



Smart Grid Standards Information

Version 1.7

Monday, May 10, 2010

Section I: Use and Application of the Standard

A. Identification and Affiliation

1.	Number of the standard	NA
2.	Title of the standard	OPEN AUTOMATED DEMAND RESPONSE COMMUNICATIONS SPECIFICATION Version 1.0 (OpenADR v1.0)
3.	Name of owner organization	OASIS, UCAlug
4.	Latest versions, stages, dates	April 2009 (Development since 2003)
5.	URL(s) for the standard	http://openadr.lbl.gov/pdf/cec-500-2009-063.pdf http://openadr.lbl.gov/src/1/ Contact: Auto-DR@lbl.gov
6.	Working group / committee	UCAlug OpenADR Taskforce: http://osgug.ucaiug.org/sgsystems/OpenADR/default.aspx OASIS EI TC: http://www.oasis-open.org/committees/energyinterop/charter.php
7.	Original source of the content (if applicable)	Lawrence Berkeley National Laboratory and California Energy Commission Public Interest Energy Research Program, April 2009, CEC-500-2009-063
8.	Brief description of scope	OpenADR v1.0 describes an open standards-based communications data model designed to promote common information exchange between the utility or Independent System Operator and electric customers using demand response price and reliability signals. This specification also addresses how third parties such as utilities, ISOs, energy and facility managers, aggregators, and hardware and software manufacturers will interface to and utilize the functions of the DRAS in order to automate various aspects of demand response (DR) programs and dynamic pricing.

B. Level of Standardization

1.	Names of standards development organizations that recognize this standard and/or accredit the owner organization	OASIS and UCAlug both have activities to standardize this specification.
2.	Has this standard been adopted in regulation or legislation, or is it under consideration for adoption?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
3.	Has it been endorsed or recommended by any level of government? If "Yes", please describe	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No The California Public Utilities Commission through its decision in 2007 to all Investor-Owned Utilities mandated the commercial use of OpenADR for Automated DR (Auto-DR) programs to Commercial and Industrial (C&I) customers.

Section I: Use and Application of the Standard

4.	Level of Standard (check all that apply)	<input type="checkbox"/> International <input type="checkbox"/> National <input checked="" type="checkbox"/> Industry <input checked="" type="checkbox"/> de Facto <input type="checkbox"/> Single Company
5.	Type of document	<input type="checkbox"/> Standard <input checked="" type="checkbox"/> Report <input checked="" type="checkbox"/> Guide <input checked="" type="checkbox"/> Technical Specification
6.	Level of Release	<input checked="" type="checkbox"/> Released <input type="checkbox"/> In Development <input type="checkbox"/> Proposed

C. Areas of Use

1.	Currently used in which domains? (check all that apply)	<input checked="" type="checkbox"/> Markets <input checked="" type="checkbox"/> Operations <input checked="" type="checkbox"/> Service Providers <input checked="" type="checkbox"/> Generation <input type="checkbox"/> Transmission <input checked="" type="checkbox"/> Distribution <input checked="" type="checkbox"/> Customer
2.	Planned for use in which domains? (check all that apply)	<input checked="" type="checkbox"/> Markets <input checked="" type="checkbox"/> Operations <input checked="" type="checkbox"/> Service Providers <input checked="" type="checkbox"/> Generation <input type="checkbox"/> Transmission <input checked="" type="checkbox"/> Distribution <input checked="" type="checkbox"/> Customer
3.	Please describe the Smart Grid systems and equipment to which this standard is applied	Utility and ISO Information Systems (backend) and operations, Aggregator systems, enterprise systems, technology integrators, energy management companies, and customer DR and building controls and information technology systems.

D. Relationship to Other Standards or Specifications

1.	Which standards or specifications are referenced by this standard?	<ul style="list-style-type: none"> ▪ Request for Comment (RFC): RFC 2246: The Transport Layer Security (TLS) Protocol Version 1.0, Internet Engineering Task Force, Jan 1999. ▪ "BACnet/WS Web Services Interface," ANSI/ASHRAE Addendum Cc to ANSI/ASHRAE Standard 135-2004.
2.	Which standards or specifications are related to this standard?	Standards used in Web services: Web Services Description Language (WSDL), Web Services Inspection Language (WSIL), SOAP, Web Services Interoperability (WS-I), HTTP, and Internet Protocol (IP)
3.	Which standards or specifications cover similar areas (may overlap)?	None known in the Commercial and Industrial Customers DR for price and reliability signals.
4.	What activities are building on this work?	<ul style="list-style-type: none"> ▪ NIST PAP 09: Standard DR and DER Signals ▪ OASIS: Energy Interop Technical Committee ▪ OASIS: Energy Market Information Exchange Technical Committee ▪ UCA OpenSG User Group's OpenADR Task Force ▪ UCA OpenSG User Group's SG Conformance ▪ NAESB Retail Energy Quadrant ▪ American National Standards Institute (ANSI)

