

DER (RM & RS) Information Package

Rev 2.1 – November 2022

Distributed Energy Resources (DER) Remote Monitoring (RM) Remote Shutdown (RS) Information Package

**Prepared by: Distributed Energy Resources (DER)
Revised: November 2022**

1. Background:

Distributed Energy Resources (DER) on the distribution grid have potential operating and safety concerns for those working to control and maintain the network. In response, Alectra Utilities requires generators to maintain a Remote Monitoring System with capability to support a Generator Remote Shutdown directive. As part of our current requirements, the following projects require Remote Monitoring / Remote Shutdown:

- Connected in parallel equal or greater than 100kW
- Closed transition emergency backup projects that are equal or greater than 1MW

2. References:

- *Connection Impact Assessment (CIA) (if applicable)*
- *Connection Cost Agreement (CCA)*
- *IEEE-1547 Standard for Interconnecting Distributed Resources with Electric Power Systems*
- *RTAC SEL-3530-4 Real-Time Automation Controller Installation Guideline*
- *RuggedMAX™ WiN5200 Installation Guideline*
- *Alectra DER Technical Interconnection Requirements*
- *GE Orbit Guideline*

3. Purpose:

This procedure is intended to act as a guideline for Generators needing to purchase, install, and commission a Remote Monitoring and Remote Shutdown System when required.

4. Introduction:

Remote Monitoring provides Alectra's Control Room with real-time data from Distributed Energy Resources. This information increases Alectra's ability to manage the efficiency and safety of power on the distribution grid.

The Remote Monitoring system is comprised of Real Time Automation Controller (RTAC) unit which polls the Generator for information, and an Antenna which wirelessly transmits the information back to Alectra's Control Room.

5. Requirements:

DER Facilities equal or greater than 100kW connected to Alectra's distribution system are required to provide remonitoring monitoring of the following:

- Voltage
- Current
- Real and reactive power
- Circuit breaker status
- Alarms (If Applicable)

Please note that DER Facilities are needed to provision for remote real time control by Alectra. Provision will include, but is not limited to, the following:

The ability to remotely dispatch the DER Facility (on/off)

Option A: Trip Command is sent from RTAC to the generator(s) communication board

Option B: Dry Contact is sent from RTAC to generator(s) auxiliary contact

Option C: Dry Contact is sent from RTAC to a separate disconnecting means (ie. Contactor, circuit breaker, contactor switch, etc.)

Table 1:

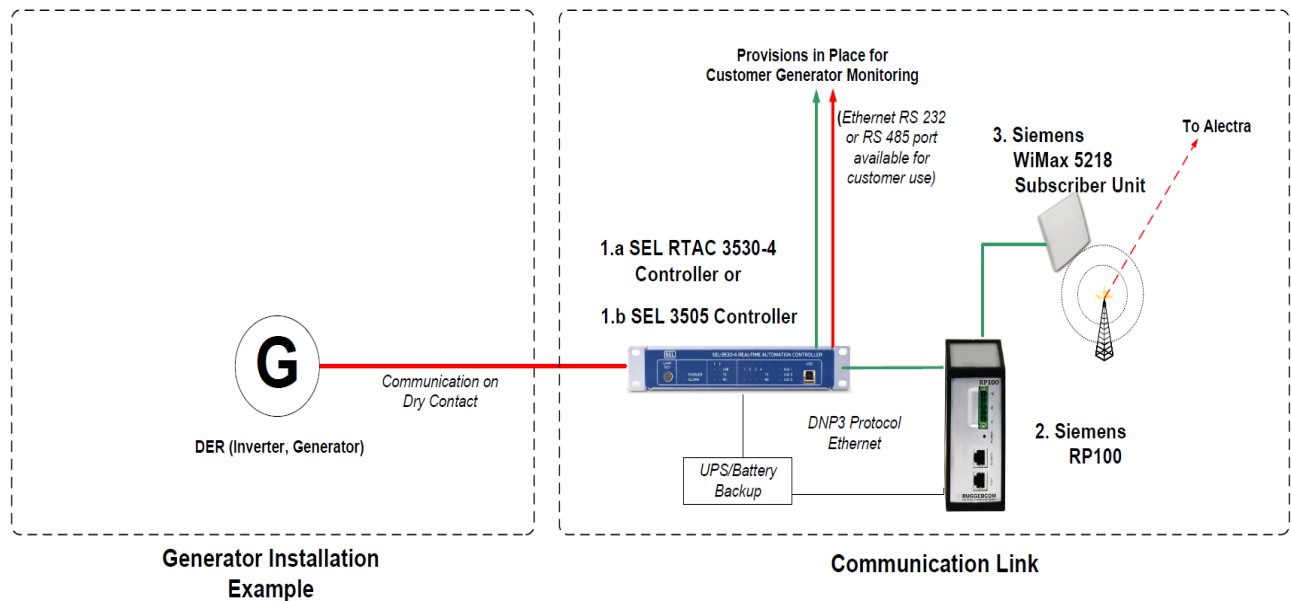
| No. of Inverters | Available Option | | |
|------------------|------------------|---|---|
| | A | B | C |
| 1 | ☒ | ☒ | ☒ |
| 2 | ☒ | ☒ | ☒ |
| ≥3† | | | ☒ |

