined to the 27-acre project site and do not result in any additional disturbed areas beyond the site. Fill will come either from the excess soil pile on the MLGS site or from a commercial borrow site. Other than trenching to install utilities and limited pile driving to support the foundation, there would be no substantial or deep excavations. All ground-disturbing activities associated with the construction of the new BESS will be in previously disturbed areas of the MLGS project site. Therefore, with the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential paleontological resources impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.5 Hazardous Materials

The proposed BESS will use CATL's LFP-280LC battery modules. A copy of the Safety Data Sheet is included in Appendix B. The battery modules will be delivered to the MLGS site in United States Department of Transportation-certified vehicles. The batteries will be delivered to the site using the approved route in accordance with existing Condition of Certification HAZ-6: State Route [SR] 4 to SR 160 to Wilbur Avenue to Marsh Landing.

In accordance with HAZ-2, Marsh Landing will update the Business Plan to include the CATL LFP-280LC battery modules following the arrival to the site. The update to the Business Plan will be reported in the 2021 Annual Compliance Report. These additions to the hazardous material list are shown in Table 1.

Table 1
Addition to Hazardous Materials Proposed for Use at the MLGS

Material	CAS Number	Application	Hazardous Characteristics	Maximum Quantity on Site
LFP[1] – Lithium Ferrous Phosphate (15-40%)	15365-14-7	Battery cell	See SDS in Appendix B	264 modules
• Graphite (7-25%)	7782-42-5			
• Hexafluoropropylene-vinylidene fluoride copolymer (3-15%)	9011-17-0			
• Lithium Hexafluorophosphate (<5%)	2134240-3			
• Acetylene Black (<2%)	1333-86-4			
• Diethyl Carbonate (<15%)	105-58-8			
• Dimethyl Carbonate (<15%)	616-38-6			
• Ethyl Methyl Carbonate (<15%)	623-53-0			
• Propylene Carbonate (<15%)	108-32-7			
• Ethylene Carbonate (<15%)	96-49-1			

Notes:

[1] Each CATL module is composed of the materials listed in the table at the indicated percentages. As described in Section 2.2.1, it is currently estimated that there will be 264 battery modules.

CAS = Chemical Abstract Service
LFP = lithium ferrous phosphate
SDS = Safety Data Sheet

There are no other changes to the hazardous materials inventory and use for the operation of the MLGS. The project modifications with the new BESS would not change the Staff Analysis nor Conditions of Certification adopted from the Black Start Capability Enhancement PTA. Therefore, with the insignificant increase of the BESS layout and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential hazardous material impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.6 Land Use

The project modifications are confined to the 27-acre project site and do not alter the analysis of potential impacts to land use resources presented in the Commission Decision and the subsequent amendments including the Black Start Capability Enhancement PTA, which found that the project would not disrupt or divide an established community; would not conflict with the established uses of the area; would be consistent with existing zoning and applicable land use plans, policies, and regulations; and would not affect farmlands. Therefore, with the insignificant increase of the BESS layout and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential land use impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.7 Noise

Project construction would result in temporary noise increases due to limited use of heavy construction equipment over a short period of time, which would not result in substantial increase in ambient noise levels. Construction noise impacts are expected to be less than significant with implementation of the Noise COCs adopted in the Commission Decision and analyzed in subsequent amendments including the Black Start Capability Enhancement PTA. While the layout of the Fluence Gridstack™ will be larger than the battery LG Chem layout, construction of the BESS is not expected to differ significantly as compared to the assumptions in the Black Start Capability Enhancement PTA. One exception is the duration of the BESS construction; construction of the Fluence Gridstack™ is anticipated to take 4 – 5 months, or 1-2 months less than originally estimate.

The project modifications, which include the addition of the new BESS, would not result in significant changes to the potential noise emissions during operations that were modeled and presented in the AFC and AFC Amendment, as discussed in the original Commission Decision and the subsequent amendments. The new BESS will continue to be east of MLGS Unit 4 within the 27-acre project site; the BESS would be more than 2,000 feet from the nearest residence. The batteries would be inside equipment enclosures (i.e., the Cubes). During operation, the BESS would store and discharge electrical energy from the grid in an electrochemical process. The primary source of the noise from the BESS would be the PCS enclosure ventilation fans and battery storage module HVAC systems. The batteries and inverters make very little noise and are fully enclosed; the noise profile for the LG Chem vs. the CATL battery modules is not expected to differ significantly. When operating at full power, the ventilation fans and HVAC systems would cycle on and off; however, operation of the project would not be expected to result in substantial temporary or periodic increases in ambient noise levels above existing conditions. Furthermore, the battery system would be operated infrequently for very short periods of time and under emergency conditions, i.e., during instructed operations from CAISO. Therefore, with the insignificant increase of the BESS layout and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential noise impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant..

3.8 Public Health

The BESS will comprise of LFP ion cells that are arranged into a module, where multiple modules are placed into a rack, and racks are placed into an enclosure. There are physical, electrical, and control designs at each level that mitigate safety risks. The BESS will be designed and operated in accordance with applicable industry best practices

and regulatory requirements, including fire safety standards. Each BESS enclosure will have its own self-contained fire detection and suppression system. The enclosure's HVAC system will be sized to maintain the advised temperature range and account for the heat dissipation from the batteries when being charged or discharged. The heating and cooling system will be designed with redundancy. Emergency response plans are in place for the existing MLGS; the existing facility contingency plans, including the Hazardous Materials Business Plan and Emergency Response Plan, will be updated with appropriate plans and procedures to address the BESS safety components. In addition, fire protection and emergency response capabilities are available from local fire and emergency response services.

There will be no new sources of emissions added to MLGS; emissions estimated during commissioning, annual testing and black start operations are unchanged with the proposed modification of the BESS. Black start operations will only be initiated during an emergency event, as directed by CAISO or PG&E. Previous analyses as discussed in the original Commission Decision and subsequent amendments concluded that the estimated cancer risks at the maximum exposed receptors due to the MLGS are well below the significance criterion, and that MLGS will continue to be in compliance with Toxic Best Available Control Technology. Commissioning and annual readiness testing was modeled and compared to NAAQS; reasonable worst-case operations for testing or emergency conditions are not expected to exceed regulatory standards. Therefore, as set forth in the Commission Decision and the subsequent amendments including the Black Start Capability Enhancement PTA, operation of the MLGS, including the new black start capability, will pose a less-than-significant health risk to nearby populations with incorporation of safety features, adherence to industry standards, and implementation of the COCs adopted in the Commission Decision and subsequent amendments.

3.9 Socioeconomics

The construction workforce would be substantially smaller than the workforce used for the original MLGS construction (a peak of 30 workers versus 272 workers), and construction would take place over a much shorter duration (less than 6 months versus 27 months). The existing MLGS staff would continue to operate the facility as modified by the black start capability enhancements. The project modifications would not change the Staff Analysis nor Conditions of Certification analysis of potential impacts to the socioeconomics due to MLGS.

The project modifications would entail less than significant refinements to the size and locations of covered and enclosed spaces at the MLGS as compared to the approved Black Start Capability Enhancement PTA following construction of the BESS. The estimated additional square footage of covered and enclosed space at MLGS due to the project modifications is anticipated to double as compared to the previously approved BESS.

The Antioch Unified School District (AUSD) has a school development impact fee that is based on the square footage of covered and enclosed space. In accordance with COC SOCIO-1, the project owner shall pay the one-time statutory school development fee to the AUSD, as required by Education Code Section 17620. Therefore, to cover this additional footprint of the buildings/enclosures, Marsh Landing anticipates it will double the estimated $358 payment to AUSD as part of the building/enclosure modifications for the increased size/layout of the new BESS.

The modifications to the project are confined to the 27-acre project site and would not alter the analysis of potential socioeconomic impacts presented in the original Commission Decision and subsequent amendments including the Black Start Capability Enhancement PTA. The analysis concluded that the proposed project would not induce substantial growth or concentration of population; induce substantial increases in demand for public service and utilities; displace a large number of people; disrupt or divide an established community; or result in disproportionate adverse effects on minority or low-income populations. Potential socioeconomics impacts are expected to be less than significant with implementation of the COCs adopted in the Commission Decision and in the subsequent amendments including the Black Start Capability Enhancement PTA.

3.10 Soils and Water Resources

3.10.1 Soils

The larger BESS layout with Fluence Gridstack™ technology will result in additional soil disturbance as compared to the LG Chem technology; however, construction activities for the new BESS is not expected to differ significantly as

compared to the assumptions in the Black Start Capability Enhancement PTA. The project modifications would not change the Staff Analysis nor Conditions of Certification analysis of potential impacts to soil resources, as the footprint of the modified BESS remains significantly less than the overall 27-acre site, which was disturbed for the construction of MLGS. Ground disturbance during construction of the BESS will be limited to an estimated 60-foot x 240-foot layout of the BESS foundation; the footprint of the previous BESS layout was estimated to be 70 feet x 80 feet. Underlying soils (3-4 feet below grade in places, or up to approximately 2,000 cubic yards) will be disturbed for geotechnical design purposes. Approximately 1,500 cy of fill will be required to raise the ground elevation of the battery storage area. This fill will come from a combination of the onsite excess soil pile or from a commercial borrow site, depending on geotechnical design for the BESS foundation. For planning purposes, 75 to 100 truck trips of imported fill will be needed to supplement the available onsite fill – no change to import soil assumptions in the Black Start Capability Enhancement PTA. Accounting for the BESS layout, construction laydown and parking, and excess soil pile on the MLGS site, the total area for the BESS Capacity and Output Increase PTA will be approximately 1.8 acres. Marsh Landing obtained a General Construction Storm Water National Pollutant Discharge Elimination System (NPDES) Permit (WDID# 5S07C392994) and prepared a Storm Water Pollution Prevention Plan (SWPPP) that identifies Best Management Practices (BMPs) for the project construction activities that incorporate the BMPs already in-place for the facility's existing SWPPP. Implementation of the SWPPP and associated BMPs will ensure the project modifications will not result in increased soil erosion or loss of topsoil, and overall will ensure impacts to soil resources due to the BESS construction will remain less than significant, consistent with the analysis of potential impacts to soils described in the AFC and the AFC Amendment, Commission Decision and the subsequent amendments including the Black Start Capability Enhancement PTA. Therefore, with the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential soil resources impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.10.2 Water Resources

The BESS would be installed east of Unit 4 in the currently unpaved portion of the 27-acre MLGS property. The total project area, including the BESS layout, construction laydown and parking and the existing soil pile is estimated to approximately 1.8 acres. The BESS construction activities will be covered under a Construction Storm Water NPDES Permit; the project SWPPP identifies BMPs already included in the facility's SWPPP to manage potential storm water run-off in project area. Because this area is currently lower than the main MLGS facility area, fill will be placed to raise the elevation of the BESS site approximately 6 feet to match the MLGS existing grade of 16 feet. Underlying soils (as much as 1500 cubic yards will be disturbed for geotechnical design purposes. Onsite fill and possibly import engineering fill be used within the BESS layout.

Stormwater discharging from almost all of the 27-acre MLGS site is treated through a bioretention facility prior to discharge. The bioretention facility is designed to remove contaminants by means of filtration through a layer of engineered soil, following the guidelines provided in the Contra Costa County C.3 Guidebook (5th Edition). Industrial runoff that is not suitable to send to the bioretention facility is contained and treated separately (e.g., using oil/water separators) before being sent off site via the plant's sanitary sewer line.

The MLGS Stormwater Control Plan (GenOn Marsh Landing, LLC, 2013) includes hydrology and hydraulic calculations for the existing drainage and bioretention facilities. The drainage facilities have been sized to convey the 25-year, 24-hour storm event. The bioretention facility has been sized to handle the 100-year, 24-hour storm event. Hydrologic analyses included in the stormwater control plan include precipitation and discharge (peak flow) data for the 10-year, 25- year, and 100-year, 24-hour storm events for the 19 drainage areas that comprise the project site. The new BESS would be installed in the approximately 6.02-acre Area 18 drainage area (NRG Marsh Landing, 2016). The overall site drainage flow patterns will not be altered with the change in grade of the BESS area.

The new BESS area will increase the amount of impervious surface area by approximately 0.17 acre. The impervious surface area at Area 18 drainage area will increase from 1.78 acres to 1.95 acres, which will be a very small increase of the overall impervious surface area of the entire 27-acre MLGS property. The increased runoff volume from this small increase in impervious surface area would not be expected to change the performance of the bioretention basin during large-flow events. The BMPs necessary for the operation of the BESS already exist in the facility's SWPPP and will be implemented, as appropriate.

