



## OpenADR in Europe

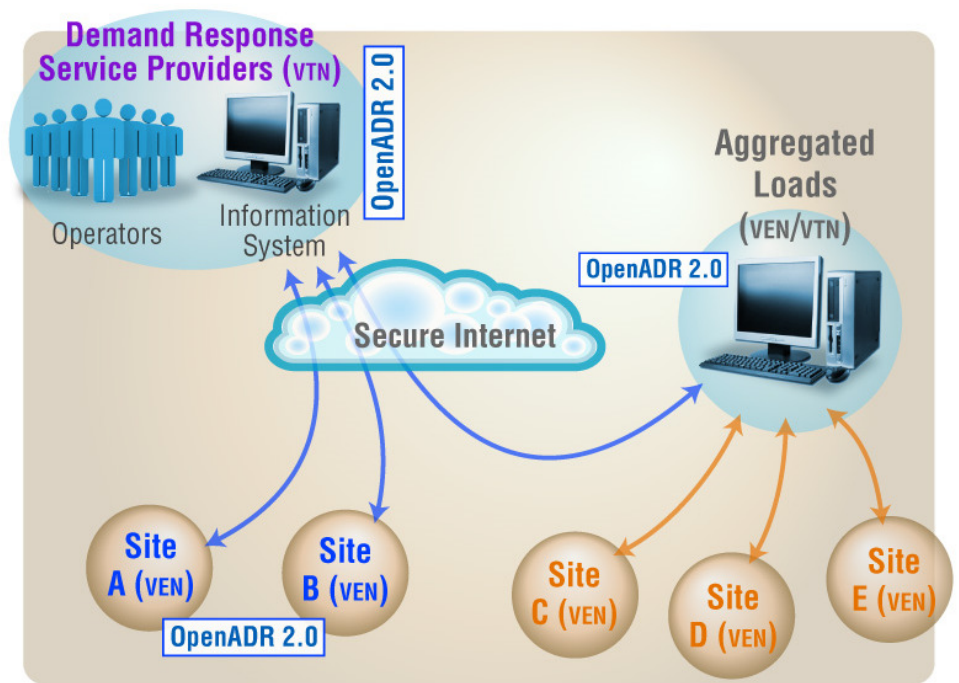
### OpenADR Overview and Updates

Rolf Bienert, Technical & Managing Director

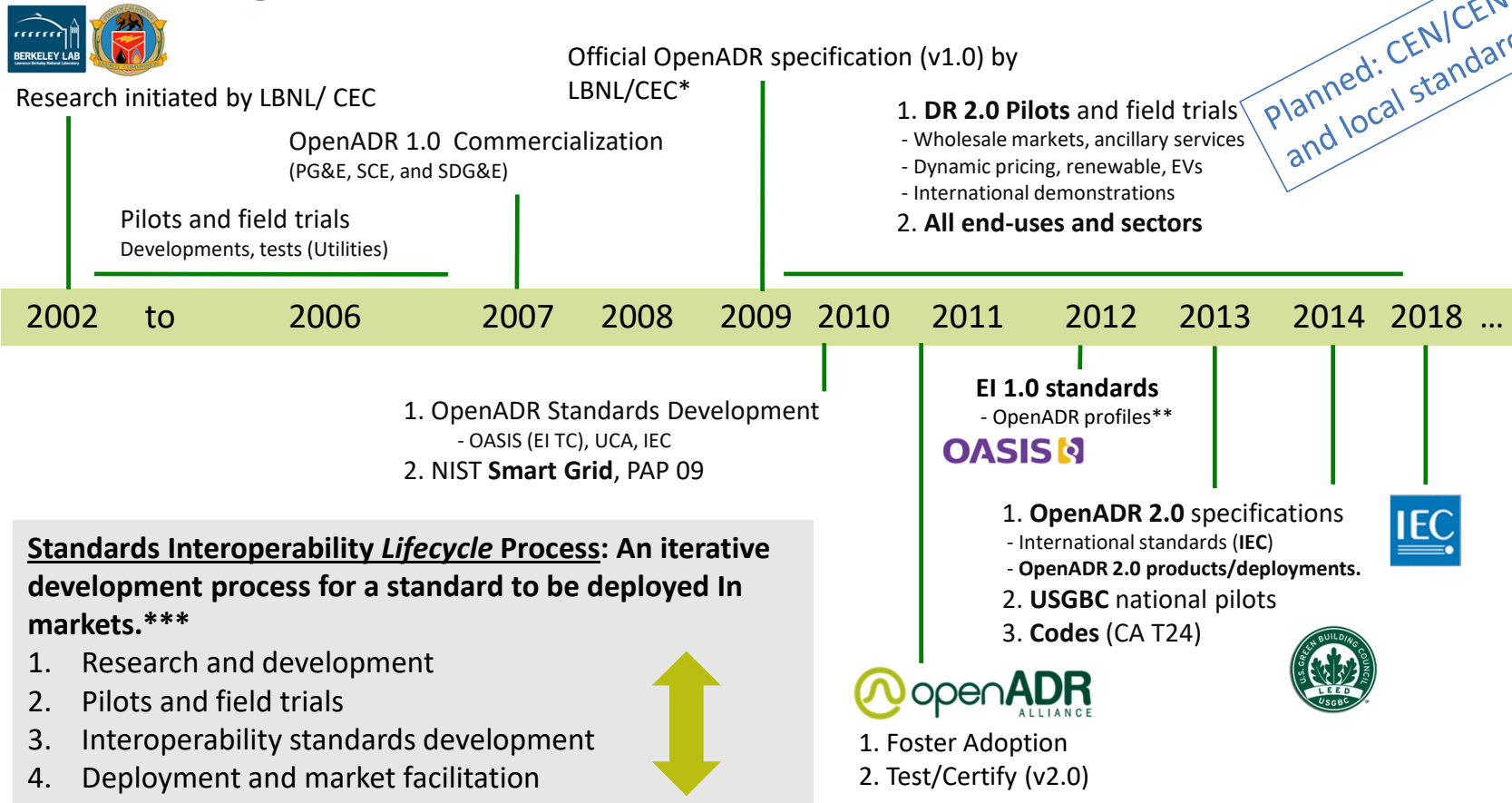


# OpenADR in a Nutshell

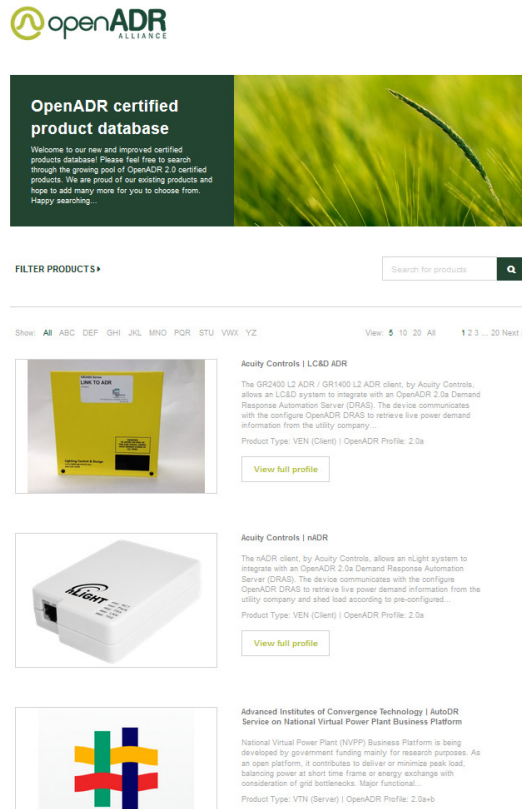
OpenADR provides a non-proprietary, open standardized Demand Response (DR) & Distributed Energy Resources (DER) interface that allows DR service providers to communicate DR, DER, and TE (Transactive Energy) signals directly to existing customers using a common language and existing communications such as the Internet.



# OpenADR Progression



# Where are we today?



The screenshot shows the OpenADR Alliance website's product database. At the top, the OpenADR Alliance logo is displayed. Below it, a header section reads "OpenADR certified product database" and includes a welcome message. A search bar with the placeholder "Search for products" and a magnifying glass icon is present. Below the search bar, a filter section shows "FILTER PRODUCTS" and a list of product types: ADR, ABC, DEF, GHI, JKL, MNO, PQR, STU, VWX, YZ. The main content area displays three product listings:

- Acuity Controls | LC&D ADR**: The GR2400 L2 ADR / GR1400 L2 ADR client, by Acuity Controls, allows an LC&D system to integrate with an OpenADR 2.0a Demand Response Automation Server (DRAS). The device communicates with the configured OpenADR DRAS to retrieve live power demand information from the utility company...  
Product Type: VEN (Client) | OpenADR Profile: 2.0a  
[View full profile](#)
- Acuity Controls | nADR**: The nADR client, by Acuity Controls, allows an nLight system to integrate with an OpenADR 2.0a Demand Response Automation Server (DRAS). The device communicates with the configured OpenADR DRAS to retrieve live power demand information from the utility company and shed load according to pre-configured...  
Product Type: VEN (Client) | OpenADR Profile: 2.0a  
[View full profile](#)
- Advanced Institutes of Convergence Technology | AutoDR**: Service on National Virtual Power Plant Business Platform  
National Virtual Power Plant (NVPP) Business Platform is being developed by government funding mainly for research purposes. As an open platform, it contributes to deliver or minimize peak load, balancing power at short time frame or energy exchange with consideration of grid bottlenecks. Major functional...  
Product Type: VTN (Server) | OpenADR Profile: 2.0a+b

- Two completed specifications
  - >7 years for 2.0a
  - >6 years for 2.0b
- 8 test houses validated
- > 215 certified systems
- ~ 165 member companies

