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TN #:	233097
Document Title:	SEGS VIII and IX BESS Staff Analysis
Description:	Staff Analysis of Petition to Add A Battery Energy Storage System
Filer:	Susan Fleming
Organization:	California Energy Commission
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CALIFORNIA
ENERGY COMMISSION

SOLAR ENERGY GENERATING SYSTEMS (SEGS) VIII AND IX (88-AFC-01C AND 89-AFC-01C)

Staff Analysis of Petition to Add a Battery Energy Storage System

On July 26, 2019, Solar Energy Generating Systems, LLC, (project owner) filed a post-certification petition (TN#: 229090) to change the design and operation of the Solar Energy Generating Systems VIII and IX (SEGS VIII & IX) projects. In the petition, the project owner proposes to add a battery energy storage system (BESS) and associated equipment to the projects.

SEGS VIII and IX are solar thermal power plants that use parabolic mirrors to concentrate solar energy to heat fluid, which is used to create steam to generate up to 160 megawatts (MW) of electricity. The CEC certified the SEGS VIII project on March 29, 1989. SEGS VIII went online in December 1989. The CEC certified the SEGS IX project on February 14, 1990. SEGS IX went online in October 1990. The projects are located at 43880 Harper Lake Road, 7 miles northeast of Highway 58 on a 500-acre site near Hinckley, California, in unincorporated San Bernardino County.

DESCRIPTION OF PROPOSED PROJECT CHANGE

The project owner is seeking approval to install and operate a BESS to provide up to 80MW of electricity with a duration up to two hours. Given the modularity of the design of the BESS, the system may be constructed in multiple phases starting with a system with a one-hour capacity.

The BESS is capable of storing excess electrical energy from the grid as electro-chemical energy and delivering it back to the grid as electrical energy, using Lithium-ion (Li-ion) batteries.

In addition to charging and discharging at a constant rate, the BESS can provide one or more ancillary services to the California Independent System Operator (California ISO) controlled grid.

ENERGY COMMISSION POST-CERTIFICATION PETITION REVIEW PROCESS

The purpose of the CEC's review process is to analyze whether the proposed changes to the project may have a significant effect on the environment or cause the project to not comply with applicable laws, ordinances, regulations, and standards (LORS) (Cal. Code Regs., tit. 20, § 1769).

Staff has concluded that impacts on the environment would be less than significant and the project would remain in compliance with all applicable LORS with the continued implementation of existing conditions of certification in the Final Commission Decision for each project, and with the implementation of staff's proposed new conditions of certification in the areas of Transmission Line Safety and Nuisance, Transmission System Engineering, and Worker Safety and Fire Protection. In addition, the project change would not affect any population including the environmental justice population as shown in **Environmental Justice Figure 1**, **Figure 2**, and **Table 1** in the Staff Analysis.

For additional information, the visit CEC's webpages for SEGS VIII and SEGS IX. Related documents, including the petition, are accessible through these webpages in the box labeled "Compliance Proceeding." Click on the "Documents for this Proceeding (Docket Log)" (SEGS VIII docket log and SEGS IX docket log) option to review the compliance docket logs and corresponding documents.

This notice is being mailed to the CEC's list of interested parties who have requested service by mail, affected public agencies, and owners and occupants of property contiguous to the project. It has also been sent electronically to the SEGS VIII and IX listservs in accordance with Title 20, California Code of Regulations, section 1209. The listserv is an automated system by which information about the facility is emailed to anyone who has subscribed. To subscribe, go to the CEC's webpages for the SEGS VIII and IX projects (linked above), scroll down the right side of the project webpage to the box labeled "Subscribe," and provide the requested contact information.

Any person may comment on the Staff Analysis. Those who wish to comment are asked to submit their comments by 5:00 p.m. on Monday, June 22, 2020. This petition, as well as staff's new proposed conditions of certification, will be scheduled for a decision at the June 25, 2020 Energy Commission Business Meeting.

To use the CEC's electronic commenting feature, go to the CEC's webpages for SEGS VIII and/or IX (linked above), click on the "Comment on this Proceeding" or "Submit e-Comment" link, and follow the instructions in the online form. Be sure to include the facility name in your comments. Once the CEC's Docket Unit files your comments in the docket, you will receive an email with a link to them. Written comments may also be mailed to:

California Energy Commission
Docket Unit, MS-4
SEGS VIII and IX (88-AFC-01C and
089-AFC-01C)
1516 Ninth Street
Sacramento, CA 95814-5512

All comments and materials filed with and published by the Docket Unit will be added to the facility Docket Log and be publicly accessible on the CEC's webpage for the facility.

If you have questions about this notice, please contact John Heiser, Compliance Project Manager, at (916) 653-8236 or via email at John.Heiser@energy.ca.gov.

For information on participating in the CEC's review of the SEGS VIII and IX petition, please contact the CEC's Public Advisor at (916) 654-4489, or at (800) 822-6228 (toll-free in California). The Public Advisor's Office can also be contacted via email at publicadvisor@energy.ca.gov.

News media inquiries should be directed to the CEC's Media Office at (916) 654-4989, or by email at mediaoffice@energy.ca.gov.

Date: May 22, 2020

Original Signed by

CHRIS DAVIS, Compliance Office Manager
Siting, Transmission, & Environmental Protection Division

Mail List: 742
Listserv: Solar Energy Generating Systems (SEGS VIII)
Listserv: Solar Energy Generating Systems (SEGS XI)

STAFF ANALYSIS

SOLAR ENERGY GENERATING SYSTEMS (88-AFC-01C AND 89-AFC-01C)

PETITION TO ADD A BATTERY ENERGY STORAGE SYSTEM

SOLAR ENERGY GENERATING SYSTEMS
(88-AFC-01C AND 89-AFC-01C)
PETITION TO ADD BATTERY ENERGY STORAGE SYSTEM
STAFF ANALYSIS

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SOLAR ENERGY GENERATING SYSTEMS (SEGS) VIII AND IX (88-AFC-01C AND 89-AFC-01C)

Petition to Add Battery Energy Storage System

EXECUTIVE SUMMARY

John Heiser

INTRODUCTION

On July 26, 2019, Solar Energy Generating Systems, LLC, (project owner) filed a post certification petition (TN#: 229090) to change the design and operation of the Solar Energy Generating Systems VIII and IX (SEGS VIII & IX) projects. In the petition, the project owner proposes to add a battery energy storage system (BESS) and associated equipment to the projects.

Construction of the proposed BESS would be within the existing SEGS VIII and IX property boundary. The BESS would occupy three acres of land located in between the SEGS VIII and SEGS IX solar fields in the southern section of the property.

The batteries would be used to provide flexibility to the electric grid by storing and delivering the electrical energy as more intermittent renewable wind and solar resources are added to the system.

The purpose of the California Energy Commission's (CEC) review process is to analyze whether the proposed changes to the project may have a significant effect on the environment or cause the project to not comply with applicable laws, ordinances, regulations, and standards (LORS) (Cal. Code Regs., tit. 20, § 1769).

NECESSITY FOR THE PROPOSED PROJECT CHANGES

As stated in the petition, the proposed addition of energy storage capability would enable SEGS VIII and IX to be more responsive to the flexibility needs of the electric grid. The proposed BESS would use Lithium-ion (Li-ion) batteries, which have a high energy density and fast charge/discharge capabilities.

STAFF'S ASSESSMENT OF THE PROPOSED PROJECT CHANGES

CEC staff reviewed the petition for potential environmental effects and consistency with applicable LORS. Staff has concluded that in the following technical areas, impacts to the environment are less than significant and the project would remain in compliance with all applicable LORS with the continued implementation of existing conditions of certification in the Final Decisions for each project: Air Quality, Biological Resources, Cultural Resources, Efficiency and Reliability, Facility Design, Geological and Paleontological Resources,

Hazardous Materials Management, Land Use, Noise and Vibration, Public Health, Socioeconomics, Soil and Water Resources, Traffic and Transportation, Visual Resources, and Waste Management.

For the technical areas of Transmission Line Safety and Nuisance, Transmission System Engineering, and Worker Safety and Fire Protection, staff has concluded that impacts on the environment would be less than significant and the project would remain in compliance with all applicable LORS with the continued implementation of existing conditions of certification in the Decisions, and with the implementation of staff's proposed new conditions of certification in these technical areas.

In addition, the project change would not affect any population including the environmental justice population as shown in **Environmental Justice Figure 1**, **Figure 2**, and **Table 1**.

Staff's conclusions for each technical or environmental area are summarized in **Executive Summary Table 1** on the following page.

Executive Summary Table 1

Technical Areas Reviewed	Technical Area Not Affected	CEQA			Conforms with Applicable LORS	Revised or New Conditions of Certification Requested or Recommended
		Potentially Significant Impact	Less Than Significant Impact with Mitigation	Less Than Significant Impact		
Air Quality				X	X	
Biological Resources				X	X	
Cultural Resources				X	X	
Efficiency and Reliability				X	N/A	
Facility Design		N/A	N/A	N/A	X	
Geological and Paleontological Resources				X	X	
Hazardous Materials Management				X	X	
Land Use				X	X	
Noise and Vibration				X	X	
Public Health				X	X	
Socioeconomics				X	X	
Soil and Water Resources				X	X	
Traffic and Transportation				X	X	
Transmission Line Safety and Nuisance			X		X	X
Transmission System Engineering		N/A	N/A	N/A	X	X
Visual Resources				X	X	
Waste Management				X	X	
Worker Safety and Fire Protection			X		X	X

Summary of Impacts for Each Technical Area

Air Quality. Construction of the BESS would occur over a period of four to six months and commissioning would be completed over approximately three weeks. Minimal short-term air quality impacts are possible during construction of the foundation and installation of the BESS. Grading activities would be minimal as the entire project site, including the proposed BESS area, was graded during original project construction. Minor dust and vehicle combustion exhaust emissions are possible. Fugitive dust control measures specified in the project Dust Control Plan would be implemented during construction and installation of the BESS. Further, the project would ensure that minimal vehicle idling occurs, thereby

minimizing vehicle exhaust emissions. Diesel-fueled construction equipment would comply with the California Air Resources Board's regulations. Furthermore, all equipment used onsite would be required to be in proper working order, including properly tuned engines. These measures, coupled with the short-term nature of construction, would result in less than significant air quality impacts during construction of the BESS.

There are no new emissions associated with operation of the BESS. Therefore, operation of the BESS would not cause significant air quality impacts.

The requested project change would conform to all applicable federal, state, and South Coast Air Quality Management District (SCAQMD) air quality LORS, and the project change would not cause significant air quality impacts. The conditions of certification in the Final Decisions for each of the projects would remain unchanged and no new air quality conditions of certification would be required.

Biological Resources. Construction would take four to six months and require 15-20 construction personnel. The BESS would be located on land that has been previously graded and cleared, and construction activities would be entirely within the existing desert tortoise fencing and would not occur near any biologically sensitive areas. All construction workers would be required to undergo employee environmental awareness training and receive the educational brochure on the biological resources in the project area. The current employee environmental awareness program training covers guidelines for operation and maintenance activities. The program would be updated by the project owner to cover standard impact avoidance and minimization measures for construction activities and submitted for review and approval per Conditions of Certification **BIO-4h** (SEGS VIII) and **BIO-8** (SEGS IX).

Implementation of existing biological resource conditions of certification for SEGS VIII and IX would ensure impacts to biological resources would be less than significant, and the projects would continue to comply with applicable LORS. Staff also concludes that construction traffic associated with the project would not increase the potential for take of special-status species in the area.

Cultural Resources. Staff concludes that construction and operation of the BESS would have a less than significant impact to cultural or tribal cultural resources with implementation of the conditions of certification from both licensing decisions (i.e., SEGS VIII **CUL-1** through **CUL-8**, and SEGS IX **CUL-1** through **CUL-20**). The project owner, in implementing the existing conditions of certification, would need to update or prepare a new cultural resources mitigation and monitoring plan (see conditions **CUL-5** for SEGS VIII and **CUL-10** for SEGS IX).

Efficiency and Reliability. The BESS would not consume natural gas or fuels directly. Therefore, the proposed change request would have no significant adverse impacts on fuel consumption or the project's overall thermal efficiency. The BESS would enhance the project's operational flexibility, and thus, improve its overall operational reliability.

Facility Design. Installation of the BESS must be in accordance with the 2019 edition of the California Building Standards Code. Implementation of the existing Facility Design conditions of certification adopted in the Energy Commission SEGS VIII and IX Decisions and construction compliance oversight by the CEC's delegate chief building official would ensure this compliance.