E. Dept of Energy Smart Grid Characteristics

Please describe how this standard may encourage each of the following:

1.	Enables informed participation by customers	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2.	Accommodates all generation and storage options	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
3.	Enables new products, services and markets	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4.	Provides the power quality for a range of needs	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
5.	Optimizes asset utilization and operating efficiency	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6.	Operates resiliently to disturbances, attacks, and natural disasters	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

F. Priority Areas Previously Mentioned by FERC and NIST

Please describe if and how this standard may be applied in each of the following areas. Note that there is space in section J to discuss any other significant areas where the standard may be applied.

1.	Cybersecurity and physical security	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2.	Communicating and coordinating across inter-system interfaces	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
3.	Wide area situational awareness	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4.	Smart grid-enabled response for energy demand	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
5.	Electric storage	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6.	Electric vehicle transportation	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
7.	Advanced metering infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
8.	Distribution grid management	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

G. Openness		
1.	Amount of fee (if any) for the documentation	None
2.	Amount of fee (if any) for implementing the standard	None
3.	Amount of fee (if any) to participate in updating the standard	None
4.	Is the standard documentation available online?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No URL: http://www.openadr.org
5.	Are there open-source or reference implementations?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6.	Are there open-source test tools?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
7.	Would open-source implementations be permitted?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
8.	Approximately how many implementers are there?	Over 200 facilities and 50 controls and IT vendors within California and pilots in Pacific Northwest (Seattle).
9.	Approximately how many users are there?	See #8
10.	Where is the standard used outside of the USA?	Under consideration/pilots in Korea, Canada, Australia, and India.
11.	Is the standard free of references to patented technology?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
12.	If patented technology is used, does the holder provide a royalty-free license to users of the standard?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Patented
13.	Can an implementer use the standard without signing a license agreement?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14.	Are draft documents available to the public at no cost?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
15.	How does one join the working group or committee that controls the standard?	Become members of OASIS and/or UCAIug.
16.	Is voting used to decide whether to modify the standard? If Yes, explain who is permitted to vote.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Within Standards Organizations (e.g., OASIS, ANSI) and User Groups (UCA OpenSG)
17.	Is an ANSI-accredited process used to develop the standard?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No In process.
18.	What countries are represented in the working group or committee that controls the standard?	U.S.A, Canada, Italy, Korea, Germany, Netherlands, etc.
H. Support, Conformance, Certification and Testing		
1.	Is there a users group or manufacturers group to support this standard?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2.	What is the name of the users group or manufacturers group (if any)?	<ul style="list-style-type: none"> ▪ Utility Communications Architecture Open Smart Grid User Group ▪ Controls Vendors (e.g., Honeywell, Siemens, Johnson Controls, etc.) ▪ Technology Integrators/Vendors (e.g., Cisco/Richards Zeta, Tendril, etc.)
3.	What type of test procedures are used to test this standard? (please check all that apply)	<input checked="" type="checkbox"/> Internal to the lab <input type="checkbox"/> Published by standards organization <input type="checkbox"/> Published by users group <input checked="" type="checkbox"/> No procedures, informal testing

