Energy Storage Incentives Connectivity Guide

BC Hydro

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2 Background

Uplight is BC Hydro's distributed energy resource management system (DERMS) of record. This platform is used to connect and control battery energy storage systems (BESS) in the Energy Storage Incentive (ESI) program. Refer to the ESI Customer Manual for complete details on the program.

Note that BC Hydro does not connect batteries for testing purposes only. Connections are only made for approved ESI participants once the battery(ies) are on site at the location(s) approved in their ESI application.

Batteries may connect via two methods:

- SCADA–currently supported
- IEEE 2030.5 certified products–support starting in 2026

3 Process

3.1 Apply for connection

- One month prior to commissioning, the customer completes the ESI Participant DERMS Connectivity Request (below), including configuration documentation, to initiate the connection process.
- Submit the form in section 6 of this document to BC Hydro via the designated key account manager or by emailing it to **demand.response@bchydro.com**

3.2 Schedule & complete testing

- BC Hydro will schedule testing with the customer and/or battery integrator, as identified in the application form.
- Testing encompasses network connectivity and battery/controller connectivity testing including
- Confirm device is accessible over the network.
    - Note: if using CradlePoint routers, customer will complete out-of-box instructions. Uplight will complete the router configuration as part of the network testing.
    - Send sample control signals to device/controller and confirm successfully received
    - Assess telemetry to confirm device is dispatchable and responding.
- A maximum of 8-12 hours should be allotted for this testing, but generally it is completed more quickly.

3.3 Receive results

- BC Hydro will confirm the results of the testing within 5 business days, by email.

4 Technical support

- For assistance completing the ESI Connectivity Request or with router configuration asset configuration documentation, please contact your battery vendor or systems integrator.
- Please review technical requirements outlined below.

5 Connectivity requirements

5.1 SCADA type connections

5.1.1 Modbus

Modbus is an open standard, request-response protocol implemented using Master-Slave configuration. SCADA will act as Master which will initiate the request to the Slave Device (Battery Controller, Inverter, Load shed device, PLC, RTU etc).

Slave/Server device stores data/information in four different register types:

Register type	Register number	Type
Discrete output coils	1-9999	Read/Write
Discrete input contacts	10001-19999	Read only
Analog input registers	30001-39999	Read only
Analog output holding register	40001-49999	Read/Write

Communication between Master/Slave, Client/Server can happen using:

- Modbus TCP/IP

5.1.2 DNP3 point types supported

Type name	Group	Support variations	
SingleBitBinaryInput	1	1–Packed format	2–With flags
DoubleBitBinaryInpu	3	1–Packed format	2–With flags
BinaryOutput	10	1–Packed format	2–With flags
Counter	20	1- 32-bit with flags 2- 16-bit with flags	5- 32-bit 6- 16-bit
FrozenCounter	21	1- 32-bit with flags 2- 16-bit with flags 5-32-bit with flags and time	6-16-bit with flags and time 9- 32-bit 10- 16-bit
AnalogInput	30	1- 32-bit with flags 2- 16-bit with flags 3- 32-bit	4-16-bit 5-Float with flags 6-Double with flags
FrozenAnalogInput	31	1- 32-bit with flags 2- 16-bit with flags 3- 32-bit with time of freeze 4- 16-bit with time of freeze	5- 32-bit 6- 16-bit 7-Float with flags 8-Double with flags
AnalogOutput	40	1- 32-bit with flags 2- 16-bit with flags	3-Float with flags 4-Double with flags
OctetString	110	0-255	

5.1.3 Hardware

- Participants are responsible for selecting and sourcing their own communications, routers, gateways, SIM cards and any other hardware required to make the connection.
- A single router with a single SIM card is sufficient for BESS under 5MW. The customer can add redundant routers or SIM cards if desired. BC Hydro requires redundancy for any end point controlling over 5MW.
- Uplight recommends using a CradlePoint router with NetCloud Mobile Essential Service such as the following, which enable Uplight to remotely configure the router as part of the testing process. (Please complete the out-of-box instructions for the initial setup, prior to testing.):
    - Cradlepoint R920 Ruggedized Router with 3-Year NetCloud Mobile Essential Service
    - Cradlepoint R920 Router with 1-Year NetCloud Mobile Essential Service
    - Cradlepoint R920 Ruggedized Router with 5-Year NetCloud Mobile Essential Plan
- Customers or systems integrators familiar with configuring SCADA routers and VPNs on their own may choose other gateways compliant with SCADA systems, such as the Advantech 3241 Industrial Router.
- It is important that the customer understands or has IT resources dedicated to handle the networking equipment.