Geological and Paleontological Resources. Staff concludes the proposed project change would not result in additional significant environmental impacts in terms of geologic resources, paleontologic resources, or geologic hazards in comparison with the original analysis for the approved project, provided the owner complies with Conditions of Certification **GEO-2** and **PAL-1** through **PAL-8** for both SEGS VIII and IX. The proposed construction would not require any change to the conditions of certification related to geology or geologic hazards adopted by the Energy Commission in its Final Decisions for SEGS VIII and IX.

Hazardous Materials Management. The proposed battery system would use Lithium-ion batteries. The batteries would be delivered to the SEGS site in U.S. Department of Transportation-certified vehicles and in compliance with all applicable requirements of the U.S Department of Transportation, California Highway Patrol, and the California Department of Motor Vehicles in accordance with Conditions of Certification **TRANS-13** in the SEGS VIII Decision and **TRANS-7** in the SEGS IX Decision. The project owner would be required to update the existing Hazardous Materials Business Plan to reflect the addition of the Lithium-ion batteries.

There would be no other changes to the hazardous materials used during operation of the SEGS. The use, handling, storage, and transportation of the lithium-ion batteries would be in compliance with all current LORS.

There would be no other changes to the hazardous materials used during operation of the SEGS BESS. The use, handling, storage, and transportation of the Lithium-ion batteries would be in compliance with all current LORS.

Therefore, the potential hazardous materials management impacts are expected to be less than significant with the continued implementation of the existing Conditions of Certification **TRANS-13** and **TRANS-7** adopted in the Commission decisions.

Land Use. The proposed change would not result in any change to the land use classification associated with the project site; would be consistent with existing zoning and applicable land use plans, policies, and regulations; and would not impact farmlands. The proposed change would be located entirely within the existing project site and would not alter the analysis of potential impacts to land use set forth in the Commission decisions. Therefore, the project change would not result in significant land use impacts. The proposed change would not result in any necessary changes to the conditions of certification for land use.

Noise and Vibration. Construction work associated with this petition would be temporary and would occur during the daytime hours. Any noise generated during these activities would result in a less-than-significant impact with implementation of the existing Noise conditions of certification in the Energy Commission Final Decisions for both SEGS VIII and IX.

Battery systems do not generate high levels of noise when operating, and thus, no noticeable increase in operational noise would result from the requested project change. The primary sources of noise from the BESS would be the HVAC systems for the Lithium-ion system, but they would not substantially elevate the existing ambient noise levels in the project area. Because the projects would continue to meet operational noise requirements established in the Commission decisions, the proposed BESS would not cause a significant adverse noise impact.

Public Health. Construction and operation of the BESS is not expected to cause a significant impact to public health.

The project owner stated construction activities would include limited site preparation and grading, installation of foundations and supports, setting battery modules, wiring and electrical system installation, and the assembly of the accessory components. The construction activities would include the operations of diesel-fueled construction equipment. California classifies diesel exhaust or diesel particulate matter (DPM) as a toxic air contaminant based on its potential to cause cancer. Risks are associated with the level and duration of exposure. The project owner expects construction activities to occur over a period of 4 to 6 months. There is no significant increase in DPM exposure to surrounding receptors associated with the construction, commissioning, or ongoing operations of the BESS and the construction activities are considered temporary.

Any diesel equipment used at the site would be required to meet State of California diesel requirements. As applicable, the diesel equipment used would need to be registered through the Statewide Portable Equipment Registration Program or Diesel Off-road On-line Reporting System and associated equipment permits would need to be retained onsite. Therefore, significant impacts to public health are not expected from the associated short-term construction activity or ongoing operation of the BESS.

Socioeconomics. The proposed change would require construction contractors and labor for the installation of the BESS. At peak construction there would be approximately 15 to 20 workers for a 6-month period. There would be no increased staff required for the operational phase of the BESS. There would be no significant impacts to utilities and public services, schools, or housing needs as a result of the proposed change, and thus no significant socioeconomic impacts. The proposed change to the project would not result in any necessary changes to the conditions of certification for socioeconomics.

Soil and Water Resources. Construction of the BESS would involve up to 9 acres of land area to facilitate construction, construction material and equipment laydown, and staging and worker parking. The completed BESS would occupy up to 3 acres.

This activity would not violate or require action related to the conditions of certification contained in the Water Resources or Soil Conservation sections of the decisions for either project. In addition, no new conditions would apply. Since the project is located within a topographically closed drainage basin and does not drain to waters of the United States, the project owner would not need to apply for coverage under the State Water Resources Control Board's General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit Order 2012-0006-DWQ). The projects were also built on low risk soils in terms of erosion, and discharges to a waterbody classified as non-sensitive for sedimentation, Harper Lake. The proposed activity is therefore a low threat to local water quality.

Construction of the proposed BESS would require about seven acre-feet (AF) of groundwater for dust control. Operation of the BESS would not require water or require a change to the SEGS projects' operational water usage.

SEGS VIII does not have a condition of certification that limits water usage. SEGS IX is limited to 950 acre-feet per year during operation by Condition of Certification **Water Supply-4**. The two SEGS solar thermal power plants averaged 954 acre-feet per year (AFY) between 2010 and 2013, but only 615 AFY for 2017. The combined projects therefore appear to be using less water than was originally anticipated. The use of seven AF of water during construction of the BESS is therefore within the expected annual water use total of the power plants. This usage is not expected to create an adverse impact.

After considering all proposed changes, the BESS would not result in any additional environmental impacts in terms of soil and water resources in comparison with the original analysis in the final decisions for each project. The existing conditions of certification are adequate to ensure that there would be no unmitigated significant impacts. The projects would also continue to comply with applicable LORS.

Traffic and Transportation. The proposed BESS would not generate significant impacts to transportation. The temporary nature and limited number of vehicles associated with construction of the proposed change would have a less than significant impact on existing traffic and transportation within the project area. Construction would require a one-time mobilization and demobilization of heavy equipment (excavator and backhoe) at the start and end of earthwork or other construction stage, as needed. Approximately 15 to 20 personnel are expected to be at the construction site daily, resulting in daily worker trips. The total duration of construction activities is expected to occur over a period of four to six months. There would be no increased staff required for the operational phase of the BESS, thus no significant increase in project operations-related vehicle miles travelled. The proposed change to the projects would not require any necessary changes to the conditions of certification for traffic and transportation. **TRANS-1** and **TRANS-2** would ensure that permits and/or licenses are secured from the California Highway Patrol and Caltrans for construction-related oversized or overweight vehicles, as well as any necessary encroachment on public right-of-way.

Transmission Line Safety and Nuisance. The proposed BESS would include a Power Conversion System (PCS), BESS controller, medium voltage transformer, a step-up transformer, enclosures, and a fire protection system. The project owner is proposing to connect the transformer to the existing on-site switchyard through a new 230-kilovolt (kV) overhead transmission line. The on-site switchyard has an open bay available for connection. The project owner reports the switchyard would not need an expansion but would require modifications to accommodate the BESS.

Staff is proposing the addition of four new transmission line safety and nuisance (TLSN) conditions of certification covering the new line and required modifications to accommodate the proposed BESS, as discussed below. These TLSN conditions of certification would be added to both the SEGS VIII and SEGS IV license. With the inclusion of the four proposed conditions, the addition of the BESS would result in less than significant impacts.

Transmission System Engineering. The proposed BESS including the facilities between the new battery storage system and the existing SEGS VIII and IX switchyard including the step-up transformers, the project 230 kV switchyard, the 230 kV overhead transmission lines, and terminations, would comply with all LORS. The interconnection with the Southern California Edison (SCE) transmission grid would not require additional downstream transmission facilities (other than those proposed by the applicant) that require California Environmental Quality Act (CEQA) review.

The California Independent System Operator's (California ISO) Material Modification Assessment (MMA) would ensure the existing transmission system can deliver the needed power for charging the BESS under the worst conditions.

Staff proposed Conditions of Certification **TSE-11** through **TSE-15,** discussed below would ensure that the construction and operation of the transmission facilities for the proposed BESS comply with the applicable LORS.

Visual Resources. The proposed change would not substantially degrade the existing visual character or quality of the site, or its surrounding. The BESS structures would be located between the SEGS VIII and IX projects and would be up to 12 feet high for battery modules mounted in containers or up to 20 feet high to the peak roof elevation for battery modules arranged in an enclosure. The existing mirrors that occupy the majority of the site are approximately 22 feet high and the tallest existing structure in the area of each of the generation units is 88 feet high. The existing control building in the area of the proposed BESS is a two-story building, approximately 30 feet high. Therefore, the BESS would not visually dominate the site, nor would it create a visual point of interest due to its size in relation to the other plant facilities. The proposed change would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. The proposed change would not require any necessary changes to the conditions of certification for visual resources.

Waste Management. Based on the information provided by the project owner, staff concludes the proposed modifications would not result in additional significant

environmental impacts in terms of waste management in comparison with the original analysis for the approved project, provided the owner complies with existing Conditions of Certification **WASTE-1**, **WASTE-2**, **WASTE-5**, **WASTE-6**, and **WASTE-7**, as applicable in both SEGS VIII and IX decisions. In addition, for SEGS VIII the project owner would also comply with existing Condition of Certification **WASTE-4**. The proposed construction would not require any change to the conditions of certification related to waste management in the Commission decisions for each project.

Worker Safety and Fire Protection. As discussed in greater detail below, staff proposes Conditions of Certification **WORKER SAFETY-11**, **WORKER SAFETY-12**, and **WORKER SAFETY-13** for inclusion in both the SEGS VIII and SEGS IX decisions, which would ensure adequate protection for on-site workers and first-responders, and would mitigate any potential fire and explosion risks posed to the offsite public to a level that would be less than significant. Staff concludes that with the adoption of the proposed conditions of certification, the projects would remain in compliance with applicable worker safety and fire protection LORS.

ENVIRONMENTAL JUSTICE

Environmental Justice Figure 1 shows 2010 census blocks in the six-mile radius of SEGS VIII and IX with a minority population greater than or equal to 50 percent. The population in these census blocks represents an environmental justice (EJ) population based on race and ethnicity as defined in the United States Environmental Protection Agency's *Guidance on Considering Environmental Justice During the Development of Regulatory Actions*. Staff conservatively obtains demographic data within a six-mile radius around a project site based on the parameters for dispersion modeling used in staff's air quality analysis. Air quality impacts are generally the type of project impacts that extend the furthest from a project site. Beyond a six-mile radius, air emissions have either settled out of the air column or mixed with surrounding air to the extent the potential impacts are less than significant. The area of potential impacts would not extend this far from the project site for most other technical areas included in staff's EJ analysis.

Based on California Department of Education data shown in **Environmental Justice Table 1**, staff concludes that the percentage of those living in the Barstow Unified School District (in a six-mile radius of the project site) and enrolled in the free or reduced price meal program is comparatively larger than those in the reference geography, and thus are considered an EJ population based on low income as defined in *Guidance on Considering Environmental Justice During the Development of Regulatory Actions*. **Environmental Justice Figure 2** shows where the boundaries of the school district are in relation to the six-mile radius around the SEGS VIII and IX sites.

Environmental Justice Table 1
Low Income Data within the Project Area

SAN BERNARDINO COUNTY SCHOOL DISTRICTS IN SIX-MILE RADIUS	Enrollment Used for Meals	Free or Reduced Price Meals	
Barstow Unified	6,226	4,937	79.3%
REFERENCE GEOGRAPHY			
San Bernardino County	403,196	288,979	71.7%

Source: CDE 2018. California Department of Education, DataQuest, Free or Reduced Price Meals, District level data for the year 2017-2018, <http://dq.cde.ca.gov/dataquest/>.

The following technical areas (if affected by a project change) consider impacts to EJ populations: Air Quality, Cultural Resources (indigenous people), Hazardous Materials Management, Land Use, Noise and Vibration, Public Health, Socioeconomics, Soil and Water Resources, Traffic and Transportation, Transmission Line Safety and Nuisance, Visual Resources, Waste Management, and Worker Safety and Fire Protection.

ENVIRONMENTAL JUSTICE CONCLUSIONS

For the technical areas of Air Quality, Hazardous Materials Management, Land Use, Noise and Vibration, Public Health, Socioeconomics, Soil and Water Resources, Traffic and Transportation, Visual Resources, and Waste Management, staff concludes that impacts would be less than significant, and thus would be less than significant on the EJ population represented in **Environmental Justice Figure 1**, **Figure 2**, and **Table 1**.

