California ISO

CAISO RIG Acceptance Test Procedure

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1.0 PURPOSE

The procedure is intended to verify that the Remote Intelligent Gateway (RIG) supplied to each Generator Owner meets the requirements of the ISO Monitoring and Communications Requirements Technical Standards.

2.0 INTRODUCTION

The RIG Acceptance tests will be performed with the active participation of California Independent System Operator (CAISO) Energy data acquisition specialists (EDAS) Team. However, the ISO's participation is limited to that of a facilitator and, as such, the ISO shall only be responsible for costs it may incur as a result of its participation in the process described herein.

The ISO expressly reserves the right to modify, or withdraw from, the process initiated and described herein. Additional requirements may be added or deleted by the ISO in its sole discretion at any time before, during or after the process. No rights shall be vested in any party, individual or entity by virtue of its preparation to participation in, or participation in, such process. The ISO shall be granted access rights as necessary to permit observation of the process. Successful completion of the process shall not in any way be deemed to affect any requirement of the ISO Tariff, including without limitation metering, certification and scheduling requirements. Validation of a RIG Unit by the ISO shall not exempt any affected person from participation in the process described herein. Participants are advised that this is an ISO document and hence ISO ADR Procedures apply to any dispute arising hereunder in accordance with Article 13 of the ISO Tariff.

2.1 METHODOLOGY

In order to run a successful test it is necessary to establish the methods and general procedures that will be followed throughout the test. It is important that these rules and procedures be agreed to, and followed, by all parties during the test. In those cases where either methods or procedures are bypassed or changed, all parties shall acknowledge the change, reach a mutually agreeable resolution, and document said changes. This resolution may involve mutually agreed to changes being made to the test procedure or resumption of the previously agreed to methods and procedures. Any additional detailed testing required to further authenticate functionality and specifications of deliverables will be conducted with the owner and ISO personnel in a Site Acceptance Test conducted at Folsom.

The owner and the ISO will each appoint a Test Representative that is solely responsible for representing their respective companies during testing. The mutual agreement of these Test

Representatives is necessary for approving the tests, any departure from the procedure, and any documentation of errors or omissions.

The ISO Test Supervisor may add or delete items from the test, redirect the test, skip sections, or review sections at any time during the test provided such changes are consistent with the scope of the project.

The tests are designed to run in the sequence given in this document except where noted. Proper sequencing of tests is necessary because of set up procedures that may have occurred in previous tests. However, it is recognized that circumstances often require that the sequence be interrupted. Such an interruption or rescheduling requires both Test Supervisors to agree, the impact of the sequence interruption be recognized, and said interruption or rescheduling be documented.

Successful testing involves the active participation and understanding of test procedures by both parties. The tests will typically be executed in the order specified. This will provide the ISO with the opportunity to observe and question test results.

2.2 OUTSTANDING ISSUES

There may be cases where test results are not satisfactory. All unsatisfactory results are to be communicated to the RIG Owner and also summarized in Full Network Model Report. If appropriate, the test may be postponed pending resolution of an unsatisfactory result.

2.3 LOGISTICS

The test period will begin with an orientation of all personnel involved in the testing. The purpose of this orientation is to review testing procedures and to set forth what is to be accomplished by the end of the test period. The test period will conclude with a review meeting. In the case where unsatisfactory test results are obtained, this meeting will be used to determine the proper course of action to obtain satisfactory results.

2.4 UNAVAILABILITY AND EXCEPTIONS

All items or features that are a part of this system, but for one reason or another are not available at the time of the tests must be documented in the Full Network Model Report.

2.5 DEFINITIONS

Unless the context otherwise indicates, any word or expression defined in the Master Definitions Supplement, Appendix A to the ISO Tariff, and capitalized

herein has the same meaning where used in these principles. In addition, the following words and expressions used in these principles with initial capitalization have the meanings set forth below:

Automatic Generation Control (AGC): Generation equipment that automatically responds to signals from the ISO's EMS control in real time to control the power output of electric generators within a prescribed area in response to a change in system frequency, tieline loading, or the relation of these to each other, so as to maintain the target system frequency and/or the established interchange with other areas within the predetermined limits.

Certificate: In cryptographic terms, an electronic document verifying a person or object's identity.

Certificate Revocation List (CRL): A list of certificates that have been revoked before their expiration date, which explicitly denounces trust for that person or object's communications.

Certifying Authority (CA): An entity that issues certificates to validate a person or object's identity.

Distributed Control System (DCS): A microprocessor-based system used for data acquisition and control of plant processes. These control systems are "distributed" in that the controllers may be physically located near the process they are controlling. DCS's usually include some kind of Man Machine Interface (MMI) device used to allow a plant operator to view the status of the process and take corrective action when necessary.

Distributed Network Protocol, (DNP 3.0) Version 3.0, a data processing application that runs on master and remote devices and is used for data exchange. (See www.dnp.org for more information on this protocol)

Energy Communications Network (ECN): The overall ISO digital network architecture comprised of multiple subnet, wide area, and local network segments

EMS Telemetry: A process for measuring a quantity (amps, volts, MW, etc.) and transmitting the result via a communication system (radio, microwave, etc.) to a remote location for indication or recording.

Field Remote Intelligent Gateway (RIG): A device functionally defined by the ISO to directly telemeter secure operational data from a Generator's Generating Units to the ISO EMS. Field RIGs are used as the means for providing direct control of Generating Units by the ISO and are a prerequisite for participation in the ISO Regulation market.

ISO Supervisory Control and Data Acquisition Intelligent Open Controller (SCADA IOC): An Internet enabled host that will receive Operational Data from the various Generation data reporting devices. The ISO SCADA IOC will be capable of retrieving Operational Data with DNP SCADA protocol and will be

secured using X.509v3 Digital Certificates and Secure Socket Layer (SSL) for authentication and encryption.

