PPL Electric Utilities

SCADA REQUIREMENTS
FOR PARALLEL OPERATION
OF DISTRIBUTED GENERATION

NO.	DATE	ER	REVISION	BY	CHECKED		APPROVED	
1	12/20/2023	884154	Added document requirements and changed RTU I/O table	TJD	IRM		DJW	
0	6/30/2022	884154	Created document for 12kV customers	TJD	RAR	MAK/ NBP	JJB	KG

CCN – 884154-000		PPL ELECTRIC UTILITIES			
SCALE – NONE					
DATE – 08/01/2022	APPROVERS DATE		PPL DRAWING NO	PAGE NO.	REV.
INTERCONNECTION AND TARIFF RULES	Kimberly Gauntner 08/01/2022 Interconnection & Tariff Rules - Supervisor		EU00568250	1 of 10	1
BY – MAK	John Bannon 08/01/2022 Protection and Control - Supervisor				
CHECKED – NBP					
PROTECTION AND CONTROL					
BY – TJD					
CHECKED - RAR					

SORTS

3 3 0 R LOC CODES

TABLE OF CONTENTS

1 FOREWORD

The information contained in this document was prepared by PPL Electric Utilities (PPL EU). This information represents minimum design requirements relative to safe and reliable operation for the PPL EU system and personnel. However, this shall not relieve the customer from sole and complete responsibility for all aspects of design, installation, maintenance, and operation of their facilities. Neither PPL EU nor any person acting on behalf of PPL EU; (a) makes any warranty with respect to the use of information disclosed in this document or that such use may not infringe on privately owned rights; or (b) assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information disclosed in this document.

To ensure that all proposed installations are handled uniformly and to minimize the possibility of misinterpreting PPL EU requirements, this document outlines the SCADA requirements for parallel operation of generation facilities. These requirements will also ensure the safety of the general public and PPL EU personnel and minimize possible damage to PPL EU equipment and that of PPL EU customers.

For new applicable installations, this document is to be used in conjunction with the "RELAY AND CONTROL REQUIREMENTS FOR PARALLEL OPERATION OF DISTRIBUTED ENERGY RESOURCES" EU00536095 document which covers DER installations on the PPL Electric distribution system (12.47 kV and below).

2   SCOPE

This document standardizes the SCADA interfaces between PPL Electric System Operations and the DER protective relays and monitoring equipment, which are customer-owned and PPL Electric controlled. The requirements stated in this document only apply when SCADA is required per the "RELAY AND CONTROL REQUIREMENTS FOR PARALLEL OPERATION OF DISTRIBUTED ENERGY RESOURCES" EU00536095 document.

3   ACRONYMS AND ABBREVIATIONS

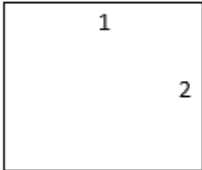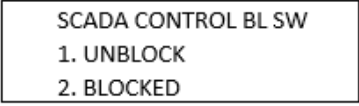The following defined acronyms and abbreviations are used in this document:

AC	Alternating Current
CTs	Current Transformers
DC	Direct Current
DTT	Direct Transfer Trip
IEEE	Institute of Electrical and Electronics Engineers
IPP	Independent Power Producer
IPR	Intertie Protective Relay
MVA	Mega Volt Amperes
MVAR	Mega Volt Amperes Reactive
MW	Mega Watts
MWh	Megawatt hour
POC	Point of Contact
POI	Point of Interconnection (alternate for POC)
PPL EU	PPL Electric Utilities
PTs	Potential Transformers
RTU	Remote Terminal Unit (SCADA)
SCADA	Supervisory Control And Data Acquisition

4 REQUIRED SCADA EQUIPMENT

Acquired by PPL and invoiced to customer:

- Cisco IR1101 Router (24VDC and 48VDC supported)

Purchased by customer:

- Optional for Cisco IR1101 Router
  - Cisco din rail mounting kit: IR1101-DINRAIL
- Novatech Orion RTU
  - Front-wired option (preferred):
    - OrionMX-2S-D1D1-IO-WR-UNIV-03-07-44-57-35-95-99
  - Rear-wired option:
    - RTU = OrionLX+-A2-B2-D1-NC0L-MMC-LVXX-41-47-57-35-95-99
    - I/O = Orion I/O-SX-EP-1100-AD-WR-42-44-98
- Bitronics M650 Meter, M650M3P511
- Battery Backup DC Power Supply (> 2 hour backup in case of outages)
- Arga Battery Monitor device (choose one)
  - 24VDC = 25-470
  - 48VDC = 25-471
  - 125VDC = 25-469
- Indication lights for isolation breaker status
- Two position SCADA Blocking Switch
  - Switch, Selector, IDEC TW Series, 2-position. IDEC Corp. Part #: ASW2L20-GW
  - Escutcheon, Selector Switch. IDEC part #: NWAS-(1 & 2)

  - Engraved Nameplate

SCADA CONTROL BL SW
1. UNBLOCK
2. BLOCKED

- NEMA 3R weatherproof pad lockable cabinet for housing the above-mentioned equipment.
- Antenna and accessories compatible with Cisco IR1101 Router
  - Antenna, x1, installed outside: Ventev M3070090D20607

- Surge protector, x2: Polyphase TSX-NFF-BFN

- Ground bar, x1: Commscope UGBKIT-0210-T

- Cable, x2, SMA-Male to N-Male: L-Com CA-SMRNMA004

- Cable, x2, N-Male to N-Female: L-Com CA4N010

- Connector, x2: terminal bronze, cable to flat, #6-#4 stranded cable range, 1 hole term. pad 1 conductor.

- Note: Customer to confirm with Verizon/AT&T that good cellular LTE network is available at the site location to be eligible for cellular SCADA Installation.

5 CONNECTION AND COMMUNICATION SCHEMETIC

The customer's communication network (fiber or ethernet) shall not interface with PPL's communication network, which is diagramed below. Hardwired interface is desired to reduce cybersecurity risk.

