

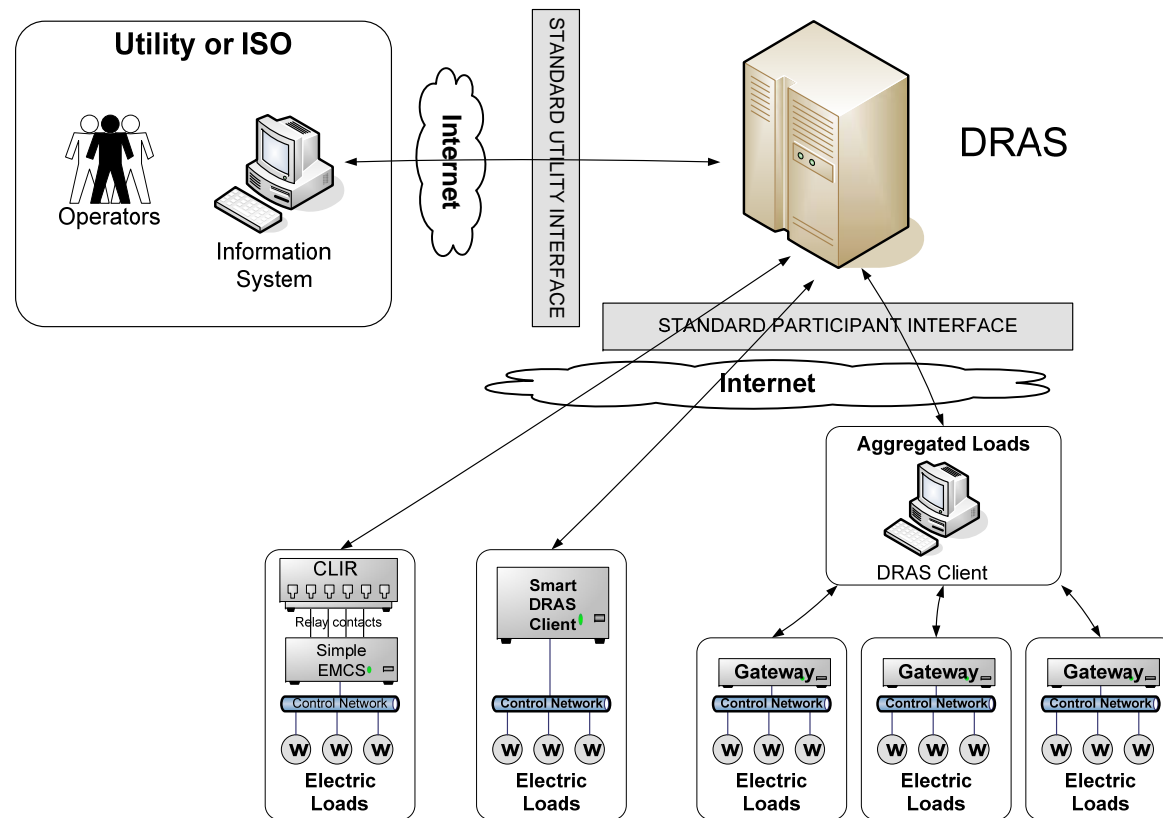


Automated Demand Response

Architecture Concepts and Technical Issues for an Open, Interoperable Automated Demand Response Infrastructure

Confidential

Automated Demand Response Concept





History



- ◆ 2002 - Research begun at DRRC into automated DR
- ◆ 2003 – Initial development at DRRC using XML exchange of information with limited field trials.
- ◆ 2004 – Use of internet relays in field trials to support automation with simple EMCS, scaled up field tests.
- ◆ 2005 – Development of DRAS concept. Collaboration with PG&E’s CPP DR program.
- ◆ 2006 – Expanded field trials and use in PG&E’s Pilot DR programs. Development of CLIR box for use as Simple DRAS Client.
- ◆ 2007 – Commercialization and use of DRAS in PG&E, SCE, and SDG&E DR programs.