# The 'Entities' of OpenADR

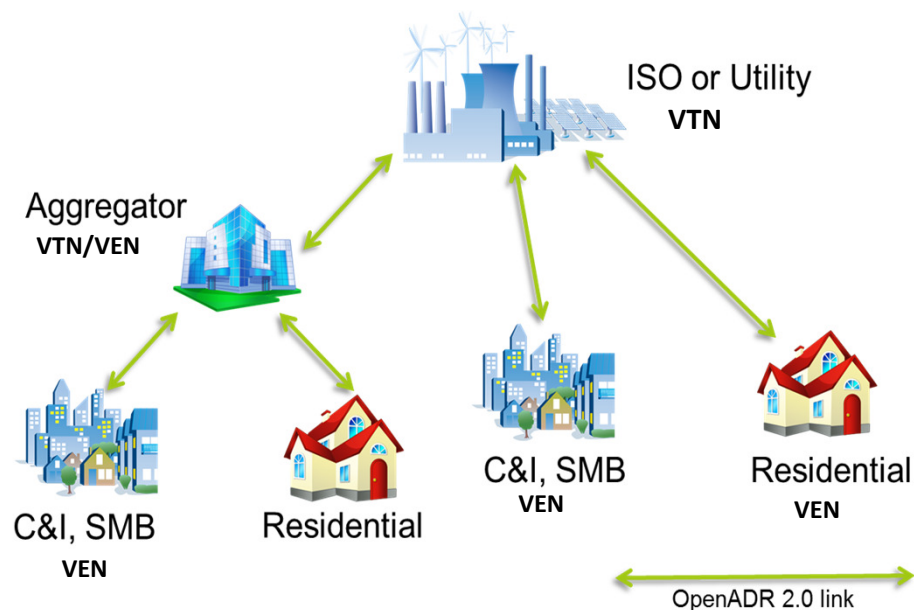
OpenADR is a message exchange protocol with two primary actors aka 'entities'

## Virtual Top Nodes (VTN)

- Manages Resources
- Creates/Transmit events
- Request Reports

## Virtual End Nodes (VEN)

- Receive events and respond to them
- Generate reports
- Control demand side resources

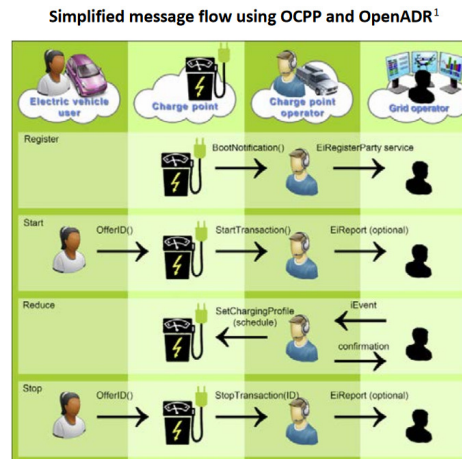


# The 'Services' of OpenADR

- Web Service like logical request-response services
  - Event Service – Send and Acknowledge DR Events
  - Opt Service – Define temporary availability schedules
  - Report Service – Request and deliver reports
  - RegisterParty Service – VEN Registration, device information exchange
- XML Payloads
- Communication through broadband or dedicated internet connection
- Security: TLS1.2 with server and client cyber sec certificates

# Interaction with other Standards

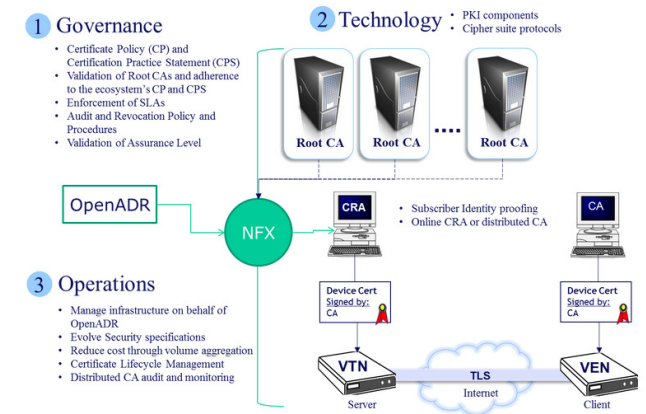
- OpenADR prefers to “inform & motivate”
- Therefore, it is well suited to integrate with other downstream standards like EEBus, OCPP, and others
- No direct translation
- Use of information elements to make decision



<sup>1</sup> <https://openadr.memberclicks.net/assets/using%20openadr%20with%20ocpp.pdf>

