# 0 What: Standard DR Signals (6.2.1)

## 0.1 Abstract:

Develop or adopt standard DR and DER signals – NIST shall organize a meeting with IEC TC57, OASIS, NAESB, and AMI-ENT to specify a process for developing a common semantic model for standard DR signals. The effort shall ensure DR signal standards support load control, supply control, and environmental signals.

## 0.2 Description:

The semantics of Demand Response are generally well understood, but the information that is conveyed varies. Signals range from price, optionally with time of effectiveness, grid integrity, to proposed environmental signals (e.g. air quality).

Defining consistent signals for Demand Response will make the information conveyed more consistent as a signal flows from grid management through aggregators to customers and within premises networks. Some of the standards define business processes, while others define XML or other data models with a variety of delivery mechanisms.

The semantics for Distributed Energy Resources should fit into the same sort of signaling framework. This group will also develop a plan for DER signal definition.

## 0.3 Objectives:

Define a framework and common terminology for:

- Price communication,
- Grid safety or integrity signals,
- DER support, and
- Other signals and/or an extensibility mechanism.

## 0.4 Why:

Demand Response has evolved over the years; previous mechanisms included phone calls, pagers, and other messaging to plant managers; current mechanisms support varying levels of automation.

As technologies, such as Open Automated Demand Response, allow rapid and un-attended automation of curtailment based on price or grid integrity, consistent signals across the entire Demand Response signaling and validation chain have raised in importance. Consistent signals will allow further automation of the Demand Response chain, and improve the responsiveness as well as the value to all stakeholders.

Renewable and other intermittent resource integration increases the need for balancing reserve, spinning reserve, and other techniques for successful integration to take advantage of lower operating cost for renewables. However, the responsiveness of the entire power generation and delivery system needs to improve in correspondence with the extent and degree of intermittency.

Distributed Energy Resource integration raises interoperation issues related to distribution automation, signals and information exchanges, and profiles; some of these (e.g. storage) are being addressed specifically in other action plans.

Markets, Operations, Distribution, distribution-related capital costs, and the Customer domain are the primary areas affected, though all are affected to some extent.

## 0.5 Where:

This is primarily levels 4 (Semantic Understanding), 5 (Business Context) and 6 (Business Procedures) of the GWAC stack, though it involves most of the cross-cutting issues.

Security and privacy can be composed in; the focus of this activity is consistent semantics that work with business processes of today and those we cannot specify that may develop in the future.

## 0.6 How:

A broad range of stakeholders need to be involved, broadly from the distribution management and markets area, building automation, industrial automation, home automation and energy management, and vehicles.[1]

There are several formalized or standardized specifications in these areas that need to share common semantics where they overlap; we should aim at a high level rather than details that may not be relevant in cross-domain interactions and interoperation.

Since there are a number of existing bodies of work, a survey of relevant efforts and their overlap and gaps relative to DR/DER signaling would seem to be a good starting point.

Other issues:

- Should requirements analysis—what information needs to be exchanged for which use cases—be done as part of this process?
- When do we need a high-level light interface, versus deep integration?
- What are differences between ISO/RTO Demand Response and Distributed Energy Resource integration and the local utility counterparts?
- Can we incorporate ancillary (fast-DR) services in the signaling approach? Or is fast DR only applicable to deep integration that will support the short time scales?
- Measurement and verification need to be addressed for both curtailment and DER. How should we address in this process?



[1] Vehicles may interact with DR and DER signals primarily through their charging stations, but the characteristics will likely need to be expressed in profiles that include decision information for the vehicle owner, e.g., amortized cost of battery use to sell energy to the grid or a microgrid.

### 0.6.1 Task Descriptions

Developed along with project team and summarized in the following table. Dates are at the end of the indicated month.

| Task | Responsible | Date | Notes |
|---|---|---|---|
| Define proper DER Interaction, Scope | Lunch table discussion; later readout to Action Team List | Input before 2009-10 | x2G DEWGs, IEC TC57. Storage Models IEEE1547.3, NAESB<br>PAP07 Outcome, PAP11 Elec Trans |
| Collect, Analyze, and Consolidate Use Cases and deliver UML (inc DER) | UCAIug, NAESB | 2009-10 | Incorporating OpenADR (Starting point for OASIS EITC). No Magic. |
| Message Semantics Work DR | OASIS EITC | Underway | Starting from OpenADR. Review by UNCIug, 1377, NAESB, BAE, SEP, TC57 CIM, Multispeak, others |
| Message Semantics Work DER | OASIS EITC | Convene by 2009-10 | Input expected by 2009-10-31 |
| Message Semantics Calendar, Price | OASIS EITC | 2010-04 | Output from PAP03, PAP04 |
| Delver Semantics, Interactions for Initial review | OASIS EITC | 2010-01 | Leave hole for Price, Calendar |
| Downstream user requirements/engagement | LonMark, BACnet, ZigBee SEP2 | 2009-10 | BACnet, LonMark, HES, x2G, UpnP, OpenHAN, ZigBee, SEP, oBIX, AHAM, UCAIug, NEMA |
| Additional message requirements for Distribution | MultiSpeak | 2009-10 | |
| Resale and process for safety and interconnection and resale | NAESB | 2009-10 | UL |
| Vocabulary | NAESB, UCAig, BACnet, LonMark | TWIKI ASAP 2009-09 to [UML] | Normalize OpenADR, NAESB, UCAIG, Place on TWIKI<br>Deliver to OASIS EITC |

## 0.6.2 Deliverables

Developed along with project team and summarized in the previous table.

