OpenADR 2.0b Profile Specification

Distributed Energy Resources (DER)

Updated 08-24-2019

Revision Number: 0.7

Document Status: **Proposed**

Document Number: 20190201-2

Contact:	Editors:	Technical Director OpenADR Alliance:
OpenADR Alliance 111 Deerwood Rd., Ste. 200 San Ramon, CA 94583 help@openadr.org	Jim Zuber, QualityLogic <jimzuber@qualitylogic.com>	Rolf Bienert <rolf@openadr.org>

Please send general questions and comments about the specification to comments@openadr.org

Table of Contents

Revisions

Version	Changes	Date/Author
0.5	Initial Release	JZ- 5/19/19
0.6	• Adding two missing parameters to voltvar curve • Removed autonomousVRefEnable and autonomousVRefTimeConstant from most sample curve 2030.5 payloads as these attributes are only allowed in voltvar curves • Added a best practice to allow OpenADR equivalents of DefaultDERControl and DERControl to overlap • Fixed "00" in payload value in curve payloads • Implement feedback James Mater, primarily improved positioning statements regarding both CSIP and OpenADR are their respective roles related to this mapping effort. • Fixed various typos	JZ – 5/24/19
0.61	• Minor updates	JZ-8/24/19
0.7	• Minor editorial changes	RB-4/21/20

1 OpenADR California Rule 21 Guidelines

1.1 Introduction

This Addendum outlines how OpenADR 2.0b can be used to achieve the ~~general~~ intent of communicating with smart inverters as outlined in Version 2.1 the Common Smart Inverter Profile Implementation Guidelines (CSIP Guidelines) released in March of 2018 by the California Public Utility Commission.

California's Public Utilities Commission Rule 21 mandates that generating facilities that utilize inverter-based technologies to interconnect with utility IOUs must support an application layer communications protocol. This protocol is used by the utilities to configure advanced inverter functions and receive state information from the inverters.

Rule 21 identifies IEEE 2030.5 as the default protocol used to communicate with the inverter or point of aggregation, although other protocols are permitted under mutual utility/3rd party agreement. The IEEE 2030.5 protocol supports a wide range of DER applications with inverter control representing a subset of that functionality. The major California IOUs created the Common Smart Inverter Profile working group to define a formal profile of IEEE 2030.5 specifically targeted at supporting the Rule 21 requirements. This addendum is intended to describe how OpenADR can also support Rule 21 requirements.

OpenADR and IEEE 2030.5 have distinctly different target use cases. OpenADR typically relies on a gateway device, building energy management system (EMS), or aggregator to translate utility DR requirements into specific device behaviors while IEEE 2030.5 is designed primarily to directly control devices. OpenADR does not intend to duplicate or replace 2030.5. However, many utilities throughout the world have invested in OpenADR infrastructure and would like to leverage that infrastructure to control DER resources including inverter-based technologies. While originally targeted at Demand Response(DR), the OpenADR protocol is very flexible and can easily be adopted to a variety of use cases beyond traditional Demand Response, and including the control of smart inverters and DER resources in general.

This Addendum will take each of the requirements defined by the CSIP Guidelines and show how these requirements can be implemented using OpenADR. This guidance will take the following forms:

- CSIP Guidelines that can be achieved through best practices recommendations, such as specific event signal definitions for communicating advanced inverter functions (Label: **BP**)
- CSIP Guidelines that are supported by OpenADR and require little guidance, such as the security infrastructure (Label: **INFO**)
- CSIP Guidelines that are unrelated to the general intent of Rule 21 such as requirement for pub/sub or access control list functionality. Or CSIP Guidelines that are outside OpenADR's usage model such that they would not make sense to implement. No attempt will be made to conform to these requirements.(Label: **NA**)

Where practical, the sample payloads used to illustrate the OpenADR best practices will retain the IEEE 2030.5 data model which is derived from IEC 61850-7-420.

In no way should this Addendum be construed as an OpenADR version of CSIP itself. As noted, there are many IEEE 2030.5 implementation strategies in CSIP that would be impractical to implement using OpenADR. Rather, this Addendum should be taken as a guide to use OpenADR to achieve the general intent of CA Rule 21 to scale the monitoring and management of DER behaviors to achieve grid stability, reliability and resilience in the face of rapidly expanding DER resources.

1.2 Resource Communication Scenarios

The CSIP Guidelines define two types of IEEE 2030.5 communication scenarios with DER resources: Direct DER Communication and Aggregator Mediated Communication as shown in Figures 1 and 2 respectively. (Images taken from the CSIP Guidelines).

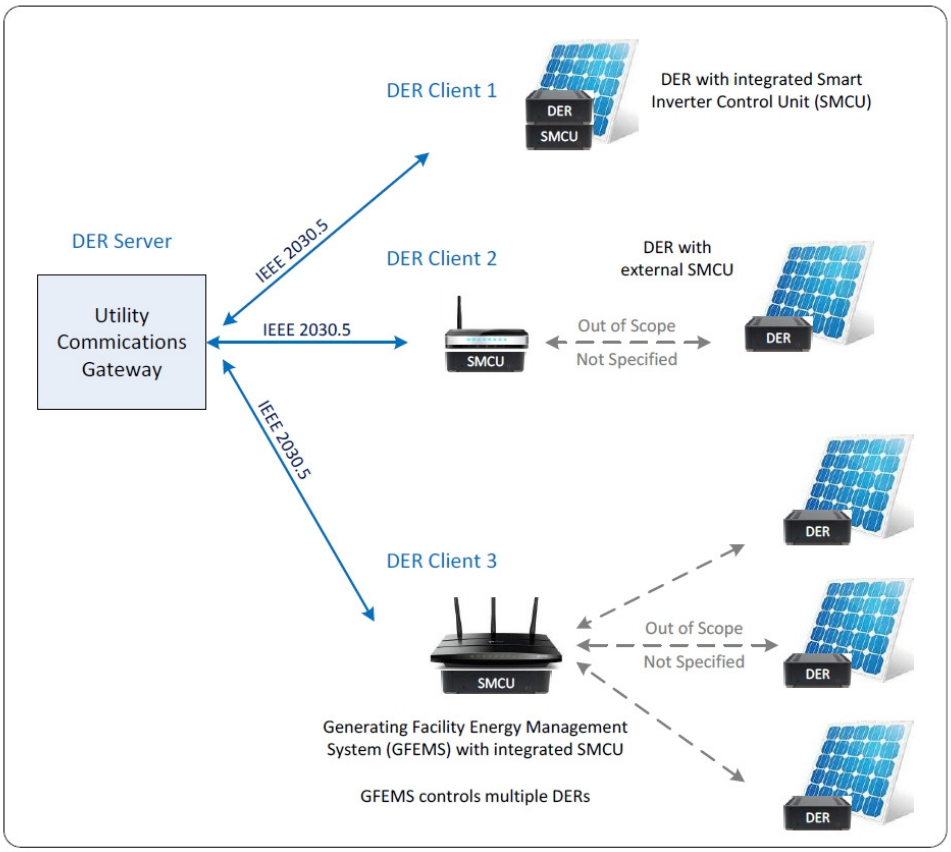

Figure 1 – CSIP Guidelines Direct DER Communication Model

The Direct DER communication model is further subdivided into the follow subgroups:

- **DER with Embedded or Separate Smart Inverter Control Unit (SMCI)**– This is where the utility communicates with a single DER Resource directly via the IEEE 2030.5 protocol, with the IEEE 2030.5 client passing through inverter functions and settings received from the utility to the DER

Resource. **DER with Generating Facility Management System (GFEMS)–** This is where the utility communicates with an IEEE 2030.5 client embedded in an EMS that has one or more DER resources under its control. The IEEE 2030.5 client and its associated EMS application layer mediates the communication between the utility and one of more local DERs under its control. It is the responsibility of the EMS application layer to manage the underlying inverters to meet the requirements of the settings provided by the utility server via IEEE 2030.5.

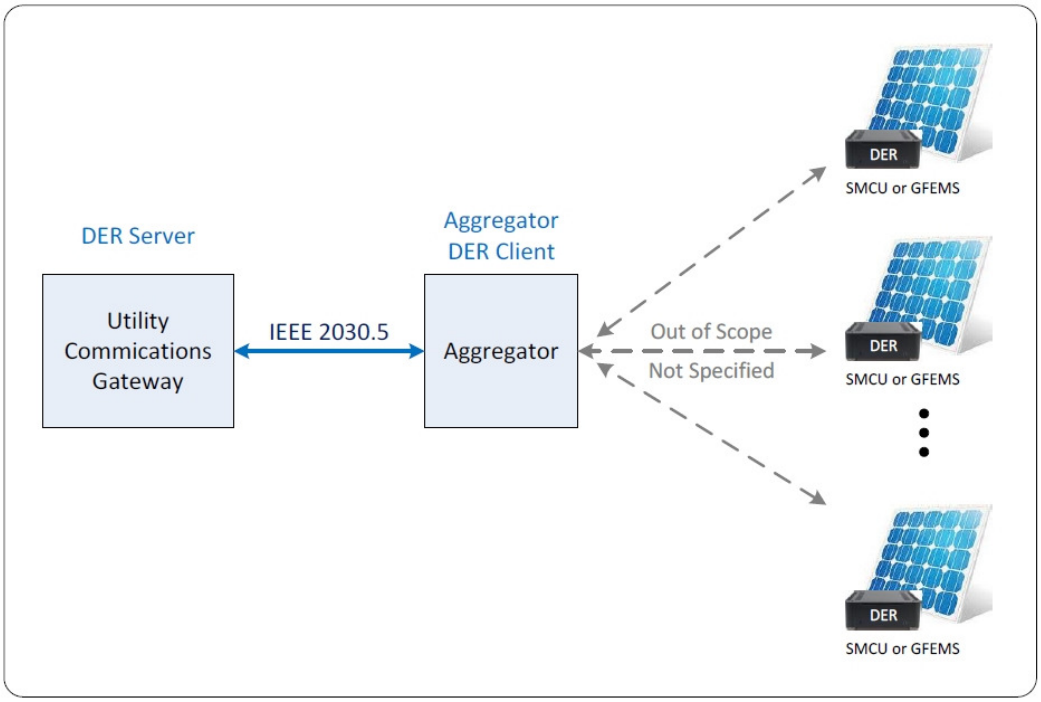

Figure 2 – CSIP Guidelines Aggregator Mediated Communication

In the CSIP Guidelines **Aggregator Mediated Communication** model, the aggregator receives detailed inverter functions and settings from the utility for each of the DER resources associated with the aggregator and the aggregator is obligated to pass through those settings to each of the downstream DER resources. The CSIP Guidelines aggregator also provides reporting for each of the DER resources under its control upstream to the utility. This aggregation scenario is referred to as a "pass-through" aggregation model where the utility is controlling each DER Resource, with the aggregator providing a gateway for that communication.

OpenADR uses a model where the utility typically views the aggregator as a single resource and upon receipt of an event the aggregator decides what downstream resources should have their load profile modified to satisfy the utility's request. This is referred to as a "smart" aggregation model and in fact all OpenADR control interactions assume there is one layer of abstraction between the receipt of control message and the actual changes to downstream resource behavior. ***The OpenADR aggregation model maps perfectly to the CSIP Direct DER Communication model for GFEMS and will be the focus of these best practice's recommendations.***

Note that in both the IEEE 2030.5 CSIP and OpenADR models where the client is not embedded in the DER resource, there is no presumption as to protocol used by the client receiving the utility DER request to command the DER resources.

Aggregator Mediated Communication and DER with Embedded or Separate Smart Inverter Control Unit (SMCUI), both passthrough models, will be out of scope for the OpenADR to CSIP Guidelines mapping. While these recommendations will show how to send inverter function and settings via OpenADR events, it is assumed that some application logic will be applied to the inverter functions and settings defined in the event prior to the VEN commanding downstream DER resources. OpenADR communication upstream will be aggregated reporting, with individual invert status and alert messages being handled by the VENs application layer.

While it would not be impossible to implement the CSIP passthrough model in OpenADR, we believe that OpenADR's classic role of facilitating the message exchange of utility control objectives to an intermediary that has application logic and downstream operational awareness is the most appropriate roll for OpenADR.

It is important to note the overarching intent of Rule 21 and the CSIP requirements is to scale the utilities ability to control millions of individuals DER devices. The specific CSIP model that maps best to OpenADR (DER with Generating Facility Management System) is not the primary use case for CSIP. That being said, we believe that if an aggregator or portfolio of aggregators were able to use the real-time grid topology and conditions in making resource decisions, then an aggregator could potentially accomplish the primary goals of CSIP by taking a utility OpenADR message with specific targeting information and specific grid support requirements for that target and turning them into specific inverter commands (sent possibly by IEEE 2030.5 messages or by an OpenADR message it creates).

1.3 Resource Targeting

In OpenADR, most VENs participate in a single Demand Response (DR) program and events may target different resources associated with the VEN by using OpenADR's abstract targeting such as groupID. IEEE 2030.5 does not support abstract targeting, so the CSIP working group developed a scheme were separate DER programs could be associated with topological or arbitrary groupings of DER resources. This scheme, documented in section 4.3 of the CSIP Guidelines, allows targeting of specific resources at given node in the grid hierarchy by issuing an event to a DER program associated with a specific grouping. As such, the CSIP Guidelines mandate that DER resources will be enrolled in as many programs as groups they belong to.

This addendum recommends retaining OpenADR's model of abstract targeting within the context of a single program to achieve the control of DERs at various nodes in the grid hierarchy by specifying a topological groupID in the event. All other forms of OpenADR targeting will be as part of the best practice's recommendations. However if specific DER resources are targeted, the OpenADR resourceID target should be used for this purpose although there is still the presumption that the VENs application

layer will make decisions about what control to send downstream resources even with the utility targets specific DER resources with the resourceID target.

Below is a slightly modified illustration taken from the CSIP Guidelines showing how grid topology identifiers can be concatenated together to create a group identifier that is assigned to inverters that reside downstream from a given node in the grid topology.

