Welcome!

RENEWABLES INTEGRATION

https://betterbuildingsinitiative.energy.gov/alliance/technology-solution/renewables-integration

Strategic use of renewables can help businesses reduce energy costs and their environmental footprint. The Renewables Integration Technology Research Team is pleased to provide resources, information and guidance on integrating renewable energy into your building portfolio.

Have Questions on PV and Roofing?: View the PV Roofing Guide
Renewables Integration – Team Goals

- Strategic use of renewables
- Building load flexibility
- Grid coordination
- Provide resources, information, and guidance on these topics to building owners and managers
Call Agenda

- **Introduction & Quick Announcements**
  - Rois Langner, NREL

- **Technical Presentations:**
  - Dan York, ACEEE
  - Craig Wright, Aurora Public Schools
  - Gregg Fischer, Tishman Speyer

- **Discussion and Q&A**
  - Rois Langner, NREL
  - Theo Kassuga, Navigant
Renewables Integration – Team Players

Technical Team Lead:

Rois Langner
Commercial Buildings Research Group, NREL
E: Rois.Langner@nrel.gov
P: 303-204-7026
Renewables Integration – Team Players

Technical Team Support:

Theo Kassuga  
Managing Consultant, Energy Navigant

Bill Goetzler  
Managing Director, Energy Navigant
GSA Proving Ground Program – Request for Information (RFI)

- DOE & GSA joint RFI was released October 9th
- Informational Webinar on November 7th

Goals:

- Identify technologies, solutions, energy/services to cost-effectively provide building load flexibility as part of a GEB strategy
- Coordinated packages of measures, controls, and/or services to be implemented at a test site
Announcements – Recent Publications

Grid-Interactive Efficient Buildings: Overview


- Building demand flexibility and associated grid services
- Grid-interactive efficient buildings
  - Characteristics
  - Strategies for optimization
  - Knowledge gaps & future research opportunities
Announcements – Recent Publications

Value Potential for Grid-Interactive Efficient Buildings in the GSA Portfolio: A Cost-Benefit Analysis

Looking for participants for two studies:

- Portfolio analysis: understand potential for load flexibility (optimized demand management)

Interested? Email us!
Rois Langner: Rois.Langner@NREL.gov
Theo Kassuga: Theo.Kassuga@Navigant.com
Better Buildings Alliance *Renewables Integration* Team

**Team Calls**

- New topics every couple months

- Did you miss the last one?
  - Find it on the Better Buildings Solution Center:
    - April 9th: *Building Load Flexibility and Grid Coordination*
    - June 25th: *EV’s – Buildings as the New Gas Station*

Have questions? Email us!

Rois Langner: 
Rois.Langner@NREL.gov

Theo Kassuga: 
Theo.Kassuga@Navigant.com
Today’s Presenters

Dan York  
Senior Fellow  
ACEEE

Craig Wright  
Natural & Renewable Resources Manager  
Aurora Public Schools

Gregg Fischer  
Director of Energy Systems  
Tishman Speyer
Technical Presentation:
Dan York, ACEEE
Integrated Energy Efficiency and Demand Response Programs

Dan York
Senior Fellow, Utilities and Local Policy
5 November 2019
Better Buildings Alliance Renewables Integration Team
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
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
- Smart components
- Equipment with embedded controls
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

RECOGNIZE ➔ PROMOTE ➔ COORDINATE ➔ INTEGRATE
Program offerings

- Recognition: 9 (41%)
- Cross-promotion: 5 (23%)
- Administrative coordination: 3 (13%)
- Single program: 5 (23%)

Program offerings diagram.
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
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:
Dan York
Email: dwyork@aceee.org
Phone: 608-243-1123

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
Technical Presentation:
Craig Wright,
Aurora Public Schools
Aurora Public Schools
Demand Response/Mitigation Efforts

Presented by:
Craig Wright – Natural and Renewable Resources Manager
Aurora Public Schools, Aurora, Colorado

Every Student Shapes a Successful Future
Prior Demand Response Experience

- Utility Rebated Pilot Program
- Motivation
  - Utility could send signal to immediately curtail demand
  - District could take advantage of technology’s suite of diagnostic and energy conservation capabilities
- Vendor supplied DR software directly interfaced with school’s building automation system (BAS)
  - Shed loads by changing setpoints
Lessons Learned

