Cleanup on Energy Savings on Aisle 7! Saving Energy in Supermarket Design and Operation

Better Buildings Summit
Monday, May 9, 2016
3:35-5:00 PM
Agenda

3:35  Welcome & Introductions
3:40  Mick Schwedler, ASHRAE
4:00  Aaron Daly, Whole Foods Market
4:20  Richard Heath, Southeastern Grocers
4:40  Group Discussion/Q&A
Today’s Presenters

Mick Schwedler
American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

Aaron Daly
Whole Foods Market

Richard Heath
Southeastern Grocers
Clean up on Aisle 7: Recommendations for 50% Energy Reduction in Grocery Stores

Mick Schwedler, PE, FASHRAE, LEED AP BD+C
Trane Applications Engineering Manager
AEDG Steering Committee Chair Emeritus
Advance Energy Design Guides (AEDG) Partnership

- Collaboration of professional organizations and DOE
- Specialized Project Committee for each guide
- Oversight is provided via AEDG Steering Committee
- Backed by DOE’s national laboratory leadership, energy simulation, technical analysis and support
- Open peer review and commentary process
AEDG Presents

“"A Way Not The Only Way...”" to achieve the desired savings

How to use energy modeling for design of buildings not amenable to tables

A prescriptive path by climate zone to achieve desired savings

How-to tips and caveats for selected energy conservation measures
Advanced Energy Design Guides

- Six 50% Guides
- 100,000+ copies
- 50% energy savings over 90.1-2004
- 50% on the way to zero net energy

Free download at: www.ashrae.org/freeaedg
50% Grocery AEDG Project Committee

- **Paul Torcellini**, Chair, National Renewable Energy Laboratory
- **Bernie Bauer**, IES Representative, Integrated Lighting Concepts
- **Aaron Daly**, Member-at-Large, Whole Foods Market
- **Don Fisher**, Member-at-Large, PG&E Food Service Technology Center
- **Michael Lane**, IES Representative, Puget Sound Energy
- **Ken Lowney**, AIA Representative, Lowney Architecture
- **Merle McBride**, ASHRAE Representative, Owens Corning
- **Jim McClendon**, ASHRAE Representative, Walmart Stores, Inc.
- **Daniel Nall**, AIA/USGBC Representative, Syska Hennessy Group
- **Caleb Nelson**, Member-at-Large Refrigeration, CTA
- **Doug Scott**, Member-at-Large Refrigeration, VaCom Technologies
- **Eric Bonnema**, Analysis Support, National Renewable Energy Laboratory
- **Lilas Pratt**, Staff Liaison, ASHRAE
AEDG Table of Contents

• Chapter 1 – Introduction
  ■ How to use this document

• Chapter 2 – Integrated Design Process
  ■ How the design process changes in order to achieve 50% energy savings

• Chapter 3 – Design Concepts and Practices
  ■ Overview of the technical approaches to achieving 50% savings
  ■ Subsystem integration

• Chapter 4 – Design Strategies and Recommendations by Climate Zone
  ■ Specific technical requirements to meet the 50% goal

• Chapter 5 – How To Implement Recommendations
  ■ Specific technical guidance for implementation of recommendations, including technical resources and warnings
Climate Zones
AEDG Savings by Climate Zone

![Graph showing annual energy end use intensity (kBtu/ft²yr) by climate zone with percent savings.]

- Refrig (elec)
- SWH (gas)
- Pumps (elec)
- Fans (elec)
- Cooling (elec)
- Heating (gas)
- Heating (elec)
- Ext Light (elec)
- Int Light (elec)
- Int Equip (gas)
- Int Equip (elec)
Recommendation Tables

Consider this a menu of energy-saving options

Building Envelope
Lighting/Daylighting
Kitchen
Refrigeration
HVAC
Plug Loads
Service Water Heating

Source: 50% AEDG Grocery Stores from ASHRAE
Recommendation Table Contents

- How-to Tips contain
  - Specific recommendations
  - Guidance on good practice for implementation
  - Cautions to avoid known problems

Source: 50% AEDG Grocery Stores from ASHRAE
Refrigeration – Energy Reduction

• Reducing Load
  – Reduces compressor size
  – Reduces condenser size
• Examples
  – Insulation
  – Case LEDs
  – Doors on Cases
Refrigeration & HVAC Interactions

• Thermal Comfort
  – Increased heating demand
  – Reduced cooling demand
  – Cold Aisle

• Heat Reclaim
  – Water
  – Air (heat and reheat)

Source: 50% AEDG Grocery Stores from ASHRAE
Refrigeration & HVAC Interactions

• Dehumidification
  – Required store condition: 75°F/55% R.H.
  – Refrigeration COP vs. A/C COP
  – Anti-sweat heater control

Source: 50% AEDG Grocery Stores from ASHRAE
Kitchen Equipment

- New technology for AEDGs
  - DCKV (Demand Controlled Kitchen Ventilation)

Source: 50% AEDG Grocery Stores from ASHRAE
Lighting Goals

• Support
  – Attracting customers
  – Facilitating merchandise evaluation
  – Enabling completion of the sale

• Lower Lighting Power Densities can be achieved by
  – High efficacy light sources
  – Lighting controls
  – Good design practice
Lighting Design

Use LED task and accent lighting to highlight key merchandise locations or vignettes to “feature display” light levels (three to ten times the general merchandise lighting level in the area of the display). The use of accent lighting to highlight all merchandise does not create the proper contrast ratios and should be avoided.