There will be no change in the MLGS' annual use of water. During construction, there will be a minimal amount of water used for grading compaction and dust control, and this will be for a short duration. Therefore, MLGS will comply with COC SOIL&WATER-6, which limits the use of City of Antioch fresh water to no more than 50 acre-feet annually.

When raised to match the MLGS main area, the BESS would be above the elevation associated with the 1 percent annual flood hazard (i.e., above the 100-year flood elevation) and 0.2 percent annual flood hazard (i.e., above the 500-year flood elevation), as shown on the Federal Emergency Management Agency Flood Insurance Rate Map with an effective date of September 30, 2015 (FEMA, 2015).

The project modifications would not result in changes to the analysis of water resources, water quality, or flood hazards described in AFC, the AFC Amendment, Commission Decision and the subsequent amendments. Therefore, with the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential water resources impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.11 Traffic and Transportation

Construction activities would be temporary and over a slightly shorter duration. The anticipated the construction duration is estimated to be approximately 4 to 5 months. Construction vehicles would access the site via SR 4, to SR 160, to Wilbur Avenue, to the project site. Vehicles would enter the existing secure MLGS gate at Wilbur Avenue.

The project intends to use the excess soil material located in the southwest portion of site, since this material was found suitable for the initial construction of the MLGS. The total amount of import fill required is estimated to be 2,000 cubic yards (up to 100 truckloads) – no change to import soil assumptions in the Black Start Capability Enhancement PTA. The amended BESS configuration is not expected to require more material due to the configuration of the layout. Materials expected to be trucked in include riprap for the slope surfacing and concrete for the equipment foundations.

In accordance with COC TRANS-1, the project would prepare a Traffic Control Plan. The project would schedule delivery of heavy equipment and the battery storage components to occur during off-peak hours (before 7 a.m. and after 9 a.m.) and obtain heavy haul permits from the Contra Costa County Public Works Department and the city of Antioch Engineering Department as needed.

Given the small number of trucks needed for construction of the new BESS in comparison to the original MLGS construction, significant adverse impacts to Wilbur Avenue are unlikely; therefore, COC TRANS-2, which requires a mitigation plan for Wilbur Avenue, would not apply to the proposed modifications resulting from the BESS Capacity and Output Increase PTA.

During the operational life of the project, routine inspections and maintenance of the BESS would occur concurrently with MLGS inspections and maintenance by the existing MLGS staff; therefore, there would be no incremental vehicle trips.

Because there would be no substantial increases in vehicle trips during construction and no increase during operations, the proposed project modifications would not alter the analysis of potential traffic and transportation impacts presented in the AFC, the AFC Amendment, the Commission Decision, and the subsequent amendments including the Black Start Capability Enhancement PTA. Therefore, the proposed modification due to the BESS Capacity and Output Increase PTA would have no significant adverse traffic and transportation impacts.

3.12 Visual Resources

The project modifications include addition of the Fluence Gridstack™ BESS as depicted in Appendix B. The CATL battery modules (264 of them) will be enclosed in approximately 33 Fluence Cubes located on the refined BESS foundation to be situated east of Unit 4. The appearance of the Fluence Cubes as compared to the cargo-container style of the approved BESS will be a significant improvement, although the size of the BESS enclosures will be similar. However, the BESS will continue to be visually imperceptible as compared to the substantial size of the four gas turbine powerblocks. This is because the largest features associated with the project (e.g., the exhaust stacks

and CTGs) will not be altered as a result of these refinements. Furthermore, the BESS would not visually dominate the site, nor would it create a visual point of interest due to the size in relation to the other plant facilities. There would therefore be no need to provide any additional perimeter landscape screening (i.e., COC VIS-2 would not apply). The proposed modification will not modify the existing analysis or conclusions presented in the AFC, AFC Amendment, and subsequent amendments including the Black Start Capability Enhancement PTA. Therefore, potential visual impacts at all seven key observation points identified in the AFC and AFC Amendment are expected to remain less than significant with implementation of the COCs VIS-1 and VIS-3 adopted in the Commission Decision and the subsequent amendments.

3.13 Waste Management

The project modifications will be confined to the 27-acre project site. The refinement of the BESS foundation will result in less than significant modification in the amount of soil disturbed to prepare the underlying fill for construction of the BESS foundation. Therefore, the types, quantities, or frequencies of wastes generated by the project during construction or operation of the MLGS would not change the Staff Analysis nor Conditions of Certification adopted in the original Commission Decision and the subsequent amendments including the Black Start Capability Enhancement PTA. Marsh Landing will continue to implement BMPs during operation of the MLGS to manage and minimize the amount of waste generated.

The proposed project modification consists of installing the modular components (i.e., Cubes) of the BESS. There would be no demolition activities. The waste materials generated during construction would include miscellaneous building materials.

Approved COCs WASTE-4 and WASTE-10 would ensure that if potentially contaminated soils are encountered during preparation of the underlying soil and placement of engineered fill per the project design and trenching for demarcation of utilities or installation of conduit banks, etc., such soil would be remediated appropriately and potential human health impacts would be mitigated. COC WASTE-5 would apply to new construction within Antioch city limits if the project meets the thresholds defined in Antioch's Construction and Demolition Debris Recycling Ordinance No. 1018-C-S. If the proposed project modification meets the requirements outlined in the ordinance, then the project owner would be required to comply with WASTE-5 and prepare and implement a Construction and Demolition Debris Recycling Ordinance Waste Management Plan for all wastes generated during construction activities. Therefore, with the short duration of construction (now reduced to 4 to 5 months), the insignificant increase of the BESS layout, and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential waste management impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

3.14 Worker Safety and Fire Protection

The project modifications are confined to the 27-acre project site and would not change the anticipated workplace hazards or require changes to the safety programs presented in the AFC, the AFC Amendment, and subsequent amendments of the Commission Decision, including the Black Start Capability Enhancement .

With the implementation of existing COCs, the proposed installation of the onsite BESS would not have a significant adverse effect on the environment and would continue to comply with all applicable LORS. The short duration of construction for the installation of the BESS would comply with worker safety and fire safety measures contained in health and safety plans, in accordance with COC WORKER SAFETY-1, used for construction of the main facility.

The BESS would become part of the MLGS operations, and thus would comply with the health and safety plans in accordance with WORKER SAFETY-2. The battery enclosures would have their own fire suppression systems. MLGS also relies on local fire protection services provided by the Contra Costa County Fire Protection Department. MLGS will update the Operations Fire Prevention Plan, Emergency Action Plan, and Hazardous Materials Business Plan to include the BESS. With these updates, the project will comply with the project Operations and Maintenance Safety and Health Program, in accordance with COC WORKER SAFETY-2.

Therefore, with the short duration of construction (now reduced to 4 to 5 months), insignificant increase of the BESS layout and implementation of the existing and adopted Conditions of Certification from the original Commission Decision and subsequent amendments including from the Black Start Capability Enhancement PTA, potential worker

safety and fire protection impacts associated with the BESS Capacity and Output Increase PTA are expected to be less than significant.

4. Engineering Assessment

4.1 Facility Design

The COCs (GEN-1 through GEN-8; CIVIL-1 through CIVIL-4; STRUC-1 through STRUC-4; MECH-1 through MECH-3; and ELEC-1) adopted in the Commission Decision ensure that the proposed modifications to the project will be designed and constructed in conformance with the applicable LORS pertinent to the engineering aspects of the project that are summarized in the Revised Staff Assessment in Facility Design Table 1. No changes or modifications to the COCs are required.

4.2 Power Plant Efficiency

The proposed project modification consists of installing a BESS to provide black start capability. The BESS itself does not consume natural gas. Although gas consumption at low loads during black start operations would be less efficient than when the facility is fully operating, black start operations would occur infrequently, for a short duration, in an emergency or for periodic testing. Therefore, the proposed modification would have no significant adverse impacts on natural gas consumption or energy resources.

4.3 Power Plant Reliability

The proposed black start capability will enhance California's power system reliability, contribute to electricity reserves in the region, and provide operating flexibility. The proposed modifications are in response to CAISO's procurement of black start capability to enhance the system restoration time in the greater San Francisco Bay Area, to ensure that the area's service restoration following a widespread system outage is reasonably consistent with service restoration for other major population centers in the state. Therefore, the proposed modifications are a benefit to the San Francisco Bay Area and California.

4.4 Transmission System Engineering

The COCs adopted in the Commission Decision ensure that the transmission-related aspects of the project will be designed, constructed, and operated in conformance with the applicable LORS identified in the Transmission System Engineering section of the Revised Staff Assessment. The proposed black start capability will enhance the ability of the MLGS to interconnect to the grid.

4.5 Transmission Line Safety and Nuisance

There are no new transmission lines associated with the proposed modifications; therefore, there will be no significant adverse impacts on the environment due to transmission line safety or nuisance factors.

There are no residences near the MLGS site or the proposed battery storage facilities. There will be no new residential exposure to any associated electric and magnetic fields.

5. References

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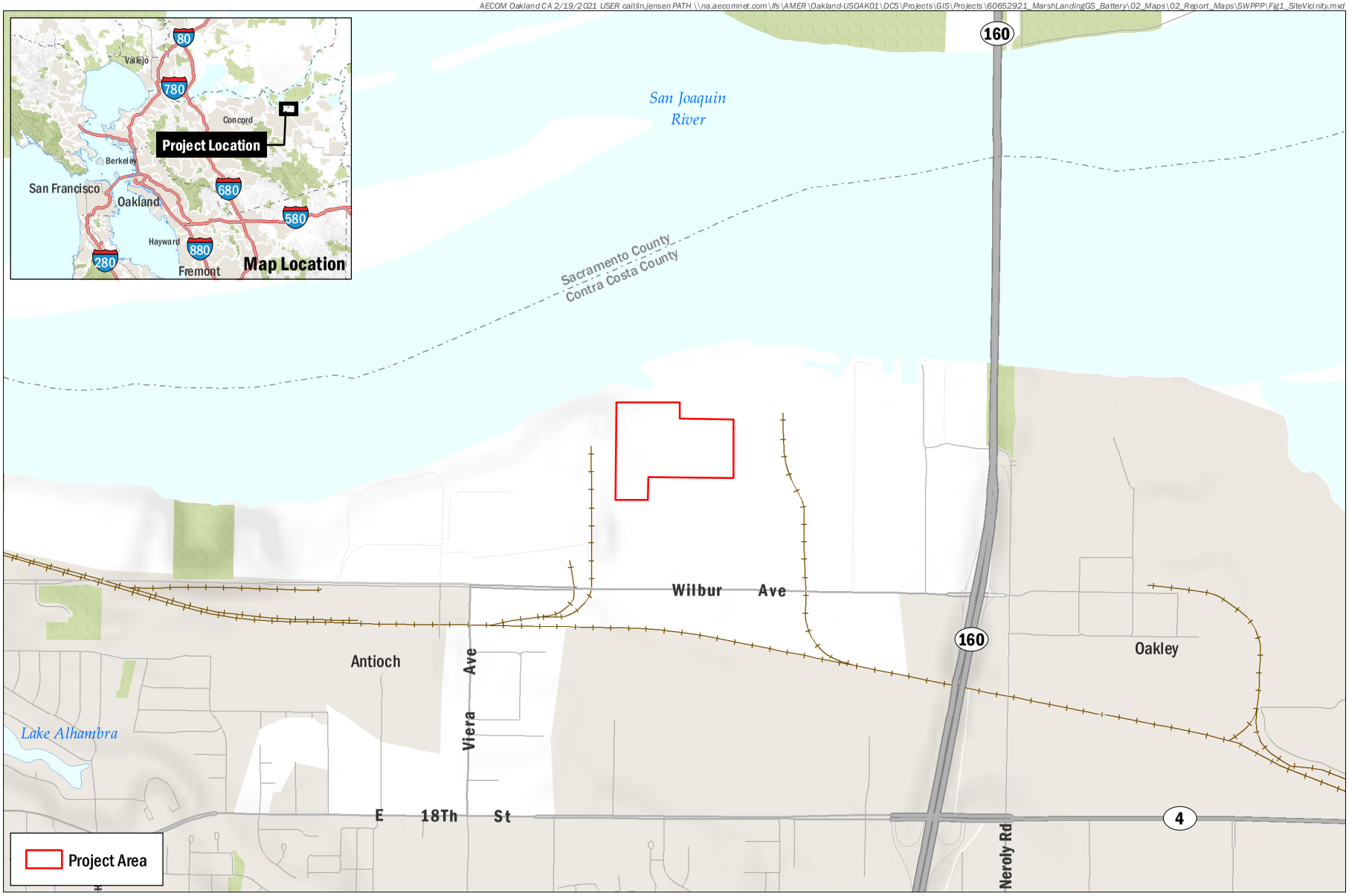