SCADA Communication Diagram
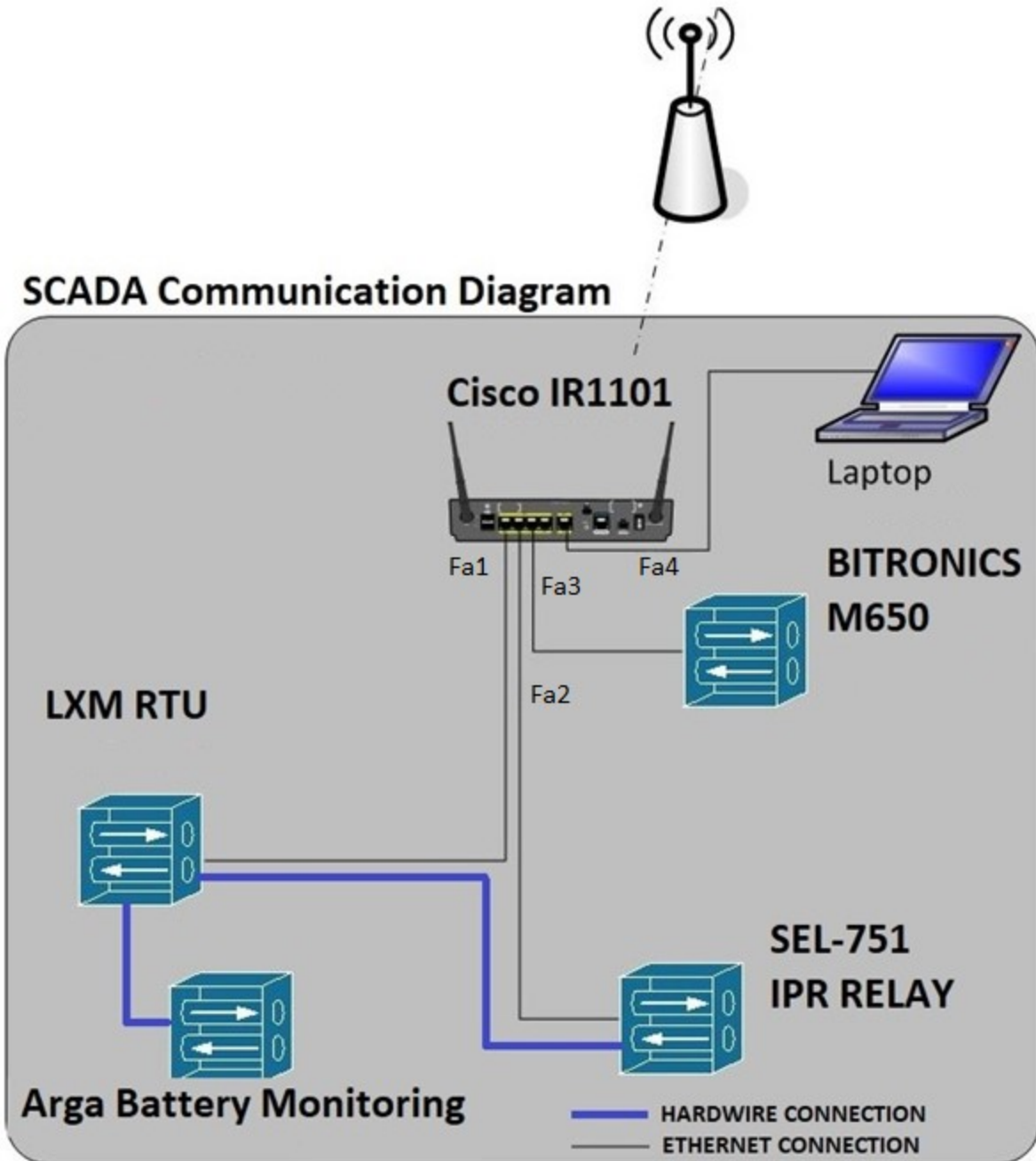
6 SCADA SYSTEM AND DEVICE FUNCTIONALITIES

6.1   SCADA Data Requirements

PPL requires the following data from a generation site with SCADA installed. Note that two options are available for generation isolation breaker status/trip interfaces, Option 1 for DNP and Option 2 for hardwired.

- Analogs, provided from Bitronics meter to Orion RTU via DNP-IP protocol:

  o Bitronics meter is connected to PTs and CTs

  o Three-phase MW and MVAR flows

  o Three phase voltages (A, B, C phases)

  o Three phase currents (A, B, C phases)

  o Frequency

- Analogs, provided from additional Bitronics meters if required.

  o Station service analogs MW/MVAR on all station service (aux) transformers.

- Alarms, hardwired to Orion RTU:

  o See **7.1 NovaTech Orion RTU Inputs and Outputs** for more information.

  o Inputs to the Orion RTU should be fused separately from the Orion RTU's fuse, so therefore a "DC Input Fuse" alarm is required.

  o Health indication of the IPR protective relay and Direct Transfer Trip (DTT) equipment, if applicable.

  o Alarm indication of all associated equipment which are considered critical for IPR relay, generation isolation breaker and SCADA system operation. Alarm statuses include but are not limited to IPR relay failure alarm, SCADA system failure alarm, DC battery system failure alarm, etc.

  o High/Low DC voltage alarm, paralleled from Arga Battery Monitoring System

  o Battery Ground alarm, from Arga Battery Monitoring System

- Status and Control from generation isolation breaker, options:

  o Option 1: Status communicated to Orion RTU via IPR relay using DNP-IP protocol. Trip output control to generation isolation breaker/LOR, sent through IPR relay.

  o Option 2: Status wired to Orion RTU from generation isolation breaker directly. Trip output control to generation isolation breaker/LOR.