# Cyber Security Aspects

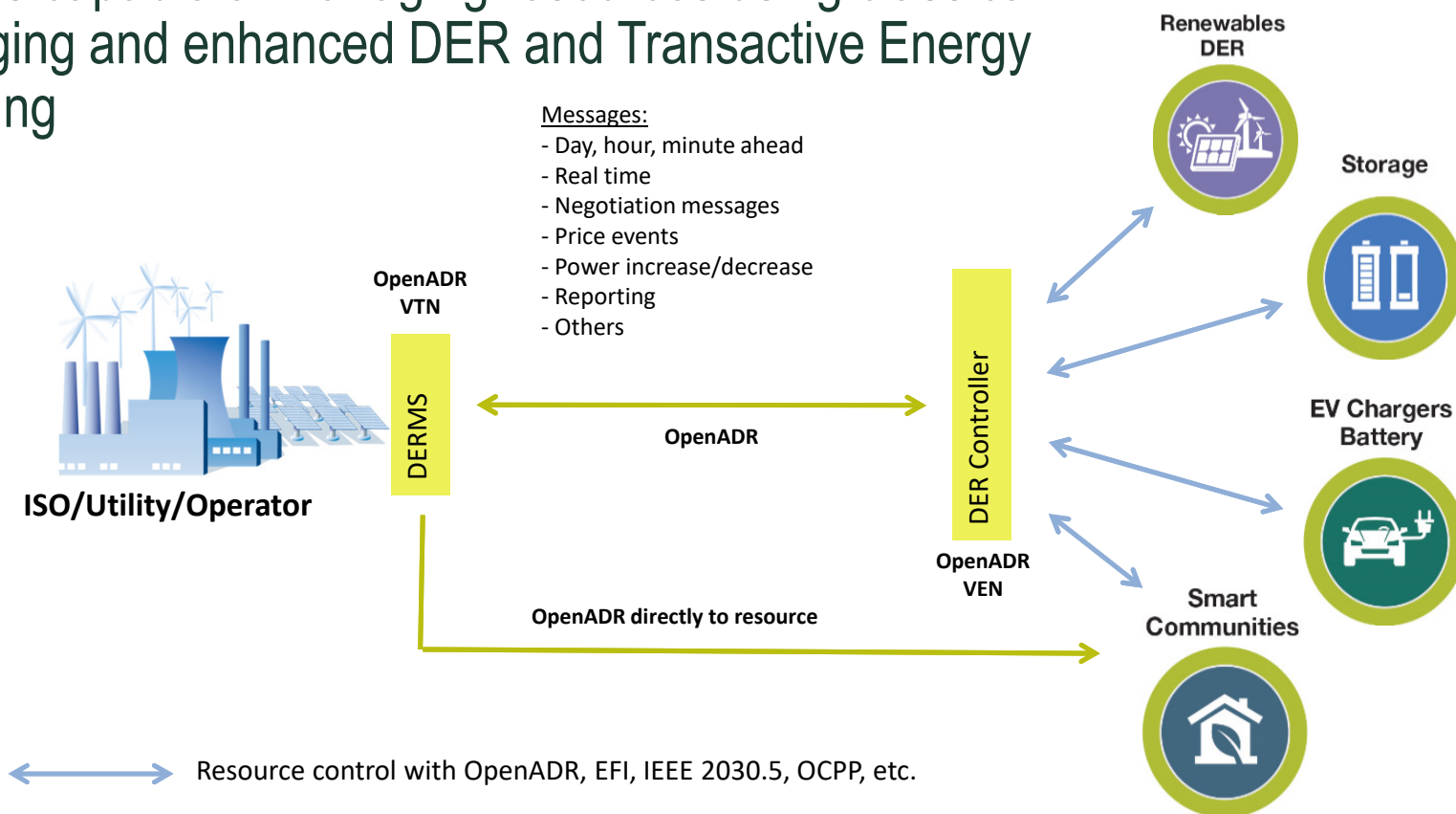
- Transport Layer Security 1.2
- Server and Client certificates
- Dedicated OpenADR ECC and RSA certificate authority
- Application up to user → utilities
- OpenADR allows for demarcation between utility network and customer owned equipment
- Security reviews performed by NIST/SGIP and IEC working groups





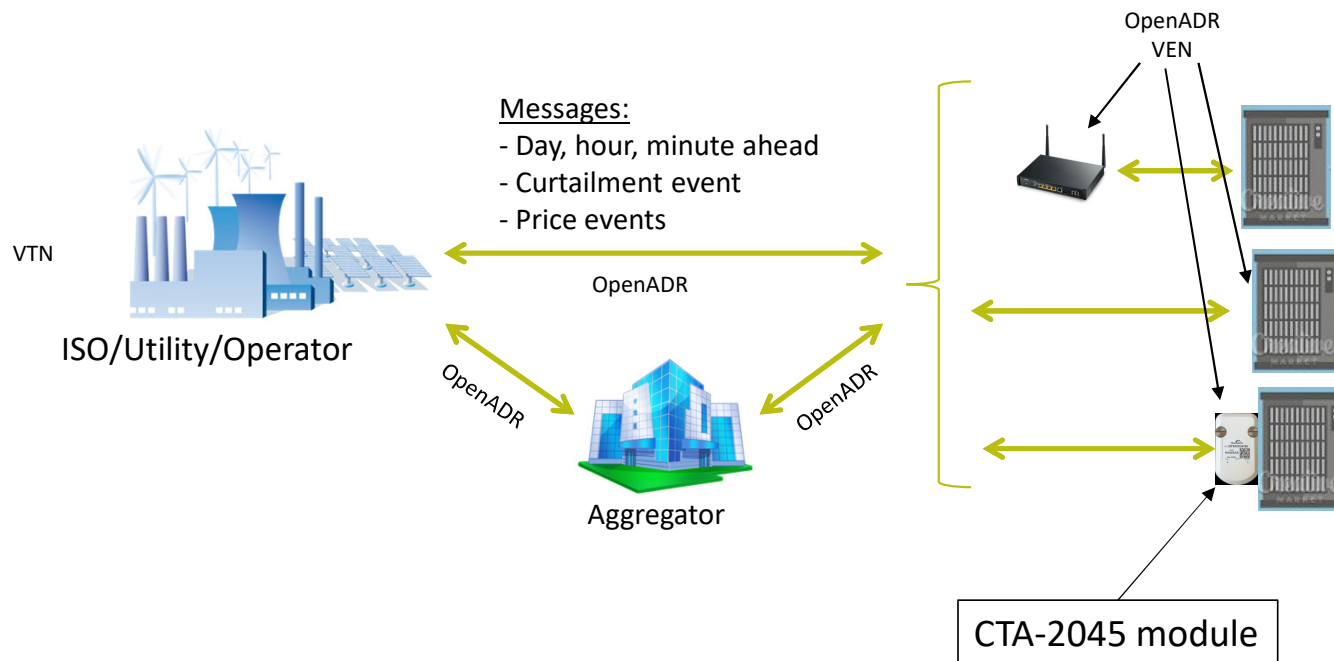
# DER Control Made Easy

OpenADR is capable of managing resources using classical DR messaging and enhanced DER and Transactive Energy (TE) signaling

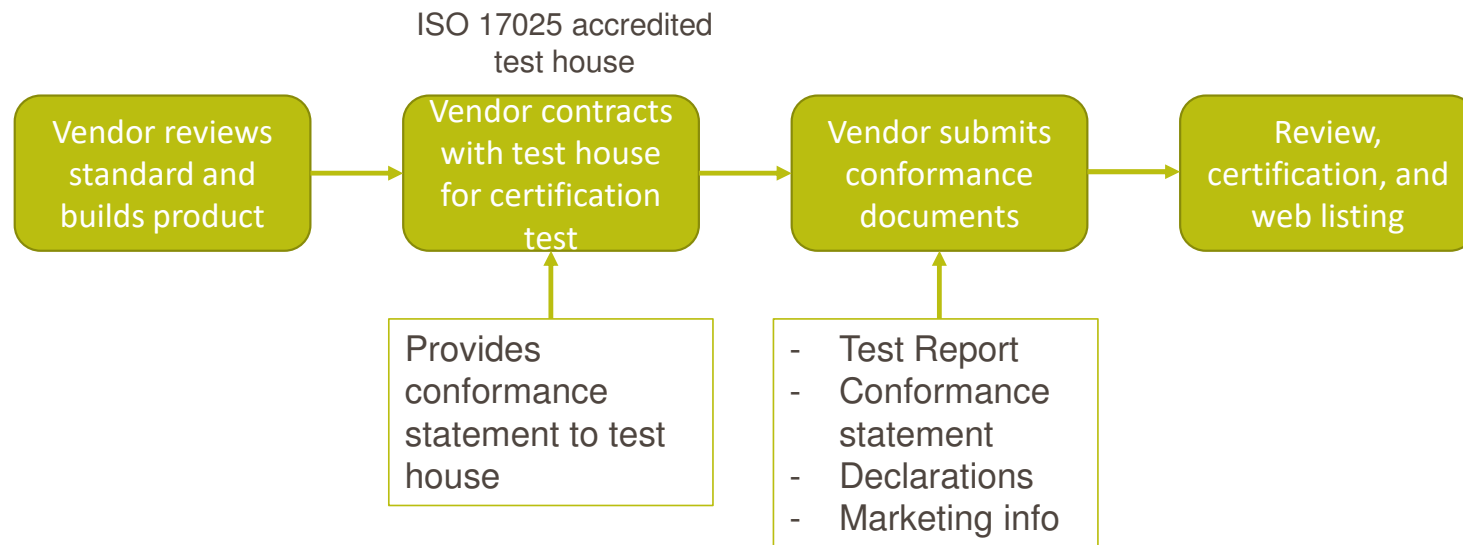


## Options for local connectivity

- Flexible architecture using a gateway, direct control, or CTA 2045 modular communications



# Certification Process



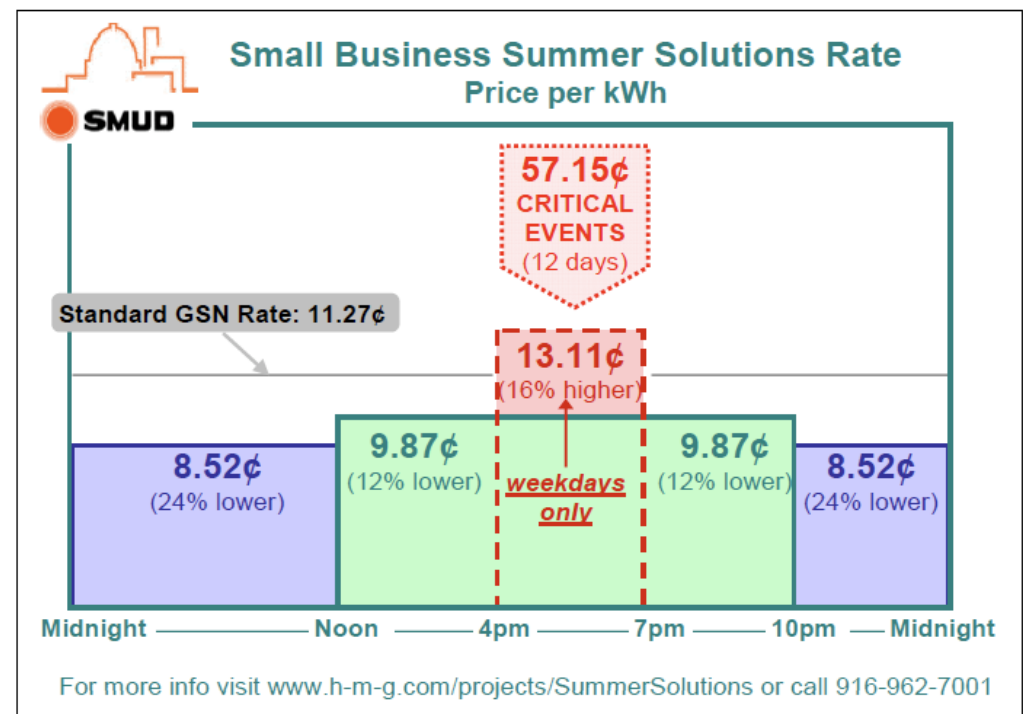
## Backup Slides

# Sacramento Municipal Utility District



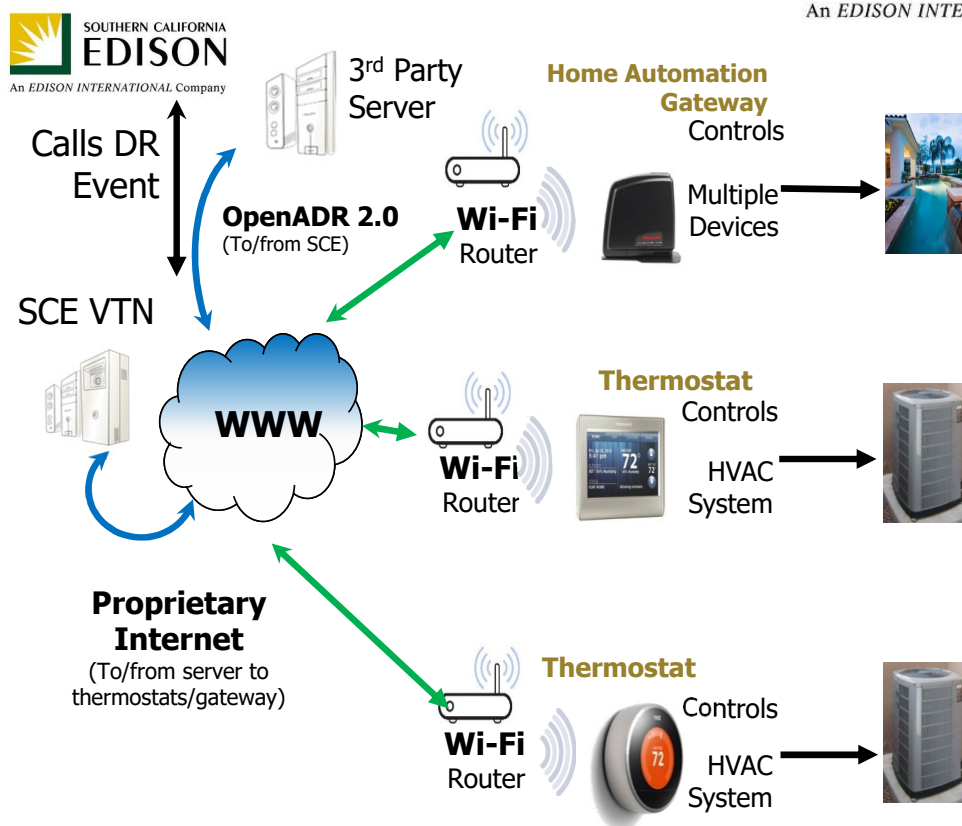
## Critical Peak Pricing Programs

- Equipment pre-programmed to respond to price signals
- Rate and/or price structure designed to encourage reduced consumption
- PUCs adopting CPP programs for residential and commercial customers
- Signal with levels range from 1 to 3 and multiple prices in single event
- Supports price responsive demand for wholesale and retail prices



# Southern California Edison

- BYOT model
- 4,800 customers select own devices
- 8 events with an average 750 watts of load reduction per hour per customer
- Energy savings:
  - 3.6MW of average energy reduction per event (peak ~7MW)
  - 115.2MWh of energy saved annually



# Hawaiian Electric Ancillary Services



- Used by ISO/utilities to obtain pre-committed load response in “real-time” from 10 minutes for resources that are used as reserves to 2 seconds.