4.	Are there test vectors (pre-prepared data) used in testing? (please check all that apply)	<input checked="" type="checkbox"/> Internal to the lab <input type="checkbox"/> Published by standards organization <input type="checkbox"/> Published by users group <input checked="" type="checkbox"/> No procedures, informal testing
5.	What types of testing programs exist? (check all that apply)	<input checked="" type="checkbox"/> Interoperability Testing <input checked="" type="checkbox"/> Conformance Testing <input checked="" type="checkbox"/> Security Testing <input type="checkbox"/> No Testing
6.	What types of certificates are issued? (check all that apply)	<input type="checkbox"/> Interoperability Certificate <input type="checkbox"/> Conformance Certificate <input type="checkbox"/> Security Certificate (text document) <input checked="" type="checkbox"/> No Certificates
7.	Are there rules controlling how and when to use the logo?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Standard has no logo
8.	Is there a program to approve test labs?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
9.	Approximately how many test labs are approved (if any)?	
10.	Is there a defined process for users to make technical comments on the standard or propose changes to the standard and have these issues resolved?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
11.	Is there a published conformance checklist or table?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
12.	Are there defined conformance blocks or subsets?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
13.	Approximately how many vendors provide test tools?	3
14.	Are there tools for pre-certification prior to testing?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
15.	Can vendors self-certify their implementations?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
16.	Is there application testing for specific uses?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
17.	Is there a "golden" or "reference" implementation to test against?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
18.	Who typically funds the testing? (check all that apply)	<input checked="" type="checkbox"/> User <input type="checkbox"/> Users Group <input checked="" type="checkbox"/> Vendor <input type="checkbox"/> Confidential
19.	Is there a method for users and implementers to ask questions about the standard and have them answered? (check all that apply)	<input checked="" type="checkbox"/> Yes, official interpretations <input type="checkbox"/> Yes, informal opinions <input type="checkbox"/> No
20.	Does the users' group (or some other group) fund specific tasks in the evolution of the standard?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
21.	Is the users' group working on integration, harmonization or unification with other similar standards?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
22.	What other standards is this standard being integrated, harmonized, or unified with (if any)?	Smart Energy Profile 2.0, CIM, IEC 61850, 610968/70, OASIS eMIX, OASIS WS-Cal, NAESB/ANSI Requirements Specifications.
23.	Are there application notes, implementation agreements, or guidelines available describing specific uses of the standard?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable

J. Notes

Please present here any additional information about the standard that might be useful:

1. OpenADR specification describes the open communications data model designed to facilitate common information exchange between a utility or Independent System Operator (electricity service providers) and electric customers using price and reliability signals for DR. OpenADR use industry accepted methods and standards to ease integration and access to DR-related services from third parties. OpenADR is one key element of the Smart Grid information and communications standards and technologies that is being developed to improve optimization between electric supply and demand.

Lawrence Berkeley National Laboratory (LBNL) developed the OpenADR specification during a two-year period (2007 to 2009) through an open consensus process with contributions from various stakeholders and the public. This resulted in the release of OpenADR specification version 1.0 (“OpenADR v1.0”) for public use. This two-year development was preceded by five-years of technology development, field tests, and commercialization. OpenADR v1.0 development was initiated through an “open process.” The process comprised of a Technical Advisory Group (TAG) with experts from key stakeholder categories and rigorous public review and comment periods. Monthly meetings and webcasts were conducted with the TAG to review and vote on the specification produced by LBNL. Meetings with DR professionals were scheduled to solicit input from all the market stakeholders. The recommendations collected through this process resulted in two public review drafts that were released for public comments.

OpenADR documents developed during the process outline technology and vendor neutral communications specification that uses Web Services to communicate DR signals to end-use customers. OpenADR leverages significantly from existing and accepted public information technology standards. Upon voting and approval of the TAG in April 2009, the final OpenADR v1.0 document was released as a CEC/LBNL report and information was made available for public to use. The final report addresses comments from all public review drafts that lead to further development of OpenADR standards.

LBNL will be funded by the California Energy Commission PIER program to continue supporting OpenADR standards development activities for the next several years, including conformance activities leading to certification and testing, any market-supported developments of the OpenADR standards.

For additional details, please see OpenADR v1.0 specification: <http://drrc.lbl.gov/openadr/pdf/cec-500-2009-063.pdf>

Section II: Functional Description of the Standard

K. GridWise Architecture: Layers

Please identify which layers this standard specifies, as described in

http://www.gridwiseac.org/pdfs/interopframework_v1_1.pdf, and the applicable section of the standard. Note the mapping to the Open Systems Interconnect (OSI) model is approximate.

1.	Layer 8: Policy	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2.	Layer 7: Business Objectives	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
3.	Layer 6: Business Procedures	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4.	Layer 5: Business Context	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
5.	Layer 4: Semantic Understanding (object model)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6.	Layer 3: Syntactic Interoperability (OSI layers 5-7)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
7.	Layer 2: Network Interoperability (OSI layers 3-4)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
8.	Layer 1: Basic Connectivity (OSI layers 1-2)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

L. GridWise Architecture: Cross-Cutting Issues

Please provide an explanation in the box beside the heading for any questions answered "Not applicable". If the question is not applicable because the function is provided in another layer or standard, please suggest any likely candidates. Note that "the standard" refers to the technology specified by the standard, not the documents themselves.

