Exhibit B

Project Description and Schedule

Yellow Rosebush Energy Center
August 2024

Prepared for
Yellow Rosebush Energy Center, LLC

Prepared by

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Acronyms and Abbreviations

AC	alternating current
Applicant	Yellow Rosebush Energy Center, LLC
ASC	Application for Site Certificate
BESS	battery energy storage system
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
DC	direct current
EFSC	Oregon Energy Facility Siting Council
Facility	Yellow Rosebush Energy Center
gen-tie	generation-tie
HV	high voltage
kV	kilovolt
Li-ion	lithium-ion
MW	megawatt
OAR	Oregon Administrative Rules
O&M	operations and maintenance
ORS	Oregon Revised Statute
POI	point of interconnect
PV	photovoltaic
SCADA	supervisory control and data acquisition
SPCC	Spill Prevention, Control, and Countermeasures

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1.0 Introduction

Yellow Rosebush Energy Center, LLC (Applicant) seeks to develop the Yellow Rosebush Energy Center (Facility), a solar energy generation facility, battery energy storage system, and related or supporting facilities in Wasco and Sherman counties, Oregon. This Exhibit B was prepared to meet the submittal requirements in Oregon Administrative Rules (OAR) 345-021-0010(1)(b). Facility components are summarized in a table provided as Attachment B-1.

The Applicant is requesting to permit a range of photovoltaic (PV) and related or supporting facility technology within a site boundary that provides for micrositing flexibility in consideration of regular technological advances in the solar industry, offering maximum efficiency in use of space, and providing development flexibility for potential customer's varying market requirements. For these reasons, Exhibit B provides a representative description of components and accompanying analysis for the maximum footprint or buildable area (for the solar arrays) within the site boundary's solar micrositing corridor, to address the greatest potential Facility impact.

The information summarized in this exhibit and described throughout this Application for Site Certificate (ASC) demonstrates that the Facility, as proposed, can be designed, engineered, constructed, operated, and decommissioned in a manner that satisfies the applicable Energy Facility Siting Council (EFSC) standards.

2.0 Description of the Proposed Facility – OAR 345-021-0010(1)(b)(A)

OAR 345-021-0010(1)(b) Information about the proposed facility, construction schedule and temporary disturbances of the site, including:

(A) A description of the proposed energy facility, including as applicable:

2.1 Generating Capacity

(i) For electric power generating plants, the nominal electric generating capacity and the average electrical generating capacity, as defined in ORS 469.300;

The proposed Facility is a photovoltaic solar energy generation facility with a nominal and average generating capacity of up to 800 megawatts (MW), as defined in Oregon Revised Statutes (ORS) 469.300(4)(c). The proposed Facility includes an up to 800-MW battery energy storage system (BESS) as a related or supporting component for stabilizing the solar resource with the capability to store and redeploy energy generated by the Facility.

2.2 Major Components, Structures, and Systems

> *(ii) Major components, structures and systems, including a description of the size, type and configuration of equipment used to generate, store, transmit, or transport electricity, useful thermal energy, or fuels;*

The Facility's major components are solar arrays which are designed to be constructed, operated, and decommissioned in the approximately 7,026-acre solar micrositing corridor that is within the Facility site boundary. The Facility site boundary is approximately 8,075 acres on private land located on contiguous parcels approximately 9 miles east of Maupin, Wasco County, Oregon, and approximately 6 miles west of Kent, Sherman County, Oregon (Exhibit C).

The Facility will generate electricity using multiple solar arrays made up of PV panels, tracker systems and piles, and related electrical collector equipment described below. The PV panels generate electricity using the photovoltaic effect whereby the material in the panels absorb the sun's energy in the form of photons and then release electrons. Each electron is then harnessed and combined with other electrons. The capture of these free electrons produces an electrical current. The PV panels are electrically connected through medium-voltage 34.5-kilovolt (kV) underground wiring to associated power inverters that convert direct current (DC) electricity generated by PV panels to alternating current (AC) electricity used by the regional electrical grid. The current from the power inverters will be gathered by an internal electrical collection system and transformed to transmission voltage at either the onsite switchyard developed by the Bonneville Power Administration (BPA) using the primary point of interconnect (POI), or at the Facility's collector substation using the alternate POI. The primary and alternate POIs are described in Section 3.4.

This ASC analyzes potential impacts associated with the largest potential solar array layout within the solar micrositing corridor. As described above, the Applicant is considering a range of technologies to preserve design flexibility and incorporate rapidly changing advances in solar technology. During the final engineering design, the Applicant will consider micrositing factors and solar technology available at that time to design the most efficient and effective solar array system. The actual solar array equipment and layout selected at final design will not exceed the potential impacts analyzed in the ASC. During pre-construction and final design engineering, the Applicant will specify the Facility components, equipment, and layout in accordance with the reporting requirements of the Oregon Department of Energy. The Applicant proposes to construct the Facility in phases described in Section 7.0. The impact analysis presented in this ASC represents the full Facility build-out of 800 MW. Attachment B-2 provides a representative example of specifications that may be used for the Facility.

The following sections describe the major components of the solar array based on the best available design information at this time and may be modified at final design.

2.2.1 Solar Panels

The Facility will include PV panels rated at 530 watts DC per panel and mounted on single-axis motorized trackers (it should be noted that watts per panel may vary at the time of Facility construction; however, for planning purposes, 530 watts DC per panel is assumed). The individual PV panels or panels will be mounted on the single-access trackers. These individual panels are grouped to create “strings.” These strings are grouped into blocks, which will be further grouped into the solar arrays. The approximate separation distance of each string is between 20 and 30 feet. This spacing allows for adequate separation of solar blocks to provide first-responder access along interior roads as well as for operations and maintenance. The PV panels will be manufactured at an off-site location and transported via truck to the Facility site. The solar arrays will be oriented north-south with PV panels tracking east-west to follow the movement of the sun throughout the day.

Exhibit C, Figure C-2 depicts the solar array layout developed for purposes of analyzing impacts, using approximately 2,037,360 panels (each approximately 530 watts) configured in approximately 20,622 strings. The actual number of panels will vary depending on the panel technology, energy output, spacing, mounting equipment, Facility phase, and other design criteria which are subject to change during final engineering design. Exhibit C identifies temporary and permanent impacts of the solar array layout.

2.2.2 Tracker Systems and Piles

The tracker installations will be constructed on driven steel piles (i.e., H-pile, C-pile, S-pile). Steel piles supporting the PV panels will be driven into the soil using pneumatic techniques on tracked equipment. The piles are driven into the ground at varying depths depending on soil characteristics and site-specific design parameters. The solar array layout in Exhibit C, Figure C-2 assumes that approximately 346,351 piles (12 piles per tracker string) will be installed. The actual number of piles may vary depending on the final tracker system, ground coverage ratio, topography, height of the solar panels, and site-specific geological conditions. Pile locations will be determined by the final layout of the tracker system and geotechnical investigations of the solar micrositing corridor. In some soil conditions, concrete backfill may be needed for pile installation. For the purposes of analysis in this ASC approximately 10 percent of piles are estimated to use concrete foundations. Concrete foundations are estimated to use approximately 0.3 cubic yards of concrete per foundation, if needed.

After the piles are installed, tracker motors, torque tubes, and other components will be assembled. Some designs allow for PV panels to be secured directly to the torque tubes using appropriate panel clamps. For other single-axis tracking systems, a galvanized metal racking system that secures the panels to the installed foundations will then be field-assembled and attached according to the manufacturer’s guidelines. Final selection of the tracking system will occur prior to construction when the Facility is in more advanced stages of design. A representative example of the tracker system is illustrated on Attachment B-2. The solar array layout in Exhibit C, Figure C-2 shows approximately 20,622 tracker strings (approximately 99 panels per string).

2.2.3 Inverters and Step-up Transformers

The Facility includes the installation of inverters that convert DC electricity to AC electricity so that the PV generated electricity can be sent to the electrical grid. The PV panels will be electrically connected in strings using wiring secured to the metal tracking system. Underground cables, either rated for direct bury or installed in a polyvinyl chloride conduit, will be installed to transmit the DC electricity from the panels via combiner boxes throughout the solar array to inverters. Preliminary calculations suggest inverter station capacity is 4.4 MW each. Typical concrete foundations for inverters are 10 feet by 20 feet, between 2 to 3 feet in depth, which is subject to change during detailed design with use of structural calculations.

Inverter step-up (ISU) transformers will increase the output voltage from the inverter to the voltage for the electrical collection system (i.e., 34.5-kV). The inverters and ISU transformers will be located together at stations dispersed throughout the solar array. The solar array layout in Exhibit C, Figure C-2 depicts approximately 199 inverter/ISU transformer stations. The final number of inverters and ISU transformers and their specifications will vary depending on the actual generation output of the solar array. The inverters and ISU transformers will comply with the applicable requirements and standards of the National Electric Safety Code and Institute of Electrical and Electronics Engineers, respectively.

2.2.4 Cabling

The electrical current produced by solar panels is in the form of DC. Cables collect and aggregate the DC before it is converted to AC and sent to the Facility collector substation. Low-voltage cabling will connect the solar panels of each tracker string in a series and combine multiple strings to a single combiner box. Cabling from multiple combiner boxes will connect to a single inverter, which will convert the DC to AC and connect to the buried collection system. The cabling system for the preliminary site plan shown on Exhibit C, Figure C-2 uses approximately 6,800 combiner boxes. Cabling can be mounted to the tracker system, placed in cable trays, or buried. Cable associated with the solar array will be located within the solar micrositing corridor and the majority will be within the solar array perimeter fence. Buried cable in the solar array perimeter fence is included in the estimated total permanent impact associated with the solar array (i.e., no temporary impacts are calculated for buried cable inside the solar array perimeter fence).

2.2.5 Collection System

From the inverters, medium-voltage 34.5-kV wiring (collector lines) will be encased in conduit and buried approximately 3 feet below grade. The underground 34.5 kV collector lines will be routed to the Facility collector substation and stepped up to 500-kV. Accumulated power will then be transmitted to the onsite BPA switchyard (primary POI), or to BPA's Buckley Substation (alternate POI) via the Facility's alternate 500-kV generation-tie (gen-tie) line where it will be injected into the regional electrical power grid via the existing BPA 500-kV transmission infrastructure. For the purposes of analysis, the solar array layout in Exhibit C, Figure C-2 depicts approximately 267.8 miles of underground 34.5-kV collector lines. No overhead 34.5-kV collector lines are proposed.

2.3 Site Plan and General Arrangement

(iii) A site plan and general arrangement of buildings, equipment and structures;

Exhibit C, Figure C-2 provides a preliminary site plan showing the Facility layout with the general arrangement of buildings, equipment, and structures described herein. As noted above, the preliminary site plan is provided for the purposes of the ASC analysis. Although the final Facility design may differ from the preliminary site plan provided, the actual solar array equipment and layout selected will not exceed the impacts analyzed.

The Applicant seeks micrositing flexibility within the solar micrositing corridor for the solar array layout and related or supporting facilities. The Applicant also requests flexibility to develop the Facility in phases to provide for the maximum efficiency of space and available technology while also providing for the maximum flexibility of potential customers. Prior to each phase of construction, the site plan will be submitted to the applicable County department for zoning, access, and building permits, as needed.

2.4 Facilities for Chemical Storage, Spill Containment Systems

(iv) Fuel and chemical storage facilities, including structures and systems for spill containment;

The Facility does not require fuel or chemicals to generate electricity. Fuel and chemical storage and spill containment procedures for Facility construction and operations are addressed below.

During Facility construction small quantities of chemical materials may be used in the temporary construction yards and stored at the operations and maintenance (O&M) building once constructed. Such materials may include cleaners, insecticides or herbicides, and paint or solvents. None will be present in substantial, reportable quantities and materials will be handled in accordance with state and federal standards. On-site fuel storage may be placed in designated areas within the temporary staging areas described in Section 3.7. Secondary containment and refueling procedures for on-site fuel storage, if needed, will follow the contractor's Spill Prevention, Control, and Countermeasures Plan (SPCC) Plan.

During Facility operations the primary chemical storage will occur in the transformers that use oil for cooling. Transformers at the inverter stations and for the BESS and collector substation will be ground-mounted units constructed on concrete pads with secondary spill containment traps designed to minimize the possibility of accidental leakage. Transformers typically use mineral oil or seed oil that are biodegradable and considered nontoxic. Transformer coolant does not contain polychlorinated biphenyls or compounds listed as extremely hazardous by the U.S. Environmental Protection Agency. The small quantity and nontoxic nature of the oils combined with the fact that the transformers will be included in secondary containment on concrete pads will minimize risk effects of potential spills on soils.

Small quantities of lubricants, degreasers, herbicides, or other chemicals may be stored in the O&M building during Facility operations. Storage of these chemicals will follow label instructions. No underground storage tanks will be installed at the O&M building. No extremely hazardous materials identified under 40 Code of Federal Regulations (CFR) 355 are anticipated to be produced, used, stored, transported, or disposed of at the Facility during operation.

In the unlikely event of a spill, the Applicant or the Applicant's contractor will follow response measures outlined in its operations SPCC Plan as required under 40 CFR 112.[1] As part of this plan, equipment containing oil or hazardous materials will be regularly monitored for leaks, and measures will be put in place if any are found to quickly control and remove spills.

