UCAIug OpenADR Taskforce Meeting

July 15, 2009

Meeting Agenda

- OpenADR overview
- Harmonization discussion

OpenADR Overview

- OpenADR History
- OpenADR Concept
- OpenADR Requirements
- OpenADR Specification

OpenADR History

Key Questions

- Can C&I facilities automate participation in DR programs?
- How best to leverage existing facility controls infrastructure?
- How best to support freedom of choice for DR strategies with facility owners?
- Where do DR signals originate and where are they consumed - where is the DR Logic?
- What role do intermediaries play?
- What is the nature of the information in DR signals?

OpenADR History

- 2002 - Research begun at LBNL Demand Response Research Center (DRRC) into automated DR, sponsored by California Energy Commission
- 2003 – Initial development at DRRC using XML exchange of information with limited field trials.
- 2004 – 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.
- 2007 to present – Commercialization and use in PG&E, SCE, and SDG&E automated DR programs.
- 2007 Effort begins to standardize OpenADR signals by developing draft specification.
- 2008 First public review draft of OpenADR specification released.
- 2008 Additional pilots and tests with EPRI, CAISO, BPA, etc.
- 2009 OpenADR specification released as official CEC document.
- 2009 UCAIug OpenADR taskforce and OASIS Energy Interoperation TC formed.

OpenADR Deployments

- Use of OpenADR in Auto-DR deployments in PG&E, SCE, and SDG&E territory (greater than 65 MW of load shed in existing programs and growing)
- More than 35 vendors have demonstrated and/or deployed equipment consuming OpenADR signals
- Tested and piloted in Pacific Northwest for winter time programs
- Tested by EPRI and CAISO
- Being piloted in CAISO MRTU based wholesale markets
- Being deployed in multiple types of DR programs (e.g. CPP, DBP, CBP, Peak Choice, PLP)

OpenADR Vendor Support
Over 35 and Growing

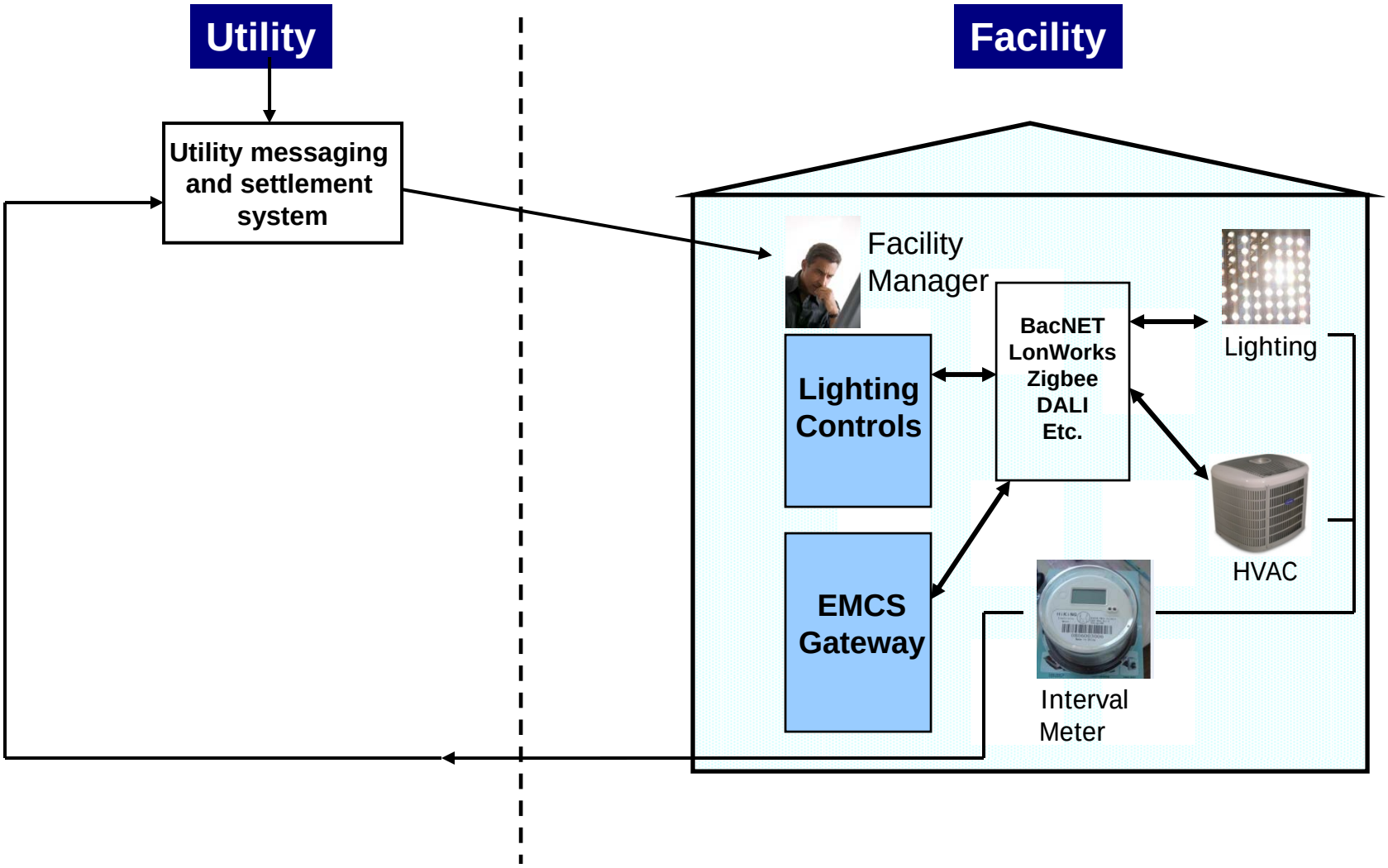
- Advantech
- Site Controls
- KW Aware
- Echelon Advanced Telemetry Technology Integrator Automation Systems Completed
- RTP Controls Technology Integrator Automation Systems Completed
- Regen Energy Technology Integrator HVAC/Lighting/Others NA
- Lynxspring Technology Integrator Automation Systems NA
- Energy ICT Technology Integrator Automation Systems NA
- Emacx Systems NA NA NA
- e-radio USA Technology Integrator RDS/FM, etc NA
- Stonewater
- Daikin Industries Ltd Commercial/Industrial HVAC NA
- Vendor Sector End-Use Client Dev
- Wattstopper
- Beckhoff
- Convergence Wireless
- Red Dwarf Technologies
- Honeywell
- BPL Global
- Cypress Systems
- Tendril
- Eaton
- Invensys/Wonderware
- Richards Zeta
- Universal Devices Commercial/Resid
- HVAC/Lighting/Others Completed
- Federspiel Controls Commercial/Industrial HVAC Completed
- Automated Logic Corp Commercial HVAC Completed
- LumEnergi Commercial Lighting Completed
- Adura Technologies Commercial Lighting Completed
- Cassatt Corp Industrial Data Center Servers Completed
- PowerIT Industrial Refrigeration Completed

