EXHIBIT C

BESS SCADA Specifications

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1 INTRODUCTION

This Attachment B to the VINLEC Energy Storage Technical Specification provides requirements and technical specifications for the control, data acquisition, and communications for the Project.

2 SCADA SYSTEM, COMMUNICATIONS AND METERING REQUIREMENTS

2.1 General

(a) Supervisory Control and Data Acquisition system (SCADA) requirements include design, engineering, labor, material, products, guarantee, training and services for, and incidental to, the complete installation of a new and fully functional SCADA system for the battery energy storage system (BESS). The SCADA system shall be located in the on-site Control Room and be comprised of environmentally ruggedized industrial PLC hardware and software, redundant SCADA servers, at-least one Historian server, at-least one Human Machine Interface (HMI) workstation, field instrumentation, meteorological stations, and communication devices.

(b) Contractor shall be responsible for installing communication lines within the Project. Contractor shall be responsible for all SCADA equipment, software and programming inside Project and for all SCADA-related communications equipment to communicate with all Contractor-provided Equipment.

(c) The SCADA system shall include all instrumentation, hardware and capability to support the required data acquisition and equipment control requirements of the Project, as described in the Technical Specifications.

(d) The BESS shall have an Energy Management System (EMS) that is fully integrated with the SCADA. The EMS may be provided as part of the Plant Controller or furnished separately.

(e) Contractor shall ensure proper integrations of Project's SCADA system with the VINLEC SCADA system.

(f) All SCADA equipment shall comply with VINLEC design standards.

(g) The SCADA, BESS Plant Controller/EMS, inverter controller and any other critical equipment controls shall be rated and specified to be fed from the system ac-supply, an Uninterruptible Power Supply (UPS) and the battery system.

(h) SCADA and Plant Controller shall include all instrumentation, hardware and capability to support the required control, monitoring, and data acquisition of the Project.

(i) Contractor shall provide the following SCADA submittals within 45 days following the Notice to Proceed Date:

    (i) Hardware and software manufacturer and specification sheets

    (ii) Control design drawings including:

        A One line diagram

        B Three lines diagram

        C Control schematic drawings need to be drawn in in IEEE standard format and not IEC format

        D Wiring diagram

        E Front view layout

        F Bill of materials

(iii) SCADA point list with device names and IP addresses of data points; and all available data points with corresponding units
(iv) Installation, Operation and Maintenance manual
(v) List of manufacturer's recommended spare parts
(vi) Software manuals

(j) Contractor shall provide a SCADA interface to the BESS system to allow operation, control and monitoring of the facility via the VINLEC SCADA System. This interface shall provide:
(i) Data interface using IEEE-1547 information models
(ii) Communications and data mapping using IEEE 1815 (Modbus) protocol
(iii) Data transport using the TCP/IP protocol suite
(iv) Physical layer supporting both RJ45 copper and multi-mode fiber interfaces
(v) Communication speed support for both 100Mb and 1Gb

(k) The SCADA interface shall be provided with configuration, diagnostic and maintenance tools to allow for future maintenance/reconfiguration as needed in the SCADA interface for the VINLEC maintenance/engineering staff.

(l) VINLEC will provide a local Remote Terminal Unit (RTU) to provide the principle interface point for the BESS system to the VINLEC SCADA system. The Contractor shall provide detailed point mapping assignments for the SCADA interface subject to final approval by VINLEC. VINLEC will implement the integration of the BESS to the VINLEC SCADA System.

(m) The Contractor shall provide service contract pricing for additional services, such as patching service, that VINLEC will be able to utilize, if needed.

2.2 Battery Management System

(a) The BESS shall be furnished with a Battery Management System (BMS).

(b) The BMS must provide comprehensive protection of the battery cells/modules/racks and be able to operate independently of the PCS controls. These minimum protections include, but are not limited to:
(i) Cell over-temperature: The BMS must monitor cell temperature and take preventive action to avoid over-temperature, and de-rate or disconnect any battery string that is above the manufacturer specified thermal limits.
(ii) Cell over-voltage/under-voltage: The BMS must monitor cell voltage and take preventive action to avoid over-voltage, and disconnect any battery string that is outside of the manufacturer specified operating limits.
(iii) Cell voltage imbalance: The BMS must detect a voltage imbalance between battery cells and disconnect the battery string if this voltage difference is beyond the manufacturer specified limits.
(iv) Over-charge: The BMS must detect an over-charge condition for racks/modules and take immediate measures to resolve the over-charge condition, or disconnect the racks/modules in order to prevent damage to the batteries.
(v) Under-charge: The BMS must detect under-charge condition for racks/modules and take immediate measures to resolve the under-charge condition, or disconnect the racks/modules in order to prevent damage to the batteries.
(vi) Over-Current: The BMS should monitor module/rack current and take appropriate action to prevent over-current, or disconnect the modules/ racks if manufacturer specified current

limits are exceeded. The rack should also have individual fuses to protect against DC wiring faults, or as backup protection to the BMS protection functions.