DRAS



- ◆ Designed in conjunction with the LBNL's Demand Response Research Center (DRRC)
- ◆ Uses a Service Oriented Architecture and leverages industry standard Web Services infrastructure
- ◆ Since going live in 2005, the DRAS has exceeded its availability requirement of 99.99%.
- ◆ Core design is scalable to 100,000+ clients
- ◆ The DRAS can be easily customized to support new programs
- ◆ DRAS is secured using the same technology used to secure banking transactions

CLIR: Client & Logic With Integrated Relay

- ◆ 8 dry contact relays
- ◆ Easy to install and manage
- Remotely upgradeable
- Secure
- Wall or shelf mount





DRAS Open Interface Standardization



- ◆ Standardize the interfaces to the DRAS in order to promote more widespread deployment of Automated DR.
- ◆ Effort begun in 2007 by LBNL/DRRC as an industry consortium of major stake holders
- ◆ Working group in LBNL/DRRC headed up by Ed Koch developing standard
- ◆ Technical Advisory Group comprised of major stake holders providing oversight and input to standards development process
- ◆ Initial drafts of standard targeted for early 2008.

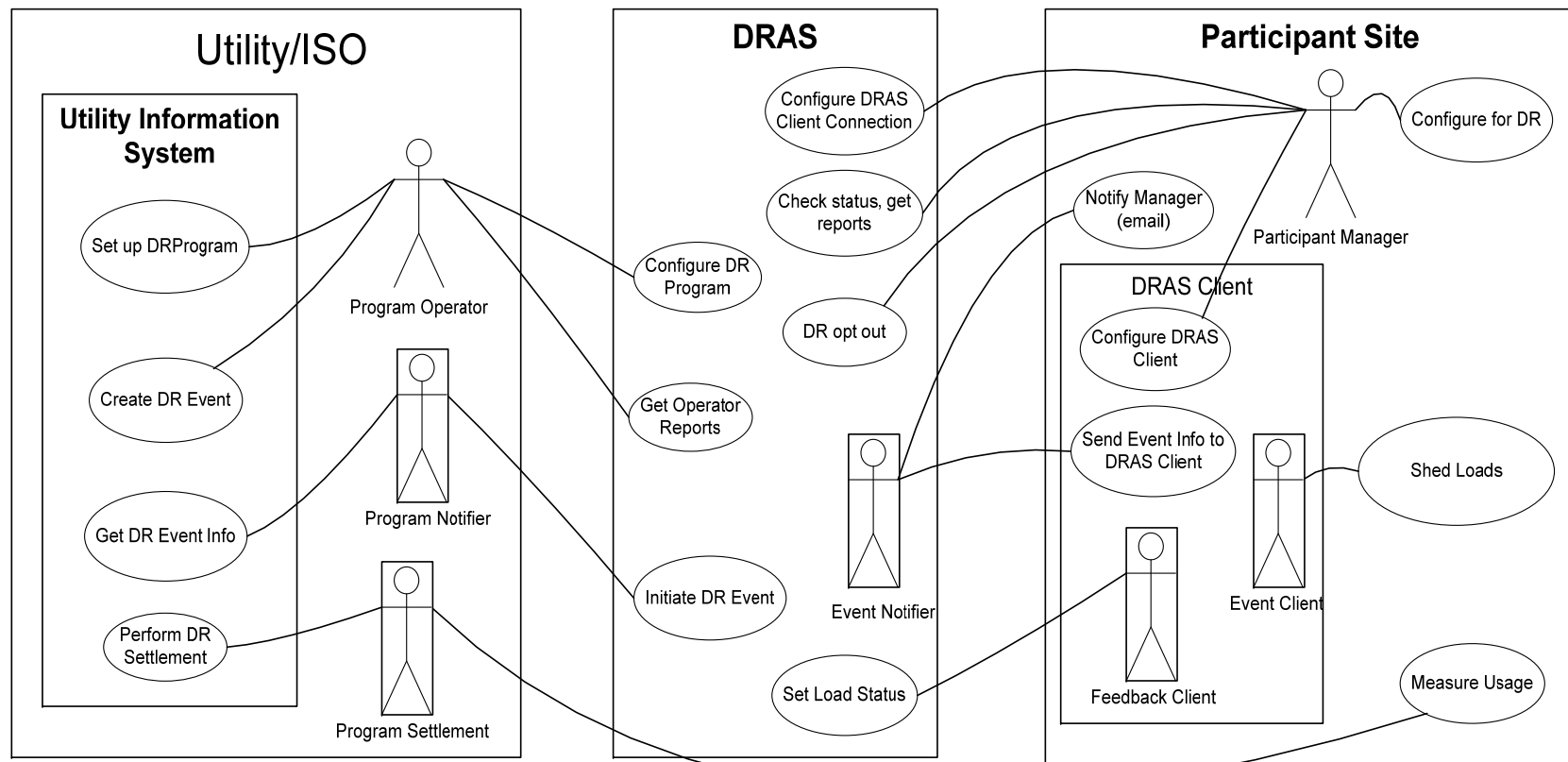
TAG Member Affiliations

- ◆ NIST - BACnet
- ◆ CA ISO
- ◆ CEC/PIER
- ◆ CIEE
- ◆ Enernex
- ◆ EPRI
- ◆ Gridnet
- ◆ Gridwise
- ◆ Infotility
- ◆ LBNL
- ◆ OpenAMI
- ◆ OpenHAN
- ◆ PG&E
- ◆ SCE
- ◆ SDG&E
- ◆ UCB - PCT

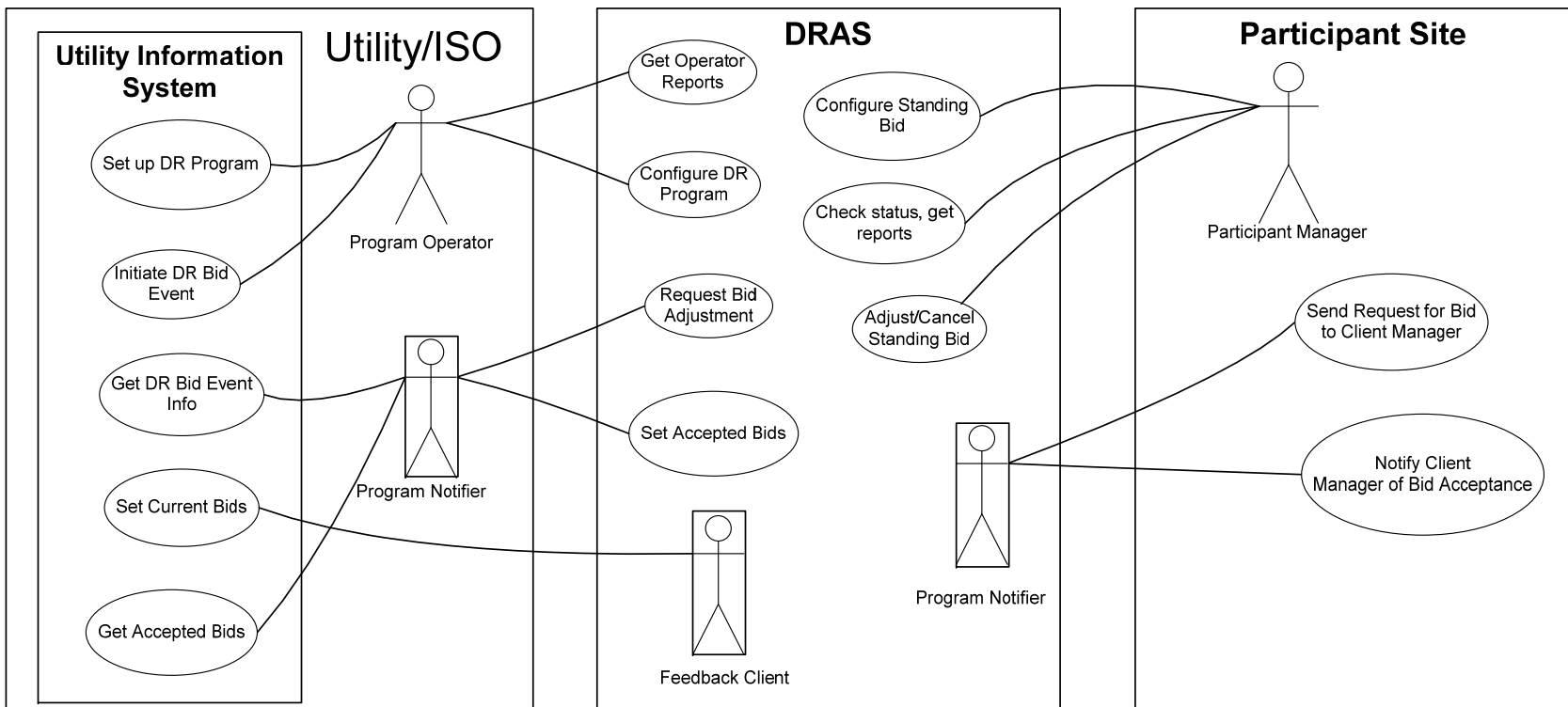
What is Being Standardized?