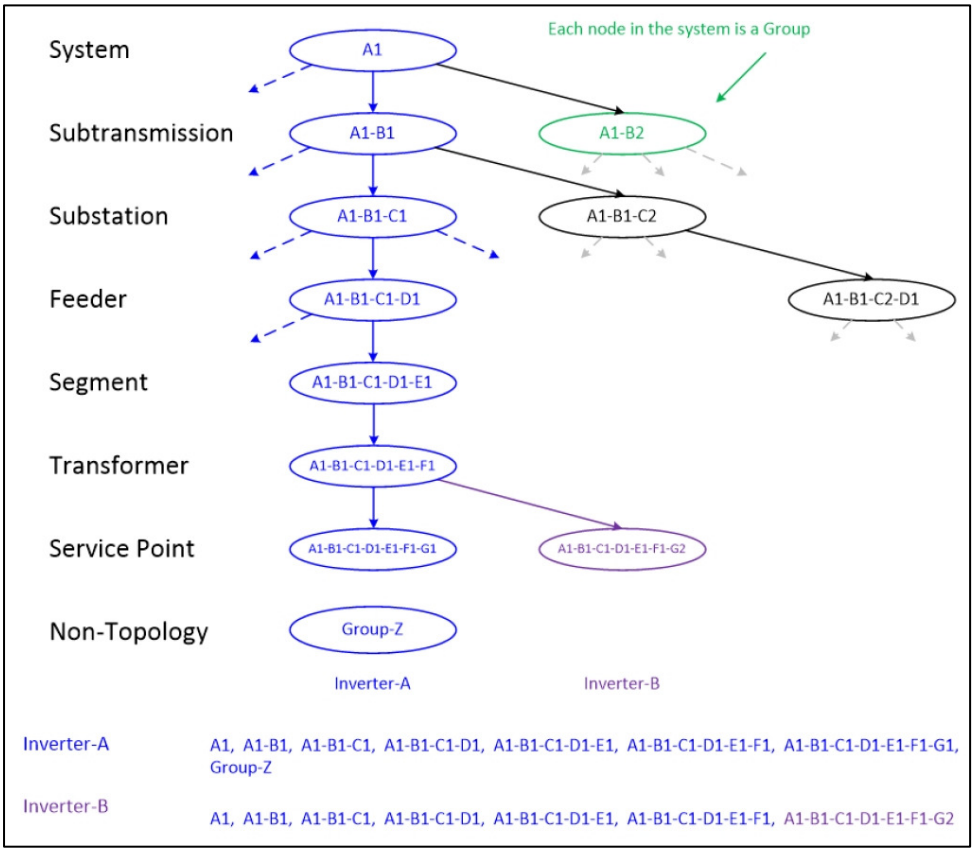

Figure 3 – Grid Topology GroupIDs

1.4 OpenADR and IEEE 2030.5 Schemas

These recommendations use the OpenADR signalType element in oadrDistributeEvent to indicate the general Grid DER Support Function for each signal. The OpenADR signalName element will contain the inverter function names used in IEEE 2030.5 DefaultDERControl and DERControl payloads, with the addition of an "x-" prefix to the signalName. If the inverter function has multiple parameters, these will be implemented in OpenADR as separate signals, using the signalID to differentiate the different parameters.

In general, the OpenADR schema allows enumerated values to be extended by using the "x-" prefix wildcard prefix. In fact, there are 4 enumerated values defined for signalType that include the "x-" prefix to distinguish them from the enumerated values from the Energy Interoperation Specification. However, as part of developing these recommendations, it was discovered that the wildcard functionality for

signalType was inadvertently omitted in the original Energy Interoperation specification and this error carried through to the current OpenADR schema.

An updated OpenADR schema will be released concurrent with the release of this document. It is believed that most existing OpenADR implementations will accept the “x-“ prefix for signalType without generating an error, but this should be verified as part of any deployment.

1.5 Inverter Functions and OpenADR Events

Section 3.0 provides sample OpenADR payloads for each of the inverter functions required by the CSIP Guidelines show in Figure 4 (taken from the CSIP Guidelines. Section 6 provides listings of the reference IEEE 2030.5 payloads that we used as the basis for the OpenADR sample payloads.

Each OpenADR event may contain one or more IEEE 2030.5 inverter functions or settings. The inverter function is uniquely identified with one or more event signals with the signalName element populated with the control names show in Figure 4, prefixed with “x-”. Where a control has more than one parameter, separate signals will be used for each parameter, with the signalID populated with parameter name. If there are no parameters, the signal ID will be populated with the control names shown in Figure 4.

OpenADR interval durations for inverter functions will be ignored from an Event Execution perspective, although the sum of the interval durations must still add up to the overall event duration to remain OpenADR Conformant. An overall event duration of zero indicates a change to the default inverter settings when an event is not active. An overall event duration with a positive value indicates that all the inverter controls in the event should become active at the time indicated by dtStart and last for the duration indicated.

Note that inverter control functions and settings are treated independently. One inverter function can be controlled by an active event while others can be at default settings. Changes to default inverter function or control settings do not impact an active event for the same function or settings, although the new default settings would take effect at the end of the event.

Grid DER Support Functions	IEEE 2030.5 DERControls	IEEE 2030.5 DefaultDERControls
Low/High Voltage Ride Through	*opModLVRTMUSTTrip* *opModLVRTMAYTrip* *opModLVRTMomentaryCessation* *opModHVRTMUSTTrip* *opModHVRTMAYTrip* *opModHVRTMomentaryCessation*	*opModLVRTMUSTTrip* *opModLVRTMAYTrip* *opModLVRTMomentaryCessation* *opModHVRTMUSTTrip* *opModHVRTMAYTrip* *opModHVRTMomentaryCessation*
Low/High Frequency Ride Through	*opModLFRTMUSTTrip* *opModLFRTMAYTrip* *opModHFRTMUSTTrip* *opModHFRTMAYTrip*	*opModLFRTMUSTTrip* *opModLFRTMAYTrip* *opModHFRTMUSTTrip* *opModHFRTMAYTrip*
Ramp Rate Setting		*setGradW* *setSoftGradW*
Connect/Disconnect	*opModEnergize*	*opModEnergize*
Dynamic Volt-VAr	*opModVoltVar*	*opModVoltVar*
Fixed Power Factor Control	*opModFixedPF*	*opModFixedPF*
Real Power Output Limit Control	*opModMaxLimW*	*opModMaxLimW*
Volt-Watt Control	*opModVoltWatt*	*opModVoltWatt*
Frequency-Watt Control	*opModFreqWatt*	*opModFreqWatt*
Set Active Power Mode (in percentage of Max power) (in Watts)	*opModFixedW* *opModTargetW*	*opModFixedW* *opModTargetW*

Figure 4 – CSIP Guidelines Required Inverter Functions

1.6 OpenADR Reporting

As noted previously, the OpenADR best practices recommendations assume a "smart" aggregator model, so OpenADR communication going upstream to the Utility will be aggregate data and NOT individual DER Resource Status messages or Alerts. However, to aid implementers wishing to implement aggregate communications, Section 5 provides a sample IEEE 2030.5 DER Availability report using the OpenADR reporting service.

1.7 CSIP and OpenADR Requirements

The left column of table in Section 2 below is taken from Appendix A of the CSIP Guidelines, with the right column providing OpenADR best practices recommendations. References to the "OpenADR Specification" in this document refers to version 1.1 of the *OpenADR 2.0 Profile specification - B Profile*. Note that the OpenADR 2.0 Profile Specification remains unaffected by this amendment. Rather, this amendment adds optional guidelines (where necessary) for the base standard.

1.8 General Assumptions and Observations:

- As this Addendum is focused on recommendations and optional features, not requirements, the word "Should" is used rather than "Must" or "Shall" throughout the OpenADR best practice's recommendations. This could change in the future if certification for CSIP Guidelines is envisioned.
- The term "DER Resource" and "inverter" will be used interchangeably although technically DER is a logical concept and could consist of multiple inverters.

- The terms “control” and “event” are used interchangeably in the OpenADR best practices recommendations.
- Edge VENs refer to VENs that are directly associated with resources and have control over those resources.
- 2030.5 uses a timestamp in seconds from Epoch time and uses seconds for duration values. OpenADR uses dateTime and duration values as specified by ISO 8601.
- In the absence of additional targeting information or where just the venID is listed as a target, to all the underlying DER resources associated with the VEN will be considered target of an event
- OpenADR targeting objects will be used to provide guidance to the VEN application layer regarding the intent of the DER event. Where targeting addresses individual inverters, the resourceID targeting object shall be used. The resourceID shall be unique within the scope of VTN. Configuration of the resourceID mapping on the VEN and VTN should be done out of band.
- In DR use cases, typically only one event executes at a time on a VEN. With DER use cases, various DER control events containing mutually exclusive inverter functions and settings may be sent with overlapping or nested time frames requiring VENs to execute multiple concurrent events. This may be an issue with some early VEN implementations where conformance rules required VENs to reject overlapping invents in the same marketContext. Conformance rules were subsequently changed to all overlapping event on a deployment specific basis.
- References to “events” in this document specifically refer to OpenADR events
- In general, VENs have a relationship with a single VTN, although there may be special use cases where a VEN polls multiple VTNs for events.
- The IEEE 2030.5 specific refers to the various data model artifacts using UML modeling terminology including classes, objects, attributes, and parameters. Objects appear to be groups of attributes associated with a class. The terms attribute and parameter seem to be used somewhat interchangeable. In OpenADR data model artifacts use XML terminology including element and attribute. Note that a UML attribute is not the same things as an XML attribute.

2 Best Practices Recommendations

The following tables list each of the requirements in the CSIP Guidelines along with corresponding best practices recommendations.

2.1 CSIP Guidelines General Requirements

ID	CSIP Guidelines General Requirements	OpenADR Best Practices
G1	Each DER Client SHALL connect to the utility in one and only one scenario.	**INFO:** CSIP Guidelines define two distinct communication models between a client and a server: Direct and Aggregator Mediated. OpenADR makes no such distinction and these best practices recommendations will focus on the Direct DER Communication model for GFEMS.
G2	Although outside the scope of CSIP Guidelines, security SHOULD be used in all non-IEEE 2030.5 interactions between the Aggregators, site hosts, GFEMS, and DERs and other entities receiving or transmitting DER related communications	**INFO:** The utilities Interconnection Handbook may provide guidance on non-OpenADR secure communications between the VEN and its associated resources. However, communication between the Ven and downstream resources is out of scope for the OpenADR protocol.
G3	For DER Clients that have an IEEE 2030.5 certificate, the GUID SHALL be derived from this certificate (see section 5.2.1.2).	**INFO:** OpenADR specification section 10.5.1 states that a fingerprint derived from the VEN x.509 certificate can be used to uniquely identify a VEN upon connection with a VTN. Once the VEN has been uniquely identified, the venID element of payloads generated by the VEN is used as a proxy for the fingerprint.
G4	Implementers SHALL refer to each utility's Interconnection Handbook for requirements related to the creation, use or management of this identifier.	**INFO:** The OpenADR specification allows the VTN to dynamically allocate a venID for use by the VEN during the registration process or for the VEN to use a pre-allocated venID. The utilities Interconnection Handbook may provide guidance related to the creation, use or management of the venID.

G5	Aggregators and DER Clients SHALL support IEEE 2030.5 based grouping and full lifecycle management of group relationships as defined within Section 5.2.3 and within each utility's Interconnection Handbook or program/contract requirements.	**BP:** Detail recommendations: • Use groupID for event targeting of multiple DER Resources to a grid topology • groupID values should use a grid topological naming convention or arbitrary grouping • For grid topology targeting, DER Resources should be mapped to all the groupIDs associated with their path along the grid topology where events might be targeted. Narrative: Refer to section 1.3 of this document for further information

G6	Autonomous functions' default settings SHALL be changeable via IEEE 2030.5 *DefaultDERControl* communications.	**BP:** Detail recommendations: • Inverter Control Events sent to a VEN with a duration of zero, should immediately change the default behavior of the targeted DER resources for an indefinite duration • DER Resources should return to the previously set default behavior upon completion of a limited duration Event Narrative: OpenADR does not have the notion of changing the default state of a device. The closest it comes is the issuance of open ended events by using a duration of zero. In this situation the change in state set by the event will remain in effect until the event is cancelled or overridden. In IEEE 2030.5 there are two distinct controls, one for changing the default state and one for issuing temporary changes in state like an OpenADR event. The best practices recommendation is to have the VEN, upon receipt of an event with a duration of zero, to modify the default state of the DER Resource. The best practices recommendations for the specific Autonomous Functions shown in table 1 of the CSIP Guidelines is covered in the best practice's recommendations for CSIP Guidelines ID P29.
G7	Modifications to default settings SHALL occur immediately upon receipt and have an indefinite duration.	**INFO:** This requirement is covered by the best practice's recommendation for CSIP Guidelines ID G6

G8	Scheduling Autonomous and Advanced Power Values and Modes SHALL be controllable via IEEE 2030.5 *DERControl* events	**BP:** Detail recommendations: • Inverter function Events sent to a VEN with a non-zero duration should be used for scheduling Autonomous and Advanced Power values and modes. • Individual interval durations should be ignored. Narrative: OpenADR's non-zero duration Events provide the same functionality as the IEEE 2030.5 DERControl events noted in this requirement. The best practices recommendations for the scheduled Autonomous and Advanced power values and modes shown in table 1 of the CSIP Guidelines is covered in the best practice's recommendations for CSIP Guidelines ID P29.
G9	Aggregators and DER Clients SHALL be responsible for assuring that all operations received from the utility are processed in the appropriate time sequence as specified by the utility.	**INFO:** Executing events for the time frames specified by the utility is an intrinsic part of OpenADR's functionality.

