DUDEK

MAIN OFFICE
605 THIRD STREET
ENCINITAS, CALIFORNIA 92024
T 760.942.5147 T 800.450.1818 F 760.632.0164

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~~TECHNICAL MEMORANDUM~~

~~To:~~	~~Rugged Solar LLC~~
~~From:~~	~~Dudek~~
~~Subject:~~	~~Aesthetics Analysis – Energy Storage~~
~~Date:~~	~~September 25, 2014~~

~~1.0 INTRODUCTION~~

~~This memorandum 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 memorandum describes the energy storage system, analyzes its potential to have a significant environmental impact related to aesthetics, 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 for 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 60 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 (L*x*WxH); 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).

3.0 ANALYSIS

The energy storage system would introduce additional man-made features to the project site that could be visible from scenic vistas and public viewpoints. In addition, potentially reflective surfaces associated with the shipping container, HVAC systems and inverters and any outdoor lighting required for nighttime maintenance of energy storage system could affect night and daytime views in the area.

3.1 Scenic Vistas

The energy storage system would be located internally within the Rugged solar farm and would consist of 9.5-foot tall containers (approximately 18 feet tall when accounting for the height of HVAC units (7.5 feet tall) and associated perimeter screen walls (i.e., implementation of PDF-ES-N-1) that would be oriented east/west in two rows of 80 containers each or 4 rows of 40 containers each. Because the containers would be surrounded by project components exhibiting a larger vertical scale and form, aesthetic impacts would be minimal. With the exception of locations at which superior angle views of the Rugged solar farm are available (i.e., eastbound Interstate 8 at the Tecate Divide and Mt. Tule), visible project components from local area public roads would primarily consist of CPV trackers located along the site boundary. Further, because the height of the top of CPV trackers would range from 13 feet, 6 inches to 30 feet above grade during normal daily operations, CPV trackers would effectively screen the energy storage system during most hours of the day from view of motorists on most local area public roads near the solar farm.

On eastbound Interstate 8 at the Tecate Divide, views to the project site would be brief and due to distance, the form, line and texture of the energy storage system containers would not be overly distinguishable from CPV trackers. However, color contrasts between containers and surrounding CPV trackers may be perceptible from superior viewing locations. Therefore, containers would be painted a color that is consistent in hue and intensity with the CPV tracker panels to minimize visible color contrast (PDF-ES-AE-1). PDF-ES-AE-1 would also require that materials, coatings, or paints having little or no reflectivity be used whenever possible.

From Mt. Tule, the energy storage system would be viewed as an interior component of the larger Rugged solar farm. The installation of 160 containers, HVAC units and associated step-up transformers would interrupt the continuity and visual pattern of repetitive CPV tracker rows spread across the solar farm. When viewed from a superior viewing location, however, the energy storage system would display an altogether short, horizontal form. As such, containers would not obstruct long, westward-oriented scenic views available from Mt. Tule.

In addition, the application of an exterior color to the containers consistent in hue and intensity with the CPV tracker panels would minimize visible color contrast with the other solar farm components. Therefore, for the reasons discussed above, the inclusion of the energy storage system to the Rugged solar farm would not result in additional impacts to valued focal and/or panoramic vistas.

3.2 Visual Character and Quality of the Site and Surroundings

The DPEIR determined that the Rugged solar farm would produce strong visual contrast with existing vegetation and terrain and that the operation of numerous rows of tall CPV trackers in the McCain Valley would create visible contrast in form and color with existing vegetation and rural residential development. As such, the Rugged solar farm was determined to have significant and unmitigable impacts to existing visual character and quality (**AE-R-1**). Due to the height of CPV trackers, the energy storage system would be screened at most public viewing locations in the surrounding area. Further, public perception of the Rugged solar farm would typically be fashioned by the visibility of peripheral solar farm components and more specifically, by CPV trackers. Although the energy storage system would be screened from most public viewpoints by taller CPV tracker systems, the inclusion of the energy storage system to the Rugged solar farm would contribute to the previously identified significant and unmitigable impact, but is not anticipated to cause in increase in the severity of that impacts beyond that previously stated in the DPEIR.

3.3 Lighting and Glare

The installation of exterior lighting on individual containers, HVAC systems or step-up transformers is not anticipated to be necessary and therefore, no additional nighttime lighting sources would be added to the Rugged solar farm. As such, no new nighttime lighting impacts would occur due to the addition of the proposed energy storage system. As stated previously, containers would be painted a color to match the hue and intensity of CPV tracker panels to minimize potential color contrast within the solar farm. The application of paint to the exterior of containers would minimize the potential for glare generated by the energy storage system. PDF-ES-AE-1 would also require that materials, coatings, or paints having little or no reflectivity be

used whenever possible. As stated in the DPEIR, CPV trackers would create glare that would be received by motorists and residences in the surrounding area (**AE-R-2** and **AE-R-3**). This source of glare was determined to be a significant and unmitigatable impacts of the Rugged solar farm. The addition of the energy storage system to the Rugged solar farm would not create a substantial source of additional glare that would increase the severity of anticipated glare impacts of the project described in the DPEIR.

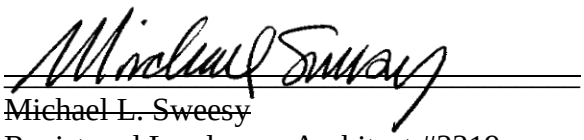
4.0 DESIGN CONSIDERATIONS

In addition to the project design features (PDFs) listed in Table 1-10, Summary of Project Design Features, of the DPEIR, the applicant has incorporated the following additional PDF as part of this component of the Rugged solar farm. PDFs would be made conditions of approval for the Rugged solar farm to ensure these features are incorporated into the solar farm design. PDF-ES-AE-1 would be implemented at the Rugged solar farm to ensure that color contrast between energy storage containers and CPV trackers is minimized and that new sources of potential glare are reduced wherever possible.

PDF-ES-AE-1 Energy storage system containers shall be painted a color consistent in hue and intensity with CPV tracker. Materials, coatings, or paints having little or no reflectivity shall be used whenever possible.

5.0 CERTIFICATION

This addendum has been prepared by Mr. Josh Saunders and Mr. Michael Sweesy. Mr. Michael Sweesy is a County of San Diego approved CEQA Consultant for Visual Analysis.



Michael L. Sweesy
Registered Landscape Architect #3319
Principal/Habitat Restoration Specialist