California ISO

GENERIC GENERATION FACILITY

CONTROL PROTECTION DATA RECORDING

Generic Compliance Narrative Example

Facility	[Facility Name]
Generator Owner – Resource ID	[Resource ID]
Project ID	[25NGRXXX]
Date	[Month Day, Year]

This narrative is a generic example for documenting a generation facility's implementation of CAISO's Large Generator Interconnection Agreement (LGIA) Appendix H and NERC PRC-028-1. Bracketed fields and generic device descriptions must be replaced with verified facility-specific information and supporting evidence before the document is used as a compliance record.

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Executive Summary

This report documents how a generation facility may demonstrate compliance with CAISO's LGIA Appendix H and NERC PRC-028-1, Disturbance Monitoring and Reporting Requirements for Inverter-Based Resources. It describes the facility locations, recording devices, data channels, triggers, record lengths, sampling rates, time synchronization, retention, reporting processes, and corrective-action controls used to satisfy the applicable requirements.

The facility owner should complete this narrative using device settings, manufacturer documentation, test records, communication architecture, data-retrieval procedures, and retention calculations that are specific to the facility. A compliance conclusion should be made only after the evidence confirms that each applicable recording point and performance criterion is met.

The facility is also subject to interconnection-agreement or transmission-provider requirements, Sections 3.10 through 3.12 may be used to document those additional obligations. Those provisions should be clearly distinguished from the PRC-028-1 requirements.

1.0 Introduction

1.1 Project Summary

The facility is a BESS/ PV /WTG generation resource with a maximum authorized output of [MW] at the Point of Interconnection (POI). The generating units connect through a [kV] collector system and [qty] main power transformers to the [kV] transmission system. The facility includes [qty] inverters manufactured by [supplier] rated for XX MVA connected on [qty] [kv] feeders with [qty] inverters per feeder.

The substation protective relays consist of [qty] line relays, [qty] HV breaker failure relay, [qty] transformer relays, [qty] bus differential relay, and [qty] MV breaker relays.

Protection, automation, and recording functions are provided by digital protective relays, disturbance recorders, plant controllers, inverter controllers, data concentrators, satellite clocks, and data servers, as applicable. The final facility narrative should identify the electrical locations at which LGIA and PRC-028-1 data are required and map each required quantity or status to a source instrument transformer, digital input, calculating device, recording device, and archive location.

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2.0 Compliance Determination

The facility owner determines applicability and compliance by evaluating the facility against each LGIA Appendix H and PRC-028-1 requirements, identifying the required monitoring locations, verifying the recording configuration, and retaining objective evidence. The evaluation should account for normal and alternate operating configurations so that the required data remain available whenever the applicable equipment is in service.

2.1 Disturbance Monitoring Device Settings Evaluation

- Identify each facility location subject to sequence of events recording (SER), fault recording (FR), or dynamic disturbance recording (DDR).
- Identify the protective relay, disturbance recorder, inverter controller, plant controller, or data concentrator that provides each required record.
- Confirm that instrument-transformer inputs, status contacts, calculated quantities, trigger equations, sample rates, record lengths, and time sources are correctly configured.
- Perform a data-retrieval or functional test to verify that the required channels are present, time-aligned, readable, and exportable in the required format.
- Maintain settings files, configuration exports, test results, architecture drawings, manufacturer documentation, and sample records as compliance evidence.

3.0 Disturbance Monitoring and Reporting Requirements

This section provides a generic narrative for documenting the facility's implementation of PRC-028-1. Device names are intentionally generic and must be replaced with actual facility designations.

3.1 Sequence of Event Recording (SER)

The facility provides time-tagged SER data for the discrete statuses specified by PRC-028-1. SER points are captured by protective relays, automation controllers, inverter controls, or other devices capable of preserving the required event sequence and exporting the data for reporting.

3.1.1 Circuit Breaker Position

SER is configured for the open and closed status of applicable line, main transformer, collector, and shunt reactive-device circuit breakers. Each status point is derived from an appropriate breaker auxiliary contact or equivalent validated indication and is assigned a clear point name, state description, and UTC time stamp.

