



## OpenADR B Profile Reporting

July 14, 2020



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- Audio: Use the Audio pane to switch between Telephone and Mic & Speakers

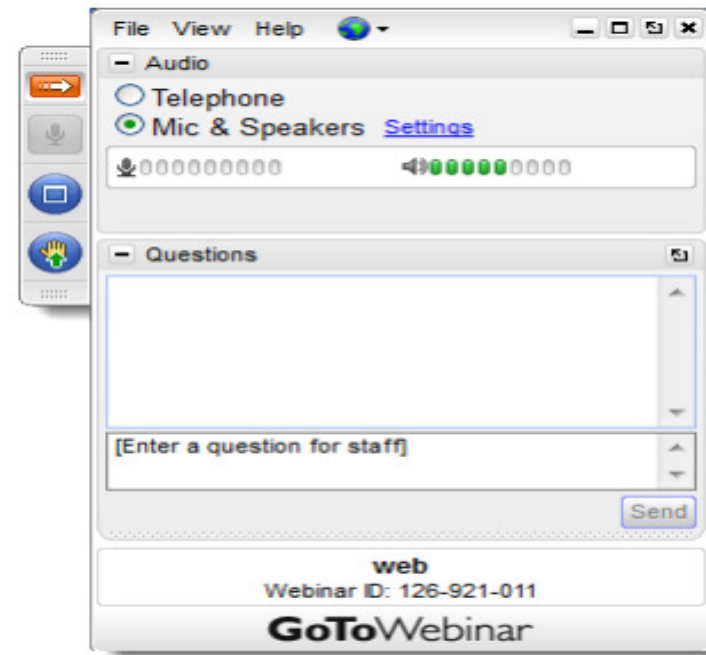
*You will be defaulted to mute*

*Please use the Questions Pane for comments or questions.*

- Q&A: Post your questions for panelists to the question box.

*Questions will be addressed at the end of the presentation.*

- This webinar is being recorded. Webinar slides and audio will be made available on the OpenADR website.



Jim Zuber  
Co-Founder, CTO, QualityLogic

Jim Zuber is QualityLogic's CTO and a co-founder of the company. QualityLogic was founded in 1986 to help solve interoperability testing problems in a wide range of industries including the smart grid, telecom, imaging, and consumer software, with a special expertise in message exchange protocols like OpenADR and 2030.5.

He was the OpenADR profile and schema editor, developed the OpenADR Test Specification, and architected the official Alliance Test Harness. Jim has spent the last 7 years training and consulting with companies to help them with their OpenADR implementations.



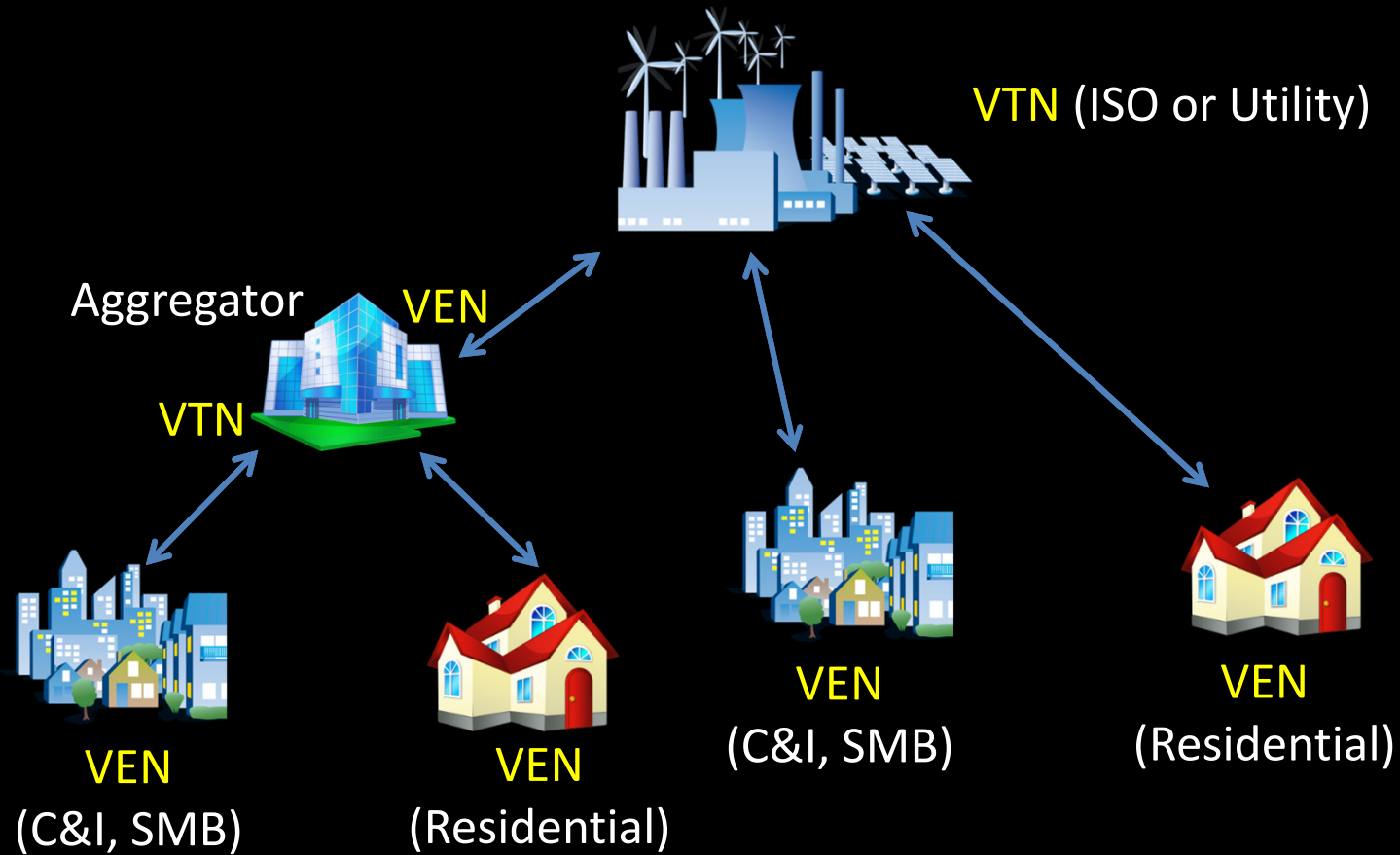
# Topics

- Reporting Basics
- Standard Reports
- Program Guide Reports
- Other Reporting Use Cases
- Reporting Interoperability

# VENs and VTNs

- Two actors in OpenADR message exchange communication exchanges:
  - Virtual End Nodes (VEN)
    - Receive DR events and trigger changes in demand side resource load profiles
    - Produce reports for upstream entities
  - Virtual Top Nodes (VTN)
    - Transmit DR events to downstream VENs
    - Request reports from VEN and consume delivered reports

# VENs and VTNs



# Report Information Exchange

## Utility (VTN)



-List of available reports  
-Data Points in each report  
-Granularity of data

## Facility (VEN)



-Request report(s)  
-Data points of interest  
-Freq, span & granularity

-Deliver Report(s)  
-Data Point values per time interval

# Report Service Payloads

- XML Payloads...
- RegisterReport – Declare (register) available reports
- CreateReport – Request specific report
- UpdateReport – Deliver requested report, one-shot or periodic
- CancelReport – Cancel requested report



# VTN Reporting

- The OpenADR protocol supports the VTN as a report producer and the VEN as a report requester
- Few use cases for this functionality
- VTN to VEN reporting is optional, so don't assume support
- This presentation presumes that VEN is always the report producer

# Reporting Toolkit

- Think of OpenADR reporting as a toolkit
- The B profile defines a few standard reports:
  - Telemetry Usage – Current usage in powerReal (W), energyReal (Wh), or pulse count
  - Telemetry Status – online, override, operational state (min, max, normal, current)
  - Historical Usage – Historical usage in powerReal (W), energyReal (Wh), or pulse count
- Use tools toolkit to define other reports for specific use cases

# Report Concepts

- **Data Point**
  - A measured or calculated quantity
  - Each data point is defined by a set of characteristics such as units of measure and scale
  - Each report supports one or more Data Points
- **Report Profile**
  - Well known report type defined in the OpenADR Alliance B Profile Specification (i.e. TELEMETRY\_USAGE)
  - Defined in terms data points for a given reporting purpose

# Report Concepts

- **Metadata Report**
  - A report of available reports.
  - Sent in the registerReport payload to communicate to VTN reports supported by VEN
  - For standard reports, each offered report can have one or more of the data points defined in a specified report profile

# Report Concepts

- **Report Request**

- Request a one shot or periodic report. Periodic report can specify start and duration of delivery
- Each requested report must have been offered in a metadata report
- Can request one or more of the data points offered in the metadata report

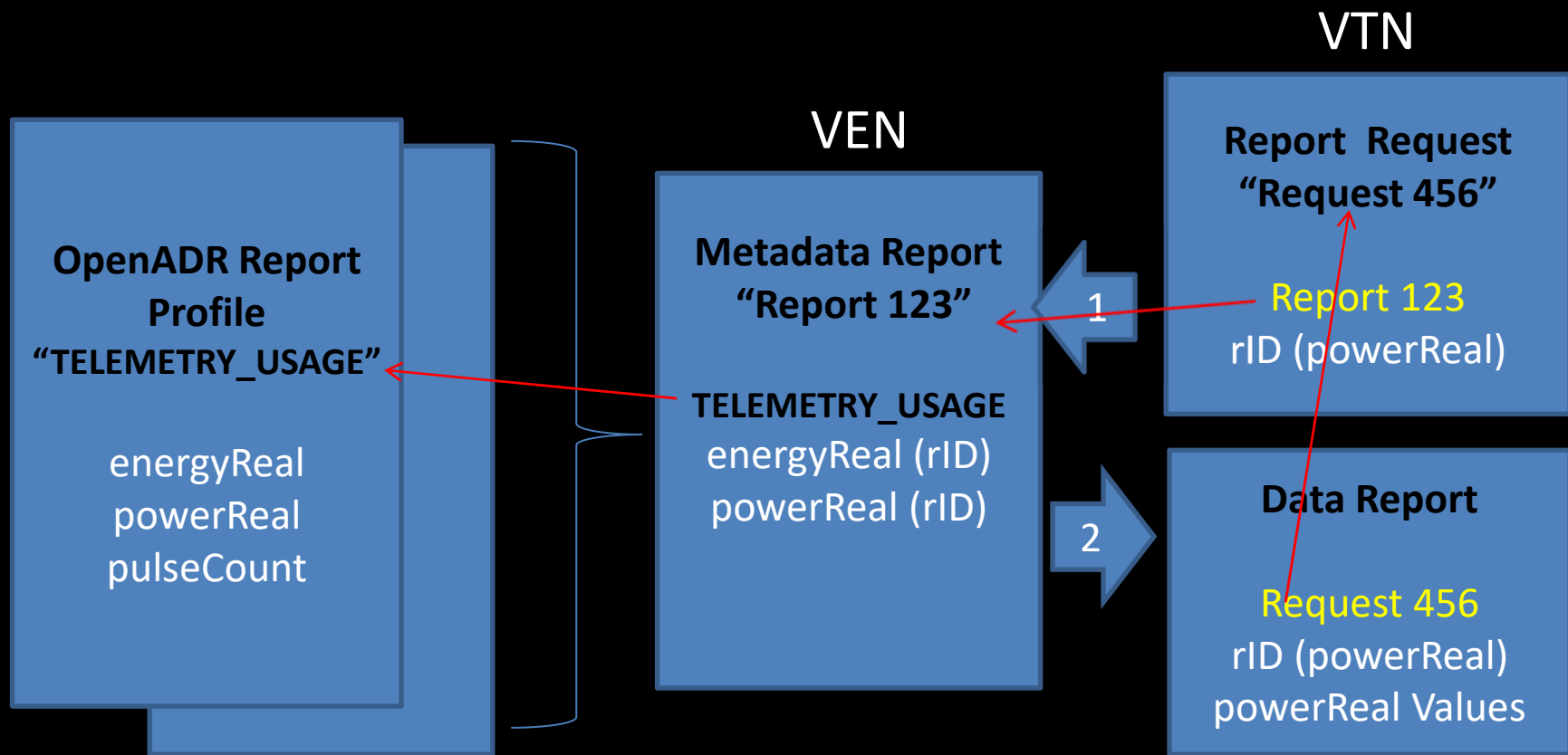
- **Data Report**

- The report containing interval data values for each of the data points requested in the report request

# Report Concepts

- **reportName**
  - Well known name of report profile
  - Make up your own report name for custom reports
- **reportSpecifierID**
  - Used to reference a specific report offered by a VEN
- **rID**
  - Used to reference a specific data point available in an offered report
- **reportRequestID**
  - Used to reference a specific report request

# Report Relationships



# Conceptual Report Format

- Descriptive information about the report is exchanged once in the MetaData report
- Delivered report data itself is very terse
- Ordering of data in report is always from value closest to Epoch time to the present

```
Report Start Time
Overall Report Duration
Reference to Report Request
Time Intervals
  First Interval
    Interval Start Time
    Interval Duration
    Data Point 1
    Data Point n
  Second Interval
    Interval Start Time
    Interval Duration
    Data Point 1
    Data Point n
```



# Tool Kit



- Reports are built from a tool kit of characteristics available in the schema
- OpenADR Report Profiles predefine the required characteristics for standard reports
- Custom reports can be constructed from these characteristics....

# reportTypes

- usage
- x-ResourceStatus
- reading
- demand
- setPoint
- deltaUsage
- deltaSetPoint
- deltaDemand
- baseline
- deviation
- avgUsage
- avgDemand
- operatingState
- storedEnergy
- targetEnergyStorage
- price
- level
- powerFactor
- percentUsage
- percentDemand
- and Others...

# Units

- currency
- currencyPerKWh
- currencyPerKW
- currencyPerThm
- current
- energyApparent
- energyReactive
- **energyReal**
- frequency
- **oadrGreenButton**
- **powerReal**
- powerApparent
- powerReactive
- **pulseCount**
- temperature
- therm
- voltage

# readingTypes

- **direct Read**
- net
- allocated
- estimated
- summed
- derived
- mean
- peak
- hybrid
- contract
- projected
- x-RMS
- **X-notApplicable**

# OpenADR 2.0 Standard ReportProfiles



Characteristic	Values
<b>reportName</b>	TELEMETRY_USAGE
<b>ReportType</b>	usage
<b>Units</b>	powerReal energyReal pulseCount
<b>readingType</b>	Direct Read
<b>Payload Data</b>	payloadFloat:value

# Other concepts

- Metadata reports can be republished or requested at any time, VTN's need to re-request periodic reports
- Missing data must have placeholder, but can be backfilled with updateReport
- Periodic reports can be sent in bursts if use case requires

```
<oadr:oadrRegisterReport ei:schemaVersion="2.0b">
  <oadr:oadrReport>
    <xcal:duration>
      <xcal:duration>PT10M</xcal:duration>
    </xcal:duration>
    <oadr:oadrReportDescription>
      <ei:rID>real_power</ei:rID>
      <ei:reportDataSource>
        <ei:resourceID>resource1</ei:resourceID>
      </ei:reportDataSource>
      <ei:reportType>usage</ei:reportType>
      <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:readingType>Direct Read</ei:readingType>
      <emix:marketContext>http://MarketContext1</emix:marketContext>
      <oadr:oadrSamplingRate>
        <oadr:oadrMinPeriod>PT1M</oadr:oadrMinPeriod>
        <oadr:oadrMaxPeriod>PT10M</oadr:oadrMaxPeriod>
      </oadr:oadrSamplingRate>
    </oadr:oadrReportDescription>
    <ei:reportRequestID>Request_123</ei:reportRequestID>
    <ei:reportSpecifierID>ReportSpecID120615_122512_481_2</ei:reportSpecifierID>
    <ei:reportName>METADATA_TELEMETRY_USAGE</ei:reportName>
```

---

```
<oadr:oadrCreateReport ei:schemaVersion="2.0b">
  <pyld:requestID>ReportReqID130615_192625_230</pyld:requestID>
  <oadr:oadrReportRequest>
    <ei:reportRequestID>ReportReqID130615_192625_730</ei:reportRequestID>
    <ei:reportSpecifier>
      <ei:reportSpecifierID>ReportSpecID120615_122512_481_2</ei:reportSpecifierID>
      <xcal:granularity>
        <xcal:duration>PT1M</xcal:duration>
      </xcal:granularity>
      <ei:reportBackDuration>
        <xcal:duration>PT1M</xcal:duration>
      </ei:reportBackDuration>
      <ei:reportInterval>
        <xcal:properties>
          <xcal:dtstart>
            <xcal:date-time>2020-06-14T13:00:00Z</xcal:date-time>
          </xcal:dtstart>
          <xcal:duration>
            <xcal:duration>PT10M</xcal:duration>
          </xcal:duration>
        </xcal:properties>
      </ei:reportInterval>
      <ei:specifierPayload>
        <ei:rID>real_power</ei:rID>
        <ei:readingType>x-notApplicable</ei:readingType>
      </ei:specifierPayload>
    </ei:reportSpecifier>
  </oadr:oadrReportRequest>
  <ei:venID>VEN130615_192312_582</ei:venID>
</oadr:oadrCreateReport>
```

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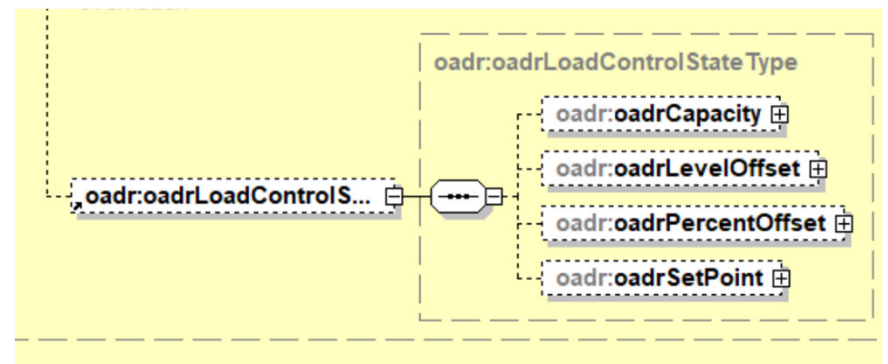
```
<oadr:oadrUpdateReport ei:schemaVersion="2.0b">
  <pyld:requestID>ReportUpdReqID130615_192730_445</pyld:requestID>
  <oadr:oadrReport>
    <xcal:dtstart>
      <xcal:date-time>2015-06-14T02:27:29Z</xcal:date-time>
    </xcal:dtstart>
    <strm:intervals>
      <ei:interval>
        <xcal:dtstart>
          <xcal:date-time>2015-06-14T02:27:29Z</xcal:date-time>
        </xcal:dtstart>
        <oadr:oadrReportPayload>
          <ei:rID>real_power</ei:rID>
          <ei:confidence>100</ei:confidence>
          <ei:accuracy>0.0</ei:accuracy>
          <ei:payloadFloat>
            <ei:value>500.0</ei:value>
          </ei:payloadFloat>
          <oadr:oadrDataQuality>Quality Good - Non Specific</oadr:oadrDataQuality>
        </oadr:oadrReportPayload>
      </ei:interval>
    </strm:intervals>
    <ei:eiReportID>RP_54321</ei:eiReportID>
    <ei:reportRequestID>ReportReqID130615_192625_730</ei:reportRequestID>
    <ei:reportSpecifierID>ReportSpecID120615_122512_481_2</ei:reportSpecifierID>
    <ei:reportName>TELEMETRY_USAGE</ei:reportName>
    <ei:createdDateTime>2015-06-14T02:27:29Z</ei:createdDateTime>
  </oadr:oadrReport>
  <ei:venID>VEN130615_192312_582</ei:venID>
</oadr:oadrUpdateReport>
```

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```

<oadr:oadrUpdateReport ei:schemaVersion="2.0b">
  <oadr:oadrReport>
    <xcal:dtstart>
      <xcal:date-time>2001-12-17T09:30:00Z</xcal:date-time>
    </xcal:dtstart>
    <strm:intervals>
      <ei:interval>
        <xcal:dtstart>
          <xcal:date-time>2001-12-17T09:30:00Z</xcal:date-time>
        </xcal:dtstart>
        <xcal:uid>
          <xcal:text>0</xcal:text>
        </xcal:uid>
        <oadr:oadrReportPayload>
          <ei:rID>123</ei:rID>
          <oadr:oadrPayloadResourceStatus>
            <oadr:oadrOnline>true</oadr:oadrOnline>
            <oadr:oadrManualOverride>false</oadr:oadrManualOverride>
            <oadr:oadrLoadControlState>
              <oadr:oadrSetPoint>
                <oadr:oadrMin>60</oadr:oadrMin>
                <oadr:oadrMax>80</oadr:oadrMax>
                <oadr:oadrCurrent>70</oadr:oadrCurrent>
                <oadr:oadrNormal>72</oadr:oadrNormal>
              </oadr:oadrSetPoint>
            </oadr:oadrLoadControlState>
          </oadr:oadrPayloadResourceStatus>
          <oadr:oadrDataQuality>Quality Good - Non Specific</oadr:oadrDataQuality>
        </oadr:oadrReportPayload>
      </ei:interval>
    </strm:intervals>
  </oadr:oadrReport>
</oadr:oadrUpdateReport>

```



# Program Guide Reports

- Thermostat Program Report
  - Temp Offset
  - On-Line Status
  - Current Temp
  - Heat Temp
  - Cool Temp
  - Hvac Mode
  - Current HVAC Mode
  - Fan Mode
  - Hold Mode
  - Away Mode
  - Current Humidity

# Program Guide Reports

- Fast DR Program
  - Telemetry Usage – Real Power
- M&V Rebates Report
  - On-Line Status
  - Energy
  - Power
- Smart Meter Interval Data Report
  - Current Sum Delivered
  - Interval Data Delivered
  - Instantaneous Demand

# Other Reporting Use Cases

- Resource Online Status/Event Participation Report
  - Would need one report per resource (ReportDataSource)
  - Interval data = true/false
  - Could map resources to signals or intervals to report on multiple resources in one report
- Complex data structure reports
  - Simple 2d spreadsheet like data model. Time in one axis, data points in other axis. Need to fit.

# Other Reporting Use Cases

- Partial Event Participation
  - Can Qualify Resource with oadrOpt, but...
  - No direct link between reports and events
  - Could trigger async reporting once event goes active – Telemetry Usage
- Forecast Load Shed Capacity
  - Periodic report or in response to receipt of event
  - Just like a history report, but looking forward

# Report Interoperability

- Certification of VEN/VTNS cover...
  - Telemetry Usage Reporting, One Data Point
  - Telemetry Status – Online state only
- Most reporting use cases will be more complex, VEN and VTN need to be on same page
- Think ahead about what reports are needed, you can't ask for what isn't offered by the VEN!

# Reporting Interoperability

- Clearly document reports
  - Data Point Characteristics
  - Report Names
  - Well defined rID names
  - Custom Units or enumerated values
- Share documented reports with both VEN and VTN vendors. Ideally share sample report payloads
- Work with certified VEN and VTN Vendors



# Reporting Interoperability

- Do interop testing early...
  - End to End if possible. If not, mock VENs or VTNs
  - Leverage OpenADR experts. Most problems can be isolated very quickly
- Common Problems/Solutions
  - Payload Structure – Validate against schema
  - Incorrect IDs – Walk through payload exchange
  - Incorrect ordering of data – always from Epoch time forward

# Take Away Thoughts

- OpenADR Reporting is a valuable tool in your DR management strategy
- With a little forethought, documentation, and coordination OpenADR reporting can be easy to successfully deploy

# Questions & Answers



Thank You



## Contact Information

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