Sources:
AECOM, 2021
CPAD, 2020
Esri, 2016

AECOM

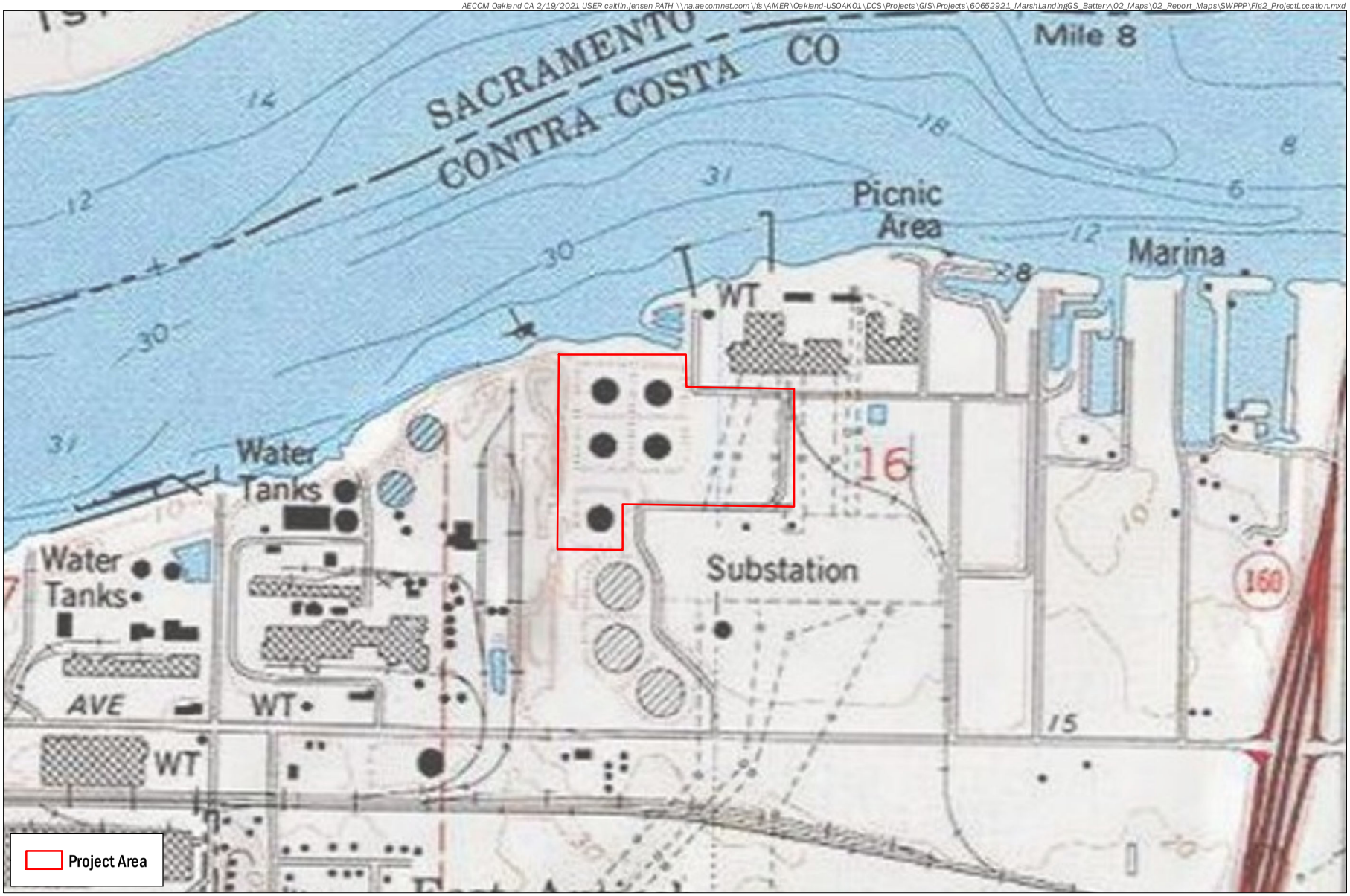
Clearway/NRG

Marsh Landing Generating Station Stormwater Pollution Prevention Plan

CONTRA COSTA COUNTY, CALIFORNIA

FIGURE 1

Site Vicinity



Sources:
AECOM, 2021
USGS, 2019

AECOM

Clearway/NRG

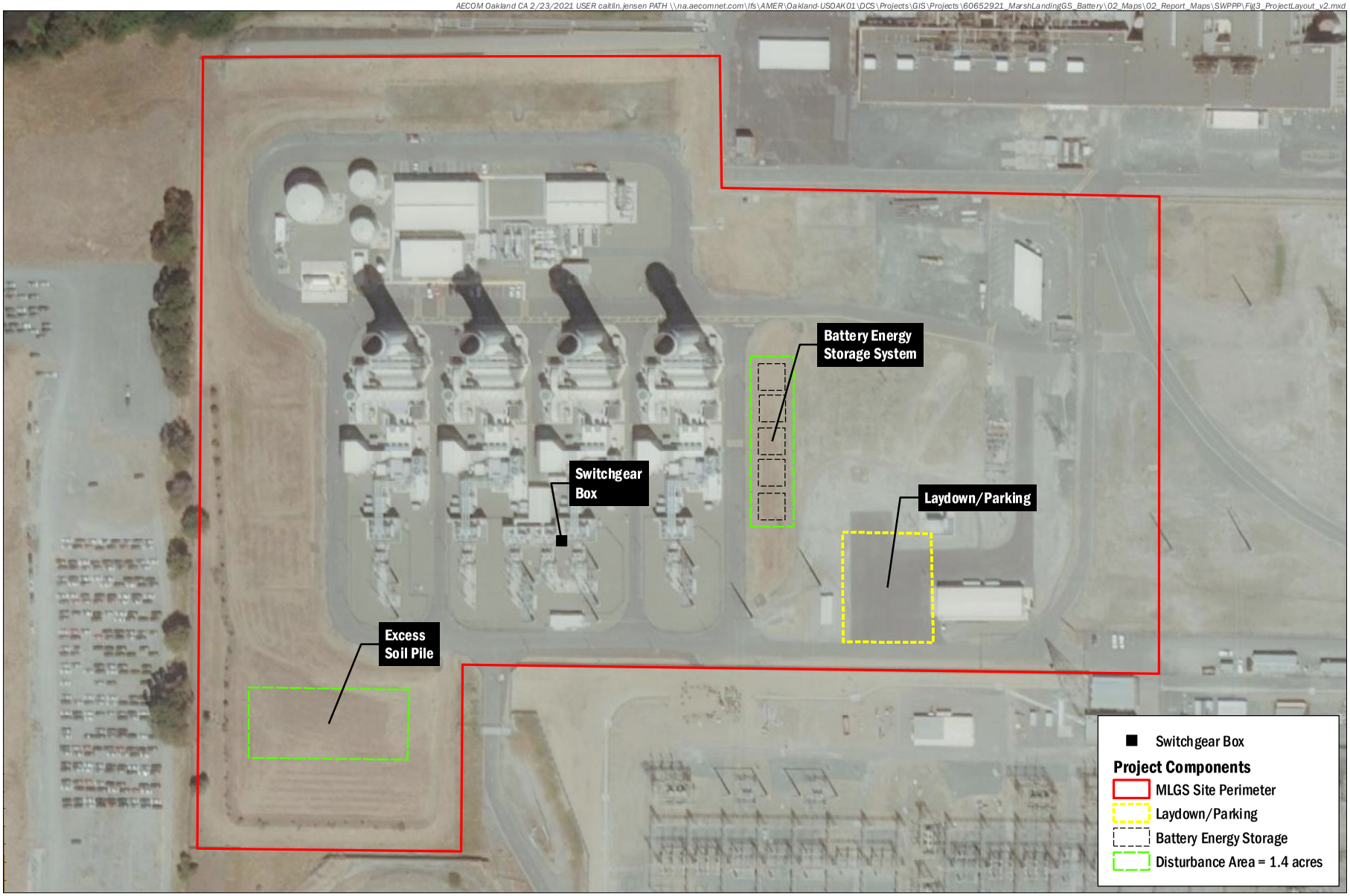
Marsh Landing Generating Station Stormwater Pollution Prevention Plan

CONTRA COSTA COUNTY, CALIFORNIA

FIGURE 2

Project Location

AECOM Oakland CA 2/23/2021 USER caitlin.jensen PATH \\na.aecomnet.com\ifs\AMER\Oakland-USOAK01\DCS\Projects\GIS\Projects\60652921_MarshLandingGS_Battery\02_Maps\02_Report_Maps\SWPPP\Fig3_ProjectLayout_v2.mxd



AECOM

Clearway/NRG

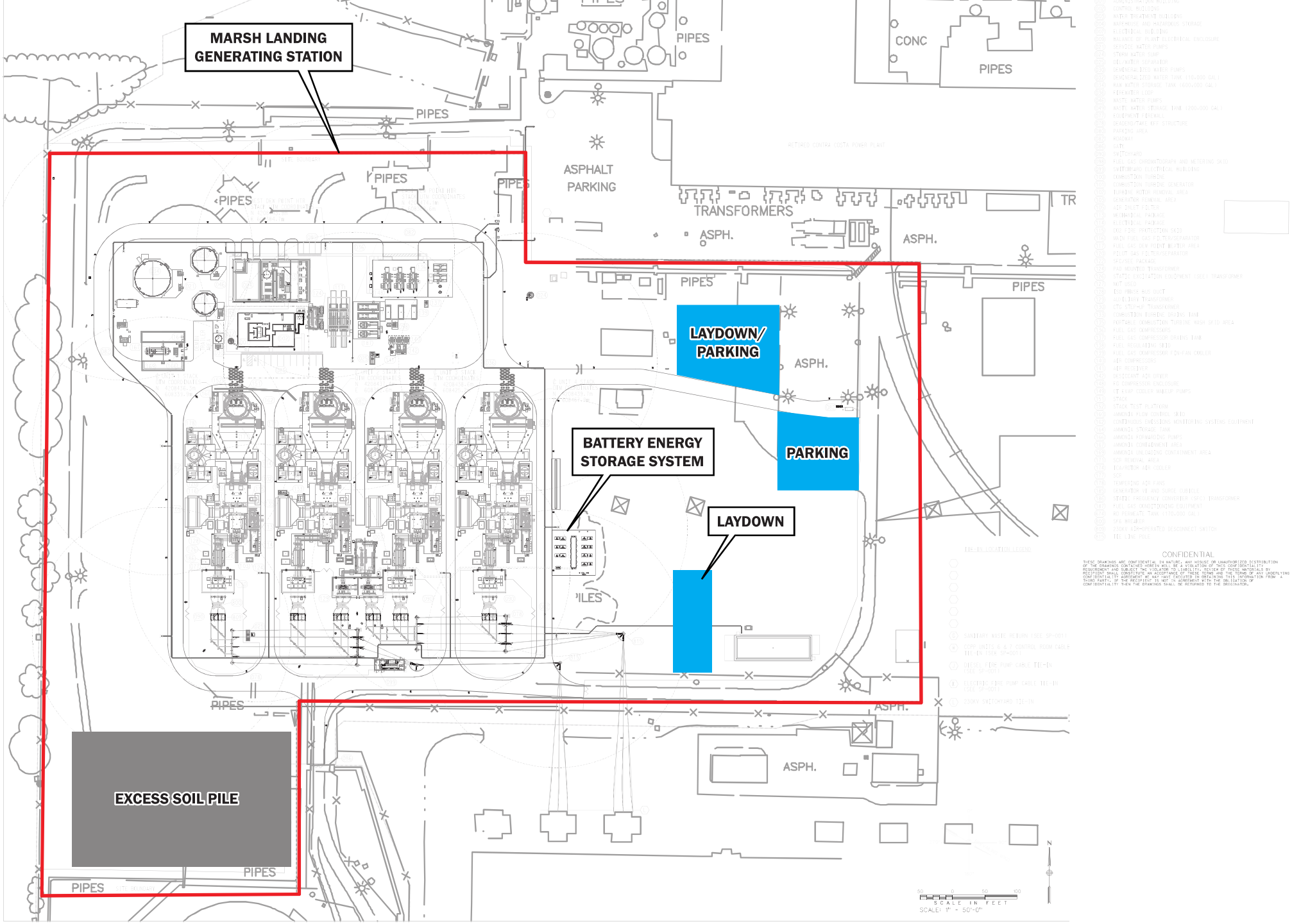
Marsh Landing Generating Station Stormwater Pollution Prevention Plan

CONTRA COSTA COUNTY, CALIFORNIA

FIGURE 3

Project Layout

Appendix A Approved Black Start Capability Enhancement Site Layout


MARSH LANDING GENERATING STATION
BATTERY ENERGY STORAGE SYSTEM
LAYDOWN/ PARKING
PARKING
LAYDOWN
EXCESS SOIL PILE
PIPES
ASPHALT PARKING
TRANSFORMERS
ASPH.
CONC
CONFIDENTIAL

tation;

Appendix B Fluence Gridstack™ Technology and Safety Overview

2. Technology Description

2.1 Fluence Solutions

Fluence offers three purpose-built energy storage systems that are optimized for common customer applications but can be configured for specific use cases and project requirements.