Equipment Location	Status Source	Recording Device	Evidence
Line/POI breaker	52a/52b or equivalent	[Relay/RTU/DFR]	Settings export and SER test
Main transformer breaker	52a/52b or equivalent	[Relay/RTU/DFR]	Settings export and SER test
Collector feeder breaker	52a/52b or equivalent	[Relay/RTU/DFR]	Settings export and SER test
Shunt reactive device breaker	52a/52b or equivalent	[Relay/RTU/DFR]	Settings export and SER test

3.1.2 Inverter-Based Resources

For each applicable inverter-based resource, the facility shall record fault codes, fault alarms, high- and low-voltage ride-through mode status, and high- and low-frequency ride-through mode status when a ride-through operation or unit trip occurs. This document in coordination with the control and data recording setting report shall identify the manufacturer of the signal name, engineering meaning, state logic, time resolution, archive location, and retrieval method for each required status.

Required SER Information	Generic Implementation	Verification Evidence
Fault codes	Inverter or unit controller event log records the code, source, entry/exit state, and timestamp.	Manufacturer documentation and sample event export
Fault alarms	Alarm log records severity, active/cleared state, and timestamp.	Alarm mapping and sample export
Voltage ride-through status	Controller records entry into and exit from voltage ride-through or momentary cessation states.	Signal list, logic description, and test record

Required SER Information	Generic Implementation	Verification Evidence
Frequency ride-through status	Controller records entry into and exit from frequency ride-through states.	Signal list, logic description, and test record

3.2 Fault Recording (FR) Data

PRC_028-1 R2 and CAISO's LGIA Appendix H specify that IBR plants shall have triggered fault recording (FR) for identified signals. Recorded channels shall use calibrated voltage and current inputs, and real and reactive power may be recorded directly or derived from the recorded instantaneous quantities using documented calculations. Specific requirements are detailed below;

3.2.1 High-Side of Main Power Transformer (MPT)

For each applicable main power transformer, FR data on the high-voltage side include phase-to-neutral voltage for each phase, current for each phase, residual or neutral current, and three-phase real and reactive power. This document in coordination with the control and data recording setting report shall identify the CT and VT/CCVT source, trigger levels, ratios and scaling, recorder channel names, polarity, and the method used to calculate power.

Analog Quantity	Source	Recording Device	Validation
Phase-to-neutral voltage, each phase	High-side VT/CCVT	[Relay/DFR]	Channel and scaling check
Current, each phase	High-side CTs	[Relay/DFR]	Channel and scaling check
Residual or neutral current	Measured neutral CT or calculated residual	[Relay/DFR]	Method and polarity check
Three-phase real and reactive power	Recorded or derived V and I	[Relay/DFR/software]	Calculation validation

3.2.2 Collector Feeder Breaker

For each applicable collector feeder breaker, FR data include phase-to-neutral voltage for each phase, current for each phase, residual or neutral current, and three-phase real and reactive power. Where one voltage source is shared by multiple feeder recorders, the design should confirm that the selected source accurately represents the feeder terminal voltage during the operating configurations covered by the standard. This document in coordination with the control and data recording setting report shall identify the CT and VT/CCVT source, trigger levels, ratios and scaling, recorder channel names, polarity, and the method used to calculate power.

Analog Quantity	Source	Recording Device	Validation
Phase-to-neutral voltage, each phase	Collector-bus VT	[Feeder relay/DFR]	Channel and scaling check
Current, each phase	Feeder breaker CTs	[Feeder relay/DFR]	Channel and scaling check

Analog Quantity	Source	Recording Device	Validation
Residual or neutral current	Measured or calculated from feeder CTs	[Feeder relay/DFR]	Method and polarity check
Three-phase real and reactive power	Recorded or derived V and I	[Feeder relay/DFR/software]	Calculation validation

3.3 Inverter Level Data Recording

Inverter-level recordings are required by CAISO's LGIA Appendix H. This document in coordination with OEM documentation and the control and data recording setting report shall identify the native sampling interval, trigger logic and levels, pre-event and post-event duration, scaling, units, data format, and retention period. The following inverter signals shall be monitored/recorded;

Data Category	Representative Signals	Recording Source
AC electrical quantities	Phase voltages, phase currents, frequency, real power, reactive power	[Inverter controller/unit recorder]
Operating states	Ride-through, momentary cessation, current injection, trip state	[Inverter controller/unit recorder]
Diagnostic information	Fault codes and alarms	[Inverter event log]
DC quantities	DC voltage and DC current	[Inverter controller/unit recorder]

3.4 Fault Recording (FR) Trigger & Record Length

FR settings are configured so that a single record, or a continuous set of time-aligned records, satisfy the specified minimum pre-trigger duration, total record length, and sample resolution as required. Trigger thresholds are coordinated with expected system conditions to capture qualifying events without preventing records through excessive or continuous triggering. (Specific trigger values shall be included in either this document or the control and data recording setting report).