(c) The BMS shall monitor, respond to, and report on balance of system operation including, but not limited to, communication errors, electrical faults, thermal management system alarms, and safety system alarms.

2.3 Plant Controller Functionality

(a) Contractor shall furnish a Plant Controller capable of providing the BESS required functionality described in the Technical Specifications. The functionality may be provided by the BESS EMS, if separate from Plant Controller. The required Project functionality includes:

- (i) Active and Reactive Power Control
- (ii) Undervoltage and Overvoltage Ride-Through
- (iii) Transient Stability Ride-Through
- (iv) Underfrequency and Over frequency Ride-Through
- (v) Primary frequency response
- (vi) Monitoring and control of BESS:
  - A Charge and discharge rates
  - B Throughput
  - C Ramp rate
  - D Response time

(a) The BESS EMS should be well coordinated with the SCADA system to ensure proper operation of the BESS system based on the project's operational requirements. The EMS should be able to toggle between multiple modes/applications such as black start, grid forming, frequency regulation, energy arbitrage, VAR support etc. to enable the use of the BESS for multiple applications.

(b) Plant Controller shall at a minimum:

- (i) Be appropriate for the safe operation of the BESS facility, allowing verification of status remotely, to identify any safety risks and shut down the system to mitigate issues as appropriate.
- (ii) Permit local and remote monitoring and control.
- (iii) Permit operator dispatch under default, manual and scheduled operating modes.
  - A Operator(s) shall be able to input charge, discharge and state-of-charge (SOC) set-point targets.
  - B Operator(s) shall be able to program combinations of different battery control modes through time-based or event-based scheduling.
  - C Operator(s) shall be able to provide time-varying real or reactive power control setpoints.
- (iv) Connect to and coordinate with bi-directional BESS inverters to facilitate charging and discharging of the battery.
- (v) Communicate with and, if necessary, provide power to external control systems such as the SCADA system.
- (vi) Monitor and report on the BESS, including information such as state of charge, state of health, voltage, current, battery temperatures at the module and cell level, and status.
- (vii) Control the BESS within design constraints for safe operation of the batteries.
- (viii) Facilitate battery O&M procedures such as cell balancing.

(ix) Provide warnings or alarms required in this Attachment B – SCADA Specifications.
(x) Provide fault and surge detection and protection, as appropriate.
(xi) Support autonomous operation, including stand-by mode, start-up, shut-down and disconnection of BESS from rest of Facility, in case of communication failure or emergency.
(xii) Provide operator over-ride capabilities to all automatic control functions if manual intervention is requested.
(xiii) Act as a data historian/repository for easy access, storage and retrieval of BESS operational data as well as external signal data (such as ISO AGC signal) for analysis and reporting purposes.
(xiv) Have a bi-directional communications and monitoring interface with system inverters, converters, BMS, and thermal management system.
(xv) Manage battery state of charge to enable essential services such as c capability and automatic BESS mode transitions, as applicable per contractual requirements.
(xvi) Manage disconnect/reconnect operations of BESS as appropriate to ensure safe, reliable and resilient operation.
(xvii) Have the capability to detect and isolate faults within the BESS

(c) Battery System State-of-Charge management: Plant Controller will monitor and manage BESS State-of-Charge to ensure that sufficient energy capacity or headroom is available to support BESS functionality. State of Charge management will prioritize and manage charge-discharge operations such that BESS manufacturer depth-of-cycling requirements are followed as much as possible.
(d) Manage Battery System asset life: Plant Controller shall administer BESS degradation by managing the energy throughput, cycling depth of charge and discharge, average SOC, and number of cycles within recommended manufacturer requirements.
(e) Data shall be stored at a time resolution in line with project contractual obligations; in, at least, 1-second increments.
(f) Historian data over project life shall be readily available for access and download by VINLEC and affiliated parties.
(g) Data acquisition, storage, and reporting shall comply with the requirements of this Attachment B – SCADA Specifications.
(h) Real time operations and performance of the system shall be available for monitoring and controls through a graphical user interface (GUI) provided through a human machine interface (HMI). HMI with monitoring and control access to BESS shall be available at the following locations:
    (i) BESS control room on Site.
    (ii) Remote operations control room with primary controls of the BESS Facility.
(i) Hardware equipment
    (i) Any specific hardware for the Plant Controller within enclosures located outdoors shall be NEMA 4 rated or better.
    (ii) Fuse holders shall be touch safe.
    (iii) Any outdoor equipment related to Plant Controller shall be rated for continuous operation at temperatures mentioned Project environmental attributes, unless located in a controlled environment building.
(j) Acceptable manufacturers
    (i) Equipment manufacturer and software Suppliers shall be approved by VINLEC.
(k) Communication system

