Better Buildings, Better Plants
SUMMIT

Learn more: betterbuildingssolutioncenter.energy.gov/summit
Let's Connect! Grid-Interactive Efficient Buildings

Wednesday, May 18\textsuperscript{th}, 2022
11:00 AM - 12:00 PM ET
Agenda

1. Welcome and Introductions
2. Overview of Grid-interactive Efficient Buildings
3. GEB Strategies – Kohl’s
4. GEB Strategies – WinnCompanies
5. Closing and Q&A
Today’s Presenters

- Jordan Ivans, *Energy Team Lead*
  - Kohl’s, Inc.

- Darien Crimmin, *Vice President of Energy and Sustainability*
  - WinnCompanies
Key Characteristics of GEBs

**EFFICIENT**
Persistent low energy use minimizes demand on grid resources and infrastructure.

**CONNECTED**
Two-way communication with flexible technologies, the grid, and occupants.

**SMART**
Analytics supported by sensors and controls co-optimize efficiency, flexibility, and occupant preferences.

**FLEXIBLE**
Flexible loads and distributed generation/storage can be used to reduce, shift, or modulate energy use.

Grid-Interactive Efficient Buildings Initiative

Grid-Interactive Efficient Commercial Buildings

- HVAC System
- Connected Lighting
- EV Charging
- Battery Storage
- Dynamic Windows
- Occupancy Sensing
- Plug Loads

Inputs for Optimization

- Smart Meter
- BAS

Two-way data

- Price Signals
- Two-way sensor and control communication

Base Load

Power Plants

Utility

Grid-Interactive Efficient Commercial Buildings

Better Buildings

U.S. DEPARTMENT OF ENERGY
Demand flexibility is needed for a lower-cost decarbonization transition, supporting changes on the grid resulting from both renewable integration and electrification.

Applicable to Other Technologies, e.g.:

For more information please visit: energy.gov/eere/buildings/GEB
Groups of GEBs Can Provide Added Value

- Achieve economies of scale
- Leverage load diversity to smooth demand curves
- Achieve greater impact through scale
- Allow for innovative business models
- Can achieve more than the sum of individual buildings
- Able to collectively afford and share infrastructure
- Facilitate incorporation of additional DERs
This is Where We’re Going Tomorrow

Image Courtesy of NASA Earth Observatory/NOAA NGDC
Jordan Ivans
Kohl’s, Inc.
Jordan Ivans, Energy Team Lead
Agenda

| Energy Efficiency |
| Demand Flexibility |
| Renewable Energy |
| Evolving Future Strategies |
At Kohl’s, we believe that incorporating sustainable solutions in the way we do business will help to build better futures for families. With such a large retail footprint, we are in a unique position to make a positive impact on the planet, and have set environmental sustainability goals to ensure that impact is forward-looking.
LED Lighting Retrofits

Reduce Store Energy Use 25-40%

Lower Overall Maintenance Expenses

Longer Lifespan

Better Light Quality
LED Lighting Retrofits

1st LED Pilot Store 2014: Plymouth, MN

Stores LED (through 2021) 63%

5 Year Look Back (Interiors)

<table>
<thead>
<tr>
<th>Year</th>
<th>Site Count</th>
<th>Energy Reduction (kWh)</th>
<th>Payback (Yrs)</th>
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<tbody>
<tr>
<td>2017</td>
<td>130</td>
<td>38M</td>
<td>5.66</td>
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<tr>
<td>2018</td>
<td>124</td>
<td>36M</td>
<td>5.55</td>
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<tr>
<td>2019</td>
<td>129</td>
<td>31M</td>
<td>6.14</td>
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<tr>
<td>2020</td>
<td>45</td>
<td>10M</td>
<td>6.74</td>
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<tr>
<td>2021</td>
<td>130</td>
<td>42M</td>
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<tr>
<td>2022</td>
<td>75</td>
<td>15M</td>
<td>9.24</td>
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ROI Based Program

- Circuit Level/Area Based SOWs
- End of Life Lighting
- Incentives

SOW Expanded:

- Lower Cost and Higher Efficiency LEDs
  - Additional Areas and Greater Savings

Challenge: How to Complete Remaining Non LED with lower ROIs?
LED Lighting Retrofits

