Enabling DER Integration with OpenADR

- Challenges and opportunities with DER
  - What is it?
  - Why is it becoming more important?

- How does OpenADR enable the integration of DER into grid operations?

- What are some real world examples of OpenADR enabling DER integration?

- What is OpenADR’s competition when it comes to DER integration?

- How should the OpenADR Alliance address DER?
  - Do nothing different?
  - DER relevant branding and positioning?
  - Technical improvements to support DER?
Agenda

- Overview – James Mater, QualityLogic
- OpenADR Applications in DER Integration
  - Integrating DER in wholesale markets – Aditya Aggarwal, Siemens Canada
  - OpenADR for DER: CEA-2045 and DER Aggregation – Walt Johnson, EPRI
- Standards Competition – Panel discussion
  - IEC 61850, IEEE 2030.5 (SEP 2), TE and ?
- OpenADR Alliance Strategy and Next Steps – All: James Moderating
What is DER?
What is DER?

- **Distributed Energy Resources** include any resource that can add energy to the grid or can modify energy behavior
- ...but is not controlled by a Utility SCADA operator

Examples include:
- Rooftop PV
- Small storage systems
- EV Charging
- Adjustable resources (thermostats, lights, HVAC)
What is the Challenge?

- DER is typically installed and controlled independent of grid operations – e.g., not coordinated
  - In small quantities, not a problem

- But at scale (arguments abound at what level) can pose a problem OR an opportunity (if coordinated)

- Challenges are:
  - Multi-objective optimization (or laminar decomposition)
    - How to meet objectives of both the grid and asset owners
  - How to communicate grid needs in a timely fashion
    - Communications not standardized if they exist
  - How to motivate DER owner behaviors
    - Pricing/regulatory issues
Use Cases

- Perspectives
  - ISO/RTO
  - Distribution Utility
  - Asset Aggregators
  - Asset Owners

- DR Use Cases: Modify behavior of loads through specific requests
  - DER in OpenADR is storage

- PV Use Cases: Modify behavior of inverters through specific autonomous behavior settings
Walt’s Use Cases

- Three primary classes of communications with DER
  - Direct device manipulation at the switch and relay level – e.g. Modbus settings
  - Command and Control – direct instructions for behaviors
    - DRLC or start battery discharging and/or
    - Settings for autonomous behaviors (automatic responses to sensed grid conditions)
  - Inform and Motivate
    - Price signals
    - Event signals
    - Transactive Energy Signals
CA Rule 21 Use Cases

Scope of Rule 21-based Communications
Example Configurations for Smart Energy Profile (SEP 2) and DNP3 as Communications Protocols between Utilities and other Parties.
# Smart Inverter Functions

<table>
<thead>
<tr>
<th>Autonomous Functions</th>
<th>Hawaiian Electric Priority</th>
<th>Effective date of Implementation</th>
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<tr>
<td>Anti-Islanding</td>
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<td>Frequency-Watt</td>
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<td>Voltage-Watt</td>
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<td>Command DER to Connect or Disconnect</td>
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Table ES-1: Mandated High-Priority Advanced Inverter Functions in Hawaiian Electric Rule 14H