Gridstack™, described in detail below, is a grid-scale, industrial-strength energy storage system designed for the most demanding market applications, with industry-leading reliability, scalability, and safety.

Sunstack™ is a PV-optimized, co-located energy storage system designed to improve and expand the capabilities of solar generation and simplify the interconnection process.

Edgestack™ is a connection-ready commercial and industrial energy storage system designed to support 500+ kW applications with rapid deployment and minimum footprint.

2.2 Fluence Gridstack™

For this proposal we have selected Fluence Gridstack™ as the ideal solution.

Gridstack™ is a grid-scale, industrial-strength energy storage system designed for the most demanding market applications, including capacity peak power, frequency regulation, renewable integration, and T&D enhancement. It is built on 12+ years of experience and has a highly scalable system architecture that delivers industry-leading reliability, scalability, and safety. The system is highly configurable with a range of components from preselected, tier-one manufacturers depending on your specific use case or application.

Gridstack™ features include:

Easily Configurable

Multiple components can be configured to meet your specific requirements with technology from preselected, tier-one manufacturers. Optimize your system for specific market applications with patented algorithms and a suite of dispatch operation modes. Configure the system to meet your needs while still leveraging the Cube's (Sec. 2.4) simplified procurement, design, engineering, and maintenance.

Highly Scalable

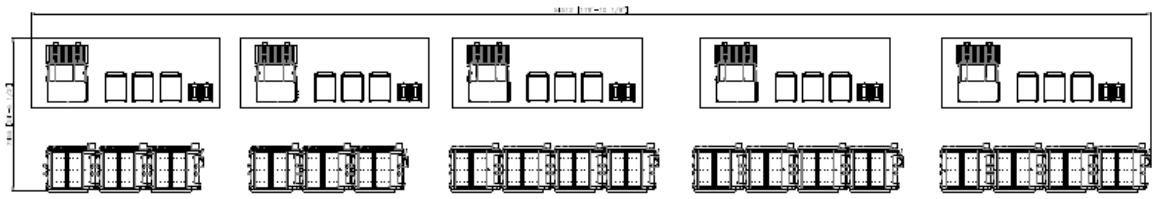
Gridstack™ brings repeatability to large energy storage deployments so you can turn systems into revenue generating assets faster than ever before. The scale-out design drives efficiencies in project permitting and delivery to reduce your implementation risk, while consistency across cores and project locations simplifies training, operations, and maintenance.

Designed for Total System Safety

Gridstack™ comes equipped with comprehensive safety features throughout the integrated hardware, software, and intelligence technology stack. A standardized design brings consistency to your storage system with the highest level of safety capability developed and tested in a factory setting.

Indicative layout for the Marsh Landing site

(dimensions are 178’x24’)



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2.3 Fluence Technology Stack

Fluence's 6th-generation Technology Stack lays the foundation for Fluence's advanced storage systems, including Gridstack™, Sunstack™, and Edgestack™. The standardized Technology Stack makes it simpler for customers to deploy storage faster and more cost effectively without sacrificing quality and configurability. Energy storage systems designed with intelligence and safety at the core give our customers the confidence to operate energy storage at scale and across fleets.

The Fluence Technology Stack combines hardware, controls, software, and intelligence into an integrated building block for safe and repeatable energy storage systems that are tailored to your use case and application.

Fluence Technology Stack

Fluence IQ: Extensible digital intelligence improves system decision-making, asset performance, and operating costs with data-driven insights and dispatch algorithms.

Fluence Operating System (OS): Fully integrated operations platform combines comprehensive controls, asset management, and system visibility across single sites or entire fleets.

Fluence Cube: Configurable, factory-built, standardized form factor delivers safe, scalable, cost-effective systems with the latest storage components.

Below, we review the Technology Stack's components from the bottom up: the Fluence Cube, the Fluence OS, and Fluence IQ.

2.4 Fluence Cube

The Fluence Cube is a modular, factory-built, standard form factor that delivers safe, cost-effective systems configurable with the latest storage component technologies.

The Cube's 6th-generation form factor brings safety, scale, and repeatability to energy storage system deployments of any size. Not only does the optimized enclosure drive efficiencies in project design and permitting, but customers benefit from system consistency across project locations, leading to simplified training, operations, and maintenance. Reduced delivery, construction, and commissioning time allow customers to turn storage systems into revenue-generating assets faster than ever before.

The Cube incorporates Fluence's 12+ years of deep expertise in storage system design and delivery to accomplish the following:

- Provide a cost-effective system with maximum quality control
- Simplify the procurement and contracting process
- Simplify system design, engineering, and permitting
- Expedite delivery, construction, and commissioning
- Incorporate industry-leading safety features and storage components

The Cube's features include:

Component Flexibility

The Fluence Cube is the foundation for three purpose-built storage systems designed to solve common customer use cases and applications: Gridstack™, Sunstack™, and Edgestack™. The Cube's optimized architecture uses a standard form factor with the flexibility to incorporate technology from preselected, tier-one manufacturers. Multiple component options meet common requirements for duration, power, battery technology, and more without the need for costly, custom designs. Our diverse supply chain creates choice and flexibility so you can avoid vendor lock-in and access the best available technologies now and in the future.

Embedded Safety

The Cube comes equipped with comprehensive safety features throughout the integrated hardware, software, and intelligence technology stack. A standardized design brings consistency to your storage system with the highest level of safety capability developed and tested in a factory setting:

- Designed for industry-leading safety standards, such as UL9540, and IEC compliance

- Protective components including sliding door lock, open door sensor, E-Stop, and more
- Fire detection and suppression system
- Incipient gas detection
- Deflagration panels to NFPA 68
- Optional dry pipe connection

Rapid Delivery and Augmentation

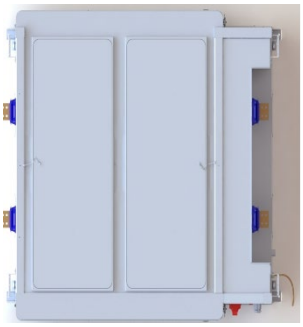
The Cube's repeatable form drives efficiencies in project design and permitting for fast delivery and rapid installation. Configure your storage system to meet current requirements, and scale-out with additional nodes or entire cores as new revenue-generating opportunities emerge or system degradation occurs. Leverage the Cube's component flexibility to reduce your augmentation risk while taking advantage of falling battery prices and best-in-class storage technologies.

The Fluence Cube

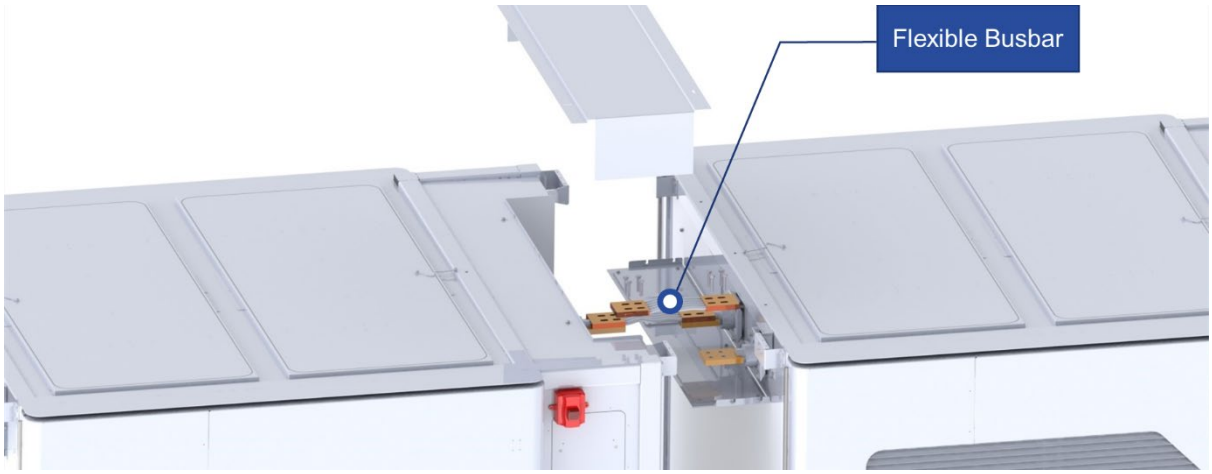
Front View

Front & Side View

Top View



Cube-to-Cube Connection



2.5 Fluence Operating System (OS)

Fluence OS is a fully integrated operations platform that combines comprehensive controls, asset management, and system visibility for the commercial operation of single storage arrays or an entire fleet. The intuitive user interface is hierarchical and modular and allows for deployment in a variety of configurations and systems ranging in size from 500 kW to 500+ MW.

Fluence OS communicates with the outside world and receives data from external meters. Depending on the market or application, this can come in a variety of forms, such as instructions from the asset owner via an Energy Management System (EMS), instructions from an Independent System Operator, or by reading in and interpreting data about grid conditions via a power quality meter.

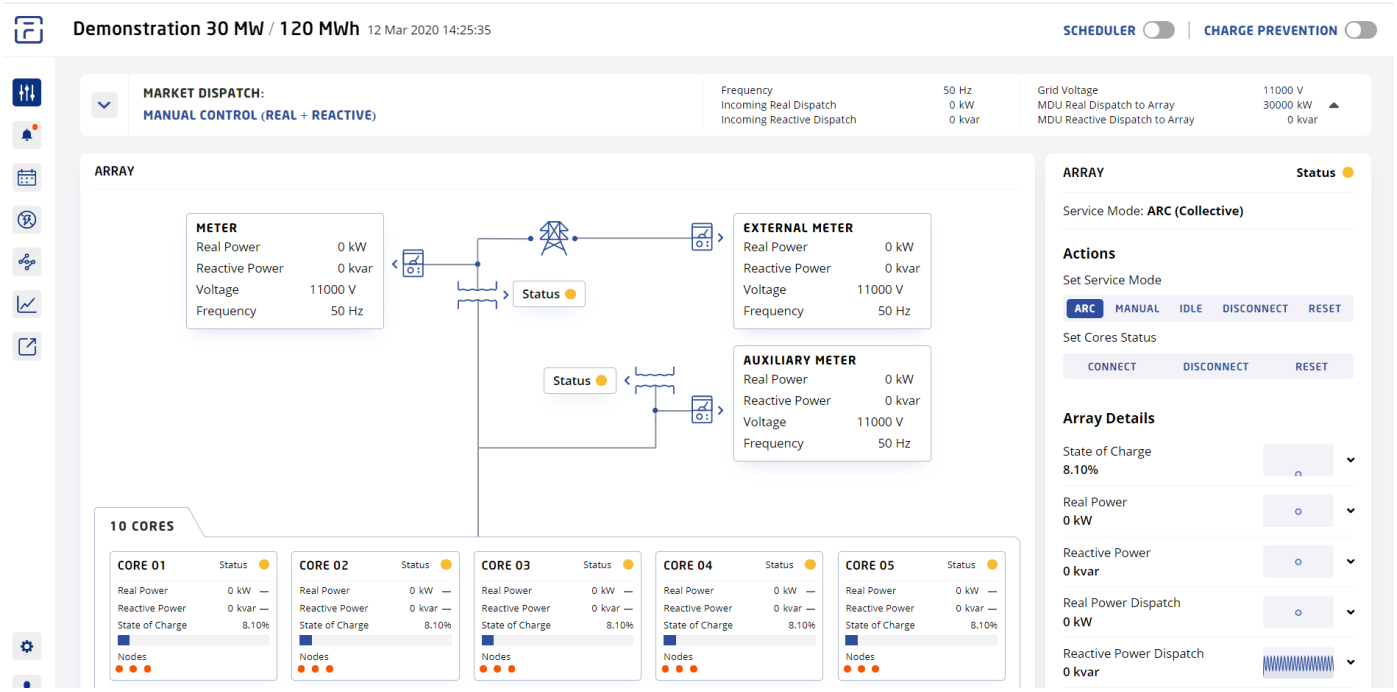
Fluence's comprehensive controls enable optimal management and reliable operation over the lifetime of storage assets. Physical controllers are distributed throughout the Fluence storage system, allowing logic to operate close to the controllable hardware, and reduce latency in the control system response. System control can be accomplished through onsite OS, remote OS, or integration with external energy management system.