Source: 50% AEDG Grocery Stores from ASHRAE
Bonus Savings and Renewables
How-To Tips

Not required, available for additional savings

- Natural Ventilation
- Thermal Storage
- Cogeneration
- Evaporative Cooling
- Solar Thermal
- Photovoltaics
- Wind Energy

Source: 50% AEDG Grocery Stores from ASHRAE
Case Studies

Refrigeration
• Case doors
• A.S. control
• LED
• EC motors

HVAC
• Desiccant wheel
• Heat Reclaim
• Reduced airflow / Fan savings

Kitchen
• Hood side panels
• DCKV responds to heat/smoke

Source: 50% AEDG Grocery Stores from ASHRAE
50% AEDG for Grocery Stores

• Developed by AIA, ASHRAE, IES and USGBC and supported by the U.S. DOE
• Grocery store owners on the committee
• Uses "off the shelf" technologies
• Recommendations fit on three pages
• Significant "How-to" expertise shared
• 50% savings are attainable
• May download for free; www.ashrae.org/freeaeddg

Practitioners consider the AEDG tables a menu of vetted options for deep energy savings!
Special Acknowledgement

- Michael Lane, Puget Sound Energy
- Daniel Nall, Syska Hennessy Group
- Caleb Nelson, CTA
- Paul Torcellini, NREL

Questions?

www.ashrae.org/freeaedg

Source: 50% AEDG Grocery Stores from ASHRAE
Aaron Daly
Cleanup on Energy Savings on Aisle 7!

Aaron Daly
Global Energy Coordinator
Who We Are

- Multi-Stakeholder Model
- Focus on Food
- Sustainability Commitment
- Distributed Decision-Making
New Stores

Challenges

- Multiple Stakeholders
- Competing Objectives
- Site/Shell Constraints
Continuous Learning Process

• Iterative Design Improvements Process

• Accounting for...
  – Climate
  – Building Type
  – Functional Needs
  – Technological Change
Case Study: 3rd & 3rd Brooklyn, NY

- Rooftop Power
- Rooftop Farm
- Local Recycled Materials
- Energy Efficient Systems
Efficient Existing Stores

Challenges

• Existing Equipment

• Maintenance

• Technology Integration
Case Study: “MarketZero”

With funding from the California Energy Commission, we are collaborating to retrofit a store to scalable near-zero net energy use.
Leveraging the AEDG

Prescriptive

• Specific Strategies Recommended
  – Included in Specs for New Buildings & Equipment

Custom

• Modeling for interactive effects
• Testing Assumptions
Thank You!

Aaron Daly, CEM
Global Energy Coordinator, Whole Foods Market
Aaron.Daly@wholefoods.com; 512-431-0360
Master the Fundamentals
Richard Heath
Saving Energy is Fundamental

Richard Heath - Director of Engineering & Energy
Fundamentals

Admiral Rickover -
Father of the Nuclear Navy

Take the Path of Least Resistance:

• Maximize the Opportunity

• Master the Fundamental Objective

• Avoid Betting on the Come
  (Data Driven Picks – My Secret to Success)

• Validate Solutions
  (Solution Must meet the Fundamental Objective)
Maximize the Opportunity

Existing Stores with Excessive Energy Use provide the biggest opportunity for Energy Reduction in Supermarkets.

Energy Hog Stores exceed the Average Energy use by a minimum of 20% with no limit on the high end.

- 24% of existing Stores are Energy Hogs
- 7% of Stores are New Construction

Correcting the operational issues that create Energy Hog Stores produces 3 times more energy savings opportunity than would reducing New Store Energy by 50%.
Master the Fundamental Objective
Align with the Fundamental Objective – Deliver what they require

Submarine

S = D
Avoid Betting on the Come

Use ALL available Data to Stack the Deck in your Favor:

For Existing Stores you have all the Data that you need to ensure your investment in Energy Reduction will provide a return.

<table>
<thead>
<tr>
<th>Store #</th>
<th>EBITDA FY.2015.P9</th>
<th>Store SqFt</th>
<th>Annualized kWh</th>
<th>Annual kWh/SqFt</th>
<th>Annual Avg Rate</th>
<th>Target kWh/SqFt</th>
<th>Potential Annual Energy Expense Savings</th>
<th>TOTAL_STR_REPAIRS</th>
<th>Projected Capital Spend (based on 3 YR Simple PB)</th>
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**This makes Capital Planning Easy**
Validate Solutions

Consequences of Losing Sight of the Fundamentals

What is the most Fundamental Parameter for Supermarket Refrigeration?

If our solutions violate Fundamental Principles we must re-evaluate our Path.
Discussion
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