SMUD

OpenADR Implementation Design Guide

Version 1.0 • March 26, 2021

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SMUD OpenADR Implementation Design Guide

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1. Design Guide Summary

This is intended to guide the implementation of OpenADR VTN and VEN services to deliver upon the use case needs of SMUD's DER programs. The information in this document in intended to be shared openly with potential technology vendors. No confidential information is included

1.1. Use Case Summary

Category	Use Case	Brief Description
Control	Load Control	Event based load control using consumption/generation setpoint
	Load Optimization	Event based signal where interval data maps resources to specific other use case event signals.
Pricing	Time of Use Pricing	Event based TOU pricing signal
	Day Ahead Hourly Pricing	Event based day ahead pricing signal
	Peak Price Events	Event based peak price signaling
Reporting	Energy Metering	Telemetry reporting of current consumption/generation
	State of Charge	Telemetry reporting of current charge state
	Capability Forecast	Reporting of potential generation and load shed capacity
Other	Group Assignment	Mapping of DER resources to grouping constructs. Out of scope for this mapping effort as may be handled at the DERMS rather than OpenADR level.

2. Use of OpenADR Conventions

2.1. General Assumptions:

1) Fast DR with event frequencies in the sub 5 minute range are out of scope for this version of the design guide, although nothing in the proposed mappings should preclude evolving these use cases to fast DR in the future. For Fast DR, review oadrResponseRequired settings and response timing window requirements for VEN oadrCreatedEvent payloads.
2) All payloads will use the OpenADR 2.0B profile
3) All payloads exchanges will use the pull exchange model
4) VENs that lose communication, are reset, or power up should probe the VTN to see if they are in a registered state (via oadrQueryRegistration), and if not in a registered state go through the full bootstrap process including registration, metadata report exchange, and event initialization with oadrRequestEvent
5) Deployed VENs and VTNs will use OpenADRs "out of the box" security characteristics including….
    a. -Kyrio OpenADR production x.509 certs, with mutual client server authentication
    b. -TLS 1.2

   c. -ECC or RSA OpenADR specific ciphers
6) VENs and VTNs are OpenADR Certified.

2.2. Event Targeting Mechanisms:

OpenADR provides the following mechanisms to map a specific DR signal to the resources associated with a VEN:

1) Market Context (Program unique identifier) – A VEN can participate in one or more programs with downstream resource mapped to programs as required. SMUD will maintain a master list of MarketContext URI values. This master list will include an integer numeric designator for each MarketContext URI. This numeric designator will be used in interval payloadFloat values for the Load Optimization use case
2) Event Level Targeting –. For the purposes of the use cases described in this implementation guide, event level targets will be restricted to the use GroupID to target resources that have been assigned membership into abstract groups. Group assignment will be communicated to aggregators out of band.

2.3. Report Data Source Mapping:

1) OpenADR reports are aggregate reports. The specific resources from which data is aggregated may be listed in the ReportDataSource object of the register report payload. Any of the defined event level target objects may be used, so for instance the reportDataSource could be “Group 123”.
2) The source of the report data can be further qualified using the reportSubject object of the register report payload. Any of the defined signal level device classes may be used in this object.
3) OpenADR does not provide a simple way to communicate a large set of non-aggregated data values for multiple resources in a single report. However, a report can be constructed that includes resource identifiers as part of the data set itself using the rid element, providing a way to do non-aggregated reporting efficiently in a single report payload

2.4. Default Data Element Formatting

The following provides general guidelines for the naming of payload data elements. Some use cases may require modified forms of these identifiers which will be documented in the individual use case guidelines. In general, most identifiers will have a human readable prefix follow by a unique identifier (uid) whose scope, if required to be unique, is defined in the OpenADR B profile specification

Data Element	***Format***	***Comments***
venID	*venID_[Customer identifier]_[uid]* *Example: venID_Company_4321*	*venID's can be dynamically allocated by the VTN at time of registration or pre-allocated on deployment of the VEN. If dynamically allocated, the UUID portion of the venID may change at each registration*
Vtn_ID	*venID_[Customer identifier]_[uid]* *Example: vtnID_Company_4321*	
MarketContext	*Valid URI* *http://www.smud.org/[use case]/[version]* *Example: hhtp://www.smud.org/tou/01*	*MarketContext will identify a unique DR programs or use case and will be included in all Event payloads. The VEN will use MarketContext as a primary filter in determining which resources are targeted for an event.*
EventID	*eventID_[uid]_* *Example: eventID_123432*	
SignalName	*Standard OpenADR signal* *0r* *x-[custom signal name]* *Example: ELECTRICITY_PRICE*	
signalID	*[signal name]_[purpose]* *Example: ELECTRICITY_PRICE_retail*	*Used to differentiate two signals of the same name in an event. If custom signal, omit leading "x-" . Postfix can be a uid if only one signal of this type is present, otherwise should be a human readable differentiating descriptor as to the purpose of each signal of the same type*

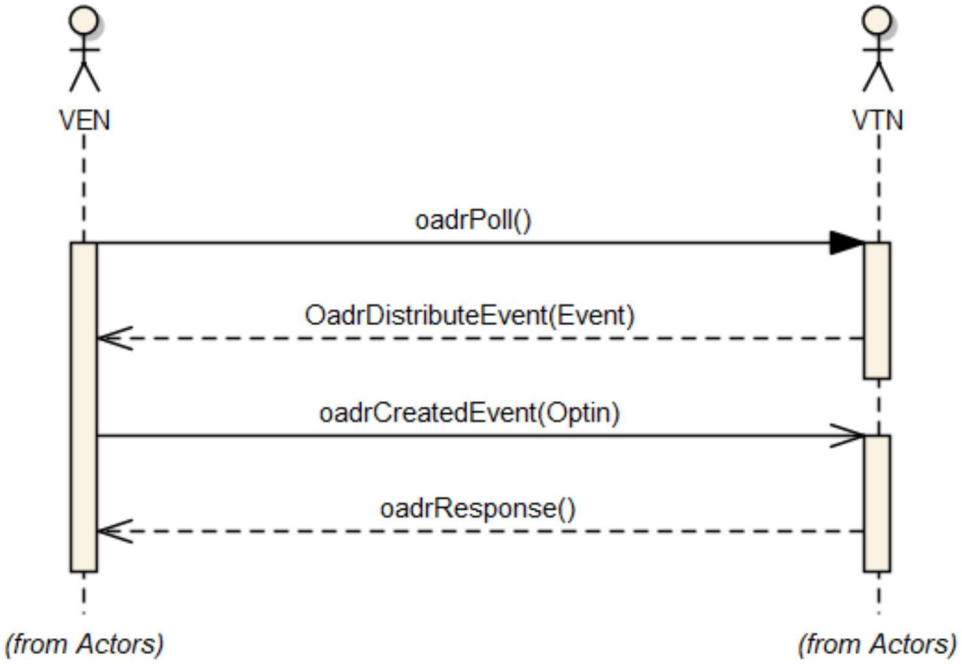
reportName	*Standard OpenADR Report* *Or* *x-[custom report name]* *Example: x-DELIVERED_CAPACITY* *x-METADATA_ x-DELIVERED_CAPACITY*	
reportSpecifierID	*[report name]_[uid]* *Example: DELIVERED_CAPACITY_4321*	*If custom report, omit leading "x-"*
reportRequestID	*[reportname]_request_[uid]* *Example:* *DELIVERED_CAPACITY_request_4321*	*If custom report, omit leading "x-"*
rid	*[ReportName]_[UOM_Descriptor]_[postfix]* Examples: TELEMETRY_STATUS_resource2 RESOURCE_FORECAST powerReal_resource2_UP	*UOM is Unit of Measure (i.e. Watts). Descriptor might be something like resourceID, but can be omitted if there is no need. If custom report names, omit "x-" prefix. An optional prefix can be included if the use case warrents*
reportID	*Ignored by OpenADR*	
resourceID	*resourceID_[descriptor]_[uid]* *Example: resourceID_lighting_4313*	*Descriptor is optional, but should be used if resource is of some common type such as lighting or hvac*
groupID	*groupID_[descriptor]* *Example: groupID_rateplan123* *Example: Group_EastSide*	*Descriptor will provide a human readable identifier where practical, such as rate plan or locational grouping*
requestID	*requestID_[uid]* *Example: requestID_1234*	

2.6. Default Event Sequence Diagrams

Documents a global pattern to include an initial opt in scenarios including event participation qualification.

2.6.1. VEN Polls for new events

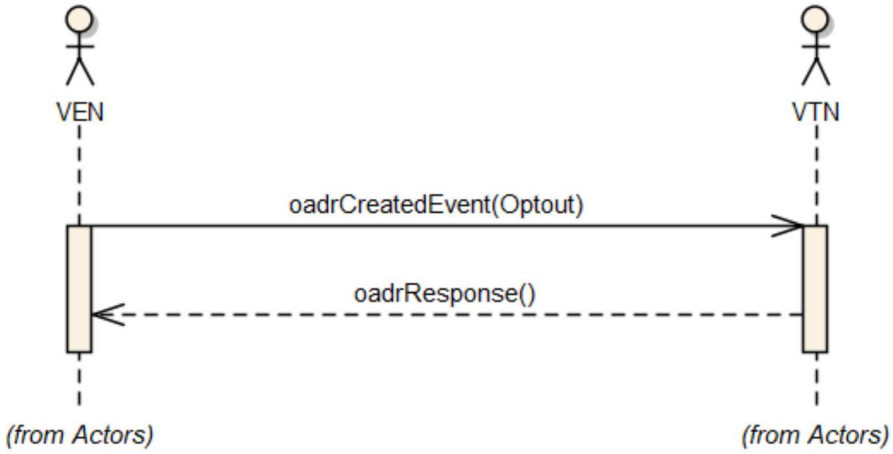
The default behavior pattern for Event related use cases is for the VEN to Optin after receiving an event as the result of an oadrPoll request as shown in the sequence diagram below:



Business rules will dictate whether a VEN must optin to an event, whether then ven can asynchronously optout after having initially done an optin, and whether a ven can optin to an event after having first done an optout.

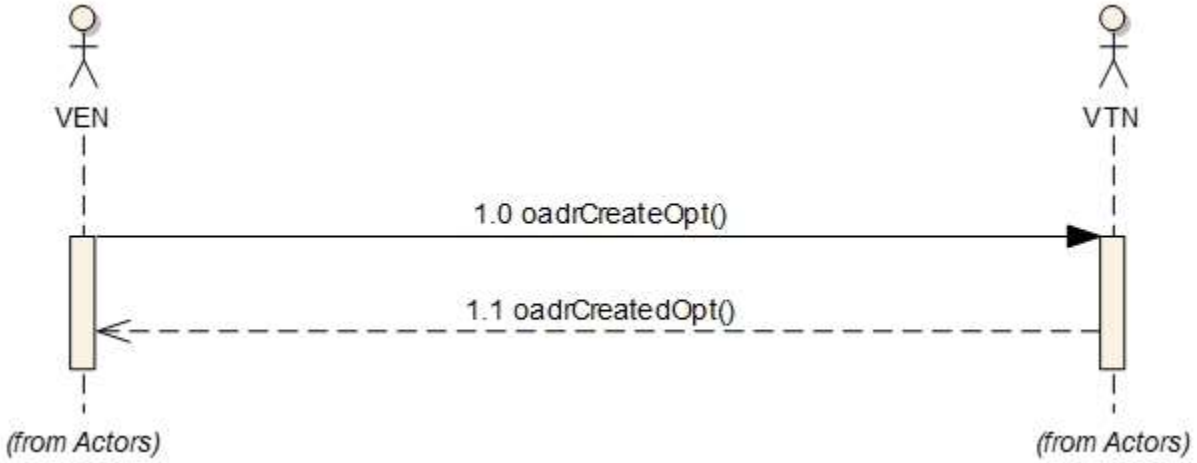
2.6.2. VEN Asynchronously opts out of event

At any time after the VEN has opted into the event it can asynchronously opt out of the event as shown in the sequence diagram below:



2.6.3. VEN Qualifies Event participation

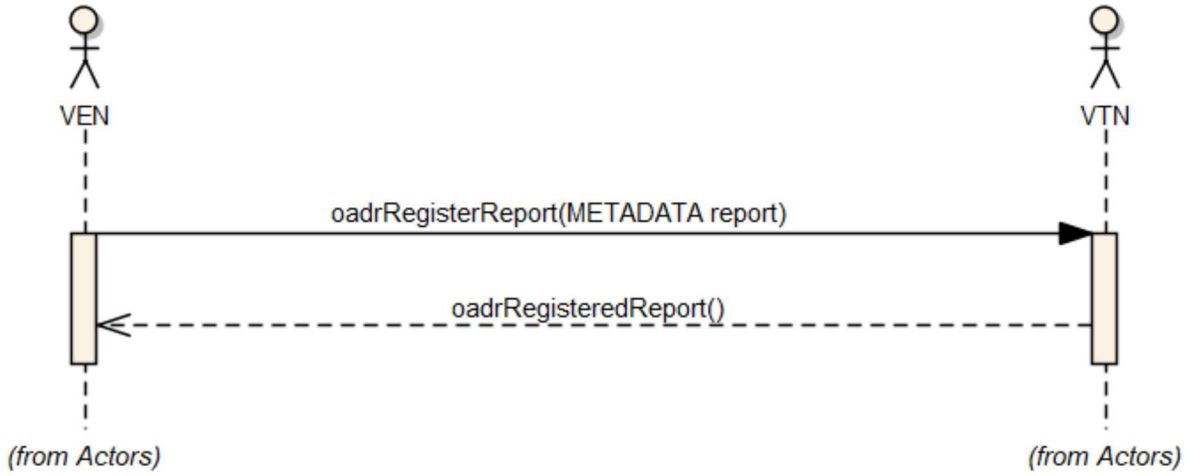
After initially opting into an event, a VEN can communicate to the VTN that some resources cannot participate in the event.



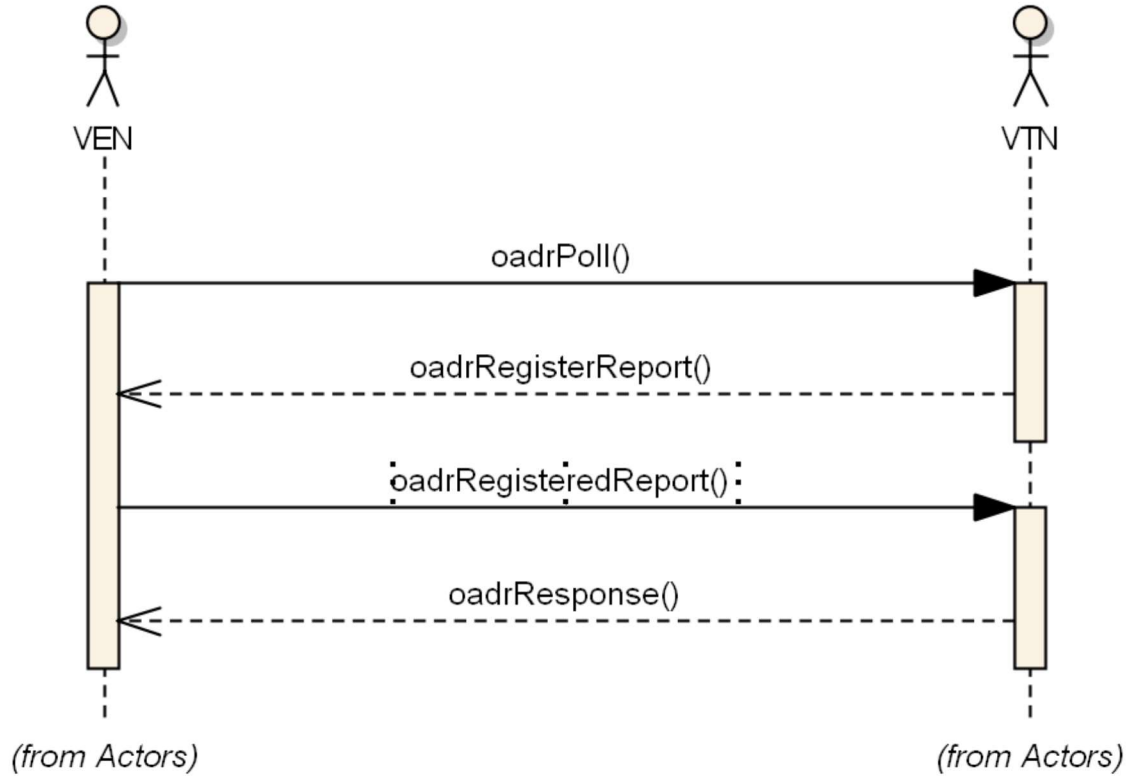
2.7. Default Reporting Sequence Diagrams

The following sequence diagrams illustrate the expected pull message exchange patter for reporting service operations.

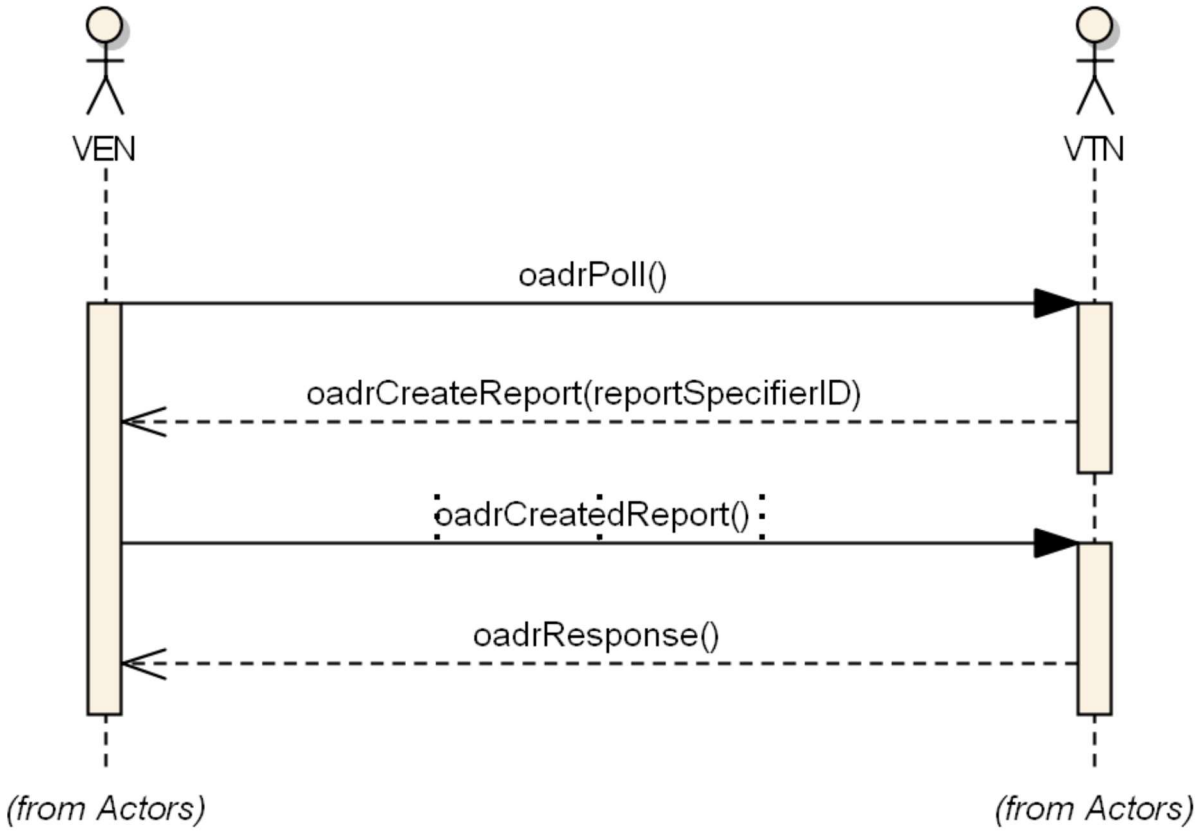
2.7.1. VEN Registers Reporting Capabilities



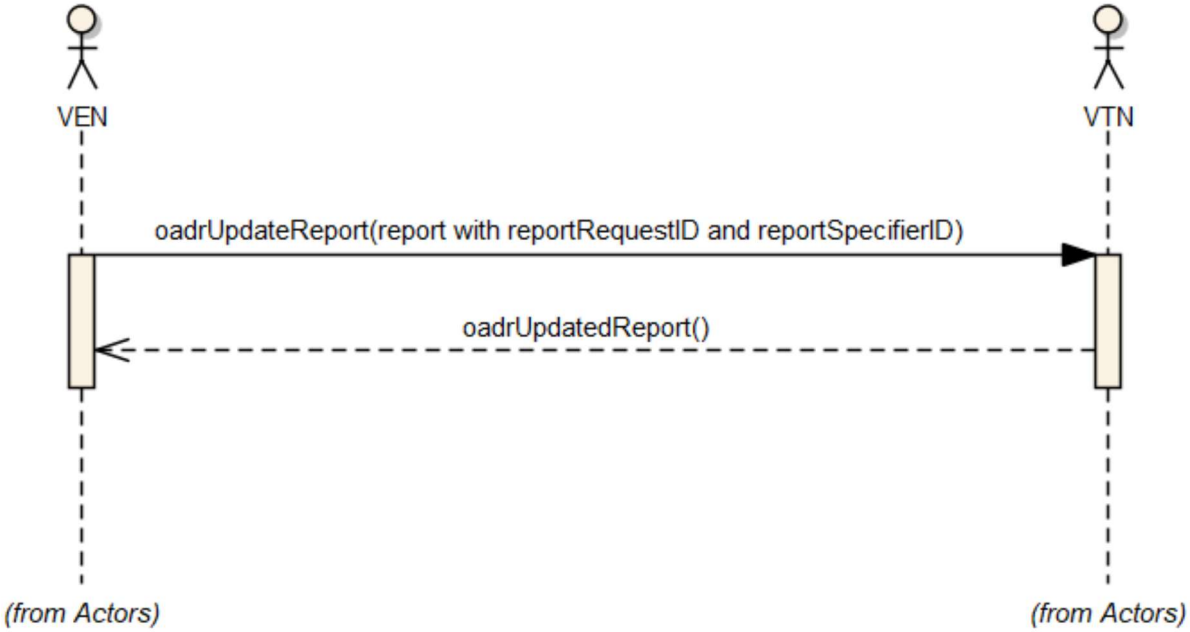
2.7.2. VTN Registers Reporting Capabilities



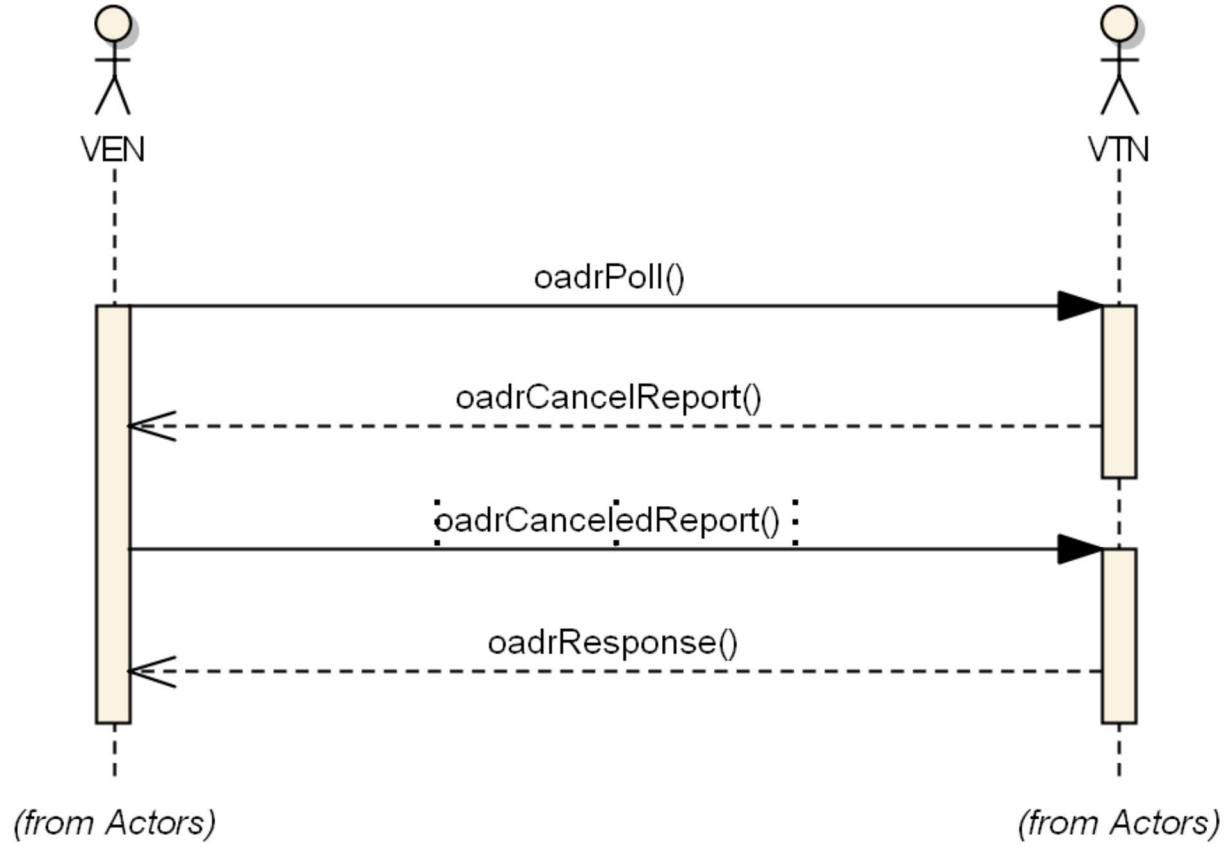
2.7.3. VTN Requests Report



2.7.4. VEN Delivers Report



2.7.5. VTN Cancels Periodic Report



2.8. Default Error Codes

Unless specified otherwise in the use case definitions, the following application layer and HTTP response codes will be used.

Compliance Error Codes (Application Layer)

- 450 – Out of sequence (event ordering, uid ordering, modification number sequencing)
- 451 – Not Allowed (changing an event in the past)
- 452 – Invalid ID (eventID, optID, requestID, registrationID, etc.)
- 453 – Not recognized (reportName, signalName, etc.)
- 454 – Invalid Data (out of range signal or report data)
- Deployment Error Codes (Application Layer)
- 460 – Signal not supported (recognized, but not supported)
- 461 – Report not supported (recognized, but not supported)
- 462 – Target mismatch (cannot resolve target/ market context to VEN or its resources)
- 463 – Not registered/ Authorized

HTTP Response Codes

- 200 OK – any response that the endpoint was able to handle completely and send a valid OpenADR response payload. This includes responses that may indicate an error at the application level.
- 404 Not Found – the VEN does not support requested operation. The requestor must not re-send the request.
- 406 Not Acceptable – If a payload is sent that does not validate against the EI schema, or if a request content-type is unsupported. The requestor must not re-send the request without first modifying it.

3. Use Case Descriptions

3.1. Load Control Use Case

Load Control Use Case Characteristic Table	
Characteristic	**Description**
Use Case Objective	Send power setpoint event to aggregator managing residential resources capable of modifying their load (or export) profile.
Description	Send day ahead LOAD_DISPATCH event signal targeted to one or many aggregators, with the aggregator managing the load profile of behind the meter batteries, water heaters, BYOD thermostats, and EV (Should this be separate use case?).
Customer Segment	Residential
Signaling end point	Aggregator
Benefit	Utility – Manage load shaping for bulk market cost shifting, distribution level economic optimization, distribution operations support such as capacity relief Includes signals to increase load during periods of abundant supply. Aggregator – Compensation by utility, added customer value increases sales Consumer-up front and recurring incentive compensation for grid support services - ?? Customer experience - Batteries and HPWH are not allowed to override because of no customer experience impact. For EVs we are thinking of allowing a dozen overrides per year per customer due to potential compromises to EV use. Smart thermostat programs have also historically allowed for override.
Target Load	Behind the meter batteries, water heaters, BYOD thermostats, and EV (V1G or throttled one way power flow or V2G throttled two way power flow) In the case of load control of EVs, the utility takes on responsibility of ensuring customer use of the EV is not compromised.

Event Signals	Signal Name: LOAD_DISPATCH Signal Type: Setpoint SignalID: As defined in default data element formatting Units: powerReal (W) scaleCode “k” or “m” powerAttribute Hertz: 60 powerAttribute, voltage: 110 or 220 powerAttribute, ac: True SignalPayload: target setpoint value used to modify load
Custom Error Codes	None
Event Time Frames	-Typically, events may be called 1 time per day, with limitations by season or year as defined in the program parameters -Typically, a single multi-hour block per day. -Notification between 1 day and 1 hour before start of event
Event Randomization	Not Used. Omit tolerance element from payload or set tolerate to zero
Event Ramp Up / Recovery	Not Used. Omit x-eiRampUp and x-eiRecovery from payload or set duration to zero.
Event Baselines	Omit eiEventBaseline from payload
Event Opt Responses	See default Event Sequence diagram and associated narrative. ResponseRequired set to always
Event Targeting	GroupID – VTN will create abstract groups by location or other constructs and send those to the VEN out of band.
Event Signal Level Targeting	Omit from payload
Polling	1 minute polling?
Sequence Diagram	Default Event Sequence
Other	MarketContext: http://www.smud.org/load_control/01 Priority set to zero Current Value – Omit from payload

3.2. Load Optimization Use Case

Load Optimization Use Case	
Characteristic	**Description**
Use Case Objective	Optimize load modification behavior
Description	Devices will be pointed to their current event signal based on forecasted grid conditions. E.G. A load may routinely optimize to the Time of Use pricing schedule and be pointed to the Day Ahead Hourly or Peak Price Event schedule. the value of the mode signal changes.
Customer Segment	Residential
Signaling end point	Aggregator
Benefit	Utility: optimal leveraging of customer load modification potential on and as-needed basis, based on extremity of forecasted grid conditions Customer: Recurring incentives for agreeing to respond to limited-use optimization events. Balancing customer autonomy and predictability with grid service incentives.
Target Load	Any flexible load?
Event Signals	Signal Name: x-LOAD_OPTIMIZATION Signal Type: level Units: None Description: VENs may receive events with electricity price information from multiple MarketContexts. The LOAD_OPTIMIZATION signal will provide direction to the VEN as to which MarketContext should take precedence with regards to adapting load profile behavior in response to pricing changes. SignalPayload values for each interval will be a well know numeric designator that maps to a MarketContext URI. During event execution, the VEN shall treat the MarketContext for the interval identifier currently active as its primary filter for determining which MarketContext has precedence. VENs may be aware of the mapping between MarketContext and numeric designators through some out of band mechanism. A subset of this mapping, relevant to this load optimization use will be included in the vtnComment element of the event payload, formatted as follows: [identifier]:[MarketContext]; [identifier]:[MarketContext]; etc Example: 21:http://www.smud.org/load_control/01;54: http://www.smud.org/tou/01

Event Time Frames	-Limited number of days per year or season where behavior would be optimized to a mode other than the default TOU price signal. -Optimization change behavior in 1 hour or multi-hour interval increments over a 24 hour period. 15 minutes may be required later. -Notification between 1 day and 1 hour before start of day -Event may be modified to tweak the optimization during event "active" period.
Event Randomization	None
Event Ramp Up / Recovery	None
Event Baselines	None
Event Opt Responses	"always" opt response
Event Targeting	GroupID – VTN will create abstract groups by location or other constructs and send those to the VEN out of band.
Event Signal Level Targeting	None
Polling	1 minute polling?
Sequence Diagram	Default Event Sequence
Other	MarketContext: http://www.smud.org/load_optimization/01 Priority set to zero Current Value – Omit from payload

3.3. Time of Use Pricing Use Case

Time of Use Pricing Use Case	
Characteristic	**Description**
Use Case Objective	Notification of current TOU Tariff Rates
Description	SMUDs default rates are defined in annual Tariff sheets. Those should be converted to price signals and communicated to the VEN on a day ahead hourly basis.
Customer Segment	Residential?
Signaling end point	Facilitator/aggregator, who will in turn distribute pricing to SMUD customer resources
Benefit	Utility: Lower system costs by increasing automated Load response to TOU rate, reducing peak, increasing beneficial off-peak load Precursor to future more dynamic pricing models. Customer: Manage costs through automating response to and awareness of electricity pricing
Target Load	Any – Best effort program I assume
Event Signals	Signal Name: ELECTRICITY_PRICE Signal Type: price Units: currencyPerKWh ItemDescription:currencyPerKWh ItemUnits: USD ScaleCode: none
Event Time Frames	-Typically, events may be called 1 times per day - Events start at midnight and end at midnight. - 23hr and 25hr event on Daylight Savings Transition Days. -Notification between 1 day and 1 hour before start of new day -24 hours of pricing values per event. one hour or multi-hour intervals of pricing values in signal. In later phases, individual interval length could be arbitrary.
Event Randomization	None
Event Ramp Up / Recovery	None
Event Baselines	None
Event Opt Responses	VEN to provide a mandatory optin as a confirmation signal that they received the event.

Event Targeting	GroupID – VTN will create abstract groups by location or other constructs and send those to the VEN out of band.
Event Signal Level Targeting	None
Polling	1 minute polling?
Sequence Diagram	Default Event Sequence
Other	MarketContext: http://www.smud.org/tou/01 Priority set to zero Current Value – Omit from payload

3.4. Day Ahead Hourly Pricing Use Case

Day Ahead Hourly Pricing	
Characteristic	**Description**
Use Case Objective	Notification of day ahead hourly pricing
Description	Provide event notification of next day's pricing on a day ahead hourly basis. Price changes are a function of wholesale market pricing or the situational use of short term price differentials to influence customer load use behavior
Customer Segment	Residential?
Signaling end point	Facilitator/aggregator, who will in turn distribute pricing to SMUD customer resources
Benefit	Utility: Shape load via price, optimizing generation costs, defer T&D upgrades Customer: Manage costs through pricing awareness?
Target Load	Any – Best effort program I assume
Event Signals	Signal Name: ELECTRICITY_PRICE Signal Type: price Units: currencyPerKWh ItemDescription:currencyPerKWh ItemUnits: USD ScaleCode: none
Event Time Frames	-Typically, events may be called 1 times per day - Events start at midnight and end at midnight. - 23hr and 25hr event on Daylight Savings Transition Days. -Notification between 1 day and 1 hour before start of new day -24 hours of pricing values per event. one hour or multi-hour intervals of pricing values in the signal. In later phases, individual interval length could be arbitrary.
Event Randomization	None
Event Ramp Up / Recovery	None
Event Baselines	None
Event Opt Responses	VEN to provide a mandatory optin as a confirmation signal that they received the event.
Event Targeting	GroupID – VTN will create abstract groups by location or other constructs and send those to the VEN out of band.
Event Signal Level Targeting	None
Polling	1 minute polling?

Sequence Diagram	Default Event Sequence
Other	MarketContext: http://www.smud.org/day_ahead_hourly/01 Priority set to zero Current Value – Omit from payload

3.5. Peak Price Event Use Case

Peak Price Event Use Case	
Characteristic	**Description**
Use Case Objective	Notification of peak price events
Description	Provide event notification of peak price events
Customer Segment	Residential
Signaling end point	Aggregator
Benefit	Utility: Load reduction in times of stress, economic or capacity Customer: reduction in rates during non-peak time frames?
Target Load	Any
Event Signals	Signal Name: ELECTRICITY_PRICE Signal Type: price Units: currencyPerKWh ItemDescription:currencyPerKWh ItemUnits: USD ScaleCode: none
Event Time Frames	-Typically, events may be called 1 times per day, with limitations by season or year as defined in the program parameters -Event duration from one to many hours. - Price signal intervals are full hour increments. Sub-hour increments could be addressed in future phases. -Notification between 1 day and 1 hour before start of event. - Event periods are intra-day. And can start at any hour of the day.
Event Randomization	None
Event Ramp Up / Recovery	None
Event Baselines	None
Event Opt Responses	VEN to provide a mandatory optin as a confirmation signal that they received the event.
Event Targeting	GroupID – VTN will create abstract groups by location or other constructs and send those to the VEN out of band.
Event Signal Level Targeting	None
Polling	1 minute polling?
Sequence Diagram	Default Event Sequence

Other	MarketContext: http://www.smud.org/peak_price/01 Priority set to zero Current Value – Omit from payload

3.6. Energy Metering Reporting Use Case

Energy Metering Use Case	
Characteristic	**Description**
Use Case Objective	Telemetry feedback of energy consumption
Description	Use OpenADRs' reporting service to gather supplementary consumption data beyond that gathered via the AMI network. Report sampling rate for Energy Metering expected to be 15 minute intervals.
Customer Segment	Residential
Signaling end point	Aggregator
Benefit	Additional data for analytics and DERMS forecasting. Potentially used for settlement in future program design.
Report Description	**Aggregate report for all resources associated with VEN or groupID** • Report Name: TELEMETRY_USAGE • Report Type: usage • Reading Type: Direct Read • Units: powerReal (W) • scaleCode "k" or "m" • powerAttribute Hertz: 60 • powerAttribute, voltage: 110 or 220 • powerAttribute, ac: True • samplingRate: Deployment specific • reportDataSource: venID or groupID **Resource specific reporting** • Report Name: x-TELEMETRY_RESOURCE • Report Type: usage • Reading Type: Direct Read • Units: powerReal (W) • scaleCode "k" or "m" • powerAttribute Hertz: 60 • powerAttribute, voltage: 110 or 220 • powerAttribute, ac: True • samplingRate: Deployment specific • reportDataSource – Omit from payload

Report Data Points (rid)	TELEMETRY_USAGE - As defined in default data element formatting Example: TELEMETRY_USAGE_powerReal x-TELEMETRY_RESOURCE – The rid will include the resourceID of the data source from which the data was derived. Format as defined in default data element formatting. Example: TELEMETRY_RESOURCE_powerReal_Resource123
Report Request Characteristics	-Periodic report -dtStart = current time -duration: 0 (open ended) -reportBackDuration and granularity: Values should be equal and should be within the supported samplingRate, but not less than 1 report per minute
Polling	Bounded by event polling requirements as requested by the VTN
Sequence Diagram	Refer to default reporting sequence diagrams
Other	MarketContext required – value program dependent

3.7 State of Charge Reporting Use Case

State of Charge Use Case	
Characteristic	**Description**
Use Case Objective	Situational awareness of energy state relevant to storage based DER such as Electric Vehicles and Battery Storage (primary use case)
Description	Report DER charge state periodically to upstream entities so that they are aware of the current charge state of the resource in order to forecast event response potential Report sampling rate for State of Charge Metering expected to be 15 minute intervals.
Customer Segment	Residential
Signaling end point	Aggregator
Benefit	Gives the utility the ability to forecast the aggregate load response for use as a distribution operations management tool or market participating resource, or load forecast modifier.
Target Load	Battery
Reports	**Resource specific reporting** • Report Name: TELEMETRY_STATUS • Report Type: x-resourceStatus • Reading Type: x-notApplicable • Units: N/A • samplingRate: Deployment specific • reportDataSource – Omit from payload

Report Data Points	Reporting data points will map to specific battery systems where name plate max/min capacity and current percentage charge state can be used to calculate potential load response Note aggregation of potential load response across multiple battery systems will need to be done at the VTN application layer (i.e. by the aggregator). A VEN may be associated with one or more battery systems. The TELEMETRY_STATUS report uses the x-resourceStatus object which does not include specification for units of measure so VENs and VTNs must establish a common understanding of units for values included in oadrUpdateReport payloads. The TELEMETRY_STATUS rid will include the resourceID of the battery system from which the data was derived. Format as defined in default data element formatting. Example: TELEMETRY_STATUS_Resource123 The following oadrPayloadResourceStatus elements will be included in oadrUpadateReport payloads: • oadrOnline – True/False, whether asset is online • oadrManualOverride – True/False, whether control of the asset has been manually overridden. • oadrLoadControlState:oadsoadrSetPoint:oadrMax – Maximum battery system capacity in kWh • oadrLoadControlState:oadrSetPoint:oadrMin – Minimum battery system capacity in kWh • oadrLoadControlState:oadrSetPoint:oadrCurrent – Current charge state as a percentage of maximum capacity
Report Request Characteristics	-Periodic report -dtStart = current time -duration: 0 (open ended) -reportBackDuration and granularity: Values should be equal and should be within the supported samplingRate, but not less than 1 report per minute
Polling	Bounded by event polling requirements as requested by the VTN
Sequence Diagram	Refer to telemetry status reporting sequence diagrams
Other	MarketContext required – value program dependent

3.8 Capability Forecast Reporting Use Case

Capability Forecast Reporting Use Case	
Characteristic	**Description**
Use Case Objective	Receive a rolling forecast of the aggregated load flexibility so that the upstream VTN's application layer is aware of how much load shed or generation can be dispatched 48hrs in the future.
Description	The VENs will offer a containing 48 one hour intervals which represent the aggregated load flexibility for the resources associated with the VTN. This load flexibility will represent a delta from forecasted normal operations unique to each program. For instance, if the forecasted normal operations are 100KW and the minimum operational level is 70KW, then the interval value in reports would be 30KW, indicating that the VEN can shed from 0 to 30KW of load during that one hour interval.
Customer Segment	Residential
Signaling end point	Aggregator
Benefit	Reference point for more accurate estimates of potential load flexibility
Target Load	Any

Reports	**Reports must contain 48 one hour intervals reflecting the next 48 hours of forecasted load flexibility as a delta from forecasted normal operations.** **Aggregate Forecast for all resources associated with venID or groupID** • Report Name: x-AGGREGATE_FORECAST • Report Type: deltaUsage • Reading Type: x-notApplicable • Units: powerReal (W) • scaleCode “k” or “m” • powerAttribute Hertz: 60 • powerAttribute, voltage: 110 or 220 • powerAttribute, ac: True • samplingRate: PT1H • reportDataSource: venID or GroupID **Resource specific forecast reporting** • Report Name: x-RESOURCE_FORECAST • Report Type: deltaUsage • Reading Type: x-notApplicable • Units: powerReal (W) • scaleCode “k” or “m” • powerAttribute Hertz: 60 • powerAttribute, voltage: 110 or 220 • powerAttribute, ac: True • samplingRate: PT1H • reportDataSource – Omit from Payload
Report Data Points	There will be two data points for each unique combination of report name and UOM. The post fixes “_UP” and “_DOWN” will used respectively to indicate load generation and load shed flexibility. Forecast values in oadrUpdateReport payloads will be positive floats. x-AGGREGATE_FORECAST - As defined in default data element formatting Examples: AGGREGATE_FORECAST_powerReal_UP AGGREGATE_FORECAST_powerReal_DOWN x-RESOURCE_FORECAST – The rid will include the resourceID of the data source from the forecast applies. Format as defined in default data element formatting. Examples: RESOURCE_FORECAST_powerReal_Resource123_UP RESOURCE_FORECAST_powerReal_Resource123_DOWN

Report Request Characteristics	-Periodic report -dtStart = 6 hours before 24 hour forecasted time frame -duration: 0 (open ended) -reportBackDuration: every 24 hours -granularity: 1 hour
Polling	Bounded by event polling requirements as requested by the VTN
Sequence Diagram	Refer to telemetry status reporting sequence diagrams
Other	MarketContext required – value program dependent

4 Sample Payloads

4.1 Load Control Use Case – Sample XML

oadrDistributeEvent Payload (Load Control Use Case)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrDistributeEvent ns2:schemaVersion="2.0b">
        <ns2:eiResponse>
           <ns2:responseCode>200</ns2:responseCode>
           <ns2:responseDescription>OK</ns2:responseDescription>
           <ns3:requestID/>
        </ns2:eiResponse>
        <ns3:requestID>requestID_12345</ns3:requestID>
        <ns2:vtnID>vtnID_CompanyName_1234</ns2:vtnID>
        <ns7:oadrEvent>
           <ns2:eiEvent>
              <ns2:eventDescriptor>
                <ns2:eventID>eventID_1234</ns2:eventID>
                <ns2:modificationNumber>0</ns2:modificationNumber>
                <ns2:modificationDateTime>2020-09-30T18:58:32Z</ns2:modificationDateTime>
                <ns2:priority>1</ns2:priority>
                <ns2:eiMarketContext>
                   <ns4:marketContext>http://MarketContext1</ns4:marketContext>
                </ns2:eiMarketContext>
                <ns2:createdDateTime>2020-09-30T18:58:31Z</ns2:createdDateTime>
                <ns2:eventStatus>far</ns2:eventStatus>
                <ns2:testEvent>false</ns2:testEvent>
                <ns2:vtnComment>Sample Payload</ns2:vtnComment>
              </ns2:eventDescriptor>
              <ns2:eiActivePeriod>
                <ns5:properties>
                   <ns5:dtstart>
                      <ns5:date-time>2020-09-30T18:59:32Z</ns5:date-time>
                   </ns5:dtstart>
                   <ns5:duration>
                      <ns5:duration>PT4H</ns5:duration>
                   </ns5:duration>
                   <ns2:x-eiNotification>
                      <ns5:duration>PT24H</ns5:duration>
                   </ns2:x-eiNotification>
                </ns5:properties>
                <ns5:components/>
              </ns2:eiActivePeriod>
              <ns2:eiEventSignals>
                <ns2:eiEventSignal>
```

```
                  <ns6:intervals>
                     <ns2:interval>
                        <ns5:duration>
                           <ns5:duration>PT4H</ns5:duration>
                        </ns5:duration>
                        <ns5:uid>
                           <ns5:text>0</ns5:text>
                        </ns5:uid>
                        <ns2:signalPayload>
                           <ns2:payloadFloat>
                              <ns2:value>40.0</ns2:value>
                           </ns2:payloadFloat>
                        </ns2:signalPayload>
                     </ns2:interval>
                  </ns6:intervals>
                  <ns2:signalName>LOAD_DISPATCH</ns2:signalName>
                  <ns2:signalType>setpoint</ns2:signalType>
                  <ns2:signalID>LOAD_DISPATCH_01</ns2:signalID>
                  <ns9:powerReal>
                     <ns9:itemDescription>RealPower</ns9:itemDescription>
                     <ns9:itemUnits>W</ns9:itemUnits>
                     <ns11:siScaleCode>k</ns11:siScaleCode>
                     <ns9:powerAttributes>
                        <ns9:hertz>0.0</ns9:hertz>
                        <ns9:voltage>0.0</ns9:voltage>
                        <ns9:ac>true</ns9:ac>
                     </ns9:powerAttributes>
                  </ns9:powerReal>
               </ns2:eiEventSignal>
            </ns2:eiEventSignals>
            <ns2:eiTarget>
              <ns2:groupID>group_1234</ns2:groupID>
            </ns2:eiTarget>
         </ns2:eiEvent>
         <ns7:oadrResponseRequired>always</ns7:oadrResponseRequired>
      </ns7:oadrEvent>
   </ns7:oadrDistributeEvent>
</ns7:oadrSignedObject>
</ns7:oadrPayload>
```

4.2 Load Optimization Use Case – Sample XML

oadrDistributeEvent Payload (Load Optimization Use Case)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns2="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns4="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns7="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="http://openadr.org/oadr-2.0b/2012/07/xmldsig-properties" xmlns:ns14="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://openadr.org/oadr-2.0b/2012/07 file:///C:/Users/Jim/Documents/QualityLogic/OpenADR/Schema/OADR20b/oadr_20b.xsd">
   <ns2:oadrSignedObject>
      <ns2:oadrDistributeEvent ns3:schemaVersion="2.0b">
        <ns3:eiResponse>
           <ns3:responseCode>200</ns3:responseCode>
           <ns3:responseDescription>OK</ns3:responseDescription>
           <ns4:requestID>683efed865b6f6a4603e</ns4:requestID>
        </ns3:eiResponse>
        <ns4:requestID>requestID_12345</ns4:requestID>
        <ns3:vtnID>vtnID_CompanyName_1234</ns3:vtnID>
        <ns2:oadrEvent>
           <ns3:eiEvent>
              <ns3:eventDescriptor>
                <ns3:eventID>eventID_1234</ns3:eventID>
                <ns3:modificationNumber>0</ns3:modificationNumber>
                <ns3:modificationReason/>
                <ns3:priority>0</ns3:priority>
                <ns3:eiMarketContext>
                   <ns6:marketContext>http://MarketContext1</ns6:marketContext>
                </ns3:eiMarketContext>
                <ns3:createdDateTime>2020-01-15T23:24:06Z</ns3:createdDateTime>
                <ns3:eventStatus>far</ns3:eventStatus>
                <ns3:testEvent>false</ns3:testEvent>
                <ns3:vtnComment>54: http://www.smud.org/tou/01</ns3:vtnComment>
              </ns3:eventDescriptor>
              <ns3:eiActivePeriod>
                <ns5:properties>
                   <ns5:dtstart>
                      <ns5:date-time>2020-10-31T00:00:00Z</ns5:date-time>
                   </ns5:dtstart>
                   <ns5:duration>
                      <ns5:duration>PT4H</ns5:duration>
                   </ns5:duration>
                   <ns3:x-eiNotification>
                      <ns5:duration>PT0M</ns5:duration>
                   </ns3:x-eiNotification>
                </ns5:properties>
                <ns5:components/>
              </ns3:eiActivePeriod>
              <ns3:eiEventSignals>
```

```
42.                <ns3:eiEventSignal>
43.                   <ns7:intervals>
44.                      <ns3:interval>
45.                        <ns5:duration>
46.                           <ns5:duration>PT4H</ns5:duration>
47.                        </ns5:duration>
48.                        <ns5:uid>
49.                           <ns5:text>0</ns5:text>
50.                        </ns5:uid>
51.                        <ns3:signalPayload>
52.                           <ns3:payloadFloat>
53.                              <ns3:value>54.0</ns3:value>
54.                           </ns3:payloadFloat>
55.                        </ns3:signalPayload>
56.                     </ns3:interval>
57.                  </ns7:intervals>
58.                  <ns3:signalName>x-LOAD_OPTIMIZATION</ns3:signalName>
59.                  <ns3:signalType>level</ns3:signalType>
60.                  <ns3:signalID>LOAD_OPTIMIZATION_01</ns3:signalID>
61.               </ns3:eiEventSignal>
62.            </ns3:eiEventSignals>
63.            <ns3:eiTarget>
64.              <ns3:groupID>group_1234</ns3:groupID>
65.            </ns3:eiTarget>
66.         </ns3:eiEvent>
67.         <ns2:oadrResponseRequired>always</ns2:oadrResponseRequired>
68.      </ns2:oadrEvent>
69.   </ns2:oadrDistributeEvent>
70. </ns2:oadrSignedObject>
71. </ns2:oadrPayload>
```

4.3 Time of Use and Day Ahead Hourly Price Use Cases – Sample XML

oadrDistributeEvent Payload (Time of Use and Day Ahead Hourly Price Use Cases)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns2="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns4="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns7="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="http://openadr.org/oadr-2.0b/2012/07/xmldsig-properties" xmlns:ns14="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns2:oadrSignedObject>
      <ns2:oadrDistributeEvent ns3:schemaVersion="2.0b">
        <ns3:eiResponse>
           <ns3:responseCode>200</ns3:responseCode>
           <ns3:responseDescription>OK</ns3:responseDescription>
           <ns4:requestID>683efed865b6f6a4603e</ns4:requestID>
        </ns3:eiResponse>
        <ns4:requestID>requestID_12345</ns4:requestID>
        <ns3:vtnID>vtnID_CompanyName_1234</ns3:vtnID>
        <ns2:oadrEvent>
           <ns3:eiEvent>
              <ns3:eventDescriptor>
                <ns3:eventID>eventID_1234</ns3:eventID>
                <ns3:modificationNumber>0</ns3:modificationNumber>
                <ns3:modificationReason/>
                <ns3:priority>0</ns3:priority>
                <ns3:eiMarketContext>
                   <ns6:marketContext>http://MarketContext1</ns6:marketContext>
                </ns3:eiMarketContext>
                <ns3:createdDateTime>2020-01-15T23:24:06Z</ns3:createdDateTime>
                <ns3:eventStatus>far</ns3:eventStatus>
                <ns3:testEvent>false</ns3:testEvent>
                <ns3:vtnComment>Test TOU</ns3:vtnComment>
              </ns3:eventDescriptor>
              <ns3:eiActivePeriod>
                <ns5:properties>
                   <ns5:dtstart>
                      <ns5:date-time>2020-10-31T00:00:00Z</ns5:date-time>
                   </ns5:dtstart>
                   <ns5:duration>
                      <ns5:duration>PT1440M</ns5:duration>
                   </ns5:duration>
                   <ns3:x-eiNotification>
                      <ns5:duration>PT0M</ns5:duration>
                   </ns3:x-eiNotification>
                </ns5:properties>
                <ns5:components/>
              </ns3:eiActivePeriod>
              <ns3:eiEventSignals>
                <ns3:eiEventSignal>
                   <ns7:intervals>
```

```
                    <ns3:interval>
                      <ns5:duration>
                         <ns5:duration>PT720M</ns5:duration>
                      </ns5:duration>
                      <ns5:uid>
                         <ns5:text>0</ns5:text>
                      </ns5:uid>
                      <ns3:signalPayload>
                         <ns3:payloadFloat>
                            <ns3:value>0.149</ns3:value>
                         </ns3:payloadFloat>
                      </ns3:signalPayload>
                    </ns3:interval>
                    <ns3:interval>
                      <ns5:duration>
                         <ns5:duration>PT300M</ns5:duration>
                      </ns5:duration>
                      <ns5:uid>
                         <ns5:text>1</ns5:text>
                      </ns5:uid>
                      <ns3:signalPayload>
                         <ns3:payloadFloat>
                            <ns3:value>0.192</ns3:value>
                         </ns3:payloadFloat>
                      </ns3:signalPayload>
                    </ns3:interval>
                    <ns3:interval>
                      <ns5:duration>
                         <ns5:duration>PT180M</ns5:duration>
                      </ns5:duration>
                      <ns5:uid>
                         <ns5:text>2</ns5:text>
                      </ns5:uid>
                      <ns3:signalPayload>
                         <ns3:payloadFloat>
                            <ns3:value>0.265</ns3:value>
                         </ns3:payloadFloat>
                      </ns3:signalPayload>
                    </ns3:interval>
                    <ns3:interval>
                      <ns5:duration>
                         <ns5:duration>PT240M</ns5:duration>
                      </ns5:duration>
                      <ns5:uid>
                         <ns5:text>3</ns5:text>
                      </ns5:uid>
                      <ns3:signalPayload>
                         <ns3:payloadFloat>
                            <ns3:value>0.192</ns3:value>
                         </ns3:payloadFloat>
                      </ns3:signalPayload>
                    </ns3:interval>
                  </ns7:intervals>
                  <ns3:signalName>ELECTRICITY_PRICE</ns3:signalName>
                  <ns3:signalType>price</ns3:signalType>
                  <ns3:signalID>ELECTRICITY_PRICE_01</ns3:signalID>
                  <ns2:currencyPerKWh>
                    <ns2:itemDescription>currencyPerKWh</ns2:itemDescription>
                    <ns2:itemUnits>USD</ns2:itemUnits>
                    <ns11:siScaleCode>none</ns11:siScaleCode>
                  </ns2:currencyPerKWh>
```

```
105.                </ns3:eiEventSignal>
106.              </ns3:eiEventSignals>
107.              <ns3:eiTarget>
108.                <ns3:groupID>group_1234</ns3:groupID>
109.              </ns3:eiTarget>
110.            </ns3:eiEvent>
111.            <ns2:oadrResponseRequired>always</ns2:oadrResponseRequired>
112.          </ns2:oadrEvent>
113.        </ns2:oadrDistributeEvent>
114.    </ns2:oadrSignedObject>
115.</ns2:oadrPayload>
```

4.4 Peak Price Event Use Case – Sample XML

oadrDistributeEvent Payload (Peak Price Event Use Case)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns2="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns4="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns7="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="http://openadr.org/oadr-2.0b/2012/07/xmldsig-properties" xmlns:ns14="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns2:oadrSignedObject>
      <ns2:oadrDistributeEvent ns3:schemaVersion="2.0b">
        <ns3:eiResponse>
           <ns3:responseCode>200</ns3:responseCode>
           <ns3:responseDescription>OK</ns3:responseDescription>
           <ns4:requestID>683efed865b6f6a4603e</ns4:requestID>
        </ns3:eiResponse>
        <ns4:requestID> requestID_12345</ns4:requestID>
        <ns3:vtnID> vtnID_CompanyName_1234</ns3:vtnID>
        <ns2:oadrEvent>
           <ns3:eiEvent>
              <ns3:eventDescriptor>
                <ns3:eventID> eventID_1234</ns3:eventID>
                <ns3:modificationNumber>0</ns3:modificationNumber>
                <ns3:modificationReason/>
                <ns3:priority>0</ns3:priority>
                <ns3:eiMarketContext>
                   <ns6:marketContext>http://MarketContext</ns6:marketContext>
                </ns3:eiMarketContext>
                <ns3:createdDateTime>2020-10-30T18:25:40Z</ns3:createdDateTime>
                <ns3:eventStatus>far</ns3:eventStatus>
                <ns3:testEvent>false</ns3:testEvent>
                <ns3:vtnComment>Test TOU</ns3:vtnComment>
              </ns3:eventDescriptor>
              <ns3:eiActivePeriod>
                <ns5:properties>
                   <ns5:dtstart>
                      <ns5:date-time>2020-10-31T10:00:00Z</ns5:date-time>
                   </ns5:dtstart>
                   <ns5:duration>
                      <ns5:duration>PT120M</ns5:duration>
                   </ns5:duration>
                   <ns3:x-eiNotification>
                      <ns5:duration>PT0M</ns5:duration>
                   </ns3:x-eiNotification>
                </ns5:properties>
                <ns5:components/>
              </ns3:eiActivePeriod>
              <ns3:eiEventSignals>
                <ns3:eiEventSignal>
                   <ns7:intervals>
```

```
                        <ns3:interval>
                          <ns5:duration>
                             <ns5:duration>PT120M</ns5:duration>
                          </ns5:duration>
                          <ns5:uid>
                             <ns5:text>0</ns5:text>
                          </ns5:uid>
                          <ns3:signalPayload>
                             <ns3:payloadFloat>
                                <ns3:value>0.149</ns3:value>
                             </ns3:payloadFloat>
                          </ns3:signalPayload>
                        </ns3:interval>
                     </ns7:intervals>
                     <ns3:signalName>ELECTRICITY_PRICE</ns3:signalName>
                     <ns3:signalType>price</ns3:signalType>
                     <ns3:signalID>ELECTRICITY_PRICE_01</ns3:signalID>
                     <ns2:currencyPerKWh>
                        <ns2:itemDescription>currencyPerKWh</ns2:itemDescription>
                        <ns2:itemUnits>USD</ns2:itemUnits>
                        <ns11:siScaleCode>none</ns11:siScaleCode>
                     </ns2:currencyPerKWh>
                  </ns3:eiEventSignal>
               </ns3:eiEventSignals>
               <ns3:eiTarget>
                  <ns3:groupID>group_4342</ns3:groupID>
               </ns3:eiTarget>
            </ns3:eiEvent>
            <ns2:oadrResponseRequired>always</ns2:oadrResponseRequired>
         </ns2:oadrEvent>
      </ns2:oadrDistributeEvent>
   </ns2:oadrSignedObject>
</ns2:oadrPayload>
```

4.5 Energy Metering Use Case – Sample XML

VEN -> VTN oadrRegisterReport Payload (Energy Metering Use Case, TELEMETRY_USAGE and TELEMETRY_RESOURCE reports)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrRegisterReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4322</ns3:requestID>
        <ns7:oadrReport>
           <ns5:duration>
              <ns5:duration>PT8H</ns5:duration>
           </ns5:duration>
           <ns7:oadrReportDescription>
              <ns2:rID>TELEMETRY_USAGE_powerReal</ns2:rID>
              <ns2:reportType>usage</ns2:reportType>
              <ns9:powerReal>
                <ns9:itemDescription>RealPower</ns9:itemDescription>
                <ns9:itemUnits>W</ns9:itemUnits>
                <ns11:siScaleCode>k</ns11:siScaleCode>
                <ns9:powerAttributes>
                   <ns9:hertz>60</ns9:hertz>
                   <ns9:voltage>110</ns9:voltage>
                   <ns9:ac>true</ns9:ac>
                </ns9:powerAttributes>
              </ns9:powerReal>
              <ns2:readingType>Direct Read</ns2:readingType>
              <ns4:marketContext>http://MarketContext1</ns4:marketContext>
              <ns7:oadrSamplingRate>
                <ns7:oadrMinPeriod>PT1M</ns7:oadrMinPeriod>
                <ns7:oadrMaxPeriod>PT15M</ns7:oadrMaxPeriod>
                <ns7:oadrOnChange>false</ns7:oadrOnChange>
              </ns7:oadrSamplingRate>
           </ns7:oadrReportDescription>
           <ns2:reportRequestID>0</ns2:reportRequestID>
           <ns2:reportSpecifierID>TELEMETRY_USAGE_1234</ns2:reportSpecifierID>
           <ns2:reportName>METADATA_TELEMETRY_USAGE</ns2:reportName>
           <ns2:createdDateTime>2020-10-11T23:54:22Z</ns2:createdDateTime>
        </ns7:oadrReport>
        <ns7:oadrReport>
           <ns5:duration>
              <ns5:duration>PT8H</ns5:duration>
           </ns5:duration>
           <ns7:oadrReportDescription>
              <ns2:rID>TELEMETRY_RESOURCE_powerReal_resource1</ns2:rID>
              <ns2:reportType>usage</ns2:reportType>
              <ns9:powerReal>
                <ns9:itemDescription>RealPower</ns9:itemDescription>
```

```
                <ns9:itemUnits>W</ns9:itemUnits>
                <ns11:siScaleCode>k</ns11:siScaleCode>
                <ns9:powerAttributes>
                   <ns9:hertz>60</ns9:hertz>
                   <ns9:voltage>110</ns9:voltage>
                   <ns9:ac>true</ns9:ac>
                </ns9:powerAttributes>
             </ns9:powerReal>
             <ns2:readingType>Direct Read</ns2:readingType>
             <ns4:marketContext>http://MarketContext1</ns4:marketContext>
             <ns7:oadrSamplingRate>
               <ns7:oadrMinPeriod>PT1M</ns7:oadrMinPeriod>
               <ns7:oadrMaxPeriod>PT15M</ns7:oadrMaxPeriod>
               <ns7:oadrOnChange>false</ns7:oadrOnChange>
             </ns7:oadrSamplingRate>
          </ns7:oadrReportDescription>
          <ns7:oadrReportDescription>
             <ns2:rID>TELEMETRY_RESOURCE_powerReal_resource2</ns2:rID>
             <ns2:reportType>usage</ns2:reportType>
             <ns9:powerReal>
               <ns9:itemDescription>RealPower</ns9:itemDescription>
               <ns9:itemUnits>W</ns9:itemUnits>
               <ns11:siScaleCode>k</ns11:siScaleCode>
               <ns9:powerAttributes>
                  <ns9:hertz>60</ns9:hertz>
                  <ns9:voltage>110</ns9:voltage>
                  <ns9:ac>true</ns9:ac>
               </ns9:powerAttributes>
             </ns9:powerReal>
             <ns2:readingType>Direct Read</ns2:readingType>
             <ns4:marketContext>http://MarketContext1</ns4:marketContext>
             <ns7:oadrSamplingRate>
               <ns7:oadrMinPeriod>PT1M</ns7:oadrMinPeriod>
               <ns7:oadrMaxPeriod>PT15M</ns7:oadrMaxPeriod>
               <ns7:oadrOnChange>false</ns7:oadrOnChange>
             </ns7:oadrSamplingRate>
          </ns7:oadrReportDescription>
          <ns2:reportRequestID>0</ns2:reportRequestID>
          <ns2:reportSpecifierID>TELEMETRY_RESOURCE_1234</ns2:reportSpecifierID>
          <ns2:reportName>x-METADATA_x-TELEMETRY_RESOURCE</ns2:reportName>
          <ns2:createdDateTime>2020-10-11T23:54:22Z</ns2:createdDateTime>
        </ns7:oadrReport>
        <ns2:venID>venID_CompanyName_54342</ns2:venID>
      </ns7:oadrRegisterReport>
   </ns7:oadrSignedObject>
</ns7:oadrPayload>
```

```
                                <ns2:rID>TELEMETRY_RESOURCE_powerReal_resource1</ns2:rID>
```

VTN -> VEN oadrRequestReport Payload Energy Metering Use Case, TELEMETRY_RESOURCE report)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrCreateReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4323</ns3:requestID>
        <ns7:oadrReportRequest>
           <ns2:reportRequestID>TELEMETRY_RESOURCE_request_1234</ns2:reportRequestID>
           <ns2:reportSpecifier>
              <ns2:reportSpecifierID>TELEMETRY_RESOURCE_1234</ns2:reportSpecifierID>
              <ns5:granularity>
                <ns5:duration>PT10M</ns5:duration>
              </ns5:granularity>
              <ns2:reportBackDuration>
                <ns5:duration>PT10M</ns5:duration>
              </ns2:reportBackDuration>
              <ns2:reportInterval>
                <ns5:properties>
                   <ns5:dtstart>
                      <ns5:date-time>2020-10-11T23:58:30Z</ns5:date-time>
                   </ns5:dtstart>
                   <ns5:duration>
                      <ns5:duration>PT0M</ns5:duration>
                   </ns5:duration>
                </ns5:properties>
              </ns2:reportInterval>
              <ns2:specifierPayload>
                <ns2:rID>TELEMETRY_RESOURCE_powerReal_resource1</ns2:rID>
                <ns2:readingType>x-notApplicable</ns2:readingType>
              </ns2:specifierPayload>
              <ns2:specifierPayload>
                <ns2:rID>TELEMETRY_RESOURCE_powerReal_resource2</ns2:rID>
                <ns2:readingType>x-notApplicable</ns2:readingType>
              </ns2:specifierPayload>
           </ns2:reportSpecifier>
        </ns7:oadrReportRequest>
        <ns2:venID>venID_CompanyName_54342</ns2:venID>
      </ns7:oadrCreateReport>
   </ns7:oadrSignedObject>
</ns7:oadrPayload>
```

```
                        <ns5:duration>PT10M</ns5:duration>
```

VEN -> VTN oadrUpdateReportPayload (Energy Metering Use Case, TELEMETRY_RESOURCE report)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrUpdateReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4324</ns3:requestID>
        <ns7:oadrReport>
           <ns5:dtstart>
              <ns5:date-time>2020-10-11T23:59:27Z</ns5:date-time>
           </ns5:dtstart>
           <ns6:intervals>
              <ns2:interval>
                <ns5:dtstart>
                   <ns5:date-time>2020-10-11T23:59:27Z</ns5:date-time>
                </ns5:dtstart>
                <ns7:oadrReportPayload>
                   <ns2:rID>TELEMETRY_RESOURCE_powerReal_resource1</ns2:rID>
                   <ns2:confidence>100</ns2:confidence>
                   <ns2:accuracy>0.0</ns2:accuracy>
                   <ns2:payloadFloat>
                      <ns2:value>410.0</ns2:value>
                   </ns2:payloadFloat>
                   <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                </ns7:oadrReportPayload>
                <ns7:oadrReportPayload>
                   <ns2:rID>TELEMETRY_RESOURCE_powerReal_resource2</ns2:rID>
                   <ns2:confidence>100</ns2:confidence>
                   <ns2:accuracy>0.0</ns2:accuracy>
                   <ns2:payloadFloat>
                      <ns2:value>400.0</ns2:value>
                   </ns2:payloadFloat>
                   <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                </ns7:oadrReportPayload>
              </ns2:interval>
           </ns6:intervals>
           <ns2:eiReportID>RP_54321</ns2:eiReportID>
           <ns2:reportRequestID>TELEMETRY_RESOURCE_request_1234</ns2:reportRequestID>
           <ns2:reportSpecifierID>TELEMETRY_RESOURCE_1234</ns2:reportSpecifierID>
           <ns2:reportName>x-TELEMETRY_RESOURCE</ns2:reportName>
           <ns2:createdDateTime>2020-10-11T23:59:27Z</ns2:createdDateTime>
        </ns7:oadrReport>
        <ns2:venID>venID>venID_CompanyName_54342</ns2:venID>
      </ns7:oadrUpdateReport>
   </ns7:oadrSignedObject>
</ns7:oadrPayload>
```

VTN -> VEN oadrCancelReport Payload Energy Metering Use Case)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrCancelReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4321</ns3:requestID>
        <ns2:reportRequestID>TELEMETRY_USAGE_request_1234</ns2:reportRequestID>
        <ns3:reportToFollow>false</ns3:reportToFollow>
        <ns2:venID>venID_CompanyName_1234</ns2:venID>
      </ns7:oadrCancelReport>
   </ns7:oadrSignedObject>
</ns7:oadrPayload>
```

4.6 State of Charge Use Case – Sample XML

VEN -> VTN oadrRegisterReport Payload (State of Charge Use Case, TELEMETRY_STATUS Report)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrRegisterReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4322</ns3:requestID>
        <ns7:oadrReport>
          <ns5:duration>
            <ns5:duration>PT8H</ns5:duration>
          </ns5:duration>
          <ns7:oadrReportDescription>
            <ns2:rID>TELEMETRY_STATUS_resource1</ns2:rID>
            <ns2:reportType>x-resourceStatus</ns2:reportType>
            <ns2:readingType>x-notApplicable</ns2:readingType>
            <ns4:marketContext>http://MarketContext1</ns4:marketContext>
            <ns7:oadrSamplingRate>
              <ns7:oadrMinPeriod>PT1M</ns7:oadrMinPeriod>
              <ns7:oadrMaxPeriod>PT15M</ns7:oadrMaxPeriod>
              <ns7:oadrOnChange>false</ns7:oadrOnChange>
            </ns7:oadrSamplingRate>
          </ns7:oadrReportDescription>
          <ns2:reportRequestID>0</ns2:reportRequestID>
          <ns2:reportSpecifierID>TELEMETRY_STATUS_1234</ns2:reportSpecifierID>
          <ns2:reportName>METADATA_TELEMETRY_STATUS</ns2:reportName>
          <ns2:createdDateTime>2020-10-11T23:54:22Z</ns2:createdDateTime>
        </ns7:oadrReport>
        <ns7:oadrReport>
          <ns5:duration>
            <ns5:duration>PT8H</ns5:duration>
          </ns5:duration>
          <ns7:oadrReportDescription>
            <ns2:rID>TELEMETRY_STATUS_resource2</ns2:rID>
            <ns2:reportType>x-resourceStatus</ns2:reportType>
            <ns2:readingType>x-notApplicable</ns2:readingType>
            <ns4:marketContext>http://MarketContext1</ns4:marketContext>
            <ns7:oadrSamplingRate>
              <ns7:oadrMinPeriod>PT1M</ns7:oadrMinPeriod>
              <ns7:oadrMaxPeriod>PT15M</ns7:oadrMaxPeriod>
              <ns7:oadrOnChange>false</ns7:oadrOnChange>
            </ns7:oadrSamplingRate>
          </ns7:oadrReportDescription>
          <ns2:reportRequestID>0</ns2:reportRequestID>
          <ns2:reportSpecifierID>TELEMETRY_STATUS_1234</ns2:reportSpecifierID>
          <ns2:reportName>METADATA_TELEMETRY_STATUS</ns2:reportName>
          <ns2:createdDateTime>2020-10-11T23:54:22Z</ns2:createdDateTime>
```

```
45.         </ns7:oadrReport>
46.         <ns2:venID>venID_CompanyName_54342</ns2:venID>
47.       </ns7:oadrRegisterReport>
48.    </ns7:oadrSignedObject>
49. </ns7:oadrPayload>
```

VTN -> VEN oadrCreateReport (State of Charge Use Case, TELEMETRY_STATUS Report)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrCreateReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4323</ns3:requestID>
        <ns7:oadrReportRequest>
           <ns2:reportRequestID>TELEMETRY_STATUS_request_1234</ns2:reportRequestID>
           <ns2:reportSpecifier>
              <ns2:reportSpecifierID>TELEMETRY_STATUS_1234</ns2:reportSpecifierID>
              <ns5:granularity>
                <ns5:duration>PT10M</ns5:duration>
              </ns5:granularity>
              <ns2:reportBackDuration>
                <ns5:duration>PT10M</ns5:duration>
              </ns2:reportBackDuration>
              <ns2:reportInterval>
                <ns5:properties>
                   <ns5:dtstart>
                      <ns5:date-time>2020-10-11T23:58:30Z</ns5:date-time>
                   </ns5:dtstart>
                   <ns5:duration>
                      <ns5:duration>PT0M</ns5:duration>
                   </ns5:duration>
                </ns5:properties>
              </ns2:reportInterval>
              <ns2:specifierPayload>
                <ns2:rID>TELEMETRY_STATUS_resource1</ns2:rID>
                <ns2:readingType>x-notApplicable</ns2:readingType>
              </ns2:specifierPayload>
              <ns2:specifierPayload>
                <ns2:rID>TELEMETRY_STATUS_resource2</ns2:rID>
                <ns2:readingType>x-notApplicable</ns2:readingType>
              </ns2:specifierPayload>
           </ns2:reportSpecifier>
        </ns7:oadrReportRequest>
        <ns2:venID>venID_CompanyName_54342</ns2:venID>
      </ns7:oadrCreateReport>
   </ns7:oadrSignedObject>
</ns7:oadrPayload>
```

VEN -> VTN oadrUpdateReport Payload (State of Charge Use Case, TELEMETRY_STATUS Report)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrUpdateReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4324</ns3:requestID>
        <ns7:oadrReport>
           <ns5:dtstart>
              <ns5:date-time>2020-10-11T23:59:27Z</ns5:date-time>
           </ns5:dtstart>
           <ns6:intervals>
              <ns2:interval>
                <ns5:dtstart>
                   <ns5:date-time>2020-10-11T23:59:27Z</ns5:date-time>
                </ns5:dtstart>
                <ns7:oadrReportPayload>
                   <ns2:rID>TELEMETRY_STATUS_resource1</ns2:rID>
                   <ns7:oadrPayloadResourceStatus>
                      <ns7:oadrOnline>true</ns7:oadrOnline>
                      <ns7:oadrManualOverride>false</ns7:oadrManualOverride>
                      <ns7:oadrLoadControlState>
                        <ns7:oadrSetPoint>
                           <ns7:oadrMin>20</ns7:oadrMin>
                           <ns7:oadrMax>900</ns7:oadrMax>
                           <ns7:oadrCurrent>82.5</ns7:oadrCurrent>
                        </ns7:oadrSetPoint>
                      </ns7:oadrLoadControlState>
                   </ns7:oadrPayloadResourceStatus>
                   <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                </ns7:oadrReportPayload>
                <ns7:oadrReportPayload>
                   <ns2:rID>TELEMETRY_STATUS_resource2</ns2:rID>
                   <ns7:oadrPayloadResourceStatus>
                      <ns7:oadrOnline>true</ns7:oadrOnline>
                      <ns7:oadrManualOverride>false</ns7:oadrManualOverride>
                      <ns7:oadrLoadControlState>
                        <ns7:oadrSetPoint>
                           <ns7:oadrMin>20</ns7:oadrMin>
                           <ns7:oadrMax>900</ns7:oadrMax>
                           <ns7:oadrCurrent>84.7</ns7:oadrCurrent>
                        </ns7:oadrSetPoint>
                      </ns7:oadrLoadControlState>
                   </ns7:oadrPayloadResourceStatus>
                   <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                </ns7:oadrReportPayload>
              </ns2:interval>
           </ns6:intervals>
           <ns2:eiReportID>RP_54321</ns2:eiReportID>
           <ns2:reportRequestID>TELEMETRY_STATUS_request_1234</ns2:reportRequestID>
```

```
49.            <ns2:reportSpecifierID>TELEMETRY_STATUS_1234</ns2:reportSpecifierID>
50.            <ns2:reportName>TELEMETRY_STATUS</ns2:reportName>
51.            <ns2:createdDateTime>2020-10-11T23:59:27Z</ns2:createdDateTime>
52.          </ns7:oadrReport>
53.          <ns2:venID>venID>venID_CompanyName_54342</ns2:venID>
54.        </ns7:oadrUpdateReport>
55.     </ns7:oadrSignedObject>
56. </ns7:oadrPayload>
```

4.7 Capability Forecast Reporting Use Case – Sample XML

VEN -> VTN oadrRegisterReport Payload (Capability Forecast Reporting Use Case, Aggregate Forecast and Resource Forecast Reports)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrRegisterReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4322</ns3:requestID>
        <ns7:oadrReport>
           <ns5:duration>
              <ns5:duration>PT24H</ns5:duration>
           </ns5:duration>
           <ns7:oadrReportDescription>
              <ns2:rID>RESOURCE_FORECAST_powerReal_UP</ns2:rID>
              <ns2:reportType>deltaUsage</ns2:reportType>
              <ns9:powerReal>
                <ns9:itemDescription>RealPower</ns9:itemDescription>
                <ns9:itemUnits>W</ns9:itemUnits>
                <ns11:siScaleCode>k</ns11:siScaleCode>
                <ns9:powerAttributes>
                   <ns9:hertz>60</ns9:hertz>
                   <ns9:voltage>110</ns9:voltage>
                   <ns9:ac>true</ns9:ac>
                </ns9:powerAttributes>
              </ns9:powerReal>
              <ns2:readingType>x-notApplicable</ns2:readingType>
              <ns4:marketContext>http://MarketContext1</ns4:marketContext>
              <ns7:oadrSamplingRate>
                <ns7:oadrMinPeriod>PT1H</ns7:oadrMinPeriod>
                <ns7:oadrMaxPeriod>PT1H</ns7:oadrMaxPeriod>
                <ns7:oadrOnChange>false</ns7:oadrOnChange>
              </ns7:oadrSamplingRate>
           </ns7:oadrReportDescription>
           <ns7:oadrReportDescription>
              <ns2:rID>RESOURCE_FORECAST_powerReal_DOWN</ns2:rID>
              <ns2:reportType>deltaUsage</ns2:reportType>
              <ns9:powerReal>
                <ns9:itemDescription>RealPower</ns9:itemDescription>
                <ns9:itemUnits>W</ns9:itemUnits>
                <ns11:siScaleCode>k</ns11:siScaleCode>
                <ns9:powerAttributes>
                   <ns9:hertz>60</ns9:hertz>
                   <ns9:voltage>110</ns9:voltage>
                   <ns9:ac>true</ns9:ac>
                </ns9:powerAttributes>
              </ns9:powerReal>
              <ns2:readingType>x-notApplicable</ns2:readingType>
```

```
45.               <ns4:marketContext>http://MarketContext1</ns4:marketContext>
46.               <ns7:oadrSamplingRate>
47.                 <ns7:oadrMinPeriod>PT1H</ns7:oadrMinPeriod>
48.                 <ns7:oadrMaxPeriod>PT1H</ns7:oadrMaxPeriod>
49.                 <ns7:oadrOnChange>false</ns7:oadrOnChange>
50.               </ns7:oadrSamplingRate>
51.            </ns7:oadrReportDescription>
52.            <ns2:reportRequestID>0</ns2:reportRequestID>
53.            <ns2:reportSpecifierID>AGGREGATE_FORECAST _1234</ns2:reportSpecifierID>
54.            <ns2:reportName>x-METADATA_x-AGGREGATE_FORECAST</ns2:reportName>
55.            <ns2:createdDateTime>2020-10-11T23:54:22Z</ns2:createdDateTime>
56.         </ns7:oadrReport>
57.         <ns7:oadrReport>
58.            <ns5:duration>
59.               <ns5:duration>PT24H</ns5:duration>
60.            </ns5:duration>
61.            <ns7:oadrReportDescription>
62.               <ns2:rID>RESOURCE_FORECAST_powerReal_resource1_UP</ns2:rID>
63.               <ns2:reportType>deltaUsage</ns2:reportType>
64.               <ns9:powerReal>
65.                 <ns9:itemDescription>RealPower</ns9:itemDescription>
66.                 <ns9:itemUnits>W</ns9:itemUnits>
67.                 <ns11:siScaleCode>k</ns11:siScaleCode>
68.                 <ns9:powerAttributes>
69.                    <ns9:hertz>60</ns9:hertz>
70.                    <ns9:voltage>110</ns9:voltage>
71.                    <ns9:ac>true</ns9:ac>
72.                 </ns9:powerAttributes>
73.               </ns9:powerReal>
74.               <ns2:readingType>x-notApplicable</ns2:readingType>
75.               <ns4:marketContext>http://MarketContext1</ns4:marketContext>
76.               <ns7:oadrSamplingRate>
77.                 <ns7:oadrMinPeriod>PT1H</ns7:oadrMinPeriod>
78.                 <ns7:oadrMaxPeriod>PT1H</ns7:oadrMaxPeriod>
79.                 <ns7:oadrOnChange>false</ns7:oadrOnChange>
80.               </ns7:oadrSamplingRate>
81.            </ns7:oadrReportDescription>
82.            <ns7:oadrReportDescription>
83.               <ns2:rID>RESOURCE_FORECAST_powerReal_resource1_DOWN</ns2:rID>
84.               <ns2:reportType>deltaUsage</ns2:reportType>
85.               <ns9:powerReal>
86.                 <ns9:itemDescription>RealPower</ns9:itemDescription>
87.                 <ns9:itemUnits>W</ns9:itemUnits>
88.                 <ns11:siScaleCode>k</ns11:siScaleCode>
89.                 <ns9:powerAttributes>
90.                    <ns9:hertz>60</ns9:hertz>
91.                    <ns9:voltage>110</ns9:voltage>
92.                    <ns9:ac>true</ns9:ac>
93.                 </ns9:powerAttributes>
94.               </ns9:powerReal>
95.               <ns2:readingType>x-notApplicable</ns2:readingType>
96.               <ns4:marketContext>http://MarketContext1</ns4:marketContext>
97.               <ns7:oadrSamplingRate>
98.                 <ns7:oadrMinPeriod>PT1H</ns7:oadrMinPeriod>
99.                 <ns7:oadrMaxPeriod>PT1H</ns7:oadrMaxPeriod>
100.                <ns7:oadrOnChange>false</ns7:oadrOnChange>
101.              </ns7:oadrSamplingRate>
102.           </ns7:oadrReportDescription>
103.           <ns7:oadrReportDescription>
104.              <ns2:rID>RESOURCE_FORECAST_powerReal_resource2_UP</ns2:rID>
105.              <ns2:reportType>usage</ns2:reportType>
```

```
106.              <ns9:powerReal>
107.                <ns9:itemDescription>RealPower</ns9:itemDescription>
108.                <ns9:itemUnits>W</ns9:itemUnits>
109.                <ns11:siScaleCode>k</ns11:siScaleCode>
110.                <ns9:powerAttributes>
111.                   <ns9:hertz>60</ns9:hertz>
112.                   <ns9:voltage>110</ns9:voltage>
113.                   <ns9:ac>true</ns9:ac>
114.                </ns9:powerAttributes>
115.              </ns9:powerReal>
116.              <ns2:readingType>x-notApplicable</ns2:readingType>
117.              <ns4:marketContext>http://MarketContext1</ns4:marketContext>
118.              <ns7:oadrSamplingRate>
119.                <ns7:oadrMinPeriod>PT1H</ns7:oadrMinPeriod>
120.                <ns7:oadrMaxPeriod>PT1H</ns7:oadrMaxPeriod>
121.                <ns7:oadrOnChange>false</ns7:oadrOnChange>
122.              </ns7:oadrSamplingRate>
123.           </ns7:oadrReportDescription>
124.           <ns7:oadrReportDescription>
125.              <ns2:rID>RESOURCE_FORECAST_powerReal_resource2_DOWN</ns2:rID>
126.              <ns2:reportType>usage</ns2:reportType>
127.              <ns9:powerReal>
128.                <ns9:itemDescription>RealPower</ns9:itemDescription>
129.                <ns9:itemUnits>W</ns9:itemUnits>
130.                <ns11:siScaleCode>k</ns11:siScaleCode>
131.                <ns9:powerAttributes>
132.                   <ns9:hertz>60</ns9:hertz>
133.                   <ns9:voltage>110</ns9:voltage>
134.                   <ns9:ac>true</ns9:ac>
135.                </ns9:powerAttributes>
136.              </ns9:powerReal>
137.              <ns2:readingType>x-notApplicable</ns2:readingType>
138.              <ns4:marketContext>http://MarketContext1</ns4:marketContext>
139.              <ns7:oadrSamplingRate>
140.                <ns7:oadrMinPeriod>PT1H</ns7:oadrMinPeriod>
141.                <ns7:oadrMaxPeriod>PT1H</ns7:oadrMaxPeriod>
142.                <ns7:oadrOnChange>false</ns7:oadrOnChange>
143.              </ns7:oadrSamplingRate>
144.           </ns7:oadrReportDescription>
145.           <ns2:reportRequestID>0</ns2:reportRequestID>
146.           <ns2:reportSpecifierID>RESOURCE_FORECAST_1234</ns2:reportSpecifierID>
147.           <ns2:reportName>x-RESOURCE_FORECAST</ns2:reportName>
148.           <ns2:createdDateTime>2020-10-11T23:54:22Z</ns2:createdDateTime>
149.        </ns7:oadrReport>
150.        <ns2:venID>venID_CompanyName_54342</ns2:venID>
151.     </ns7:oadrRegisterReport>
152.  </ns7:oadrSignedObject>
153.</ns7:oadrPayload>
```

VTN -> VEN oadrCreateReport Payload (Capability Forecast Reporting Use Case, Resource Forecast Report)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrCreateReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4323</ns3:requestID>
        <ns7:oadrReportRequest>
           <ns2:reportRequestID>RESOURCE_FORECAST request_1234</ns2:reportRequestID>
           <ns2:reportSpecifier>
              <ns2:reportSpecifierID>RESOURCE_FORECAST 1234</ns2:reportSpecifierID>
              <ns5:granularity>
                <ns5:duration>PT1H</ns5:duration>
              </ns5:granularity>
              <ns2:reportBackDuration>
                <ns5:duration>PT24H</ns5:duration>
              </ns2:reportBackDuration>
              <ns2:reportInterval>
                <ns5:properties>
                   <ns5:dtstart>
                      <ns5:date-time>2020-10-11T23:58:30Z</ns5:date-time>
                   </ns5:dtstart>
                   <ns5:duration>
                      <ns5:duration>PT0M</ns5:duration>
                   </ns5:duration>
                </ns5:properties>
              </ns2:reportInterval>
              <ns2:specifierPayload>
                <ns2:rID>RESOURCE_FORECAST_powerReal_resource2_UP</ns2:rID>
                <ns2:readingType>x-notApplicable</ns2:readingType>
              </ns2:specifierPayload>
              <ns2:specifierPayload>
                <ns2:rID>RESOURCE_FORECAST powerReal_resource2_DOWN</ns2:rID>
                <ns2:readingType>x-notApplicable</ns2:readingType>
              </ns2:specifierPayload>
           </ns2:reportSpecifier>
        </ns7:oadrReportRequest>
        <ns2:venID>venID_CompanyName_54342</ns2:venID>
      </ns7:oadrCreateReport>
   </ns7:oadrSignedObject>
</ns7:oadrPayload>
```

VEN -> VTN oadrUpdateReport Payload (Capability Forecast Reporting Use Case, Resource Forecast Report)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns7:oadrPayload xmlns="http://www.w3.org/2000/09/xmldsig#" xmlns:ns10="http://www.opengis.net/gml/3.2" xmlns:ns11="http://docs.oasis-open.org/ns/emix/2011/06/siscale" xmlns:ns12="http://www.w3.org/2009/xmldsig11#" xmlns:ns13="urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07" xmlns:ns2="http://docs.oasis-open.org/ns/energyinterop/201110" xmlns:ns3="http://docs.oasis-open.org/ns/energyinterop/201110/payloads" xmlns:ns4="http://docs.oasis-open.org/ns/emix/2011/06" xmlns:ns5="urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ns6="urn:ietf:params:xml:ns:icalendar-2.0:stream" xmlns:ns7="http://openadr.org/oadr-2.0b/2012/07" xmlns:ns8="http://www.w3.org/2005/Atom" xmlns:ns9="http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <ns7:oadrSignedObject>
      <ns7:oadrUpdateReport ns2:schemaVersion="2.0b">
        <ns3:requestID>requestID_4324</ns3:requestID>
        <ns7:oadrReport>
           <ns5:dtstart>
              <ns5:date-time>2020-10-11T0:00:00Z</ns5:date-time>
           </ns5:dtstart>
           <ns6:intervals>
              <ns2:interval>
                <ns5:dtstart>
                   <ns5:date-time>2020-10-11T00:00:00Z</ns5:date-time>
                </ns5:dtstart>
                <ns7:oadrReportPayload>
                   <ns2:rID>RESOURCE_FORECAST powerReal_resource2_UP</ns2:rID>
                   <ns2:confidence>100</ns2:confidence>
                   <ns2:accuracy>0.0</ns2:accuracy>
                   <ns2:payloadFloat>
                      <ns2:value>110.0</ns2:value>
                   </ns2:payloadFloat>
                   <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                </ns7:oadrReportPayload>
                <ns7:oadrReportPayload>
                   <ns2:rID>RESOURCE_FORECAST_powerReal_resource2_DOWN</ns2:rID>
                   <ns2:confidence>100</ns2:confidence>
                   <ns2:accuracy>0.0</ns2:accuracy>
                   <ns2:payloadFloat>
                      <ns2:value>400.0</ns2:value>
                   </ns2:payloadFloat>
                   <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                </ns7:oadrReportPayload>
              </ns2:interval>
              <ns2:interval>
                <ns5:dtstart>
                   <ns5:date-time>2020-10-11T01:00:00Z</ns5:date-time>
                </ns5:dtstart>
                <ns7:oadrReportPayload>
                   <ns2:rID>RESOURCE_FORECAST powerReal_resource2_UP</ns2:rID>
                   <ns2:confidence>100</ns2:confidence>
                   <ns2:accuracy>0.0</ns2:accuracy>
                   <ns2:payloadFloat>
                      <ns2:value>120.0</ns2:value>
                   </ns2:payloadFloat>
                   <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                </ns7:oadrReportPayload>
                <ns7:oadrReportPayload>
                   <ns2:rID> RESOURCE_FORECAST_powerReal_resource2_DOWN</ns2:rID>
```

```
                    <ns2:confidence>100</ns2:confidence>
                    <ns2:accuracy>0.0</ns2:accuracy>
                    <ns2:payloadFloat>
                       <ns2:value>360.0</ns2:value>
                    </ns2:payloadFloat>
                    <ns7:oadrDataQuality>Quality Good - Non Specific</ns7:oadrDataQuality>
                 </ns7:oadrReportPayload>
              </ns2:interval>
              <!--22 ADDITIONAL INTERVALS OF DATA 1 HOUR APART -->
           </ns6:intervals>
           <ns2:eiReportID>RP_54321</ns2:eiReportID>
           <ns2:reportRequestID>RESOURCE_FORECAST request_1234</ns2:reportRequestID>
           <ns2:reportSpecifierID>RESOURCE_FORECAST 1234</ns2:reportSpecifierID>
           <ns2:reportName>x-RESOURCE_FORECAST</ns2:reportName>
           <ns2:createdDateTime>2020-10-11T23:59:27Z</ns2:createdDateTime>
        </ns7:oadrReport>
        <ns2:venID>venID>venID_CompanyName_54342</ns2:venID>
     </ns7:oadrUpdateReport>
  </ns7:oadrSignedObject>
</ns7:oadrPayload>
```

Appendix A - Use Case Characteristic Template

This table provides template for defining each OpenADR use case.

Use Case Characteristic Template	
Characteristic	**Description**
Use Case Objective	A few sentences that communicate the value proposition of the use case.
Description	A more detailed, but still high level, description of the use case. Could include diagram if need be.
Customer Segment	Targeted customer segment such as residential, small business, industrial, etc.
Signaling end point	Who is the entity that will receive the event signaling from the utility and/or generate reports for upstream? Primary usage is to identify if an aggregator is the endpoint.
Benefit	What is the upside for the customer and/or utility of this use case?
Target Load	What is the target load for event based use cases in terms of resource type or capacity?
Event Signals	Which event signals will be used for this use case in terms of signal name, signal type, units of measure, and other characteristics?
Custom Error Codes	An articulation of error codes in the OpenADR profile specification as they apply to this implementation.
Event Time Frames	-How often are events called? -How often do rates change that drive events? -How much advance notice needs to be provided? -What is the granularity of interval data in events?
Event Randomization	Are events randomized?
Event Ramp Up / Recovery	Are ramp up or recovery times specified as part of event?
Event Baselines	Is baseline data included in the event and implicitly linked to one of the included event signals?

Characteristic	Description
Event Opt Responses	-Are VENs required to respond with an OptIn or OptOut response? -Can VENs opt back in after opting out? -Are there any constraints on the VENs ability to effectively cancel or modify an event? -Will the use case use the Opt service to qualify resources participating in events (partial resource participation)?
Event Targeting	Which eiTarget enumerations will be including in Events to provide guidance to the VEN regarding the resources that should modify their load profile as indicated by the event signal interval data?
Event Signal Level Targeting	-Will signals be qualified by device class enumerations and if so, which device classes are likely to be used? -Will multiple instances of the same identical signal be used in the same event, differentiated by signal ID?
Reports	-Which reports types will be used for this use case in terms of the following characteristics: -Report Name -Report Type -Reading Type -Units -What is the granularity required for reporting data as reflected in the reportDataSource object? May drive number of reports required.
Report Data Points	-What are the data points that will be support for each report in terms of report type, reading type, and unit of measure? -If well know names will be used for rid's in the report payloads, please enumerate those names and how them map to the data points
Report Request Characteristics	-Will reports be one shot or periodic? -For periodic, what will be the typical granularity of data required? -Will the same granularity be available for all data point types? -How often should periodic reports be delivered? -Will periodic report delivery expire or be open ended? -Will there potentially be holes in the data requiring async UpdateReports to correct?
Polling	-What will be a typical polling interval? -Will there be a need to have more frequent bursts of polling?
Sequence Diagram	-Reference to sequence diagram showing payload interactions
Other	-Other characteristics, such as inclusion of marketContext