5.1.4 Communications

- The customer must have a wired or wireless connection to the Internet.
- Customer must provide a static public IP address to Uplight, for the edge gateway, which Uplight will reference to allow connection from that IP address to the Uplight Flex SCADA EMS gateway router.
- The customer is responsible for setting up their own VPN unless CradlePoint option listed above is chosen.
- The customer will configure gateway and install VPN. Configuration details, as needed, will be exchanged with Uplight during the network connectivity setup and testing process.
- The edge gateway must provide access to all the data streams listed in the tag template provided below.
- Requirements for on-site communications to be established:
    1. One reserved IP address for a single Cradlepoint or three IP addresses for a pair on the site network. These IP addresses must be on the same subnet as the MODBUS or DNP3 devices.
    2. The IP addresses and port of the controllers for either MODBUS or DNP3 must be provided.
    3. The MODBUS or DNP3 device must be configured to allow connection to/from the Cradlepoint device IPs.
    4. The firewall, if present, must also permit this traffic to/from the Cradlepoint and MODBUS/DNP3 controllers.

5.1.5 Testing

Asset controls testing by Flex: Customer, Uplight, OEM, BC Hydro

- Uplight sets up and maintains SCADA Server (The server is the entity that manages the communications and control for the registered end devices/clients.)

- Uplight and OEM conduct pre-testing, using a device in OEM lab or other commissioned device, to ensure the ability to receive telemetry from the site and assets, to send control commands from Flex to the site, and to confirm asset responds as intended.
    - Uplight will coordinate with OEM for this testing and iterate as needed.
    - This step is only needed the first time OEM/Uplight are connecting. Testing will include review of monitoring data, as well as testing of various control scenarios.
- Uplight and Customer conduct test of installed/commissioned Customer device, to ensure both network communications and asset monitoring and control are functioning properly.
    - Uplight will coordinate with Customer for this testing and iterate as needed.
    - Testing will include review of monitoring data, as well as testing of various control scenarios.

5.2 EEE 2030.5 communications standard

5.2.1 Documentation

- Determine if the OEM will be using aggregator cloud or a certified gateway directly to device controller with the customer. Confirm support for Out Of Band (OOB) enrollment option and support for DER function set.
- OEM provides sample files of communications to IEEE 2030.5 server. These files may be from the certification process. Files include TLS certificates, device capabilities, and end-device registration data, all part of the SunSpec Common Smart Inverter Profile (CSIP) and California Rule 21 requirements.
- Note IEEE 2030.5 uses HTTP over TCP/IP, and TLS for point-to-point security between Client and Server.

5.2.2 Testing

Asset controls testing by Flex: Customer, Uplight, OEM, BC Hydro

- Uplight sets up and maintains IEEE 2030.5 Server (The server is the entity that manages the communications and control for the registered end devices/clients.)
- OEM is responsible for Function Set Assignments and End Device Registration
- Uplight and OEM complete OOB enrollment of lab device, including exchange of DNS information, PIN, short and long-form device ID.
- Uplight and OEM conduct pre-testing, using a device in OEM lab or other commissioned device, to ensure the ability to receive telemetry from the site and assets, to send control commands from Flex to the site, and to confirm asset responds as intended.
    - Uplight will coordinate with OEM for this testing and iterate as needed.
    - This step is only needed the first time OEM/Uplight are connecting. Testing will include review of monitoring data, as well as testing of various control scenarios.
- Uplight and Customer complete OOB enrollment of onsite device, including exchange of DNS information, PIN, short and long-form device ID.
- Uplight and Customer conduct test of installed/commissioned Customer device, to ensure both network communications and asset monitoring and control are functioning properly.
    - Uplight will coordinate with Customer for this testing and iterate as needed.
    - Testing will include review of monitoring data, as well as testing of various control scenarios.

6 ESI participant DERMS connectivity request form

Please complete the form below, including the tag templates for applicable connectivity method. Return this form to BC Hydro by email to **demand.response@bchydro.com** with the subject line **"DERMS Connectivity Request".** BC Hydro will confirm receipt of your application within 5 business days.

