OpenADR
DR Program Guide

OpenADR Alliance Webinar
July 28, 2015
Topics

- The need for a Program Guide
- DR programs supported
- DR Template Structure
- Drill into one program (CPP)
- Deployment Scenarios
- Odds and ends
DR Programs

- There is no such thing as a standardized DR program
- Each DR program design tends to be unique based on the structural, regulatory, and regional needs
- And each program has numerous possible deployment scenarios involving a variety of actors
OpenADR Message

- OpenADR 2.0 clearly specifies expected DR message exchange behavior between utilities and downstream resources
- However …
  - Event signals
  - Report formats
  - Targeting
- …must be specified on a deployment specific basis
Needs

- Utilities would like:
  - Models of typical DR Programs
  - Guidance on how to use OpenADR with programs
- VEN/VTN vendors would like:
  - Some uniformity in OpenADR usage by utilities
  - A way to validate interoperability with programs
- Both want to move away from the “blank page” starting point when using OpenADR in a DR program deployment
Solution

- The OpenADR Alliance is working on a DR Program Guide to address these issues
- The guide will...
  - Define DR program templates
  - Define OpenADR best practices
  - Define deployment scenarios
  - Aid utilities in selecting templates and deployment scenarios
DR Program Templates

- DR program Templates in Guide
  - Critical Peak Pricing
    - Prices raised during peaks, lower prices non-peak
  - Capacity Bidding Program
    - Pre-committed day of/day ahead load shed capacity
  - Residential Thermostat Program
    - Allow changes to PCT, free PCT/Discount/Rebate
  - Fast DR Dispatch (Ancillary Services)
    - Pre-committed large real time load shed capacity
DR Program Templates

- Residential Electric Vehicle TOU Program
  - TOU pricing with day ahead price notification
- Public Station EV RTP Program
  - RTP influences customer charge decision
- Distributed Energy Resources (DER) Program
  - Uses harvested energy and load shed to offset high prices
DR Program Characteristics

- Load Profile Objective
- Primary Drivers
- Program Description
- Customer Incentive
- Rate Design
- Target Customer
- Target Loads
- Prerequisite

- Program Time Frame
- Event Constraints
- Event Days
- Event Duration
- Notification
- Opt Behavior
- Certification Events
## CPP – Program Characteristics

<table>
<thead>
<tr>
<th>Load Profile Objective</th>
<th>Peak demand reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Drivers</td>
<td>Reduced capital expenditures and reduced energy costs</td>
</tr>
<tr>
<td>Program Description</td>
<td>When utilities observe or anticipate high wholesale market prices or power system emergency conditions, they may call critical events during a specified time period (e.g., 3 p.m.—6 p.m. on a hot summer weekday), the price for electricity during these time periods is substantially raised.</td>
</tr>
<tr>
<td>Customer Incentive</td>
<td>Customers may be offered discounted energy prices during non-peak times as an incentive to participate in the program.</td>
</tr>
</tbody>
</table>
## CPP – Program Characteristics

<table>
<thead>
<tr>
<th>Rate Design</th>
<th>CPP is a price program with rates increasing during critical peaks in energy consumption. Typically CPP rates are an adder or multiplier to flat, tiered, or TOU base rates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Customer</td>
<td>Residential or C&amp;I</td>
</tr>
<tr>
<td>Target Load</td>
<td>Any</td>
</tr>
</tbody>
</table>
| Prerequisite                      | Customer must have interval metering  
- C&I customers may have to meet a demand criterion  |
| Program Time Frame                | Typically spans months of the year where peak energy consumption occurs, although may be year round in some cases.                                                                                                                                 |
| Event Constraints                 | Typically Monday through Friday, excluding holidays, with consecutive day events typically allowed                                                                                                       |
## CPP – Program Characteristics

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event Days</td>
<td>-Typically 9 to 15 per year</td>
</tr>
<tr>
<td>Event Duration</td>
<td>-Typically during a fixed time frame for all events ranging from 4 to 6 hours during the highest energy consumption times of the day.</td>
</tr>
<tr>
<td>Notification</td>
<td>-Typically day ahead</td>
</tr>
<tr>
<td>Opt Behavior</td>
<td>-Typically customers are not required to participate in events</td>
</tr>
<tr>
<td>Certification Events</td>
<td>-Typically none</td>
</tr>
</tbody>
</table>
OpenADR Characteristics