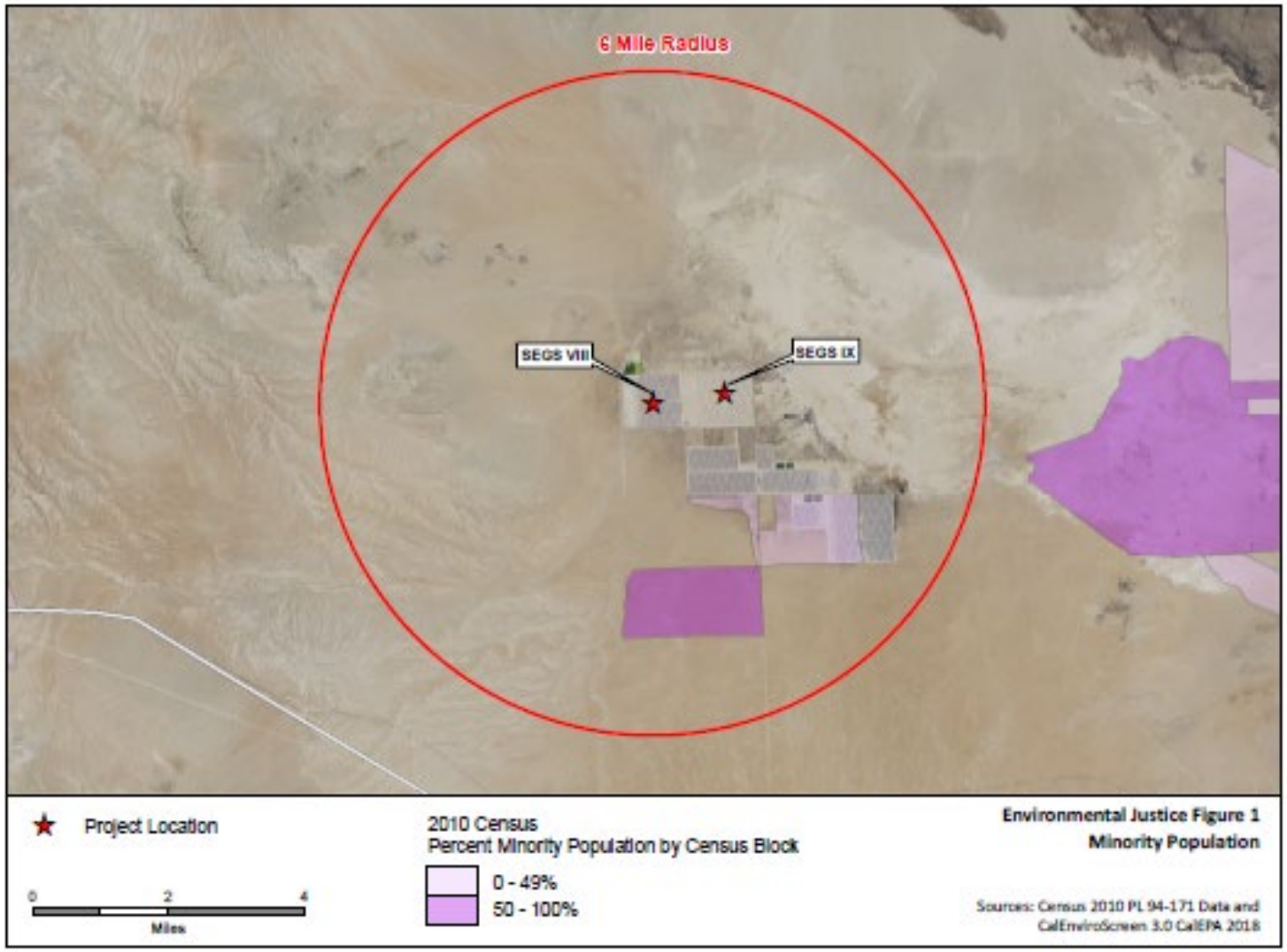
For Cultural Resources (indigenous people), staff reviewed the ethnographic and historic literature to determine whether any EJ populations use or reside in the project area. No known hunting and gathering areas would be impacted by the proposed project change, therefore Native Americans are not considered members of the EJ population in the project area.

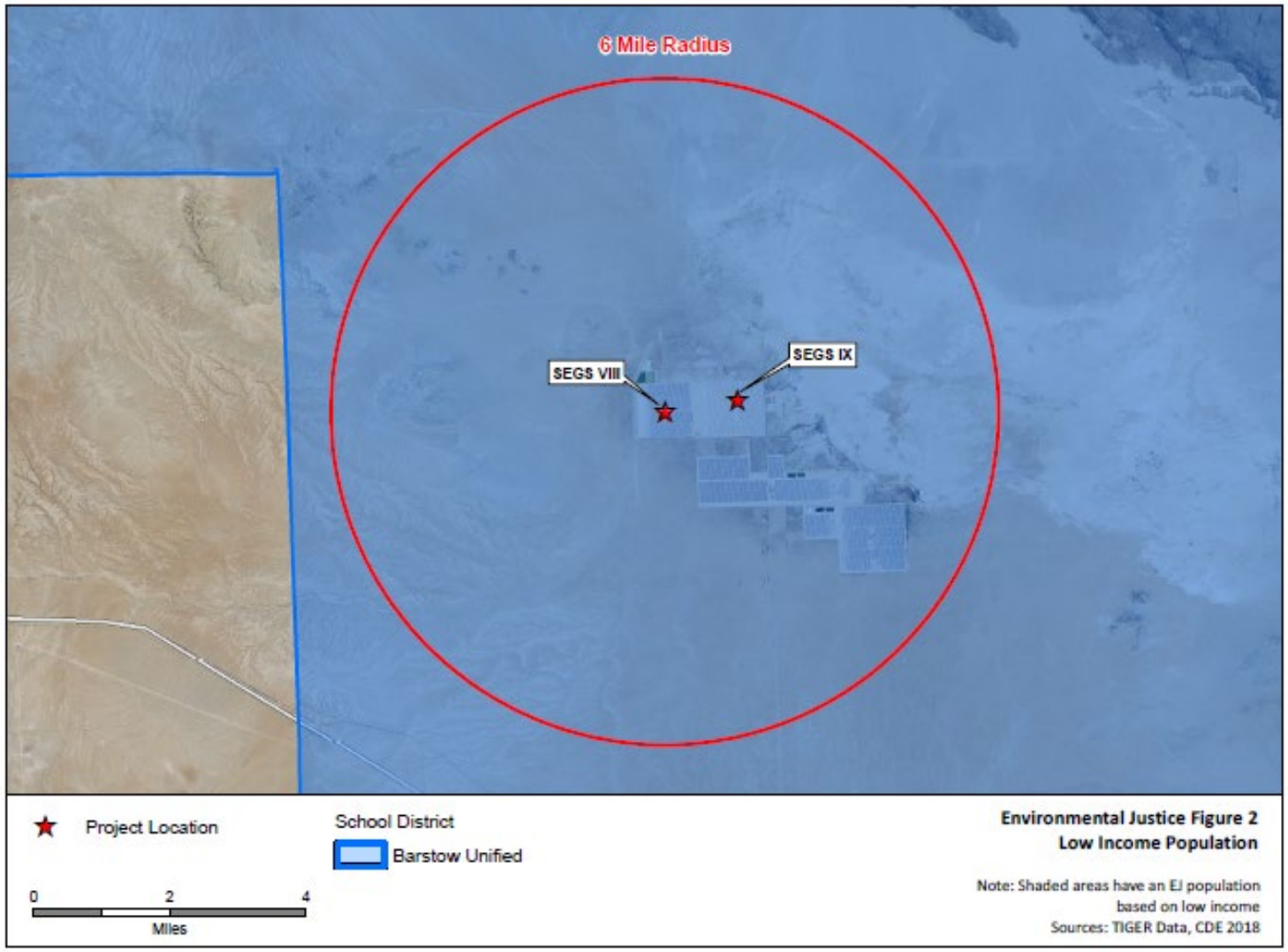
In the Transmission Line Safety and Nuisance and Worker Safety and Fire Protection analyses, staff proposes changes to conditions of certification. Staff has determined that by adopting the proposed changes to the existing conditions of certification, the project changes would not cause significant impacts for any population in the project's six-mile radius, including the EJ population. Impacts to the EJ population are less than significant.

STAFF RECOMMENDATIONS AND CONCLUSIONS

Staff concludes that the change to the projects would not result in significant adverse environmental impacts, and the projects would remain in compliance with all applicable laws, ordinances, regulations, and standards, with implementation of existing conditions of certification in the Commission decisions for each project and with implementation of staff's proposed conditions of certification for Transmission Line Safety and Nuisance, Transmission System Engineering, and Worker Safety and Fire Protection. Staff also

concludes that none of the required findings in Title 20, California Code of Regulations, section 1748(b) are applicable to this amendment.


6 Mile Radius
SEGS VIII
SEGS IX
Project Location
0
2
4
Miles
2010 Census
Percent Minority Population by Census Block
0 - 49%
50 - 100%
Environmental Justice Figure 1
Minority Population
Sources: Census 2010 PL 94-171 Data and
CalEnviroScreen 3.0 CalEPA 2018


6 Mile Radius
SEGS VIII
SEGS IX
Project Location
School District
Barstow Unified
0
2
4
Miles
Environmental Justice Figure 2
Low Income Population
Note: Shaded areas have an EJ population based on low income
Sources: TIGER Data, CDE 2018

SOLAR ENERGY GENERATING SYSTEMS (SEGS) VIII AND IX (88-AFC-01C and 89-AFC-01C)

Petition to Add a Battery Energy Storage System
Transmission Line Safety and Nuisance Analysis
Prepared by: Nancy Fletcher

Introduction and Summary

The proposed battery energy storage system (BESS) would include a power conversion system (PCS), BESS controller, medium voltage transformer, a step-up transformer, enclosures, and a fire protection system. The project owner is proposing to connect the transformer to the existing on-site switchyard through a new 230-kilovolt (kV) overhead transmission line. The on-site switchyard has an open bay available for connection. The project owner reports the switchyard would not need an expansion but would require modifications to accommodate the BESS.

Staff is proposing the addition of four new transmission line safety and nuisance (TLSN) conditions of certification covering the new line and required modifications to accommodate the proposed BESS. These TLSN conditions of certification would be included on both the SEGS VIII and SEGS IX licenses. With the inclusion of the four proposed conditions, the addition of the BESS would result in less than significant impacts on the environment. The analysis took into consideration potential impacts to environmental justice populations. There are no transmission line safety and nuisance environmental justice issues related to the proposed change and no minority or low-income populations would be significantly or adversely impacted.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS COMPLIANCE

The laws, ordinances, regulations, and standards (LORS) and practices listed in **TLSN Table 1** apply to the proposed BESS project. Staff reviewed the BESS to determine compliance with the listed LORS divided into the following sections: Aviation Safety, Interference with Radio Frequency Communication, Audible Noise, Fire Hazards, Hazardous and Nuisance Shocks, and Electric and Magnetic Fields.

Transmission Line Safety and Nuisance Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description and Compliance
Aviation Safety	
Federal	
Title 14 Code of Federal Regulations (C.F.R.) Part 77 (Safe, Efficient Use and Preservation of the Navigable Airspace)	Describes the criteria used to determine the need for a Federal Aviation Administration (FAA) "Notice of Proposed Construction or Alteration" in cases of potential obstruction hazards. Staff does not expect the project to create an obstruction hazard.
FAA Advisory Circular 70/7460-1L (Obstruction Marking and Lighting)	Describes the FAA standards for marking and lighting objects deemed an air navigation hazard. The FAA does not consider the Advisory Circular a regulation and therefore the standards are not automatically mandatory. However, proposed projects affecting the National Airspace System would be required to notify the FAA under Title 14, and the FAA would determine if the guidelines become mandatory. Staff does not expect the project to affect the National Airspace System.
Communication Interference	
Federal	
Title 47 C.F.R., part15 (Radio Frequency Devices)	Regulates operation of devices that can interfere with communications. The BESS transmission line would be rated at less than 345-kV and would be located within the existing facilities. Staff does not expect project related radio-frequency interference; however, staff is proposing the addition of a condition of certification outlining procedures to be used if the project owner receives a complaint.
Federal Communications Commission (FCC) Communications Act of 1934 as amended by the Telecom Act of 1996	Creates the Federal Communication Commission tasked with regulating communications by radio, television, wire and satellite. The FCC regulations prohibit operations of radio frequency devices to cause interference with licensed services. Compliance is expected.

