



BERKELEY LAB

LAWRENCE BERKELEY NATIONAL LABORATORY



U.S. DEPARTMENT OF
ENERGY

Enabling Technologies and Communications for Grid Integration

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<http://gig.lbl.gov>

<http://www.openadr.org>



THE GRID INTEGRATION GROUP

<http://gig.lbl.gov>

Grid Integration Objectives

Grid Integration of end-uses and electrical vehicle fleets represents a key efficiency and energy security objective for the Federal and State Agencies.

The Grid Integration Group (GIG) develops the technologies and tools to:

1. facilitate dynamic interaction between grid operators and energy consumers;
2. support the grid integration of intermittent renewable sources; and
3. foster the participation of distributed energy resources.

Grid Integration Group

Demand Response (DR)

- Energy Technology & Systems Integration
- Tariffs, Rate Design
- Communications and Telemetry
- Commercial, Industrial and Residential End uses, automation, and Controls
- Open and Automated DR

Microgrids

- Optimization of Distributed Energy Resources
- Distributed Energy Resources, Technologies, and Integration
- V2G, Vehicle to Building (V2B), Microgrids
- Distributed Energy Resources Modeling

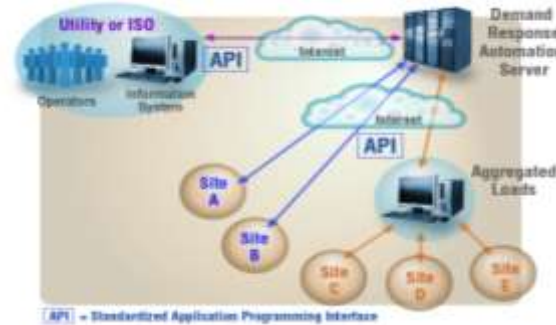
Electricity Reliability

- Real-Time Grid Reliability Management
- Customers & Markets
- Renewable Integration
- Load as a Resource (LAAR)
- Reliability Technology Issues & Needs Assessment

Core Competency: Technology Demonstrations, Pilots and Deployment, Markets, Regulations, Policies, Standards

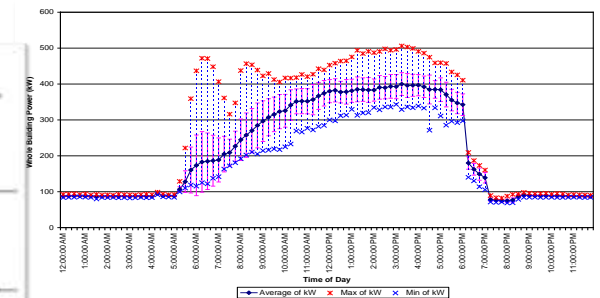
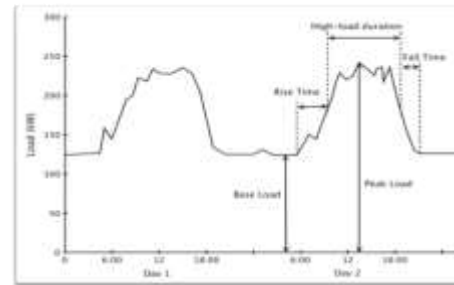
Demand Response, automation, and Open Technologies