	Shared Meaning of Content	
1.	Do all implementations share a common information model?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
2.	Can data be arranged and accessed in groups or structures?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
3.	Can implementers extend the information model?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
4.	Can implementers use a subset of the information model?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
	Resource Identification	
5.	Can data be located using human-readable names?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
6.	Can names and addresses be centrally managed without human intervention?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
	Time Synchronization and Sequencing	
7.	Can the standard remotely synchronize time?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Provided in another layer
8.	Can the standard indicate the quality of timestamps?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Provided in another layer
	Security and Privacy	
9.	Where is security provided for this standard?	<input type="checkbox"/> Within this standard <input checked="" type="checkbox"/> By other standards

Section II: Functional Description of the Standard

10.	Does the standard provide authentication?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
11.	Does the standard permit role-based access control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
12.	Does the standard provide encryption?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
13.	Does the standard detect intrusions or attacks?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
14.	Does the standard facilitate logging and auditing of security events?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
15.	Can the security credentials be upgraded remotely?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No Credentials
16.	Can the security credentials be managed centrally?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No Credentials
17.	Please list any security algorithms and standards used	The Secure Tunnel, Transport Layer Security Protocol (TLS), Version 1.0 (or newer) with Rivest, Shamir & Adleman PK cryptography (RSA) extension.

Section II: Functional Description of the Standard

18.	Please provide additional information on how the standard addresses any “Yes” answers above	<ol style="list-style-type: none"> 1. Please see OpenADR v1.0 Section 10 (Security Policy) and Appendix C (Security Analysis and Requirements) for details: http://drcc.lbl.gov/openadr/pdf/cec-500-2009-063.pdf 2. OpenADR explicitly encourages additional support for stronger ciphers, as long as they are part of the official TLS specification as published by the Internet Engineering Task Force (IETF): <ul style="list-style-type: none"> ▪ Key exchange: RSA1024 ▪ Data Encryption: 3DES (Data Encryption Standard), AES128 (Advanced Encryption Standard) ▪ Message Integrity Code (MIC): Secure Hash Algorithm (SHA1) – MIC: SHA1 ▪ Message Authentication Code (MAC): Hashed MAC (HMAC) – MAC-HMAC-SHA1 3. OpenADR follows a well established set of security policies to insure that all exchanges of information are authenticated, private, and maintain integrity of the information being exchanged. 4. OpenADR allows easy integration with end user facility IT infrastructure: <ul style="list-style-type: none"> ▪ Ease in dealing with firewalls ▪ Good IT network citizen (i.e. no security risk, insignificant network load, etc). 5. The OpenADR-based system should recover gracefully from facility faults with minimum lost data. Examples of such faults might be power failures or connectivity loss. 6. The latency of DR events sent from the utility to the end user should be no more than 1 minute, depending upon the configuration of the interaction between the DRAS and DRAS Client. 7. The DRAS must maintain accurate time within 15 seconds. 8. Support for non-repudiation
19.	Please provide additional information about why any of the questions listed above do not apply to this standard	<ul style="list-style-type: none"> ▪ OpenADR v1.0 specification only covers the communication protocols used to interact with the DRAS and the DRAS Clients. It is therefore only intended to cover modes of attack that would be perpetrated by using one of the communications channels that are used to implement the interface to the DRAS as described in the analysis section of Appendix C. Any other certainly necessary security measures (firewalls, intrusion detection, etc.) are not covered. ▪ Security Management like key and certificate distribution, firmware updates, key revocation, etc. is implementation dependent and thus not in the scope of this document.

Section II: Functional Description of the Standard

Logging and Auditing		
20.	Does the standard facilitate logging and auditing of critical operations and events?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
21.	Can the standard gather statistics on its operation?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
22.	Can the standard report alerts and warnings?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
Transaction State Management		
23.	Can the standard remotely enable or disable devices or functions?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not applicable
System Preservation		
24.	Can the standard automatically recover from failed devices or links?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable <input type="checkbox"/> Provided in another layer
25.	Can the standard automatically re-route messages?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable <input type="checkbox"/> Provided in another layer
26.	Can the standard remotely determine the health (as opposed to just connectivity) of devices or software?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
Other Management Capabilities		
27.	Please describe any other system or network management capabilities the standard provides.	<ul style="list-style-type: none"> ▪ Support two-way communications for both the PUSH and the PULL model of interaction. ▪ Provides flexibility for facility devices/clients more control over the communications including the ability to more easily communicate through firewalls and being network-friendly and in scenarios where very low latency of the messages delivery is required. ▪ Allows network configuration and management within facilities, network operations center, aggregators, etc. for DR programs.
Quality of Service		
28.	Is data transfer bi-directional?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
29.	Can data be prioritized?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
30.	What types of reliability are provided?	<input type="checkbox"/> Reliable <input type="checkbox"/> Non-guaranteed <input checked="" type="checkbox"/> Both <input checked="" type="checkbox"/> Either <input type="checkbox"/> Provided in another layer
31.	Can information be broadcast to many locations with a single transmission?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
32.	Please describe any other methods the standard uses to manage quality of service.	Provides Web service based specifications and data models that could be built on any required parameters to maintain requisite QoS wherever OpenADR is implemented.
Discovery and Configuration		