OpenADR Specification Technical Advisory Group Member Affiliations

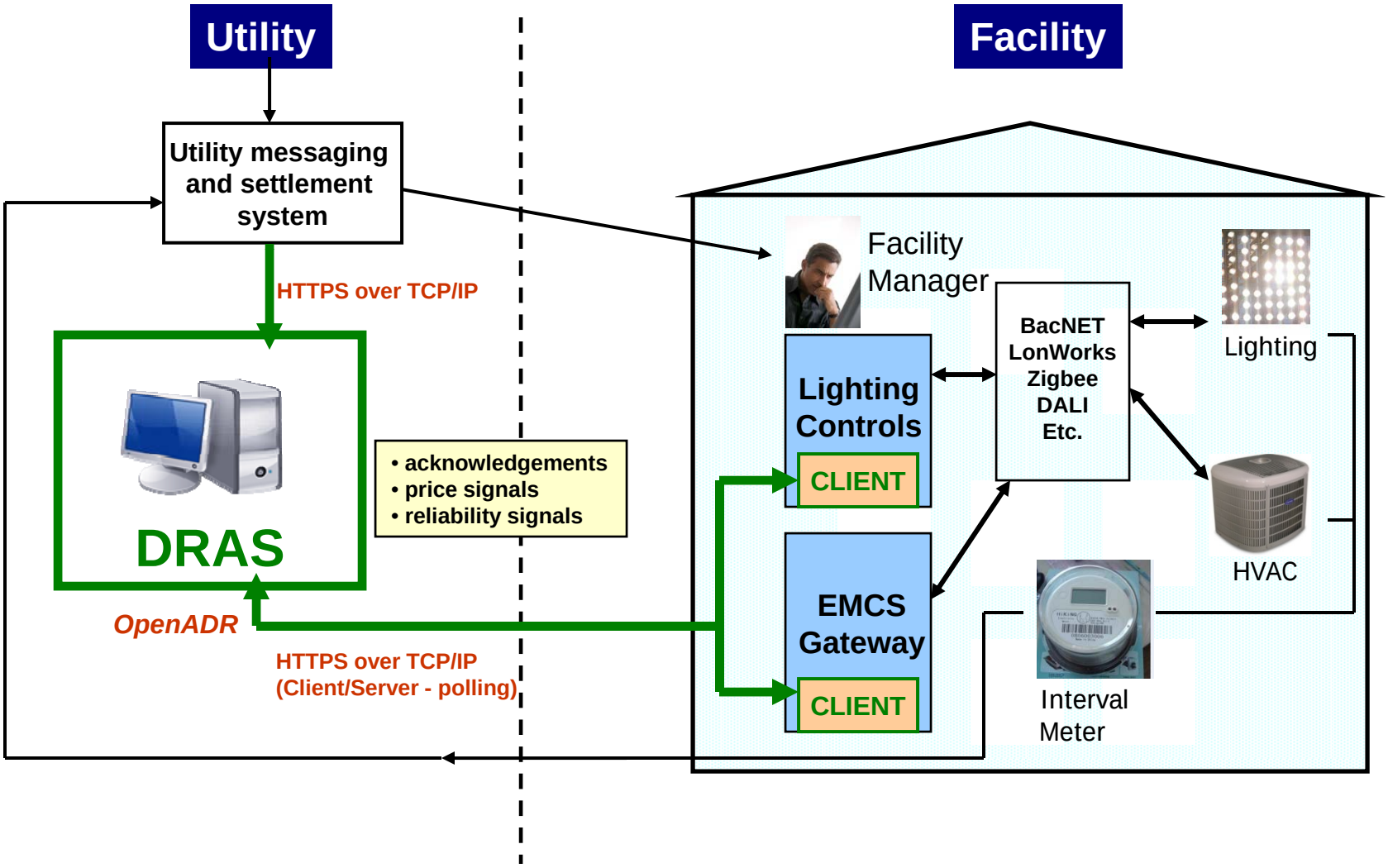
- NIST
- CAISO
- CEC/PIER
- CIEE
- Enernex
- EPRI
- Gridnet
- Gridwise
- LBNL
- UCAIug
- PG&E
- SCE
- SDG&E
- UCB - PCT