- ◆ Interfaces used by Utilities/ISO and their DR Participants.
- ◆ Automatic DR Event Notification including support for RTP.
 - Smart DRAS Clients
 - Simple DRAS Clients
- ◆ Automatic bid submission by Participants

Event Notification Use Case



Automated Bidding Use Case



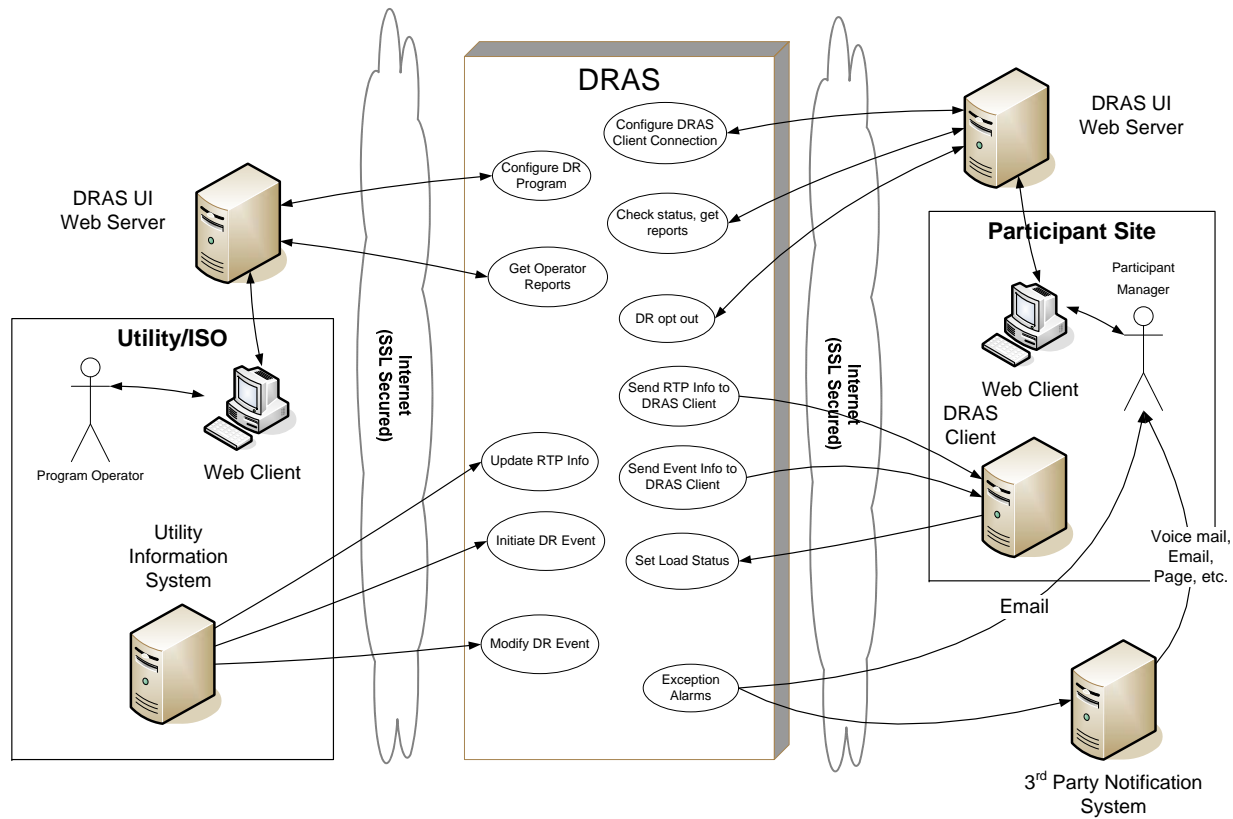
General DRAS Requirements

- ◆ Communications with the DRAS should use readily available and existing networks such as the internet.