- Other status and control, hardwired to Orion RTU:

- Status input from all circuit breakers and motor-operated switches between the POC and the generator(s). This would include the high side breaker, low side breaker, and generator breaker.

6.2   SCADA Physical Requirements

All SCADA equipment shall be installed in a weatherproof pad lockable NEMA 3R cabinet. Since only cellular router is installed by PPL, be sure to leave adequate space for the router. DC and coaxial cables shall be preinstalled in the cabinet with penetrations properly sealed. The Antenna must be installed external to any cabinets or control houses.

The SCADA cabinet shall be accessible by PPL EU only. Customer shall make sure it is installed in an appropriate accessible location.

6.3   Requirements of Associated Devices

Appendix I lists the I/O associated with the Orion RTU and Bitronics meter. PPL's equipment will be programmed this way, so it is important that the wiring matches.
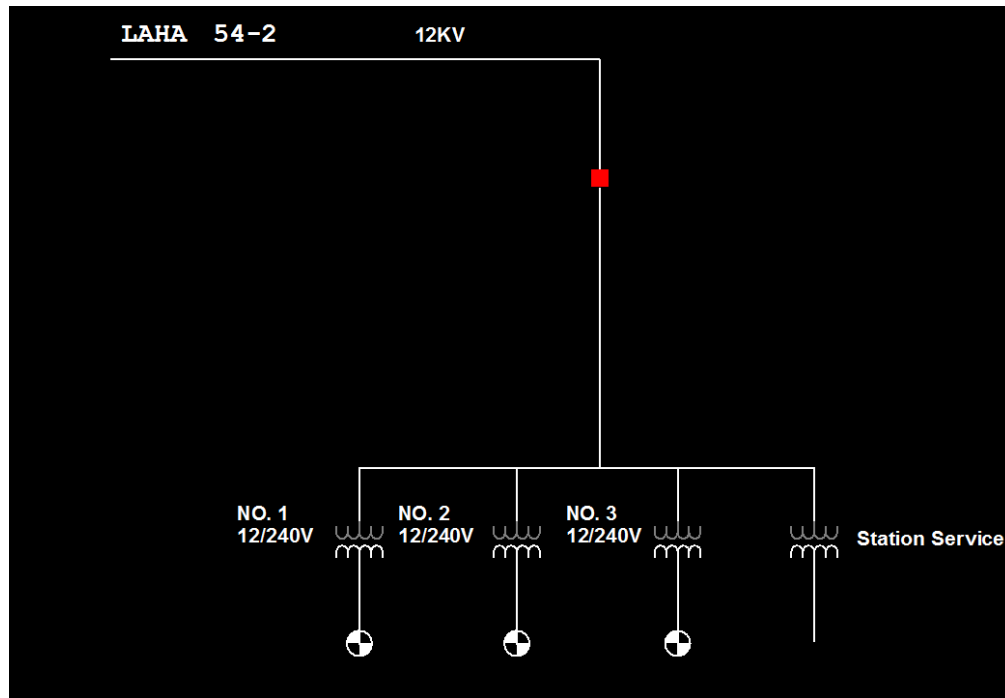
IPR relay(s) drawings(s) shall depict hardwired status output and trip input connections to Orion RTU for generation isolation breaker, plus other required alarms as mentioned in Appendix I.

6.4   Drawing Requirements

The following documentation is required for review by PPL SCADA engineers before testing with PPL system operations. This allows time for a thorough review, SCADA Point Assignment Sheet development, and submission to PPL's Energy Management System (EMS) developers.

