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ADDENDUM
ACOUSTICAL ASSESSMENT REPORT
Rugged Solar LLC Project
Environmental Review Project Number 3910-120005
Major Use Permit 3300-12-007
Boulevard, San Diego County, California

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EXECUTIVE SUMMARY

Dudek has prepared this addendum noise analysis report for the Rugged Solar Farm, evaluating operational noise impacts associated with outdoor mechanical equipment, to include the proposed optional addition of an energy storage system component. Operational noise impacts associated with the energy storage systems include heating, ventilation and air conditioning units (HVAC), power inverters, and step up transformers. The applicant proposes to implement one of two project design feature options, both of which are analyzed in this report. The options are based on two different types of HVAC units. Option 1 would be implemented if the energy storage container units are equipped with the standard HVAC unit (NACO Model 30RB120 or sound equivalent). Each HVAC unit would be surrounded by a solid perimeter (screen) wall with elevation one foot higher than the top elevation of the HVAC unit. In addition, each step up transformer and related pair (2) of power inverters would be enclosed with an 8-foot high solid perimeter wall.

Option 2 would be implemented if a quieter HVAC unit (Daikin McQuay 025D, or sound equivalent) is used. With this option, each would be surrounded by a solid perimeter (screen) wall with elevation one foot higher than the top elevation of the chiller unit. No energy storage transformer or power inverter screen walls are proposed or necessary if the Daikin McQuay 025D, or sound-equivalent HVAC model is used.

This addendum analyzes both project design feature options, and incorporates the following applicable mitigation measure for the Rugged solar farm from the original report and Draft Program Environmental Impact Report (DPEIR) Section 2.6, Noise:

M-N-R-1 Enclose Inverters in Noise Attenuating Structures: To ensure noise from inverters would comply with the County Noise Ordinance, the following would be implemented:

- Locate non-enclosed inverters a minimum of 800 feet or greater from the nearest property line, or enclose inverters within 800 feet of property lines in cement blocks or other type of structure capable of achieving a minimum 10 dB attenuation.
- Direct all switch station doorways and exterior ventilation ducts away from adjacent property lines.
- Prior to the approval of building plans, a noise analysis shall be prepared that demonstrates that the inverters comply with the County Noise Ordinance.
- The O&M building at the Rugged solar farm shall be located no closer than 1,250 feet from the property line.

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ADDENDUM
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1.0 INTRODUCTION

This addendum to the Dudek Acoustical Assessment Report for the Rugged Solar LLC Project (October 2013) provides information regarding a new, optional component of the Soitec Solar Development Project (Proposed Project) that was not analyzed in the Draft Program Environmental Impact Report (DPEIR) dated January 2014. Rugged Solar LLC (Rugged) proposes to include an optional energy storage system in the Rugged solar farm as part of the Proposed Project. This addendum describes the energy storage system, analyzes its potential to have a significant environmental impact related to noise, and concludes that the addition of the energy storage system on the Rugged solar farm would not affect the conclusions of the DPEIR prepared and circulated for the development of the Proposed Project.

2.0 PROJECT DESCRIPTION

The applicant proposes to include a component as part of the Rugged solar farm, to be located in southeastern San Diego County. This component consists of energy storage in the form of lithium ion (Li-ion) batteries (energy storage system), which would be located on the Rugged solar farm site in order to store energy produced by CPV trackers and to provide the ability to dispatch this energy upon request depending upon demand and other factors. The battery storage system would provide 160 Megawatt hours (MWh) of Li-ion battery storage in the form of 160 1 MWh containers each measuring 40 feet x 8.5 feet x 9.5 feet (LxWxH) on approximately 7 acres with appropriate fire access and approximately 20 feet of spacing on all four sides of each container.

2.1 Location

The energy storage system would be located on an approximate 7-acre portion of the Rugged solar farm site immediately south of the on-site substation (see Figures 1a and 1b, Energy Storage System Location) in an area previously proposed to be developed with approximately 47 CPV trackers and associated inverters and step-up transformers. The proposed energy storage system would not change the developed footprint of the Rugged solar farm site.

2.2 Components

The Li-ion battery storage would be housed in standard 40’ International Organization of Standardization (ISO) shipping containers. The containers are typically made from 12 to 14 gauge steel. The supplier’s logo would be displayed on each container and containers can be painted to order (i.e., containers can be painted with any color stocked by the supplier). The containers would be oriented east/west in two rows of 80 containers each or in four rows of 40

containers each. An approximate 7-acre area would be required to accommodate two rows of 80 containers and an additional 0.5-acre area would be required to accommodate four rows of 60 containers.. Approximately 20 feet of spacing would be provided on all four sides of each container measuring 40 feet x 8.5 feet x 9.5 feet (LxWxH); see Figure 2, Energy Storage Container Size and Spacing. It should be noted that inverters and step-up transformers would be located within the container spacing as described below and as depicted in Figure 3.