State	
California Public Utilities Commission (CPUC) General Order 52 (GO-52)	Governs the construction and operation of power and communications lines to prevent or mitigate interference. Staff is proposing a new condition of certification to ensure compliance with CPUC GO-52.
Audible Noise	
State	
Governor's Office of Planning and Research State General Plan Guidelines	Includes recommendations for noise level standards to prevent the creation of incompatible land uses due to noise. Staff does not expect significant audible noise from the additional transmission line.
Local	
County of San Bernardino Noise Ordinance	Establishes standards for both noise-sensitive land use and noise-generating land uses. Staff does not expect significant audible noise from the additional line.
Fire Hazards	
State	
Title 14, California Code of Regulations, sections 1250-1258 (Fire Prevention Standards for Electric Utilities)	Provides specific exemptions from electric pole and tower firebreak-clearance standards, electric conductor clearance standards, and specifies when and where standards apply. Incorporates provisions of Public Resources Code sections 4292-4296 for any mountainous land, forest covered land, brush covered land or grass-covered land within state responsibility areas. Staff is proposing additional conditions of certification to ensure the project would not create a fire hazard.
CPUC GO-95 (Rules for Overhead Electric Line Construction)	Includes regulations to protect the public from potential fire hazards associated with power line facilities. Staff is proposing additional conditions of certification to ensure compliance with initial construction and ongoing maintenance.
CPUC GO-165 (Inspection requirements for Electric Distribution and Transmission Facilities)	Establishes inspection cycles for electric distribution and transmission facilities (excluding facilities contained in a substation). Establishes inspection systems for transformers, switching/protective devices, regulators/capacitors and other

	specified equipment. Staff is proposing additional conditions of certification to ensure compliance with applicable requirements.
CPUC GO-166 (Standards for Operation, Reliability and safety During Emergencies and Disasters)	Establishes standards for electric utilities to insure the utilities are prepared for emergencies and disasters. The measures include a Fire Prevention Plan (FPP) for facilities located in areas designated in the highest two tiers on the CPUC fire-threat map. The SEGS VIII and IX facilities are not located in an area currently designated in the specified tiers requiring a FPP. Therefore, staff is not proposing a condition of certification.
Hazardous and Nuisance Shocks	
State	
CPUC GO-95 (Rules for Overhead Electric Line Construction)	Governs clearance requirements to prevent hazardous shocks, grounding techniques to minimize nuisance shocks, and maintenance and inspection requirements. Staff is proposing additional conditions of certification to ensure compliance with industry standards and effectively minimize the potential for hazardous and nuisance shocks.
Title 8, California Code of Regulations, section 2700 and the following (High Voltage Safety Orders)	Specifies requirements and minimum standards for safely installing, operating, working around, and maintaining electrical installations and equipment. Staff is proposing additional conditions of certification to ensure compliance with industry standards and effectively minimize the potential for hazardous and nuisance shocks.
National Electrical Safety Code (NESC)	Specifies grounding procedures to limit nuisance shocks and specifies minimum conductor ground clearances. Staff is proposing additional conditions of certification to ensure compliance with industry standards and effectively minimize the potential of hazardous and nuisance shocks.
Industry Standards	
Institute of Electrical and Electronics	Specifies guidelines for grounding-related

Engineers (IEEE) 1119 (IEEE Guide for Fence Safety Clearances in Electric-Supply Stations)	practices within the right-of-way and substations. Staff is proposing additional conditions of certification to ensure compliance with industry standards and effectively minimize the potential for hazardous and nuisance shocks.
Electric and Magnetic Fields (EMF)	
State	
CPUC GO-131D (Rules Relating to the Planning and Construction of Electric Generation, Transmission/Power/Distribution Line Facilities and Substations Located in California)	Specifies application and noticing requirements for new line construction including EMF reduction. Staff does not expect significant EMF exposure from the BESS project to the surrounding area.
CPUC Decision 93-11-013	Specifies CPUC requirements for reducing power frequency electric and magnetic fields. Staff does not expect significant EMF exposure from the BESS project to the surrounding area.
CPUC Decision 06-01-042	Re-affirms CPUC EMF Policy in 93-11-013. Staff does not expect significant EMF exposure from the BESS project to the surrounding area.
Industry Standards	
Institute of Electrical and Electronics Engineers (IEEE) 644-1944 Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines	Specifies standard procedures for measuring electric and magnetic fields from an operating electric line. Staff does not expect significant EMF exposure from the BESS project to the surrounding area and is not proposing any measurements.

ANALYSIS

The petitioner is proposing a new overhead transmission line to connect the proposed BESS to the existing onsite switchyard. The petitioner would not need to expand the footprint of the onsite switchyard because it already includes an extra bay position for the new line. The petitioner would modify the switchyard by adding a new breaker, new switches, and new metering. The proposed single circuit BESS 230 kV transmission line would be approximately 600 feet in length and would be located entirely within the common SEGS VIII and SEGS IX footprint. SEGS VIII and SEGS IX would share the proposed BESS transmission line.

The BESS transmission line would be located within the project site so there are no immediate receptors along the proposed BESS transmission line. The nearest airport is

approximately 14.1 miles from the proposed project. However, maps indicate there are structures surrounding the project that could be either residences or worksites.

Staff assessed the proposed BESS transmission line design to determine whether its related field and non-field impacts would constitute a significant environmental hazard in the area around the proposed BESS transmission line route. All related health and safety LORS intend to minimize potential hazards. Staff's analysis focuses on the following issues taking into account both the physical presence of the line and the physical interactions of its electric and magnetic fields: aviation safety, interference with radio-frequency communication, audible noise, fire hazards, hazardous shocks, nuisance shocks, and electric and magnetic field (EMF) exposure.

Aviation Safety

Title 14, Code of Federal Regulations (C.F.R.), part 77 establishes standards and notification requirements for objects affecting navigable airspace. The purpose of the regulation is to evaluate the effect of any construction or alteration on operating procedures, determine potential hazardous effects of proposed construction on air navigation, identify mitigating measures to enhance safe air navigation, and chart new objects. The requirements establish the criteria for determining whether a notification to the Federal Aviation Administration (FAA) is required via Form 7460-1. All projects determined to be obstructions, whether permanent or temporary, are subject to the noticing requirements.

The petitioner would be required to file a notification with the FAA 45 days prior to construction for any of the following construction or alterations:

- Any construction or alteration exceeding 200 feet above ground level.

- Any construction or alteration:(a) within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point of the runway of each airport with at least one runway more than 3,200 feet in length, (b) within 10,000 feet of a public use or military airport which exceeds a 50:1 surface from any point of the runway of each airport with its longest runway no more than 3,200 feet in length, (c) within 5,000 feet of a public use heliport which exceeds a 25:1 surface.

- Any highway, railroad, or other traverse way whose prescribed adjusted height would exceed that above noted standards.

- When requested by the FAA.

- Any construction or alteration located on a public use airport or heliport regardless of height or location.

In addition, FAA Advisory Circular No. 70/7460-1L, Obstruction Marking and Lighting, describes standards for marking and lighting obstructions identified in 14 C.F.R., Part 77. The standards establish provisions for marking and lighting of structures including transmission poles and towers that exceed an overall height of 200 feet or any obstruction standard in 14 C.F.R., part 77 (an obstruction is defined at 499 feet above ground level). In addition, voluntary provisions are included for specific structures below 200 feet above ground level.

The petitioner stated BESS project components would not be any higher than the existing facility structures. The petitioner reports the highest existing structure at the SEGS facility is approximately 88 feet high. The nearest airport reported is approximately 14.1 miles from the SEGS VIII and SEGS IX facilities. There are no known airports or heliports close enough for any line-related collision hazards. Therefore, staff does not expect any potential hazard for aviation safety and does not recommend a specific condition of certification regarding aviation safety for the proposed BESS transmission line.

Interference with Radio Frequency Communication

Radio frequency describes the frequency band at which wireless telecommunication signals are transmitted and broadcast. The operation of a transmission line can potentially interfere with telecommunication signals such as railroad signal circuits, radio communications, cellular telephones, cordless devices, and television reception. Potential interference is a product of corona and gap discharge.

Corona is a phenomenon associated with energized high voltage transmission lines. Under certain conditions, the localized electric field near an energized conductor can be sufficiently concentrated to produce a tiny electric discharge that can ionize air close to the conductors (EPRI 1982). Corona discharge or corona are common names describing this partial discharge. Corona is a type of energy loss that can produce small amounts of sound, radio noise, heat, and chemical reactions such as ozone production. Corona is more of a concern with extra high voltage transmission lines rated above 345 kilovolts (kv) and is typically not a design problem for lines rated at 230 kv and below.

Gap discharge can develop on power lines at any voltage including low voltage lines. Gap discharge involves tiny separations between mechanically connected metal parts where a small spark can discharge across the gap and create electrical noise. The severity of gap discharge interference is dependent on the strength and quality of the signal and the distance between a receiver and the transmission line. A responsible party can avoid or minimize discharge gap by proper design and maintenance. Sources of gap discharge can be readily located and corrected.

The LORS relating to interference do not establish a limit on the level of radio noise or interference a transmission line may produce; however, federal requirements limit the operating parameters of power line carrier systems for compatibility with the radio

spectrum. Requirements in 47 C.F.R. part 15 prohibit operations that cause harmful interference. Harmful interference is defined as any emission, radiation, or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radio communications service operating in accordance with 47 C.F.R., part 15.

Potential interference levels are dependent on the magnitude of the electric fields involved and the distance from the line. Reducing the line electric fields and locating the line away from inhabited areas minimizes the potential for interference.

The project owner would be required to build the BESS transmission line according to standard practices that minimize surface irregularities and discontinuities. The proposed BESS transmission line would be rated at less than 345 kV and would be located within an existing power plant with no nearby residents or other worksites. Staff does not expect any corona-related radio-frequency interference or gap discharge complaints.

However, staff is proposing the addition of **TLSN-14** establishing procedures to record and correct any potential complaint. This condition is consistent with **TLSN-5** in the SEGS VIII and IX licenses for the existing transmission lines.

Audible Noise

Audible noise could result from the action of the electric field at the surface of the BESS transmission line conductor. Corona noise can have a characteristic crackling, frying, hissing sound, or hum. The potential noise level depends on a number of factors including the strength of the line's electric field, weather, or any other factor influencing discharge amplitude. Typically, foul weather corona is worse for alternating current audible noise and summer fair weather is more critical to direct current audible noise.

Corona noise is usually more relevant from higher voltage (345 kV or higher) overhead lines. Lines carrying more than 220 kV have bundled conductors that reduce the electric field strength gradient, and therefore reduce Corona noise. In addition, research has demonstrated the audible noise from transmission lines under 345 kV is generally insignificant and can be indistinguishable from background noise at the edge of a right-of-way with a width of 100 feet or more. The proposed line right-of-way (ROW) would fall entirely within the boundaries of the existing SEGS VIII and SEGS IX facilities with similar connecting lines. The project owner proposes locating the new generation tie lines within the SEGS site and would design and construct the lines to best industry standards, reducing project-related audible noise interference.

There are no specific noise limit regulations for transmission line noise; however, the BESS line would be required to comply with the noise and vibration standards in the County of Bernardino Development Code (Division 3, Countywide Development Standards; Chapter 83.01, General Performance Standards (GPS), Section 83.01.080-Noise, Section 83.01.090-Vibration). The San Bernardino County Development Code

standards are consistent with the State of California General Performance Guidelines recommendations for community noise and land use compatibility. In addition, the proposed BESS transmission line would be remotely located and there are no nearby sensitive receptors.

The project owner would be required to construct the BESS transmission line according to industry standards. Audible noise would be limited through design, construction, and maintenance practices. Industry research concludes adherences to these standards effectively minimizes the potential for significant noise and vibration from the proposed BESS transmission line. Transmission line standards would minimize field strengths; therefore, staff does not expect the proposed line operation to add significantly to current background noise levels in the project area.

Staff recommends the adoption of proposed Condition of Certification **TLSN-11** to ensure compliance with industry standards. **TLSN-11** would require the project owner to construct the BESS transmission according to applicable standards that would effectively minimize the potential for audible noise from the proposed BESS transmission line.