†Daisy chaining of inverters is not allowed

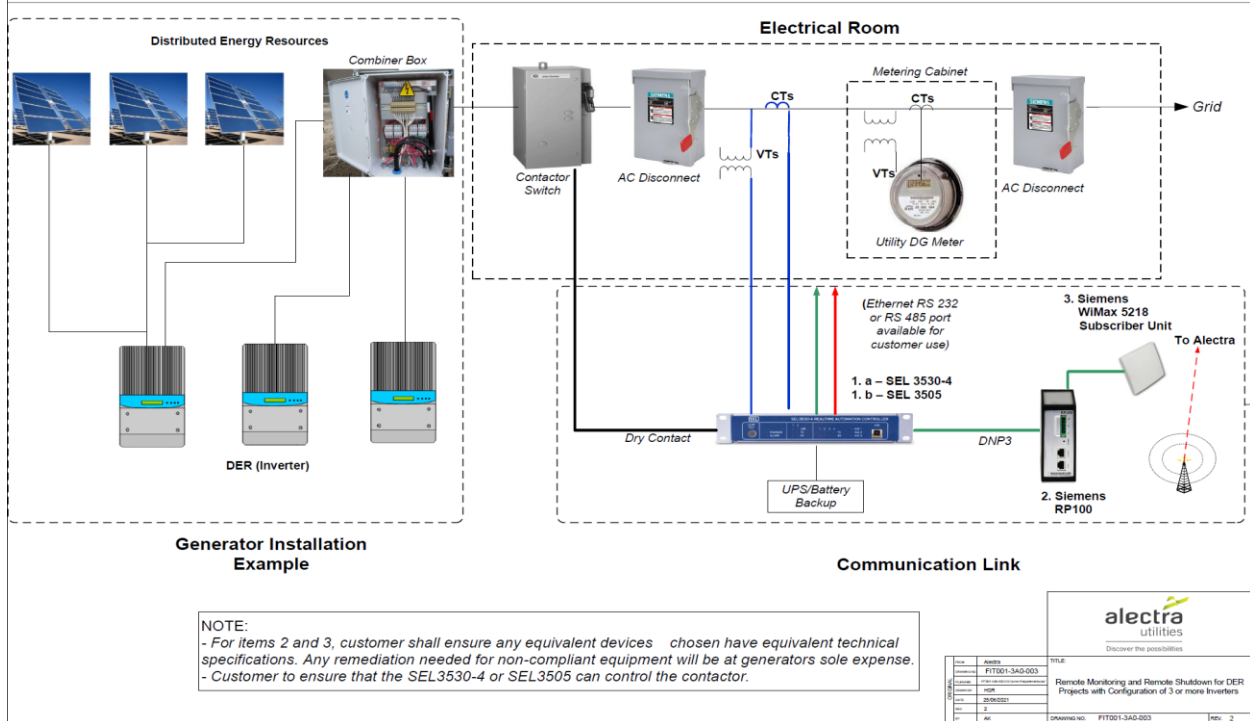
6. **SCADA Solution** - Communication via WiMAX 1.8 GHz

The following schematics show the relationship between Generators and the Communication Link.