(i) Contractor shall be responsible for interfacing the Contractor-provided communication network to the VINLEC communication system.
(ii) At nodes in the network, managed switches shall be used.
A Switches shall be approved by VINLEC.
B Switches shall have a minimum of one spare port.
(iii) All network switches shall be supplied by dual power system rated and specified to be fed from an UPS.
(iv) The communication protocol between the Plant Controller, SCADA system, BESS inverters, and all relays or protection equipment shall be Ethernet TCP/IP with Modbus/TCP/IP interfaces.
(v) Alternate communication protocol may be suggested by Contractor to be approved by VINLEC.
(vi) The Plant Controller will interface and be capable of accepting data and status signals from BESS, VINLEC, and protection relays in the Electric Power System.
(vii) Plant Controller should be capable of operator over-ride for all automatic control functions if manual intervention is required.

(l) Hardware specific to the Plant Controller, if required, shall be housed in a room or enclosure accessible only to authorized personnel.
(m) Contractor shall provide a detailed description of software services, maintenance, downtime and updates required.
(n) Contractor will specify necessary equipment requirements for maintenance and will also provide details on personnel qualifications necessary.

2.4 SCADA Equipment

(a) All SCADA equipment shall be approved by VINLEC.
(b) Devices shall be listed to UL and labeled by a Nationally Recognized Testing Laboratory (NRTL).
(c) Fuse holders shall be finger safe.
(d) Contractor shall provide a RTU on-site and at Project site Control Room. The RTU shall be connected to project SCADA and shall support Modbus and DNP 3.0 protocols.
(e) Contractor shall supply, install and commission the SCADA hardware to be located at the Project site Control Room.
(f) Power requirements:
(i) Site power will be provided to the SCADA system at 50 Hz 240 VAC (single-phase). SCADA provider power supplies shall be included if required input power to device(s) is not 240 VAC (single-phase).
(ii) Backup power shall be provided in the case of a power outage for 8 hours for RTU, RTAC or SCADA Server, Historian, Plant Controller through a UPS.
(g) Enclosure:
(i) All above mentioned equipment, with the exception of instrumentation devices that need to be exposed, shall be housed in a non-corrosive, NEMA 4X rated enclosure or better.
(ii) Enclosure shall be UL 746C rated. All AC powered monitoring and control panels shall be UL508A listed.
(iii) All equipment should be securely mounted to a DIN rail.

2.5 Component Level Communication

(a) Communication between fiber nodes and equipment at each node (such as inverters and data loggers) shall be copper Ethernet.
    (i) Transmission speed shall be 100BASE-T
    (ii) Ports shall be standard Ethernet RJ-45
    (iii) Cabling shall be a minimum of CAT 5E with a jacket rating of CMR or CMP.
(b) Communication between components such as data loggers, sub meters, inverters, weather station and sensor I/O components shall comply with the component manufacturer's installation instructions.
    (i) The cable shield shall be grounded on one end of the cable only.
    (ii) Termination resistors shall be used at each end of any daisy chain connections in accordance with device manufacturer instructions.
(c) Inverters that have a proprietary communication protocol shall be ordered with conversion devices to connect them to the network.

2.6 Sensor Level Communication

(a) Cabling shall be specified by the component manufacturer or provided with the sensors and shall be designed to have no impact on sensor accuracy irrespective of ambient conditions.
(b) Sensor cabling that is not completely contained within enclosures and conduit shall be outdoor and UV rated.
(c) Sensor cabling shall not exceed the manufacturer's recommended maximum length.

2.7 Metering

(a) Facility metering shall be as described in the Technical Specifications.
(b) The SCADA system shall communicate with all AC meters and shall at least record real and reactive power at BESS interfaces and Plant Controller.
    (i) Component level AC metering will be at a minimum time-interval of 1-min. Higher resolution metering is preferred.
    (ii) Contractor shall make available 3-phase current transformers (CTs) and potential transformers (PTs) for all component level power meters to monitor.