- ◆ The DRAS interfaces should be platform independent and leverage existing standards such as XML and Web Services.
- ◆ The DRAS communications should use a security policy that enables non-repudiation and encryption of the communications with the DRAS.
- ◆ The DRAS should support communications with a variety of control systems that may range from a very simple EMCS (Simple DRAS client) to those with sophisticated data processing and programming capabilities (Smart DRAS client).

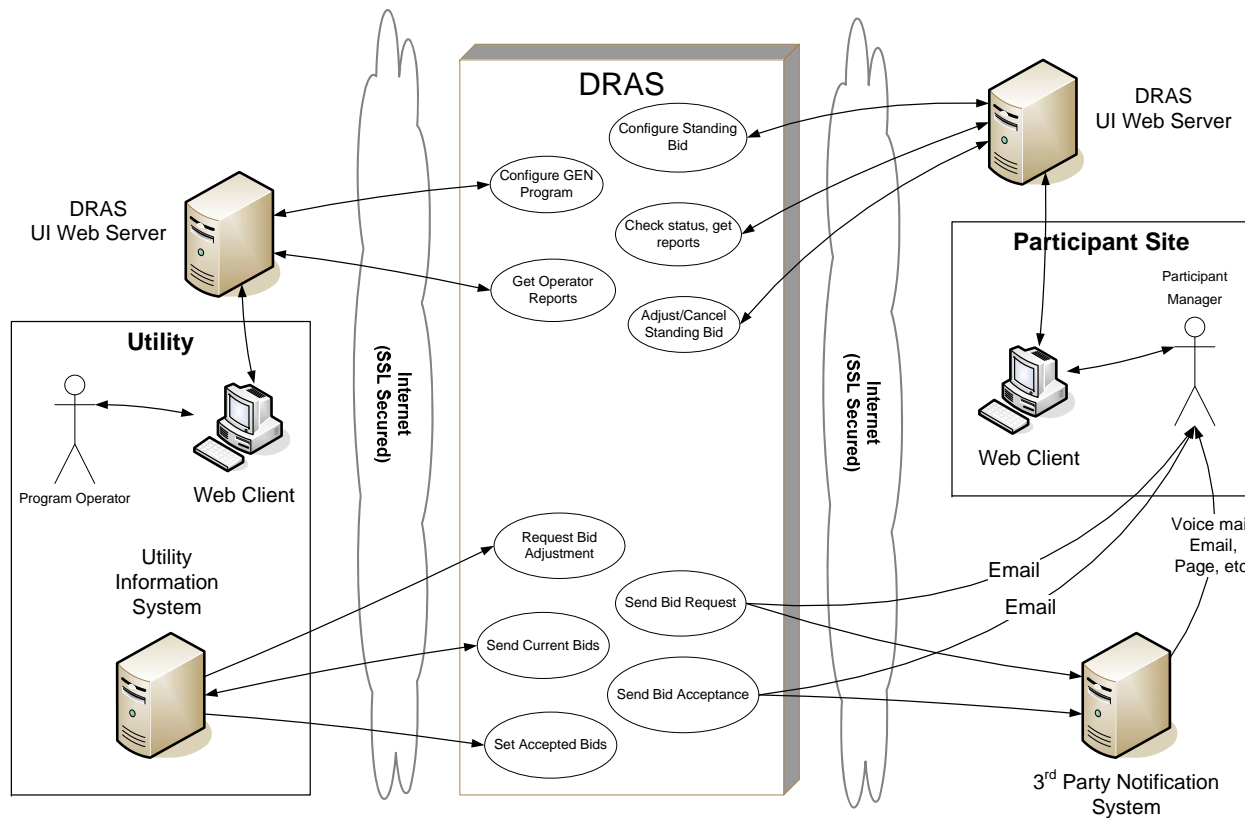
General DRAS Requirements (cont.)