Typical DER Configuration



Projects with “Three or more Inverters”



This is a simplified diagram to be used as a reference

NOTE:

If Wi-Max is not available in the project area, the Alectra DER team will advise of another SCADA solution.

Alectra’s Remote Monitoring system is designed in compliance with *IEEE Std. 1547*.

All Generator Remote Monitoring equipment is located on the DER’s premises. Generators are expected to have functioning Remote Monitoring systems prior to Generation Connection to the grid. In the event of a monitoring system breakdown, it is expected that the Generator will have the link repaired within 3 days of the failure.

For Shutdown of the Generator initiated by the System Controller (Alectra), a DNP Pulse on trip command (C0 Table 2) will to be sent to the customer RTAC by the Base Station RTAC. The customer’s RTAC will take the appropriate action(s) to both disconnect the Generator and block the Generator from being reconnected until the Allow generator connect pulse is issued, this should be stored in non-volatile memory.

For the Allow generator connect signal (C0 of Table 2), a DNP Pulse on close will be sent to the customer RTAC by the Base Station RTAC. The customer’s RTAC will take appropriate actions to allow the Generator to be reconnected; this should be stored in non-volatile memory.

The customer RTAC will be programmed to have a Connect Permission status (D3 of Table 2). This status will be set to 0 (zero) when the shutdown command is issued. The status will be set to 1 (one) when the Allow generator connect command (C0 of Table 2) pulse is received.

Customers are required to provide the Generator breaker status of the DER (DGEO of Table 2) from the RTAC:

-0 or FALSE for Off Status (generator breaker open)

-1 or TRUE for ON Status (generator breaker closed)

Table 2: SCADA Configuration-DNP 3.0 Object 12 Variation 1

| Input | Register Description | Register Name | DNP Index | Units | Scaling | Deadband | HONI ICCP (Y/N) | Notes | Nomenclature (Leave blank if point not req) |
|----------------|----------------------|---|--------------------|-------|---------------|----------|-----------------|-------|---|
| Analog Inputs | A0 | Line A Voltage (L-N) | Va | 0 | Volts | 1 | 10 | | |
| | A1 | Line B Voltage (L-N) | Vb | 1 | Volts | 1 | 10 | | |
| | A2 | Line C Voltage (L-N) | Vc | 2 | Volts | 1 | 10 | | |
| | A3 | Average Line Voltage (L-N) | Vln_avg | 3 | Volts | 1 | 10 | | |
| | A4 | Line AB Voltage (L-L) | Vab | 4 | Volts | 1 | 10 | | |
| | A5 | Line BC Voltage (L-L) | Vbc | 5 | Volts | 1 | 10 | | |
| | A6 | Line CA Voltage (L-L) | Vca | 6 | Volts | 1 | 10 | | |
| | A7 | Average Line Voltage (L-L) | Vll_avg | 7 | Volts | 1 | 10 | | |
| | A8 | Line A Current | Ia | 8 | Amps | 1 | 1 | | |
| | A9 | Line B Current | Ib | 9 | Amps | 1 | 1 | | |
| | A10 | Line C Current | Ic | 10 | Amps | 1 | 1 | | |
| | A11 | Average Line Current | Iavg | 11 | Amps | 1 | 1 | | |
| | A12 | Output Real Power (BESS) | kw | 12 | KW | 1 | 1 | | |
| | A13 | Output Reactive Power (BESS) | kvar | 13 | KVAR | 1 | 1 | | |
| | A14 | Power Factor | pf | 14 | | 0.01 | | | |
| A15 | Frequency | f | 15 | Hz | 1 | 10 | | | |
| Digital Inputs | D0 | Generator Breaker Status | DGEO | 0 | Binary Input | | | | |
| | D1 | Main Breaker Status (if applicable) | B1 | 1 | Binary Input | | | | |
| | D2 | Additional Breaker Status (if applicable) | B2 | 2 | Binary Input | | | | |
| | D3 | Connect permission status | B3 | 3 | Binary Input | | | | |
| | D4 | Relay Protection Failure | B4 | 4 | Binary Input | | | | |
| Control | C0 | Generator Shutdown Command (Disconnect) and Block Connect | Open/Block Connect | 0 | Binary Output | | | | Pulse on trip |
| | | Allow generator connect | Allow Connect | 0 | Binary Output | | | | Pulse on close |