- Event Signals
  - Price, level, etc.
- Opt Responses
  - optIn/OptOut
- Event Descriptor
  - Priority, Test Events
- Event Active Period
  - Randomization, etc.
- Baselines
  - Historical Data

- Event Targeting
  - ResourceID, Group, etc.
- Reporting Services
  - Telemetry Reporting
- Opt Services
  - Temporary Schedules
- Registration Services
  - Polling Intervals
| Event Signals | -A SIMPLE signal with levels 1 to 3 mapped to the pricing impact of the CPP event. If a CPP program has a single pricing component it should be mapped to level 1.  
-If the deployment supports B profile VENs, in addition to the SIMPLE signal, an ELECTRICITY_PRICE signal may be included in the payload with a type of priceRelative, priceAbsolute, or priceMultiplier depending on the nature of the program. |
### Opt Responses

- VTNs sending events **should set the oadrResponseRequired element to "always"**, requiring the VEN to respond with an optIn or optOut.

- As participation in a CPP program is a "best effort" exercise, there is no formal meaning to optIn or optOut beyond a courtesy availability indication of intent to participate. We recommend that VENs respond with optIn unless there has been some specific override action taken by the customer.

- The oadrCreateOpt payload would typically not be used to qualify resources participating in events.

### Event Descriptor

- The event **priority should be set to 1** unless the program rules or VTN configuration specify otherwise. **Test events are typically not used** with CPP programs.

### Event Active Period

- eiRampUp, eiRecovery, tolerance elements are typically not used.
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baselines</td>
<td>- Baselines are typically not included in the event payload</td>
</tr>
<tr>
<td>Event Targeting</td>
<td>- CPP programs typically don't differentiate between resources for a given customer. <strong>Targeting typically specifies the venID</strong>, indicating that all the resources associated with the VEN should participate, or a list of all the resourceIDs associated with VEN.</td>
</tr>
<tr>
<td>Reporting Services</td>
<td>- Telemetry reporting is typically not used as it is not absolutely necessary for CPP programs</td>
</tr>
<tr>
<td>Opt Services</td>
<td>- <strong>Use of the Opt service</strong> to communicate temporary availability schedules typically would not be used as part of a CPP program. However, some deployments could use this service to preserve available event days for customers who indicate lack of availability.</td>
</tr>
<tr>
<td>Registration Services</td>
<td><strong>Polling intervals</strong> requested by the VTN for typical day-ahead CPP programs are not required to be more frequent than once an hour. However, the use of polling for heartbeat detection may require more frequent polling.</td>
</tr>
</tbody>
</table>
Deployment Scenarios

- The way a DR Program is deployed is independent of the characteristics of the program.
- The Alliance Program Guide defines a number of Deployment Scenarios, then provides typical mapping against the DR Program Templates
Sample Deployment Scenario
Direct 1

DR Program Party

Resource Party

Agreement

Enrolled

Owns

Owns

Programs

Program 1

Implements

Enrolled

Associated

VEN

Resource

Load Control

Commun.

Associated

Grid Infrastructure

Demand Side Infrastructure

In Direct 1, the Ven is a stand-alone entity communicating with the load controller.