- Common goals:
  - DR Vendor – Ease of connectivity depends on consistent, well annotated programming (i.e. Project Haystack)
  - BAS Installation/Service Provider – View technology as an opportunity, not a threat
  - Owner – Train technicians on what system will and won't do. Buy-in to limitations
  - Utility – Develop technical competency to support implementation
Aurora Community Campus
Annual Peak Demand Comparison

**APRIL 2019**

- William Smith
  - 105 kW
  - 4/15/19 15:00
- Mosley
  - 235 kW
  - 4/1/19 6:45
- Quest
  - 276 kW
  - 4/8/19 13:00
- Pickens Tech
  - 491 kW
  - 4/21/19 8:00

**Utility Rates**

- Primary General (PG) = $16.41/kW
- Secondary General (SG) = $18.51/kW

**8:30, APRIL 12, 2019**

- William Smith
  - 90 kW (approx.)
  - 4/12/19 8:30 (approx)
- Mosley
  - 227 kW
  - 4/12/19 8:30
- Quest
  - 166 kW
  - 4/12/19 8:30
- Pickens Tech
  - 480 kW
  - 4/12/19 8:30

- 1107 kW
- x $18.51/kW
- $20,491

- 963 kW
- x $16.41/kW
- $15,803

75% of Building Area

*Every Student Shapes a Successful Future*
Annual Savings - SG to PG Rate

April Demand Reduction
1,107 kW
- 963 kW
144 kW Saved (13%)

April Cost Reduction
$20,491 SG
- $15,803 PG
$  4,688 Saved (23%)

100% of Building Area
$4,688/0.75 = $6,251

Annual Savings
x 12 months = $75,000 saved/year
Aurora Community Campus
Solar+Storage
Technical Presentation:
Gregg Fischer, Tishman Speyer
• Director of Energy Systems
• Sustainability + Utilities @ Tishman Speyer
• Oversee building and energy systems for the US portfolio (50,000,000 SF)
• Based out of Rockefeller Center in NYC (global HQ)
• Focus:
  • Building Automation
  • Energy Monitoring/Management
  • Fire Alarm
  • Security/Card Access
  • Lighting Controls
  • Energy Supply Contracts
  • Tenant Billing Systems
Established 1978

80,000,000 sqft of class A commercial office space and luxury residential globally

$90,000,000,000 in assets in 30 markets, 7 countries and 4 continents

- Rockefeller Center
- 200 Park
- 11 W42nd Street
- 520 Madison Ave
- 300 Park

2000+ tenants worldwide

Divisions:
- Sustainability + Utilities
- Design & Construction
- Investment Management
- Property Management
- Leasing
- Acquisition and Development

1200+ real estate professionals
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**New York**
- Fuel Switching
- Thermal Storage
- Fan Reduction
- Lighting

**Boston**
- Low Flow/Low Temp
- Lighting
- Exhaust Fans

**DC**
- Fan Reduction
- Exhaust Fans
- Lighting

**Chicago**
- Heat Reduction (W)
- Fan Reduction (S)
- Lighting

**California**
- Battery Storage
- Exhaust Fans
Reducing energy usage helps conserve natural resources and benefits the environment.

**THREE energy-conserving techniques for you to adopt:**

1. Shut down equipment after work hours (i.e., copiers, printers, etc.)
2. Lower shades and blinds
3. Turn off lights

Tishman Speyer thanks you for your participation.

To learn more about sustainability initiatives at Tishman Speyer, please visit: tishmanspeyer.com/sustainability
Permanent Demand Reduction Strategy: Thermal Storage

2019: 20,000 Ton-Hrs of ice (2,000,000 lbs)
Permanent Demand Reduction Strategy: Energy Management System

- Live demand management
- Limitations for demand response: eclipsing ratcheted peak demand windows
- Possible solutions: ratcheted demand window relief on either side of demand response window
Permanent/Temporary Demand Reduction Tools: Technology

- Security & Access
- Fire Alarm System
- Building Automation System
- Lighting Controls
- Energy Management
- Water Management
- Elevator Systems
- Metering
- HVAC Systems
Permanent/Temporary Demand Reduction Tools: Expansion

- NORTH AMERICA: 44,323,229
- EUROPE: 4,893,889
- CHINA: 15,528,073
- BRAZIL: 7,128,004
- INDIA: 8,102,044
Comments? Questions?

Please share your thoughts!
Thank you!

Email:
rois.langner@nrel.gov
theo.kassuga@navigant.com
to be added to our listserv.

Stay tuned for announcements on upcoming BBA Renewables Integration Team calls!