Table 3: The configuration of the SCADA points shall be, but not limited to, as follows:

| Definition | Unit | Scale | Deadband | Zero Deadband | Max Value | Min Value |
|---------------------------|------|-------|---------------|---------------|----------------|----------------|
| Line A Voltage (L-N) | V | 1 | 3% of nominal | 10 | +6% of Nominal | -6% of Nominal |
| Line B Voltage (L-N) | V | 1 | 3% of nominal | 10 | +6% of Nominal | -6% of Nominal |
| Line C Voltage (L-N) | V | 1 | 3% of nominal | 10 | +6% of Nominal | -6% of Nominal |
| Average Line Voltage(L-N) | V | 1 | 3% of nominal | 10 | +6% of Nominal | -6% of Nominal |
| Line A Current | A | 1 | 5% of max | 1% of Max | 105% of Max | -1% of Max |
| Line B Current | A | 1 | 5% of max | 1% of Max | 105% of Max | -1% of Max |
| Line C Current | A | 1 | 5% of max | 1% of Max | 105% of Max | -1% of Max |
| Average Line Current | A | 1 | 5% of max | 1% of Max | 105% of Max | -1% of Max |
| Power Factor | | 0.01 | 5 | | 110 | -110 |
| Frequency | Hz | 1 | 1.8 | 10 | 63.6 | 56.4 |
| Output Real Power | kW | 1 | 5% of max | 1% of Max | 100% of Max | -1% of Max |
| Output Reactive Power | kVAR | 1 | 5% of max | 1% of Max | 100% of Max | -1% of Max |

7. Connection Procedure:

1. Customer reviews Remote Monitoring requirements outlined in this document.
2. Customer purchases and installs equipment to Alectra's specification.
3. Customer returns completed RMCF (Remote Monitoring Control Form) to Alectra
4. Alectra DER team receives the completed RMCF and reviews it for technical completion.
5. The DER team provides the customer with the corresponding IP addresses and forwards the approved and completed RM Control Form to the customer and Engineering for processing.
6. Alectra Engineering processes the RM Control Form, applies for the necessary licensing with Industry Canada, and issues a connection order for the WiMax Network.
7. Customer configures equipment to Alectra's specification.
8. Alectra commissions the Communication Link.

8. Specifications:

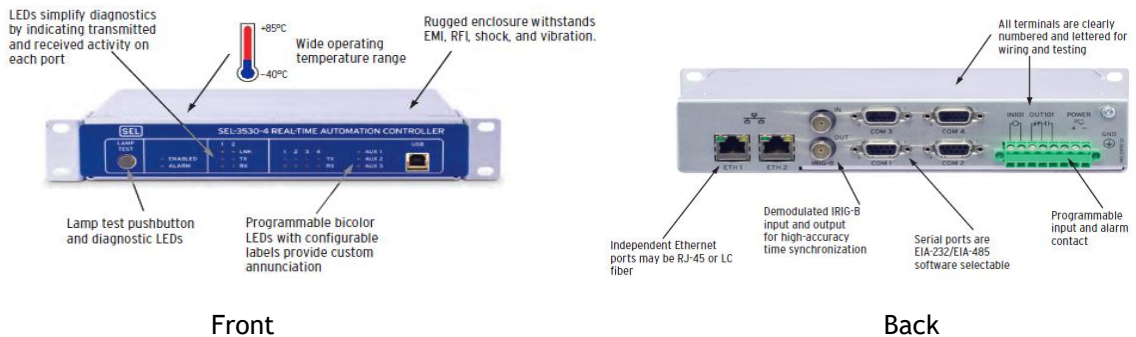
8.1. Equipment

Table 4:

| Item | Equipment | Manufacturer | Part Number |
|------|---------------------------------|-----------------------------|--------------|
| 1.a | Real Time Automation Controller | Schweitzer Engineering Labs | SEL - 3530-4 |
| 1.b | Automation Controller | Schweitzer Engineering Labs | SEL - 3505 |
| 2 | PoE Power Injector | Siemens | RP100 |
| 3 | Subscriber Unit | Siemens | WiN 5218 |

8.1.1. Real Time Automation Controller (RTAC)

- The SEL RTAC communicates with most devices using built-in client/server protocols. It converts data between protocols, performs math/logic functions, and executes output logic for real-time control.
- Dimensions are approximately 222mm x 216mm x 43mm (LxWxH).



8.1.2. WiMax Subscriber Unit (CPE)

- The WiN5218 is a high-performance outdoor radio antenna that provides broadband wireless access. The self-learning subscriber unit automatically detects the Alectra link station using the best signal available allowing for plug and play installation and low maintenance operation.
- Dimensions are approximately 60mm x 305mm x 305mm (LxWxH).



8.1.3. Uninterruptible Power Source (UPS)

- It is recommended that the SEL RTAC and WiMax Subscriber Unit are powered by an Uninterruptible Power Source to maintain data transmission during an outage.
- At this time, Alectra does not specify a particular UPS make or model.

8.2. Installation

8.2.1. Real Time Automation Controller (RTAC)

- The SEL RTAC can be ordered as rack mount or surface mount.
- The unit is installed indoors in a dry location, relatively close to the Generator's control equipment.
- Network connections to the Generator equipment use Cat-5 Ethernet cable or serial cable.
- Installation should conform to the *RTAC SEL-3530-4 Installation Guideline*.



8.2.2. WiMax Subscriber Unit (CPE)

- The Subscriber Unit is mounted outdoors at a height of 8m or higher and must be securely mounted to a rigid structure or pole.
- The mounting height must provide line of site between the antenna and Alectra's Base Station.
- An LED Indicator is provided on the Subscriber to aid in aligning with Alectra's Base Station.
- The unit is Powered Over Ethernet (POE).
- Outdoor rated Cat-5 Ethernet cable is required.
- Installation must conform to RuggedMAX™ WiN5200 Installation Guidelines.



7.3 Communication

7.3.1 Remote Monitoring

- Generator Remote monitoring data is to be provided to the RTAC via a DNP3 over Ethernet protocol, via Ethernet data port. If Ethernet is not available, a serial data port using DNP3 data protocol is acceptable.

7.3.2 Remote Shutdown

- A *remote shutdown* command will be sent to the Generator Breaker's controller from the RTAC by means of a 'Pulse On Trip' Command.
- The DER will remain forced to be offline until permission is granted by Alectra system Control by means of a 'Pulse On Close' Command

7.3.3 Radio License

- Alectra's WiMax Radio Network operates in the 1.8GHz licensed microwave band.
- Alectra will secure and manage the appropriate licensing for each generator.

7.3.4 Wireless Connection

- The Subscriber Antenna is pointed in the direction of the appropriate Link Station.

8 Responsibilities:

Customer:

- Purchase specified equipment from Alectra approved vendors.
- Install specified equipment.
- Have SEL RTAC configured as per Alectra direction.
- Have WiMax CPE Configured as per Alectra direction.
- Aim WiMax antenna toward specified link station.
- Return completed RM Control Form to Alectra with network drawings and technical contact information.
- Support Remote Monitoring Link Commissioning
- On-going Maintenance of remote monitoring system.

Alectra:

- Provide remote monitoring specifications.
- Complete path loss study and advise on customer specifications.
- Secure appropriate 1.8GHz licensing with Industry Canada.
- Provide network IP and DNP addresses.
- Commission Remote Monitoring Link.