- OpenADR developed into national and international standard



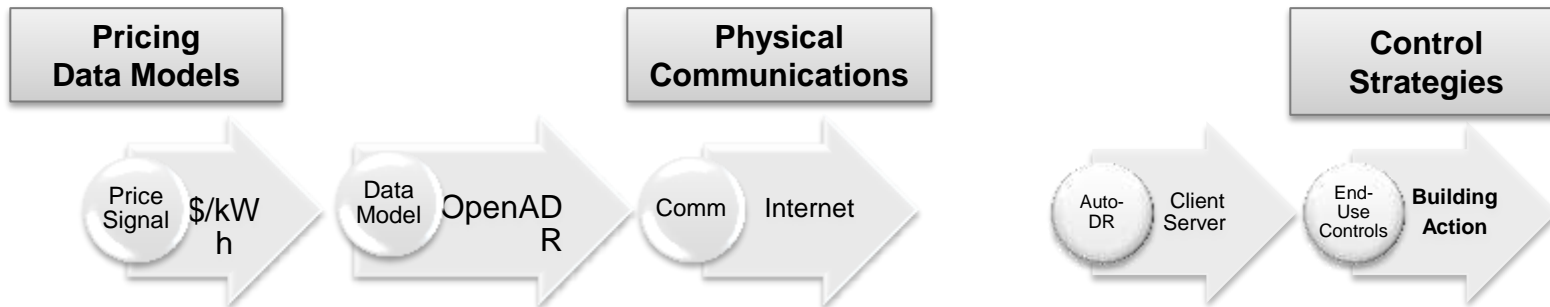
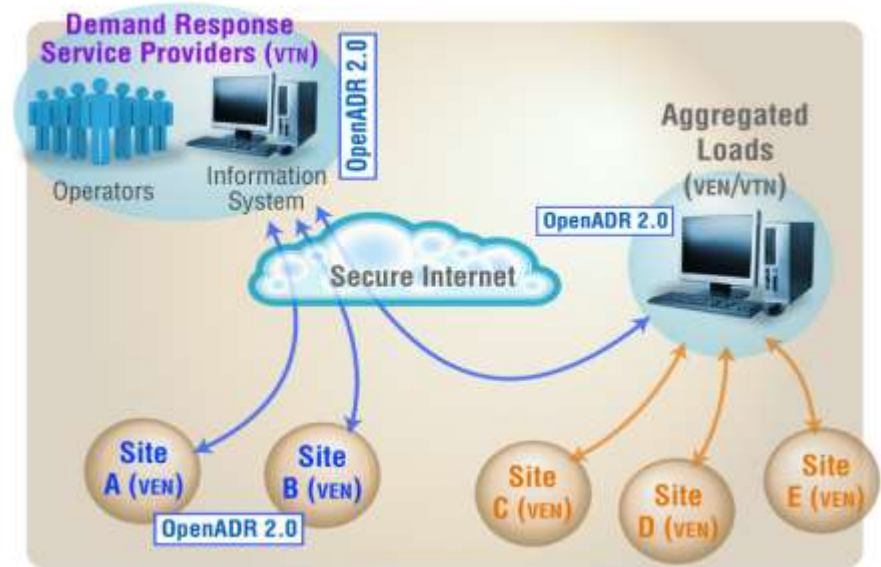
- Demand Response Quick Assessment Tool (DRQAT) to estimate and optimize DR strategies in facilities

- Load Analysis tools to pre-screen loads for participation in various timescales of DR



OpenADR and Interface with End-Uses

- ❑ Provides non-proprietary, open standardized DR interface (XML)
- ❑ Allows electricity providers to communicate DR signals directly to existing customers.
- ❑ Common language and existing communications (e.g., Internet).
 - ❑ Enables protocol interoperability Secure architecture for point-to-point, decentralized markets.
 - ❑ Scalable hierarchy of Virtual Top and End Nodes (VTN, VEN)

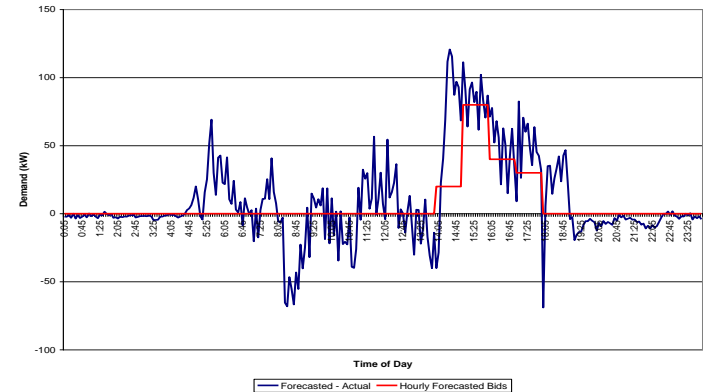


Information Technology Demand-Side Integration

Develop and demonstrate strategies and technologies to transform, innovate and integrate systems, open communications, and distributed energy resources.

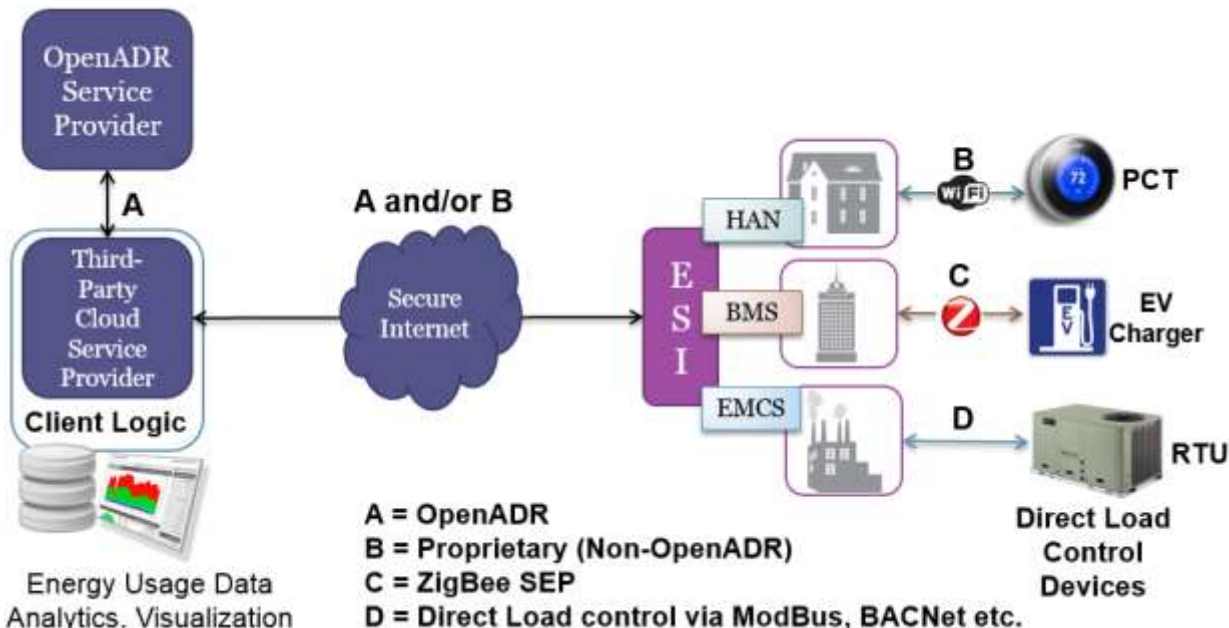
Fully integrated end-to-end systems demonstrations using demand-side assets for grid integration:

1. Load as a regulation resource: V2G demonstration
2. Load as spinning and non-spinning reserves: Participating Load Pilot
3. Price-responsive commercial buildings in New York to minimize operational costs.



Systems Interoperability: Demonstration & Research

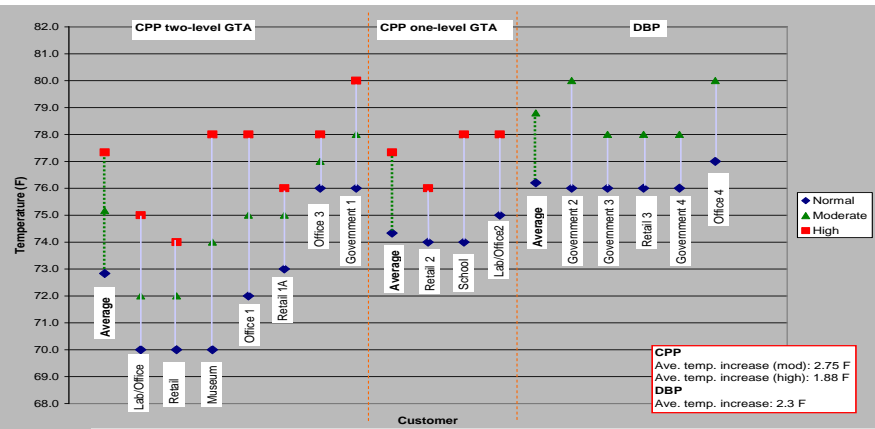
Conduct research and support open and related automated DR technologies, end-use devices, and their integration with the electric grid.



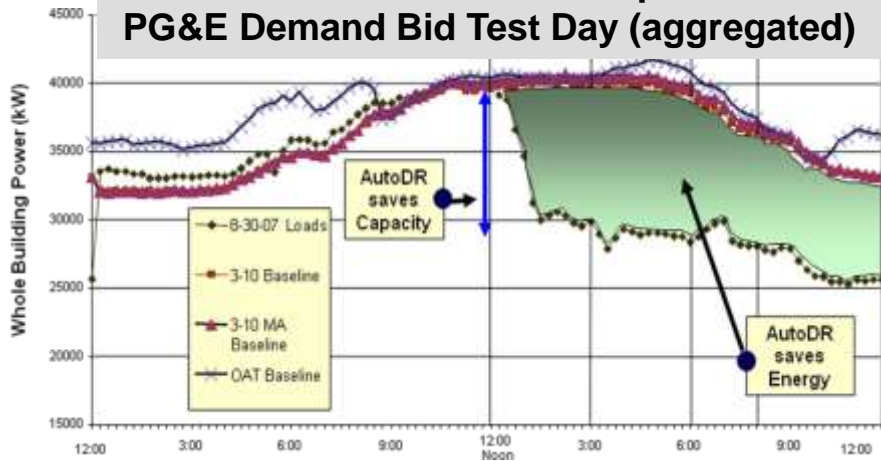
- Key interoperability concepts for DR communications
- Structured for current (point-to-point communications) and for future (de-centralized communications) DR markets
- Energy transactions and customer participation in multiple markets
- End-to-end integration of open communications with demand-side resources (B2G, V2G, etc.)

* <http://drrc.lbl.gov/demand-grid-d2g-lab>

DR Control Strategies Evaluation



Commercialization Impact: PG&E Demand Bid Test Day (aggregated)



AutoDR into CA Codes

Building use	HVAC										Lighting				Other		
	Global temp. adjustment	Duct static pres. Increase	SAT Increase	Fan VFD limit	CHW temp. 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															
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

Contact

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Web References:

- <http://www.lbl.gov/>
- <http://gig.lbl.gov/>
 - <http://der.lbl.gov/>
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- <http://www.openadr.org/>