OpenADR Concept

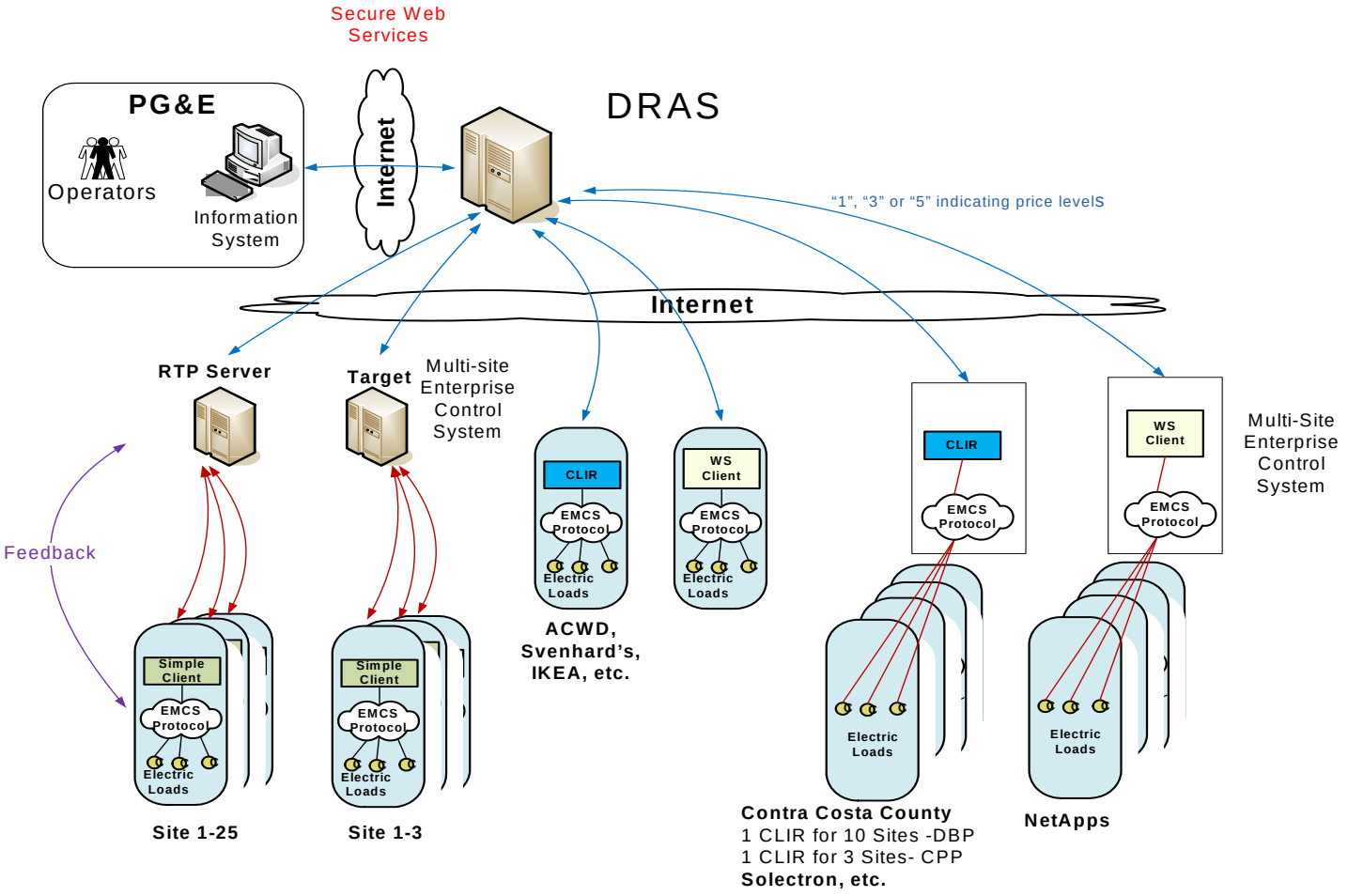
Manual DR


Utility
Facility
Utility messaging and settlement system
Facility Manager
BacNET
LonWorks
Zigbee
DALI
Etc.
Lighting
Lighting Controls
HVAC
EMCS Gateway
Interval Meter