The Fluence OS's features include:

Comprehensive Controls

Fluence OS allows users to manage storage system operations according to pre-set modes, including idle, automatic resource control (ARC), autonomous dispatch, and more. Actively manage the timing, modes, and parameters of different storage applications, as well as power resources via Node, Core, and Array controllers. Fluence OS provides flexibility for external interfaces such as SCADA and EMS via common protocols, including DNP3, Modbus RTU, Modbus-TCP, and more.

Fluence OS Screenshot



Deep System Visibility

OS users can access real-time information through multiple system views, including control view, plant view, and fleet view. Key performance indicators include real and reactive power dispatch, state of charge, cell voltage and temperature, auxiliary system details, core and node status, and fire system and e-stop status. The alarms panel includes a hierarchy of warnings and alerts and enables acknowledgement, action logging, and search and sort functions. Alarm classification settings require the operator to acknowledge critical alarms regardless of where they are in the OS. Comprehensive system data collection and cloud-based storage enables regular system monitoring.

Embedded Safety

Safety is found throughout every level of the Fluence OS. OS controller software monitors cell parameters as provided by the battery management system (BMS) and provides an additional layer of protection beyond that already present in the OEM BMS. Fluence OS continuously monitors, detects, and alerts operators to potential anomalies in the system which are isolated and flagged for immediate operator attention. If an atypical cell state is detected, the Fluence OS will E-Stop the system automatically.

2.6 Fluence IQ

Continuously unlocking new value from your storage system, Fluence IQ is an extensible digital intelligence layer that improves system decision-making, asset performance, and operating costs with data-driven insights and dispatch algorithms. Fluence IQ leverages massive data volumes, precise dispatch algorithms, and advanced data analysis to enhance all levels of your system hardware, software, monitoring, and services. Built on a decade of extensive data collection and management, Fluence provides the tools to participate in energy markets and applications, uncover key insights, and make informed decisions. With thousands of data points collected from the system every 1.5 seconds, Fluence enables you to drive continuous optimization of your energy storage asset.

Fluence IQ features include:

Precise Dispatch Algorithms

Fluence IQ's Market Dispatch Unit (MDU) offers a suite of software modules and algorithms developed for 40+ applications across 29 markets. MDU applications are built on historical data and true market requirements for optimal accuracy and performance. MDU algorithms, including real and reactive power dispatch, primary frequency control, contingency response, non-spinning reserves, power factor regulation, and more, are updated based on market-specific rule changes and other learnings.

Advanced Data Analysis

Through long-term service agreements (LTSAs), Fluence provides customers with contractual limit analysis summarizing system operating risk on factors such as annual throughput, discharge counts, and state of charge (SOC). Monthly performance reporting provides in-depth view of critical system indicators, including availability, roundtrip efficiency, state of health, and more. Tailored data formats and feeds can be scoped to support additional analysis and reporting.

Data and Cybersecurity

Fluence provides high-grade, 256-bit encryption on all data on-site and in transit to the cloud. Data transfer and connectivity with a private cloud data center takes place over secure, site-to-site VPN tunnels utilizing customer-provided network connectivity. All software is accessed via VPN with multi-factor authentication and role-based user controls. Fluence IQ comprises enterprise-class network security, firewall capabilities, and monitoring and control of local network traffic.

3. Fluence Gridstack™ Technical Specifications, Key Equipment, and Design Assumptions

3.1 Technical Specifications and Key Equipment

System Technical Specifications & Design Basis	
SYSTEM OVERVIEW	
Quote Number	
Substantial Completion Date	May 2021
Rated power, rated discharge duration[1]	11.5MW (22.5MVA), 1hr
Enclosure type	Cube
Design power factor at POI at rated power	0.75
Metering location	MV Switchgear
Rated power inclusive of auxiliary loads?	Yes
Balance-of-plant (BOP) losses from Fluence scope to Metering Location	included
Charge type	CPCV (Constant Power / Constant Voltage)
Estimated CPCV charge time	1.25 hrs
Discharge type	CP (Constant Power)
C-Rate	1.0
Frequency	60 Hz
SITE INFORMATION	
Design ambient site temperature for rated power	40 °C
No. of interconnections	1
Medium voltage (by customer)	4.16kV
Maximum voltage variation (equipment power output rating may de-rate at voltages below the rated AC voltage)	±5%
EQUIPMENT (preliminary—subject to change)	
Battery Modules	
Manufacturer, Module, & material	CATL, LFP-280LC, LFP
Catalogue / nameplate energy	46.6 kWh
Battery Rack	
Number of Modules per rack	8

[1] At metering location, design ambient site temperature, altitude, power factor, and project C-Rate.

Max DC voltage	1497 V
Catalogue energy	372.74 kWh
Total number of racks (BOL)	33
Inverters	
Manufacturer, Model	EPC CAB1000-3
AC operating voltage	690 V
Number of cores (inverter blocks)	5
Cubes	
Number of Cubes	18
Number of battery racks per Cube	Up to 2
Battery Cube dimensions (LxWxH)	2.201 x 2.276 x 2.649 m
Fire suppression system	solid aerosol
PERFORMANCE EXPECTATIONS (as measured by Fluence test Procedures)	
EOL Usable AC Capacity (10 years)	>7.5 MWh
EOL Usable AC Capacity (20 years)	>6.5 MWh
BOL round-trip efficiency (estimate, excludes auxiliary losses)	>85%
Technical availability (A_t)[2]	98%
System response time (assumes no ramping)	1 s
Ramp rate (0% to 100% rated charge/discharge power)	Settable by customer. Maximum ramp rate to full power in < 1 min
Noise emission level at 1 m from project fence	80 dB(A)
Operating temperature range (power de-rates above and below in kVA for all inverters per ºC)	–20 ºC to +50 ºC

3.2 Design Assumptions and Exclusions

Fluence has priced its offer based on the Fluence Design Specifications, industry best practices for energy storage equipment, and the assumptions disclosed herein.

Design

1. The system has been designed to the Operating Temperature Range & Power Factor specified above and to provide the rated power and duration at the metering location under CPCV charging.
2. Battery cube walls do not have a fire rating and the scope assumes no studies or experiments related to fire propagation at the site.
3. Inverters and battery enclosures have been designed to perform at the site Operating Temperature Range as specified above.
4. Battery SOC accuracy and calibration procedures are subject to the OEM limitations & requirements.
5. This offer is based upon industry standards and applicable codes in effect as of the date of this proposal.

[2] **NOTE:** Technical Availability is subject to the system being under LTSA with Fluence.

Clearway - Fluence
System Safety Overview

Marsh Landing Project Safety Details
10/7/2020

B. Lang (bjoern.lang@fluenceenergy.com)

Fluence 6th Generation Technology Stack

Fluence IQ: Extensible digital intelligence improves system decision-making, asset performance, and operating costs with data-driven insights and dispatch algorithms.

Fluence Operating System (OS): Fully integrated operations platform gives operators comprehensive control, optimal asset management, and system visibility across single sites or entire fleets.

Fluence Cube: Modular, factory-built, standardized form factor delivers safe, scalable, cost-effective systems configurable with the latest storage components.

FLUENCE CUBE OVERVIEW

Fluence Cube is our modular, factory-built standard form factor that delivers safe, scalable, cost-effective systems configurable with the latest storage components

The Cube is Fluence's 6th generation storage technology – incorporating 12+ years of deep expertise in storage system design and delivery:

- Cost-effective system with maximum quality control
- Fast procurement and contracting process
- Simple system design, engineering, and permitting
- Rapid delivery, construction and commissioning
- Latest safety features and storage components

Fluence Cube

COMPONENT FLEXIBILITY

- Incorporate various technologies to meet common requirements for power, duration, battery technology, etc.
- No need for costly, custom designs.
- Technology agnostic approach avoids vendor lock-in and reduces risk

EMBEDDED SAFETY

- Fully equipped with comprehensive safety features throughout tech stack
- Factory-built design brings consistent quality control
- Continuous safety upgrades are based on extensive research and industry-leading experience

RAPID DELIERY AND AUGMENTATION

- Repeatable form drives efficiencies in project design and permitting
- Configure your storage system to meet current requirements and scale-out as new revenue opportunities emerge or system degradation occurs
- Taking advantage of falling battery prices and best-in-class technologies.

FLUENCE

A Siemens and AES Company

Delivering the Safest Energy Storage System

Intelligent System Design

We design complete energy storage solutions that operate as a single integrated system with safety embedded in every layer of controls and hardware.

MULTIPLE LAYERS OF REDUNDANCY

- OS layered on top of all subcomponents to keep the system safe and functional.
- Patented control algorithms enable projects to be monitored and controlled.

COMPREHENSIVE REAL-TIME MONITORING

- OS provides real-time visibility into the performance of the system
- Continuously monitors, detects, isolates and alerts operators to potential anomalies.

HARDWARE-ENABLED SAFETY MEASURES

- Rigorous qualification and certification of all components.
- Subsystems protect themselves in event of a fault or failure in another subsystem.

Supplier Qualification

Through our technology agnostic approach, Fluence partners with leading suppliers and conducts rigorous prequalification and testing to ensure the quality and safety of components

Vendors go through an extensive pre-qualification process, including battery tests, PCS at limits of intended use, and corner cases to see how the equipment performs and if they are operating safely. Fluence operates two labs which perform comprehensive component and system testing.

Qualification requirements include:

- ISO9001 & 14001
- Battery cells are certified to UL1642 and IEC62619
- Modules and low voltage switchgear certified to UL1973 and IEC61000-6
- Low-voltage directive compliance for the EU (LVD 2014/35/EU).
- Transportation of dangerous good compliance to UN 38.3

Fluence's Safety Engineering Approach

- Fluence undertakes a continual **safety engineering process** which assesses risks potentially associated with lithium-ion stationary energy storage. Fluence incorporates **safety elements** in system designs.
- Fluence's approach considers **all phases of a potential event**, with mitigations seeking to prevent an event, limit the extent of an event, and safely conclude an event
- Fluence's approach incorporates **both design mitigations and procedural mitigations** (e.g. human factors)
- Fluence participates in **global standards committees** related to safety to both learn from and influence the industry norms

Fully Integrated Safety from Cell to System

Fluence Gen6 provides industry-leading safety at all levels of our energy storage systems

Battery Cell
- All cells are certified to IEC62619

Battery Module
- All modules are compliant with UL1973, IEC62619, and UN38.3

Battery Racks
- All racks are compliant with UL1973 and IEC62619
- BMS provides functional safety of electronic safety-related systems certified to IEC61508

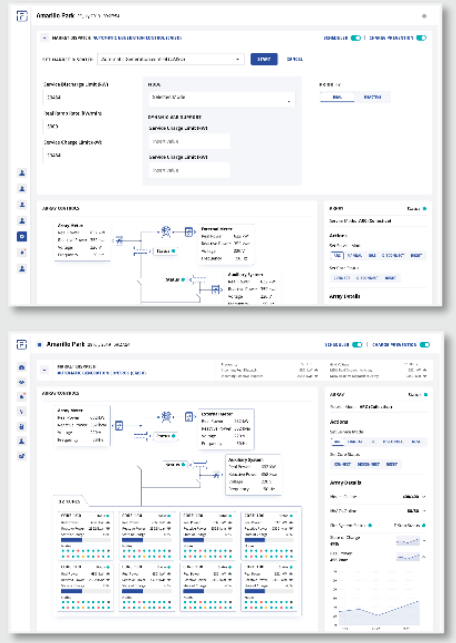
Battery Container – Fluence Cube
- Cube physically isolates <1 MWh of batteries, limiting failure event potential
- Enclosure cannot be entered and is serviced externally
- Designed for UL9540 and 9540A
- Features include e-stop, fire suppression, gas detection, deflagration panels, and more

Battery System
- UL1741 compliance
- Ground fault and battery fault protection including voltage, current, and temperature

Fluence Controls

Fluence OS controller software communicates with the battery management system for an additional level of protection beyond OEM BMS logic.

