Integrated Energy Efficiency and Demand Response Programs

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Agenda

• Scope of research
• Benefits of integration
• Enabling technologies
• Findings
  • Levels of program integration
  • Program landscape and examples
• Barriers to integrated programs
• Related development: GEBs
Scope of integrated EE/DR research

- Research focused on programs that integrate energy efficiency and demand response

- Research goals:
  - Characterize the landscape of integrated programs
  - Identify benefits, barriers, enabling mechanisms, and challenges to integration
  - Provide lessons for integrating programs
Benefits of integration

Commonly realized benefits:
• Customer bill savings
• Increased participation and program satisfaction
• Lower program costs

Emerging benefits:
• Increased resource adequacy and grid reliability
• Grid congestion relief
• Earnings opportunities (e.g. shareholder incentives)

Benefits not yet realized:
• Increased wholesale competition & lower wholesale prices
• Increased availability of ancillary services

ACEEE
American Council for an Energy-Efficient Economy
For residential buildings, enabling technologies are:

- Smart and Wi-Fi enabled thermostats & appliances
- Advanced metering infrastructure (AMI)
- Direct load control switches
- Mobile apps and marketplaces
For commercial buildings, integrated EE/DR requires these capabilities:

- Central control system
- Equipment with embedded controls
- Smart components
Research findings

Despite benefits—are still few fully integrated EE/DR programs

• Starting data set: 52 largest electric utilities (includes IOUs and munis)
• Of 44 utility plans ACEEE reviewed, found only 5 programs at highest level of integration
• Only 22 programs with some degree of integration
• Most programs are residential – few C/I programs
• Smart thermostats are prevalent: gateway to integration
We found 4 levels of integration

• Level 1: Recognition of EE or DR capabilities
• Level 2: Cross promotion of programs
• Level 3: Administrative coordination
• Level 4: Single fully integrated program
Program offerings

- Recognition: 5 programs (23%)
- Cross-promotion: 3 programs (13%)
- Administrative coordination: 5 programs (23%)
- Single program: 9 programs (41%)
Some programs use creative ways to combine EE and DR value streams.

- AEP It’s Your Power: Energy management app for homeowners
- PG&E ADR Program: Additional EE incentives for DR customers
- Southern Company Smart Neighborhoods: Aggregating DERs
AEP Ohio: It’s your power

- Smart home and demand response program with 3 elements:
  - Mobile app with marketplace
  - Energy Bridge
  - Connected equipment and devices

Source: AEP OH
Baltimore Gas & Electric: Home Energy Check-Up and PeakRewards

- Simultaneous enrollment
  - Quick home energy check-up
    - Provides measures including LEDs, smart power strips, faucet aerators
  - Peak rewards demand response program

Source: BGE
Commercial/industrial programs

• **Level 1: Recognition**
  • **ComEd: Smart Buildings Operations** Pilot: real-time energy optimization program—primarily EE, includes DR targets
  • **Duke Carolinas/Duke Progress**: EnergyWise Business Program—HVAC cycling DR program, some t-stat EE savings

• **Level 2: Cross Promotion**
  • **ComEd**: Smart t-stat included in multiple programs—EE and DR are cross promoted
  • **Eversource Massachusetts**: facilitate enrollment in EE and DR – promote technologies eligible for both
  • **National Grid New York**: Electric C&I Retrofit Program – promotes connected tech to enroll customers in DR programs
Commercial/industrial programs

• **Level 3: Administrative coordination**
  - **Xcel Energy Colorado**: Energy Management Systems Program offers incentives for peak demand and energy reductions
  - **Oncor**: 3rd parties administer Load Management Standard Offer program; some also offer EE programs
  - **Southern California Edison**: coordinates program administration—applications, marketing, education, and outreach.

• **Level 4: Integration**
  - **NV Energy**: PowerShift Commercial Energy Services – single program and appointment to offer rebates for EE equipment, assessments, and smart t-stats that can be enrolled for DR
Barriers and challenges

- **Internal organization of utilities** – separate teams/business units for EE and DR (silos)
  - Different goals, budgets, business cases
  - Difficulties in coordination and communication

- **Regulatory hurdles**
  - Evaluating cost-effectiveness
  - Rate structures, funding

- **Conflicting objectives**: saving kWh vs. targeted kW

- **Technologies**: despite advances, still can be problems
Key Takeaways

• There are few fully integrated programs
• New technologies are creating opportunities for integration
• Residential smart thermostat programs are the most prevalent among current offerings.
• Organizational changes and supportive regulation will reduce barriers to integration.

Administrators should pursue integrated programs when the net benefits outweigh the costs of integration.
Next step for integration:
Grid-interactive efficient buildings (GEBs)
Smart, connected buildings

- Grid connectivity is rapidly becoming important --- response to/need created by rapid growth of DERS
- GEBs: Energy-efficient buildings with the ability to be demand flexible
- No real programs yet---mostly research and demonstration projects
Key GEB technologies can save energy and/or interact with the grid.
ACEEE research on GEBs: We found no full GEB programs or pilots; Instead, a spectrum of EE and grid interactivity
From an industry perspective, top barriers for smart buildings and GEBs include:

- Interoperability
- Cybersecurity
- Workforce
Thanks! For more info or questions—also our GEB Utilities Working Group:
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ACEEE Publications

*Integrated Energy Efficiency and Demand Response Programs*
https://aceee.org/research-report/u1906

*State of the Market: Grid-Interactive Efficient Utility Programs*
https://aceee.org/white-paper/gebs-103019