Fire Hazards

This analysis addresses fire hazards that could be caused by sparks from conductors of overhead lines, or that could result from direct contact between a line and nearby trees and other combustible objects. The Worker Safety and Fire Protection section provides additional details on fire safety related to the other BESS project components and SEGS VIII and SEGS IX facilities.

GO-95 establishes fire-safety regulations applicable to the BESS transmission line. In response to wildfires reportedly ignited by overhead utility lines and aerial communication facilities in close proximity to power lines, the California Public Utilities Commission (CPUC) initiated rulemaking to consider and adopt regulations regarding overhead power-line facilities. Most of the adopted fire-safety regulations were new or revised rules incorporated into GO-95.

As part of CPUC fire safety rulemaking, the CPUC developed a map to delineate areas considered a high fire threat. The CPUC also developed a map indicating where there is an elevated risk for destructive power line fires and where stricter fire-safety regulations should apply. The CPUC adopted additional regulations to enhance fire-safety in areas designated as a High Fire Threat District (HFTD). According to the maps developed by the CPUC, SEGS VIII and SEGS IX are not located in an area designated as a HFTD.

GO-165 establishes inspections requirements for electric distribution and transmission facilities to ensure safety. The inspection frequency is increased in areas designated HFTD. According to the maps developed by the CPUC, SEGS VIII and SEGS IX are not located in an area designated as a HFTD.

Title 14, California Code of Regulations, sections 1250-1258 incorporates minimum clearance from the Public Resources Code, clarifies when and where standards apply, and provides specific exemptions from requirements. The regulations establish firebreak clearances for flammable vegetation and materials.

The project owner would be responsible for complying with any applicable clearances, tree trimming, and other vegetation management requirements in GO-95 and Title 14, California Code of Regulations, sections 1250-1258 to mitigate fire hazards on an on-going basis. In addition, the project owner would be required to comply with any ongoing inspection and maintenance activities required by GO-165. The proposed BESS transmission line would be located on the existing SEGS VIII and SEGS IX graded site, and compliance is expected.

Staff recommends the adoption of proposed Conditions of Certification **TLSN-11** and **TLSN-12** to ensure compliance with these program requirements. **TLSN-11** would require the project owner to construct the BESS transmission according to applicable standards and **TLSN-12** would require the project owner to demonstrate compliance with ongoing fire prevention requirements in the annual compliance report.

Hazardous Shocks

Hazardous shocks could result from direct or indirect contact between an individual and the energized line, whether overhead or underground. Such shocks are capable of serious physiological harm or death. Potential shocks could result from electrical faults from the proposed new equipment or transmission system.

GO-95 includes safety requirements for overhead line construction. GO-95 includes clearance, grounding, materials, maintenance, inspection, and other construction safety requirements. Adherence to the requirements would minimize the potential for hazardous shocks.

Potential hazardous shock could also result from electrical faults from equipment in the existing switchyard. The existing SEGS VIII and SEGS IX utilize a common switchyard located within a secured shared area between the existing solar fields. In addition, the existing SEGS VIII and SEGS IX switchyard is fenced to keep individuals within the SEGS site from entering the switchyard to prevent hazardous shocks.

The petitioner would design and construct the BESS 230-kV generation tie lines in accordance with applicable LORS. Compliance with the minimum national safe operating clearances applicable in areas where the line might be accessible to the public would ensure safety. Implementing the GO-95-related measures against direct contact with the energized line would serve to minimize the risk of hazardous shocks. Staff's

recommended Conditions of Certification **TLSN-11** and **TLSN-13** would be adequate to ensure implementation of the necessary mitigation measures.

Nuisance Shocks

Nuisance shocks occur from electric currents below levels legally and medically recognized as likely to cause physiological harm. Nuisance shocks can result from direct contact with metal objects electrically charged by fields from the energized line. The potential may arise from a conductive connection to a source of electric potential, or by induction from a source of alternating current on an ungrounded electrically conductive object.

The National Electrical Safety Code (NESC), also known as the American National Standard C2, published by the Institute of Electrical and Electronics Engineers (IEEE), provides basic grounding provisions applicable to the construction, maintenance, and operation of conductors and equipment in electric supply stations and overhead and underground electric supply and communication lines. There are no design-specific federal or state regulations to limit nuisance shocks in the transmission line environment; however, the grounding procedures effectively minimize the potential for nuisance shocks.

The project owner would be responsible for ensuring compliance with these ground-related practices within the right-of-way. Staff recommends Condition of Certification **TLSN-13** to ensure the project owner follows grounding provisions.

Electric and Magnetic Field Exposure

Electric and magnetic fields (EMF) are invisible areas of energy originating from both natural and manmade sources. Power lines and electrical devices all produce EMF. The EMF produced from power lines is extremely low frequency (ELF) EMF. In the ELF range of 0- 100 kHz, electric and magnetic fields are not coupled or interrelated in the same way they are at higher frequencies. Power-frequency EMF is in the range of 50 or 60 hertz (Hz), carries little energy, has no ionizing effects, and usually no thermal effects.

Electric Fields

Voltage (the expression of a potential difference in charge) produces electric fields around transmission lines. Volts per meter (V/m) is the unit of measurement for electric field strength. Electric fields increase in strength as voltage increases. Electric fields are easily shielded/weakened by conducting objects such as trees and buildings and the strength of the field decreases rapidly with increasing the distance from the source. Electric fields do not penetrate the body significantly but they can build up a charge on the surface.

Magnetic Fields

The flow of electric currents through transmission lines and electrical devices produce magnetic fields. Gauss (G) or tesla (T) are the units of measurement for magnetic fields. Unlike electric fields, magnetic fields are not easily shielded/weakened by most

materials. Magnetic field strength is directly proportional to the current; that is, increased amperes produce a stronger magnetic field. Like electric fields, increased distance from the sources decreases magnetic field strength. Exposure to magnetic fields can potentially cause circulating currents to flow in the body.

Health Risk Assessment Findings

There are documented public health concerns regarding potential health impacts from exposure to EMF. There are numerous research studies and scientific reviews examining potential health effects from EMF exposure to address concerns. Reports from the National Research Council/National Academy of Sciences, American Medical Association, American Cancer Society, National Institute of Environmental Health Sciences, World Health Organization (WHO), International Commission on Non-Ionizing Radiation Protection (ICNRP), American Physical Society, and California's Department of Health Services, have demonstrated there are no consistent health impact conclusions from human studies (epidemiological and clinical) and animal studies.

In 1996, the World Health Organization (WHO) launched a large, multidisciplinary research effort (i.e. the International EMF Project) to assess health and environmental effects of exposure to varying electric and magnetic fields in the frequency range 0-300 Giga-Hz and explore the development of internationally acceptable standards limiting EMF exposure. In 2002, the WHO published a handbook intended to summarize research to support decision-makers. In 2002, WHO concluded that scientific research did not indicate any high health risks from EMF, however the research noted the International Agency for Research on Cancer (IARC) classified ELF magnetic fields as possibly carcinogenic to humans based on epidemiological studies of childhood leukemia.

This classification is in the same category as coffee and denotes agents when there is limited evidence of carcinogenicity in humans, and less than sufficient evidence for animals. The study noted that while the IARC classified ELF magnetic fields as possibly carcinogenic, there were other possibilities for the observed association between exposure to ELF magnetic fields and childhood leukemia.

In 2005, WHO convened a Task Group of scientific experts to further assess any health risks from exposure to ELF electric and magnetic fields. The Task Group reviewed the evidence and updated the evidence regarding cancer. In 2007, WHO published under joint sponsorship with the International Labour Organization and ICNRP, a comprehensive health risk assessment of possible effects of exposure to ELF electric and magnetic fields.

The WHO considers health as a state of complete physical, mental, and social well-being and not only the absence of disease or infirmity. The evaluation includes an extensive examination of the sources, measurements and exposures, electric and magnetic fields inside the body, biophysical mechanism, neurobehavior, neuroendocrine

system, neurodegenerative disorders, cardiovascular disorders, immunology and hematology, reproduction and development, cancer, health risk assessment, and protective measures.

The majority of the studies performed and continued research focuses on the area of concern, ELF magnetic fields. Following is a summary of results from recent studies and the 2007 WHO publication:

- **Effects on general health:** Research experts including the EMF Task group concluded there are no substantive health issues related to ELF electric fields at levels generally encountered by the public. The ongoing focus is on magnetic field exposure. Exposure to power-frequency electric fields can cause biological responses ranging from perception to annoyance. There is only inconsistent and inconclusive evidence supporting any link between symptoms such as headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido for humans from exposure to ELF electric and magnetic fields.

- **Effects on neurodegenerative disorder:** Studies have explored hypothesized links with exposure to ELF fields and neurodegenerative disease. Results are inconsistent and evidence for association is inadequate.

- **Effects on cardiovascular disorders:** Studies of both short-term and long-term exposure indicate that while electric shock is a health hazard, other cardiovascular effects associated with ELF fields are unlikely to occur at commonly encountered ELF fields for environmental and occupational exposures. Overall, the evidence does not support a link between ELF exposure and cardiovascular disease.

- **Effects on immunology and hematology:** Studies on ELF electric and magnetic fields effects on immunology and hematology are inconsistent. Overall, the evidence for effects on the immune and hematological system is inadequate.

- **Effects on reproductive outcome:** The overall weight of evidence shows that exposure to fields at typical environmental levels does not increase the risk of any adverse outcome including spontaneous abortions, malformations, low birth weight, and congenital diseases. There have been occasional reports of associations between health problems and presumed exposure to electromagnetic fields, such as reports of prematurity and low birth weight in children of workers in the electronics industry. However, studies do not conclusively demonstrate a causal relationship with exposures to electromagnetic fields. Other factors such as exposure to solvents could account for the outcomes.

- **Visual Effects:** Cataract development resulting from high-intensity radiofrequency and microwave radiation has been extensively studied. The lowest thresholds for cataract induction are at 1-100 Giga-hz. Animal studies do not support eye damage

from EMF at levels that are not thermally hazardous such as ELF magnetic and electric fields. A visual phenomenon described as a flickering of light known as phosphenes have been reported from exposure to ELF magnetic frequencies below 100 Hz. The frequency most likely to produce phosphenes is 20 Hz. Power frequencies are generally too high for phosphenes to occur at the expected levels of exposure for the general public.

- **Adult Cancers:** Evidence on an association between ELF magnetic field exposure and adult brain cancer, leukemia, and breast cancer remains inadequate. In fact, additional studies conducted weakened any association of adult breast cancer and ELF magnetic field exposures. Despite many studies, the evidence for any effect remains highly controversial. However, it is clear that if electromagnetic fields do have an effect on cancer, then any increase in risk will be extremely small.

- **Childhood leukemia and cancers:** There have been studies showing a weak association between measured fields and childhood leukemia, but it is not clear whether this represents a cause-and-effect relationship. A number of epidemiological studies suggest small increases in risk of childhood leukemia with exposure to low frequency magnetic fields in the home. However, scientists have not generally concluded that these results indicate a cause-and-effect relationship between exposure to the fields and disease. Moreover, animal and laboratory studies continue to demonstrate inconsistent data with the hypothesis that fields cause or promote cancer. After reviewing all the data, scientific groups continue to acknowledge that the evidence is inconclusive but is sufficient to warrant limited concern and continued research. The presently available series of studies indicates no association between EMF exposure and childhood cancers other than leukemia.

The International EMF Project continues to evaluate scientific literature, identify gaps in knowledge, and promote research to clarify health risks from EMF exposure. Research indicates using common household appliances can expose individuals in their homes to stronger fields than those produced by high-voltage lines. The difference between these types of field exposures is that the higher-level, appliance-related exposures have short-term duration, while the exposures from power lines are lower level, but could have a longer duration time based on receptor location. Scientists have not established which of these exposure types would be more biologically meaningful in the individual. Based on the available research, organizations have determined that there is not sufficient evidence that exposure to ELF magnetic fields pose a significant health hazard to exposed humans.

While the results to date contain many inconsistencies, organizations have concluded any exposure-related health risk would likely be small. In addition, continuing research has not indicated any large increases in risk for any cancer in children or adults from EMF exposure. Researchers continue to recommend the development of health protection policies and policy implementation for areas of scientific uncertainty.