Fluence OS continuously monitors, detects and alerts operators to potential anomalies in the system. Potential problems are isolated and flagged for immediate attention, including alerts to Fluence 24/7 monitoring staff.



Owner Support
- Operation and maintenance documentation with required PPE & service protocols
- Onsite training for maintenance personnel including key hazard identification
- First Responder materials provided; training & onsite orientation available upon request
- Fluence supplies trained & certified personnel for post installation service works

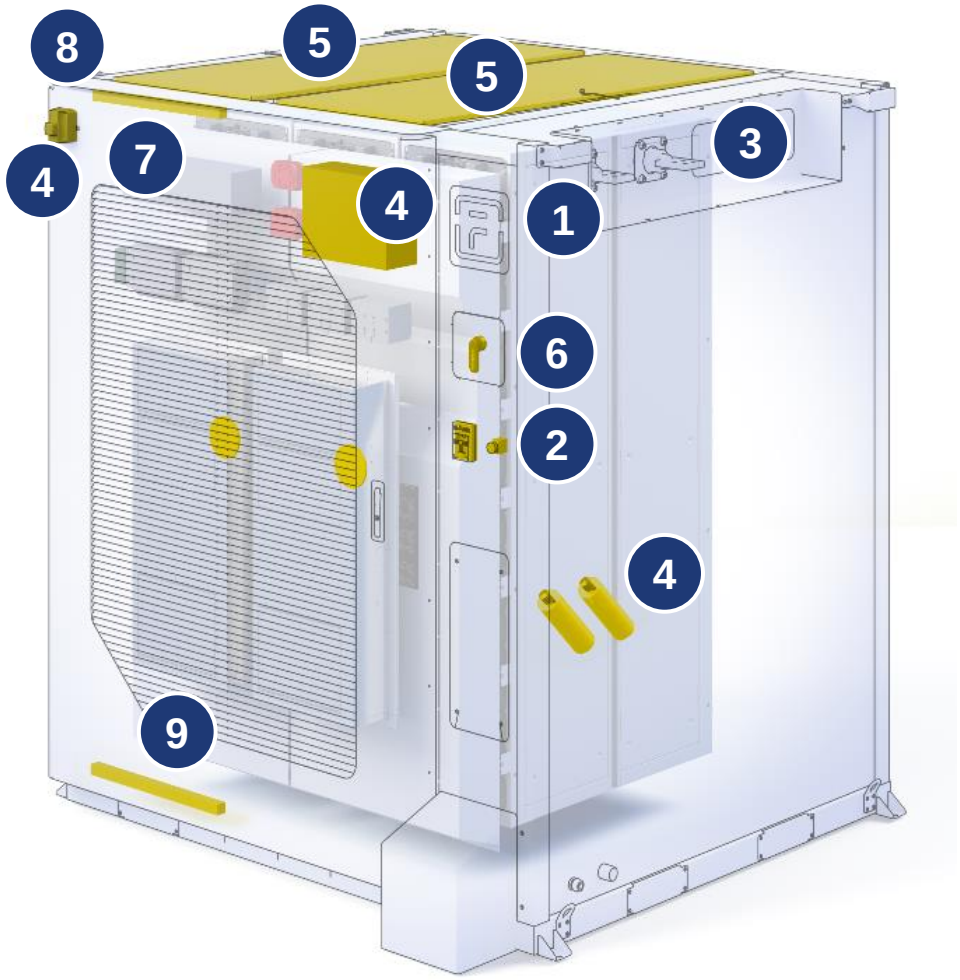
Fluence Safety Planning

Fluence provides site safety planning templates and industry best practices for use by owner in preparing customized emergency response plans.

Fluence Cube – Safety Design and Event Isolation

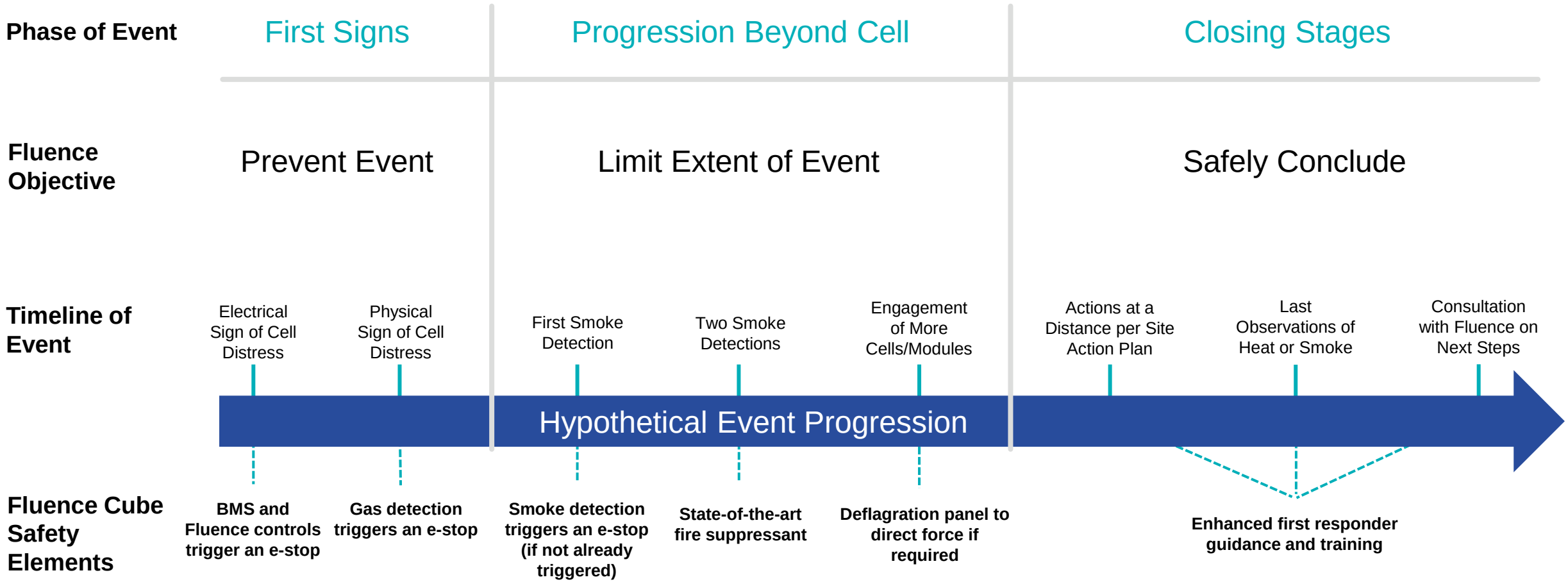
- **Ground Fault Detection:** Electrical isolation monitoring devices are present on each DC battery bus to detect faults and disconnect the system before a serious problem occurs.
- **No Entry Necessary:** Fluence Cube is entirely filled with equipment - accessible from the door - so there is no ability or need for operators to enter the container.
- **Non-Propagation:** In the event of a fire, the Cube will electrically isolate itself and is designed to contain any fire inside and prevent propagation to battery modules in adjacent containers.
- **Isolated Replacement:** In the case of an event, an individual Cube can be removed and a replacement unit put in its place.

Fluence Cube – Safety Features



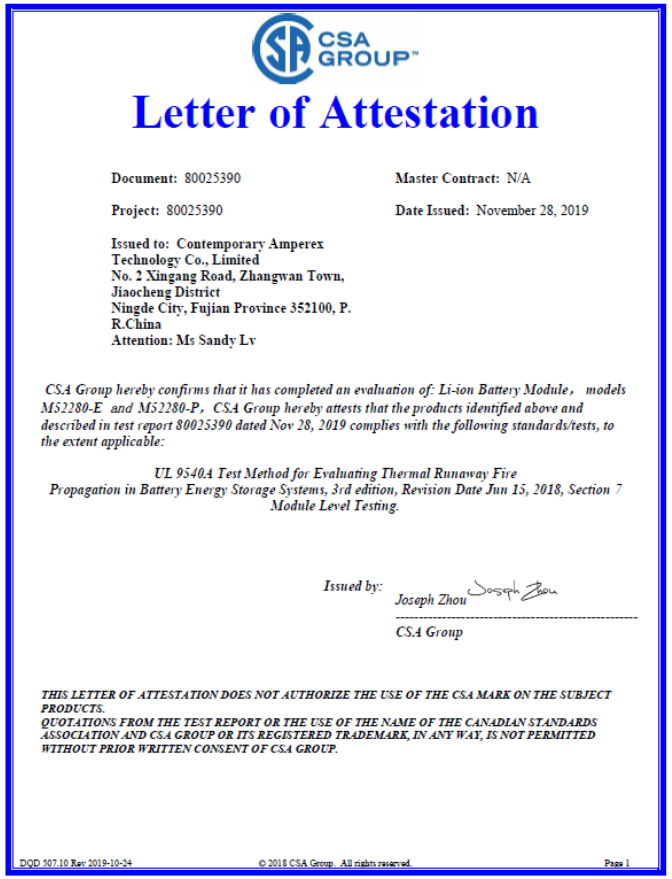
1. Battery Management System (BMS)
2. Emergency Shutdown (E-Stop)
3. Incipient Gas Detection: Carbon Monoxide
4. Fire Detection and Suppression System
5. Deflagration Panels
6. Lockable Disconnect Switch
7. Open Door Sensor
8. Gas Spring Damper
9. Sliding Door Lock

Fluence Safety Strategy for Hypothetical Event Timeline



UL 9540a Test Results

CATL LC Rack has been tested successful on Module and Rack Level



CSA GROUP™

Letter of Attestation

Document: 80025390 **Master Contract:** N/A

Project: 80025390 **Date Issued:** November 28, 2019

Issued to: Contemporary Amperex Technology Co., Limited
No. 2 Xingang Road, Zhangwan Town, Jiaocheng District
Ningde City, Fujian Province 352100, P. R.China
Attention: Ms Sandy Lv

CSA Group hereby confirms that it has completed an evaluation of: Li-ion Battery Module, models MS2280-E and MS2280-P, CSA Group hereby attests that the products identified above and described in test report 80025390 dated Nov 28, 2019 complies with the following standards/tests, to the extent applicable:

UL 9540A Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 3rd edition, Revision Date Jun 15, 2018, Section 7 Module Level Testing.

Issued by: Joseph Zhou
CSA Group

THIS LETTER OF ATTESTATION DOES NOT AUTHORIZE THE USE OF THE CSA MARK ON THE SUBJECT PRODUCTS.
QUOTATIONS FROM THE TEST REPORT OR THE USE OF THE NAME OF THE CANADIAN STANDARDS ASSOCIATION AND CSA GROUP OR ITS REGISTERED TRADEMARK, IN ANY WAY, IS NOT PERMITTED WITHOUT PRIOR WRITTEN CONSENT OF CSA GROUP.

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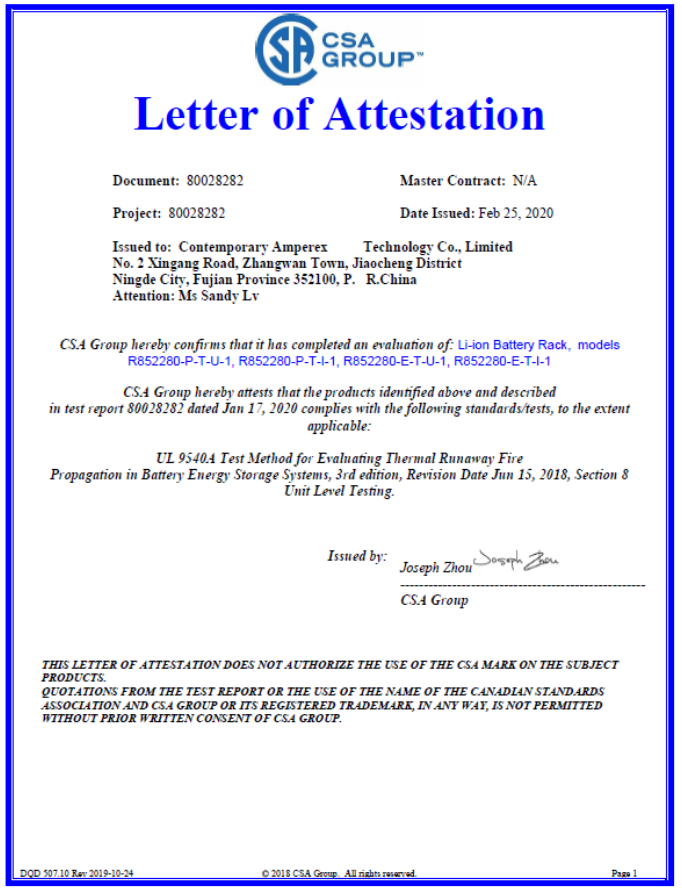

CSA GROUP™

Letter of Attestation

Document: 80028282 **Master Contract:** N/A

Project: 80028282 **Date Issued:** Feb 25, 2020

Issued to: Contemporary Amperex Technology Co., Limited
No. 2 Xingang Road, Zhangwan Town, Jiaocheng District
Ningde City, Fujian Province 352100, P. R.China
Attention: Ms Sandy Lv

CSA Group hereby confirms that it has completed an evaluation of: Li-ion Battery Rack, models R852280-P-T-U-1, R852280-P-T-I-1, R852280-E-T-U-1, R852280-E-T-I-1

CSA Group hereby attests that the products identified above and described in test report 80028282 dated Jan 17, 2020 complies with the following standards/tests, to the extent applicable:

UL 9540A Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 3rd edition, Revision Date Jun 15, 2018, Section 8 Unit Level Testing.