G10	An Aggregator acting for its DERs and DER Clients SHALL be able to store at least 24 scheduled DER control events for each DER.	**BP:** Detail Recommendations: • VENs should be able to store 24 Events for each targeted group the VTN is likely to dispatch events to for a given program Narrative: IEEE 2030.5 uses an aggregator passthrough model, meaning that the aggregator will receive events for each DER Resource it is managing and must be capable of storing up to 24 Events for each DER Resource. As outlined in section 1.2 of this document, the IEEE 2030.5 aggregator mediated communications are out of scope for these recommendations. VENs playing the role of a "smart aggregator" will receive inverter function and settings events from utilities. Utilities may include in the targeting information in these events (i.e. groupIDs, etc.), providing guidance as to the intent of the event to the aggregator's application layer, aiding in the dispatch of inverter controls and settings to the underlying DER resources. As with
G11	In the absence of scheduled controls, DERs SHALL maintain a default control setting specified by interconnection tariffs or the utility Interconnection Handbook.	**INFO:** The utilities Interconnection Handbook may provide guidance as to the initial default control settings for resources associated with the VEN. Note that these default settings may be overridden by an inverter control or settings event with a zero duration as defined in the recommendations for CSIP Guidelines ID G6.

G12	Should there be a loss of communications, DERs SHALL complete any scheduled events and then revert to default settings or as determined by the site host or tariffs/contracts.	**INFO:** OpenADR's default behavior would be to complete the event and return to normal operations (default settings) upon completion of the event, although this is not explicitly mandated in the OpenADR conformance rules. Note that the best practices recommendation for CSIP Guidelines ID G6 outlines how OpenADR can modify the defaults settings.
G13	When commanded in a manner where two or more operations are possibly in conflict, the interpreting system SHALL operate against the control operation which has the highest priority subject to the systems capability, contracts and self-protection requirements.	**BP:** Detail Recommendations: • When two events contain the same inverter function or setting and the active time frames that overlap, they shall be considered overlapping events. • VTNs should not send overlapping or nested events • VENs should generate an OpenADR 4xx response in oadrCreatedEvent upon receipt of overlapping or nested events • An OpenADR Event with a duration of zero (default state change) may be sent while an event is executing with the same inverter function or setting. The updated default state will take effect when the active event completes execution. Narrative: OpenADR leaves the handling of overlapping events to deployment specific rules. IEEE 2030.5 mandates specific behavior when events with the same Grid Support function overlap (i.e. highest priority takes precedence). 2030.5 uses a value called primacy in DER Controls , whereas OpenADR uses an event payload value named priority. These two values are equivalent. Note: This topic is discussed in more detail in section 3.0.

G14	If avoidance of conflicting commands is not possible, the more recently received command SHOULD have precedence over the older command.	**INFO:** See best practices recommendation for CSIP Guidelines ID G13.
G15	In either case, it SHALL be the responsibility of the aggregator or DER Client to decide how to handle these two simultaneous controls.	**INFO:** See best practices recommendation for CSIP Guidelines ID G13.
G16	For Aggregator communications, notifications and call backs (subscription/notification) SHALL be used to limit system polling to the greatest extent practical.	**INFO:** This recommendation is intended to limit the amount of traffic between the aggregator and the utility by using the 2030.5 pub/sub functionality for notification of new controls for downstream DER resources. OpenADR does not have pub/sub capabilities, although the use of a push message exchange model can reduce network traffic to some extent. As these best practice's recommendations envision a "smart aggregator" model with a small number of events flowing from the utility to the aggregator and the reports flowing from the aggregator to the utility being consolidated reports, if not then the amount of network traffic will be minimal even using a pull exchange model.
G17	To simplify communication requirements for Direct DER Communications scenarios, unless specified otherwise in utility Interconnection Handbooks or programs/contracts, all communications SHALL be initiated by the DER Client (i.e., client-side initiation).	**NA:** OpenADR supports both a push and pull message exchange model. However, almost all implementations of OpenADR use the pull exchange model for what CSIP Guidelines refer to as direct DER communications. It seems unnecessary and unrelated to the core functionality recommended in CSIP Guidelines to constrain OpenADR communication between edge DER resources and upstream nodes to a pull exchange model.
G18	In Direct DER communication scenarios, the DER Client SHALL initiate communications with the utility according to a pre-defined polling and posting interval to ensure the DER has up to date settings and the utility understands the operational state of the DER.	**INFO**: This is consistent with OpenADR's polling mechanism where as part of registration the VTN requests a specific polling interval from the VEN.

G19	Unless specified in each utility's Interconnection Handbook, default polling and posting rates SHALL be as follows: -Polling of *DERControls* and *DefaultDERControls* (Direct DER Communication)– every 10 minutes -Posting monitoring information (Direct and Aggregator Mediated Communications)– every 5 minutes	**BP:** Detail Recommendations: • Edge VENs should poll upstream resources at least once every 10 minutes • Aggregators, if not configured to accept push messaging, should poll the Utilities at least once every 10 minutes Narrative: As previously noted in the best practice's recommendation for CSIP Guidelines ID G17, there does not seem a need to mandate push communication for aggregator to utility communication. In OpenADR the VTN controls how frequently telemetry reports are delivered, so it seems unnecessary to mandate a reporting frequency in these best practice's recommendations.
G20	For DERs with an external SMCU, the SMCU SHALL transfer the DER control to the generating facility within 10 minutes of receiving the control from the server.	**BP:** Detail Recommendations: • Edge VENs should send control signals to associated resources within 10 minutes of receiving an event from upstream resources
G21	For DERs with a GFEMS, the GFEMS SHALL transfer the DER control to the DERs within 10 minutes of receiving the control from the server.	**BP:** Detail Recommendations: • Edge VENs should send control signals to associated resources within 10 minutes of receiving an event from upstream resources

G22	For DERs mediated by Aggregators, the Aggregator SHALL transfer the DER control to the DERs within 15 minutes of receiving the control from the server.	**BP:** Detail Recommendations: • Aggregator VENs that receive signaling from a Utility should send control signals to downstream resources within 15 minutes of receiving an event from the Utility
G23	Aggregators acting for its DERs and DER Clients SHALL have the capability to report the monitoring data in Table 2.	**NA:** In the 2030.5 model it is assumed that IEEE 2030.5 clients will be reporting monitoring data for every associated DER Resource to upstream entities. In OpenADR, VENs typically report aggregate data to upstream entities. These recommendations do not envision a VEN playing a pass-through aggregator role communicating detailed DER resource specific status information upstream to the utility. It is assumed that nameplate ratings, adjusted settings, operational status, and alarm data communications will occur between the DER Resources and the aggregator VEN, and that aggregate situational status information will be compiled by the VEN application layer and made available to the utility in the form of OpenADR reports.
G24	Aggregators acting for its DERs and DER Clients SHALL have the capability to include the data qualifiers in Table 3.	**NA:** See best practices recommendation for CSIP Guidelines ID G23.

G25	All measurements SHALL include a date-time stamp.	**BP:** Detail Recommendations: • For aggregate reporting from the VEN to upstream resources, each OpenADR report interval should contain a dtStart element with a data-time value. This should hold true for of all reports offered by OpenADR in the context of these CSIP Guidelines mapping recommendations. Narrative: OpenADR conformance rule 315 describes various scenarios where dtstart and/or duration are required as part of report interval data. While a time stamp could be derived from just duration data in intervals, it is recommended that dtstart time stamp be included as part of each report interval.
G26	Unless otherwise specified in each utility's Interconnection Handbook or programs/contracts, Aggregators acting for its DERs and DER Clients SHALL report the monitoring data in Table 2 and MAY include the data qualifiers in Table 3	**NA:** See best practices recommendation for CSIP Guidelines ID G23.
G27	For those situations where the DERs cannot provide Monitoring Data, the Aggregator acting for its DERs and DER Clients SHALL not send the data.	**INFO:** In OpenADR reports are offered by the VEN and requested by the VTN. In a scenario where DERs lack the capability to send monitoring data, the VEN would not offer such a report and therefore the aggregator would not have data to send upstream. In the case of a transitory problem where DER cannot provide monitoring data, OpenADR requires that placeholder data be sent with a "Quality Bad" enumeration in the dataQuality element. See best practices recommendation for CSIP Guidelines ID G23

G28	Aggregators acting for its DERs and DER Clients SHALL have the capability to report the Nameplate Ratings and Adjusted Settings information shown in Table 4.	**NA:** See best practices recommendation for CSIP Guidelines ID G23
G29	Nameplate Ratings and Adjusted Settings SHOULD be reported once at start-up and whenever there is a change in value.	**NA:** See best practices recommendation for CSIP Guidelines ID G23
G30	Aggregators acting for its DERs and DER Clients SHALL have the capability to report the dynamic Operational Status Information shown in Table 5.	**NA:** See best practices recommendation for CSIP Guidelines ID G23
G31	Aggregators acting for its DERs and DER Clients SHALL have the capability to report the alarm data shown in Table 6 as they occur.	**NA:** See best practices recommendation for CSIP Guidelines ID G23
G32	All alarms and their “return to normal” messages SHALL include a date-time stamp along with the alarm type.	**NA:** See best practices recommendation for CSIP Guidelines ID G23

2.2 CSIP Guidelines IEEE 2030.5 Protocol Requirements

ID	IEEE 2030.5 Protocol Requirements	OpenADR Best Practices
P1	The specific version of the protocol implemented SHALL be IEEE 2030.5-2018.	**NA:** This is a CSIP Guideline unrelated to the general intent of Rule 21
P2	Utility servers, Aggregators, and DER Clients SHALL support all CSIP required IEEE 2030.5 function sets and resources in Table 7.	**NA:** This is a CSIP Guideline unrelated to the general intent of Rule 21
P3	Unless otherwise specified in the utility's Implementation Handbook, coordination of this time and rates for updating this time SHALL conform to the requirements of IEEE 2030.5-2018.	**INFO:** OpenADR does not have a formal time synchronization mechanism, however OpenADR conformance rule 114 requires a deployment specific "reasonable" time synchronization between the VEN and VTN.
P4	Aggregators acting for its DERs and DER Clients SHALL support the *EndDevice:DER* resources in Table 8 if the utility server makes them available.	**NA:** See best practices recommendation for CSIP Guidelines ID G23
P5	Aggregators and DER Clients SHALL meet all IEEE 2030.5 mandatory requirements that are described in the standard for each of these sections/functions unless otherwise specified in utility Interconnection Handbooks or programs/contracts.	**NA:** This is a CSIP Guideline unrelated to the general intent of Rule 21
P6	HTTPS SHALL be used in all Direct and Aggregated communications scenarios.	**INFO:** OpenADR also requires HTTPS or similarly secured XMPP communication.
P7	Aggregators and DER Clients SHALL support the required IEEE 2030.5 security framework and other security frameworks as required by the utility Interconnection Handbook or programs/contracts.	**INFO:** OpenADR and 2030.5 both define use of TLS 1.2, authentication of both client and server x.509 certificates, similar SHA-256 certificates, and use of a hashed fingerprint based the x.509 certificate for authorization.
P8	TLS version 1.2 SHALL be used for all HTTPS transactions.	**INFO:** OpenADR requires TLS 1.2

P9	DER Clients SHALL support the IEEE 2030.5 cipher suite.	**INFO:** OpenADR Requires SHA-256 X.509 certificates, although not the exact same ciphers as required by 2030.5
P10	Aggregators SHALL also support the TLS_RSA_WITH_AES_256_CBC_SHA256 cipher suite or other cipher suites as specified by the utility Interconnection Handbook or programs/contracts.	**INFO:** OpenADR requires SHA-256 X.509 certificates, although not the exact same ciphers as required by 2030.5
P11	All utility servers, Aggregators, and DER Clients SHALL have a valid certificate.	**INFO**: OpenADR Requires a valid certificate.
P12	A valid certificate SHALL be used in all IEEE 2030.5 TLS transactions.	**INFO**: OpenADR Requires a valid certificate to be used with TLS transactions.
P13	Certificates for Aggregators and DER Clients SHALL only be provisioned upon completion of Conformance Testing.	**INFO**: OpenADR follows similar guidelines.
P14	The GUID for both Aggregators and DERs SHALL be the IEEE 2030.5 Long Form Device Identifier (LFDI) which is based on the 20-byte SHA-256 hash of the device's certificate.	**INFO:** OpenADR specification section 10.5.1 states that a fingerprint derived from the VEN x.509 certificate can be used to uniquely identify a VEN upon connection with a VTN. Once the VEN has been uniquely identified, the venID element of payloads provided by the VEN is used as a proxy for the fingerprint. All VEN to VTN payloads include a venID
P15	The certificates specified by each utility SHALL be used for authentication.	**INFO**: OpenADR has a designated certificate authority that issues certificates, but utilities have the freedom to specify security requirements as required for their deployments.

P16	If authentication fails, the authenticator SHOULD issue a TLS Alert – Bad Certificate and close the connection.	**NA:** Specific TLS alert messages are outside the scope of the OpenADR standard although TLS 1.2 is required for OpenADR and expired certs are tested as part of OpenADR certification.
P17	For Aggregators and DER Clients, the authorization list SHALL be based on the LFDI since the SFDI may not provide enough collision protection for a large population (e.g. 1 million) of devices.	**INFO:** OpenADR used the venID element as a proxy for a fingerprint derived from the X.509 cert. venID is used to uniquely identify the VEN when communicating with a VTN.
P18	If the device is not on the authorization list, the utility server SHOULD return an HTTP error code (e.g. 404 – Not Found) to terminate the transaction.	**NA:** Specific HTTPS error codes are outside the scope of the OpenADR standard, although OpenADR does specify some specific error codes. In OpenADR it is assumed that the fingerprint or associated resourceID is mapped to a specific utility backend account, providing an effective authorization list.
P19	The utility SHALL establish the permissions for read, write, control, and other interactions, based on agreements on which interactions are authorized between each DER and the utility.	**NA:** Access control lists are a CSIP Guidelines unrelated to the general intent of Rule 21
P20	When an Aggregator accesses the *EndDeviceList*, the utility server SHALL only present *EndDevices* that are under the management of that Aggregator.	**INFO:** In the CSIP Guidelines model, the aggregator obtains a list of DERs, identified by their LFDI, to manage. However, the mapping of the LFDI to DER resource must be done on both the client and server out of band. While these recommendations do not envision a VEN playing a pass-through aggregator role, there will be a need for out of band mapping of DER resources on VENs and VTNS for targeting objects used in OpenADR events
P21	In the Direct DER Communications scenario, the GUID used to identify the DER Client SHALL be the DER's LFDI.	**INFO:** OpenADR uses the venID element as a proxy for a fingerprint derived from the X.509 cert. venID is in all payload initiated by the VEN.