The Facility's BESS is anticipated to use lithium-ion (Li-ion) batteries. Li-ion battery systems are modular systems that contain multiple smaller battery cells. The cells are hermetically sealed and are the primary containment for the battery. The module containing the cells serves as a secondary leak-proof containment. Modules are placed on anchored racks within steel containers. The risk of leaking is low because in the unlikely case that a battery cell ruptures the battery cells and their modules are contained in the battery energy storage system steel container. Used Li-ion batteries can be considered hazardous waste by the U.S. Environmental Protection Agency and will be disposed of according to the most current guidelines at the end of their useful life. See Section 3.1 for additional description of the battery energy storage system.

2.5 Fire Prevention and Control

(v) Equipment and systems for fire prevention and control;

Solar facilities do not pose a significant fire risk. Exhibit V provides detailed information on wildfire risks and prevention. This section provides a summary of these topics.

The greatest risk of fire could occur during Facility construction. Examples of construction activities associated with fire risk are welding and metal cutting for foundation rebar frames and vehicles and construction equipment that may be used in areas of tall, dry grass. In order to prevent fires from occurring, the construction contractor will implement a number of systems and procedures. These will include requirements to conduct welding or metal cutting only in areas that are graveled or cleared of vegetation, and to keep emergency firefighting equipment on-site when potentially hazardous operations are taking place. The Applicant's construction contractor will be trained in fire prevention awareness and have on-site fire extinguishers to respond to small fires. In the event of a large fire, emergency responders will be dispatched.

During Facility operations, the solar array will have shielded electrical cabling, as required by applicable code, to prevent electrical fires. The collection system and collector substation will have redundant surge arrestors to deactivate the Facility during events of unusual operational events that could start fires. The collector substation will have also sufficient spacing between equipment

[1] Prior to construction, the Applicant or the Applicant's contractor will complete the Tier I Qualified Facility SPCC Plan Template accessed here: https://www.epa.gov/sites/default/files/2014-05/documents/tier1template.pdf.

to prevent the spread of fire. With proper maintenance and safety checks, the electrical collection system and up to 500-kV alternate gen-tie line unlikely to cause a fire. In addition, electrical equipment will meet applicable National Electrical Safety Code and Institute of Electrical and Electronics Engineers standards and will not pose a significant fire risk. Vegetation within the solar array perimeter fence and along the alternate gen-tie line corridor (if constructed) will be managed to reduce fuels for fire. Weeds will be managed in accordance with the weed management procedures described in the Facility Draft Noxious Weed Control Plan (see Exhibit P, Attachment P-4).

Facility roads will be sufficiently sized for emergency vehicle access in accordance with current Oregon Fire Code requirements, including Section 503 and Appendix D - Fire Apparatus Access Roads. Specifically, roads will be 16 to 20 feet wide with an internal turning radius of up to 48 feet and less than 10 percent grade to provide access to emergency vehicles. Vegetation will be cleared and maintained along perimeter service roads to provide vegetation clearance for fire safety. Road cross sections consist of 6 to 8 inches of compacted gravel supported on 6 inches of compacted native dirt. The fenced areas around the BESS, collector substation, and O&M building will be graveled with no vegetation present.

Smoke/fire detectors will be placed around the Facility that will be tied to the supervisory control and data acquisition (SCADA) system (see Section 3.3) and will contact local firefighting services. The O&M building will have basic firefighting equipment for use on site during maintenance activities, such as shovels, beaters, portable water for hand sprayers, fire extinguishers, and other equipment.

On-site employees will receive training on fire prevention and response. Employees will keep vehicles on roads and off dry grassland when feasible during the dry months of the year, unless such activities are required for emergency purposes, in which case fire precautions will be observed. In the rare event of an electrical fire in the solar panel blocks or collector substation, it is likely that Facility staff will monitor and contain the fire, but not try to extinguish it.

At the beginning of Facility operations, a copy of the site plan indicating the arrangement of the Facility structures and access points will be provided to the Bakeoven-Shaniko Rangeland Fire Protection Association and South Sherman Rural Fire Protection District (if the alternate POI is used). The Applicant has communicated with and will continue to coordinate with the Bakeoven-Shaniko Rangeland Fire Protection Association and South Sherman Rural Fire Protection District. Exhibit U and V provide additional discussion of Facility fire prevention measures and coordination with local emergency responders.

2.5.1 Battery Energy Storage System

The chemicals used in Li-ion batteries are generally nontoxic but do present a flammability hazard. Li-ion batteries are susceptible to overheating and require cooling systems, especially at the utility scale (LAZARD 2021). The gas released by an overheating Li-ion cell is mainly carbon dioxide. The electrolyte solution, usually consisting of ethylene or propylene, may also vaporize and vent if the cell overheats (Battery University 2022).

The Applicant will implement the following fire prevention and control methods to minimize fire and safety risks if Li-ion batteries are used for battery storage:

- The batteries will be stored in completely contained, leak-proof modules.
- Ample working space will be provided around the battery energy storage system for maintenance and safety purposes.
- Off-site, 24-hour monitoring of the battery energy storage system will be implemented and will include shutdown capabilities.
- The Applicant will implement technical specifications for BESS fire protection in the design, engineering, procurement, and construction of its BESS facility (Attachment B-3).
- Transportation of Li-ion batteries is subject to 49 CFR 173.185 – Department of Transportation Pipeline and Hazardous Material Administration. This regulation contains requirements for prevention of a dangerous evolution of heat; prevention of short circuits; prevention of damage to the terminals; and prevention of batteries coming into contact with other batteries or conductive materials. Adherence to the requirements and regulations, personnel training, safe interim storage, and segregation from other potential waste streams will minimize any public hazard related to transport, use, or disposal of batteries.
- Design of the battery energy storage system will be in accordance with applicable UL Solutions (specifically, 1642, 1741, 1973, 9540A; UL Solutions 2023), National Electric Code, and National Fire Protection Association (specifically 855) standards, which require rigorous industry testing and certification related to fire safety and/or other regulatory requirements applicable to battery storage at the time of construction.
- The Applicant will employ the following design practices, as applicable to the available technology and design at time of construction:
    - Use of HVAC systems for Li-ion phosphate systems to maintain battery temperatures within the optimal range, which reduces the risk of battery malfunction that could lead to fire;
    - Use of Li-ion phosphate battery chemistry, which is a more thermally stable Li-ion cathode chemistry;
    - Employment of an advanced and proven battery management system;
    - Qualification testing of battery systems in accordance with UL 9540A (UL Solutions 2023);
    - Employment of fire control panels with 24-hour battery backup;

- Installation of fire sensors, smoke and hydrogen detectors, alarms, emergency ventilation systems, cooling systems, and aerosol fire suppression/extinguishing systems in every battery container;
- Installation of doors that are equipped with a contact that will shut down the battery container if opened;
- Installation of fire extinguishing and thermal insulation sheets between each individual battery cell;
- Implementation of locks and fencing to prevent entry of unauthorized personnel;
- Installation of remote power disconnect switches; and
- Clear and visible signs to identify remote power disconnect switches.

3.0 Description of Related and Supporting Facilities – OAR 345-021-0010(1)(b)(B)

(B) A description of major components, structures and systems of each related or supporting facility;

Related or supporting facilities consist of the up to 800-MW BESS, collector substation, operations and maintenance (O&M) building, gen-tie line, site access and service roads, perimeter fencing and gates, temporary construction staging areas, and potentially temporary workforce housing. As described above, the Applicant seeks micrositing flexibility within the solar micrositing corridor for the solar array layout and related or supporting facilities. The following descriptions are based on the best available information at this time and may be modified in the final ASC and at final design prior to construction of each phase of development. These Facility components are also summarized in Attachment B-1.

3.1 Battery Energy Storage System

The BESS plays an essential role in enabling the Facility to meet its full grid potential. Energy storage facilitated by the BESS provides a suite of benefits, including peak capacity, energy time shifting, and grid stabilization, which are critical components in creating a fully sustainable energy system. The BESS allows the Facility to deliver flexible capacity to the grid from low carbon energy charged from the solar arrays and also provides a fast response to balance power supply and demand, which creates a more reliable, stable, and productive energy grid. The BESS provides these benefits with limited potential disturbances as the components are remotely controlled and monitored, requiring only periodic on-site maintenance. The BESS has no air emissions or wastewater discharges and does not require water use during operations.

To provide these benefits of energy storage, the Facility includes an up to 800-MW BESS on the west side of the Facility directly north of the Facility's collector substation (Exhibit C, Figure C-2).

The BESS consists of two separate non-additive, low-side AC coupled systems, using lithium-ion batteries. Lithium-ion batteries are the most common type of utility-scale battery energy storage system technologies at this time. Current design anticipates using 89 Sungrow inverters[2] for each BESS system. The BESS stores energy in times of excess production and later discharges energy generated by the Facility when it is needed. The BESS containers will be placed on aggregate base material and gravel. The BESS containers will house the Facility batteries and are anticipated to use a series of self-contained enclosures located on a concrete pad. Each container holds the batteries, a SCADA system, and a fire prevention system. Cooling units will be placed either on top of the containers or along the side depending on the equipment selected at final design. See Attachment B-4 for a typical battery energy storage system arrangement developed by the Applicant.

3.1.1 Battery Energy Storage System Equipment

The BESS design will include, but not be limited to, the following elements:

- Battery storage equipment, including battery cells, modules, racks and containers, inverters (which convert electricity from AC-to-DC, and DC-to-AC), transformers (which "step up" and "step down" the system voltage), and switchboards;
- Balance of plant equipment and control instrumentation, which may include medium-voltage and low-voltage electrical systems, fire suppression, HVAC systems for cooling, building electrical systems, and SCADA systems; and
- High-voltage (HV) equipment, including HV circuit breaker, HV current transformers and voltage transformers, a packaged control building for the HV breaker and transformer equipment, HV towers, structures, and HV cabling.

The battery containers will be placed on concrete slabs. Each container holds the batteries, a battery management system, and a fire prevention system. Cooling units will be placed either on top of the concrete containers or along the side. By connecting multiple containers, the battery energy storage system can be scaled to the desired capacity.

3.1.2 Battery Energy Storage System Operations and Maintenance

The batteries and other materials for the BESS will be manufactured off-site and transported to the Facility by truck. As applicable, defective or decommissioned parts will be disposed of or recycled in compliance with 49 CFR 173.185, which regulates the transportation of Li-ion batteries.

The O&M activities will mainly consist of minimal procedures that do not require tampering with the battery cell components. Li-ion systems will likely require replacement of the batteries every 20 years.

[2] Current models under consideration include Sungrow 4400UD, Sungrow SC5000UD-MV-US, and Sungrow SG3600UD.

The battery energy storage system will be stored in completely contained, leak-proof modules. The modules will be stored on a concrete pad to capture any leaks that may occur. O&M staff will conduct inspections of the BESS according to the manufacturer's recommendations.

As described in Section 2.4, an SPCC Plan will be developed to manage, prevent, contain, and control potential releases, with provisions for quick and safe cleanup of hazardous materials. Fire prevention and control measures specific to the BESS are discussed in Section 2.5.1 and Exhibit V.

3.2 Collector Substation

One collector substation will be used for the proposed Facility and will be located within the Facility site boundary (Exhibit C, Figure C-2). Prior to construction, the collector substation site will be cleared and graded, with a bed of crushed rock applied for a durable surface. The collector substation is anticipated to consist of transformers, gen-tie line termination structures, a bus bar, circuit breakers and fuses, control systems, meters, and other equipment that will be determined at final design. Any additional equipment will be within the fenced collector substation area. The collector substation will be developed within the approximately 19.5-acre area shown on Exhibit C, Figure C-2, will be enclosed and locked by a 6- to 8-foot tall chain-link fence, and will be fenced separately from the solar arrays. The collector substation will use up to four generator step-up transformers to step up power from 34.5-kV to 500-kV at the POI. The transformers use mineral oil or seed oil that is biodegradable and considered nontoxic.

3.3 Operations and Maintenance Building

The O&M building will be located within an approximately 3.9-acre area south of the collector substation. The O&M building includes a small administrative area with a SCADA control room, a work area to perform minor repairs, and a storage area for spare parts, transformer oil, and other incidental chemicals. The preliminary O&M building design is estimated to be 24 feet by 60 feet within the O&M area. The O&M building is anticipated to be wood framed with wood truss construction, metal roofing, and metal siding on a reinforced concrete foundation. The colors of the siding and roofing can be locationally dependent. For example, the Applicant anticipates using a tan siding with a red or copper roof to blend in with the surroundings. The administrative area will be air conditioned and include offices, kitchen/break room, restrooms, and locker rooms with showers. The O&M building will be fenced separately from the solar arrays with the BESS and collector substation.

A SCADA system will be installed to collect operating and performance data from the solar array. The SCADA system provides for remote operation and monitoring of the Facility's solar array, BESS, and collector substation components from a control room in the O&M building and by a remote operations center. Fiber optic cables for the SCADA system will be installed with the collection system (Section 2.2.5). The fiber cables will be installed in the same trench where the collection system is buried.

3.4 Generation-tie Line

The Facility is considering two options for the POI to the regional electrical grid (Exhibit C, Figure C-2):

- The primary POI under consideration is at the proposed BPA switchyard that is within the Facility site boundary and will be developed by BPA. The Facility's collector substation will connect to the adjacent BPA switchyard. The BPA switchyard will then connect to the BPA 500-kV John Day to Grizzly transmission line located directly adjacent to the westernmost edge of the Facility. The Facility's collector substation will interconnect directly with the proposed BPA switchyard using a short overhead span of gen-tie line between the adjacent facilities.
- The alternate POI under consideration will include an alternate up to 500-kV generation-tie (gen-tie) line of 4.5 miles (approximately 2.6 miles within Wasco County and approximately 1.9 miles within Sherman County) and connect to BPA's existing Buckley Substation located in Sherman County north of the Facility. The alternate gen-tie line will start at the Facility's collector substation and run east of and parallel to the BPA's 500-kV transmission line corridor and connect to the Buckley Substation. The alternate gen-tie line is an associated transmission line and is not a transmission line within the meaning of EFSC jurisdiction (see Section 5.0 below). The alternate gen-tie line will be outside the fenced solar arrays but within the Facility site boundary (Exhibit C, Figure C-2). The alternate gen-tie line is described further in Section 4.5.

3.5 Site Access and Service Roads

The Facility will use and improve existing access roads to the extent practicable. The primary transportation corridor to the Facility is Bakeoven Road via US 97. The Facility will be accessed from Wilson Road. Approximately 24.8 miles of new service roads will be constructed within the solar micrositing corridor to provide access to the solar arrays and related or supporting Facility components (Exhibit C, Figure C-2). Approximately 2.1 miles of existing roads may need improvements or alterations (Exhibit C, Table C-2). Prior to construction, the Applicant will coordinate with the Wasco County Planning Department to vacate the portion of the road right-of-way associated with Wilson Road that occurs within the Facility site boundary. The Applicant will follow the applicable standards in Chapter 21 of the Wasco County Land Use and Development Ordinance or as directed by Wasco County to vacate the road right-of-way.

The service roads within the solar array will be up to 20-feet wide with up to a 48-foot turning radius to be consistent with Oregon Fire Code requirements or other applicable county standards (i.e., access for first-responder apparatus), which conform to the 2018 International Fire Code. The surface will be composed of gravel, compacted aggregate base, or another commercially available suitable surface and be able to support 75,000 pounds. The roads will accommodate Facility construction and O&M activities, such as cleaning the PV panels and facilitating on-site circulation and adequate turnarounds for emergency vehicles. Facility roads will be treated to create a durable, generally dustless surface for use during construction and operation. Dust abatement treatments will involve surfacing interior roads with gravel combined with the use of an approved dust palliative or water. To the extent feasible, vegetation will be cleared and maintained along perimeter roads to provide a vegetation clearance area for fire safety. Use of the service roads may continue after construction, or new service roads may be removed, and the land restored to pre-construction conditions.

3.6 Perimeter Fencing and Gates

Facility components will be enclosed by approximately 50.8 miles of perimeter fencing. The BESS, collector substation, O&M building and BPA's switchyard will be fenced to restrict public access during construction and operations. A chain-link security fence will be installed around these related or supporting uses that require controlled access. The security fence around the BESS, collector substation, O&M building and BPA's switchyard is anticipated to be up to 8 feet in height (6 to 7 feet of fence, crowned with 1 foot of barbed wire [three strands]), mounted on 45-degree extension arms facing outwards. The solar arrays will be enclosed by fixed-knot (or a similar wildlife friendly option) or chain-link perimeter fencing up to 8 feet in height. The fence posts will be set in concrete and/or driven into the ground. Fencing may be raised off the ground approximately 6 to 8 inches to accommodate small animal movement under the fence.

The Facility site will be locked and gated. The locations of specific access points and gates will depend on the final configuration of the solar arrays and related infrastructure which will be determined at final design. If first responders needed to access the site for any reason, a key will be available in a lock box or some other approved method. The perimeter fence will have 24-foot-wide security gates installed at various locations for ingress and egress. Controlled access gates will be located at the entrances to the Facility. Site access gates will be swing- or rolling-type. Access through the main gates will require an electronic swipe card to prevent unaccompanied visitors from accessing the Facility. Facility personnel, contractors, agency personnel, and visitors will be logged in and out at the O&M building during normal business hours. Visitors and non-Facility employees (except agency personnel on government business) will be allowed entry only with approval from a staff member at the Facility. Additional security may be provided by closed-circuit video surveillance cameras and anti-intrusion systems, as required, for protection of the Facility as well as for the safety of visitors.

3.7 Temporary Construction Staging Areas

Temporary construction staging areas will be needed on the Facility site, including fenced parking, covered trash disposal facilities, construction trailers, a laydown area, and sufficient portable toilets and potable water for construction staff. Mobile trailers or similar suitable facilities (e.g., modular offices) will be used as construction offices for Facility and subcontractor personnel. Construction laydown and parking areas will be within the Facility site as shown on Exhibit C, Figure C-2 and may be relocated periodically as the solar array is constructed. Temporary construction staging may also occur in the BESS, collector substation, and O&M areas during construction and prior to

Facility operations. During construction, temporary utilities will be provided for construction offices. Temporary construction power, before the construction of permanent distribution power, will likely come from portable generators or by connecting to the existing nearby sub-transmission lines. Temporary area lighting will be provided and strategically located for safety and security.

Construction materials—such as panels, racking systems, piles, gen-tie structures, conduit, conductors, concrete, pipe, wire and cable, fuels, reinforcing steel, and small tools—will be delivered to the site by truck. Site access will be restricted to construction personnel only. After the construction phase, the fence to secure the site will be installed after selective grading and vegetation grubbing is complete, but before large components are brought onto the site for assembly and installation. During initial groundwork, equipment will be stored overnight and on weekends and holidays in a secure, fenced, and gated storage area within the footprint of the solar array.

3.8 Temporary Workforce Housing

Temporary workforce housing, if needed and feasible to provide within the Facility site, may occur within the Facility site boundary. The need for workforce housing will be determined in final design and prior to construction. If needed, the Applicant will work with Oregon Department of Energy and Wasco County to appropriately permit temporary workforce housing.

4.0 Approximate Dimensions of Major Structures and Features – OAR 345-021-0010(1)(b)(C)

(C) The approximate dimensions of major facility structures and visible features;

The Facility's major structures and their approximate dimensions are described below and summarized in Attachment B-1. Dimensions included in the descriptions are for representative purposes only. The vendor, size, number, and arrangement of the solar arrays and other related or supporting components have not yet been determined and will be verified prior to construction at final engineering and design. Attachment B-2 provides representative examples of how the solar arrays may appear in scope and size. Attachment B-4 provides pictures of the Applicant's existing BESS projects to provide a similar representative example of how the BESS may appear in scope and size.

4.1 Solar Array Dimensions

The solar array will comprise linear rows (strings) of panels within perimeter fencing, as depicted in Exhibit C, Figure C-2. Representative solar panels measure approximately 7.6 feet by 4.0 feet by 1.3 inches thick; this will be a targeted standard dimension, with variations pending final technology selection and design considerations. The maximum height of the solar array will be 12 feet when the panels are fully tilted on the tracking system. A representative example of the solar panel and tracking system is illustrated on Attachment B-2. The solar panels are constructed with heat strengthened glass and anti-reflective coating. The exact number and size of panels, layout, and associated equipment specifications will be determined during final design; however, as noted previously, the actual solar array equipment and layout selected will not exceed the impacts analyzed.

4.2 Battery Energy Storage System Dimensions

The BESS area will include approximately 1,220 BESS containers. The BESS containers will be placed on aggregate base material and gravel. The BESS containers will house the Facility batteries. As described above, the lithium-ion battery types may use a series of self-contained enclosures measuring approximately 12 feet wide, 36 feet long, and 10 feet tall and located on concrete pads within an approximately 44.2-acre centralized area near the Facility’s collector substation. Each container holds the batteries, a supervisory and power management system, and a fire prevention system. Cooling units will be placed either on top of the containers or along the side depending on the equipment selected at final design.

The battery storage area will be fenced separately from the solar array and secured as described in Section 3.6. The entire footprint of the battery storage sites is assumed to be permanently disturbed (Exhibit C). As stated above, the technology described in this Exhibit is preliminary and, while final design may differ, impacts will not exceed those analyzed in this ASC.

4.3 Collector Substation Dimensions

The Facility collector substation will be situated on an approximately 19.5-acre site, locked and fenced inside the solar array fence line (see Exhibit C, Figure C-2). The tallest substation components will be approximately 50 feet in height. The BPA interconnection switchyard will be located on an approximately 20-acre locked, separately fenced site adjacent to the collector substation.

4.4 34.5-kV Underground Collector Line Dimensions

The 34.5-kV collector lines will run underground for improved reliability. The collector lines will be directly buried at a depth up approximately 3 feet and subject to the requirements of the National Electrical Safety Code. The approximately 267.8 miles of underground collector lines will be directly buried at a depth of approximately 3 feet. The underground collector lines will generally be within the solar array fence line following the Facility’s service road routes. The underground collector lines that occur outside the solar array fence line will connect adjacent solar arrays to the collector substation (see Exhibit C, Figure C-2).

4.5 Generation-tie Line Dimensions

The Facility’s collector substation will interconnect directly with the proposed BPA switchyard using a short overhead span of gen-tie line between the adjacent facilities using an approximately 160 to 180-foot steel monopole. The alternate 500-kV gen-tie will be supported by approximately 160 to 180-foot steel monopoles that will be spaced approximately 1,000 feet apart. Each monopole will require a concrete caisson foundation that will be approximately 8 feet in diameter (larger for dead-end structures) with a foundation depth of between 40 and 60 feet. Custom structures may be required to accommodate larger spans to avoid sensitive resources or steep terrain. Tension stringing equipment (i.e., pulling site) will be spaced approximately 10,000 feet apart and be 100-feet wide by 600-feet long and located within the gen-tie right of way. Each support structure will have one pole, with a total permanent disturbance for each structure of 1,600 square feet. Approximately 4.5 miles of overhead transmission line will be used and will be outside of the solar array fence line area (see Exhibit C, Figure C-2). A representative example of the alternate 500-kV gen-tie line support structure is illustrated on Attachment B-5.

4.6 O&M Building Dimensions

The O&M building will either be a one-story pre-engineered metal or wood-framed structure up to 5,000 square feet, located on up to 3.8 acres. The O&M building will be supported on a reinforced concrete foundation or on individual spread footings. A permanent, graveled parking and storage area for employees, visitors, and equipment will be located adjacent to the O&M building. The O&M building will be approximately 24 feet high and within the solar array fence line area (see Exhibit C, Figure C-2).

4.7 Temporary Construction Staging Area Dimensions

The temporary construction staging and equipment laydown will occur within the approximately 3.5-acre and 20-acre temporary construction staging areas in the solar micrositing corridor (see Exhibit C, Figure C-2). Temporary construction staging may also occur in the BESS, collector substation, and O&M areas during construction and prior to Facility operations. The temporary construction staging area may contain temporary aboveground fuel tanks (Exhibit G). If needed, the Applicant's contractor will determine the capacity of the aboveground fuel tanks needed for construction. As described in Section 2.4 and Exhibit G, on-site fuel storage will include secondary containment and follow refueling procedures for on-site fuel storage in the contractor's SPCC Plan.

5.0 Transmission Line Corridor – OAR 345-021-0010(1)(b)(D)

> *(D) If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a transmission line or pipeline that, by itself, is an energy facility under the definition in ORS 469.300, a corridor selection assessment explaining how the applicant selected the corridors for analysis in the application. […]*

As described above, the Facility is considering two options for the POI to the regional electrical grid.

The primary POI, in and of itself, is not an energy facility as defined in ORS 469.300 because it does not cross more than one city or county. The collector substation will connect directly to the proposed BPA switchyard, which will connect to the existing 500-kV BPA John Day to Grizzly transmission line adjacent to the Facility, all of which is entirely within the unincorporated areas of Wasco County. Therefore, a corridor selection assessment is not required for the primary POI.

The alternate POI under consideration is BPA's existing Buckley Substation located in Sherman County north of the Facility. This POI, if selected, involves the construction of a 4.5-mile-long associated gen-tie line located adjacent and parallel to BPA's 500-kV John Day to Grizzly transmission line. While this alternate gen-tie line does cross more than one county, it is not an energy facility as defined in ORS 469.300(11)(a)(C) because it is an associated transmission line, is not more than 10 miles in length, and would be constructed within 500 feet of an existing corridor occupied by high voltage transmission lines with a capacity of 230,000 volts or more. The proposed centerline of the alternate gen-tie line ranges in distance from approximately 60 to 260 feet from the centerline of the existing BPA's 500-kV John Day to Grizzly transmission line to the west. As a result, a corridor assessment for either proposed POI and associated gen-tie line is not required.

6.0 Description of Transmission Line – OAR 345-021-0010(1)(b)(E)

(E) If the proposed energy facility is a pipeline or transmission line or has, as a related or supporting facility, a transmission line or pipeline of any size:

(i) The length of the pipeline or transmission line;

The primary POI directly connects the collector substation to the BPA switchyard, which then connects to the existing 500-kV BPA John Day to Grizzly transmission line adjacent to the Facility. The Facility's collector substation will interconnect directly with the proposed BPA switchyard using a short overhead span of gen-tie line between the adjacent facilities and no additional gen-tie line is needed. The existing 500-kV BPA John Day to Grizzly transmission line connects to BPA's existing Bakeoven Substation.

If selected, the alternate POI will use the alternate 500-kV gen-tie line extending from the Facility collector substation approximately 4.5 miles north and parallel to the 500-kV BPA John Day to Grizzly transmission line to BPA's existing Buckley Substation. Approximately 2.6 miles of the alternate 500-kV gen-tie line is within unincorporated Wasco County and approximately 1.9 miles is within unincorporated Sherman County. See Exhibit C, Figure C-2 for the primary and alternate POI and alternate 500-kV gen-tie line locations.

(ii) The proposed right-of-way width of the pipeline or transmission line, including to what extent new right-of-way will be required or existing right-of-way will be widened;

The alternate 500-kV gen-tie line will be located on new right-of-way directly adjacent and parallel to the BPA's 500-kV John Day to Grizzly transmission line. The proposed alternate 500-kV gen-tie line will be within an approximately 200-foot-wide right-of-way that will occur within the 250-foot-wide corridor which is the Facility site boundary. As described above, no transmission line right-of-way is necessary for the primary POI, due to the location of the proposed collector substation being directly adjacent to the proposed BPA switchyard.

The alternate 500-kV gen-tie line traverses private land for approximately 4.5 miles to its terminus at the Buckley Substation.

Facilities on BPA property will be owned and constructed by BPA per the terms of the Facility's interconnection agreement. The Facility's interconnection agreement will be finalized after issuance of the site certificate and BPA's environmental review.

> *(iii) If the proposed transmission line or pipeline corridor follows or includes public right-of-way, a description of where the transmission line or pipeline would be located within the public right-of-way, to the extent known. If the applicant proposes to locate all or part of a transmission line or pipeline adjacent to but not within the public right-of-way, describe the reasons for locating the transmission line or pipeline outside the public right-of-way. The applicant must include a set of clear and objective criteria and a description of the type of evidence that would support locating the transmission line or pipeline outside the public right-of-way, based on those criteria;*

As described above, no transmission line right-of-way is necessary for the primary POI, due to the location of the proposed collector substation being directly adjacent to the proposed BPA switchyard. The proposed alternate 500-kV gen-tie line does not include or follow public right-of-way because no public right-of-way is available between the collector substation and BPA's Buckley substation. However, the proposed alternate 500-kV gen-tie line route is directly adjacent and follows parallel to BPA's 500-kV John Day to Grizzly transmission line, in order to minimize Facility disturbances and to site the line in an area already impacted by energy infrastructure. The alternate 500-kV gen-tie line generally follows a straight line from the collector substation north to the Buckley Substation. While this route does not follow an existing public right-of-way, it follows the route of existing energy infrastructure, which will minimize negative impacts to the surrounding landscape. Exhibit K provides additional information regarding land use compliance for the alternate 500-kV gen-tie line route.

> *(iv) For pipelines, the operating pressure and delivery capacity in thousand cubic feet per day and the diameter and location, above or below ground, of each pipeline;*

The Facility does not include a pipeline; therefore, this requirement is not applicable.

> *(v) For transmission lines, the rated voltage, load carrying capacity, and type of current and a description of transmission line structures and their dimensions; and*

The gen-tie line will have a rated voltage of up to 500-kV and be able to carry the full output of the Facility. The type of current is alternating current. The Facility's collector substation will interconnect directly with the proposed BPA switchyard using a short overhead span of gen-tie line between the adjacent facilities using an approximately 160 to 180-foot steel monopole. The alternate 500-kV gen-tie line will be constructed on approximately 160 to 180-foot steel monopoles that will be spaced approximately 1,000 feet apart. Each monopole will require a concrete caisson foundation that will be approximately 8 feet in diameter (larger for dead-end structures) with a foundation depth of between 40 and 60 feet. Custom structures may be required to accommodate larger spans to avoid sensitive resources or steep terrain. Tension stringing equipment (i.e., pulling site) will be spaced approximately 10,000 feet apart and be 100-feet wide by 600-feet long and located within the gen-tie right of way. Typical 500-kV support structures are illustrated on Attachment B-5.

7.0 Project Construction Schedule – OAR 345-021-0010(1)(b)(F)

OAR 345-021-0010(1)(b)(F) A construction schedule including the date by which the applicant proposes to begin construction and the date by which the applicant proposes to complete construction. Construction is defined in OAR 345-001-0010. The applicant must describe in this exhibit all work on the site that the applicant intends to begin before the Council issues a site certificate. The applicant must include an estimate of the cost of that work. For the purpose of this exhibit, "work on the site" means any work within a site or corridor, other than surveying, exploration or other activities to define or characterize the site or corridor, that the applicant anticipates or has performed as of the time of submitting the application.

The Applicant proposes to begin construction on or after June 2027 and to construct the Facility in phases. An example of a phased construction schedule is outlined in Table B-1. The Applicant requests flexibility to tailor the number of phases and the size and construction schedule for each phase to meet market demand. The entire Facility, including all phases, will be completed by 2035, unless the Applicant seeks an amendment to extend the construction deadline.

The Applicant proposes findings and conditions throughout this ASC to allow phasing during Facility design and construction. Phasing Facility design and construction allows the Applicant the ability to tailor delivery of power for a particular customer, depending on market demands. The Applicant may own and operate the entire Facility, or the Applicant may seek to transfer one or more portions of the Facility to a new owner/operator. In accordance with ORS 469.300(6), preconstruction conditions may be satisfied for the applicable facility, facility component, or phase, as applicable, based on final design and configuration.

Table B-1. Example Construction Schedule

Year	Activity
2025	Issuance of Yellow Rosebush Energy Center site certificate.
2027	Final engineering and begin construction.
2027 - 2035	Phased construction to operation.
2027 - 2030	Phase 1 construction; approximately 36 months (400 MW).
2030	Anticipated Phase 1 construction completion deadline; commence Phase 1 commercial operation.
2032 - 2035	Phase 2 construction; approximately 36 months (400 MW).
2035	Anticipated Phase 2 construction completion deadline; commence Phase 2 commercial operation for full buildout.

8.0 Submittal Requirements and Approval Standards

8.1 Submittal Requirements

Table B-2. Submittal Requirements Matrix

Requirement	Location
OAR 345-021-0010(1)(b) Exhibit B. Information about the proposed facility, construction schedule and temporary disturbances of the site, including:	-
(A) A description of the proposed energy facility, including as applicable:	Section 2.0
(i) The nominal electric generating capacity and the average electrical generating capacity, as defined in ORS 469.300.	Section 2.1
(ii) Major components, structures and systems, including a description of the size, type and configuration of equipment used to generate electricity and useful thermal energy.	Section 2.2
(iii) A site plan and general arrangement of buildings, equipment and structures;	Section 2.3
(iv) Fuel and chemical storage faculties, including structures and systems for spill containment	Section 2.4
(v) Equipment and systems for fire prevention and control.	Section 2.5
(vi) For thermal power plants: (i) A discussion of the source, quantity and availability of all fuels proposed to be used in the facility to generate electricity or useful thermal energy. (ii) Process flow, including power cycle and steam cycle diagrams to describe the energy flows within the system; (iii) equipment and systems for disposal of waste heat; (iv) The fuel chargeable to power heat rate.	N/A
(vii) For surface facilities related to underground gas storage, estimated daily injection and withdrawal rates, horsepower compression required to operate at design injection or withdrawal rates, operating pressure range and fuel type of compressors.	N/A
(viii) For facilities to store liquefied natural gas, the volume, maximum pressure, liquefaction and gasification capacity in thousand cubic feet per hour.	N/A

Requirement	Location
(B) A description of major components, structures and systems of each related or supporting facility.	Section 3.0
(C) The approximate dimensions of major facility structures and visible features.	Section 4.0
(D) If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a transmission line or pipeline that, by itself, is an energy facility under the definition in ORS 469.300, a corridor selection assessment explaining how the applicant selected the corridor(s) for analysis in the application. In the assessment, the applicant shall evaluate the corridor adjustments the Department has described in the project order, if any. The applicant may select any corridor for analysis in the application and may select more than one corridor. However, if the applicant selects a new corridor, then the applicant must explain why the applicant did not present the new corridor for comment at an information meeting under OAR 345-015-0130. In the assessment, the applicant shall discuss the reasons for selecting the corridor(s), based upon evaluation of the following factors:	Section 5.0
(i) Least disturbance to streams, rivers and wetland during construction.	N/A
(ii) Least percentage of the total length of the pipeline or transmission line that would be located within areas of Habitat Category 1, as described by the Oregon Department of Fish and Wildlife.	N/A
(iii) Greatest percentage of the total length of the pipeline or transmission line that would be located within or adjacent to public roads, and existing pipeline or transmission line rights-of-way.	N/A
(iv) Least percentage of the total length of the pipeline or transmission line that would be located within lands that require zone changes, variances or exceptions.	N/A
(v) Least percentage of the total length of the pipeline or transmission line that would be located in a protected area as described in OAR 345-022-0040.	N/A
(vi) Least disturbance to areas where historical, cultural or archaeological resources are likely to exist.	N/A
(vii) Greatest percentage of the total length of the pipeline or transmission line that would be located to avoid seismic, geological and soils hazards.	N/A
(viii) Least percentage of the total length of the pipeline or transmission line that would be located within lands zoned for exclusive farm use.	N/A
(E) If the proposed energy facility is a pipeline or transmission line, or has, as a related or supporting facility, a transmission line or pipeline of any size:	Section 6.0
(i) The length of the pipeline or transmission line.	Section 6.0
(ii) The proposed right-of-way width of the pipeline or transmission line, including to what extent new right-of-way will be required or existing will be widened.	Section 6.0

Requirement	Location
(iii) If the proposed transmission line or pipeline corridor follows or includes public right-of-way, a description of where the transmission line or pipeline would be located within the public right-of-way, to the extent known. If the applicant proposes to locate all or part of a transmission line or pipeline adjacent to but not within the public right-of-way, describe the reasons for locating the transmission line or pipeline outside the public right-of-way. The applicant must include a set of clear and objective criteria and a description of the type of evidence that would support locating the transmission line or pipeline outside the public right-of-way, based on those criteria.	Section 6.0
(iv) For pipelines, the operating pressure and delivery capacity in thousand cubic feet per day and the diameter and location, above or below ground, of each pipeline.	N/A
(v) For transmission lines, the rated voltage, load carrying capacity, and type of current and a description of transmission line structures and their dimensions.	Section 6.0
(F) A construction schedule including the date by which the applicant proposes to begin construction and the date by which the applicant proposes to complete construction. Construction is defined in OAR 345-001-0010. The applicant shall describe in this exhibit all work on the site that the applicant intends to begin before the Council issues a site certificate. The applicant shall include an estimate of the cost of that work. For the purpose of this exhibit, "work on the site" means any work within a site or corridor, other than surveying, exploration or other activities to define or characterize the site or corridor that the applicant anticipates or has performed as of the time of submitting the application.	Section 7.0

8.2 Approval Standards

OAR 345 Division 22 does not provide an approval standard specific to Exhibit B.

9.0 References

Battery University. 2022. BU-304a: Safety Concerns with Li-ion. February 2022. http://batteryuniversity.com/learn/article/safety_concerns_with_li_ion.

LAZARD. 2021. Lazard's Levelized Cost of Storage—Version 7.0. https://www.lazard.com/media/451882/lazards-levelized-cost-of-storage-version-70-vf.pdf.

UL Solutions. 2023. UL 9540A Test Method. Available online at: https://www.ul.com/services/ul-9540a-test-method.

Attachment B-1. Facility Component Summary

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Facility Component Summary

Facility Component(s)	Quantity[1]	Unit	Description
Facility Site Boundary			• Approximately 8,075 acres of private land.
Solar Micrositing Corridor			• Approximately 7,026 acres of private land where development of the solar array and related or supporting facility components may occur.
Solar Array			• Nominal and average generating capacity of up to 800 megawatts (MW) • Anticipated solar array footprint: 5,012.9 acres within the 7,026-acre solar micrositing corridor
Solar Panels	2,037,360	Each	• Dimensions: 7.6 feet long by 4.0 feet wide • Coating: Antireflective glass • Approximately 530 watts per module
Tracker System	20,622	Strings	• Type: Single axis tracker • Height of combined tracker system and solar module = 12 feet • 100 modules per string
Piles	346,351	Piles	• Approximately 12 piles per tracker string • Posts are made of steel (i.e., H-pile, C-pile, S-pile)
Cabling	6,800	Combiner Boxes	• Low voltage (DC) cabling will connect, in series, strings of solar modules to an inverter
Inverters	199	Inverter/ transformer stations	• The inverter converts the DC energy to AC energy • 4.4-kV amp stations (can be co-located with transformers on the same concrete slab) • Noise level (see Exhibit Y for further details)
Transformers	199	Inverter/ transformer stations	• The pad mounted transformer will step up the AC output voltage to a higher voltage of 34.5 kilovolts (kV) • Transformers will be non-polychlorinated biphenyl (PCB) oil–filled types
Collection System	267.8	Miles	• 34.5-kV cables • Underground cables buried to a depth of 3 feet • No overhead collector lines proposed

Facility Component Summary

Facility Component(s)	Quantity[1]	Unit	Description
Battery Energy Storage System (BESS)			• Located adjacent to the collector substation • Fenced separately from the solar arrays • Containers placed on a concrete foundation, 36 feet by 12 feet each • Dimensions of containers: 10 feet tall, 12 feet wide, and 36 feet long • Lithium-ion battery storage technology • Battery cell lifespan of 20 years • Chain-link perimeter fencing, 6 to 8 feet in height • Noise level (see Exhibit Y for further details) • Uses contained, leak-proof modules, off-site 24-hour monitoring, fire control sensors, smoke and hydrogen detectors, alarms, emergency ventilation systems, cooling systems, and aerosol fire suppression/extinguishing systems in each container (Exhibit B, Section 2.5.1 for further details)
BESS	44.2	Acres	• 1,220 battery storage units
Collector Substation			• Height = up to 50 feet • Fenced separately from the solar array areas with a 6- to 8-foot-tall wire mesh fence. • 4 generator step-up transformers will be non-PCB oil–filled types • Noise level (see Exhibit Y for further details) • Additional substation equipment may include generation-tie line termination structures, a bus bar, circuit breakers and fuses, control systems, meters, and other equipment that will be determined at final design.
Collector Substation	19.5	Acres	• Collector substation will be developed within the approximately 19.5-acre area shown on Exhibit C, Figure C-2

Facility Component Summary

Facility Component(s)	Quantity[1]	Unit	Description
Generation-tie Line			
Up to 500-kV Generation-tie Line (for alternate point of interconnect at BPA's Buckley Substation)	4.5	Miles	• Within the site boundary, but outside of the solar array fence line • Approximately 24 steel support structures with 1,000-foot spans • Support structure height approximately 160 to 180 feet above grade • Right-of-way corridor is approximately 200-feet wide • Noise level (see Exhibit Y for further details)
Operation and Maintenance (O&M) Building			
O&M Building	24' x 60'	Linear feet	• Single-story structure adjacent to the collector substation • Fenced separately from the solar arrays • Located on 3.9-acre area • Would include a communication and supervisory control and data acquisition (SCADA) system • Height = approximately 24 feet
New Service Road and Existing Road Improvements			
Service roads (new)	24.8	Miles	• Graded and graveled • Service roads up to 20 feet wide
Access roads (existing roads to improve)	2.1	Miles	• Graded and graveled • Widened up to 20 feet, as needed.
Temporary Construction Staging			
Temporary Construction Staging Area	23.5	Acres	• May contain temporary storage of diesel and gasoline fuels, located in aboveground tanks and within designated secondary containment areas. • Temporary construction staging may also occur in the BESS, collector substation, and O&M area during construction.
Perimeter Fencing			
Perimeter Fencing	50.8	Miles	• Total fenced area is approximately 5,007.7 acres • Will include lockable vehicle and pedestrian access gates • Chain-link perimeter fencing is up to 8 feet in height and may include fixed-

Facility Component Summary

Facility Component(s)	Quantity[1]	Unit	Description
			knot or other similar wildlife-friendly options. • Includes enclosure of the solar arrays, BESS, collector substation, O&M building, and BPA's switchyard.

Notes:
1. Quantity is representative for purposes of analysis in the Application for Site Certificate and will be refined at final engineering design prior to construction.

Attachment B-2. Representative Drawing of Solar Panel and Tracking System

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First Solar

Series 7 *TR1* Bifacial.

505-540 Watt Thin Film Solar Module

Series 7 *TR1* Bifacial modules combine First Solar's thin film technology with a larger form factor and an innovative new back rail mounting system to deliver improved efficiency, enhanced installation velocity, and unmatched lifetime energy performance for utility-scale PV projects.

More Lifetime Energy per Nameplate Watt

- Industry's best (0.3%) warranted degradation rate
- Superior temperature coefficient, spectral response and shading behavior
- No power loss from LID and LeTID
- Anti-reflective coated glass enhances energy production
- Added bifacial energy yield

Unmatched Quality and Reliability

- End-to-end manufacturing process for globally consistent quality
- Tested and certified to IEC standards and beyond
- Durable glass/glass construction
- Immune to and warranted against power loss from cell cracking
- 30-year Linear Performance Warranty
- 12-year Limited Product Warranty

Optimized Module Design

- Optimized back rail mount design enhances installation velocity
- Frameless design improves soiling and snow shedding
- Dual junction box design reduces wire management complexity and cost

Industry's Most Eco-efficient PV Solution

- Industry leading carbon footprint, water footprint and energy payback time
- Globally available PV module recycling services

America's Solar Company

- Designed, responsibly sourced, and manufactured in the USA

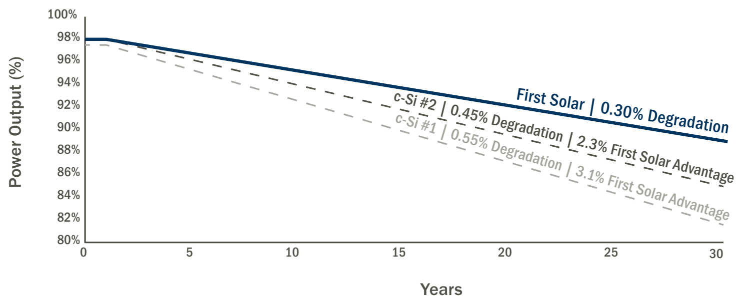
19.4%
HIGH BIN EFFICIENCY

30YR
LINEAR PERFORMANCE WARRANTY

98%
WARRANTY START POINT

0.3%
WARRANTED ANNUAL DEGRADATION RATE

First Solar Lifetime Energy Advantage
From 30 Year Warranted Annual Power Degradation



Learn more about First Solar and Series 7 *TR1* at firstsolar.com/S7

Series 7 *TR1* Bifacial.

First Solar

Electrical Specifications

RATINGS AT STANDARD TEST CONDITIONS (1000W/m², AM 1.5, 25°C)[2]

SERIES 7 BIFACIAL MODEL TYPES: FS-7XXX-*TR1*-B / FS-7XXXA-*TR1*-B (XXX = NOMINAL POWER)

Nominal Power[3] (-0/+5%) P_{MAX} (W)	505		510		515		520		525		530		535		540	
	STC[4]	BNPI[5]	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI
Nominal Power P_{MAX} (W)	505	519	510	524	515	529	520	535	525	540	530	545	535	550	540	555
Voltage at P_{MAX} V_{MAX} (V)	182.5	182.5	183.4	183.4	184.3	184.3	185.2	185.2	186.0	186.0	186.9	186.9	187.8	187.8	188.7	188.7
Current at P_{MAX} I_{MAX} (A)	2.77	2.85	2.78	2.86	2.80	2.88	2.81	2.89	2.82	2.90	2.84	2.92	2.85	2.93	2.86	2.94
Open Circuit Voltage V_{OC} (V)	223.9	223.9	224.5	224.5	225.0	225.0	225.6	225.6	226.1	226.1	226.7	226.7	227.2	227.2	227.7	227.7
Short Circuit Current I_{SC} (A)	3.01	3.10	3.02	3.11	3.03	3.12	3.04	3.13	3.04	3.13	3.05	3.14	3.06	3.15	3.06	3.15
Efficiency (%)	18.1		18.3		18.5		18.6		18.8		19.0		19.2		19.4	
Maximum System Voltage V_{SYS} (V)	1500[6]															
Limiting Reverse Current I_R (A)	5.0															
Maximum Series Fuse I_{CF} (A)	5.0															

TEMPERATURE CHARACTERISTICS

Module Operating Temperature Range	(°C)	-40 to +85
Temperature Coefficient of P_{MAX}	T_K (P_{MAX})	-0.32%/°C [Temperature Range: 25°C to 75°C]
Temperature Coefficient of V_{OC}	T_K (V_{OC})	-0.28%/°C
Temperature Coefficient of I_{SC}	T_K (I_{SC})	+0.04%/°C
Nominal Operating Cell Temperature	(°C)	43
Bifaciality Factor	%	20±5%

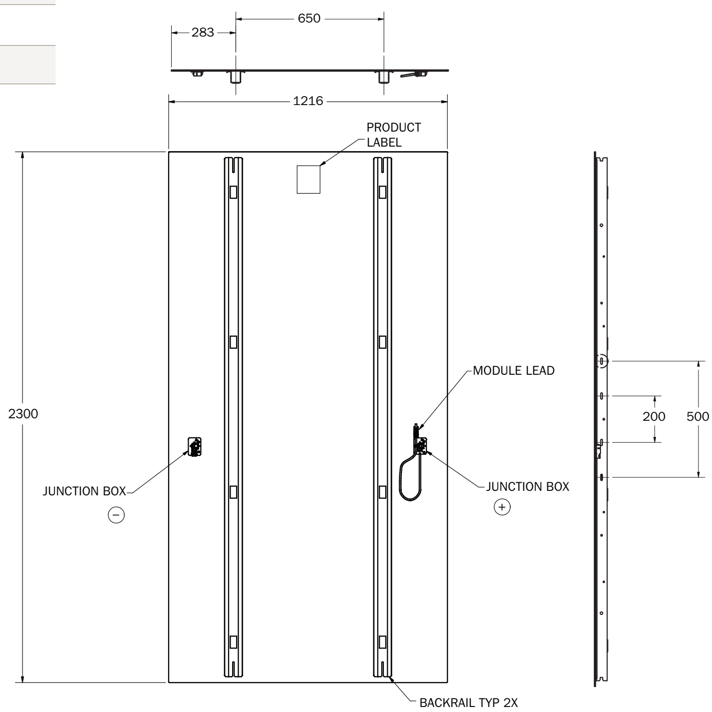
PACKAGING INFORMATION

Model Type	Modules Per Pack	Packs per 53' Container
FS-7XXXA-*TR1*-B	46	10

MECHANICAL DESCRIPTION

Length	2300mm
Width	1216mm
Area	2.80m²
Module Weight	39.7kg
Leadwire[6]	2.5mm², 650mm (+) & Bulkhead (-)
Connectors	TE Connectivity PV4-S or alternate
Junction Box	IP68 Rated
Bypass Diode	N/A
Cell Type	Thin film CdTe semiconductor, up to 268 cells
Frame Material	Galvanized steel
Front Glass	Heat strengthened
Back Glass	Heat strengthened
Encapsulation	Laminate material with edge seal
Frame to Glass Adhesive	Silicone
Load Rating	2400Pa

Mechanical Specifications



Install in portrait only

Certifications & Tests[7]

CERTIFICATIONS AND LISTINGS

IEC 61215:2021 & 61730-1:2016[6],CE
IEC 61701 Salt Mist Corrosion
IEC 60068-2-68 Dust and Sand Resistance
IEC 62716 Ammonia Corrosion
UL 61730 1500V Listed

EXTENDED DURABILITY TESTS

IEC TS 63209-1 Extended Stress Test
Long-Term Sequential
Thresher Test
PID Resistant

QUALITY & EHS

ISO 9001:2015
ISO 14001:2015
ISO 45001:2018
ISO 14064-3:2006
EPEAT Silver Registered

1 Limited power output and product warranties subject to warranty terms and conditions
2 All ratings ±10%, unless specified otherwise. Specifications are subject to change
3 Measurement uncertainty applies
4 Frontside electrical ratings
5 Bifacial Name Plate Irradiance, as per IEC 61215:2021
6 IEC 61730-1: 2016 Class II
7 Testing Certifications/Listings pending

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A Flex Company

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NX Horizon

Smart Solar Tracking System

Serving as the backbone on over 35 gigawatts of solar power plants around the world, the NX Horizon™ smart solar tracker system combines best-in-class hardware and software to help EPCs and asset owners maximize performance and minimize operational costs.

Flexible and Resilient by Design

With its self-aligning module rails and vibration-proof fasteners, NX Horizon can be easily and rapidly installed. The self-powered, decentralized architecture allows each row to be commissioned in advance of site power, and is designed to withstand high winds and other adverse weather conditions. On a recent 838 megawatt project in Villanueva, Mexico, these design features allowed for the project to go online nine months ahead of schedule.

TrueCapture and Bifacial Enabled

Incorporating the most promising innovations in utility scale solar, NX Horizon with TrueCapture™ smart control system can add additional energy production by up to six percent. Further unlocking the advantages of independent-row architecture and the data collected from thousands of sensors across its built-in wireless network, the software continuously optimizes the tracking algorithm of each row in response to site terrain and changing weather conditions. NX Horizon can also be paired with bifacial PV module technology, which can provide even more energy harvest and performance. With bifacial technology, NX Horizon outperforms conventional tracking systems with over 1% more annual energy.

Quality and Reliability from Day One

Quality and reliability are designed and tested into every NX Horizon component and system across our supply chain and manufacturing operations. Nextracker is the leader in dynamic wind analysis and safety stowing, delivering major benefits in uptime and long-term durability NX Horizon is certified to UL 2703 and UL 3703 standards, underscoring Nextracker's commitment to safety, reliability and quality.

Features and Benefits

5 years in a row

Global Market Share Leader (2015-18)

35 GW

Delivered on 5 Continents

Best-in Class

Software Ecosystem and Global Services

Up to 6%

Using TrueCapture Smart Control System

GENERAL AND MECHANICAL

Tracking type	Horizontal single-axis, independent row.
String voltage	1,500 V_{DC} or 1,000 V_{DC}
Typical row size	78-90 modules, depending on module string length.
Drive type	Non-backdriving, high accuracy slew gear.
Motor type	24 V brushless DC motor
Array height	Rotation axis elevation 1.3 to 1.8 m / 4'3" to 5'10"
Ground coverage ratio (GCR)	Configurable. Typical range 28-50%.
Modules supported	Mounting options available for virtually all utility-scale crystalline modules, First Solar Series 6 and First Solar Series 4.
Bifacial features	High-rise mounting rails, bearing + driveline gaps and round torque tube.
Tracking range of motion	Options for ±60° or ±50°
Operating temperature range	SELF POWERED: -30°C to 55°C (-22°F to 131°F) AC POWERED: -40°C to 55°C (-40°F to 131°F)
Module configuration	1 in portrait. 3 x 1,500 V or 4 x 1,000 V strings per standard tracker. Partial length trackers available.
Module attachment	Self-grounding, electric tool-actuated fasteners.
Materials	Galvanized steel
Allowable wind speed	Configurable up to 225 kph (140 mph) 3-second gust
Wind protection	Intelligent wind stowing with symmetric dampers for maximum array stability in all wind conditions
Foundations	Standard W6 section foundation posts

ELECTRONICS AND CONTROLS

Solar tracking method	Astronomical algorithm with backtracking. TrueCapture™ upgrades available for terrain adaptive backtracking and diffuse tracking mode
Control electronics	NX tracker controller with inbuilt inclinometer and backup battery
Communications	Zigbee wireless communications to all tracker rows and weather stations via network control units (NCUs)
Nighttime stow	Yes
Power supply	SELF POWERED: NX provided 30 or 60W Smart Panel AC POWERED: Customer-provided 120-240 V_{AC} circut

INSTALLATION, OPERATIONS AND SERVICE

PE stamped structural calculations and drawings	Included
Onsite training and system commissioning	Included
Installation requirements	Simple assembly using swaged fasteners and bolted connections. No field cutting, drilling or welding.
Monitoring	NX Data Hub™ centralized data aggregation and monitoring
Module cleaning compatibility	Compatible with NX qualified cleaning systems
Warranty	10-year structural, 5-year drive and control components.
Codes and standards	UL 3703 / UL 2703 / IEC 62817

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Attachment B-3. Technical Specifications for BESS Fire Protection

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Exhibit BESS-2

Technical Specifications for

BESS Fire Protection

For the Design, Engineering, Procurement, and Construction of BESS Facilities

1 REVISION HISTORY

Date [yyyy-mm-dd]	Rev	Description	Revision by
1/23/2023	0	Initial release	M.Zavala-Iraheta

2 Introduction

2.1 This Technical Specification ("Specification"), including Appendices, contains the minimum requirements for the design, selection and integration of fire-protection systems (PFS) in lithium-ion battery energy storage systems (BESS) in a containerized or building solution for Shell New Energies.

2.2 This document also covers the following critical aspects of an effective FPS:

2.3 Preventative methods for identification of early signs of issues that may lead to fire or release of gas.

2.4 Fire detection system and sensors, including first/second line of defense before releasing aerosol gas or water.

2.5 Selection of a clean, non-toxic, and highly effective fire-suppression method.

2.6 Alarming requirements and integration with BESS controls and monitoring.

2.7 Other safety considerations (such as emergency exhaust ventilation for active explosion protection and external air sampling capability), and IR cameras.

3 Definitions

TERM	DEFINITION
ANSI	American National Standards Institute, Inc.
IEEE	Institute of Electrical and Electronic Engineers
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratories, Inc.
CONTRACTOR	Party responsible to carry out all or part of the design, procurement, installation, commissioning and/or management of a project.
MANUFACTURER	Firm, organization, or person who shall provide goods, materials and/or services to the Contractor for completion. of the Work.

TERM	DEFINITION
OWNER	Savion LLC. an associate or subsidiary, or other organization acting as owner, purchaser, or customer as designated in the Purchase Order.
FACILITY	BESS facility, including its battery cells, BESS inverters, transformers, control and protection systems, and balance of plants.
SITE	Refers to entire property where facility and related substation(s) reside.
THIRD-PARTY	An entity that is involved in some way in an interaction that is primarily between two other entities.
AC	Alternating Current
BESS	Battery Energy Storage System
DC	Direct Current
FAT	Factory Acceptance Testing
FPS	Fire Protection System
FSS	Fire Suppression System
IEC	International Electrotechnical Commission
NERC	North American Electric Reliability Corporation
NFPA	National Fire Protection Association
ANSI/NETA ATS-2009	Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

4 Applicable Codes, Standards, and Regulations

The Project design, engineering, and construction shall meet all the applicable local, municipal, township, county/parish, provincial, regional, state, national, and/or international codes, regulations, licenses, and standards, which may be amended, replaced, or supplemented from time to time, and which may be required by any governing authorities having jurisdiction.

- It is the CONTRACTOR's responsibility to be knowledgeable and employ designs and engineering practices that incorporate the latest active revisions of the applicable Codes and Standards where and when applicable.

TERM	DEFINITION
NFPA 1	Fire Code
NFPA 70	National Electrical Code
NFPA 111	Standard on Stored Electrical Energy Emergency and Standby Power Systems
NFPA 855	Standard for the Installation of Stationary Energy Storage Systems
ICC IFC-2021	International Code Council – International Fire Codes latest version
UL 1973	Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications
UL 1642	Standard for Lithium Batteries
UL 1741	Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
UL 9540	Standard for Energy Storage Systems and Equipment
UL 9540A	Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems
NFPA 2001	Standard on Clean Agent Fire Extinguishing Systems
UL 1991	Standard for Tests for Safety-Related Controls Employing Solid-State Devices
UL 1998	Standard for Software in Programmable Components
NEMA	Standard for Enclosures
OSHA 1910	Standard Interpretations: “Standard Interpretations are letters or memos written in response to public inquiries or field office inquiries regarding how some aspect of or terminology in an OSHA standard or regulation is to be interpreted and enforced by the Agency.
UL 1974	The standard for Evaluation for Repurposing Batteries

TERM	DEFINITION
NFPA 10	The standard for Portable Fire Extinguishers
NFPA 13	The standard for the Installation of Sprinkler Systems
NFPA 69	The standard for Explosion Prevention Systems
NFPA 704	Standard System for the Identification of the Hazards of Materials for Emergency Response
NFPA 101	Life Safety Code

5 TECHNICAL SPECIFICATIONS

5.1 APPLICATION OF FIRE PROTECTION SYSTEMS

5.1.1 Fire protection systems in Li-Ion battery systems offer an additional independent protection layer beyond those protection layers already provided by the battery system supplier and beyond any other project-related protection layers like separation distances or similar measures.

5.1.2 Fire protection systems is to delay propagation from one battery cell, module, and container to the next, such that first responders have time to act.

5.1.3 In order of priority, fire protection systems in connection with Li-Ion batteries should be designed to:

5.1.4 Prevent human injury.

5.1.5 Ensure battery flammable gas concentrations are addressed,

5.1.6 Minimize damage to and loss of property.

5.1.7 Comply with local/regional authorities and insurance company requirements.

5.1.8 Proper monitoring and tracking of all battery parameters are critical to ensure safety as well as warranty compliance. The energy management system (EMS) software must be configured with battery-specific parameters to ensure that no battery will be commanded to operate outside of its safe range. The system shall transmit an alarm signal to an approved location if potentially hazardous temperatures or other conditions such as a loss of communication, short circuits, over-voltage, or under-voltage are detected.

5.1.9 Internal shorts are the primary cause of battery thermal runaway because protective circuitry in the battery packs cannot protect the battery from an internal short. Internal shorts are typically caused by manufacturing defects, impurities, dendritic lithium formation, or mechanical damage.

5.1.10 To meet the above goals, it is the obligation of the Project Engineer/Manager to assure the items below are followed for all Li-Ion battery energy storage projects:

5.1.11 Use of Li-Ion battery modules and battery subsystems which adhere to required standards and are verified by THIRD-PARTY issued certificates.

5.1.12 If applicable, make sure the recommended concentration of fire suppressant is used by reviewing calculations and verifying assumptions.

5.1.13 If applicable, have each new fire suppression system design tested and reviewed to provide the results to the project engineer.

5.1.14 Follow the design recommendations of this document.

5.1.15 Assure compliance to any local / regional / country standards as may be required according to the specific target jurisdiction or authority. Provide minimum standards requirements when the authority having jurisdiction has not settled on a standard.

5.2 Overview of BESS Fire and Safety Requirements and Compliance

5.2.1 General

5.2.1.1 All BESSs that use enclosures and are installed in open areas shall include automatic fire detection and ventilation or deflagration and suppression systems within the ESS enclosure and buildings.

5.2.1.2 The BESS equipment and entire system shall be listed and certified under UL9540.

5.2.1.3 Battery cells shall be UL1973 certified for stationary applications.

5.2.1.4 All electrical installation shall be performed based on NFPA 70 (Version Listed in Project Design Basis), and shall follow IEEE C2 for signage, level of clearance and separation and applicable fire ratings.

5.2.1.5 Smoke detectors shall be installed per NFPA 72.

5.2.1.6 Fire control and suppression system (FSS) tests shall have been performed and verified based on UL 9540A testing approach, and NFPA 855 requirements.

5.2.2 Safety Considerations

5.2.2.1 The Fire Protection System has several critical components that need to be identified and confirmed to work within the parameters of the BESS container. This includes all components such as suppressant agent, gas detection, fire alarm control panel, system integration, and all associated alarms and warnings. The installation, shipping and commissioning of the system along with the reliability and overall responsibility of the system are critical.

5.2.2.2 A summary list of all components and aspects of the system safety is as follows:

5.2.2.3 Container design

5.2.2.4 BMS (Battery Management System)

5.2.2.5 Preventative measures

5.2.2.5.1 Gas and smoke detection and indicators

5.2.2.5.2 Cell level sensors and measurements

5.2.2.5.3 Environmental monitoring and conditioning of interior

5.2.2.5.4 Data analytics for condition monitoring

5.2.2.5.5 Gas aspiration

5.2.3 Fire suppression

5.2.3.1 Fire extinguishing agents by separating the fuel from the oxygen element or by removing the heat element of the fire triangle (as applicable)

5.2.3.2 Water spray (as applicable)

5.2.3.3 Ventilation

5.2.3.4 Explosion/deflagration protection

5.3 Design And Operation Documentation

5.3.1 The contractor or their engineering and integration vendor shall submit an FPS design and operation document to address the following key questions and procedures. FPS is a fast-evolving technology and there may be new innovative approaches proposed by vendors.

5.3.1.1 Is there any consideration for applying preventative methods?

5.3.1.2 What design approach is followed for proper FSS selection and tank/agent sizing?

5.3.1.3 What Agent is used within the BESS system, and which is most suitable according to the Li-Ion battery chemistry in use?

5.3.1.4 What Fire Suppression Regulations and Standards are considered and from which year?

5.3.1.5 What are the types, locations, and number of sensors incorporated?

5.3.1.6 How does FPS work?

5.3.1.7 How is the commissioning and testing of FPS performed?

5.3.1.8 How is the integration of the Fire Protection System with BESS Controls achieved and what are the monitoring and alarming points?

5.3.1.9 How is the integration of the fire suppression system with a local Fire & Gas detection and alarming system (alarming to the Fire brigade) accomplished?

5.3.1.10 What is the appropriate inspection and maintenance procedure and intervals?

5.3.1.11 Which components of FPS require replacement and what is the timeframe?

5.3.1.12 What provisions are considered for dehumidification?

5.3.2 A logic diagram of the fire suppression system and the associated control system shall be provided by the CONTRACTOR to the OWNER.

5.3.3 The key aspects of the FPS design following NFPA 855 guidelines shall be highlighted in the design report and explained in detail.

5.4 BESS Installation and Enclosure Requirements

5.4.1 BESS Enclosure Types

5.4.1.1 The BESS enclosures can be of container type or individual outdoor rated modules (cabinet). The owner will determine the enclosure type based on project specifics.

5.5 Enclosure Requirements

5.5.1 Battery Energy Storage System (BESS) enclosures shall be constructed in accordance with local codes for outdoor applications, and comply with all the following:

5.5.2 Access to all components shall be provided via exterior doors. There shall not be a hallway, aisle, or similar feature within a BESS container or cabinet. The enclosure should be non-occupiable.

5.5.3 Equipment enclosures shall have a fire rating of at least two hours (NFPA 855, Section 4.3.6), or longer as per local requirements.

5.5.4 Contractor shall follow the requirements as stated in UL9540 and NFPA 855 for clearances between multiple battery racks, and/or between battery racks and walls and any associated switchgear enclosure installed in the vicinity of BESS containers. Additional clearance may be applied based on applications, functions or type of the adjacent devices.

5.5.5 Human presence in and around the enclosure and areas containing BESS equipment are limited to personnel that operate, maintain, service, test and repair the (B)ESS and other energy systems.

5.5.6 No desks or workstations shall be permitted in battery-containing enclosures.

5.5.7 Stationary storage battery systems shall not be located in areas where the floor level has an elevation more than 75 feet above the lowest level of fire department vehicle access, or where the floor level is more than 30 feet below the finished floor of the lowest level of exit discharge according to ICC IFC Chapter 12.

5.5.8 Enclosures housing (B)ESS shall not exceed 52 ft (NFPA 855 Section 4.4.3.2.1). by 8 ft. by 9.5 ft.

5.5.9 (B)ESS located outdoors shall be separated by a minimum ten feet (NFPA 855 Section 4.4.3.3) from the following exposures:

5.5.9.1 Lot lines

5.5.9.2 Public ways

5.5.9.3 Buildings

5.5.9.4 Stored combustible materials

5.5.9.5 Hazardous materials

5.6 Building Solution Requirements

5.6.1 Dedicated use building based Battery Energy Storage Systems (BBESS) shall be constructed in accordance with local building codes and comply with all the following:

5.6.1.1 The building shall only be used for electrochemical energy storage, energy generation, and other electrical grid-related operations.

5.6.1.2 Occupants in the rooms and areas containing BESS are limited to personnel that operate, maintain, service, test and repair the BBESS and other energy systems.

5.6.1.3 Administrative and support personnel shall be permitted in incidental use areas within the buildings that do not contain BESS, provided:

5.6.1.4 The areas do not occupy more than 10 percent of the building area of the story in which they are located.

5.6.1.4.1 The areas are separated from the BESS and other energy system rooms and areas by two-hour fire barriers and two-hour fire-resistance-rated horizontal assemblies constructed in accordance with the locally enforced building code, as appropriate.