Issued by: Joseph Zhou
CSA Group

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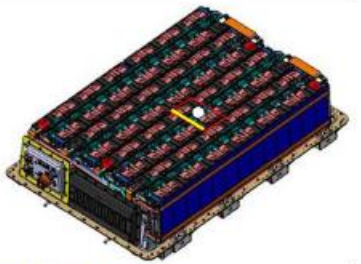
UL 9540a Test Results

Module Level



Sample During Testing:

Figure.3 Heater Location of the DUT

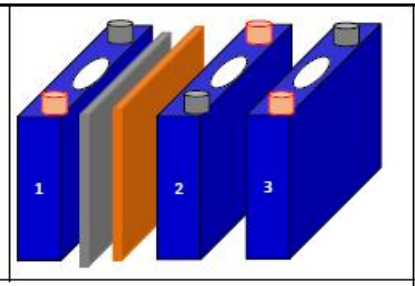


Figure. 4 Heater Location

Sample After Testing

Figure.5 DUT During Testing

Figure.6 DUT During Testing

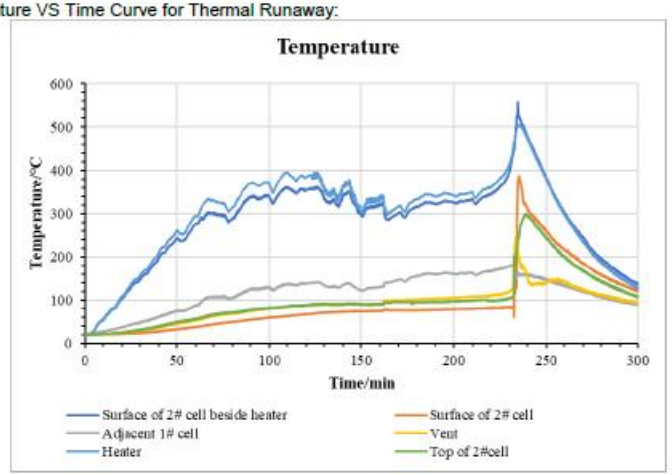
Figure. 7 Side View of the DUT

Figure.8 Front View of the DUT

Figure. 9 Top View of the DUT

Figure. 10 Inside View of DUT

Temperature VS Time Curve for Thermal Runaway:



Temperature VS Time Curve for Thermal Runaway

UL 9540a Test Results

Rack Level

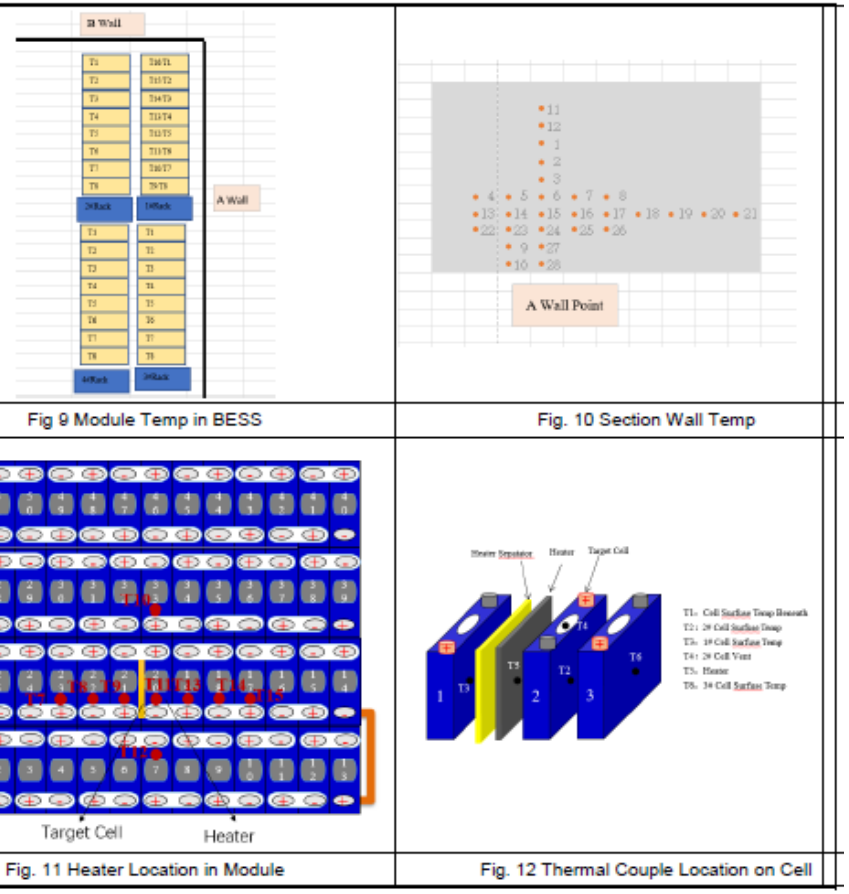


Fig 9 Module Temp in BESS

Fig. 10 Section Wall Temp

Fig. 11 Heater Location in Module

Fig. 12 Thermal Couple Location on Cell

Fig 13 BESS under Test

Fig.14 Initial BESS after Test

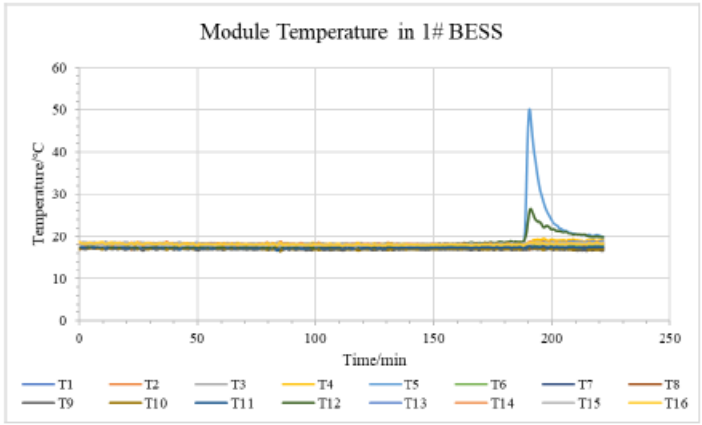


Fig. 5 Module Temperature in 1# BESS

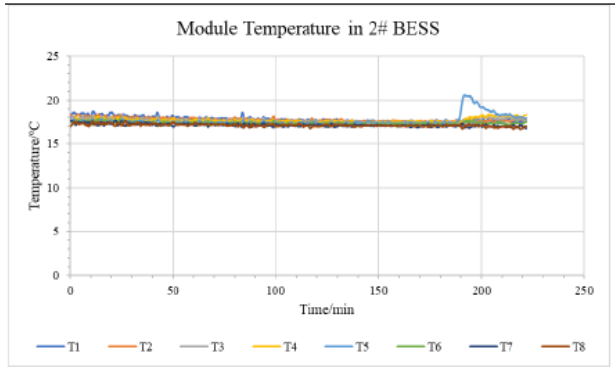


Fig. 6 Module Temperature in 2# Target BESS

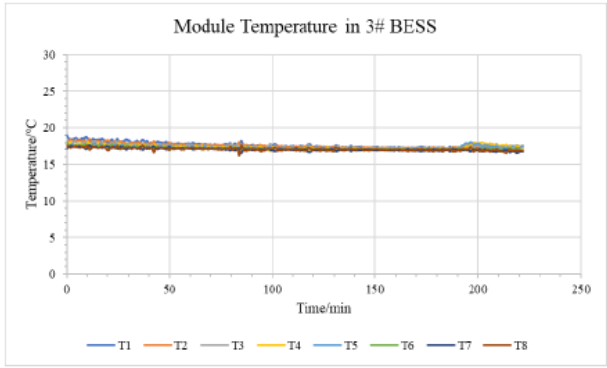


Fig. 7 Module Temperature (3# BESS)

Fluence Cube – Safety Features

Battery Management System (BMS)

The fastest reaction to any detection of abnormal conditions will take place in the BMS, which will initiate first e-stop of the system to electrically isolate the batteries.

The BMS collects data at the battery cell and module levels and communicates to external systems via Modbus protocol (RTU or TCP/IP).

- Monitors temperature, voltage, current, state of charge, state of health, etc.
- Identifies abnormal battery conditions or deviations in normal system operating conditions
- BMS-level data and warnings sent to Fluence controls for additional action, monitoring, and reporting

Fluence Cube – Safety Features

Emergency Shutdown (E-Stop)

The Emergency Shutdown (E-Stop) functionality can be triggered by the Cube hardware, Fluence OS, or an operator or first responder. A protective circuit allows us to deenergize an enclosure (battery and PCS) in the event of a fire, an operator input or a site-wide emergency.

Each Cube is capable of E-Stopping the Core. E-Stop triggers include:

- Fire Suppression System
- Core Emergency Shutdown Signal
- Cube Emergency Shutdown Button
- Smoke detector
- Carbon monoxide sensor
- Leaf Controller signal (e.g. sudden change in the voltage of individual cell)

Fluence Cube – Safety Features

Incipient Gas Detection

When batteries first show signs of physical distress, they release gas created by heating and/or chemical processes in the cells. The detection system can interrupt the event at this stage.

- Upon detection of incipient battery off-gases or electrolyte leakage, system e-stop will occur
- This process electrically isolates any impacted batteries

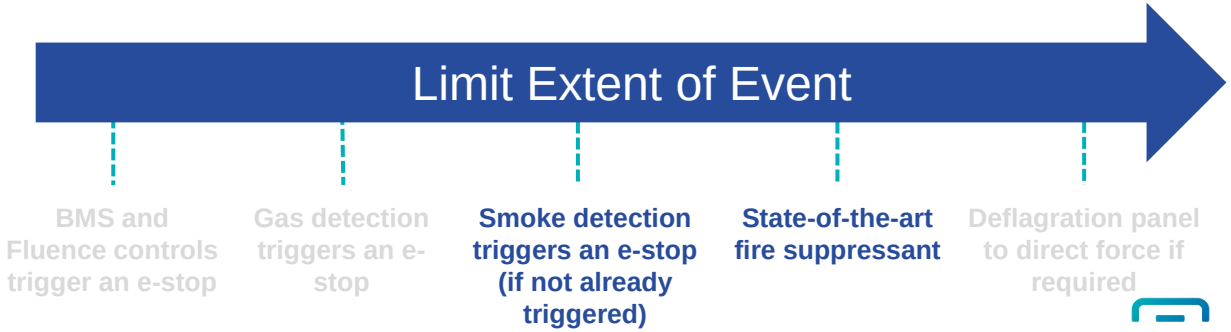
Fluence Cube – Safety Features

Fire Detection and Suppression System

The primary role of the fire suppression system is extinguishment of a non-battery fire before it spreads to cells. Fire suppression systems will not halt the progression of thermal runaway. Depending on several factors, fire suppression may slow the progression.