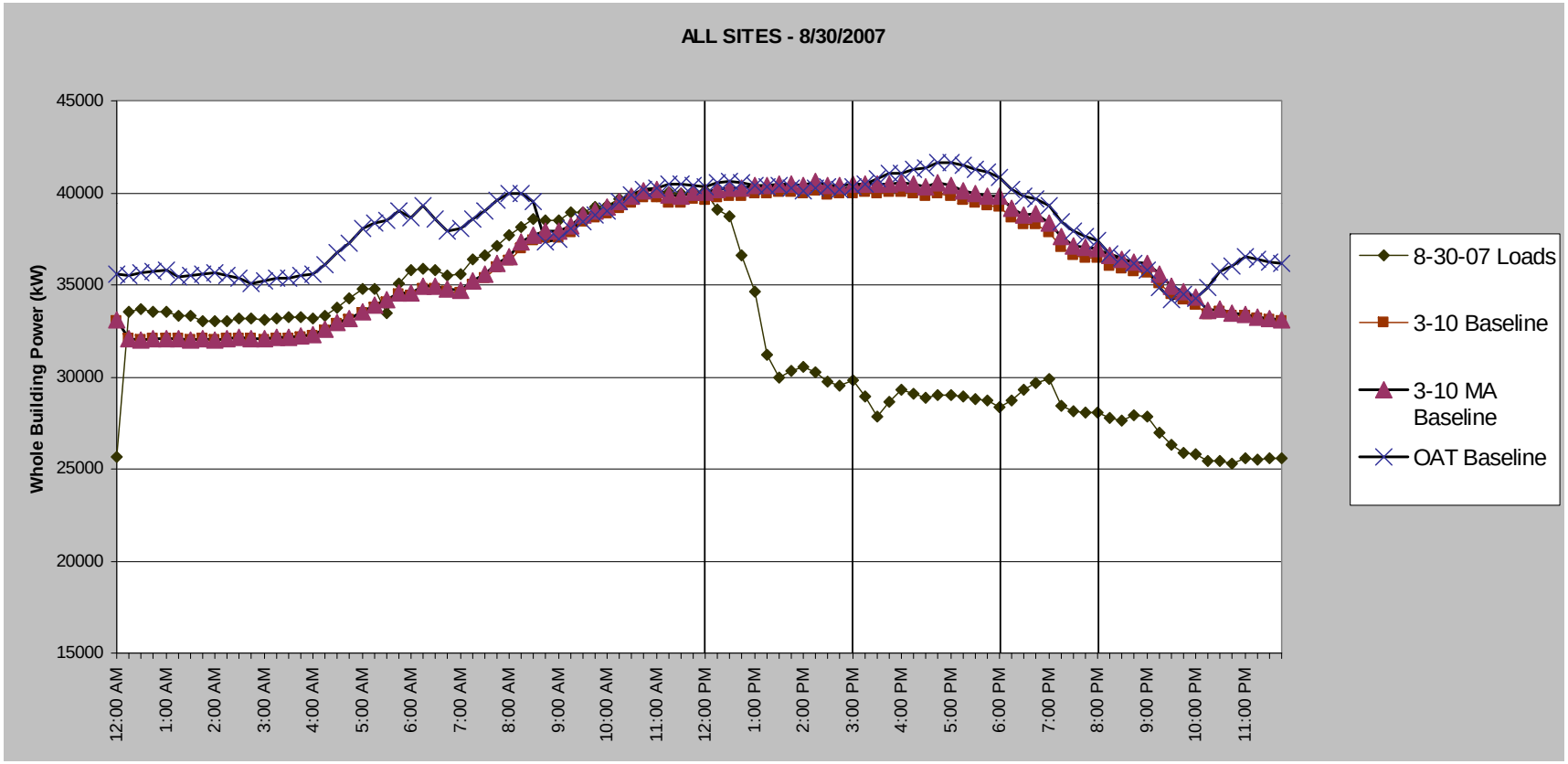
Automated DR with OpenADR



PG&E Deployment Scenarios



PG&E Cumulative Shed (Auto-CPP 8/30/07)



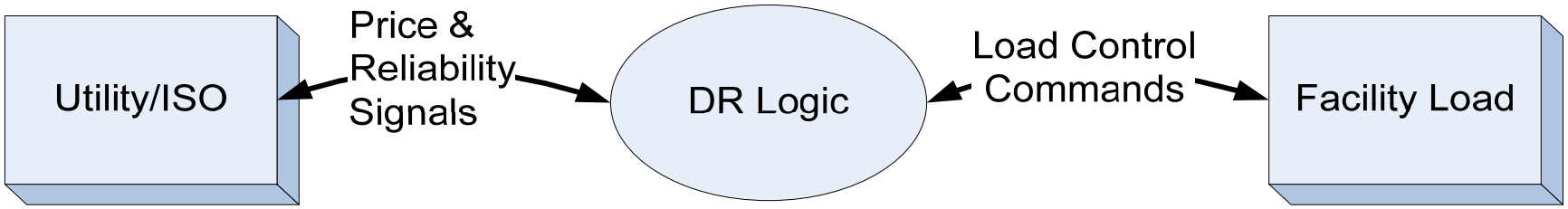
OpenADR versus Direct Load Control, Example Custom Shed Strategies

Global Temperature Reset Migrated to California Energy Code

		HVAC											Lighting					Other
	Building use	Global temp. adjustment	Duct static pres. Increase	SAT Increase	Fan VFD limit	CHWtemp. Increase	Fan qty. reduction	Pre-cooling	Cooling valve limit	Boiler lockout	Slow recovery	Extended shed period	Common area light dim	Office area light dim	Turn off light	Dimmable ballast	Bi-level switching	Non-critical process shed
ACWD	Office, lab	X	X	X		X			X	X		X						
B of A	Office, data center		X	X	X	X			X									
Chabot	Museum	X						X										
2530 Arnold	Office	X									X							
50 Douglas	Office	X									X							
MDF	Detention facility	X																
Echelon	Hi-tech office	X	X	X			X						X	X	X	X		
Centerville	Junior Highschool	X						X										
Irvington	Highschool	X						X										
Gilead 300	Office			X														
Gilead 342	Office, Lab	X		X														
Gilead 357	Office, Lab	X		X														
IKEA EPaloAlto	Furniture retail	X																
IKEA Emeryville	Furniture retail	X																
IKEA WSacto	Furniture retail																	
Oracle Rocklin	Office	X	X															
Safeway Stockton	Supermarket																X	
Solectron	Office, Manufacture	X													X			
Svenhard's	Bakery																	X
Sybase	Hi-tech office														X			
Target Antioch	Retail	X					X											
Target Bakersfield	Retail	X					X											
Target Hayward	Retail	X					X						X				X	
Walmart Fresno	Retail	X															X	

OpenADR Requirements

DR Logic

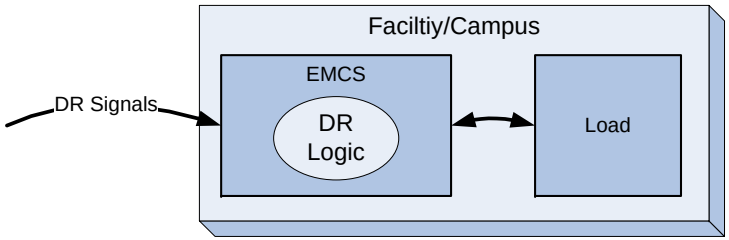

Utility/ISO
Price &
Reliability
Signals
DR Logic
Load Control
Commands
Facility Load