Do not submit this form to BC Hydro until one month before the battery is on-site.

ESI Project Number: _____

Key contact for connectivity testing:

- Name: _____
- Email: _____
- Phone: _____

Expected date of battery commissioning on site: _____

Date battery will be ready for connectivity testing: _____

Battery Manufacturer: _____

Battery Size: kW: _____ kWh: _____

Connectivity method:

- _____ SCADA
- Router make & model: _____
- _____ IEEE 2030.5

Is the system capable of delivering all data streams outlined in the ESI Program Manual Section 2.4.4 Telemetry and the ESI Connectivity Guide, Appendix 1 or 2?

- ☐ Yes
- ☐ No

Static public IP address for the edge gateway: _____

For SCADA connections:

- Complete tag template for Modbus (Appendix 1) or DNP3 (Appendix 2) below
- *Note: Contact BC Hydro if you wish to use a different SCADA protocol other than Modbus or DNP3.*

For IEEE 2030.5 connections:

- Attach sample files of communications to IEEE 2030.5 server. Include the following documentation which all part of the SunSpec Common Smart Inverter Profile (CSIP):
    - TLS certificates
    - device capabilities
    - end-device registration data

7 Appendix 1: SCADA Tag List Template: Modbus

Standard Tag List Template

Please complete the highlighted columns in all three tables below.

Modbus TCP/IP

Connection details	Description	Customer inputs
Type	Modbus TCP Over VPN	
IP Address	Local LAN IP Address	
Unit ID	Unit Identifier	

Register Information

Device type	Register address	Data type	Offset	Function code	Units	Scale	Flex stream name	Flex stream description
Sample Value	30001 40001	32 Bit unsigned 32 Bit Float	0 1	3 3,6	Kw kwh	1 0.001	GEN_POWER_ACTUAL SOE_ABS_ACTUAL	
Solar PV							GEN_POWER_ACTUAL	AC Real Power Output
Battery							GEN_POWER_ACTUAL	AC Real Power Output
Battery							SOE_ABS_ACTUAL	Battery state of Energy
Battery							SET_POINT_ABS	AC Real Power Set Point

Battery							SET_POINT_ABS_CNF	AC Real Power Set Point Confirmation
Site Meter							LOAD_POWER_ACTUAL	Site load power
DLC Devices ON/ OFF Control							RTCC_DR_PREACTION	Command issued during DR event Notification
DLC Devices ON/ OFF Control							RTCC_DR_DEPLOY	Command issued during DR event start/end

8 Appendix 2: SCADA Tag List Template: DNP3

Please complete the highlighted columns in both tables below.

Connection Information

SCADA supports DNP3 over TCP/IP connection and below are details required for establishing connection with DNP3 outstation (Device).

Settings	Description	Customer inputs
IP Address	IP Address of the Device	
Port	Default 20000, port used for connecting to the Device	
Source Address	Source Address of the device	
Destination Address	Destination Address of the master station, by default is 3	
Unsolicited Messages	Uplight support unsolicited messages from Outstation	

Points Information

Device type	Group	Variations	Point type	Units	Flex stream name	Flex stream description
Sample Value	30 30	1 5	32 Bit with flags (Analog Input) Float with flags (Analog Input)	kw kwh	GEN_POWER_ACTUAL SOE_ABS_ACTUAL	
Solar PV			(Analog Input)	kw	GEN_POWER_ACTUAL	AC Real Power Output
Battery			(Analog Input)	kw	GEN_POWER_ACTUAL	AC Real Power Output
Battery			(Analog Input)	kwh	SOE_ABS_ACTUAL	Battery state of Energy
Battery	40	3	Float with flags (Analog Output)	kw	SET_POINT_ABS	AC Real Power Set Point
Battery			(Analog Input)	kw	SET_POINT_ABS_CNF	AC Real Power Set Point Confirmation
Site Meter			(Analog Input)	kw	LOAD_POWER_ACTUAL	Site load power
DLC Devices ON/ OFF Control	10	2	(Binary Output)		RTCC_DR_PREACTION	Command issued during DR event Notification
DLC Devices ON/ OFF Control	10	2	(Binary Output)		RTCC_DR_DEPLOY	Command issued during DR event start/end