3.4.1 High-Side of Main Power Transformer (MPT)

The high-side FR recorder is configured for the required pre-trigger data, total record duration, and minimum samples per cycle. Trigger logic includes the applicable neutral or residual overcurrent, AC phase overvoltage, AC phase undervoltage, overfrequency, and underfrequency conditions. Additional triggers, such as breaker status change, phase overcurrent, protection trip, or breaker failure, shall be included.

Device	Pre-Trigger	Total Length	Resolution	Required Trigger Types
[MPT high-side recorder]	≥ 150 ms	≥ 2.0 s	≥ 64 samples/cycle	Residual/neutral overcurrent; phase overvoltage; phase undervoltage; overfrequency; underfrequency

3.4.2 Feeders

Each applicable collector-feeder recorder is configured to meet the same minimum pre-trigger duration, total record length, and sample resolution. Trigger logic includes the specified residual or neutral

overcurrent, AC phase overvoltage, AC phase undervoltage, overfrequency, and underfrequency conditions, together with any facility-specific triggers needed to reliably capture feeder disturbances.

Device	Pre-Trigger	Total Length	Resolution	Required Trigger Types
[Collector feeder recorder(s)]	≥ 150 ms	≥ 2.0 s	≥ 64 samples/cycle	Residual/neutral overcurrent; phase overvoltage; phase undervoltage; overfrequency; underfrequency

3.5 Dynamic Disturbance Recording (DDR) Data

Continuous DDR is provided for each applicable main power transformer. Data are recorded continuously or through a continuous archive process that preserves the required quantities and allows an event interval to be retrieved without gaps.

3.5.1 High-Side of Main Power Transformer (MPT)

DDR data for the high side of each applicable main power transformer include one phase-to-neutral voltage and the current for the corresponding phase, or positive-sequence voltage and positive-sequence current; three-phase real and reactive power; and frequency derived from a recorded voltage. This document in coordination with the control and data recording setting report shall identify the source PMU, relay, DFR, phasor data concentrator, or historian for each channel and demonstrate that the channels share a common time base.

3.6 Dynamic Disturbance Recording (DDR) Sample Rate

The DDR system uses an input sampling rate of at least 960 samples per second and records the required electrical quantities at least 60 times per second. If data pass through a phasor data concentrator or historian, the configuration should demonstrate that the end-to-end output rate and archive process preserve the required reporting rate without decimation below the standard.

Recording Source	Input Sampling Rate	Output Recording Rate	Evidence
[PMU/relay/DFR 1]	≥ 960 samples/second	≥ 60 records/second	Device settings and archive configuration
[PMU/relay/DFR 2]	≥ 960 samples/second	≥ 60 records/second	Device settings and archive configuration

3.7 Time Synchronization

All SER, FR, Inverters and DDR devices are time-synchronized to Coordinated Universal Time to within ±1 millisecond. The facility uses a traceable time source, such as a GNSS satellite clock, and distributes time through IRIG-B, Precision Time Protocol, Network Time Protocol where adequate, or another verified method. The Generator Owner periodically verifies clock lock, device synchronization status, network paths, and time accuracy, and documents alarm response for loss of synchronization.

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Device Class	Time Source/Protocol	Required Accuracy	Verification
Protective relays and DFRs	[GNSS clock / IRIG-B / PTP]	Within ±1 ms of UTC	Clock status and time-comparison test
Inverter and plant controls	[PTP / other verified source]	Within ±1 ms of UTC	Controller status and time-comparison test
Data concentrator/historian	[PTP / NTP / direct GNSS]	Supports preservation of source timestamps	Archive timestamp review

3.8 Reporting Requirements

The Generator Owner maintains procedures and assigned responsibilities for retrieving, validating, packaging, and transmitting requested SER, FR, and DDR data to an authorized requesting entity. At a minimum, the process addresses the following controls:

1. Data remain retrievable for at least 30 calendar days, inclusive of the day on which the data were recorded.
2. Data are provided within 10 calendar days after a valid request unless the requester grants an extension.
3. SER data are supplied in ASCII comma-separated value format consistent with the applicable attachment to PRC-028-1.
4. FR data are supplied as appropriately headed CSV files or COMTRADE files conforming to IEEE C37.111-1999 or a later revision permitted by the standard.
5. DDR data are supplied as appropriately headed CSV files or COMTRADE files conforming to IEEE C37.111-1999 or a later revision permitted by the standard.
6. Data files follow the COMTRADE naming convention in IEEE C37.232-2011 or a later revision permitted by the standard.