DR Signal Consumption Scenarios with Respect to Facility

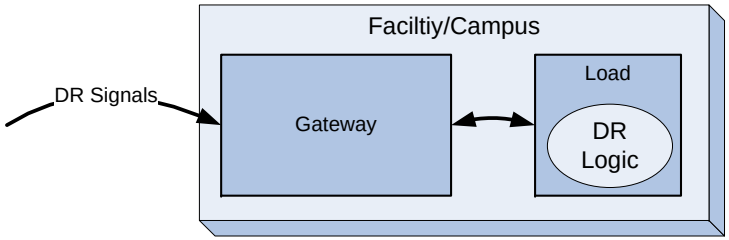
A. Use of a centralized controller within the facility (EMCS) to program and control the shed strategies for the entire facility.

B. DR Logic is implemented completely within the load controllers themselves, i.e. within the lighting or HVAC controls.

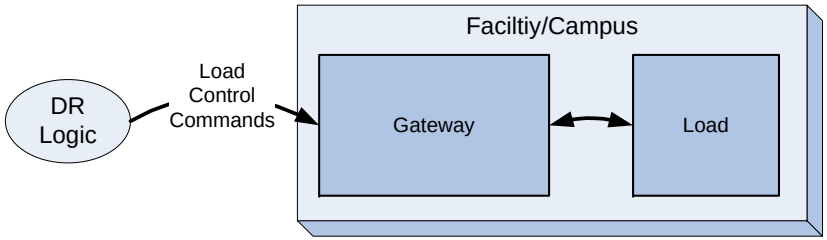
C. DR Logic is implemented completely outside the facility. This is the model used for direct load control programs by utilities and managing load reductions for customer groups by aggregators.



DR Logic in EMCS

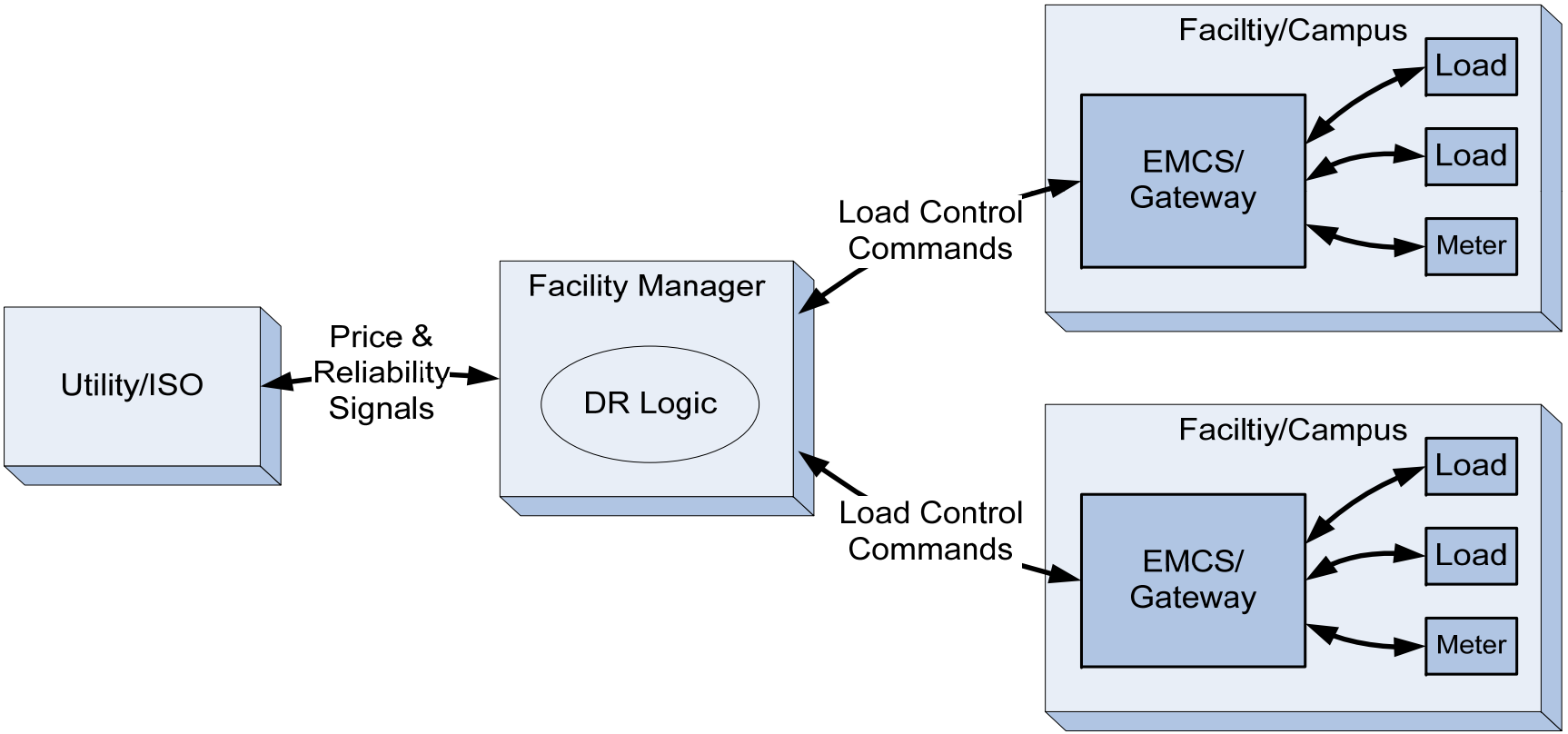


DR Logic in Load Controller



DR Logic External to Facility

DR Signal Consumption with Intermediary



OpenADR Requirements (ease of deployment)

- OpenADR should support communications with ***existing*** control systems without requiring major upgrades to those systems.
- OpenADR should support communications with a variety of control systems ranging from a very simple EMCS (Simple DRAS client) to those with sophisticated data processing and programming capabilities (Smart DRAS client).
- OpenADR should support communications with intermediaries (e.g. aggregators) that may be responsible for managing the loads.
- Clients that consume OpenADR signals should be able to integrate with existing facility networks and IT infrastructures.