The Li-ion batteries (cells) would be arranged into modules, which in turn would be stored in battery racks. The racks would be entirely contained within the container. The container would have an access door at each end and overhead lighting on the interior roof. Each container would have an integrated heating, ventilation, and air conditioning (HVAC) unit located on the roof of the container. Each HVAC unit would measure approximately 7.5 feet in height. An inverter with a battery management system and container control system would be installed externally on a concrete pad next to each container. A step-up transformer would be associated with a set of two containers and would be installed alongside the container on a separate concrete pad. Thus, a total of 160 HVAC units, 160 inverters, and 80 step-up transformers would be associated with the energy storage system. Figure 3 provides an example illustration of the containers, step up transformers, and related infrastructure while Figure 4 provides an example of the typical container interior and battery pack configurations. Figure 5 presents the typical Li-ion battery pack components.

The proposed batteries and containers also include the following important monitoring and safety components:

- Modular battery racks designed for ease of maintenance. Every rack's battery monitoring system (BMS) continually monitors for unsafe voltage, current, and temperature, and has control of an automated switch (contactor) to disconnect the rack from the system if necessary.
- Integrated fire detection and suppression system
- Li-ion nanophosphate chemistry which is considered to be the most stable Li-ion technology and substantially reduces the possibility of thermal runaway and provides for reduced reaction from abuse (Sandia National Laboratories 2012) and A123 Systems (no date).

~~Figure 1a Energy Storage System Location – Option 1 Configuration~~

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~~Figure 1b Energy Storage System Location – Option 2 Configuration~~

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3.0 ANALYSIS

3.1 Solar Farm Operation Noise Sources

On-site stationary noise sources associated with the Rugged solar farm and evaluated in the Dudek Acoustical Assessment Report for Rugged Solar LLC (October 2013) would include pad-mounted inverters and transformers, substation transformers, tracker array motors and dryers/blowers. The noise from operation of the energy storage system container HVAC systems and step-up transformers must be added to the previously assessed stationary noise sources in order to determine composite noise levels from all project components. We briefly summarize each of the operational components previously evaluated, in addition to the new energy storage component, before presenting the results of the assessment of operations noise.

3.1.1 Building Block Inverters and Transformers

The Rugged solar farm includes a total installation of 3,588 CPV Trackers. The CPV Trackers would be arranged into a building block that consists of Soitec Concentrix CX-S530 dual-axis trackers that would feed into an inverter station. The proposed Xantrex Inverter, or equivalent, has a noise level rating of 77 dB at 6 feet (Schneider Electric 2011). The proposed transformer has a sound rating of 60 dB at 5 feet based on National Electric Manufactures Association (NEMA) ratings for the size of transformer anticipated to be used with inverters (NEMA 2000).

The inverter/transformer equipment represents the most substantial noise source in the panel array areas, compared to tracker and blower noise. The distance spacing between inverters/transformers is such that a given point on the project perimeter may be exposed to noise from more than a single inverter station. For this reason, property line noise exposure was evaluated from the combined noise from the three closest inverter stations.

3.1.2 Substation Transformer

The Rugged solar farm requires the use of a private on-site collector substation 60feet by 100 feet that would be located on a 2.0-acre site within the central portion of the site (refer to *Figure 1*). The purpose of the substation is to collect the energy received from the overhead and underground collector system and increase the voltage from 34.5–138 kV. Once the voltage is stepped up to 138kV, the power would be conveyed through a 35-foot high deadened structure that terminates the gen-tie within the on-site collector substation. The power would then be conveyed through the gen-tie line to the Boulevard Substation.

The transformer at the on-site substation would be either a 50 MVA or 70 MVA step up transformer. A transformer with 50 MVA or 70 MVA capacity has a noise level rating of 72 dB

at 5 feet (Delta Star 2012). See *Figure 1* for the proposed location of the substation, which Dudek used for evaluation of noise levels at the project property boundaries.

3.1.3 Operations and Maintenance

An operations and maintenance (O&M) area is also proposed in the central subarea of the site, east of Ribbonwood Road and west of McCain Valley Road on APN 611-100-07-00 and would contain parking, a 7,500 sf building, and other maintenance material and equipment. The O&M operations yard would potentially generate noise levels during daytime hours on the order of 70 dBA Leq at 50 feet (AECOM 2012).