- Single line diagram of the facility

- A simplified single line showing only:

    - PPL's line name and voltage

    - The breaker that PPL will have access to trip via SCADA

    - Disconnect switches or other devices accessible to PPL capable of isolating generation

    - (Numbered) generators, transformers, and station service transformers

- Site diagram of the facility

- A 3-line diagram and DC schematic illustrating the protection and control scheme

- Control schematic showing hardwired connections to the RTU

- Control schematic showing all programmable devices, including ethernet connections to the router

Figure 6.11: Simplified Single Line

SCADA REQUIREMENTS FOR PARALLEL
OPERATION OF DISTRIBUTED GENERATION

EU00568250
Revision:1
Effective Date: 12/20/2023
Page 11 of 12

7 APPENDIX I

7.1 NovaTech Orion RTU Inputs and Outputs

Abbreviation	Description	I/O	MX 2S Terminal	LX+I/O Terminal
CMD_DISABLE	SCADA blocking switch (From Two position SCADA blocking switch)	Input	IN01	LX IN01
DC_FUSE	Input fuse monitor. All alarms to be on a single fuse.	Input	A01	A01
HI/LO DC	From Arga Battery Monitoring System	Input	A02	A02
BATT GND	From Arga Battery Monitoring System	Input	A03	A03
LOSS_AC	From DC Battery Charger	Input	A04	A04
BATT_CHRGR_TBL	Health of DC Battery Charger	Input	B01	A05
DC_TBL	Health of Arga Battery Monitoring System	Input	B02	A06
IPR_RLY_FAIL	IPR relay failure alarm (From IPR Relay)	Input	B03	A07
DTT TBL (if applicable)	Failure of a DTT scheme or relay	Input	B04	A08
	Spare alarm point	Input	IN02	A09
	Spare alarm point	Input	IN03	A10
	Spare alarm point	Input	IN04	A11
	Spare alarm point	Input	IN05	A12
	Spare alarm point	Input	IN06	A13
	Spare alarm point	Input	IN07	A14
	Spare alarm point	Input	IN08	A15
	Spare alarm point	Input	A05	A16
Note 1*	Spare Breaker Status 52A	Input	A06	B01
	Spare Breaker Status 52A	Input	B05	B02
	Spare Breaker Status 52A	Input	B06	B03
	Spare Breaker Status 52A	Input	A07	B04
	Spare Breaker Status 52A	Input	A08	B05
	Spare Breaker Status 52A	Input	B07	B06
	Spare Breaker Status 52A	Input	B08	B07
	Spare Breaker Status 52A	Input	A05	B08
Note 2*	Spare Breaker Trip	Output	A01	C01
	Spare Breaker Trip	Output	A02	C02
	Spare Breaker Trip	Output	A03	C03
	Spare Breaker Trip	Output	A04	C04
	Spare Breaker Trip	Output	B01	C05
	Spare Breaker Trip	Output	B02	C06
	Spare Breaker Trip	Output	B03	C07
	Spare Breaker Trip	Output	B04	C08

Note 1* Breaker Status comes from the IPR Relay to the RTU via DNP.
Note 2* Breaker Trip goes through IPR Relay, sent from RTU via DNP

Orion MX 2S (preferred RTU option):
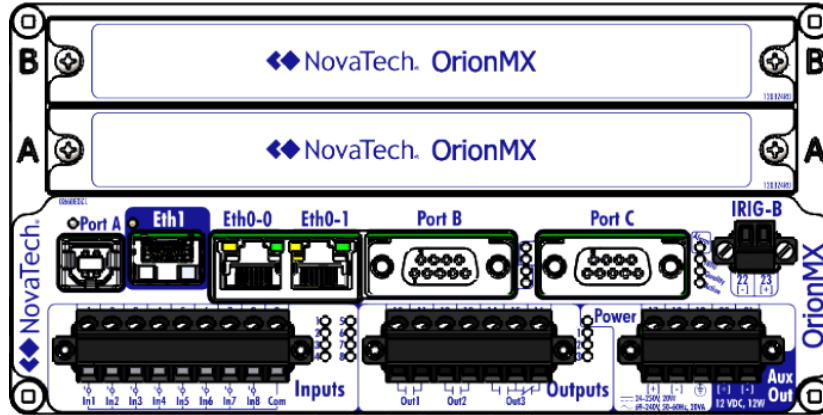
Orion MX 2S Slot A and Slot B populated as below: