Enabling The Standard for Automated Demand Response

Understanding OpenADR 2.0

Agenda

- Smart Grid, Demand Response (DR) and Automated DR
- From OpenADR 1.0 to OpenADR 2.0
- OASIS Energy Interop and OpenADR 2.0
- OpenADR Alliance overview
- Current Status
- Q&A

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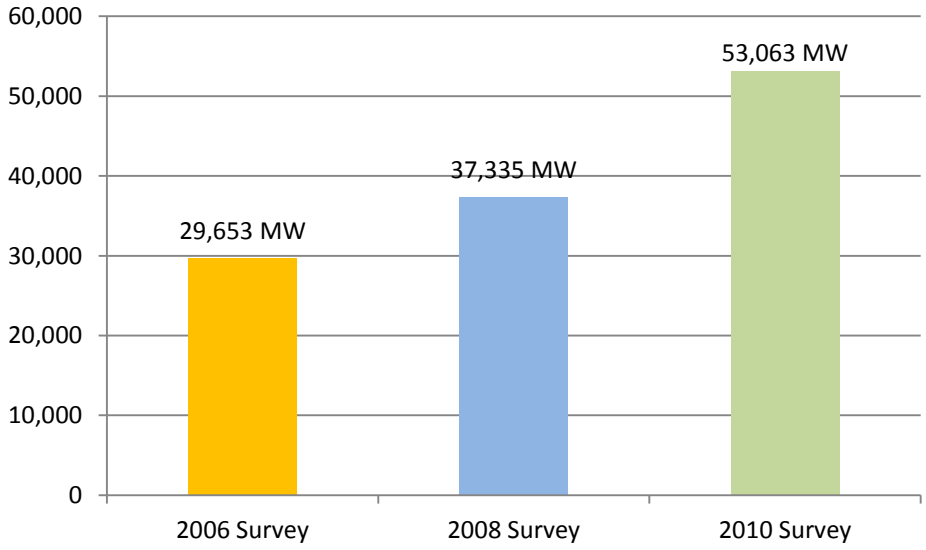
Motivation for Demand Response

- Growing Peak Loads make it difficult to keep up with demand
- 10% reduction for 60 hours/yr = 5000MW or 50 100MW peak plants
- Recent heat waves in the North East showed that DR can help



Demand Response Potential Peak Load Reduction in MW, United States: 2006, 2008, 2010 - Business as usual -
Source: Federal Energy Regulatory Commission

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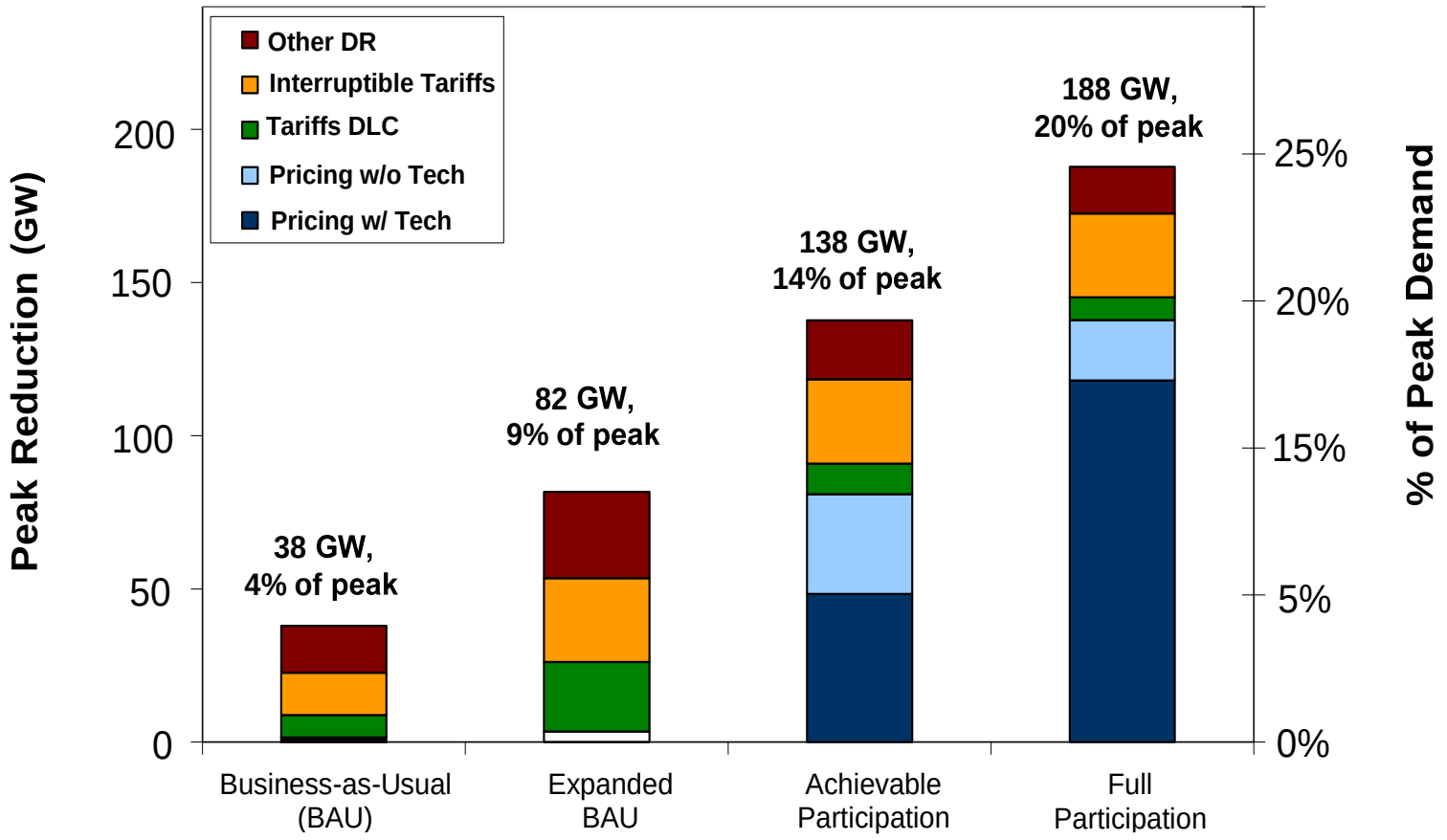
Motivation for Automated DR

- Demand Response Potential



(Source: Federal Energy Regulatory Commission)

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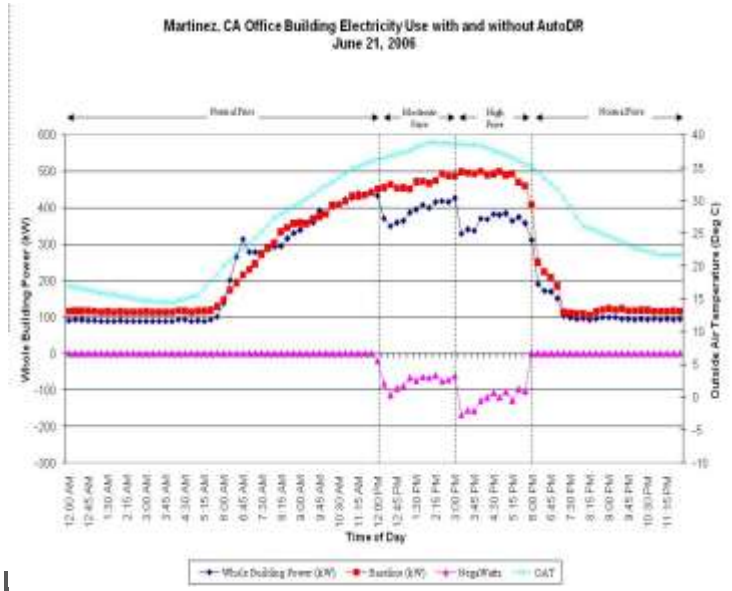
Why DR Is Important

- Direct Financial Benefits
- Market Benefits
- Reliability
- System & Network
- Environmental and Societal
- Customer Service and Risk Management
- Power Cost Stabilization
- Consumer Choice



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Motivation for Automated DR and Standardization

- OpenADR developed to meet automation goals from 2002
  - Cost - Develop low-cost, automation infrastructure
  - Technology – Evaluate reliability & readiness for common signals
  - Capability - Evaluate control strategies to modify electric loads
- OpenADR is a public domain standard to communicate price and reliability signals
- OpenADR-based Auto-DR programs, offered by utilities/ISOs

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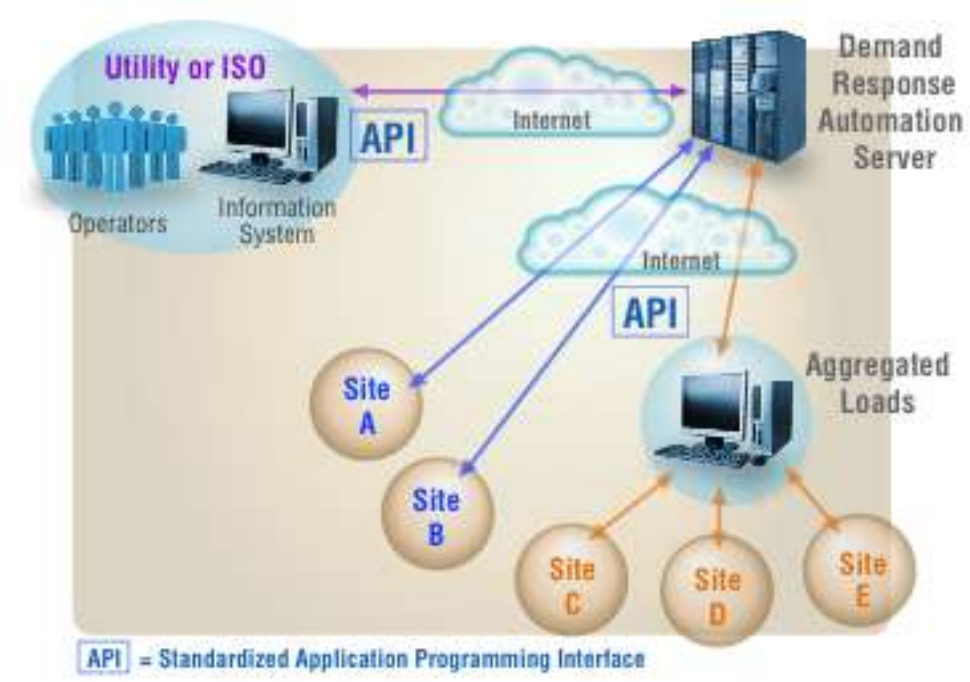
OpenADR in a Nutshell

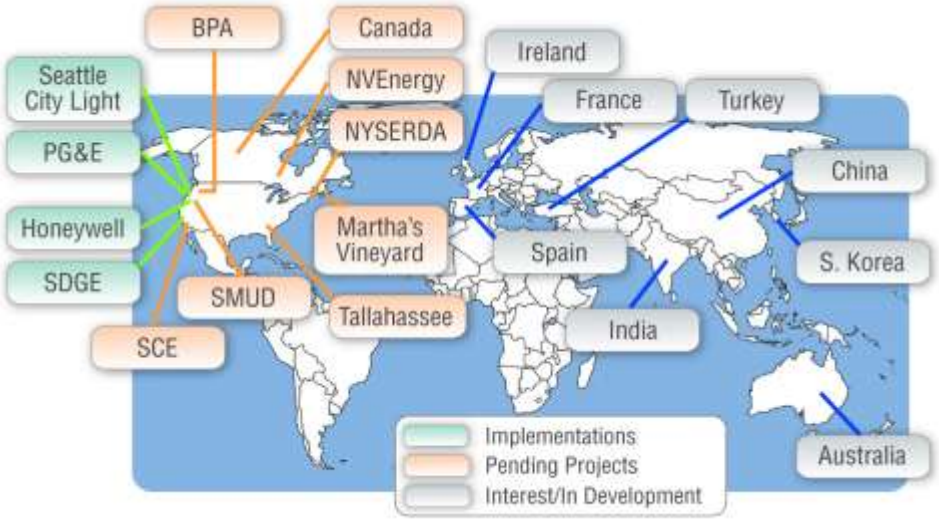
- Open Automated Demand Response (OpenADR) provides a non-proprietary, open standardized DR interface that allows electricity providers to communicate DR signals directly to existing customers using a common language and existing communications such as the Internet.

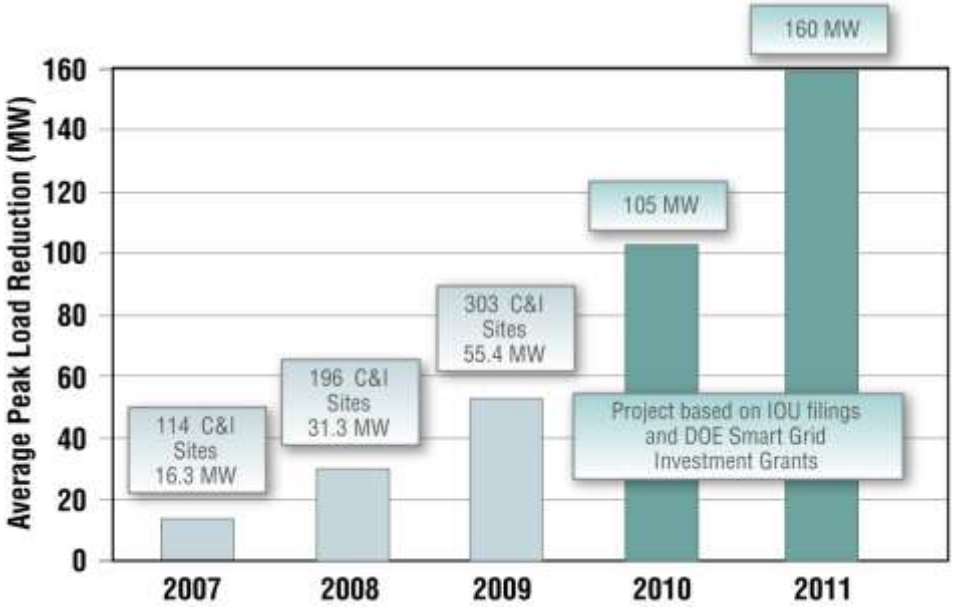


Source: LBNL

OpenADR Deployments

OpenADR Deployments around the World

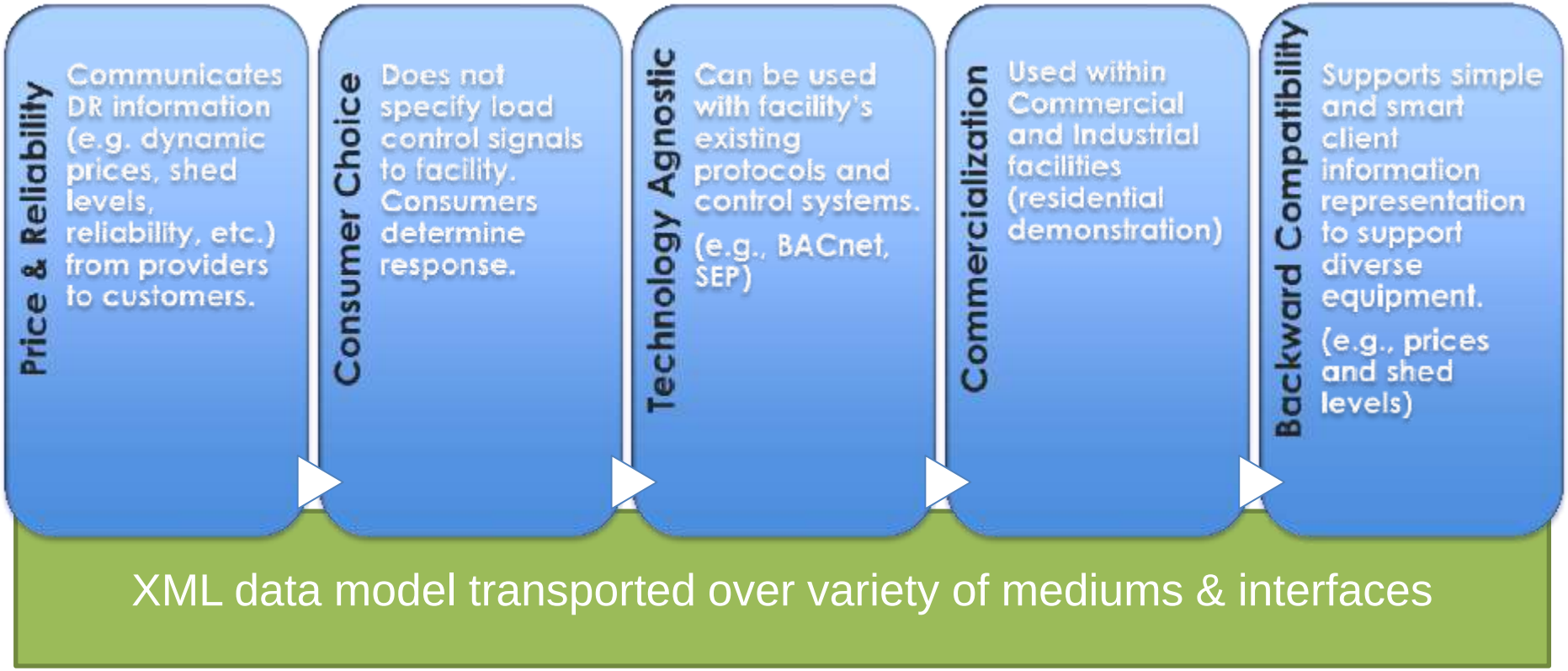




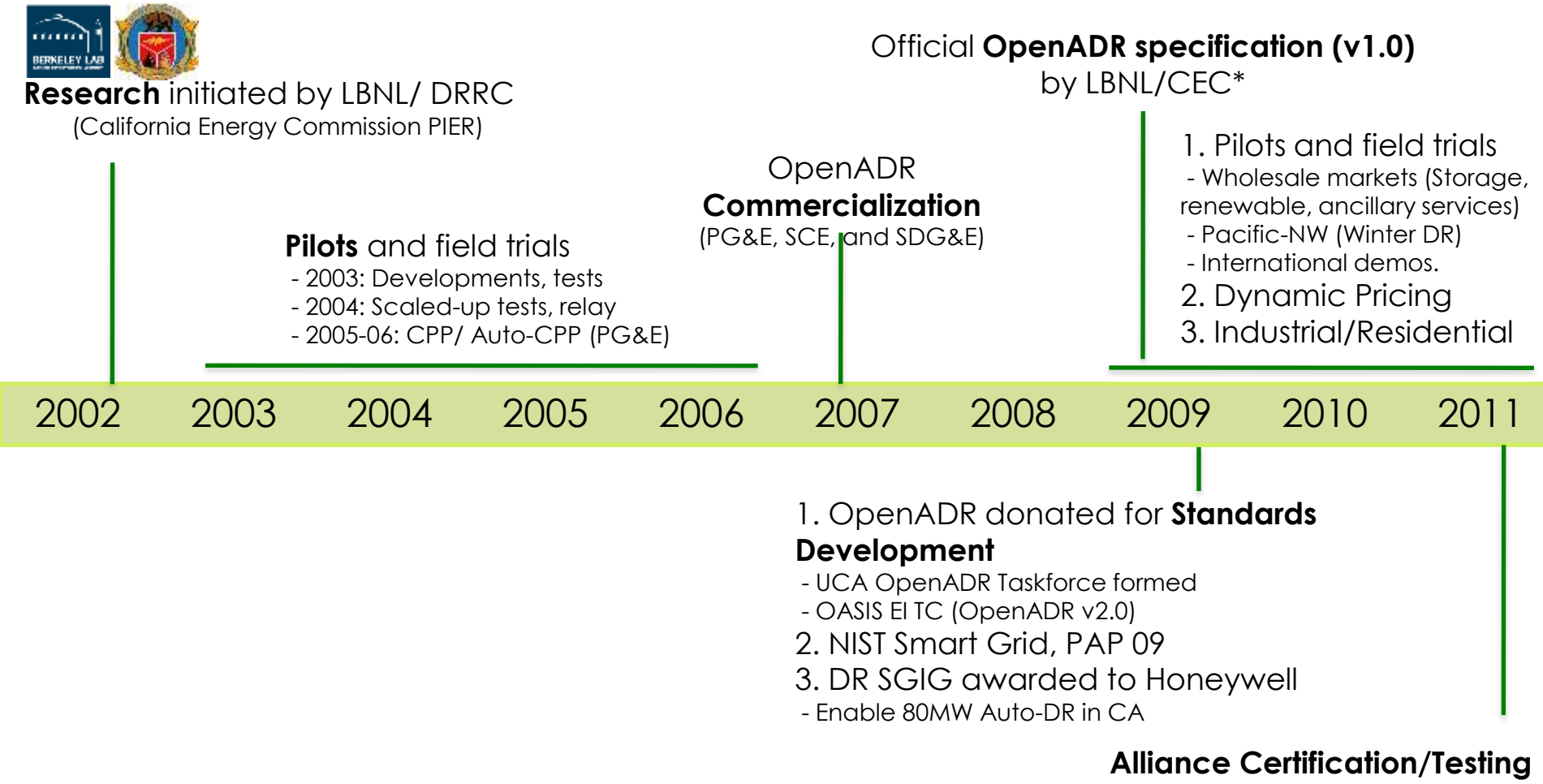
OpenADR Commercial Deployment MW (current enrollment ~200 MW)

OpenADR Features and Benefits

- Low cost automation allows consumers to use less expensive power providing benefits to consumers, utilities, system operators, and society at large.



OpenADR Progression



***OpenADR v1.0:** http://openadr.lbl.gov/

OpenADR 1.0 and 2.0

OpenADR 1.0

- Open specification
- No certification program
- Limited number of vendors
- Geared towards specific DR programs

OpenADR 2.0

- Based on formal industry standard
- Test tool, test plan & certification program
- Backed by industry alliance
- Conforms to NIST Smart Grid Interoperability Framework
- Expanded architecture to include pricing, telemetry and other services

→ **How did it come together?**

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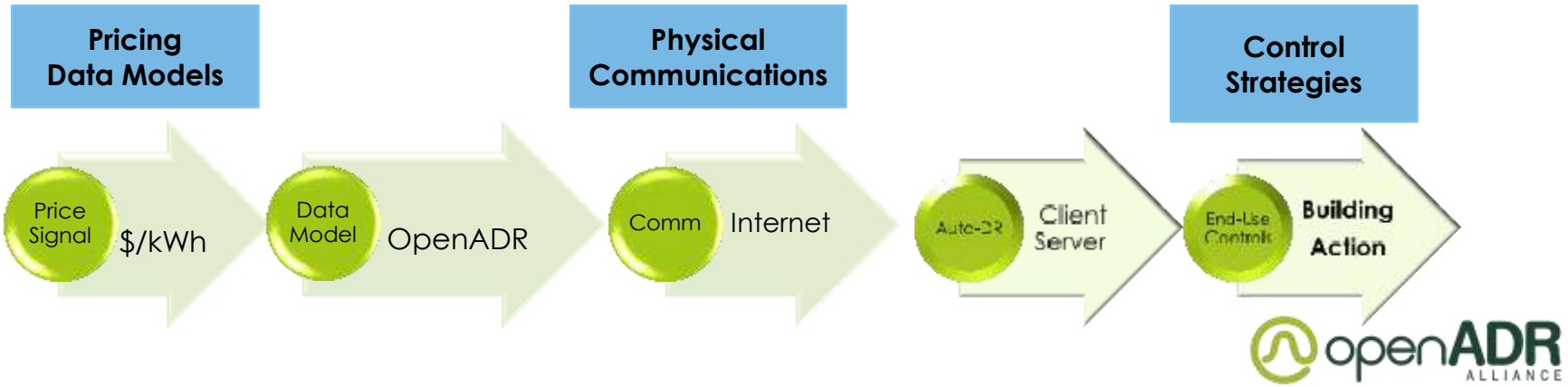
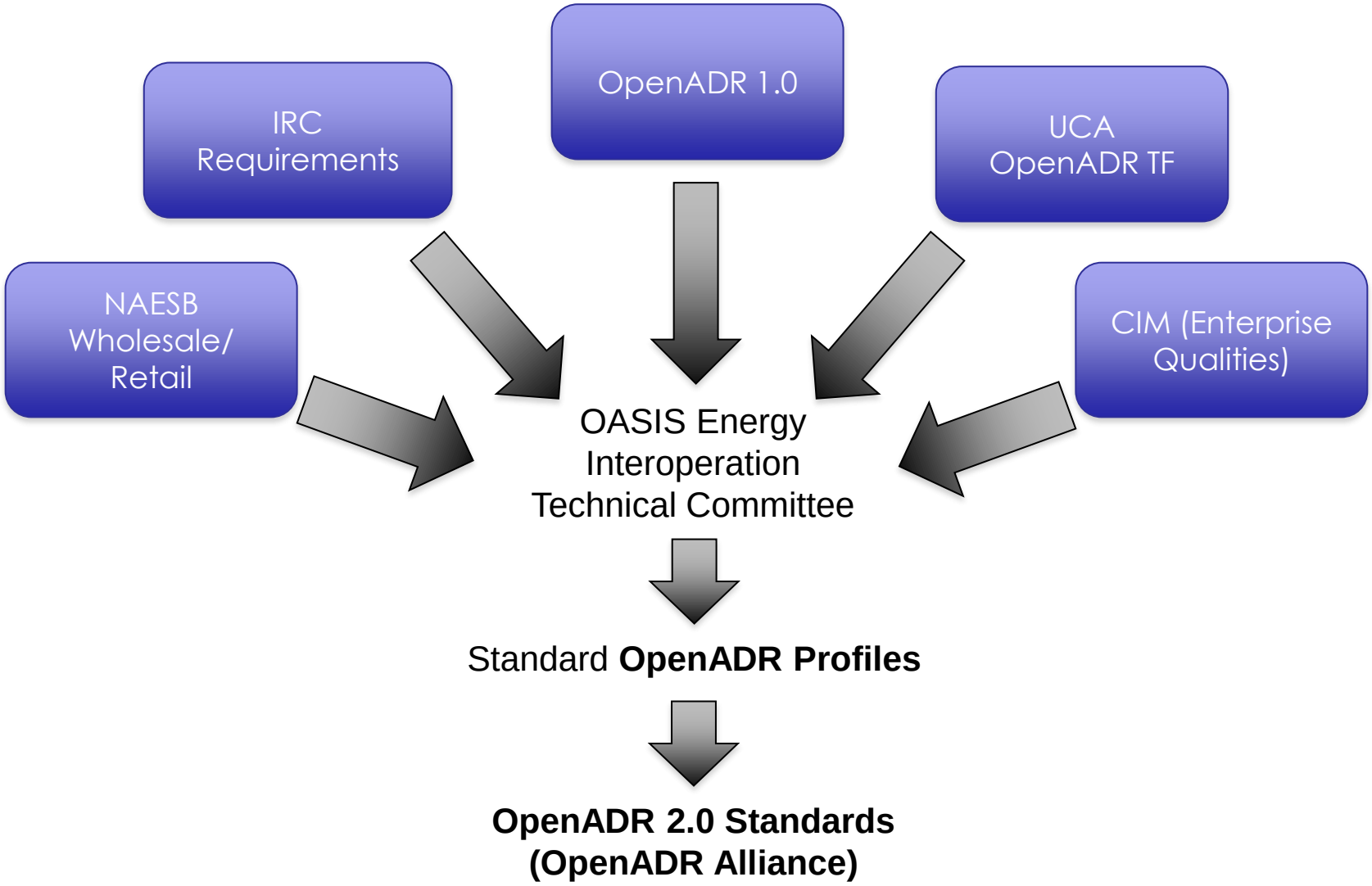
OpenADR 2.0

- NIST Smart Grid initiative started harmonization project in 2009
- Priority Action Plans (PAPs) to work on common standards for price models, schedule representation and standard DR Signals (PAP 3, 4 and 9)
- OpenADR 2.0 uses the standardized output from the above efforts
- Adds feedback and other price related features



OpenADR 2.0


OpenADR 1.0
IRC Requirements
UCA OpenADR TF
NAESB Wholesale/ Retail
CIM (Enterprise Qualities)
OASIS Energy Interoperation Technical Committee
Standard **OpenADR Profiles**
OpenADR 2.0 Standards (OpenADR Alliance)

OpenADR 2.0 Application

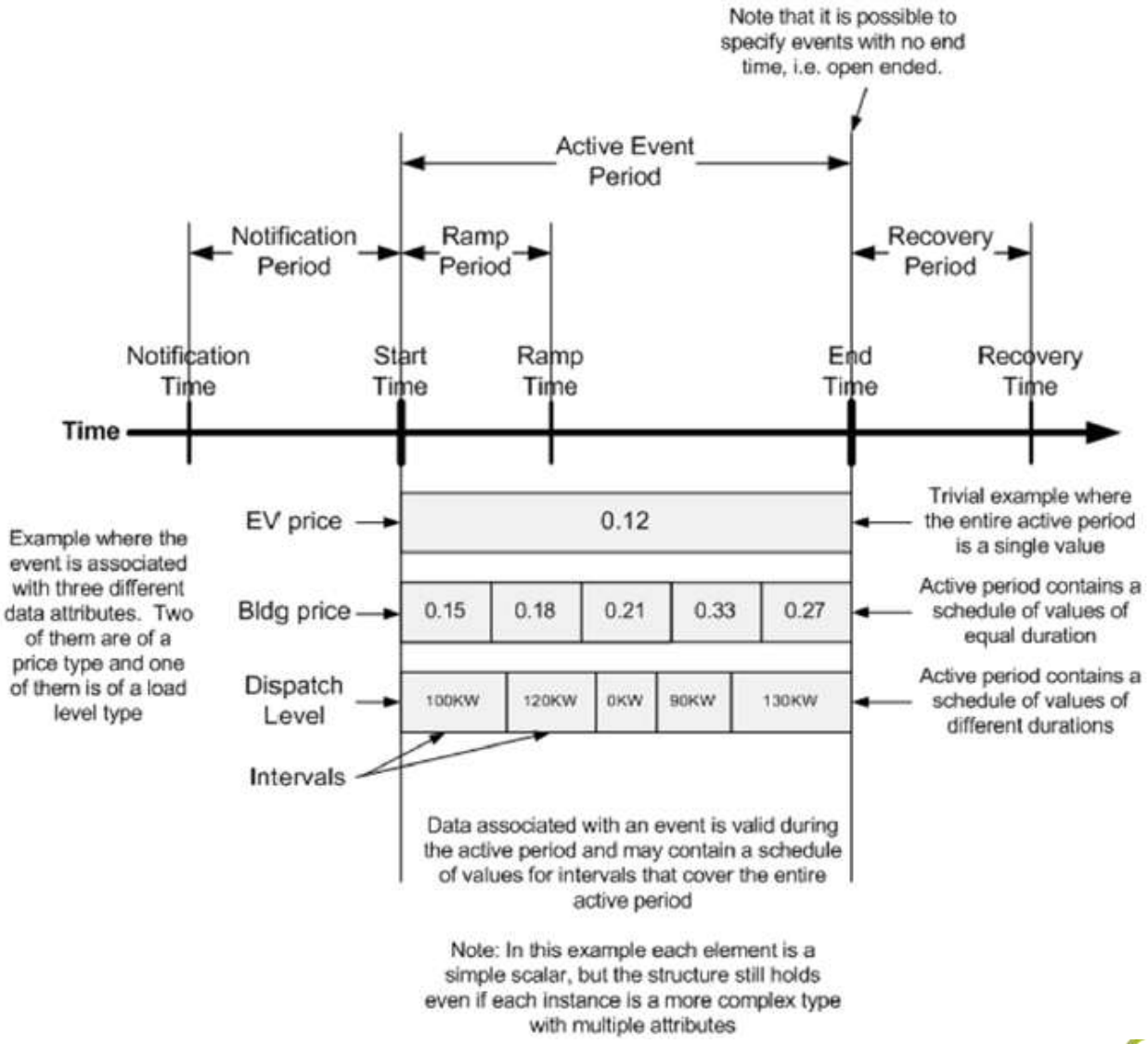


***Figure Source: OASIS Energy Interop Draft Standards (http://www.oasis-open.org/committees/energyinterop/)**

OpenADR 2.0 - OASIS

- Architectural models for
  - Data models for information exchange
  - Information exchange patterns
  - Distributed Energy Resources (DER)

- Use work across Smart Grid domain related to –
  - Price/Reliability DR from OpenADR 1.0
  - Transactive Prices from Energy Market Information Exchange
  - Common schedule from Web Service Calendar (WS-Calendar)
  - NAESB, UCA, ISOs, RTOs, etc.

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OpenADR 2.0 - OASIS

- Energy Interop Technical Committee (EI TC) works to:
  - Describe information and comms models
  - Define web services

- Create models for –
  - Dynamic price signals
  - Reliability signals
  - Emergency signals
  - Communication re market participation info
  - Load predictability and generation information

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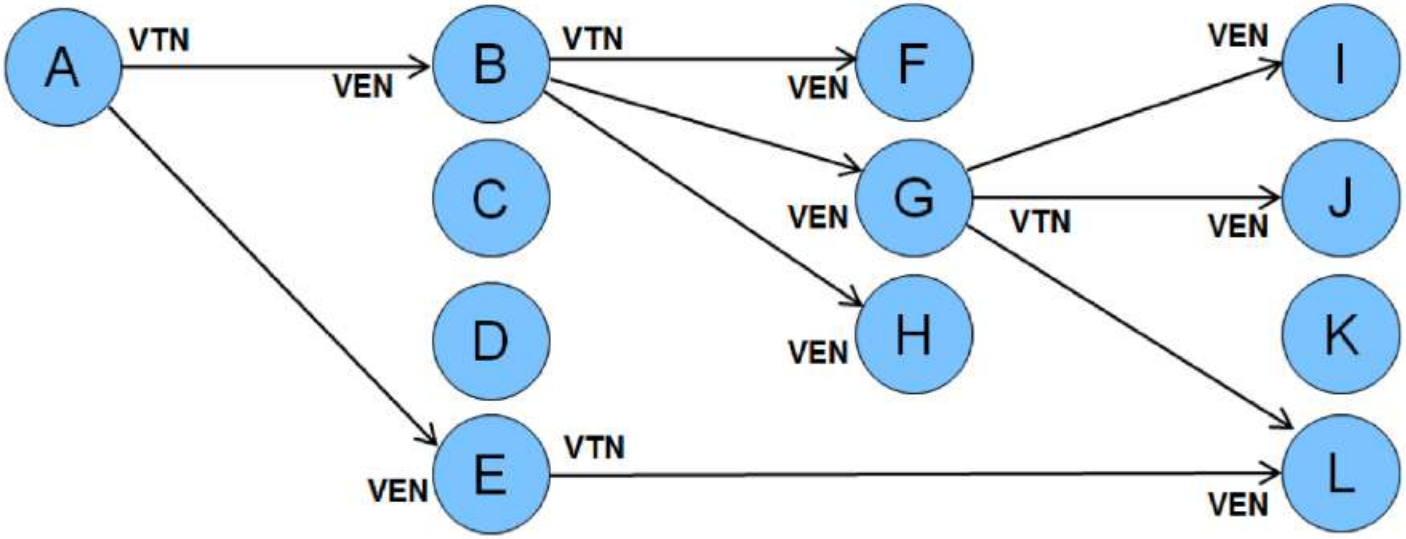
OpenADR 2.0 - OASIS

- OpenADR 2.0 profiles in the EI v1.0

Service	*Section*	*Notes*
EiRegisterParty	7.1	Register to identify and receive information
EiQuote	7.2	EiDistributeQuote for distributing dynamic prices (push), other operations for pull including block and tier tariff communication
EiEvent	9	The core event functions and information models
EiReport	10	The ability to set periodic or one-time information on the state of a Resource
EiAvail	11.2	Constraints on the possible time a Resources is available or not
EiOpt	11.3	Overrides the EiAvail; addresses short-term changes in availability
EiEnroll	8	Used to enroll a Resource for participation in Events.
EiMarketContext	12.2	Used to discover program rules, standard reports, etc.

OpenADR 2.0

- Some new lingo –
  - Server is now a Virtual Top Node (VTN)
  - Client is now a Virtual End Node (VEN)
- Devices can be VTNs, VENs, or combinations thereof



What is the OpenADR Alliance?

- California-based nonprofit 501(c)(6) corporation
- Member-based organization comprised of industry stakeholders interested in fostering OpenADR adoption
- Leverages Smart Grid-related standards from OASIS, UCA and NAESB
- Supports development, testing, and deployment of commercial OpenADR
- Enables stakeholders to participate in automated DR, dynamic pricing, and electricity grid reliability

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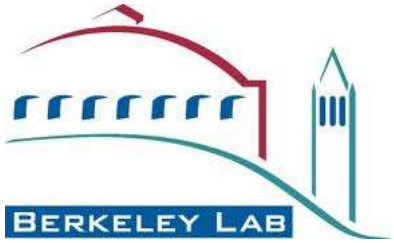
Alliance Goals

- Coordination with standards organizations for release of OpenADR 2.0
- Successful Testing/Compliance Program
- Education on the Standard and its implementation
- Market acceptance and adoption of OpenADR

OpenADR Members

Sponsors



Honeywell

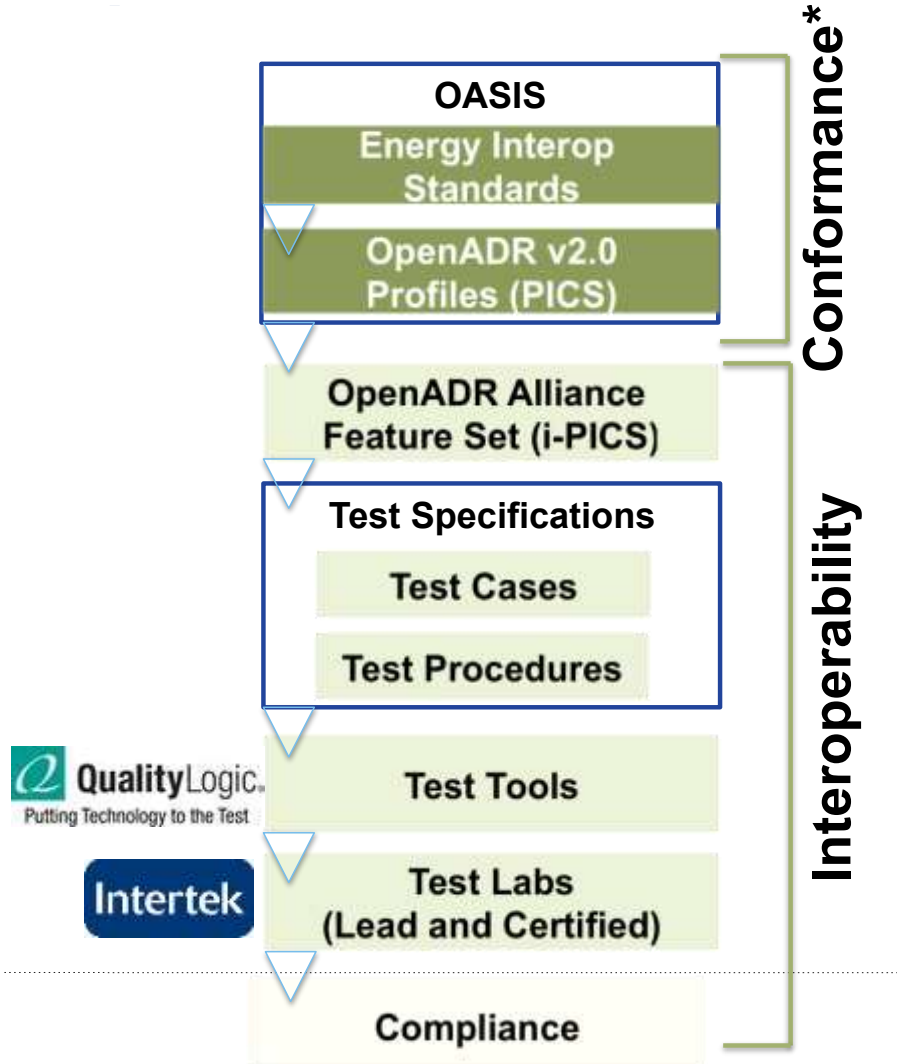
Contributors

Adopters

Committee Activities Snapshot

- Complete OpenADR 2.0 specification feature sets
- Define the policy framework for compliance (refer to UCA CPRM and SGIP IPRM)
- Implement certification and compliance program
  - Complete OpenADR 2.0 specification test cases
  - Develop test procedures
  - Test tool vendor to provide validated test system
  - Accredited test house to implement testing service
- Support OpenADR compliant development (e.g., web-based test tool, plug-fests, remote interop testing)
- Contribute feedback to SGIP SGTCC IPRM process
- Evaluate and support technical harmonization
- Facilitate transition from legacy DR to OpenADR 2.0

Certification & Testing



*Conformance with data models

Certification & Testing

- Alliance is creating
  - Profile Specification
  - PICS documents
  - Test plan and testing
  - Certification documents
  - Certification test tool
- Test facility and test tool validated by the Alliance
- Members can obtain test tool for pretesting and do final certification testing at the test lab

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Certification & Testing

Device Types & Feature Set	VTN e.g Servers			VEN e.g. Energy Management Clients		
	A	B	C	A	B	C
EiEvent						
Simple Profile	Y	Y	Y	Y	Y	Y
Full Profile	N	Y	Y	N	Y	Y
Performance Criteria Profile	N	N	Y	N	N	Y
Ei Quote						
Full Profile	N	Y	Y	N	Y	Y
Ei Opt						
Simple Profile	N	Y	Y	N	Y	Y
Full Profile	N	Y	Y	N	Y	Y
EiFeedback						
Full Profile	N	N	Y	N	N	Y
EiStatus						
Full Profile	N	Y	Y	N	Y	Y
Admin Services						

- The OpenADR Alliance is working on 3 different feature sets using increasing sets of services and features from EI

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Outreach and Education

- OpenADR Primer
- Demos
  - Grid-Interop
  - DistribuTECH
- Speaking
  - Grid-Interop – Dec.
  - EnergySMART - Sep
  - Smart Energy International – Oct.
  - Mass Market Demand Response Conference - Nov
  - AHR Expo – Jan
  - Distributech – Jan

Current Status

- OASIS Energy Interoperation 1.0 standard approved for third public review
- Completed first interoperability test event
- Established test tool framework
- Finalizing profile certification and test plan
- Preparing market education and outreach programs
- Growing Ecosystem of suppliers

→ Join us …!

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Thank You!
Questions?

Contact us – see below

Rolf Bienert
Technical Director

rolf@openadr.org
+1 925 336 0239

Barry Haaser
Managing Director

barry@openadr.org
+1 408 778 8370

www.openadr.org

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