- ◆ The DRAS should not be dependent on specific control systems within the facilities.
- ◆ DRAS Clients that communicate with the DRAS should easily integrate with existing facility networks and IT infrastructures.
- ◆ The DRAS should support aggregated loads that may be managed by third party aggregators.
- ◆ Reconciliation of DR Event participation is outside the scope of the DRAS. There are a number of methods such as aggregators, AMI, etc. that can and will handle the measurement of sheds for the purposes of the reconciliation of DR programs.

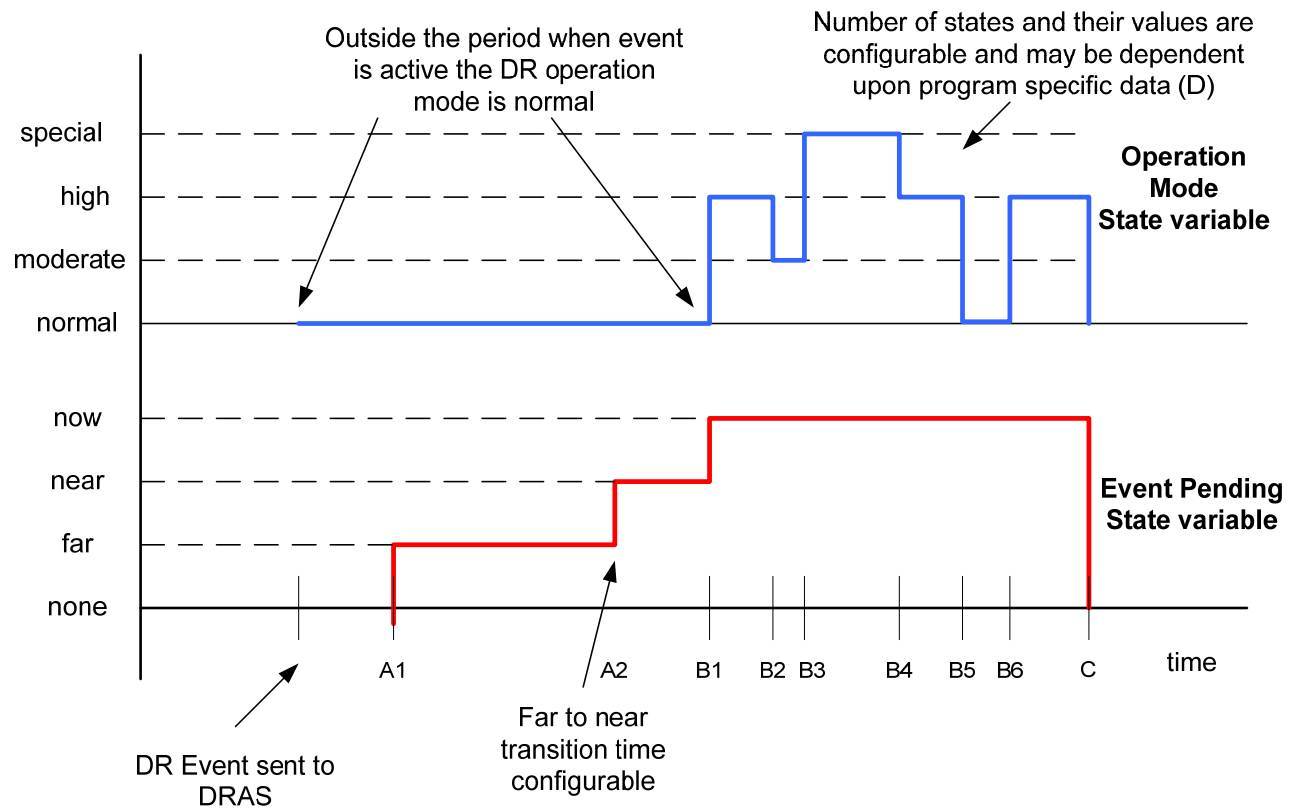
DRAS Event Architecture



DRAS Bidding Architecture



DR Event Model





Summary of Short Term Objectives



- ◆ Have draft ready in early 2008 for next summers DR programs
- ◆ Find Utilities/ISO's outside of California to both support the standardization effort and use the DRAS
- ◆ Encourage more third party vendors to build the DRAS Client functionality into their facility equipment