EMF Exposure Guidelines and Policies

Exposure to low-frequency electric and magnetic fields below 100 kilohertz (kHz) normally results in negligible energy absorption and no measurable temperature rise in the body. While there are guidelines for exposure limits to non-iodizing radiation, there are no health-based federal regulations or industry codes specifying environmental limits or maximum acceptable levels of EMF from power lines.

While the available research does not conclusively establish a hazard from EMF exposure from power lines, the research does not serve as proof of a definite lack of a hazard. Staff therefore considers it appropriate, in light of present uncertainty, to recommend feasible reductions of such fields when needed without affecting safety, efficiency, reliability, and maintainability.

Approach to Reducing EMF Exposures

In 1991, the CPUC began an investigation to consider the CPUC's role in mitigating potential health effects of EMFs from electric utility power lines. Due to lack of conclusive evidence of potential health effects from utility electric facilities and power lines, the CPUC issued Decision 93-11-013, establishing EMF policy for California's investor-owned electric utilities. The decision acknowledged that scientific research had not demonstrated that exposures to EMF causes health hazards and that it was inappropriate to set numeric standards that would limit exposure. The CPUC addressed public concern over EMF by establishing seven interim measures establishing a no-cost and low-cost EMF reduction policy that utilities would follow for proposed electrical facilities and power lines.

In 2006, the CPUC revisited the EMF management issue to assess the need for policy changes based on updated research on possible health impacts and improvements in EMF exposure mitigation. The findings specified in Decision 06-01-042 did not support significant changes to the existing CPUC interim policies. On January 27, 2006, CPUC Decision 06-01-042 affirmed Decision 93-11-013, to mitigate EMF exposure for new utility transmission and substation projects. The CPUC continued to acknowledge the inability to conclusively verify a relationship between EMF exposure and negative health effects. However, the 2006 decision directs the CPUC to continue to pursue and review available studies and scientific reviews, and report on new findings. If new findings indicate negative EMF health impacts, the CPUC would reconsider their EMF policies.

The seven measures ordered in 1993 and affirmed in the CPUC 2006 decision include:

- No-cost and low-cost steps to reduce EMF levels: When regulated utilities design new projects or upgrade existing facilities, approximately 4 percent of the project's budget may be used for reducing EMFs. The PUC did not set specific reduction levels for EMFs. It was inappropriate to set a specific numerical standard until a scientific basis for doing so exists.

- New designs to reduce EMF levels: The PUC's Advisory and Compliance Division and Safety Division held workshops for utilities to develop EMF design guidelines for new and rebuilt facilities. The guidelines incorporate alternative sites, increase the size of rights-of-way, place facilities underground, and use other suggested methods for reducing EMF levels at transmission, distribution and substation facilities.

- Measurement of EMFs: Uniform residential and workplace EMF measurement programs were also designed in the workshops; they are available to utilities and their customers. Other utilities are also encouraged to use them.

- Education and Research: The PUC wants the public and groups having a financial or basic interest in EMFs to become involved in developing education and research programs; these programs are established and managed by the Department of Homeland Security (DHS). PUC-regulated utilities and municipal utilities use ratepayer funds to pay for their share of development costs for the following programs:

- EMF Education: This $1.49 million program will provide credible, meaningful, consistent, and timely EMF information to electric utility customers, employees, and the public. DHS will coordinate a uniform EMF education program to supplement, but not duplicate, those that most electric utilities already have. Utilities without programs should implement one as soon as possible.

- EMF Research: A $5.6 million four-year non-experimental research program will be directed by DHS. This program will provide utility participation in state, national, and international research to be pursued to the extent that it benefits ratepayers.

- Other Research: Utilities are authorized to contribute to federal experimental research conducted under the National Energy Policy Act of 1992.

The 2006 CPUC requirement for EMF reductions are applicable to new and modified lines in any of the utilities' service areas. The CPUC currently requires the design of most new transmission lines in California meet the safety and EMF-reducing guidelines of the electric utility in the service area. Each utility complies by establishing its own EMF-reducing measures and incorporating such measures into the designs for all new or upgraded power lines and related facilities. EMFs are required under this CPUC policy to be similar to fields from similar lines in that service area. The municipal and other publicly owned utilities that are not under the direct jurisdiction of the CPUC voluntarily comply with CPUC EMF policy. Designing the proposed project line according to existing field strength-reducing guidelines would constitute compliance with the CPUC requirements for line field management.

The 2006 CPUC decision clarified the application of EMF reducing policy. The CPUC concluded low-cost EMF mitigation is not necessary in agricultural and undeveloped land except for permanently occupied residences, schools or hospitals located on these lands. Since there are no residences in the immediate vicinity of the proposed BESS transmission line, long-term residential EMF exposures are not expected for any offsite receptors.

The only project-related EMF exposures of potential significance would be short-term exposures of plant workers, regulatory inspectors, maintenance personnel, visitors, or any other individual in the immediate vicinity of the proposed BESS transmission line. These types of exposures are short term and not expected to result in any significant health concern based on available research. Therefore, staff concludes, requiring the petitioner to build the BESS transmission line according to applicable code in would be sufficient for mitigating potential EMF exposure. Staff recommends the adoption of proposed Conditions of Certification **TLSN-11** to ensure compliance with industry standards.

CONCLUSIONS AND RECOMMENDATIONS

Staff concludes with the adoption and implementation of the four proposed TLSN conditions of certification, potential impacts to from the construction and operation of the BESS would be less than significant. With the application of the proposed TLSN conditions, staff concludes:

- the BESS would not be expected to cause interference with radio frequency communication;
- the BESS would not be expected to cause significant audible noise;
- the BESS would not pose a significant fire hazard;
- the potential for hazardous and nuisance shocks would be minimized; and
- the BESS would not result in significant changes to EMF levels.

In addition, staff does not expect the proposed transmission line to pose an aviation hazard based on current FAA criteria. Staff is not proposing any additional condition of certification based on potential hazards to aviation.

AMENDED CONDITIONS OF CERTIFICATION

Both SEGS VIII and IX Decisions should be modified to add new Transmission Line Safety and Nuisance Conditions of Certification, shown below. The changes will be

reflected in the Final Decisions for both facilities. **Bold underline** indicates new language.

Battery Energy Storage System

TLSN-11 The project owner shall construct the BESS 230-kV transmission line according to the requirements of California Public Utility Commission's General Order (GO) 95, GO-131-D, and Title 8 of the California Code of Regulations.

Verification: At least 30 days prior to the start of construction of the BESS transmission line or related structures and facilities, the project owner shall submit to the compliance project manager (CPM) a letter signed by a California registered electrical engineer affirming that the lines will be constructed according to the requirements stated in the condition.

TLSN-12 The project owner shall maintain the BESS 230-kV transmission line and pole sites to comply with fire prevention requirements and ongoing inspection and maintenance as required in GO-95, GO-165, and Title 14 of the California Code of Regulations Sections 1250-1258.

Verification: The project owner shall provide a summary of inspections, maintenance, cleanup, and other fire prevention activities to demonstrate compliance in the Annual Compliance Report.

TLSN-13 The project owner shall ensure that all permanent metallic objects within the proposed route are grounded according to industry standards.

Verification: At least 30 days before the BESS 230-kV transmission line is energized, the project owner shall submit confirmation of compliance to the CPM.

TLSN-14 The project owner shall make every reasonable effort to locate and correct, on a case-by-case basis, all causes of radio frequency interference attributed to the transmission line facilities.

The project owner shall maintain records of any complaint and any corrective actions.

Verification: The project owner shall submit the required records to the CPM in the annual report.

REFERENCES

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SOLAR ENERGY GENERATING SYSTEMS (SEGS) VIII AND IX (88-AFC-01C AND 89-AFC-01C)

Petition to Add Battery Energy Storage System
Transmission System Engineering Staff Analysis
Prepared by: Laiping Ng and Mark Hesters

Introduction and Summary

The proposed SEGS VIII and IX petition to connect the new battery storage system to the existing SEGS VIII and IX switchyard, with two new step-up transformers and new 230-kV overhead transmission lines and terminations, is acceptable and would comply with all applicable LORS. The interconnection with the Southern California Edison (SCE) transmission grid would not require additional downstream transmission facilities (other than those proposed by the applicant) that require California Environmental Quality Act (CEQA) review.

The BESS would not cause additional downstream transmission impacts other than those identified in the approved SEGS VIII and IX decisions.

The California Independent System Operator's (California ISO) Material Modification Assessment (MMA) would ensure the existing transmission system can deliver the needed power for charging the BESS under the worst conditions.

Staff proposed Conditions of Certification **TSE-11** through **TSE-15**, to be included in both decisions, would help ensure that the construction and operation of the transmission facilities for the proposed BESS comply with the applicable LORS.

INTRODUCTION

The SEGS BESS proposed to modify the SEGS VIII and IX certifications to install a maximum capacity of up to 80 MW with a duration of two hours of battery storage energy system. The existing SEGS VIII and IX would interconnect to the proposed BESS, the total output of the system would not exceed 160-megawatt (MW) to the California ISO-controlled grid.

The proposed BESS would consist of Lithium ion (Li-ion) batteries, power conversion system, BESS controller, medium voltage transformer, BESS generator step-up transformer, and protection systems.

The individual Li-ion cells range between 2 to 6 volts direct current (DC) voltage either in series or parallel connection to form battery modules between 32 and 96 volts. In

self-supporting racks, several battery modules would be installed either in series or parallel configuration to deliver the desired voltage and power rating. The rack, between 400 volts and 1,100 volts in direct current, would further be connected either in series or parallel configuration to deliver the BESS level energy and power rating.

The power conversion system would enable the bi-directional inverter to convert electric energy from alternating current (AC) to DC during the battery charging cycle and DC to AC when battery energy is transferred back to the grid (TN# 229090).

The medium voltage transformer would transform AC output from the power conversion system to AC voltage of 12 kV to 35 kV. The BESS 54/72/90 megavolt ampere (MVA) generator step-up transformer would step up the voltage to 230 kV.

The BESS would be connected to the existing SEGS VIII and SEGS IX switchyard through a 0.12-mile long 795kcmil ACSR overhead conductor. The BESS energy would be able to deliver to, and charge from, the grid through the switchyard via an existing 14-mile long overhead generator tie-line connecting the switchyard to the SCE Kramer Substation (TN# 229725).

SUMMARY OF THE DECISION

SEGS VIII and SEGS IX were certified by the Energy Commission in March 1989 and February 1990 respectively. SEGS VIII and SEGS IX each generate a maximum of 80 MW, a total of 160 MW. Through a 14 mile-long 230-kV overhead generator tie-line, SEGS VIII and IX are connected to the existing SCE Kramer Substation. The generated solar thermal electricity is transferred to the SCE transmission system from the Kramer Substation.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS) COMPLIANCE

SEGS VIII and SEGS IX were certified by Energy Commission before the establishment of the California Independent System Operator (California ISO). Therefore an update of LORS is required.

Role of California Independent System Operator

The California ISO is responsible for ensuring electric system reliability for all participating transmission owners and is also responsible for developing the standards necessary to achieve system reliability. The project power will be dispatched to the California ISO grid via SCE's Kramer Substation. The California ISO studies the SCE system to ensure adequacy of the proposed transmission interconnection. The California ISO determines the reliability impacts of the proposed project modifications on the SCE transmission system in accordance with all applicable reliability criteria. According to its tariffs, the California ISO will determine the "need" for transmission

additions or upgrades downstream from the interconnection point to insure reliability of the transmission grid. The interconnection of the BESS is being analyzed through the California ISO MMA process. The California ISO may provide written and verbal testimony on its findings at the Energy Commission hearings for this petition.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

California Public Utilities Commission (CPUC) General Order 95 (GO-95), "Rules for Overhead Electric Line Construction," formulates uniform requirements for construction of overhead lines. Compliance with this order ensures adequate service and safety to persons engaged in the construction, maintenance and operation or use of overhead electric lines and to the public in general.

CPUC General Order 128 (GO-128), "Rules for Construction of Underground Electric Supply and Communications Systems," formulates uniform requirements and minimum standards to be used for underground supply systems to ensure adequate service and safety to persons engaged in the construction, maintenance and operation, or use of underground electric lines and to the public in general.

The National Electric Safety Code, 1999, provides electrical, mechanical, civil and structural requirements for overhead electric line construction and operation.