P22	Implementers SHOULD refer to each utility's Interconnection Handbook or programs/contracts for more information needed to establish the LFDI.	**NA:** This is a CSIP Guideline unrelated to the general intent of Rule 21
P23	Aggregators acting for its DERs and DER Clients SHALL track the *DERProgram* associated with that group.	**INFO:** In 2030.5 there is one DER program for each group, so this requirement is really stating that the client should monitor each of the programs to see if there are any events. In OpenADR there is typically one program a client is enrolled in and zero or more groups associated with that program. OpenADR clients typically poll the server, and the server is obligated to return all relevant events when polled, so by definition OpenADR clients will track programs associated with all groups.
P24	Aggregators acting for its DERs and DER Clients SHALL support up to 15 *DERPrograms* simultaneously for each DER.	**NA:** This requirement is unnecessary for OpenADR as groups are defined within the context of a program, where in the CSIP Guidelines for IEEE 2030.5 there are as many programs as there are groups. Furthermore, OpenADR VENs playing the role of an aggregator are receiving aggregate DER Events from the utilities, not events specific to each downstream DER.
P25	Aggregators acting for its DERs and DER Clients SHALL traverse all these links and lists to discover all *DERPrograms* the DER is required to track.	**NA:** In 2030.5 aggregators use discovery to obtain links used to monitor DER programs for control events. This is not relevant to the OpenADR usage model where clients (VENs) poll servers (VTNs) at well know endpoint for all relevant inverter function control events.
P26	For each DER *EndDevice*, the utility server SHALL use one FSA to point to a *DERProgramList* containing all topology-based *DERPrograms* and MAY use additional FSAs to point to a *DERProgramList* containing non-topology-based *DERPrograms*.	**NA:** This requirement is 2030.5 specific, defining how a client discovers links to lists of DER programs. This is not relevant to OpenADRs usage model where the specific programs supported are configured out of band on OpenADR clients.

P27	DER Clients SHALL be capable of supporting 15 FSAs.	**NA:** This is a CSIP Guideline unrelated to the general intent of Rule 21
P28	For the CSIP Guidelines Direct Communication scenario, the DER Client SHALL only receive function set assignments for a single energy connection point reflecting the aggregate capabilities of the plant at its point of common coupling with the utility.	**INFO:** This requirement just states that in the 2030.5 Direct Communication scenario, the client should be treated as a single logical DER resource reflecting the aggregate capabilities of the actual DER resources associated with the client. This is consistent with the OpenADR Usage model.

P29	DER Clients SHALL use the IEEE 2030.5 mappings for the Grid DER Support Functions shown in Table 9.	**BP:** Detail Requirements: • Inverter function controls and settings will be communicated using the OpenADR oadrDistributeEvent payload • The OpenADR Event object signalType element should contain the CSIP Grid Support Function name, prefixed with "x-", shown in table 9 of the CSIP Guidelines. Refer to sample payloads in section 4 of this document for specific syntax. • The OpenADR Event object signalName element should contain the inverter function control name shown in the CSIP Guidelines table 9, prefixed with "x-" • For non-curve related inverter controls and settings without parameters, the OpenADR Event object signalID element should contain the inverter function control name shown in the CSIP Guidelines table 9, without the "x-" prefix added • For curve related 2030.5 DER Controls and inverter controls and settings with parameters, the OpenADR Event object signalID element should contain the inverter function or settings parameter name Narrative: Sample OpenADR oadrDistributeEvent payloads are provided for each Grid DER Support function shown in the CSIP Guidelines Table 9 in section 3 of this document.

P30	*DERControls* are IEEE 2030.5 events and SHALL conform to all the event rules in Section 12.1.3 of IEEE 2030.5-2018.	**BP:** OpenADR allows overlapping and nested events to occur, however specific client behaviors are defined on a deployment specific basis. Section 4.0 of this document provides best practices recommendations for each of the event rules and guidelines in the IEEE 2030.5 specification. Note: The section number "12.1.3" in this requirement is incorrect. It should be "10.2.3 Event rules and guidelines"
P31	Aggregators SHALL subscribe to each *DERProgramList* assigned to its DERs to discover changes in *DERProgram*:*primacy*.	**NA:** Primacy is equivalent to OpenADR's priority element. OpenADR will provide the VEN with an updated event anytime the priority changes. As these best practice's guidelines do not allow VTNs to send overlapping events, this requirement is not applicable.
P32	Aggregators SHALL subscribe to the *DERControlList* of each *DERProgram* assigned to its DERs to discover new controls or changes to existing controls.	**INFO:** In OpenADR any time a new event is targeted at a VEN or an existing event is modified, the VTN will provide the event to the VEN.
P33	Aggregators SHALL subscribe to the *DefaultDERControl* of each *DERProgram* assigned to its DERs to discover changes to the default controls.	**INFO:** In OpenADR any time a new event is targeted at a VEN or an existing event is modified, the VTN will provide the event to the VEN.
P34	Unless otherwise specified in utility Interconnection Handbooks or programs/contracts to allow subscriptions, DER Clients SHALL poll to each *DERProgram* assigned to it to discover changes in *DERProgram*:*primacy*.	**NA:** Primacy is equivalent to OpenADR's priority element. OpenADR will provide the VEN with an updated event anytime the priority changes. As these best practice's guidelines do not allow VTNs to send overlapping events, this requirement is not applicable.

P35	Unless otherwise specified in utility Interconnection Handbooks or programs/contracts to allow subscriptions, DER Clients SHALL poll to the *DERControlList* of each *DERProgram* assigned to it to discover new controls or changes to existing controls.	**INFO:** In OpenADR any time a new event is targeted at a VEN or an existing event is modified, the VTN will provide the event to the VEN.
P36	Unless otherwise specified in utility Interconnection Handbooks or programs/contracts to allow subscriptions, DER Clients SHALL poll to the *DefaultDERControl* of each *DERProgram* assigned to it to discover changes to the default controls.	**INFO:** In OpenADR any time a new event is targeted at a VEN or an existing event is modified, the VTN will provide the event to the VEN.
P37	The utility MAY optionally specify a recommended polling rate for these resources using the *DERProgramList:pollRate* resource.	**INFO:** In OpenADR there is a single polling interval that is determined during registration by the VTN.
P38	If the polling rate is specified, DER Clients SHOULD poll at this rate.	**INFO:** In OpenADR there is a single polling interval that is determined during registration by the VTN.
P39	Aggregators SHALL subscribe to the following lists: • *EndDeviceList* • *FunctionSetAssignmentsList* of each of the DERs under its management • *DERProgramList* of each of the DERs under its management • *DERControlList* of each of the DERs under its management • *DefaultDERControls* of each of the DERs under its management	**NA:** This is a 2030.5 specific requirement not relevant to OpenADR DER use case model
P40	Aggregators MAY subscribe to other lists and instances, such as EndDevice, DERProgram, DERControl instances and others	**NA:** This is a 2030.5 specific requirement not relevant to OpenADR DER use case model

P41	Aggregators acting for its DERs and DER Clients SHALL use the IEEE 2030.5 Metering Mirror function set to report metrology data. <Tables 10 and 11>	**NA:** See best practices recommendation for CSIP Guidelines ID G23.
P42	Aggregators acting for its DERs and DER Clients SHOULD post readings based on the *MirrorUsagePoint*:*postRate* resource.	**NA:** See best practices recommendation for CSIP Guidelines ID G23.
P43	Aggregators acting for its DERs and DER Clients SHALL be able to report the information shown in Table 12.	**NA:** See best practices recommendation for CSIP Guidelines ID G23.
P44	Aggregators acting for its DERs and DER Client SHALL be able to report the dynamic status information shown in Table 13.	**NA:** See best practices recommendation for CSIP Guidelines ID G23.
P45	DER Clients SHALL be able to report alarm data shown in 14.	**NA:** See best practices recommendation for CSIP Guidelines ID G23.
P46	The Aggregator SHOULD subscribe to the *EndDeviceList* to receive notifications for any additions or changes to the list.	**NA:** OpenADR does not support pub/Sub notifications. The pub/sub requirements deal with 2030.5 pass-through aggregators keeping track of their assigned DER resources. This is not relevant to these best practice's recommendations.
P47	The Aggregator SHOULD subscribe to each *EndDevice* instance under its control to receive notifications for any deletions of that instance.	**NA:** Refer to best practice's recommendations for CSIP Guideline ID P46
P48	For every inverter under its control, the Aggregator SHOULD subscribe to the list pointed to by *EndDevice: FunctionSetAssignmentsListLink* to receive notifications for any changes in the inverter's group assignments.	**NA:** Refer to best practice's recommendations for CSIP Guideline ID P46
P49	For every inverter under its control, the Aggregator SHOULD subscribe to all of the *DERControlLists* associated with its FSA groups and *DERProgram* assignments to receive notifications for any new or changed *DERControl* events.	**NA:** Refer to best practice's recommendations for CSIP Guideline ID P46

P50	For every inverter under its control, the Aggregator SHOULD subscribe to all of the *DERPrograms* associated with its FSA groups to receive notifications for changes to the *DERProgram* meta-data.	**NA:** Refer to best practice's recommendations for CSIP Guideline ID P46
P51	For every inverter under its control, the Aggregator SHOULD subscribe to all of the *DERProgramLists* associated with its FSA groups to receive notifications for additions, deletions, or changes to the list.	**NA:** Refer to best practice's recommendations for CSIP Guideline ID P46
P52	Maintenance of subscriptions is described previously for the IEEE 2030.5 Specification. In particular: • The Aggregator Client SHOULD renew its subscriptions periodically (e.g. every 24 hours) with the Utility Server. • The Aggregator Client SHOULD fall back to polling on perceived communications errors.	**NA:** Refer to best practice's recommendations for CSIP Guideline ID P46

3 Event Rules and Guidelines

This table documents the OpenADR best practices recommendations for the Event Rules and Guidelines found in section 10.2.3.3 of the 2030.5-2018 specification. CSIP Guidelines ID P30 requires support for these rules and guidelines. Note that the terms “overlapping” and “nested” events in this appendix refer to two events with the same inverter function or setting scheduled to execute in the same time frame.

Section 10.2.3.3 **IEEE 2030.5 Event Rules and Guidelines**	**OpenADR Best Practices**
a) Clients that act on events that do not subscribe to their Event lists SHALL poll the lists for new Events at least once every 15 minutes and SHOULD poll at least every 5 minutes.	**NA:** In OpenADR that VTN determines the polling intervals, so this rule is not relevant.
b) Clients SHALL monitor the active Event(s) for status changes at least once every 15 minutes and SHOULD monitor at least once every 5 minutes. Note that these resources might be acquired in meeting requirement a) above; additional polling might not be needed.	**NA:** The OpenADR VTN is obligated to deliver new or modified events when polled or in a push exchange model when changes occur.
c) Editing Events SHALL NOT be allowed except for updating status. Service providers SHALL cancel Events that they wish clients to not act upon and/or provide new superseding Events.	**NA:** OpenADR allows events to be modified at any time provided the characteristics modified are not in the past.
d) For function sets with direct control, Flow Reservation Responses with the same subject mRID, and the Pricing function set, clients SHALL NOT simultaneously execute or report execution of multiple simultaneous Events (e.g., Nested Events and Overlapping Events). The rules below clarify the expected behavior in cases in which either of these situations arises.	**NA:** Flow Reservation and Pricing function sets do not play a role in the CSIP Guidelines Inverter 2030.5 requirements.

e) A client SHALL consider the current Event complete if a superseding Event is started.	**BP:** Detail Recommendations: • VTNs should not send overlapping or nested events where the DER control signal is the same as a previously sent event • VENs should return an application level 4xx error if it receives an overlapping event where the DER control signal is the same Narrative: In 2030.5 a superseding event is one where the same inverter function control or setting is sent such that it overlaps or nests with a previously sent event containing the same control. A superseding event in 2030.5 causes the prior event to terminate and the new one to start. OpenADR does not support this behavior model.
f) When comparing two Nested Events or Overlapping Events from servers with the same primacy, the creationTime element SHALL be used to determine which Event is newer and therefore supersedes the older. The Event with the larger (e.g., more recent) creationTime is the newer Event.	**NA:** Refer to best practice's recommendations in this section for requirement "e" . VTNs should not send overlapping or nested events.
g) Events presented to the HAN SHOULD make minimum use of Overlapping Events and Nested Events. Overlapping Events and Nested Events SHOULD only be used where changing conditions mandate superseding previous Events.	**NA:** Refer to best practice's recommendations in this section for requirement "e". VTNs should not send overlapping or nested events.

h) When changing conditions mandate changes in the sequence or contents of Events, the following guidelines MAY be used to indicate desired actions: **1)** Canceling existing Events and reissuing new Events. **2)** Sending overlapping or nested Events to supersede existing Events.	**INFO:** In OpenADR, changing conditions with respect to events can be addressed by modifying the existing event or cancelling the current event and dispatching a new event. As noted in practice's recommendations in this section for requirement "e", VTNs should not send overlapping or nested events.
i) When a Nested Event completes, the containing/superseded Event SHALL NOT be reinstated and SHALL remain in a superseded state.	**NA:** Refer to best practice's recommendations in this section for requirement "e". VTNs should not send overlapping or nested events.
j) For function sets with direct control, it is RECOMMENDED that process h)2) be used for most situations since it can allow a smoother change between two sets of directives but in no way does it negate the responsibilities identified in rule g).	**NA:** Direct control function sets are not part of the CSIP Guidelines.
k) Clients SHALL verify the EventStatus of an Event before acting upon it. If the EventStatus potentiallySupersededTime has changed since last checked, and if the EventStatus type is "Partially Superseded," clients SHALL check all Events from that function set instance that may supersede the original Event.	**NA:** Refer to best practice's recommendations in this section for requirement "e". VTNs should not send overlapping or nested events.
l) When a client receives an Event with the Specified End Time in the past (Specified End Time <Current Time), this Event SHALL be ignored. Note that the Duration Randomization is not used in this calculation.	**INFO:** In general, this requirement is consistent with OpenADR's behavior, however OpenADR has an event start time and duration with an implied end time. VEN's typically would apply randomization to the start time, add the duration, then determine if the effective end time was in the past. With 2030.5, the randomization would not be factored into the calculations to determine if the effective end time is in the past.