Direct 1
Sample Deployment Scenario
Aggregator 1

DR Program Party

Aggregator Party

Aggregator Intermediary Infrastructure

VTN

Grid Infrastructure

Programs

Program 1

Communicates w/ Via OpenADR

Locales 1, 2, 3

Load Control

Resource 1

Demand Side Infrastructure
## Signal Recommendations

<table>
<thead>
<tr>
<th>Template</th>
<th>A Profile Signal</th>
<th>B Profile Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Peak Pricing Program (CPP)</td>
<td>SIMPLE</td>
<td>SIMPLE ELECTRICITY_PRICE (Price or Price Multiplier)</td>
</tr>
<tr>
<td>Capacity Bidding Program</td>
<td>SIMPLE</td>
<td>SIMPLE BID_LOAD (Setpoint in powerReal) BID_PRICE</td>
</tr>
<tr>
<td>Residential Thermostat Program</td>
<td>SIMPLE</td>
<td>SIMPLE LOAD_CONTROL (Integer offset, % of capacity)</td>
</tr>
<tr>
<td>Fast DR Dispatch</td>
<td>SIMPLE</td>
<td>SIMPLE LOAD_DISPATCH (powerReal setpoint or delta)</td>
</tr>
<tr>
<td>Residential EV TOU Program</td>
<td>SIMPLE</td>
<td>SIMPLE ELECTRICITY_PRICE</td>
</tr>
<tr>
<td>Public Station EV Real-Time Pricing Program</td>
<td>N/A</td>
<td>ELECTRICITY_PRICE</td>
</tr>
<tr>
<td>Distributed Energy Resources (DER) DR Program</td>
<td>N/A</td>
<td>ELECTRICITY_PRICE</td>
</tr>
</tbody>
</table>
# Reporting Recommendations

<table>
<thead>
<tr>
<th>Template</th>
<th>Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Peak Pricing Program (CPP)</td>
<td>Not Used</td>
</tr>
<tr>
<td>Capacity Bidding Program</td>
<td>ISO Capacity Bidding</td>
</tr>
<tr>
<td></td>
<td>TELEMETRY_USAGE</td>
</tr>
<tr>
<td></td>
<td>realPower data point</td>
</tr>
<tr>
<td>Residential Thermostat Program</td>
<td>Not Used</td>
</tr>
<tr>
<td>Fast DR Dispatch</td>
<td>TELEMETRY_USAGE</td>
</tr>
<tr>
<td></td>
<td>realPower data point</td>
</tr>
<tr>
<td></td>
<td>May include voltage data point</td>
</tr>
<tr>
<td></td>
<td>May include charge state data point</td>
</tr>
<tr>
<td>Residential EV TOU Program</td>
<td>Not Used</td>
</tr>
<tr>
<td>Public Station EV Real-Time Pricing Program</td>
<td>Not Used</td>
</tr>
<tr>
<td>Distributed Energy Resources (DER) DR Program</td>
<td>Not Used</td>
</tr>
</tbody>
</table>
## Target Recommendations

<table>
<thead>
<tr>
<th>Template</th>
<th>Event Targeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Peak Pricing Program (CPP)</td>
<td>venID</td>
</tr>
<tr>
<td></td>
<td>List of all resourceIDs</td>
</tr>
<tr>
<td>Capacity Bidding Program</td>
<td>venID</td>
</tr>
<tr>
<td></td>
<td>resourceId representative of entire load</td>
</tr>
<tr>
<td>Residential Thermostat Program</td>
<td>resourceId of HVACs</td>
</tr>
<tr>
<td></td>
<td>venID with DeviceClass target of Thermostat</td>
</tr>
<tr>
<td>Fast DR Dispatch</td>
<td>venID</td>
</tr>
<tr>
<td></td>
<td>resourceId representative of entire load</td>
</tr>
<tr>
<td>Residential EV TOU Program</td>
<td>venID</td>
</tr>
<tr>
<td>Public Station EV Real-Time Pricing Program</td>
<td>No specific targeting</td>
</tr>
<tr>
<td></td>
<td>May use grid location</td>
</tr>
<tr>
<td></td>
<td>May use geographic area</td>
</tr>
<tr>
<td>Distributed Energy Resources (DER) DR Program</td>
<td>venID</td>
</tr>
</tbody>
</table>
Data Sets, Sample Payloads

- The Program Guide provides data sets and sample payloads for each template

A.1.1 CPP Scenario 1 - Simple Use case, A or B Profile

- **Event**
  - Notification: Day before event
  - Start Time: 1pm
  - Duration: 4 hours
  - Randomization: None
  - Ramp Up: None
  - Recovery: None
  - Number of signals: 1
  - Signal Name: SIMPLE
    - Signal Type: level
    - Units: N/A
    - Number of intervals: 1
    - Interval Duration(s): 4 hours
    - Typical Interval Value(s): 1
    - Signal Target: N/A
  - Event Target(s): venID_1234
  - Priority: 1
  - VEN Response Required: always
  - VEN Expected Response: optln

- **Reports**
  - None
Program Guide Testing

- Testing methodology in design phase
- Reference implementation interop testing is current design preference