NERC/WECC Planning Standards: The Western Electricity Coordinating Council (WECC) Planning Standards are merged with the North American Electric Reliability Council (NERC) Planning Standards and provide the system performance standards used in assessing the reliability of the interconnected system. These standards require the continuity of service to loads as the first priority and preservation of interconnected operation as a secondary priority. Certain aspects of the NERC/WECC standards are either more stringent or more specific than the NERC standards alone. These standards provide planning for electric systems so as to withstand the more probable forced and maintenance outage system contingencies at projected customer demand and anticipated electricity transfer levels, while continuing to operate reliably within equipment and electric system thermal, voltage, and stability limits. These standards include the reliability criteria for system adequacy and security, system modeling data requirements, system protection and control, and system restoration.

Analysis of the WECC system is based to a large degree on Section I.A of the standards, "NERC and WECC Planning Standards with Table I and WECC Disturbance-Performance Table" and on Section I.D, "NERC and WECC Standards for Voltage Support and Reactive Power". These standards require that the results of power flow and stability simulations verify defined performance levels. Performance levels are defined by specifying the allowable variations in thermal loading, voltage and frequency, and loss of load that may occur on systems during various disturbances. Performance levels range from no significant adverse effects inside and outside a system area during a minor disturbance (loss of load or a single transmission element out of service) to a

level that seeks to prevent system cascading and the subsequent blackout of islanded areas during a major disturbance (such as loss of multiple 500-kV lines along a common right of way, and/or multiple generators). While controlled loss of generation or load or system separation is permitted in certain circumstances, their uncontrolled loss is not permitted (WECC 2006).

NERC Reliability Standards for the Bulk Electric Systems of North America provide national policies, standards, principles and guidelines to assure the adequacy and security of the electric transmission system. The NERC Reliability Standards provide for system performance levels under normal and contingency conditions. With regard to power flow and stability simulations, while these reliability standards are similar to NERC/WECC standards, certain aspects of the NERC/WECC standards are either more stringent or more specific than the NERC Standards for Transmission System Contingency Performance. The NERC reliability standards apply not only to interconnected system operation but also to individual service areas (NERC 2006).

California ISO planning standards also provide standards and guidelines to assure the adequacy, security, and reliability in the planning of the California ISO transmission grid facilities. The California ISO Grid Planning Standards incorporate the NERC/WECC and NERC reliability planning standards. With regard to power flow and stability simulations, these planning standards are similar to the NERC/WECC or NERC Reliability Planning Standards for Transmission System Contingency Performance. However, the California ISO standards also provide some additional requirements that are not found in the WECC/NERC or NERC standards. The California ISO standards apply to all participating transmission owners interconnecting to the California ISO-controlled grid. They also apply when there are any impacts to the California ISO grid due to facilities interconnecting to adjacent controlled grids not operated by the California ISO (California ISO 2002a).

California ISO/Federal Energy Regulatory Commission (FERC) Electric Tariff provides guidelines for construction of all transmission additions/upgrades (projects) within the California ISO-controlled grid. The California ISO determines the "need" for the proposed modified project where it will promote economic efficiency or maintain system reliability. The California ISO also determines the cost responsibility of the proposed modified project and provides an operational review of all facilities that are to be connected to the California ISO grid (California ISO 2007a).

SWITCHYARDs AND INTERCONNECTION FACILITIES

The proposed 80 MW BESS with a duration of 2 hours of provided energy would be connected to the 54/72/90 megavolt ampere (MVA) transformer (34.5/230 kV) in the existing SEGS VIII and IX switchyard through a 0.12 mile-long 795-thousandths of circular millimeter (kcmil) ACSR overhead conductor. The switchyard would be modified by adding a new H-frame structure, a new breaker, new switches, and new meters in an open bay position to connect the BESS.

With the BESS, the total output of SEGS VIII and IX would not exceed the previously approved 160 MW to the SCE Kramer Substation via the existing fourteen-mile-long generator tie-line. A new energy management system would be installed to monitor the energy output of each facility.

Since the total generation output would not exceed the approved limit, there will not be any additional downstream transmission impacts other than those identified in the SEGS VIII and IX interconnection studies.

Potential impacts of the BESS to the transmission system are analyzed through a MMA request. The MMA request was submitted on July 10, 2019 to SCE and California ISO. The existing interconnection agreement would be modified as part of the MMA process to ensure the transmission system is capable of delivering the additional power to the BESS (TN# 231314).

Compliance with LORS

Staff's proposed Conditions of Certification **TSE-11** through **TSE-15** would help ensure that construction and operation of the transmission facilities for the proposed project would comply with applicable LORS:

1. Staff proposed Condition of Certification **TSE-11** would ensure that the equipment for construction of the transmission facilities of the proposed project would comply with applicable LORS.

2. Staff proposed Condition of Certification **TSE-12** would ensure the final design of the proposed transmission facilities would comply with applicable LORS.

3. Staff proposed Condition of Certification **TSE-13** would ensure that the proposed project would be properly interconnected to the transmission grid. **TSE-13** also ensures that the generator output would be properly delivered to the transmission system.

4. Staff proposed Condition of Certification **TSE-14** would ensure that the project would synchronize with the existing transmission system and the operation of the facilities would comply with applicable LORS.

5. Staff proposed Condition of Certification **TSE-15** would ensure that the proposed project would be built to required specifications and the operation of the facilities would comply with applicable LORS.

CONCLUSIONS AND RECOMMENDATIONS

The proposed BESS facilities, including the new battery storage system, existing SEGS VIII and IX switchyard, step-up transformers, the 230 kV overhead transmission lines and terminations, are acceptable and would comply with all applicable LORS. The interconnection with the SCE transmission grid would not require additional downstream transmission facilities (other than those proposed by the applicant) that require CEQA review.

The BESS would not cause additional downstream transmission impacts other than those identified in the approved SEGS VIII and IX.

The MMA would ensure the existing transmission system is capable of delivering the needed power for charging the BESS under the worst condition.

Staff proposed Conditions of Certification **TSE-11** through **TSE-15** would help ensure that the construction and operation of the transmission facilities for the proposed BESS would comply with the applicable LORS.

AMENDED CONDITIONS OF CERTIFICATION

Both SEGS VIII and IX Decisions should be modified to add new Transmission System Engineering Conditions of Certification, shown below. The changes will be reflected in the Final Decisions for both facilities. **Bold underline** indicates new language.

Battery Energy Storage System

TSE-11 The project owner shall furnish to the CPM and to the DCBO a schedule of transmission facility design submittals, a Master Drawing List, a Master Specifications List, and a Major Equipment and Structure List. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide designated packages to the CPM when requested.

Verification: Prior to the start of construction of transmission facilities, the project owner shall submit the schedule, a Master Drawing List, and a Master Specifications List to the DCBO and to the CPM. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment (see list of major equipment in Table 1: Major Equipment List below). Additions and

deletions shall be made to the table only with CPM and DCBO approval. The project owner shall provide schedule updates in the monthly compliance report.

Table 1: Major Equipment List

Breakers
Step-up transformer
Switchyard
Busses
Surge arrestors
Disconnects
Take-off facilities
Electrical control building
Switchyard control building
Transmission pole/tower
Grounding system

TSE-12 For the power plant switchyard, outlet line and termination, the project owner shall not begin any construction until plans for that increment of construction have been approved by the DCBO. These plans, together with design changes and design change notices, shall remain on the site for one year after completion of construction. The project owner shall request that the DCBO inspect the installation to ensure compliance with the requirements of applicable LORS. The following activities shall be reported in the monthly compliance report:

a) **receipt or delay of major electrical equipment;**

b) **testing or energization of major electrical equipment; and**

c) **the number of electrical drawings approved, submitted for approval, and still to be submitted.**

Verification: Prior to the start of each increment of construction, the project owner shall submit to the DCBO for review and approval the final design plans, specifications and calculations for equipment and systems of the power plant switchyard, outlet line, and termination, including a copy of the signed and stamped statement from the responsible electrical engineer verifying compliance with all applicable LORS, and send the CPM a copy of the transmittal letter in the next monthly compliance report.

TSE-13 The project owner shall ensure that the design, construction, and operation of the proposed transmission facilities will conform to all applicable LORS, and the requirements listed below. The project owner shall submit the number of copies required by the DCBO of the design drawings and calculations. Once approved, the project

owner shall inform the CPM and DCBO of any anticipated changes to the design, and shall submit a detailed description of the proposed change and complete engineering, environmental, and economic rationale for the change to the CPM and DCBO for review and approval.

a) **The power plant outlet line shall meet or exceed the electrical, mechanical, civil, and structural requirements of CPUC General Order 95, CPUC General Order 128, or National Electric Safety Code (NESC); Title 8 of the California Code and Regulations (Title 8); Articles 35, 36 and 37 of the *High Voltage Electric Safety Orders;* California ISO standards; National Electric Code (NEC); and related industry standards.**

b) **Breakers and busses in the power plant switch yard and other switchyards, where applicable, shall be sized to comply with a short-circuit analysis.**

c) **Outlet line crossings and line parallels with transmission and distribution facilities shall be coordinated with the transmission line owner and comply with the owner's standards.**

d) **The project conductors shall be sized to accommodate the full output of the project.**

e) **Termination facilities shall comply with applicable SCE interconnection standards.**

f) **The project owner shall provide to the CPM:**

   i) **Special Protection System (SPS) sequencing and timing if applicable,**

   ii) **A letter stating that the mitigation measures or projects selected by the transmission owners for each reliability criteria violation for which the project is responsible, are acceptable,**

   iii) **A copy of the final approved Material Modification Assessment signed by the California ISO and the project owner and a copy of the approved Generator Interconnection Agreement modified to incorporate the Bulk Electric Storage System.**

Verification: Prior to the start of construction or modification of transmission facilities, the project owner shall submit to the DCBO for approval:

a) **Design drawings, specifications, and calculations conforming with CPUC General Order 95 or National Electric Safety Code (NESC); Title 8 of the California Code and Regulations (Title 8); Articles 35, 36 and 37 of the *High Voltage Electric Safety Orders;* CA ISO standards; National Electric Code (NEC); and related industry standards, for the poles/towers, foundations, anchor bolts, conductors, grounding systems, and major switchyard equipment;**

b) **For each element of the transmission facilities identified above, the submittal package to the DCBO shall contain the design criteria, a discussion of the calculation method(s), a sample calculation based on "worst case conditions"[1] and a statement signed and sealed by the registered engineer in responsible charge, or other acceptable alternative verification, that the transmission element(s) will conform with CPUC General Order 95 or National Electric Safety Code (NESC); Title 8 of the California Code and Regulations (Title 8); Articles 35, 36 and 37 of the *High Voltage Electric Safety Orders;* California ISO standards; National Electric Code (NEC); and related industry standards;**

c) **Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in charge, a route map, and an engineering description of the equipment and configurations covered by requirements TSE-13 a) through f);**

d) **Special Protection System (SPS) sequencing and timing, if applicable, shall be provided concurrently to the CPM.**

e) **A letter stating that the mitigation measures or projects selected by the transmission owners for each reliability criteria violation for which the project is responsible, are acceptable,**

f) **A copy of the approved Material Modification Assessment signed by the California ISO and the project owner and a copy of the approved Generator Interconnection Agreement modified to incorporate the Bulk Electric Storage System.**

Prior to the start of construction or modification of transmission facilities, the project owner shall inform the DCBO and the CPM of any anticipated changes to the design that are different from the design previously submitted and approved and shall submit a detailed description of the proposed change and complete engineering, environmental, and economic rationale for the change to the CPM and DCBO for review and approval.

[1]Worst-case conditions for the foundations would include for instance, a dead-end or angle pole.

TSE-14 The project owner shall provide the following Notice to the California ISO prior to synchronizing the facility with the California Transmission system:

1. **At least one week prior to synchronizing the facility with the grid for testing, provide the California ISO a letter stating the proposed date of synchronization; and**

2. **At least one business day prior to synchronizing the facility with the grid for testing, provide telephone notification to the California ISO Outage Coordination Department.**

Verification: The project owner shall provide copies of the California ISO letter to the CPM when it is sent to the California ISO one week prior to initial synchronization with the grid. The project owner shall contact the California ISO Outage Coordination Department Monday through Friday, between the hours of 0700 and 1530 at (916) 351-2300 at least one business day prior to synchronizing the facility with the grid for testing. A report of conversation with the California ISO shall be provided electronically to the CPM one day before synchronizing the facility with the California transmission system for the first time.