l1) For function sets with direct control, if the Event responseRequired indicates, clients SHALL POST a Response to the replyTo URI with a Status of “Rejected - Event was received after it had expired”.	**NA:** Direct control function sets are not part of the CSIP Guidelines.
m) When a client receives an Event and calculates an Effective Start Time (Start Time + Start Randomization) in the past and a Specified End Time in the future ([Effective Start Time < Current Time] AND [Specified End Time > Current Time]), the client SHALL begin the Event using the current time and the absolute value of Start Randomization. For response reporting purposes, the start time SHALL be reported as the Current Time plus applied Start Randomization applied. For Event duration purposes, the Specified End Time SHALL be preserved, and any Duration Randomization attributes SHALL be applied to the abbreviated Duration.	**INFO:** In general, this requirement is consistent with OpenADR’s behavior, however OpenADR has an event start time, a randomization window, and duration with an implied end time. The full duration is added to the event start time plus a VEN selected randomization value to determine the effective end time. An OpenADR Event that was received during the active state would still result in the same effective end time as if the event had been received in a far state.

n) For function sets with direct control, regardless of the state of an Event (scheduled or active), when a client detects an Overlapping Event condition, the Event with the latest creation time will take precedence over the previous Event. Depending on the state of the Event (scheduled or active), one of the following steps SHALL take place: **1)** If the previous Event is scheduled and not active and if the Event responseRequired indicates, the client SHALL POST a Response (referencing the previous Event) with the Status of "The Event has been superseded." After the Response has been successfully POSTed, the client SHALL ignore the previous Event scheduled. **2)** If the previous Event is active, the client SHALL change directly from its current state to the requested state at the effective start time of the Overlapping Event. If the Event responseRequired indicates, the client SHALL POST a response (referencing the previous Event) with a Status of "The event has been superseded" at the effective start time of the Overlapping Event.	**NA:** Direct control function sets are not part of the CSIP Guidelines.

o) Randomization SHALL NOT cause Event conflicts or unmanaged gaps. To clarify: **1)** For Successive Events clients SHALL use the earlier Event's Effective End Time as the Effective Start Time of the later Event. Events are not reported as superseded and Clients should report Event statuses as they normally would for a set of Successive Events. Note: This means that a group of Successive Events without Duration Randomization will run successively using the initial Start Randomization for each of the Events in the group. **2)** Randomization SHALL NOT artificially create a gap between Successive Events.	**BP:** Detailed Recommendations: • Successive events requiring randomization should be avoided by issuing a single event and then modifying the duration as needed to extend the active period of the event. • Use cases requiring successive events should be issued without randomization or the VTN should randomize dtstart values in events to target various groups of DER resources to accomplish randomization without using OpenADRs build in randomization window (tolerance element). Narrative: In OpenADR the VEN selects the random start time within a time window (tolerance element) provided by the VTN. As the VTN does not know the actual effective start and end time, there is no way to avoid gaps between successive events if randomization is used. It is assumed that successive events in this context are two back to back events containing the same inverter control or setting.
p) It is permissible to have gaps when Events are not Successive Events or Overlapping Events.	**INFO:** Refer to best practice's recommendations in this appendix for requirement "o".

q) If multiple deviceCategory's are identified for an Event, future Events for an individual deviceCategory (or a subset of the original Event) that cause an Overlapping Event will supersede the original Event strictly for that deviceCategory (or a subset of the original Event). Note: Rule f) applies to all Overlapping Events. **1)** Those clients whose deviceCategory is not listed in the future Event but whose deviceCategory was included in the original Event SHALL continue to execute per the parameters of the original Event. **2)** Rule c) continues to apply. Servers SHALL NOT edit the original Event but SHALL maintain all Events in their entirety. **3)** A server SHALL set the potentiallySuperseded flag when the Event is superseded for any of the device categories and update the potentially SupersededTime.	**NA:** Refer to best practice's recommendations in this appendix for requirement "e". VTNs should not send overlapping or nested events.
r) Servers SHOULD maintain and serve Events for the maximum Effective Scheduled Period. This applies even if the Event in question is cancelled, so as to support devices that may have previously received a copy of the Event from the server.	**NA:** This is a 2030.5 requirement not relevant to the intent of Rule 21.
s) When an Event is removed from the server (e.g., due to limited storage space for the Event list) clients SHALL NOT assume the Event has been cancelled. Client devices SHALL only act on a cancellation as indicated in the rules above or an update to the Event's Status attribute.	**INFO:** In OpenADR, the VTN is obligated to return all relevant events to the VEN in the oadrDistributeEvent payload. If an event that the VEN is aware of is not contained in an oadrDistributeEvent payload it is implicitly cancelled. This behavior differs from 2030.5 where the absence of an event from the server does not infer that it is cancelled.

t) For DERControls, differing controls (e.g., opModTargetVar, opModTargetW) within DERControl Events are independent and are allowed to overlap or nest without superseding. If multiple controls are identified for a DERControl Event, future DERControl Events for an individual control (or a subset of the original Event) that cause an Overlapping Event will supersede the original Event strictly for that control (or a subset of the original Event). Note: Rule f) applies to all Overlapping Events. **1)** Those clients whose control is not listed in the future Event but whose control was included in the original Event SHALL continue to execute per the parameters of the original Event. **2)** Those clients whose control is listed in the future Event but whose deviceCategory is not listed in the future Event SHALL continue to execute per the parameters of the original Event. **3)** Rule c) continues to apply. Servers SHALL NOT edit the original Event but SHALL maintain all Events in their entirety. **4)** A server SHALL set the potentiallySuperseded flag when the Event is superseded for any of the controls and update the potentiallySupersededTime **5)** This rule also applies to the DefaultDERControl and DERControl Events should always be assumed to overlap the DefaultDERControl.	**INFO:** As noted in Section 1.8 of this document, OpenADR VENs may be required to execute multiple events in the same time frame, provided they contain mutually exclusive inverter functions or settings. VTNs should not send overlapping or nested events (i.e. with the same DER Control) as noted in the best practice's recommendations in this appendix for requirement "e".

4 Sample OpenADR Event Payloads

The following OpenADR payloads show how the IEEE 2030.5 inverter functions and settings payload taken from the CSIP SunSpec Certification test can be implemented using OpenADR. Except for ramp rate settings setGradW and setSoftGradW, all other grid support functions are supported as both a time-based event or as a default setting. All payload examples will show a time-based event, except for the ramp rate related events which will show a duration of zero.

A IEEE 2030.5 DERControl event can contain multiple advanced inverter functions and settings. Each of these inverter functions and settings are mapped to one or more OpenADR event signals as described in section 1.5. The first sample payload will show a generic OpenADR Payload with the event portion of the payload identified in orange. Subsequent payload examples will only show the event portion of the payload.

Please note the following decisions made by the author to map between the IEEE 2030.5 payloads and their OpenADR equivalents:

- In IEEE 2030.5 curves, such as volt-var, are defined distinct from the event, then referenced in the DERControl or DefaultDERControl payload with a link. The OpenADR equivalent sample payloads will show curves defined as an integral part of the event object in the oadrDistributeEvent payload and the curve should be acted upon when received by the VEN.
- IEEE 2030.5 DER curve xMultiplier and yMultiplier parameters are not show in sample payloads as the units object in OpenADR already has a siScaleCode element.
- 2030.5 DER curve curveType attribute is not show in sample payloads as OpenADR signalName will contain the IEEE 2030.5 string unique identifier for the curve type shown in Figure 4 in this document.
- IEEE 2030.5 DER curve randomizeStart and randomizeDuration parameters are not show in sample payloads as the OpenADR tolerance object contains sub elements to define a randomization window.
- Note that all time-based events have interval times that add up to 10 minutes. This was done to be consistent across the examples. Interval times should be ignored for inverter functions and settings, but the sum of the durations should match the overall time of the event to maintain consistency with the OpenADR conformance rules.
- DefaultDERControl is implemented in OpenADR payloads with both the overall event duration and the interval durations set to zero.
- In OpenADR each IEEE 2030.5 inverter function control or curve can be sent as a separate event or they can be concatenated together as one large event. There is no implied execution order or implementation concurrency with multiple inverter functions or curves contained in the same event.

- Determining customUnit values for the sample payloads was challenging. In general the payloads use the most basic unit of measure, such as “percent”. However, implementers will have to refer to the IEEE 2030.5 specification to determine “percentage of what”. Note that having this information in the OpenADR payload provide more definition than the equivalent IEEE 2030.5 payloads which do not specify any kind unit of measure information beyond the name of the inverter function.

Namespace Prefix Legend

- xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
- xmlns:dsig11="http://www.w3.org/2009/xmldsig11#"
- xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
- xmlns:oadr="http://openadr.org/oadr-2.0b/2012/07"
- xmlns:clm5ISO42173A="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07"
- xmlns:pyld="http://docs.oasis-open.org/ns/energyinterop/201110/payloads"
- xmlns:ei="http://docs.oasis-open.org/ns/energyinterop/201110"
- xmlns:scale="http://docs.oasis-open.org/ns/emix/2011/06/siscale"
- xmlns:emix="http://docs.oasis-open.org/ns/emix/2011/06"
- xmlns:strm="urn:ietf:params:xml:ns:icalendar-2.0:stream"
- xmlns:xcal="urn:ietf:params:xml:ns:icalendar-2.0"
- xmlns:power="http://docs.oasis-open.org/ns/emix/2011/06/power"

4.1 Generic OpenADR Event Payload

Note that the event signal object is colored in orange in the payload listing.

```
<oadr:oadrPayload>
    <oadr:oadrSignedObject>
        <oadr:oadrDistributeEvent ei:schemaVersion="2.0b">
            <ei:eiResponse>
                <ei:responseCode>200</ei:responseCode>
                <pyld:requestID/>
            </ei:eiResponse>
            <pyld:requestID>OadrDisReq091214_043740_513</pyld:requestID>
            <ei:vtnID>TH_VTN</ei:vtnID>
            <oadr:oadrEvent>
                <ei:eiEvent>
                    <ei:eventDescriptor>
                        <ei:eventID>Event091214_043741_028_0</ei:eventID>
                        <ei:modificationNumber>0</ei:modificationNumber>
                        <ei:priority>0</ei:priority>
                        <ei:eiMarketContext>
                        <emix:marketContext>http://MarketContext1</emix:marketContext>
                        </ei:eiMarketContext>
                        <ei:createdDateTime>2014-12-09T12:37:40Z</ei:createdDateTime>
                        <ei:eventStatus>far</ei:eventStatus>
                    </ei:eventDescriptor>
                    <ei:eiActivePeriod>
                        <xcal:properties>
                            <xcal:dtstart>
                                <xcal:date-time>2014-12-09T13:00:00Z</xcal:date-time>
                            </xcal:dtstart>
                            <xcal:duration>
                                <xcal:duration>PT4H</xcal:duration>
                            </xcal:duration>
                            <ei:x-eiNotification>
                                <xcal:duration>PT24H</xcal:duration>
                            </ei:x-eiNotification>
                        </xcal:properties>
                        <xcal:components/>
                    </ei:eiActivePeriod>
                    <ei:eiEventSignals>
                        <ei:eiEventSignal>
                            <strm:intervals>
                                <ei:interval>
                                    <xcal:duration>
                                        <xcal:duration>PT4H</xcal:duration>
                                    </xcal:duration>
                                    <xcal:uid>
                                        <xcal:text>0</xcal:text>
                                    </xcal:uid>
                                    <ei:signalPayload>
                                        <ei:payloadFloat>
                                            <ei:value>80.0</ei:value>
                                        </ei:payloadFloat>
                                    </ei:signalPayload>
                                </ei:interval>
                            </strm:intervals>
                            <ei:signalName>BID_LOAD</ei:signalName>
                            <ei:signalType>setpoint</ei:signalType>
                            <ei:signalID>SIG_02</ei:signalID>
```

```
                            <power:powerReal>
                              <power:itemDescription>RealPower</power:itemDescription>
                                <power:itemUnits>W</power:itemUnits>
                                <scale:siScaleCode>k</scale:siScaleCode>
                                <power:powerAttributes>
                                    <power:hertz>60.0</power:hertz>
                                    <power:voltage>220.0</power:voltage>
                                    <power:ac>true</power:ac>
                                </power:powerAttributes>
                            </power:powerReal>
                        </ei:eiEventSignal>
                    </ei:eiEventSignals>
                    <ei:eiTarget>
                        <ei:venID>venID_1234</ei:venID>
                    </ei:eiTarget>
                </ei:eiEvent>
                <oadr:oadrResponseRequired>always</oadr:oadrResponseRequired>
            </oadr:oadrEvent>
        </oadr:oadrDistributeEvent>
    </oadr:oadrSignedObject>
</oadr:oadrPayload>
```

4.2 Voltage_Ride_Through, opModHVRTMomentaryCessation

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>0</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1300</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Seconds</oadr:itemDescription>
            <oadr:itemUnits>sec</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>11000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
```

```
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>11000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>yvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== OpenLoopTms  ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>0</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>OpenLoopTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Second</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
       </ei:eiEventSignal>
       <!-- ===== rampDecTms ===== -->
       <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampDecTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampIncTms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampIncTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampPT1Tms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>10</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampPT1Tms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
```