2.8 SCADA Control Equipment

(a) System data shall be recorded with the following detail:
    (i) AC meter data shall be recorded at 1-minute intervals.
    (ii) Battery and Inverter data and fault codes shall be recorded at 1-minute intervals.
    (iii) Environmental data shall be recorded at 1-minute intervals.
(b) The SCADA system shall have provisions for full remote access.
(c) A firewall shall be installed between the Project network and the incoming connection.
(d) If remote access is required for patching service of the HMI or other controls, including Plant Controller, then a control hand switch or some key system shall be installed to enable/disable access when the system in use and not in use for the patching service.

(e) Single pair instrument cable shall be rated 600V minimum, with XLP or PVC insulation.
(f) Multiple pair instrument cable shall be rated 600V minimum, with XLP or PVC insulation.
(g) Single or multiple twisted shielded pair cable shall include a drain wire and an overall PVC jacket.
(h) Data communications cable shall be stranded copper AWG 18-22, twisted pair, shielded and sized as equivalent.
(i) External Interfaces
    (i) An external interface shall be available to authorized users to view the DAS/SCADA screens through an Internet browser.
    (ii) An external interface must be available to interface with Plant Controller complying with the requirements of 100Base-T (copper 100Mbit Ethernet, RJ45 connectors).
    (iii) The Plant Controller requires power supply in either of the following ways:
        A 30 VDC/1ADC with a single-pole circuit-breaker no larger than 6A; or
        B 50 Hz, 240 VAC (single-phase).
(j) Calculated Points
    (i) The data acquisition system (DAS) shall allow user to create calculated data points that calculate new values based on the values of any monitored or calculated data points.
    (ii) Calculated data points shall be available for alarming and trending.

2.9 SCADA System Software Functionality

(a) The SCADA system and user interface, or Human Machine Interface (HMI), shall be based on commercially-available software. Software selection shall be submitted by Contractor for VINLEC approval. Software shall include as a minimum the following licenses: (a) System Platform; (b) HMI Development; (c) HMI Runtime; (d) Historian
(b) Contractor shall submit HMI hardware and software selection for VINLEC approval. VINLEC approved standard equipment shall be utilized.
    (i) If the standard model is not used, then Contractor shall provide identical equipment to VINLEC for NERC/CIP compliance testing.
(c) External Interfaces
    (i) An external interface shall be available to authorized users to view the SCADA system screens through an Internet browser with reporting capability.

2.10 SCADA server and Human Machine Interface

(a) Contractor shall provide HMI hardware and operation station installed on site, within the Control House, comprising of industrial grade computer(s) suitable for foreseeable environmental conditions
    (i) SCADA server and HMI station shall allow full viewing, analysis, reporting, fault diagnosis, fault resetting, inverter control functionality, battery system control functionality and Plant Control functionality.
(b) Contractor shall allow remote connection to SCADA server and visualization client using secure VPN connection for remote maintenance and technical support.
(c) Contractor shall coordinate remote access requirements with VINLEC. E.g. a web based access may be required.

2.11 Time synchronization

(a) A GPS satellite receiver shall be installed to provide time synchronization signals. This device shall provide time synchronization signals for the Battery system and BESS Plant Controller, main SCADA server, and all devices communicating with the SCADA system.

2.12 Facility SCADA data collection and storage:

(a) Data recorded shall be time series data (e.g., voltage, current, power, temperature) and event data (e.g., faults, warning, errors, operator-initiated changes)
(b) Time series data shall be recorded with an averaging period of one minute and shall include mean, min, max and standard deviation
(c) Data sampling rates for time series data shall of independent of site communications network. Sampling rates shall be 0.5 Hz or higher for time series data.
(d) Processed data shall be stored locally in queue so that no data is lost if site communications network is temporarily lost. When communications is regained, the queue shall be downloaded to the SCADA computer/server
(e) If any inverter is switched off, monitoring, communication and data collection with other inverters will not switch off.
(f) All data shall be stored in industry standard relational database. Any Open Database Connectivity (ODBC) compliant database may be used. The data shall be time-stamped and searchable with a range of data access query functions provided. It shall be possible to store user generated query functions.
(g) The query-returned data shall be capable of graphical or tabular presentation. It shall be capable of being exported to external analysis programs in appropriate formats, e.g. comma-separated values (CSV) and Excel.
(h) The SCADA system shall back-up all recorded data, on-site and in remote databases
(i) Backups shall be written to standard media using open, non-proprietary file formats.
(j) Historical data shall be stored for at-least three years.