## ■ OpenADR supports

- Spinning and non-spinning reserves
- Variable event durations

Program Type	Wind Integration <b>FastDR Pilot</b>
Curtailment Window	7am – 9 pm Mon-Fri
Annual Limit	40 or 80 hrs/yr
Event Duration Limit	1 hr/event
Number of Events Limit	40 or 80/yr
Load Response	10-min w/notification UFR N/A
Notification Period	1- minute
Incentive	\$5 or \$10/kw-month
Implementation Incentive	TA/TI = Up to \$600/KW
YTD 2013 Events	34 - Evaluation
Gateway device	Any OpenADR 2.0b device



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Electric Company®*

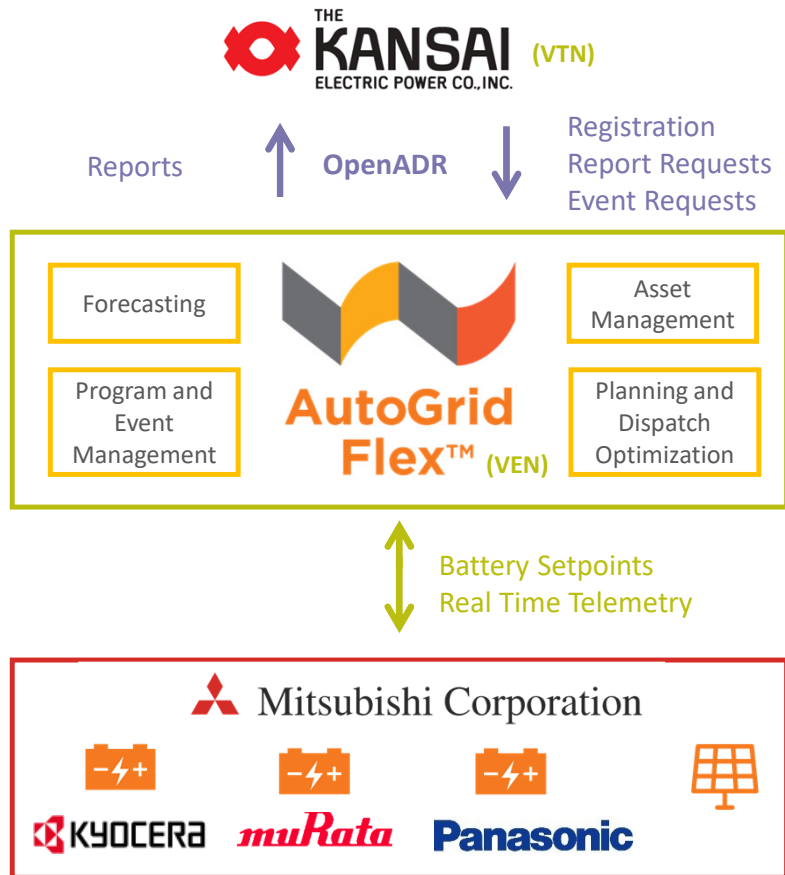
## Excess Supply DR Pilot (XSP) Design

**Objective: Test the capabilities of price-responsive demand side resources to increase load as a service to the grid during times of excess supply.**

- Participants nominate block of hours between 8 am and 4 pm when they are available to shift energy when needed to balance the grid.
- Events called out-of-market day ahead based on forecasts of probability of excess generation in real-time wholesale market.
- Technology neutral: Includes energy storage, thermal storage, process shifting, PV, disabling backup generation, and EVSE.
- Notification of events using OpenADR 2.0b supported but not required in most cases.