```
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== vRef ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>0</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>vRef</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Percent</oadr:itemDescription>
                    <oadr:itemUnits>per</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== yRefType ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>4</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModHVRTMomentaryCessation</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>yRefType</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                    <oadr:itemUnits>index</oadr:itemUnits>
                    <scale:siScaleCode>none</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
        </ei:eiEventSignals>
```

4.3 Voltage_Ride_Through, opModHVRTMUSTTrip

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>16</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>16</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1300</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>3</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1300</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
```

```
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>4</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Seconds</oadr:itemDescription>
            <oadr:itemUnits>sec</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>13000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                       <xcal:uid>
                           <xcal:text>1</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>12000</ei:value>
                           </ei:payloadFloat>
                       </ei:signalPayload>
                   </ei:interval>
                   <ei:interval>
                       <xcal:duration>
                           <xcal:duration>PT2M</xcal:duration>
                       </xcal:duration>
                       <xcal:uid>
                           <xcal:text>2</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>12000</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>3</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>11000</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>4</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>11000</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>yvalue</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== OpenLoopTms  ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>OpenLoopTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Second</oadr:itemDescription>
```

```
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampDecTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>rampDecTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampIncTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>rampIncTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampPT1Tms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
```

```
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>10</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampPT1Tms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== vRef ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>vRef</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== yRefType ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>4</ei:value>
                        </ei:payloadFloat>
```

```
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>yRefType</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                <oadr:itemUnits>index</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
    </ei:eiEventSignals>
```

4.4 Voltage_Ride_Through, opModLVRTMomentaryCessation

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>0</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>15</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Seconds</oadr:itemDescription>
            <oadr:itemUnits>sec</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>5000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
```

```
                <xcal:duration>
                    <xcal:duration>PT5M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>5000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>yvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== OpenLoopTms  ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>0</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>OpenLoopTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Second</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampDecTms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampDecTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampIncTms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampIncTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampPT1Tms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>10</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampPT1Tms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
```

```
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== vRef ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>0</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>vRef</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Percent</oadr:itemDescription>
                    <oadr:itemUnits>per</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== yRefType ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>4</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModLVRTMomentaryCessation</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>yRefType</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                    <oadr:itemUnits>index</oadr:itemUnits>
                    <scale:siScaleCode>none</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
        </ei:eiEventSignals>
```

4.5 Voltage_Ride_Through, opModLVRTMUSTTrip

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>150</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>150</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1100</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>3</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1100</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
```

```
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>4</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>2100</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>5</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
        <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Seconds</oadr:itemDescription>
            <oadr:itemUnits>sec</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                       <xcal:uid>
                           <xcal:text>0</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>0</ei:value>
                           </ei:payloadFloat>
                       </ei:signalPayload>
                   </ei:interval>
                   <ei:interval>
                       <xcal:duration>
                           <xcal:duration>PT2M</xcal:duration>
                       </xcal:duration>
                       <xcal:uid>
                           <xcal:text>1</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>5000</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>2</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>5000</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>3</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>-7000</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>4</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>8800</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>5</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>-8800</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>yvalue</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
```

```
                    <oadr:itemUnits>per</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== OpenLoopTms  ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>0</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>OpenLoopTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Second</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampDecTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
                <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
                <ei:signalID>rampDecTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampIncTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
```

```
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampIncTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampPT1Tms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>10</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>rampPT1Tms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== vRef ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
```

```
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>vRef</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== yRefType ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>4</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLVRTMustTrip</ei:signalName>
            <ei:signalType>x-Voltage_Ride_Through</ei:signalType>
            <ei:signalID>yRefType</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                <oadr:itemUnits>index</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
    </ei:eiEventSignals>
```

4.6 Voltage_Ride_Through, opModHVRTMAYTrip, opModLVRTMAYTrip

The parameters opModHVRTMayTrip and opModLVRTMayTrip were not used in the 2030.5 certification test, so no 2030.5 reference payload was available.

4.7 Frequency_Ride_Through, opModLFRTMUSTTrip

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>16</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>16</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>30000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>3</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>30000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
```

```
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>4</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>40000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
        <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Seconds</oadr:itemDescription>
            <oadr:itemUnits>sec</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>5300</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                       <xcal:uid>
                           <xcal:text>1</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>5690</ei:value>
                           </ei:payloadFloat>
                       </ei:signalPayload>
                   </ei:interval>
                   <ei:interval>
                       <xcal:duration>
                           <xcal:duration>PT2M</xcal:duration>
                       </xcal:duration>
                       <xcal:uid>
                           <xcal:text>2</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>5690</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>3</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>-5850</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>4</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>5850</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>yvalue</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== OpenLoopTms  ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>OpenLoopTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Second</oadr:itemDescription>
```

```
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampDecTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
                <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
                <ei:signalID>rampDecTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampIncTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
                <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
                <ei:signalID>rampIncTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampPT1Tms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
```

```
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>10</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>rampPT1Tms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== vRef ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>vRef</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== yRefType ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
```

```
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModLFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>yRefType</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                <oadr:itemUnits>index</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
    </ei:eiEventSignals>
```

4.8 Frequency_Ride_Through, opModHFRTMUSTTrip

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>16</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>16</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>30000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>3</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>30000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
```

```
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>4</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>40000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
        <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Seconds</oadr:itemDescription>
            <oadr:itemUnits>sec</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>6400</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                        <xcal:uid>
                            <xcal:text>1</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>6200</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT2M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>2</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>6200</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>3</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>-6050</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT2M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>4</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>6050</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>yvalue</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== OpenLoopTms  ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>OpenLoopTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Second</oadr:itemDescription>
```

```
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampDecTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
                <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
                <ei:signalID>rampDecTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampIncTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
                <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
                <ei:signalID>rampIncTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampPT1Tms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
```

```
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>10</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>rampPT1Tms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== vRef ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>vRef</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== yRefType ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
```

```
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModHFRTMUSTTrip</ei:signalName>
            <ei:signalType>x-Frequency_Ride_Through</ei:signalType>
            <ei:signalID>yRefType</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                <oadr:itemUnits>index</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
    </ei:eiEventSignals>
```

4.9 Frequency_Ride_Through, opModLFRTMAYTrip, opModHFRTMAYTrip

The parameters opModLFRTMayTrip and opModHFRTMayTrip were not used in the 2030.5 certification test, so no 2030.5 reference payload was available from which to create an OpenADR payload sample.

4.10 Dynamic_Volt_Var, opModVoltVar

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>9200</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>9670</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT3M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10300</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT3M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>3</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10700</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
```

```
        <ei:signalName>x-opModVoltVar</ei:signalName>
        <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>3000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT2M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>0</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT3M</xcal:duration>
                </xcal:duration>
                       <xcal:uid>
                           <xcal:text>2</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>0</ei:value>
                           </ei:payloadFloat>
                       </ei:signalPayload>
                   </ei:interval>
                   <ei:interval>
                       <xcal:duration>
                           <xcal:duration>PT3M</xcal:duration>
                       </xcal:duration>
                       <xcal:uid>
                           <xcal:text>3</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>-3000</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltVar</ei:signalName>
            <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
            <ei:signalID>yvalue</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== OpenLoopTms  ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltVar</ei:signalName>
            <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
            <ei:signalID>OpenLoopTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Second</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampDecTms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltVar</ei:signalName>
            <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
            <ei:signalID>rampDecTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
```

```
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampIncTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModVoltVar</ei:signalName>
                <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
                <ei:signalID>rampIncTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampPT1Tms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>10</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModVoltVar</ei:signalName>
                <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
                <ei:signalID>rampPT1Tms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== vRef ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
```

```
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltVar</ei:signalName>
            <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
            <ei:signalID>vRef</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== yRefType ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>2</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltVar</ei:signalName>
            <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
            <ei:signalID>yRefType</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                <oadr:itemUnits>index</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== autonomousVRefEnable ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
```

```
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltVar</ei:signalName>
            <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
            <ei:signalID>autonomousVRefEnable</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Boolean</oadr:itemDescription>
                <oadr:itemUnits>bool</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== autonomousVRefTimeConstant ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltVar</ei:signalName>
            <ei:signalType>x-Dynamic_Volt_Var</ei:signalType>
            <ei:signalID>autonomousVRefTimeConstant</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
    </ei:eiEventSignals>
```

4.11 Ramp_Rate_Setting, setGradW, setSoftGradW

This payload is set up as the equivalent of a 2030.5 defaultDERControl with interval duration of PT0M

```
<ei:eiEventSignals>
    <!-- ===== setSoftGradW  ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT0M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>200</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-setSoftGradW</ei:signalName>
        <ei:signalType>x-Ramp_Rate_Setting</ei:signalType>
        <ei:signalID>setSoftGradW</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== setGradW ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT0M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-setGradW</ei:signalName>
        <ei:signalType>x-Ramp_Rate_Setting</ei:signalType>
        <ei:signalID>setGradW</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
</ei:eiEventSignals>
```

4.12 Fixed_Power_Factor, opModFixedPFInjectW

```
<ei:eiEventSignals>
    <!-- ===== displacement  ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>950</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModFixedPFInjectW</ei:signalName>
        <ei:signalType>x-Fixed_Power_Factor</ei:signalType>
        <ei:signalID>displacement</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Cosine(theta)</oadr:itemDescription>
            <oadr:itemUnits>cos</oadr:itemUnits>
            <scale:siScaleCode>m</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== excitation ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>0</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModFixedPFInjectW</ei:signalName>
        <ei:signalType>x-Fixed_Power_Factor</ei:signalType>
        <ei:signalID>excitation</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Boolean</oadr:itemDescription>
            <oadr:itemUnits>bool</oadr:itemUnits>
            <scale:siScaleCode>none</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
</ei:eiEventSignals>
```

4.13 Fixed_Power_Factor, opModFixedPFAbsorbW

```
<ei:eiEventSignals>
    <!-- ===== displacement  ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>950</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModFixedPFAbsorbW</ei:signalName>
        <ei:signalType>x-Fixed_Power_Factor</ei:signalType>
        <ei:signalID>displacement</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Cosine(theta)</oadr:itemDescription>
            <oadr:itemUnits>cos</oadr:itemUnits>
            <scale:siScaleCode>m</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== excitation ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModFixedPFAbsorbW</ei:signalName>
        <ei:signalType>x-Fixed_Power_Factor</ei:signalType>
        <ei:signalID>excitation</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Boolean</oadr:itemDescription>
            <oadr:itemUnits>bool</oadr:itemUnits>
            <scale:siScaleCode>none</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
</ei:eiEventSignals>
```

4.14 Connect_Disconnect, opModEnergize

opModConnect, so it is included in this sample, although it is not mentioned in the CSIP Guidelines.

```
<ei:eiEventSignals>
    <!-- ===== opModConnect  ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModConnect</ei:signalName>
        <ei:signalType>x-Connect_Disconnect</ei:signalType>
        <ei:signalID>opModConnect</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Boolean</oadr:itemDescription>
            <oadr:itemUnits>bool</oadr:itemUnits>
            <scale:siScaleCode>none</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== opModEnergize ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>1</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModEnergize</ei:signalName>
        <ei:signalType>x-Connect_Disconnect</ei:signalType>
        <ei:signalID>opModEnergize</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Boolean</oadr:itemDescription>
            <oadr:itemUnits>bool</oadr:itemUnits>
            <scale:siScaleCode>none</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
</ei:eiEventSignals>
```

4.15 Real_Power_Output_Limit, opModMaxLimW

```
<ei:eiEventSignals>
    <!-- ===== opModMaxLimW ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>5000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModMaxLimW</ei:signalName>
        <ei:signalType>x-Real_Power_Output_Limit</ei:signalType>
        <ei:signalID>opModMaxLimW</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
</ei:eiEventSignals>
```

4.16 Volt_Watt_Control, opModVoltWatt

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT3M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT3M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10600</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT4M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>11000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModVoltWatt</ei:signalName>
        <ei:signalType>x-Volt_Watt_Control</ei:signalType>
        <ei:signalID>xvalue</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
    <!-- ===== yvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
```

```
                <xcal:duration>
                    <xcal:duration>PT3M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT3M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>10000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT4M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>0</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModVoltWatt</ei:signalName>
        <ei:signalType>x-Volt_Watt_Control</ei:signalType>
        <ei:signalID>yvalue</ei:signalID>
               <oadr:customUnit>
                   <oadr:itemDescription>Percent</oadr:itemDescription>
                   <oadr:itemUnits>per</oadr:itemUnits>
                   <scale:siScaleCode>c</scale:siScaleCode>
               </oadr:customUnit>
           </ei:eiEventSignal>
           <!-- ===== OpenLoopTms  ===== -->
           <ei:eiEventSignal>
               <strm:intervals>
                   <ei:interval>
                       <xcal:duration>
                           <xcal:duration>PT10M</xcal:duration>
                       </xcal:duration>
                       <xcal:uid>
                           <xcal:text>0</xcal:text>
                       </xcal:uid>
                       <ei:signalPayload>
                           <ei:payloadFloat>
                               <ei:value>0</ei:value>
```

```
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltWatt</ei:signalName>
            <ei:signalType>x-Volt_Watt_Control</ei:signalType>
            <ei:signalID>OpenLoopTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Second</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampDecTms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltWatt</ei:signalName>
            <ei:signalType>x-Volt_Watt_Control</ei:signalType>
            <ei:signalID>rampDecTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
                <oadr:itemUnits>sec</oadr:itemUnits>
                <scale:siScaleCode>c</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== rampIncTms ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>600</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltWatt</ei:signalName>
            <ei:signalType>x-Volt_Watt_Control</ei:signalType>
            <ei:signalID>rampIncTms</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Seconds</oadr:itemDescription>
```

```
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampPT1Tms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>10</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModVoltWatt</ei:signalName>
                <ei:signalType>x-Volt_Watt_Control</ei:signalType>
                <ei:signalID>rampPT1Tms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== vRef ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>0</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModVoltWatt</ei:signalName>
                <ei:signalType>x-Volt_Watt_Control</ei:signalType>
                <ei:signalID>vRef</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Percent</oadr:itemDescription>
                    <oadr:itemUnits>per</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== yRefType ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
```

```
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>1</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModVoltWatt</ei:signalName>
            <ei:signalType>x-Volt_Watt_Control</ei:signalType>
            <ei:signalID>yRefType</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                <oadr:itemUnits>index</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
    </ei:eiEventSignals>
```