Storage capacity should be based on a documented worst-case or conservative event rate, record size, channel count, and archive behavior. The facility should monitor available storage, confirm that automatic file rollover does not reduce retention below 30 days, and periodically test remote or local retrieval of representative SER, FR, and DDR records.

Data Type	Primary Archive	Minimum Retention	Retrieval Method	Output Format
SER	[Relay/DMA/server]	≥ 30 days	[Local or secure remote method]	CSV
FR	[Relay/DMA/server]	≥ 30 days	[Local or secure remote method]	CSV or COMTRADE
DDR	[PDC/historian/server]	≥ 30 days	[Local or secure remote method]	CSV or COMTRADE
Inverter event data, if applicable	[Unit controller/server]	≥ 30 days or governing requirement	[Vendor tool/API]	Documented export format

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3.9 Corrective Action Plan

Upon discovering a failure of required SER, FR, or DDR recording capability, the Generator Owner initiates its deficiency-management process. Recording capability is restored within 90 calendar days, or a Corrective Action Plan is submitted to the Regional Entity within 90 calendar days and implemented according to the approved or established plan timeline. The record should identify the discovery date, affected data, interim risk controls, root cause, restoration actions, responsible owner, milestones, and evidence of return to service.

3.10 Status of Plant Controller and Plant Control Set Points

The facility records the operating status of the plant controller and applicable plant-control set points during specified ride-through, reactive-current injection, momentary-cessation, and inverter-trip events. This document in coordination with the control and data recording setting report shall identify each set point, its source device, scan or sample rate, timestamp method, historian tag, retention period, and retrieval procedure.

3.11 LTC Position

The facility records the position of the main power transformer no-load tap changer or load tap changer for the identified triggered events.

3.12 Transient Data Sample Rate

The facility owner shall document and validate the end-to-end performance of the measurement, communications, controller, and historian path. The verified rate should therefore reflect the slowest element in the data path and should be supported by configuration files or an end-to-end test.

Data	Facility-Specific Required Rate	Verified End-to-End Rate	Evidence
Three-phase voltage and current	[Enter requirement]	[Enter verified rate]	Recorder configuration/test
Circuit-breaker and reactive-device status	[Enter requirement]	[Enter verified rate]	SOE configuration/test
Plant-controller status and set points	[Enter requirement]	[Enter verified rate]	Controller, protocol, and historian test
Transformer tap position	[Enter requirement]	[Enter verified rate]	Controller and historian test
Inverter ride-through and trip data	[Enter requirement]	[Enter verified rate]	Manufacturer configuration/test

Appendix A - One-Line Diagram

Insert the current facility one-line diagram that identifies the POI, main power transformer(s), collector buses, feeder breakers, shunt devices, instrument transformers, and recording-device locations. No figure is included in this generic example.

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Appendix E - GPS Clock Settings

Provide time-source configuration, protocol distribution, device synchronization settings, clock alarms, and time-accuracy test evidence.

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Appendix F - Disturbance Monitoring Archive Configuration

Provide archive capacity, rollover settings, directory structure, access controls, storage monitoring, and retrieval test evidence.

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Appendix G - Phasor Data Concentrator Configuration

Provide PMU/PDC station names, data rates, channel mappings, archive settings, and continuous-data retrieval evidence.

Appendix H - Historian Configuration

Provide historian tags, scan rates, deadbands, source timestamps, retention settings, and export procedures for applicable plant and inverter data.

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Appendix I - Substation Relay Settings Reports

Provide approved relay or DFR settings reports showing SER points, analog channels, event triggers, pre-trigger duration, record length, sample rate, and time synchronization.

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Appendix J - Letter from Inverter Manufacturer

Provide manufacturer confirmation of inverter event signals, ride-through state definitions, trigger behavior, sampling rate, record duration, timestamp accuracy, file format, and retention.

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Appendix K - Inverter Documentation

Provide relevant manuals, signal lists, data-logger configuration, retrieval instructions, scaling information, and sample event files.