5.6.1.4.2 A means of egress is provided from the incidental use areas to the public way that does not require occupants to traverse through areas containing BESS or other energy system equipment.

5.6.1.4.3 Rooms containing stationary storage battery systems shall be separated from other areas of the building in accordance with Section 509.1 of the International Building Code. Battery systems shall not be allowed to be in the same room with the equipment they support.

5.6.1.4.4 Combustible materials not related to the stationary storage battery system shall not be stored in battery rooms, cabinets or enclosures.

5.6.1.4.5 Where stationary batteries are installed in a separate equipment room that can be accessed only by authorized personnel, they shall be permitted to be installed on an open rack for ease of maintenance.

5.7 Preventative Methods

5.7.1 BESS design shall include the state-of-the-art preventative methods that are based on extensive cell-level monitoring, advanced sensors for gas-release detection and predictive data analytics.

5.7.2 By applying proper sensors and monitoring systems at the cell or rack level, a gas detection system shall be used to provide an early warning of gas built-up within the BESS.

5.7.3 Early detection of gas build-up shall initiate a high priority alarm for owner and operator to investigate remotely.

5.7.4 Rapid increasing of the gas level shall initiate automatic BESS shutdown process.

5.7.5 The power and communication cables for the fire panel located inside the container shall be 2-hour rated cables in accordance with UL 2196.

5.8 Fire Detection System

5.8.1 The container shall include a properly designed and supplied fire detection system with early smoke detection and fire detection designed to operate under expected airflow conditions. Once the smoke or fire is detected through the detectors, the alarms shall be enunciated locally and be transmitted via the OWNER's EMS system.

5.8.2 In addition to other codes and standards, fire alarms for independent fire detection systems in all office areas shall be designed in accordance with 36 CFR Part 1911.

5.8.3 Independent smoke/heat detection systems shall be designed to provide the protection and coverages stated in the Section 6 Spacing and location of detectors shall take into account the airflow, ceiling height and slope, and ceiling constructions of the protected area.

5.8.4 Any fire sensor shall initiate a fire alarm at the appropriate local supervisory panel and the existing Fire Alarm Annunciator Panel (FAAP) in the control room.

5.8.5 Remote annunciation of local supervisory panels or FAAP shall be provided through remote communications to the owners SCADA system.

5.8.6 The following equipment shall be furnished and installed for each fire detection system:

5.8.6.1 Ionization smoke detectors except HVAC (if not specified), or photoelectric smoke detectors or spot type heat detectors

5.8.6.2 Fire detection circuits, wiring, raceway, and supports as required for a complete system

5.8.6.3 Local supervisory panel with distinctive trouble and alarm signals in accordance with the article titled Local Supervisory Panel herein, except where otherwise specified.

5.8.6.4 Interface junction box(es) near HVAC control panels.

5.8.6.5 Trouble horn and fire alarm bell (it can be common with other systems controlled from the same panel)

5.8.6.6 Visible signalling system

5.8.6.7 Connecting wire and raceway for all electrical devices

5.8.6.8 Signage shall be provided on the outside of the container specifying that the enclosure is an energy storage system (lithium-ion batteries) with automatic fire suppression (as applicable) and list the emergency contact number.

6 Fire-protection System (FPS) and Agents

6.1 The following principles shall be applied in selecting the media:

6.1.1 Effectiveness of the medium in suppressing Li-Ion battery fires

6.1.2 Lowest possible toxicity and risk to the operator

6.1.3 Lowest possible environmental effect (low GWP)

6.1.4 Lower cost and complexity of the installation

6.1.5 Least consequences in case of discharge

6.2 Gaseous Agent Fire Suppression Systems

6.2.1 Due to the danger of hidden or covered fire sources, only gaseous extinguishing agents shall be used.

6.2.2 Nitrogen based agent or a mixture of nitrogen and argon gas shall be applied.

6.2.3 Use of Argon shall be avoided if dealing with second-hand batteries.

6.2.4 Water base sprinkler systems are recommended as secondary methods, if requested by the owner.

6.3 Fire suppression system shall include the following system components and integration:

6.3.1 Detection system (gas and smoke detection)

6.3.2 Discharge nozzles

6.3.3 Piping

6.3.4 Control panel

6.3.5 Integration with energy management system (EMS)

6.3.6 Discharge and warning alarms

6.3.7 Hazard warnings and caution signs

6.3.8 Fire detection device(s)

6.3.9 Manual discharge station

6.3.10 Storage of extinguishing agent

6.4 NOVEC 1230

6.4.1 The NOVEC 1230-based FSS or comparable products shall be the primary choice for BESS installations where the clean agent is required.

6.4.1.1 The minimum design concentration (MDCC) of NOVEC 1230 for the energy storage system shall be 9.0%.

6.5 Gas Detection

6.5.1 Due to the aggressive nature and the potential for extensive heat/gas release in the Lithium-ion battery chemistries that can lead to a thermal runaway and initiating fire, temperature sensors and gas detection systems shall be used to provide an early warning of gas built-up within the BESS.

6.5.2 The gas detection system shall be designed to activate where the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL), or where the level of toxic or highly toxic gas exceeds 1/2 the Immediately Dangerous to Life or Health (IDLH) value.

6.5.3 The gas detection system design shall include:

6.5.3.1 Initiation of distinct audible and visible alarms in the battery storage room,

6.5.3.2 transmission of an alarm to an approved location,

6.5.3.3 de-energizing (or blocking) of the battery charging process, and

6.5.3.4 activation of the mechanical ventilation system, where the system is interlocked with the gas detection system.

6.6 Pressure Relief Valve

6.6.1 If utilized, the pressure relief valve should be designed to consider the additional pressure of a deployed inert gas system.

6.6.2 The pressure relief valve shall not defeat the inert gas agent's firefighting qualities.

6.6.3 Calculations shall be provided to the OWNER to show how the additional pressure was relieved while maintaining and guaranteeing the effectiveness of the inert gas fire suppression system.

6.7 Ventilation System

6.7.1 BESS must employ automatic ventilation and/or deflagration venting to reduce gas accumulation and ignition inside the container or enclosure. The venting must be designed according to NFPA 68 or other similar standards and consider the highest possible concentration of gas released from the battery rack following the TR event of single or multiple cells inside a module.

6.7.2 If multiple flammable gases are expected to be emitted, the lowest acceptable level of toxicity or flammability limit shall dictate the ventilation requirement.

6.7.3 Ventilation shall be designed to have a termination mechanism such that in the event of a fire, it closes the inlet gate to prevent the supply of oxygen to the fire.

6.7.4 Ventilation shall not prevent the function of sensors necessary to detect hazardous gases.

6.7.5 Explosion hazards should be calculated as a function of volume and gas concentration in all sub-compartments of the enclosed space. The risk of projectiles, debris, and throwing objects through the ventilation system shall be estimated.

6.7.6 If a sufficient number of gas detectors are not provided, ventilation must be provided for each module to prevent gas accumulation within the BESS enclosure and vent to a safe location outside.

6.7.7 Ventilation must be designed according to NFPA69, IEC 60079-10-1 and/or other similar standards.

6.8 Safe Release Requirements

6.8.1 Security to prevent the undue release of the fire suppression agent shall be implemented either per interlocked hard-wired series connection or alternatively through the use of a certified fire suppression releasing control panel that allows for manual de-activation of the system.

6.8.2 Manual de-activation (and re-activation) shall be possible through externally placed key switches (one for each door). Operators will deactivate the system prior to entry and will re-activate the system upon leaving the enclosure. This requirement holds both for walk-in and non-walk-in enclosures – although walk-in systems are not desirable in general.

6.8.3 Each walk-in enclosure/e-house shall have at least two hand-held fire extinguishers (one at each end) for use by personnel while inside the enclosure.

6.8.4 Each walk-in enclosure shall be designed always with two doors, one at each end.

6.8.5 Only Class C (clean agent) type fire extinguishers shall be used.

6.8.5.1 Clean Agents should not be corrosive or known to have environmental impacts.

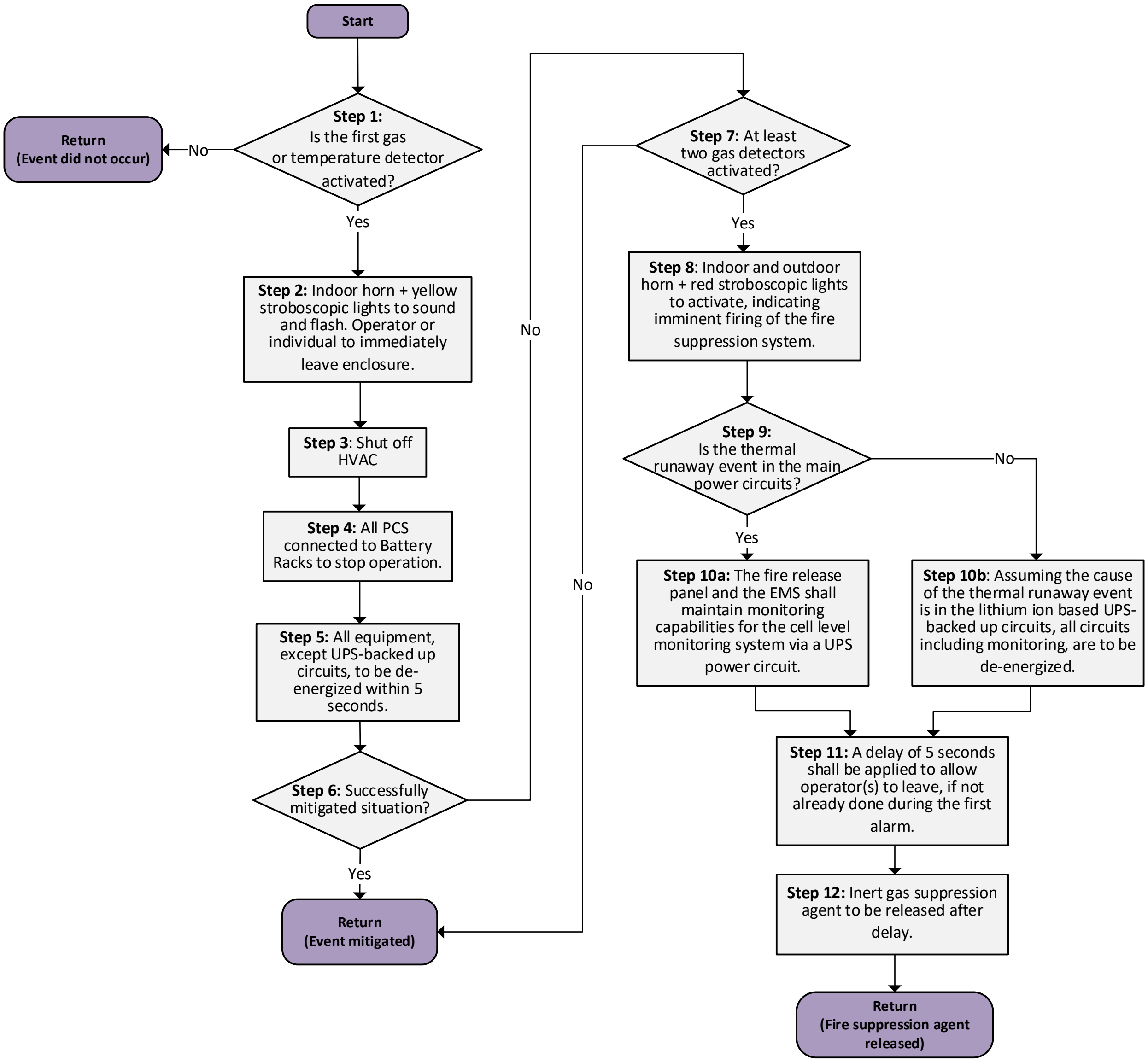
6.8.6 Each Fire Suppression System shall have a minimum of 8 hours of battery backup, such that the FSS is active even if the auxiliary power to the enclosure is lost for a period of 24 hours.

6.8.7 Certification of Release Panels for fire suppression systems shall be according to regionally accepted certification organizations like UL and/or FM Approvals (FM Global insurance group) as applicable for the US market.

6.9 RELEASE PANEL PROGRAMMING

6.9.1 At least one gas detector and one smoke detector shall be installed in each battery building/enclosure.

6.9.2 The following flowchart shows the sequence of events corresponding to the first and second levels of alarm.


Start
Step 1: Is the first gas or temperature detector activated?
No
Return (Event did not occur)
Yes
Step 2: Indoor horn + yellow stroboscopic lights to sound and flash. Operator or individual to immediately leave enclosure.
Step 3: Shut off HVAC
Step 4: All PCS connected to Battery Racks to stop operation.
Step 5: All equipment, except UPS-backed up circuits, to be de-energized within 5 seconds.
Step 6: Successfully mitigated situation?
No
Yes
Return (Event mitigated)
Step 7: At least two gas detectors activated?
No
Yes
Step 8: Indoor and outdoor horn + red stroboscopic lights to activate, indicating imminent firing of the fire suppression system.
Step 9: Is the thermal runaway event in the main power circuits?
No
Yes
Step 10a: The fire release panel and the EMS shall maintain monitoring capabilities for the cell level monitoring system via a UPS power circuit.
Step 10b: Assuming the cause of the thermal runaway event is in the lithium ion based UPS-backed up circuits, all circuits including monitoring, are to be de-energized.
Step 11: A delay of 5 seconds shall be applied to allow operator(s) to leave, if not already done during the first alarm.
Step 12: Inert gas suppression agent to be released after delay.
Return (Fire suppression agent released)

6.10 Water Sprinkler Systems

6.10.1 Sprinklers shall be installed as a secondary system if requested by Owner to form a Hybrid system of applying different media (e.g. NOVEC1230 and Water) at different fire event stages.