OpenADR Requirements (nature of the information)

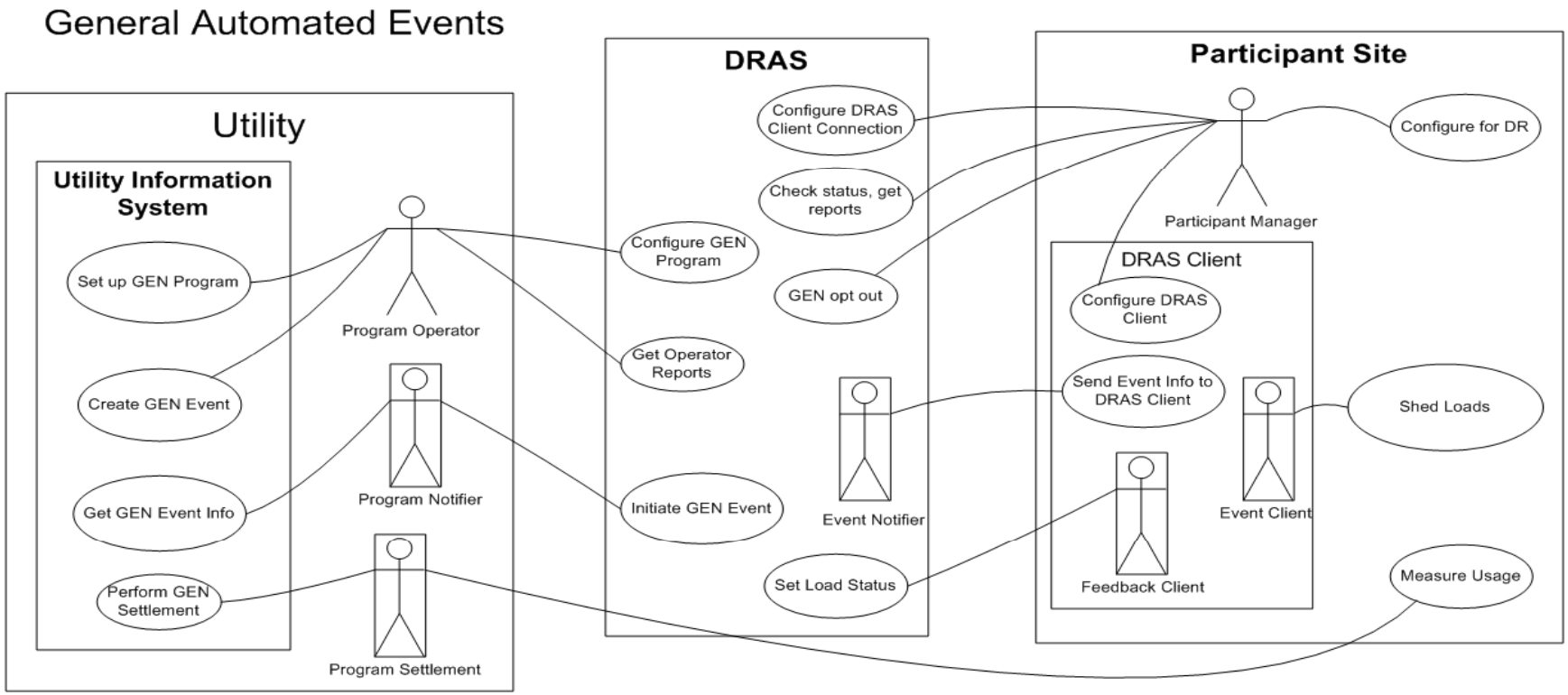
- The nature of the information in the OpenADR signal should allow for a great deal of latitude in how loads are managed
- OpenADR signals should not be dependent on specific control systems or devices within the facilities (not intended for direct load control)
- The complexity of the information should be such that simple rules can be devised by non-IT professionals (i.e. facility managers) to allow the DR Logic to be specified

OpenADR Requirements (Implementation)