4.17 Frequency_Watt_Control, opModFreqWatt

The 2030.5 payload for Frequency Watt Control includes opModFreqDroop, which appears to be an equivalent to opModFreqWatt, however opModFreqDroop is not required by CSIP. opModFreqDroop is not included in the OpenADR payload below.

```
<ei:eiEventSignals>
    <!-- ===== xvalue ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>56</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>1</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>57</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>2</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>58</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>3</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>59</ei:value>
```

```
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>4</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>60</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>5</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>61</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>6</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>62</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT1M</xcal:duration>
                </xcal:duration>
                    <xcal:uid>
                        <xcal:text>7</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>63</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>8</xcal:text>
```

```
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>64</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>9</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>65</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModFreqWatt</ei:signalName>
            <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
            <ei:signalID>xvalue</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Hertz</oadr:itemDescription>
                <oadr:itemUnits>Hz</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== yvalue ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>1</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>100</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
```

```
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>2</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>3</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>100</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>4</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>100</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>5</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>100</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>6</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>100</ei:value>
                        </ei:payloadFloat>
```

```
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>7</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>100</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>8</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>100</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT1M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>9</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>0</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModFreqWatt</ei:signalName>
            <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
            <ei:signalID>yvalue</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>Percent</oadr:itemDescription>
                <oadr:itemUnits>per</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
        <!-- ===== OpenLoopTms  ===== -->
        <ei:eiEventSignal>
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
```

```
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>0</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModFreqWatt</ei:signalName>
                <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
                <ei:signalID>OpenLoopTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Second</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampDecTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModFreqWatt</ei:signalName>
                <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
                <ei:signalID>rampDecTms</ei:signalID>
                <oadr:customUnit>
                    <oadr:itemDescription>Seconds</oadr:itemDescription>
                    <oadr:itemUnits>sec</oadr:itemUnits>
                    <scale:siScaleCode>c</scale:siScaleCode>
                </oadr:customUnit>
            </ei:eiEventSignal>
            <!-- ===== rampIncTms ===== -->
            <ei:eiEventSignal>
                <strm:intervals>
                    <ei:interval>
                        <xcal:duration>
                            <xcal:duration>PT10M</xcal:duration>
                        </xcal:duration>
                        <xcal:uid>
                            <xcal:text>0</xcal:text>
                        </xcal:uid>
                        <ei:signalPayload>
                            <ei:payloadFloat>
                                <ei:value>600</ei:value>
                            </ei:payloadFloat>
                        </ei:signalPayload>
                    </ei:interval>
                </strm:intervals>
                <ei:signalName>x-opModFreqWatt</ei:signalName>
                <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
```

```
359.                <ei:signalID>rampIncTms</ei:signalID>
360.                <oadr:customUnit>
361.                    <oadr:itemDescription>Seconds</oadr:itemDescription>
362.                    <oadr:itemUnits>sec</oadr:itemUnits>
363.                    <scale:siScaleCode>c</scale:siScaleCode>
364.                </oadr:customUnit>
365.            </ei:eiEventSignal>
366.            <!-- ===== rampPT1Tms ===== -->
367.            <ei:eiEventSignal>
368.                <strm:intervals>
369.                    <ei:interval>
370.                        <xcal:duration>
371.                            <xcal:duration>PT10M</xcal:duration>
372.                        </xcal:duration>
373.                        <xcal:uid>
374.                            <xcal:text>0</xcal:text>
375.                        </xcal:uid>
376.                        <ei:signalPayload>
377.                            <ei:payloadFloat>
378.                                <ei:value>10</ei:value>
379.                            </ei:payloadFloat>
380.                        </ei:signalPayload>
381.                    </ei:interval>
382.                </strm:intervals>
383.                <ei:signalName>x-opModFreqWatt</ei:signalName>
384.                <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
385.                <ei:signalID>rampPT1Tms</ei:signalID>
386.                <oadr:customUnit>
387.                    <oadr:itemDescription>Seconds</oadr:itemDescription>
388.                    <oadr:itemUnits>sec</oadr:itemUnits>
389.                    <scale:siScaleCode>c</scale:siScaleCode>
390.                </oadr:customUnit>
391.            </ei:eiEventSignal>
392.            <!-- ===== vRef ===== -->
393.            <ei:eiEventSignal>
394.                <strm:intervals>
395.                    <ei:interval>
396.                        <xcal:duration>
397.                            <xcal:duration>PT10M</xcal:duration>
398.                        </xcal:duration>
399.                        <xcal:uid>
400.                            <xcal:text>0</xcal:text>
401.                        </xcal:uid>
402.                        <ei:signalPayload>
403.                            <ei:payloadFloat>
404.                                <ei:value>0</ei:value>
405.                            </ei:payloadFloat>
406.                        </ei:signalPayload>
407.                    </ei:interval>
408.                </strm:intervals>
409.                <ei:signalName>x-opModFreqWatt</ei:signalName>
410.                <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
411.                <ei:signalID>vRef</ei:signalID>
412.                <oadr:customUnit>
413.                    <oadr:itemDescription>Percent</oadr:itemDescription>
414.                    <oadr:itemUnits>per</oadr:itemUnits>
415.                    <scale:siScaleCode>c</scale:siScaleCode>
416.                </oadr:customUnit>
417.            </ei:eiEventSignal>
418.            <!-- ===== yRefType ===== -->
419.            <ei:eiEventSignal>
```

```
            <strm:intervals>
                <ei:interval>
                    <xcal:duration>
                        <xcal:duration>PT10M</xcal:duration>
                    </xcal:duration>
                    <xcal:uid>
                        <xcal:text>0</xcal:text>
                    </xcal:uid>
                    <ei:signalPayload>
                        <ei:payloadFloat>
                            <ei:value>1</ei:value>
                        </ei:payloadFloat>
                    </ei:signalPayload>
                </ei:interval>
            </strm:intervals>
            <ei:signalName>x-opModFreqWatt</ei:signalName>
            <ei:signalType>x-Frequency_Watt_Control</ei:signalType>
            <ei:signalID>yRefType</ei:signalID>
            <oadr:customUnit>
                <oadr:itemDescription>DERUnitRefType</oadr:itemDescription>
                <oadr:itemUnits>index</oadr:itemUnits>
                <scale:siScaleCode>none</scale:siScaleCode>
            </oadr:customUnit>
        </ei:eiEventSignal>
    </ei:eiEventSignals>
```

4.18 Active_Power_Mode, opModFixedW

```
<ei:eiEventSignals>
    <!-- ===== opModFixedW ===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>5000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModFixedW</ei:signalName>
        <ei:signalType>x-Active_Power_Mode</ei:signalType>
        <ei:signalID>opModFixedW</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Percent</oadr:itemDescription>
            <oadr:itemUnits>per</oadr:itemUnits>
            <scale:siScaleCode>c</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
</ei:eiEventSignals>
```

4.19 Active_Power_Mode, opModTargetW

```
<ei:eiEventSignals>
    <!-- ===== opModTargetW===== -->
    <ei:eiEventSignal>
        <strm:intervals>
            <ei:interval>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <xcal:uid>
                    <xcal:text>0</xcal:text>
                </xcal:uid>
                <ei:signalPayload>
                    <ei:payloadFloat>
                        <ei:value>2000</ei:value>
                    </ei:payloadFloat>
                </ei:signalPayload>
            </ei:interval>
        </strm:intervals>
        <ei:signalName>x-opModTargetW</ei:signalName>
        <ei:signalType>x-Active_Power_Mode</ei:signalType>
        <ei:signalID>opModTargetW</ei:signalID>
        <oadr:customUnit>
            <oadr:itemDescription>Watts</oadr:itemDescription>
            <oadr:itemUnits>W</oadr:itemUnits>
            <scale:siScaleCode>none</scale:siScaleCode>
        </oadr:customUnit>
    </ei:eiEventSignal>
</ei:eiEventSignals>
```

5 Sample OpenADR Report Payload

The best practices recommendations in the document do not envision VENs sending passthrough report upstream reflecting individual DER resource nameplate ratings, adjusted setting, operational status, or alerts. Rather, it is expected that the VENs will receive this messaging and the VEN's application will aggregate the data to provide upstream VTNs with summary status reports. As the form of those summary reports is unknown, we are providing an example of a IEEE 2030.5 report required by the CSIP Guidelines for help implementers see how various DER reporting characteristics can be implemented using OpenADR reporting.

Namespace Prefix Legend

- xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
- xmlns:dsig11="http://www.w3.org/2009/xmldsig11#"
- xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
- xmlns:oadr="http://openadr.org/oadr-2.0b/2012/07"
- xmlns:clm5ISO42173A="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07"
- xmlns:pyld="http://docs.oasis-open.org/ns/energyinterop/201110/payloads"
- xmlns:ei="http://docs.oasis-open.org/ns/energyinterop/201110"
- xmlns:scale="http://docs.oasis-open.org/ns/emix/2011/06/siscale"
- xmlns:emix="http://docs.oasis-open.org/ns/emix/2011/06"
- xmlns:strm="urn:ietf:params:xml:ns:icalendar-2.0:stream"
- xmlns:xcal="urn:ietf:params:xml:ns:icalendar-2.0"
- xmlns:power="http://docs.oasis-open.org/ns/emix/2011/06/power"

x-DERAvailability Report

Detailed descriptions of the report data points can be found in the IEEE 2030.5 specification in the description of the DERAvailability object in section B.22.

```
<oadr:oadrPayload>
    <oadr:oadrSignedObject>
        <oadr:oadrRegisterReport>
            <pyld:requestID>RegReq120615_122508_975</pyld:requestID>
            <oadr:oadrReport>
                <xcal:duration>
                    <xcal:duration>PT10M</xcal:duration>
                </xcal:duration>
                <!-- ===== availabilityDuration ===== -->
                <oadr:oadrReportDescription>
                    <ei:rID>availabilityDuration</ei:rID>
                    <ei:reportType>operatingState</ei:reportType>
                    <oadr:customUnit>
                        <oadr:itemDescription>Seconds</oadr:itemDescription>
                        <oadr:itemUnits>s</oadr:itemUnits>
                        <scale:siScaleCode>none</scale:siScaleCode>
                    </oadr:customUnit>
```

```
                    <ei:readingType>x-notApplicable</ei:readingType>
                    <emix:marketContext>http://MarketContext1</emix:marketContext>
                </oadr:oadrReportDescription>
                <!-- ===== maxChargeDuration ===== -->
                <oadr:oadrReportDescription>
                    <ei:rID>maxChargeDuration</ei:rID>
                    <ei:reportType>operatingState</ei:reportType>
                    <oadr:customUnit>
                        <oadr:itemDescription>Seconds</oadr:itemDescription>
                        <oadr:itemUnits>s</oadr:itemUnits>
                        <scale:siScaleCode>none</scale:siScaleCode>
                    </oadr:customUnit>
                    <ei:readingType>x-notApplicable</ei:readingType>
                    <emix:marketContext>http://MarketContext1</emix:marketContext>
                </oadr:oadrReportDescription>
                <!-- ===== reserveChargePercent ===== -->
                <oadr:oadrReportDescription>
                    <ei:rID>reserveChargePercent</ei:rID>
                    <ei:reportType>operatingState</ei:reportType>
                    <oadr:customUnit>
                        <oadr:itemDescription>Percent</oadr:itemDescription>
                        <oadr:itemUnits>per</oadr:itemUnits>
                        <scale:siScaleCode>c</scale:siScaleCode>
                    </oadr:customUnit>
                    <ei:readingType>x-notApplicable</ei:readingType>
                    <emix:marketContext>http://MarketContext1</emix:marketContext>
                </oadr:oadrReportDescription>
                <!-- ===== reservePercent ===== -->
                <oadr:oadrReportDescription>
                    <ei:rID>reservePercent</ei:rID>
                    <ei:reportType>operatingState</ei:reportType>
                    <oadr:customUnit>
                        <oadr:itemDescription>Percent</oadr:itemDescription>
                        <oadr:itemUnits>per</oadr:itemUnits>
                        <scale:siScaleCode>c</scale:siScaleCode>
                    </oadr:customUnit>
                    <ei:readingType>x-notApplicable</ei:readingType>
                    <emix:marketContext>http://MarketContext1</emix:marketContext>
                </oadr:oadrReportDescription>
                <!-- ===== statVarAvail ===== -->
                <oadr:oadrReportDescription>
                    <ei:rID>statVarAvail</ei:rID>
                    <ei:reportType>operatingState</ei:reportType>
                    <power:powerReactive>
                        <power:itemDescription>ReactivePower</power:itemDescription>

                        <power:itemUnits>VAR</power:itemUnits>
                        <scale:siScaleCode>none</scale:siScaleCode>
                        <power:powerAttributes>
                            <power:hertz>60.0</power:hertz>
                            <power:voltage>220.0</power:voltage>
                            <power:ac>true</power:ac>
                        </power:powerAttributes>
                    </power:powerReactive>
                    <ei:readingType>x-notApplicable</ei:readingType>
                    <emix:marketContext>http://MarketContext1</emix:marketContext>
                </oadr:oadrReportDescription>
                <!-- ===== statWAvail ===== -->
                <oadr:oadrReportDescription>
                    <ei:rID>statWAvail</ei:rID>
                    <ei:reportType>operatingState</ei:reportType>
```

```
                    <power:powerReal>
                        <power:itemDescription>RealPower</power:itemDescription>
                        <power:itemUnits>W</power:itemUnits>
                        <scale:siScaleCode>none</scale:siScaleCode>
                        <power:powerAttributes>
                            <power:hertz>60.0</power:hertz>
                            <power:voltage>220.0</power:voltage>
                            <power:ac>true</power:ac>
                        </power:powerAttributes>
                    </power:powerReal>
                    <ei:readingType>x-notApplicable</ei:readingType>
                    <emix:marketContext>http://MarketContext1</emix:marketContext>
                </oadr:oadrReportDescription>
                <ei:reportRequestID>0</ei:reportRequestID>
                <ei:reportSpecifierID>ReportSpecID_122512_481_2</ei:reportSpecifierID
                <ei:reportName>x-DERAvailability</ei:reportName>
                <ei:createdDateTime>2015-06-12T19:25:12Z</ei:createdDateTime>
            </oadr:oadrReport>
            <ei:venID>ec27de207837e1048fd3</ei:venID>
        </oadr:oadrRegisterReport>
    </oadr:oadrSignedObject>
</oadr:oadrPayload>
```

6 IEEE 2030.5 Certification Test Reference Payloads

The following payloads were used as the basis for creating the sample OpenADR payloads in this document. They were generated using the 2030.5 CSIP Certification test suite, version 3.4, schema version 210, tests BASIC-004 through BASIC-014. The payloads include a DERControl and a DERCurve if appropriate.