Section II: Functional Description of the Standard

33.	Can the software or firmware be upgraded remotely? OpenADR provides communications specifications and not implementation specific details. Individual implementations within the facilities can use these features and is not within the scope of OpenADR.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable
34.	Can configuration or settings be upgraded remotely?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
35.	Can implementations announce when they have joined the system?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
36.	Can implementations electronically describe the data they provide?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
System Evolution and Scalability		
37.	What factors could limit the number of places the standard could be applied?	<ul style="list-style-type: none"> ▪ Utility and ISO DR programs. ▪ Policy and Market decisions.
38.	What steps are required to increase the size of a system deploying this standard?	<ul style="list-style-type: none"> ▪ Recognition that there is a need for interoperability standards for DR/DER. ▪ See #37.
39.	Is the information model separate from the transport method?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
40.	Does the standard support alternate choices in the layers(s) below it?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No layers below
41.	List the most common technology choices for layers implemented below this standard	<ul style="list-style-type: none"> ▪ TCP/IP, HTTP, SOAP, Web Services ▪ OpenADR is independent of technology and network communication protocols.
42.	Does the standard support multiple technology choices in the layers above it?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No layers above
43.	List the technologies or entities that would most commonly use this standard in the layer above	NA. See #41 and #42 above.
44.	Please describe any mechanism or plan to ensure the standard is as backward-compatible as possible with previous versions	<ul style="list-style-type: none"> ▪ OpenADR provides minimum set of specifications for DR programs that can be either price- and/or reliability-based. These requirements are intended to make sure all implementations could function with any future development iterations. ▪ Essential feature of OpenADR allows participants to define a number of OpenADR Clients within facilities that includes information on type of client –Simple or Smart type. The simple type allows a mapping technique of complex information (smart) that can be back-ward compatible to any implementation, including legacy systems.

Section II: Functional Description of the Standard

45.	Please describe how the design of this standard permits it to be used together with older or legacy technologies	<ul style="list-style-type: none"> ▪ See # 44 above. ▪ The OpenADR implementations since pilots in 2003 and commercial Auto-DR program since 2007 are integrated with both legacy and new systems. Support to legacy system is core OpenADR feature.
46.	Please describe how the design of this standard permits it to co-exist on the same network or in the same geographic area with similar technologies, and give examples	<ul style="list-style-type: none"> ▪ OpenADR is application layer specification and it can co-exist within any network and technologies. Examples of implementations include Internet, radio-broadcast, wireless, etc. ▪ OpenADR is independent of a building controls network and integrates with it using various software and/or hardware technologies. Examples include BACnet, Modbus, LonMark, etc.
47.	Electromechanical	We do not understand request for this information.

M. Architectural Principles

Please describe how this standard may apply any of these principles:

1.	Symmetry – facilitates bi-directional flow of energy and information	OpenADR is a two-way communication specification that facilitates DR/DER information and acknowledgement and network connectivity of clients within the facilities.
2.	Transparency – supports a transparent and auditable chain of transactions	OpenADR specifies requirements for non-repudiation and logging of all transactions related to DR, price and events.
3.	Composition – facilitates the building of complex interfaces from simpler ones	See #44, #45. OpenADR provides DR event information in form of smart and simple client information and mapping strategies that could be used to build complex interfaces and other value-added services to facilitate various participant requirements.
4.	Loose coupling – can support bilateral and multilateral transactions without elaborate pre-arrangement	OpenADR assumes a loose coupling between any entities exchanging OpenADR-based messages. OpenADR supports the exchange of business level information concerning DR such as prices and shed levels (for price and reliability events). It is independent of either the systems sending or receiving OpenADR based messages and is interoperable with existing and legacy systems. Furthermore there are no assumptions made by the sender of an OpenADR based message as to how the receiver will use the information. There is very little required to configure entities to exchange OpenADR messages.

Section II: Functional Description of the Standard

5.	Shallow integration – does not require detailed mutual information to interact with other components	Yes. See #46 in section L above. OpenADR is independent of communication networks, technologies, and component-specific implementations.
6.	Please list any other architectural models, reference architectures or frameworks this standard was designed to be compliant with, e.g. W3C, IEC TC57, OSI and how it fits those models	W3C, OSI, Web Services, etc.