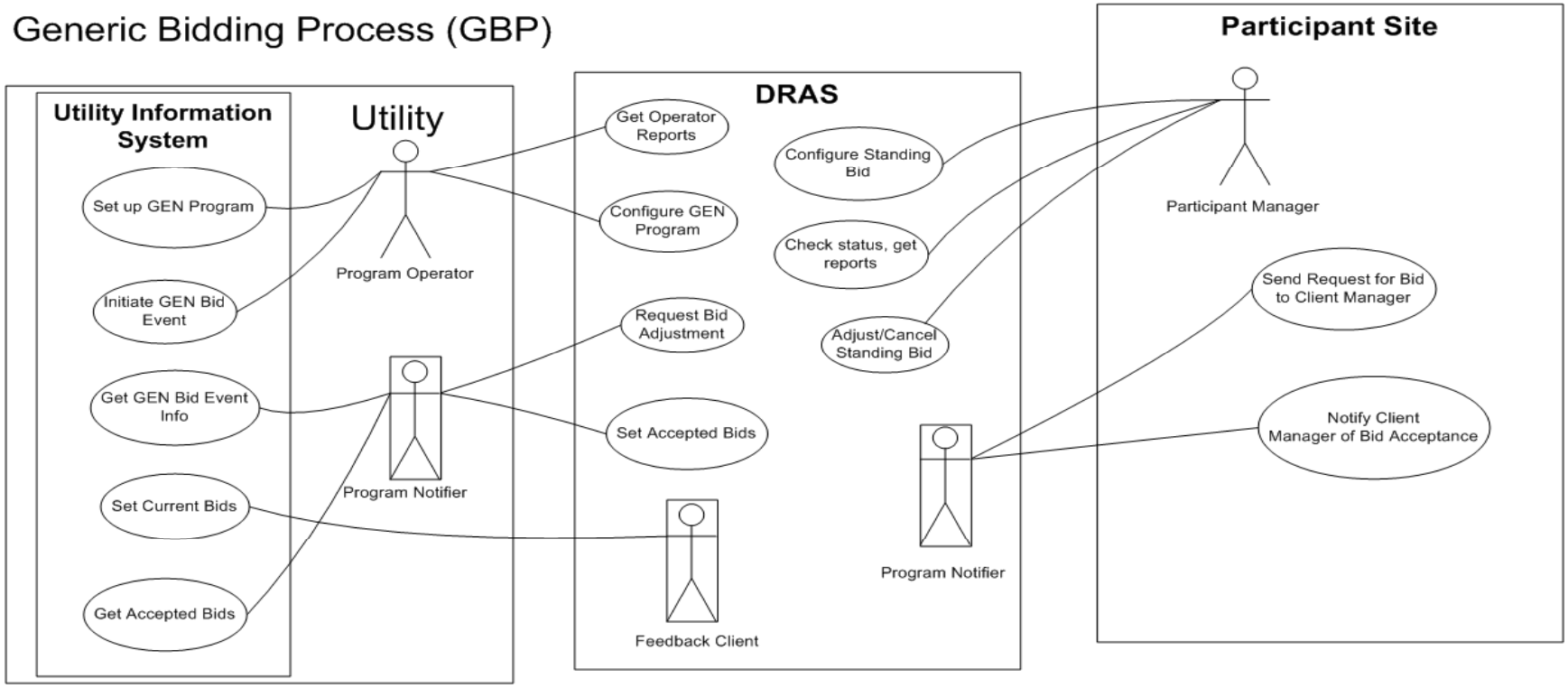
- Customer performance and settlement of DR Event participation is outside the scope of OpenADR interactions.
- OpenADR should support feedback from facilities for the purposes of forecasting and monitoring during events.
- The implementations for enabling OpenADR interactions should be platform independent and leverage existing standards such as XML and Web Services.
- The OpenADR interactions should be designed so that it can be performed in a secure and non-repudiated fashion.
- Communications of OpenADR signals should not require special networks and use available and existing networks such as the internet.