6.1 BASIC-004 - Low/High Voltage Ride-Through

Note that the 2030.5 certification test did not appear to use LVRTMayTrip or HVRTMayTrip which are required by CSIP, so those curves are not listed below.

```
<DERCurve>
    <mRID>80020000000000000000012a1b2c3b4</mRID>
    <description>HVRTMomentaryCessation</description>
    <creationTime>1557786415</creationTime>
    <CurveData>
        <xvalue>0</xvalue>
        <yvalue>11000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>1300</xvalue>
        <yvalue>11000</yvalue>
    </CurveData>
    <curveType>4</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>4</yRefType>
</DERCurve>
```

```
<DERCurve>
    <mRID>80020000000000000000011a1b2c3b4</mRID>
    <description>HVRTMustTrip</description>
    <creationTime>1557786415</creationTime>
    <CurveData>
        <xvalue>16</xvalue>
        <yvalue>13000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>16</xvalue>
        <yvalue>12000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>1300</xvalue>
        <yvalue>12000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>1300</xvalue>
        <yvalue>11000</yvalue>
```

```
    </CurveData>
    <CurveData>
        <xvalue>10000</xvalue>
        <yvalue>11000</yvalue>
    </CurveData>
    <curveType>5</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>4</yRefType>
</DERCurve>
```

```
<DERCurve>
    <mRID>8002000000000000000000010a1b2c3b4</mRID>
    <description>LVRTMomentaryCessation</description>
    <creationTime>1557786415</creationTime>
    <CurveData>
        <xvalue>0</xvalue>
        <yvalue>5000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>15</xvalue>
        <yvalue>5000</yvalue>
    </CurveData>
    <curveType>9</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>4</yRefType>
</DERCurve>
```

```
<DERCurve>
    <mRID>8002000000000000000000000fa1b2c3b4</mRID>
    <description>LVRTMustTrip Curve</description>
    <creationTime>1557786415</creationTime>
    <CurveData>
        <xvalue>150</xvalue>
        <yvalue>0</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>150</xvalue>
        <yvalue>5000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>1100</xvalue>
        <yvalue>5000</yvalue>
    </CurveData>
```

```
    <CurveData>
        <xvalue>1100</xvalue>
        <yvalue>7000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>2100</xvalue>
        <yvalue>8800</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>10000</xvalue>
        <yvalue>8800</yvalue>
    </CurveData>
    <curveType>10</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>4</yRefType>
</DERCurve>
```

```
<DERControl>
    <mRID>80020000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>2</version>
    <creationTime>1557786415</creationTime>
    <EventStatus>
        <currentStatus>1</currentStatus>
        <dateTime>1557786535</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>event active</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557786535</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModHVRTMomentaryCessation href="/derp/0/dc/3"/>
        <opModHVRTMustTrip href="/derp/0/dc/2"/>
        <opModLVRTMomentaryCessation href="/derp/0/dc/1"/>
        <opModLVRTMustTrip href="/derp/0/dc/0"/>
    </DERControlBase>
</DERControl>
```

6.2 BASIC-005 - Low/High Frequency Ride-Through

Note that the 2030.5 certification test did not appear to use HFRTMayTrip or LFRTMayTrip which are required by CSIP, so those curves are not listed below.

```
<DERCurve>
```

```
    <mRID>80020000000000000000011a1b2c3b4</mRID>
    <description>LFRTMustTrip</description>
    <creationTime>1557786987</creationTime>
    <CurveData>
        <xvalue>16</xvalue>
        <yvalue>5300</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>16</xvalue>
        <yvalue>5690</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>30000</xvalue>
        <yvalue>5690</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>30000</xvalue>
        <yvalue>5850</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>40000</xvalue>
        <yvalue>5850</yvalue>
    </CurveData>
    <curveType>7</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>0</yRefType>
</DERCurve>
```

```
<DERCurve>
    <mRID>80020000000000000000000fa1b2c3b4</mRID>
    <description>HFRTMustTrip Curve</description>
    <creationTime>1557786987</creationTime>
    <CurveData>
        <xvalue>16</xvalue>
        <yvalue>6400</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>16</xvalue>
        <yvalue>6200</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>30000</xvalue>
        <yvalue>6200</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>30000</xvalue>
        <yvalue>6050</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>40000</xvalue>
        <yvalue>6050</yvalue>
    </CurveData>
```

```
    <curveType>2</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>0</yRefType>
</DERCurve>
```

```
<DERControl>
    <mRID>80020000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <creationTime>1557786987</creationTime>
    <EventStatus>
        <currentStatus>0</currentStatus>
        <dateTime>1557786987</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>Creation</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557787107</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModHFRTMustTrip href="/derp/0/dc/0"/>
        <opModLFRTMustTrip href="/derp/0/dc/1"/>
    </DERControlBase>
</DERControl>
```

6.3 BASIC-006 - Volt/Var

```
<DERCurve>
    <mRID>8002000000000000000000fa1b2c3b4</mRID>
    <description>Volt-Var VarAvail Curve</description>
    <autonomousVRefEnable>false</autonomousVRefEnable>
    <autonomousVRefTimeConstant>0</autonomousVRefTimeConstant>
    <creationTime>1557787211</creationTime>
    <CurveData>
        <xvalue>9200</xvalue>
        <yvalue>3000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>9670</xvalue>
        <yvalue>0</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>10300</xvalue>
        <yvalue>0</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>10700</xvalue>
        <yvalue>-3000</yvalue>
    </CurveData>
    <curveType>11</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>2</yRefType>
</DERCurve>
```

```
<DERControl>
    <mRID>8002000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <creationTime>1557787211</creationTime>
    <EventStatus>
        <currentStatus>0</currentStatus>
        <dateTime>1557787211</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>Creation</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557787331</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModVoltVar href="/derp/0/dc/0"/>
    </DERControlBase>
</DERControl>
```

6.4 BASIC-007 - Ramp Rates

```
<DefaultDERControl>
    <mRID>8002000000000000000000015a1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <DERControlBase>
        <opModVoltVar href="/derp/0/dc/2"/>
    </DERControlBase>
    <setESDelay>0</setESDelay>
    <setESHighFreq>0</setESHighFreq>
    <setESHighVolt>0</setESHighVolt>
    <setESLowFreq>0</setESLowFreq>
    <setESLowVolt>0</setESLowVolt>
    <setESRampTms>0</setESRampTms>
    <setESRandomDelay>0</setESRandomDelay>
    <setGradW>10000</setGradW>
    <setSoftGradW>200</setSoftGradW>
</DefaultDERControl>
```

6.5 BASIC-008 - Fixed Power Factor

Note that opModFixedPF shown is the CSIP spec has been changed to opModFixedPFAbsorbW and opModFixedPFInjectW in the 2030.5 specification. opModFixedPFAbsorbW is note used in the test case.

```
<DERControl>
    <mRID>8002000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <creationTime>1557847699</creationTime>
    <EventStatus>
        <currentStatus>0</currentStatus>
        <dateTime>1557847699</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>Creation</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557847819</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModFixedPFInjectW>
            <displacement>950</displacement>
            <excitation>false</excitation>
            <multiplier>-3</multiplier>
        </opModFixedPFInjectW>
    </DERControlBase>
</DERControl>
```

```
<DefaultDERControl>
    <mRID>8002000000000000000000015a1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <DERControlBase>
        <opModFixedPFAbsorbW>
            <displacement>1</displacement>
            <excitation>true</excitation>
            <multiplier>0</multiplier>
        </opModFixedPFAbsorbW>
    </DERControlBase>
    <setESDelay>0</setESDelay>
    <setESHighFreq>0</setESHighFreq>
    <setESHighVolt>0</setESHighVolt>
    <setESLowFreq>0</setESLowFreq>
    <setESLowVolt>0</setESLowVolt>
    <setESRampTms>0</setESRampTms>
    <setESRandomDelay>0</setESRandomDelay>
    <setGradW>0</setGradW>
    <setSoftGradW>0</setSoftGradW>
</DefaultDERControl>
```

6.6 BASIC-009 - Connect/Disconnect

```
<DERControl>
    <mRID>8002000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>2</version>
    <creationTime>1557848219</creationTime>
    <EventStatus>
        <currentStatus>1</currentStatus>
        <dateTime>1557848339</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>event active</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557848339</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModConnect>true</opModConnect>
        <opModEnergize>true</opModEnergize>
    </DERControlBase>
</DERControl>
```

6.7 BASIC-010 - Limit Max Active Power Mode

```
<DERControlList>
        <mRID>8002000000000000000000aa1b2c3b4</mRID>
        <description>DERCX0</description>
        <version>1</version>
        <creationTime>1557848436</creationTime>
        <EventStatus>
            <currentStatus>0</currentStatus>
            <dateTime>1557848436</dateTime>
            <potentiallySuperseded>false</potentiallySuperseded>
            <potentiallySupersededTime>0</potentiallySupersededTime>
            <reason>Creation</reason>
        </EventStatus>
        <interval>
            <duration>60</duration>
            <start>1557848556</start>
        </interval>
        <randomizeDuration>0</randomizeDuration>
        <randomizeStart>0</randomizeStart>
        <DERControlBase>
            <opModMaxLimW>5000</opModMaxLimW>
        </DERControlBase>
    </DERControl>
</DERControlList>
```

6.8 BASIC-011 - Volt-Watt

```
<DERCurve>
    <mRID>8002000000000000000000010a1b2c3b4</mRID>
    <description>Volt-Watt Curve</description>
    <creationTime>1557849766</creationTime>
    <CurveData>
        <xvalue>10000</xvalue>
        <yvalue>10000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>10600</xvalue>
        <yvalue>10000</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>11000</xvalue>
        <yvalue>0</yvalue>
    </CurveData>
    <curveType>12</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>0</rampDecTms>
    <rampIncTms>0</rampIncTms>
    <rampPT1Tms>0</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>-2</xMultiplier>
    <yMultiplier>-2</yMultiplier>
    <yRefType>1</yRefType>
</DERCurve>
```

```
<DERControl>
    <mRID>8002000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <creationTime>1557849766</creationTime>
    <EventStatus>
        <currentStatus>0</currentStatus>
        <dateTime>1557849766</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>Creation</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557849886</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModVoltWatt href="/derp/0/dc/0"/>
    </DERControlBase>
</DERControl>
```

6.9 BASIC-012 - Frequency-Watt

```
<DERCurve>
    <mRID>80020000000000000000012a1b2c3b4</mRID>
    <description>Freq-Watt Curve</description>
    <creationTime>1557850244</creationTime>
    <CurveData>
        <xvalue>56</xvalue>
        <yvalue>0</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>57</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>58</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>59</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>60</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>61</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>62</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>63</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>64</xvalue>
        <yvalue>100</yvalue>
    </CurveData>
    <CurveData>
        <xvalue>65</xvalue>
        <yvalue>0</yvalue>
    </CurveData>
    <curveType>0</curveType>
    <openLoopTms>0</openLoopTms>
    <rampDecTms>600</rampDecTms>
    <rampIncTms>600</rampIncTms>
    <rampPT1Tms>100</rampPT1Tms>
    <vRef>0</vRef>
    <xMultiplier>0</xMultiplier>
    <yMultiplier>0</yMultiplier>
    <yRefType>1</yRefType>
</DERCurve>
```

```
<DERControl>
```

```
    <mRID>80020000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <creationTime>1557850244</creationTime>
    <EventStatus>
        <currentStatus>0</currentStatus>
        <dateTime>1557850244</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>Creation</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557850364</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModFreqDroop>
            <dBOF>60036</dBOF>
            <dBUF>59964</dBUF>
            <kOF>50</kOF>
            <kUF>50</kUF>
            <openLoopTms>500</openLoopTms>
        </opModFreqDroop>
        <opModFreqWatt href="/derp/0/dc/0"/>
    </DERControlBase>
</DERControl>
```

6.10 BASIC-013 - Set Active Power Mode - in % of Max Power

```
<DERControl>
    <mRID>8002000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <creationTime>1557850617</creationTime>
    <EventStatus>
        <currentStatus>0</currentStatus>
        <dateTime>1557850617</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>Creation</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557850737</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModFixedW>5000</opModFixedW>
    </DERControlBase>
</DERControl>
```

6.11 BASIC-014 - Set Active Power Mode – in Watts

```
<DERControl href="/derp/0/derc/0" replyTo="/rsps/0/rsp" responseRequired="07">
    <mRID>8002000000000000000000aa1b2c3b4</mRID>
    <description>DERCX0</description>
    <version>1</version>
    <creationTime>1557851639</creationTime>
    <EventStatus>
        <currentStatus>0</currentStatus>
        <dateTime>1557851639</dateTime>
        <potentiallySuperseded>false</potentiallySuperseded>
        <potentiallySupersededTime>0</potentiallySupersededTime>
        <reason>Creation</reason>
    </EventStatus>
    <interval>
        <duration>60</duration>
        <start>1557851759</start>
    </interval>
    <randomizeDuration>0</randomizeDuration>
    <randomizeStart>0</randomizeStart>
    <DERControlBase>
        <opModTargetW>
            <multiplier>0</multiplier>
            <value>2000</value>
        </opModTargetW>
    </DERControlBase>
</DERControl>
```