TSE-15 The project owner shall be responsible for the inspection of the transmission facilities during and after project construction, and any subsequent CPM and DCBO approved changes thereto, to ensure conformance with CPUC GO-95 or NESC, Title 8, CCR, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders", applicable interconnection standards, NEC and related industry standards. In case of non-conformance, the project owner shall inform the CPM and DCBO in writing within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after first synchronization of the project, the project owner shall transmit to the CPM and DCBO:

a) **"As built" engineering description(s) and one-line drawings of the electrical portion of the facilities signed and sealed by the registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95 or NESC, Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders", and applicable interconnection standards, NEC, related industry standards.**

b) **An "as built" engineering description of the mechanical, structural, and civil portion of the transmission facilities signed and sealed by the registered engineer in responsible charge or acceptable alternative**

verification. "As built" drawings of the electrical, mechanical, structural, and civil portion of the transmission facilities shall be maintained at the power plant and made available, if requested, for CPM audit as set forth in the "Compliance Monitoring Plan".

c) **A summary of inspections of the completed transmission facilities, and identification of any nonconforming work and corrective actions taken, signed and sealed by the registered engineer in charge.**

References

California ISO 1998a – California ISO tariff scheduling protocol posted April 1998, Amendments 1,4,5,6, and 7 incorporated

California ISO 1998b – California ISO dispatch protocol posted April 1998

California ISO 2002a – California ISO Grid Planning Standards, February 2002

California ISO 2003a - California ISO, FERC Electric Tariff, First Replacement Vol. No. 1, March 11, 2003.

California ISO (California Independent System Operator) 2007a – California ISO, FERC Electric Tariff, First Replacement Vol. No. 1, March, 2007.

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SEGS 2019– Solar Energy Generating Systems (SEGS) VIII and IX– Petition for Modification of SEGS VIII and IX (88-AFC-01C and 89-AFC-01C) to add a Battery Energy Storage System (BESS) to the project. (TN# 229090) docketed July 26, 2019

SEGS 2019a – Solar Energy Generating Systems (SEGS) VIII and IX– Data Request Responses Set 1 (TN# 229725) docketed September 12, 2019

SEGS 2019b – Solar Energy Generating Systems (SEGS) VIII and IX– Data Request Responses Set 2 (TN# 231314) docketed December 24, 2019

WECC (Western Electricity Coordinating Council) 2002. NERC/WECC Planning Standards, August 2002

SOLAR ENERGY GENERATING SYSTEMS (SEGS) VIII AND IX (88-AFC-01C AND 89-AFC-01C)

Petition to Add Battery Energy Storage System
Worker Safety and Fire Protection Analysis
Prepared by: Brett Fooks

Introduction and Summary

SEGS VIII and XI filed a post certification petition on July 26, 2019 requesting approval to install a battery energy storage system (BESS) at the Solar Energy Generating Systems VIII & IX projects (SEGS 2019).

SCOPE OF ANALYSIS

The scope of this analysis is to determine whether construction and operation of the proposed BESS would:

- Comply with worker safety and fire protection laws, ordinances, regulations, and standards(LORS);
- Protect workers during construction and operation of the facility;
- Provide adequate protection from fire and explosion; and,
- Require the change, deletion, or addition of any new condition(s) of certification in order to ensure compliance with LORS.

BACKGROUND

The SEGS project was certified operational by the Energy Commission in December 1989, as an 80-megawatt (MW) solar-parabolic trough plant that uses heat transfer fluid (HTF) to create heat for steam boilers to produce electricity. SEGS is located at 43880 Harper Lake Road, Hinkley, California.

The proposed project consists of installing an 80-MW Lithium-ion BESS. The BESS consists of Lithium-ion battery banks installed in multiple metal enclosures. The enclosures would not have any internal walkways or internal personnel access ways. The enclosures would not be occupied space and all maintenance activities would be conducted from the exterior via removable panels or doors that can be opened from the outside. The individual Lithium-ion batteries would be configured in multipacks in battery storage racks.

ANALYSIS

Worker safety and fire protection are regulated through LORS, at the federal, state, and local levels. Industrial workers at the facility operate equipment and handle hazardous materials and may face hazards that can result in accidents and serious injury. Protective

measures are employed to eliminate or reduce these hazards or to minimize the risk through special training, protective equipment, and engineering and procedural controls.

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 prepared in accordance with existing Condition of Certifications **SAFETY-1** in both the SEGS VIII and IX decisions. During plant operation, the Operations Fire Prevention Plan, Emergency Action Plan, and Hazardous Materials Management Plan would be updated to include the BESS in accordance with existing laws, ordinances, regulations, and statutes (LORS).

SEGS relies on local fire protection response services provided by the San Bernardino County Fire Department (SBCFD). Large battery energy storage systems, like the one that would be installed at SEGS, are still a new technology for local fire fighters given that the siting of these projects is still in its infancy. Therefore, staff proposes Condition of Certification **WORKER SAFETY-11**, which would require the project owner to submit the fire protection plans for the BESS to the San Bernardino County Fire Department for their review and comment before construction can begin.

Staff's evaluation of the safety of Lithium-ion batteries determined that large Lithium-ion BESS installations pose potential hazards. Because they store large amounts of energy, one of the principal hazards associated with Lithium-ion BESSs is fire, which could occur if a battery casing were opened, punctured, or crushed. A fire could also be caused if a battery cell is short-circuited or overheated. If a fire ensues after such an event, it may burn rapidly with flare-burning effect and may ignite other batteries in proximity. The fire would produce corrosive and/or toxic gases including hydrogen chloride, hydrogen fluoride, and carbon monoxide, like a fire involving a like-amount of plastics, requiring first responders to wear self-contained breathing apparatus to suppress the fire safely. Such fires also produce flammable gases that could, under certain circumstances, lead to an explosion within the BESS container. Due to the potential for fire and explosion, staff concludes that SEG's BESS would present a significant risk that should be mitigated.

Staff has reviewed the current regulatory framework regarding fire and life safety as related to the proposed Lithium-ion BESS. The current regulatory framework is rapidly evolving to address the risks involved with Lithium-ion BESS installations. There are several safety standards for BESSs that have been developed by industry standards groups including Underwriters Laboratories (UL) and the National Fire Protection Association (NFPA). One of the newest, issued in 2019, is NFPA 855: Standard for the Installation of Stationary Energy Storage Systems. Others include UL 9540-2020: Energy Storage Systems and Equipment which lists requirements for BESSs supporting the local-area electric power systems or the electrical utility power grid, and UL 9540A-2019: Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems which provides the standard test methodology for determining fire and explosion hazards presented by a given BESS design when undergoing an overheating failure, such as thermal-runaway. The most recent edition of the California Fire Code (CFC) also provides fire safety requirements for stationary Lithium-ion battery energy storage systems. These recent standards and codes provide

evidence that the regulatory environment is quickly evolving to deal with this new Lithium-ion BESS technology.

The petition states that the Lithium-ion batteries temperature would be continuously monitored by a battery indication and control system. If any battery begins to rise above a certain temperature set point, the battery control system would shut down portions or all the battery enclosure to prevent the start of a fire. In the case of a fire, an inert-gas-based fire suppression system would activate to help extinguish the fire (TN# 229090, pg. 2-3).

Recent evidence of the potential hazards presented by BESS installations, is provided by news reports of an explosion in a remote BESS enclosure which occurred at the Arizona Public Service (APS) McMicken site on April 19, 2019. Four first responders were seriously injured upon opening the door to a BESS after a suspected internal fire had subsided. A report being prepared by APS detailing the cause of the incident has not yet been issued. Preliminary reports indicate that a single rack of battery modules was compromised by an initiating thermal event. The BESS's internal fire suppression agent was discharged, and the fire did not spread to the surrounding racks. However, the compromised batteries emitted a mixture of explosive gases, which built up inside the BESS container. Although the batteries themselves did not explode, upon opening the container door, the gas mixture exploded. The explosion at the APS McMicken site demonstrates that potentially explosive gases generated during a BESS fire event must be managed safely to protect onsite workers and first responders.

Due to the recentness of the McMicken site explosion, most published standards and existing fire codes do not yet explicitly address the explosion hazard of remote outdoor BESS enclosures located away from occupied buildings. To address this risk, staff proposes Condition of Certification **WORKER SAFETY-12**, which would require the project owner to conduct a BESS hazard mitigation analysis using the method prescribed by UL 9540A, and to submit it to the SBCFD for review and comment, and to the CPM for review and approval. Staff's proposed Condition of Certification **WORKER SAFETY-12** would ensure adequate protection to on-site workers and to first responders by ensuring that explosion risks posed by the BESS are mitigated by the BESS fire protection plans to a level that is less than significant.

SEGS has an existing fire water source, including a water storage tank with two hydrants within approximately 100 feet of the proposed BESS location, that could be used by the SBCFD in case of a fire (SEGS 2019a, Data Request B15). Water is the recommended fire suppressant for use by first responders to help prevent a fire from spreading beyond a single enclosure. In the event of a fire in one of the BESS enclosures, water would be used to cool adjacent enclosures subject to radiant exposure from that fire. Staff proposes Condition of Certification **WORKER SAFETY-13**, which would require the project owner to provide access to a fire water supply for use by the fire department when responding to potential fires at the BESS.

CONCLUSIONS AND RECOMMENDATIONS

Based on staff's analysis of the information provided in the petition, staff proposes Conditions of Certification **WORKER SAFETY-11**, **WORKER SAFETY-12**, and **WORKER SAFETY-13** be added to the final decisions for both SESGS VIII and IX to ensure adequate protection for on-site workers and first-responders, and mitigate any fire and explosion risks posed to the offsite public to a level that is less than significant.

With the adoption of staff's proposed Conditions of Certification **WORKER SAFETY-11**, **WORKER SAFETY-12**, and **WORKER SAFETY-13** for both SEGS VIII and IX, staff concludes that the proposed project modifications would comply with applicable worker safety and fire protection LORS.

AMENDED CONDITIONS OF CERTIFICATION

Both SEGS VIII and IX Decisions should be modified to add new Worker Safety and Fire Protection Conditions of Certification, shown below. The changes will be reflected in the Final Decisions for both facilities. **Bold underline** indicates new language.

Battery Energy Storage System

WORKER SAFETY-11 The project owner shall submit the fire protection plans for the Battery Energy Storage System (BESS) to the San Bernardino County Fire Department (SBCFD) for review and comment, to the delegate chief building official (DCBO) for plan check and inspection, and to the compliance project manager (CPM) for review and approval.

Verification: At least sixty (60) days prior to the start of construction of the BESS project, the project owner shall provide the complete set of BESS fire protection drawings and specifications to the SBCFD for review and comment, to the DCBO for plan check approval and construction inspection, and to the CPM for review and approval.

WORKER SAFETY-12 The project owner shall submit a BESS hazard mitigation analysis per UL 9540A to the SBCFD for review and comment, to the DCBO for plan check and inspection, and to the CPM for review and approval.

The hazard mitigation analysis shall include consideration of potential thermal runaway fault conditions occurring in a single-battery storage rack, cell module or cell array. The analysis shall include mitigations to prevent flammable gases released during fire, overcharging and other abnormal conditions within the BESS, from creating an explosion hazard that could injure workers or emergency first-responders.

Verification: At least sixty (60) days prior to the start of construction of the BESS project, the project owner shall provide the hazard mitigation analysis to the

SBCFD for review and comment, to the DCBO for plan check and inspection, and to the CPM for review and approval.

WORKER SAFETY-13 The project owner shall provide an approved fire water supply for use by first responders when responding to an emergency related to the BESS.

Verification: At least sixty (60) days prior to the start of construction of the BESS, the project owner shall provide the fire water supply plans to the SBCFD for review and comment, to the DCBO for plan check and inspection, and to the CPM for review and approval.

REFERENCES

2019 California Fire Code, California Code of Regulations, Title 24, Part 9.

NFPA 855. National Fire Protection Association (2020). Standard for the Installation of Stationary Energy Storage Systems (NFPA 855).

SEGS 2019, Petition to amend – battery energy storage system. 26 July 2019, Docket No. 88-AFC-01C (TN# 229090).

SEGS 2019a, Data Request Responses – second set of data responses. 24 December 2019, Docket No. 88-AFC-01C (TN# 231314).

UL 2019. Underwriters Labs, *UL 9540A Standard for Safety Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems. Fourth Edition*, November 12, 2019.

UL 2020. Underwriters Labs, *UL9540 Standard for Energy Storage Systems and Equipment. Second Edition,* February 27, 2020.