Fire suppression will be engaged immediately upon thermal limit detection. The Fire Detection and Suppression System includes:

- Smoke detector (trigger external horn and strobe light)
- 1 external horn + strobe light, outdoor mounted for easy identification
- Solid aerosol suppressant to prevent spread of fires to batteries



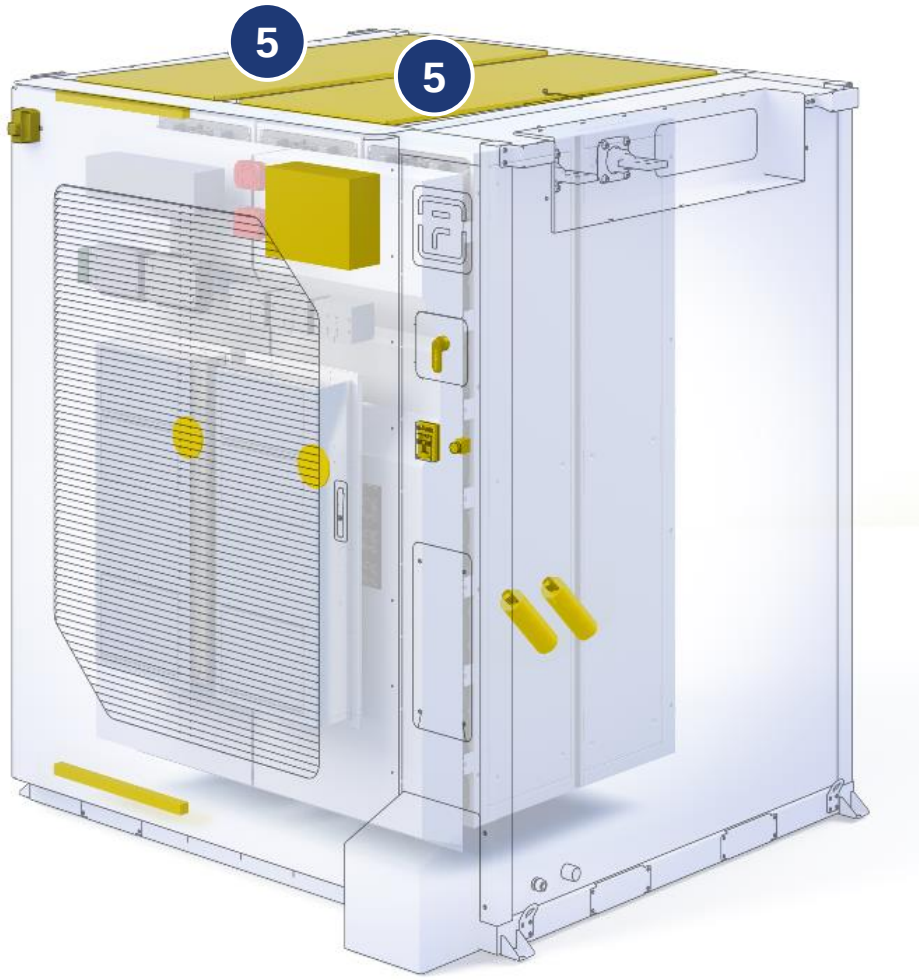
Fluence Cube – Safety Features

Deflagration Panels

If batteries were to reach a state of thermal runaway, they release gases created by the chemical breakdown of the materials inside the cell. If the event progresses, these gases may approach or exceed limits which could create an explosive atmosphere.

If a fire is suppressed but gas evolution continues to a point where any significant pressure is built up, the deflagration panels will direct the force of any pressure up and away from humans.

- The pressure release serves to minimize structural and mechanical damage and the safety risk to operators or first responders
- The Cube contains two or more deflagration panels compliant with NFPA 68.



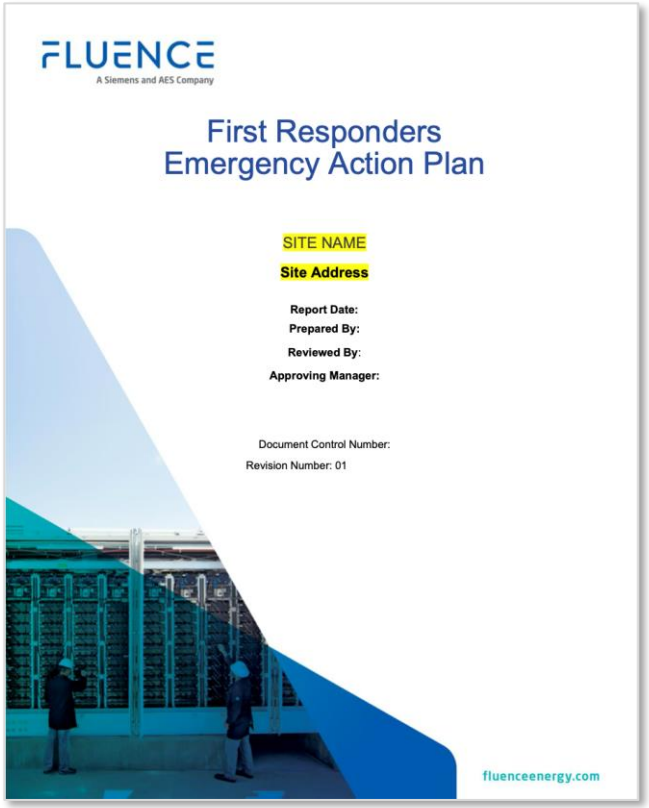
Fluence Cube – Safety Features

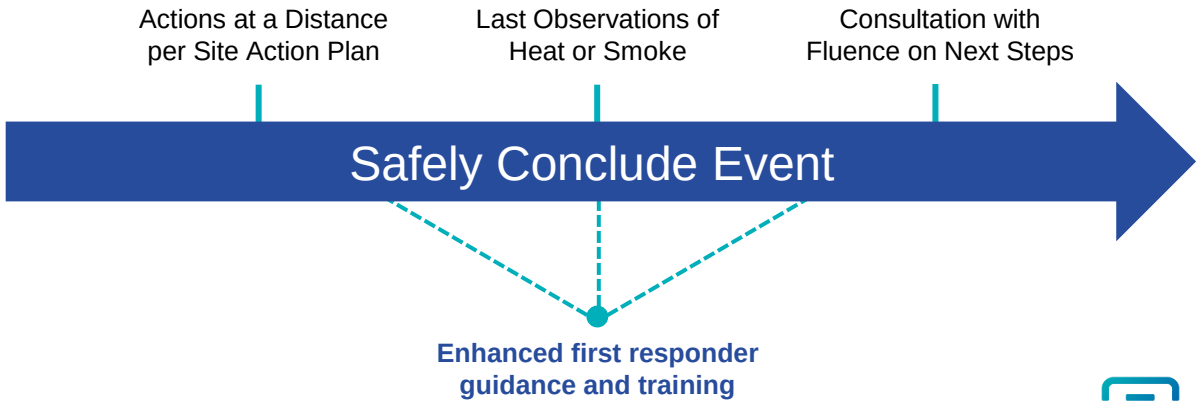
First Responder Guidance

During an event, the cube should remain isolated and unopened until fully cooled. A fire strobe and alarm will alert first responders not to open it and Cube signage reinforces this message.

Fluence will provide first responder guidance (tailored to site specifics) and offer training, for incorporation into site emergency action plans.

- Guidance documentation will include a recommended sequence of operations for a potential event.
- Fluence consultation to be provided to aide decision makers at site were an event to occur.



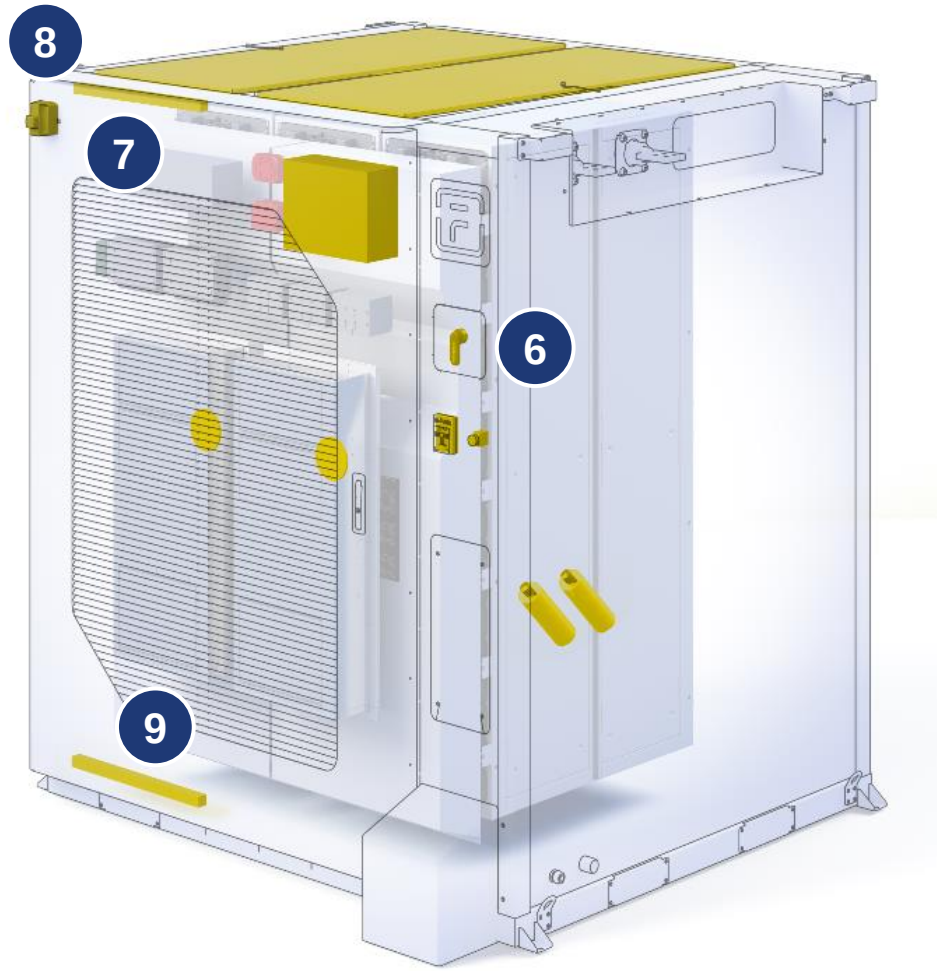


Fluence Cube – Safety Features

Door Safety Components

Additional safety features ensure the Cube door can be safely operated if personnel need to access or maintain internal Cube components.

- Lockable Disconnect Switch
- Open Door Sensor: notifies operators if the door is left open
- Gas Spring Damper: prevents the door from opening too quickly
- Sliding Door Lock: locks the door in place to prevent unintended opening



Fluence OS Data Collection and Monitoring

Data Collection

- Typically, > 80,000 data points are collected every two seconds for a 10 MW project.
- Comprehensive data collection provides system insights and supports continual improvements.
- In case of a safety event, Fluence retains data on system performance - stored locally on-site and regularly backed up to the cloud per project requirements

24/7 Remote Monitoring*

- All systems are built with 24/7 remote monitoring and control capabilities.
- Remote monitoring allows for the detection of a potential event before it occurs.
- High priority alerts are sent to a 24-hour monitoring service where operators can take immediate action according to Standard Operating Procedures (SOPs).

System Limits

- System limits are the parameters Fluence OS uses to ensure safe operation.
- Parameters include cell, BMS and PCS voltage, temperature, SOC, SOH, humidity, and more.
- If parameter warnings are reached, battery charging and discharging are reduced as needed to ensure safe system operation.

*Available as part of Fluence Operational Services packages

Data and Cybersecurity

FLUENCE
A Siemens and AES Company

Fluence Data and Cybersecurity

Fluence follows the NIST Cybersecurity Framework and supports NERC cybersecurity standards

On-Site

- VPN remote site access with multi-factor authentication and 256-bit encryption
- Secure, role-based user access and control to local systems
- Enterprise-class network security and firewall software monitors and controls all local network traffic
- Weekly vulnerability scanning and patching of local devices

In Transit

- High grade, AES 256-bit encryption is used to protect all data in transit from local systems to virtual private cloud (VPC).
- All data transfer and connectivity with private cloud data center takes place over secure, site-to-site VPN tunnels, utilizing customer-provided network connectivity.

In the Cloud

- Secure, logically isolated cloud environment uses restrictive firewall and security group rules to limit connectivity within the Virtual Private Cloud (i.e. deny-by-default).
- Two geographically diverse VPCs provide VPN access. All external access into cloud data center is via VPN, utilizing multifactor authentication.

Thank You

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Appendix C Grading and Storm Drainage Plan and Surfacing Plan (Provided Separately)

Appendix D List of Property Owners

051 031 015
Pacific Gas and Electric Company
Po Box 770000
San Francisco, CA 94177-0001

051 031 016
Pacific Gas and Electric Company
5555 Florin Perkins Rd
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051 031 017
GenOn Delta LLC
804 Carnegie Center
Princeton, NJ 08540

051 031 020
NRG Delta LLC
804 Carnegie Center
Princeton, NJ 08540

051 031 021
NRG Delta LLC
804 Carnegie Center
Princeton, NJ 08540

051 031 005
Commercial Development Company Inc.
1650 Des Peres Rd., Ste. 303
Saint Louis, MO 63131