3.1.4 Tracker Motors and Dryers/Blowers

Individual tracker dimensions are approximately 48 feet across by 25 feet tall. Each CPV Tracker unit would be mounted on a steel pole. Noise associated with the trackers would be from the motors and dryers/blowers. Field noise measurements of the tracker indicates the tracker motor generates a noise level of 37 dB at 50 feet and the dryers/blowers generate a noise level of 43 dB at 50 feet (AECOM 2012).

3.1.5 Energy Storage Container HVAC / Inverters / Step-Up Transformers

With respect to potential long-term operational noise associated with the energy storage component, the HVAC unit for each storage container would be a primary source of noise generation. Standard literature for one mass energy storage vendor indicates a typical installation of one step-up transformer for each pair of containers. Thus, a total of 160 HVAC units, 160 power inverters, and 80 transformers would be associated with the storage containers.

Information from the vendor indicates the HVAC unit which is supplied as standard equipment for the storage containers produces 68 dBA at a distance of 50 feet during full operation (NACO Model 30RB120). An alternate HVAC unit with the same capacity is available from another vendor, which has a much lower sound rating of 60 dBA at a distance of 30 feet during full operation (Daikin McQuay 025D). The anticipated step-up transformer has a sound rating of 60 dB at 5 feet based on National Electric Manufactures Association (NEMA) ratings for the size of transformer anticipated to be used with storage battery systems (NEMA 2000). The anticipated power inverter is a Xantrex model, or equivalent, which has a noise level rating of 77 dB at 6 feet (Schneider Electric 2011). However, it should be noted that the anticipated power inverter would be bi-drectional whereas the Xantrex model is not. A total of 160 energy storage containers would be provided to house the energy storage systems, in two rows of 80 containers apiece (or in four rows of 40 containers apiece), oriented east/west. Each container would be equipped with an individual HVAC system and between each pair of containers, a step-up transformer and inverter would be provided (80 total). Noise contribution from the

energy storage complex was modelled using the acoustic center of the dedicated energy storage system yard.

3.2 Equipment Noise Levels at Property Lines

Figure 5 of the Dudek Acoustical Assessment Report for Rugged Solar LLC (DPEIR Appendix 2.6-2, October 2013) illustrates the noise modeling locations selected to determine the worst-case cumulative noise levels at the property lines, resulting from the building block inverters and transformers, substation transformer, operations and maintenance yard, tracker motors and dryers/blowers. *Figure 6* depicts the property lines accounted for in the cumulative noise level analysis. A cumulative noise level analysis from the Rugged solar farm with addition of the energy storage component was completed, which included assessment at the same locations as previously identified in the Dudek Acoustical Assessment Report. Since the applicant proposes one of two project design feature options based on the type of HVAC equipment that will be used, the following analyzes both options.

3.2.1 Option 1

If the energy storage container units are equipped with the standard HVAC unit (NACO Model 30RB120, or sound equivalent), each HVAC unit would be surrounded by a solid perimeter screen wall with elevation one foot higher than the top elevation of the HVAC unit. In addition, each step-up transformer and related pair (2) of power inverters would be enclosed with an 8-foot high solid perimeter wall.

The results of the cumulative noise levels for Option 1 are included in *Table 1* (refer to *Attachment 1* for calculation worksheets). Each cumulative noise level includes contribution from the substation transformer, operations yard, tracker and blower motors, solar panel inverters and the energy storage system HVAC units, inverters, and step-up transformers. As indicated above, the analysis assumes adherence to Mitigation M-N-R-1 from the DPEIR (i.e., inverters setback 800 feet or more to adjacent residential property lines and operations and maintenance yard located not closer than 1,250 feet from adjacent residential property lines). As illustrated in *Table 1*, the resulting noise level from combined project noise sources would comply with the County's noise ordinance criteria at all project property boundaries; thus, operational noise under Option 1 would not result in a significant noise impact.

Table 1
Summary of Project Noise Levels at Property Lines
OPTION 1

Property Line	Project Noise Level (dBA Leq)	Exceed County daytime noise limit (50 dBA Leq)	Exceed County nighttime noise limit (45 dBA Leq)
#1	44	No	No
#2	42	No	No
#3	42	No	No
#4	45	No	No
#5	45	No	No
#6	44	No	No
#7	41	No	No
#8	42	No	No
#9	42	No	No
#10	44	No	No
#11	42	No	No
#12	43	No	No
#13	44	No	No
#14	43	No	No
#15	43	No	No
#16	45	No	No

3.2.2 Option 2

Option 2 is use of a quieter HVAC unit (Daikin McQuay 025D, or equivalent) with each HVAC unit surrounded by a solid perimeter (screen) wall with elevation one foot higher than the top elevation of the chiller unit. No transformer or inverter screen walls are proposed or necessary if the Daikin McQuay 025D, or sound-equivalent HVAC model is used.