6.10.2 As a line of last fire defence, a parallel water connection allowing water to be deployed inside battery enclosures via a sprinkler pipe network may provide first responders a means to deploy water for its cooling efficacy when the battery system is already aflame and likely a total loss. Installation of an external water feeding point connected to a sprinkler piping system (inside the container) is allowed. The actual connection to a water supply point external to the container however must be made by first responders (water is not to be permanently connected to the sprinkler system).

6.10.3 The installation of the sprinklers system shall follow standard requirements as set out in NFPA 13.

6.11 CONTRACTOR Responsibilities

6.11.1 The development and implementation of test procedures for construction, inspection, start-up, and performance in accordance with FACILITY description, design conditions, and technical data shall be the responsibility of the CONTRACTOR.

6.11.2 CONTRACTOR shall provide a commissioning procedure for OWNER's review, which will incorporate, but not be limited to, items of this document.

6.11.3 The CONTRACTOR shall be responsible for permitting the installation and operation of the system in accordance with ICC IFC Section 105.7.2.

6.11.4 A failure modes and effects analysis (FMEA) or other approved hazard mitigation analysis shall be performed and have it approved by the Owner. The analyses shall be conducted in accordance with ICC IFC Section 104.7.2.

6.11.5 The CONTRACTOR shall be responsible for providing all inputs, materials, and other supplies required to carry out such tests.

6.11.6 The CONTRACTOR shall submit a description of all relevant test procedures for approval at least thirty (30) business days prior to any testing starts.

6.11.7 CONTRACTOR shall schedule and perform any other Site Acceptance Testing as recommended by relevant MANUFACTURERS on all items of electrical Fire suppression equipment included in the scope.

6.11.8 Prior to Energization and upon successful completion of the tests specified in the document, OWNER will issue "authorization to proceed" in a form set forth, to demonstrate readiness for energization as per requirements under the Interconnection Agreement.

7 Testing and Reporting

7.1 GENERAL

7.1.1 Fire protection system shall be tested, and the full functionalities shall be verified after BESS installation. Items to be tested shall include gas detectors, smoke sensors, releasing system, alarming and integration into BMS and EMS of the BESS.

7.1.2 The actual test data for the system shall be submitted by the CONTRACTOR to the OWNER for acceptance prior to performing the test for approval.

7.1.3 The OWNER's engineer and the EPC will develop a detailed system level integration scope and testing procedures & reports. A sample testing procedure report is provided below.

7.1.4 The fire suppression agent tank shall be temporarily disconnected from the firing pin assembly during the tests. It shall be reconnected for normal operations immediately after the BESS enclosure has been commissioned, and the reconnection shall be documented on the final test report.

7.2 TEST PROCEDURE

7.2.1 Tables below provide sample procedures for integration and acceptance testing. Contractor shall suggest a comprehensive test plan prior to the testing.

7.2.2 Testing shall be performed with extinguisher tank and clean/dry agent removed to check full functionalities of the detection system.

Step	Description	Comments/Notes	Initials	
A	Verify all PCS are running as appropriately demonstrated on the HMI/remote interface.			
B	Locate the smoke/gas detector.			
C	Use canned gas/smoke to spray in the vicinity of the detector to cause activation.			
D	Verify the PCSs have shutdown, only in tested Enclosure and not in the other Enclosures (if applicable).			
E	Verify that the fire suppression tank pin has fired out of its housing.			
F	Verify that the alarm has been reported with a Fire Suppression Alarm to the HMI/remote interface.			
G	Open the Enclosure doors to properly ventilate the smoke/gas.			

H	Reset the firing pin for the fire suppression tank.			
I	Reset the system fault from the HMI/remote interface.			

Pass/Fail Criteria					
All fire suppression systems performed as stated in steps D, E, & F of this procedure.					
Unit	Passed	Failed	Date	Initial	
1					
2					
Test Performed by:					
Test Witnessed by:					

8 Post-Event Analysis and Re-Testing Procedures

8.1 Smoke/Heat Sensor Activation Not Causing Release of Fire Suppression Agent

8.1.1 Any time the system is de-energized as a consequence of first-level gas or smoke alarm activation, the following steps and analysis shall be followed:

8.1.1.1 For at least one hour before the event till after the event: Thorough analysis of the cell, module, and rack temperature values received by the SCADA or EMS from the Battery Management System to identify any abnormal temperature values.

8.1.1.2 For at least one hour before the event till after the event: Thorough analysis of the temperature values received from the enclosure temperature sensors to identify any abnormal temperature values.

8.1.1.3 After checking the latest temperature values received from cell, module, rack, and enclosure temperature sensors, if the temperatures are within an acceptable range (i.e. below 60°C), then the enclosure shall be examined from the exterior using a thermal image camera to identify the presence of thermal hotspots.

8.1.1.4 If no hotspots are identified, then the enclosure shall have all energy isolation devices locked out / tagged out and enclosure doors may be opened and examined for any visible damage.

8.1.1.5 If no evidence of fire is found, the system can be restarted and closely monitored for any abnormalities.

8.1.1.6 If data or remote status of the BESS including environmental parameters are unattainable, then internal access to the container shall only be permitted upon a proper assessment from an on-site asset management representative.

8.2 Fire Suppression Agent Release

8.2.1 After the release of the fire suppression system based on a detection event, the following shall be observed:

8.2.1.1 A detailed root-cause analysis shall be performed by a nominated group, preferably with help from an independent moderator to identify the cause of the problem. The group must generate a report to be submitted to management.

8.2.1.2 Based on the outcome of the report. Owners and the Contractor management team shall determine the necessary course of action, including whether the system can be re-started after maintenance or else if any changes in the design or operational procedures are necessary to avoid a similar event.

8.2.1.3 Post-fire maintenance shall be performed by qualified personnel as per the corresponding service and O&M Manual. All warnings, especially those pertaining to the length of elapsed time before entering the hazard area shall be respected.

----------- End of Document ----------

Attachment B-4. Battery Energy Storage System Overview

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A RENEWABLE ENERGY COMPANY

Energy Storage

Battery Energy Storage System (BESS)

Grid-Connected BESS Description

A typical grid-connected BESS consists of:

- **Battery enclosures** (which contain racks of lithium-ion batteries similar to what are in portable phones and electronics)
- **Inverters** (which convert electricity from AC-to-DC, and DC-to-AC)
- **Transformers** (which “step up” and “step down” the system voltage)
- **Cooling systems** similar to packaged HVAC units used on commercial buildings and apartment complexes (batteries generate heat when charging and discharging)
- **Control instrumentation**; and **electric grid interconnection switchgear** (for 13kV interconnection)
- **Substation** (for 69kV interconnection) which provide switching and protection to the BESS’s electrical systems, and point of interconnection at the project site

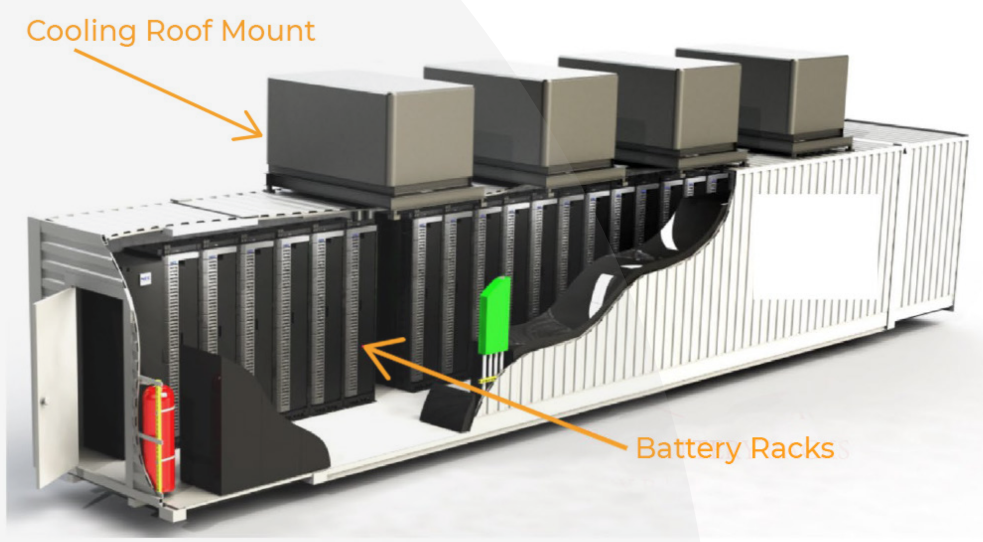

Photo Credit: NEC

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Limited Potential Impacts

BESS projects are among the least environmentally impactful developments in any community. Once completed, BESS projects:

- Generate minimal traffic because they are remotely controlled and monitored, requiring only periodic on-site maintenance
- Have no air emissions or wastewater discharges and do not require any water use
- Are relatively quiet, with the only generated sound being similar to a commercial HVAC unit
- Can be easily screened from view
- Are significantly less impactful than alternative industrial uses and are also far less impactful on community resources than commercial and residential land uses
- Generate valuable property tax revenue

SAVION

Please contact your Savion representative for more information or visit www.savionenergy.com

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Attachment B-5. Representative Drawing of Alternate Generation-tie Line Support Structure

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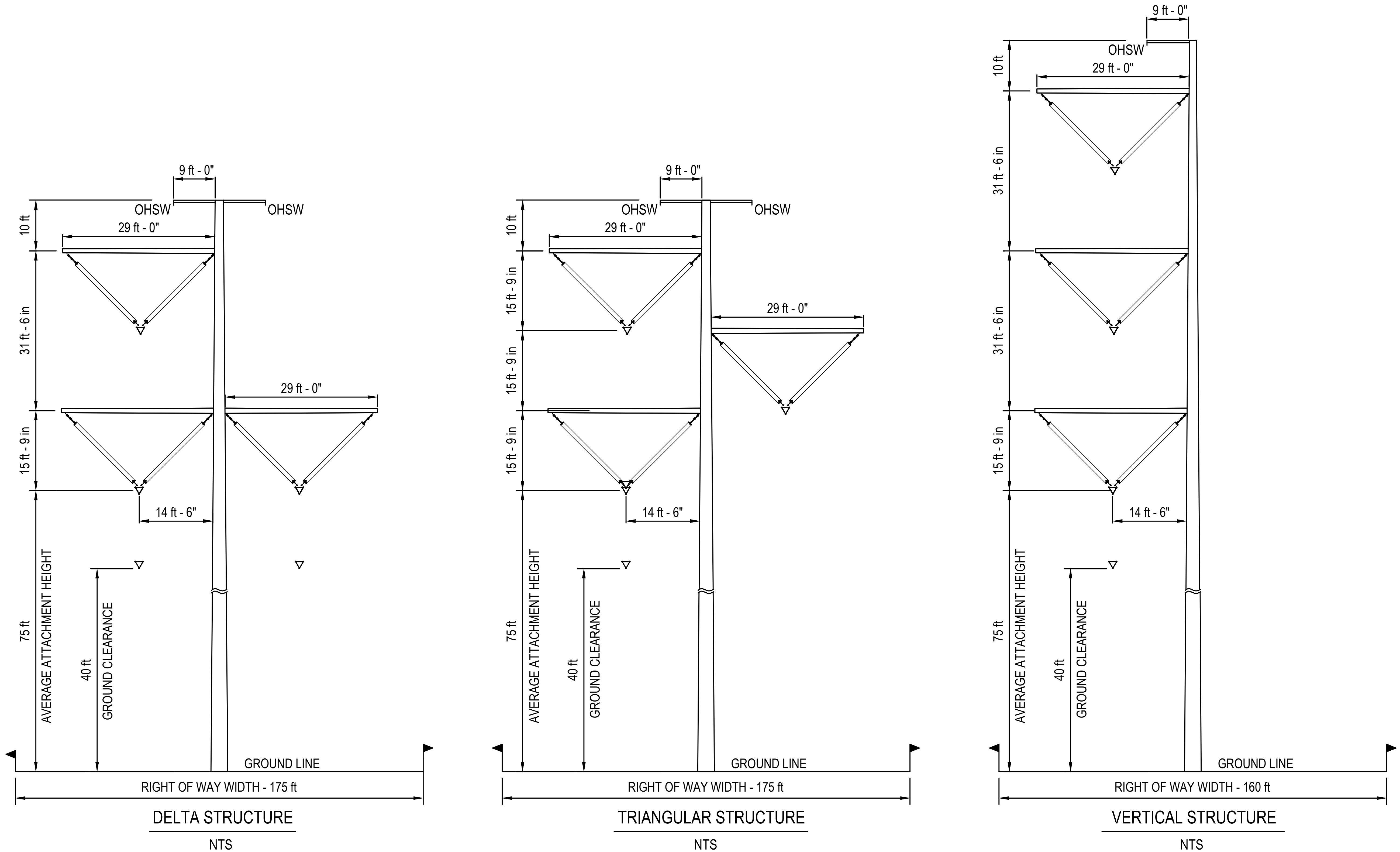

DRAFT - NOT FOR CONSTRUCTION

SUBJECT

Yellow Rosebush Energy Center

Typical 500-kV Support Structures

Attachment B-5.