Metering and Data Acquisition Systems (MDAS): An ISO system that collects information on the generation and consumption of electricity between suppliers and customers for use in settlements. MDAS communicates via TCP/IP to meters over the Energy Communications Network (ECN/WENET).
Operational Data: Data (such as, but not limited to kV, MW, MVAr, MWh, MVArh, status) collected at defined periods by ISO EMS Telemetry that is immediately available for ISO system operator's use in determining system conditions.

Public-Key Cryptography Standards (PKCS): A series of cryptographic standards, published by RSA Laboratories that define the syntax for implementing public key handling.

Public Key Infrastructure – (PKI)**:** PKIs are designed to establish secure domains and trusted relationships necessary for conducting secure electronic business. PKI involves the various processes that deal with the creation, distribution, authentication, and storage of keys and certificates.

Scan Rate: Predefined rate for receiving or sending data.

System Monitoring and Support Center (SMSC): A group established at the ISO that monitors alarms generated by critical systems integral to the operation of the ISO and the reliability of the grid. This group monitors alarms related to the RIGs 24 hours/day and seven days/week.

Secure Socket Layer (SSL): A security protocol that uses symmetrical and public key cryptography to secure communication over the Internet.
Transmission Control Protocol / Internet Protocol (TCP / IP): IP is used at the network layer of the Objective Systems Integrators (OSI) stack for routing packets. TCP is used at the transport layer of the OSI stack and works with IP for packet routing.

X.509v3: Digital certificate public key format defined by the International Telecommunications
Unit (ITU) X.509 Standard

2.6. PREREQUISITES FOR ACCEPTANCE TESTING

Generator Owners will accomplish all the NRI prerequisites prior to the start of Generation Acceptance Testing:

2.6.1 Communication Block Diagram

Generator owners will provide the ISO with Communication Block Diagram showing functional and specific details. This diagram shows the RIG connecting to the input device(s) and initiating device(s) (such as meters, PLC, DCS, etc.). It is important to note that all devices between the meter(s) or transducers and the RIG must be documented on the block

diagram. The diagram should also identify protocols used, master/slave arrangements, baud rates, circuit numbers, etc, to allow for proper troubleshooting and to facilitate discussions.

2.6.3 Spreadsheet

RIG spreadsheet sent by CAISO EDAS team will have the Analog and Digital data points that ISO requires the site. CAISO EDAS will test all the points listed on the spreadsheet.

2.6.4 RIG Pre-Checkout

Generator Owners will have performed all necessary pre-checkout tests of the RIG to assure functional field systems prior to the start of the testing with the ISO. This pre-checkout will include but will not be limited to the following:

1. Power-up and diagnostic checks of the RIG device.
2. Verification of the correct configuration, mapping and scaling of each point in the RIG database.
3. Verification of the correct protocol communication with other devices (i.e. meters, transducers, DCS's, PLC's, etc.). This must include a point-to-point check with each device connected with the RIG prior to the beginning of testing with the ISO.

2.7. TEST OVERVIEW

After the RIG has been connected and powered up, secure connectivity with the ISO interface shall be verified. Note the establishment of secure communications, as required, on the RIG Installation Checklist. Once communication has been verified, the test of inputs and outputs (I/O) will commence. A point-to-point check validating the correct scaling of the signal from the meter side through each device to the EMS display at the ISO will be conducted. All analog inputs will be verified using a three-point check (0, mid-scale, and full scale). The data will be validated, as scaled correctly through each input device, as appropriate. All data will be verified for appropriate encryption.

2.7.1 Generator Owner Responsibility

Generator Owners of existing facilities and/or units in commercial operation must schedule an outage with the ISO Outage Coordination no later than 72 hours prior to performing the data points check. Testing will be conducted on the online system and all related entities must be aware of the scheduled testing.

The Generator Owner is solely responsible for supplying the means to drive the appropriate signals through to the RIG that reflect 0%, 50% and 100% analog values to the ISO EMS System and an appropriate means to validate digital points. At the ISO's discretion, a field engineer may audit this test.

3.0 TEST PROCEDURE

3.1. INITIAL TESTS

The following initial tests will be conducted prior to testing accuracy of I/O values and calculations:

3.1.1 Establish Secure Communication

Refer to Appendix A of this document for the procedures for establishing secure communication with the ISO.

3.1.2 Confirm RIG Visibility to EMS

ISO Representative will verify if the data is being received by ISO EMS and the RIG heartbeat is incrementing as expected.

3.2 PERFORM DATA CHECK ON ALL I/O VALUES

3.2.1 Analog Values

Manually input an analog value. Verify that the correct value is displayed at the EMS display. All analog inputs will be verified using a three-point check (0, mid-scale, and full scale).

3.2.2 Digital Values

Toggle each digital value. Verify that the correct value is displayed the EMS display. Verify each correct state of the digital point.

3.2.3 Calculations

Any points that are identified in the generator's database as utilizing a calculation need to be demonstrated as to correct inputs and result. Logic results supplied to the EMS must be verified (i.e. data quality, UCON, etc).

3.3 PERFORM ALARM AND DATA FLAGGING CHECK

Test data quality alarms by disconnecting communication lines starting from the device connected to the RIG, then between the RIG and the Master Interface. Using the block diagram as a reference, disconnect and reconnect each communication line individually from the RIG. Each one should alarm appropriately - note the alarms generated. Reconnect each line and note system restoration. Note any exceptions.

3.4 CONNECTIVITY VALIDATION

After the acceptance testing to verify the correct values and performance, the RIG will remain connected to the ISO for 72 hours to ensure connectivity stability. During that time, any failure to maintain the transmission of data will be analyzed and may require resolution before the site is declared commercial operation.