# Kansai Electric Power Co



## First Residential Solar and Storage Virtual Power Plant in Japan

### Profile

- Mitsubishi Corporation owns and operates 5GW of generating capacity and 1,000 km of transmission
- KEPCO supplies 13M customers in the Kansai region of Japan

### Problem

- METI-funded program for development of VPP applications
- Need flexible platform to support optimization over solar self consumption and communicate with multiple vendors
- Ultimately support more renewable integration for Japan

### Solution: AutoGrid Flex

- Aggregation of 300 residential storage assets on one monitoring and control platform
- Storage vendors including Kyocera, Murata, Panasonic
- Co-optimization of self-consumption with aggregate-level capacity

# National Grid

nationalgrid

Send Static  
Event



Measurement and  
Verification



OpenADR  
Dispatch Signal



Device Usage  
Information



## Gas DR with smart thermostats

### Profile

- 3.3 million U.S. customers in MA, NY, and RI

### Problem: Natural Gas in New York

- Natural Gas pipeline constraints entering Long Island
- Existing gas turbines running up to capacity during peak demand
- Looking for non pipes alternative to reduce peak load

### Solution: AutoGrid Flex

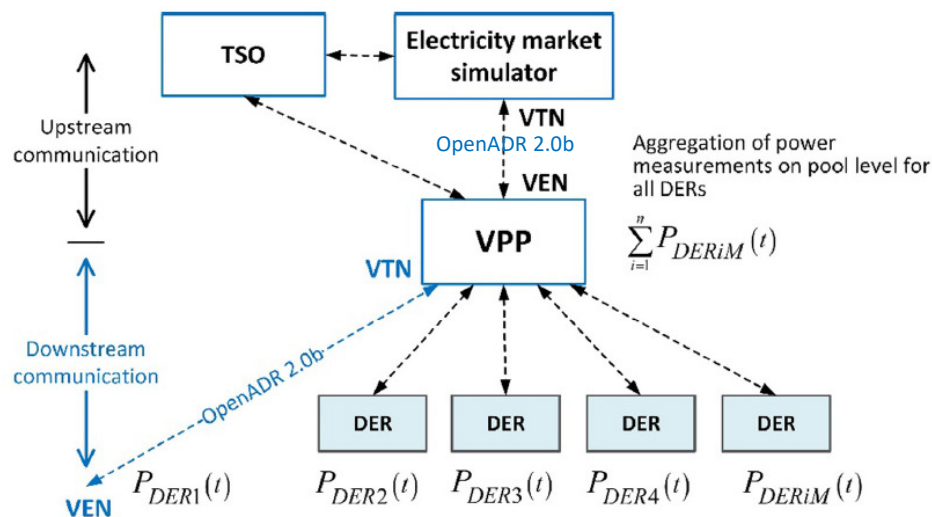
- Unified dashboard for gas and electric programs
- Focus on timely dispatch
- See device usage information at near real time on open platform
- First Natural Gas DR project in the world

# Southern California Edison

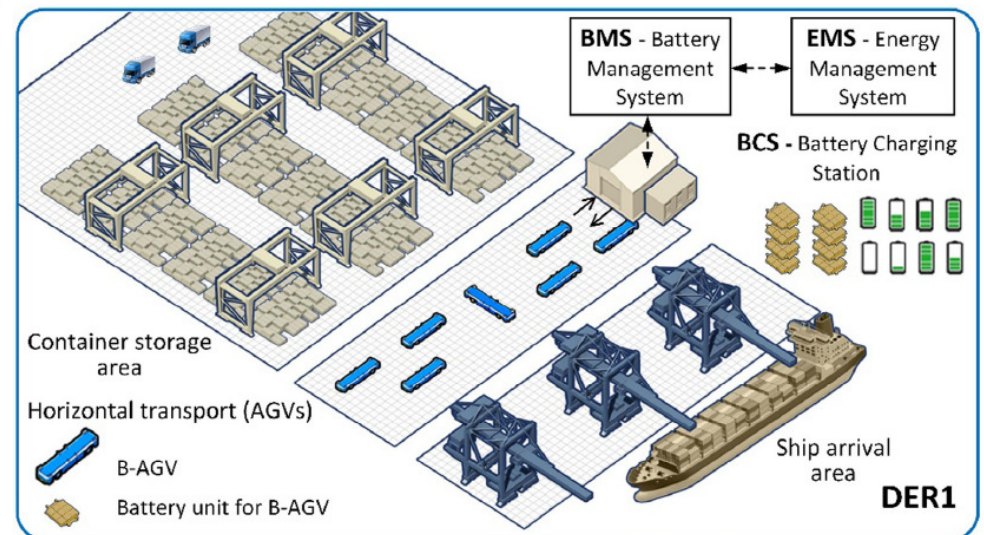
- Support EV TOU customers
- Deployed 80 L2 EVSEs with payment modules at 9 SCE facilities
- OpenADR
  - Varied Pricing: Tiers, Rate of Charge, Penalty
  - Varied Curtailment Events
- OCPP
  - Session Reports
  - EVSE Status
  - Credit Card



## Europe - Slovenia & Germany



# Virtual Power Plant (VPP)



<https://www.sciencedirect.com/science/article/pii/S0142061517311560?via%3Dihub>

# Thank you!

## Contact:

Rolf Bienert

Managing & Technical Director OpenADR Alliance

[rolf@openadr.org](mailto:rolf@openadr.org)

## Education Programs

Don Dulchinos

[don@openadr.org](mailto:don@openadr.org)

## Marketing

Shannon Mayette

[shannon@openadr.org](mailto:shannon@openadr.org)