**Challenge:** How to Complete Remaining Non LED with lower ROIs?

- Proven Historical Expense Savings
- New Net Zero Goals

### 2023-2025 LED Ramp Up

- **Scope:** Stores, Corporate, Logistics
  - Interior & Exteriors
- **Projected Energy Save:** 117M kWh
- **Projected Expense Save:** $13M
- **Payback:** 8.67 yrs

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*Projected Based on Current Energy/Carbon Footprint*
HVAC

Upgrades and Retro-Commissioning

Prioritizing

● Associate and Customer Comfort
● Increasing Maintenance Expense
● Increasing Energy Consumption
● Aligning with BAS Upgrades
● Right-Sizing Units

Retro-Commissioning

● Full Review of Building
● Identifying Deviations/Opportunities from Current Standards
### Building Automation Systems

| Building Optimization | Schedule Compliance  
|-----------------------|----------------------
|                       | Remote Monitoring    
|                       | Data Driven Logic    
|                       | Changes              
| Demand Management     | HVAC Optimization    
|                       | Demand Response      
|                       | Load Shedding / Shifting 
| Variances & Anomalies | Energy Use Trends    
|                       | Demand Spikes        
|                       | Easter / Christmas   

800 - 1,200 Monitor/Control Points in each store

Onsite Power Submetering
Demand Flexibility

Demand Response

- **Benefits:**
  - Grid Demand Relief
  - Correlation with higher TOU periods
  - Direct payments from utilities

- **Risks**
  - Building Comfort
  - Longer Duration Events and Performance

- **Process**
  - Pre-cool
  - Event: Disable HVAC Compressors
  - Zones resume cooling if temps hit 75
  - Post event: Set points return to normal

*Delivers >$300k Value Annually*
Demand Flexibility

Load Shifting

HVAC Staging

- **Avoiding Coincidental Peaks by delaying compressors**
- **Benefits:** Lower energy usage and decreased peak demand charges
  - 5-10kW monthly peak demand save
  - 1-3% kWh Save

Optimized Start

- **Issue:** Morning Start up creating Demand Spikes
  - Units Ramp up simultaneously at Store Open to meet space temps

- **Resolution:**
  - Logic focused at Zone Level
  - Monitor delta b/t current and Occupied Temp
  - Calculated to hit Occupied Temp

- **Benefits:**
  - Avoids creating Morning Peak Demand Spikes
Solar Energy

Since 2007 -
162 Rooftop Arrays
- Total 51.5 MW

500kW MA VNM Program

2021 - 60,736 MWh
- 6.35% of Total Electricity

2022
- 15 New Rooftop arrays
  - 10%+ increase
- NY Community Solar
Onsite Solar Considerations

- Existing Roof Condition
- Location
- Current vs Future Energy Needs
- Competitive Market Pricing
  - Deal Structures
  - Risk Tolerance
  - RECs
Energy Reduction Goal

Reduce energy consumption by 30% at Kohl's facilities by 2025 (2008 baseline)

2021 Progress: 29%
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<th>Net Zero Building Operations</th>
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Thank You!

Jordan Ivans, Energy Team Lead
Darien Crimmin
WinnCompanies
Connected Communities Project Description

Up to 6 affordable and mixed-income multifamily housing communities, representing approximately 1,000 households, selected from two portfolios located in Massachusetts will be transformed into GEBs. The Project will demonstrate how both an aggregated portfolio and individual multifamily apartment communities can reliably and cost-effectively serve as grid assets by strategically deploying efficiency, demand flexibility, renewable generation, and energy storage, while providing energy savings, resilience, comfort, and environmental benefits to underserved communities.

KEY INNOVATION:

✔ Demonstrate financeable pathways for existing affordable multifamily housing to transition into GEBs

✔ Develop and/or enhance new or existing platforms to integrate control of energy storage, PV, and connected devices, fully automating the load flexibility within existing affordable housing communities

✔ Pilot new approaches to “Resiliency as a Service” for vulnerable communities to optimize battery storage design and financing
Data Acquisition

Remote Monitoring/Analytics from Logical Buildings SmartKit AI Platform

Credit: Logical Buildings Inc
What are optimal and financeable GEB Packages that work for affordable housing?

- Comfort
- Functional Reliability
- Secure Communications
- Proven Value Streams
- Readily available technology
- Scalability
- Code compliant

Credit: Navigant Consulting
Thank You!

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