The results of the cumulative noise levels for Option 2 are included in *Table 2* (refer to *Attachment 1* for calculation worksheets). Each cumulative noise level includes contribution from the substation transformer, operations yard, tracker and blower motors, solar panel inverters and the energy storage system HVAC units, inverters, and step-up transformers. Again, the analysis assumes adherence to Mitigation M-N-R-1 from the DPEIR. As illustrated in *Table 2*, the resulting noise level from combined project noise sources would comply with the County's noise ordinance criteria at all project property boundaries; thus, operational noise under Option 2 would also not result in a significant noise impact.

Table 2
Summary of Mitigated Project Noise Levels at Property Lines
OPTION 2

Property Line	Project Noise Level (dBA Leq)	Exceed County daytime noise limit (50 dBA Leq)	Exceed County nighttime noise limit (45 dBA Leq)
#1	44	No	No
#2	41	No	No
#3	42	No	No
#4	44	No	No
#5	44	No	No
#6	44	No	No
#7	41	No	No
#8	42	No	No
#9	42	No	No
#10	44	No	No
#11	42	No	No
#12	43	No	No
#13	44	No	No
#14	43	No	No
#15	43	No	No
#16	44	No	No

3.3 Short Term Construction Noise

Because no additional grading would be required and construction equipment and duration would remain the same as evaluated in the DPEIR, the on-site construction noise would not be appreciably altered with substitution of the energy storage units for approximately 47 CPV components. Installation of the energy storage systems would also result in a short-term increase in traffic on the local area's roadway network; approximately 160 truck trips (320 one-way trips) would be required for energy storage unit deliveries. However, approximately 123 one-way trips for material deliveries associated with the 47 CPV components were originally analyzed in the DPEIR, and therefore the storage unit substitution for 47 CPV components would result in a net trip increase of 197 overall trips over an eight-month period.

Energy storage container deliveries could reach up to 25 truck trips per day (or 50 one-way trips per day). At this level, the peak construction truck traffic for the Rugged solar farm would increase to 197 one-way trips per day. This increase would not be sufficient to increase traffic noise levels a substantial amount. Typically, traffic volumes must double to create an increase in perceptible (3 dBA) traffic noise (Caltrans 2009). The addition of 197 construction-related trips

to the roadway network would not double existing traffic levels and, therefore, would not increase traffic noise by 3 dBA.

4.0 DESIGN CONSIDERATIONS

Implementation of applicant proposed design feature PDF-ES-N-1 (i.e., Option 1 or Option 2 as discussed above in Section 3.2.1 and 3.2.2) would maintain project noise impacts at a level below significance, including compliance with the County's daytime and nighttime hourly Leq standards. No further design considerations would be necessary in order to address potentially significant noise impacts.

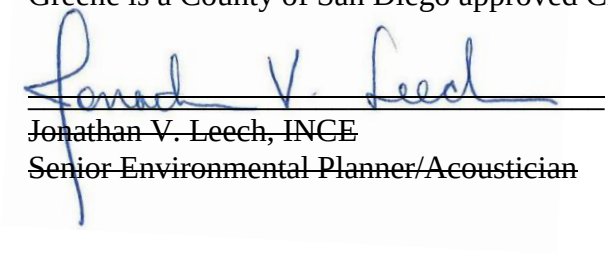
PDF-ES-N-1 To ensure noise from energy storage system HVAC units, transformers and inverters will comply with the County Noise Ordinance, one of the following measures shall be implemented:

1) If the battery storage container units are equipped with the standard HVAC unit (NACO Model 30RB120, or sound equivalent), each HVAC unit shall be surrounded by a solid perimeter screen wall with elevation one foot higher than the top elevation of the HVAC unit. In addition, each step-up transformer and related pair (2) of power inverters shall be enclosed with an 8-foot high solid perimeter wall.

2) If the battery storage container units are equipped with a quieter HVAC unit (Daikin McQuay 025D, or sound equivalent), each HVAC unit shall be surrounded by a solid perimeter screen wall with elevation one foot higher than the top elevation of the chiller unit. No transformer or inverter screen walls are necessary if the Daikin McQuay 025D, or sound-equivalent HVAC model is used.

5.0 CERTIFICATION

This addendum has been prepared by Mr. Jonathan V. Leech and Mr. Mike Greene. Mike Greene is a County of San Diego approved CEQA Consultant for Acoustics.



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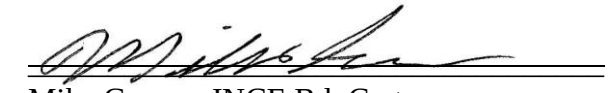

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~~ATTACHMENT 1~~

~~Operating Noise Levels at Adjacent Property Boundaries~~