## 0.7 Who

The Task Leads (in alphabetical order by organization) are

| ***Organization*** | ***Contact*** | ***Email*** |
|---|---|---|
| BACnet/ASHRAE | Sharon Dinges | sdinges@trane.com |
| LonMark | Ron Bernstein | ron@lonmark.org |
| MultiSpeak | Bob Saint | robert.saint@nreca.coop |
| NAESB | Jonathan Booe | jbooe@naesb.org |
| OASIS | Laurent Liscia | Laurent.Liscia@oasis-open.org |
| UCAIug | Wayne Longcore | wrlongcore@cmsenergy.com |
| ZigBee SEP2 | Robby Simpson | robby.simpson@ge.com |

Other organizations identified, members of which suggested or committed to participation in the Action Plan:

| | | | |
|---|---|---|---|
| AHAM | HES | NEMA | OpenHAN |
| B2G DEWG | I2G DEWG | No Magic, Inc | PAPs 3, 4, 7, 11 |
| BAE Systems | IEC TC57 | oBIX | Underwriters Laboratory |
| H2G DEWG | IEEE 1547.3, 1377 | OpenADR/LBL | UpnP/WS-DD/DP |

Invitees to the workshop breakout session included the following:

| **Role** | **Project Team<br>Organization** | **Name** |
|---|---|---|
| NIST Lead | David Holmberg | David Holmberg David.Holmberg@NIST.gov |
| EPRI Support | Cox Software Architects<br>TC9 Inc | William Cox wtcox@CoxSoftwareArchitects.com<br>Toby Considine Toby.Considine@gmail.com |
| SDOs | ASHRAE<br>ASHRAE<br>IEC TC57 WG14 Distr Mgt<br>IEC TC57 WG16 Dereg Mkt C<br>ISO/IEC JTC 1 WG15<br>LonMark<br>NAESB<br>NAESB<br>OASIS<br>OASIS WS-Device Profile<br>SAE | Sharon Dingus sdingus@trane.com<br>Steven Bushby steven.bushby@nist.gov<br>Greg Robinson grobinson@xtensible.net<br>Jean Goulet goulet.jean@ireq.ca<br>Tim Schoeckle schoechl@colorado.edu<br>Ron Bernstein ron@lonmark.org<br>Rae McQuade rmcquade@naesb.org<br>Jonathan Booe jbooe@naesb.org<br>James Bryce Clark jamie.clark@oasis-open.org<br>Toby Nixon Toby.Nixon@microsoft.com<br>Rich Scholer rscholer@ford.com |
| Other Stakeholders | Users Group Lead<br>UCAIug Smart Grid SC<br>UCAIug AMI-ENT TF<br>UCAIug OpenADR TF<br>AHAM<br>AHAM<br>EPRI (appliances) | Wayne Longcore wrlongcore@cmsenergy.com<br>Jeff Gooding Jeff.Gooding@SCE.COM<br>Joe Zhou jzhou@xtensible.net<br>Albert Chiu akc6@pge.com<br>Matt Williams mwilliams@aham.org<br>Charles Smith CHARLESR.SMITH@ge.com<br>Gale Horst ghorst@epri.com |
| Additional | ISO/RTU+GWAC | Robert Burke rburke@iso-ne.com |

| | | |
|---|---|---|
| Invitees | GWAC<br>GWAC<br>LBNL OpenADR<br>LBNL OpenADR<br>LBNL OpenADR<br>Microsoft Energy<br>ZigBee/HomePlug SEP2<br>Other Experts<br>I2G, GWAC<br>FIATECH<br>CABA<br>CABA (alt)<br>Building Smart<br>Home Automation<br>Emergency Mgt<br>ASHRAE BACnet | Ron Ambrosio rfa@us.ibm.com<br>Lynne Kiesling lynne@knowledgeproblem.com<br>Mary Ann Piette MAPiette@lbl.gov<br>Girish Ghatikar GGhatikar@lbl.gov<br>Ed Koch ed@akuacom.com<br>Larry Cochrane larrcoch@microsoft.com<br>Robby Simpson robby.simpson@ge.com<br>Ed Cazalet ed@cazalet.com<br>Dave Hardin david.hardin@ips.invensys.com<br>Robert Wible wible@fiatech.org<br>David Katz dkatz@sustainable.on.ca<br>Ron Zimmer zimmer@caba.org (alt)<br>Deke Smith deke@dksic.net<br>Kenneth Wacks kenn@alum.mit.edu<br>Michelle Raymond michellearaymond@gmail.com<br>Jim Lee Jim.Lee@cimetrics.com |

## 0.8 When:

Schedules are indicated in the previous table. Most deliverables are input to the responsible organizations by the end of October 2009; others are as indicated.