2.13 Project Facility SCADA monitoring points:

(a) At a minimum, the BESS facility SCADA system shall monitor, record, and store the following measurements:
(b) Meteorological station
    (i) Ambient air temperature (°C)
    (ii) Wind speed (mph)
(c) Each Battery/Inverter enclosure
    (i) Alerts and alarms
    (ii) Heat sink temperature (°C)
    (iii) Enclosure HVAC status
    (iv) Ambient temperature (°C)
    (v) HVAC system temperature setpoint (°C)
    (vi) Enclosure temperature (°C)

(vii) Enclosure door/lock position
(viii) Emergency Stop Status

(d) Battery system
(i) State of charge (%)
(ii) State of health (% of beginning of life capacity)
(iii) Operating mode
(iv) Power consumption (kW, KVAr, KVA) charging and discharging
(v) Frequency (Hz)
(vi) Voltage (Volts, phase and rms)
(vii) Current (Amps, phase and rms)
(viii) Cumulative lifetime energy charged (kWh)
(ix) Cumulative lifetime energy discharged (kWh)
(x) Status and fault codes
(xi) Auxiliary power consumption (kW, KVAr)

(e) DC-side battery system
(i) Cell, module, and rack current (A)
(ii) Cell, module, and rack voltage (V)
(iii) Module state of charge (%)
(iv) Cell, module, and string temperatures (°C)
(v) Status and fault codes
(vi) Status, alarms and diagnostics from fire protection system and UPS
(vii) Total DC charged energy (kWh)
(viii) Total DC discharged energy (kWh)

(f) Inverter AC-side and DC-side
(i) Power (kW, kVAr, KVA)
(ii) Voltage (dc, phase and rms as applicable)
(iii) Current (dc, phase and rms as applicable)
(iv) Frequency (Hz)
(v) Power factor
(vi) Status, fault codes and diagnostics

(g) Transformer
(i) Oil and winding temperature (°C)
(ii) Pressure/vacuum
(iii) Oil level
(iv) Tap changer position
(v) Status, fault codes and diagnostics

(h) AC disconnect switch
(i) Switch points with position
(ii) Protection relaying feedback and alarms

(i) Energy meters
(i) Voltage (phase, rms)
(ii) Current (phase, rms)
(iii) Power kW, kVA, kVAR
(iv) Total imported kW, kVA
(v) Total exported kW, kVA

(vi) Status and fault codes
(vii) kWh imported
(viii) kWh exported
(ix) Frequency Hz
(x) Power factor

(j) Safety System
    (i) Fire suppression system alarm and status
    (ii) Heat, smoke, gas (including Hydrogen) systems alarm and status

2.14 Data Reporting

(a) User shall be able to view and interrogate time-series and event database to query the data and events for any time-periods. Common selections and queries shall be catered in pre-developed drop-down menus.
(b) User shall be able to trend and plot concurrently selected data-sets and comparison of data-sets
(c) Monitoring and reporting platform shall have multiple dashboards to monitor complete plant, as well as sub-systems such as dc-side batteries, inverters.
(d) Visualization platform shall show system status in real time via single line diagram that shows interconnected elements of the system, such as BESS, ac-intertie, transformer(s), circuit breaker(s).
    (i) The system shall allow different views of the single line diagram as schematic or a synoptic to check behavior of all devices in top-down hierarchy
    (ii) The user shall be able to interact with subsystem one-line displays to perform any associated user interactions in monitoring and control
(e) The system shall provide multiple views to organize alarms, events and tickets grouped by active, deactivated, allocated.
(f) The system shall implement an event log and event tracker.

2.15 Supplier Information security

(a) Supplier shall design the BESS including Plant Controller and SCADA, to be prepared for malicious attacks or human error, per applicable data security standards required by VINLEC. Contractor shall incorporate security components and systems for the facility that consider Critical Infrastructure Protection guidelines published by the North American Electric Reliability Corporation (NERC).
(b) The Supplier will provide a cybersecurity plan to mitigate critical vulnerabilities in hardware and software, such that where possible, no single point of failure exists within the systems.
(c) A firewall shall be installed, with a password required for access to the system via external and remote interfaces.
(d) Multiple login accounts shall be allowed, in order to allow for differing levels of access to data, settings, and operational algorithms.

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