OpenADR Specification

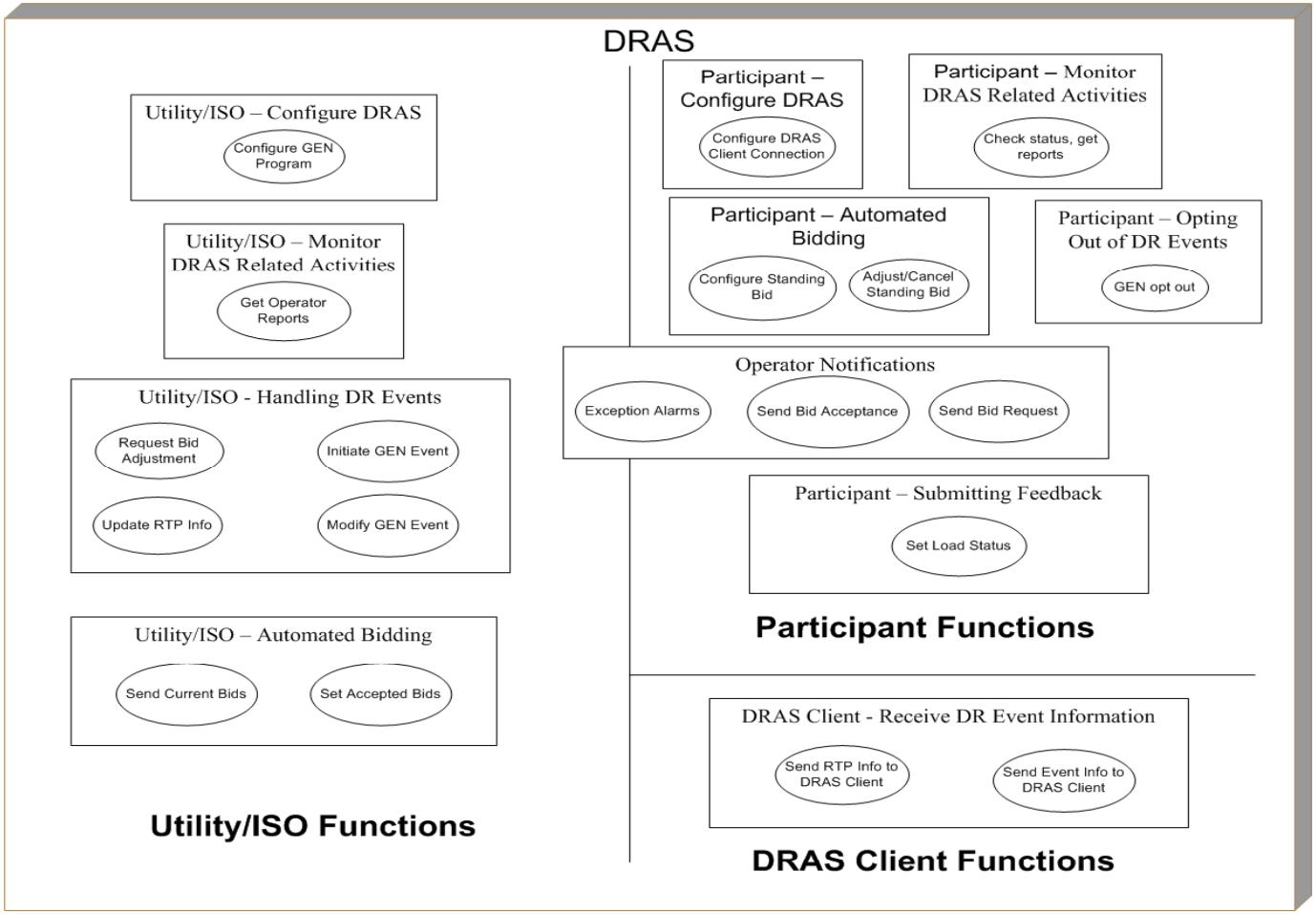
Automated DR Events Uses Case



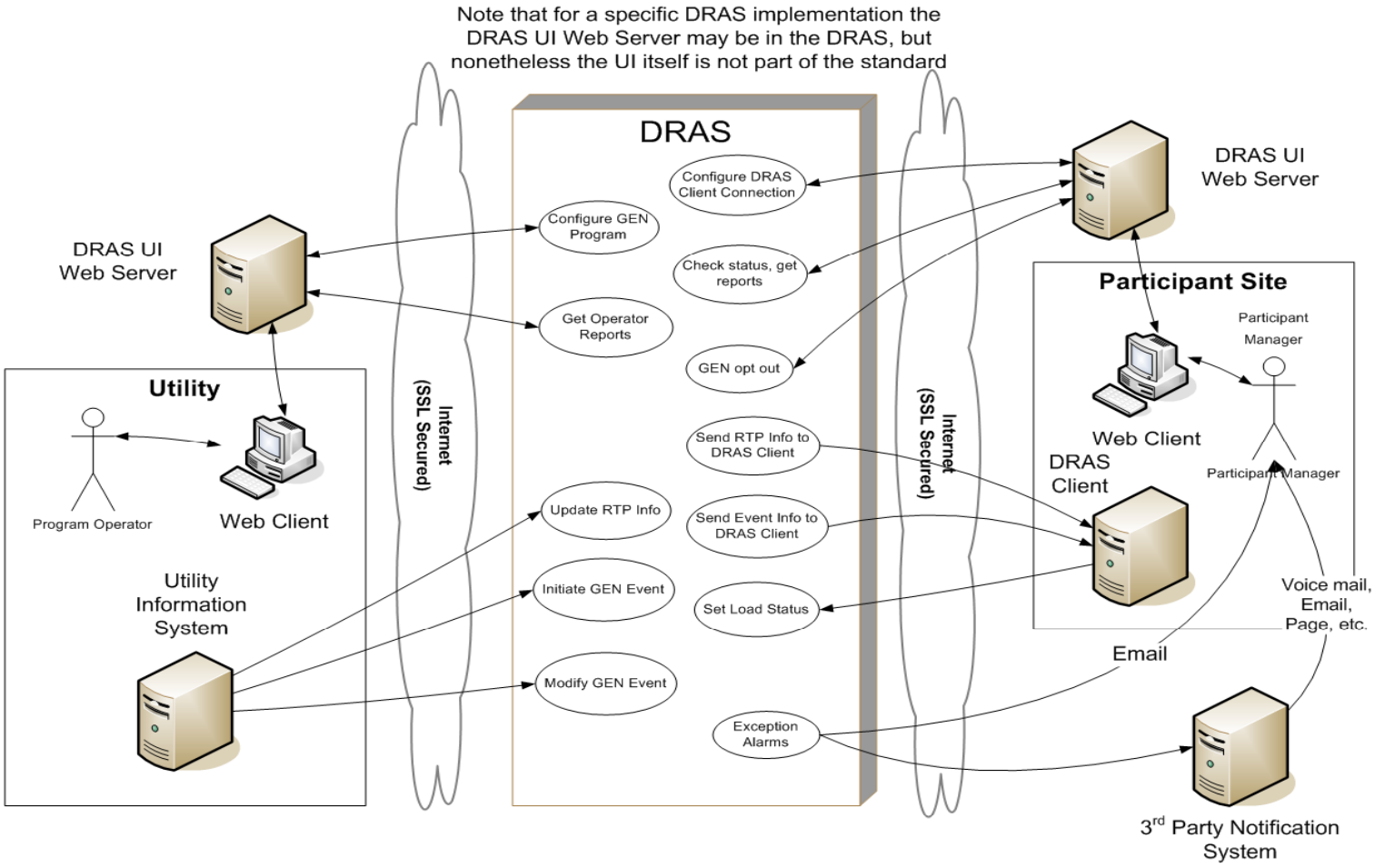
Automated Bidding Use Case



DRAS Interfaces



DRAS Event Architecture



OpenADR Signal Components

- DR Event information (e.g. prices, shed levels – not device specific commands)
- Schedules for the DR Event and related information.
- Ancillary information.
- Simplified DR Event representation in addition to full information (Simple vs. Smart Client)

OpenADR Specification Development Focus

- Incorporate emerging standards for pricing information and scheduling constructs
- Enhance feedback channels for improved forecasting of facility load profiles and real time monitoring of performance
- Enhanced support for “Fast DR” such as ancillary services
- Harmonize with emerging Smart Grid standards.

BACKUP SLIDES