

Fast. Forward.



Learning.

NACStech
NCS PCATS

LEED Opportunities For Convenience Stores

Population vs. Energy Consumption

**U.S. accounts for 5% of the world's population,
yet uses 26% of the world's energy**



Population



Energy Consumption

Driving Industry Trends

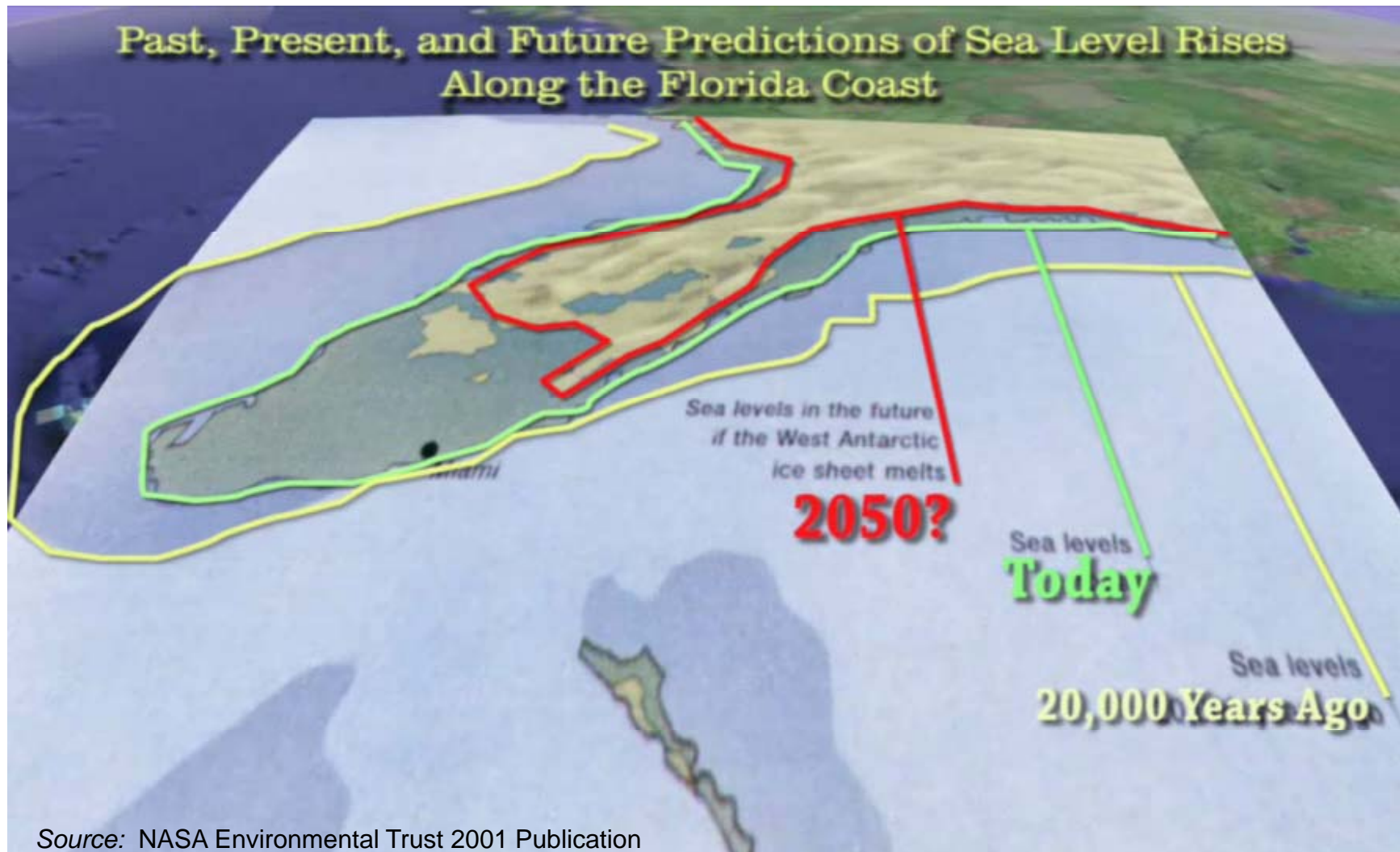
In the United States commercial and residential buildings consume:

- ~40% of the total energy.
- 70% of the electricity.
- 40% of the raw materials.
- 12% of the fresh water supplies.

These buildings account for 30% of greenhouse gas emissions.



Environment Past Present & Future



Leadership in Energy & Environmental Design

- *LEED* is the internationally accepted benchmark for the design, construction and operation of high performance green buildings.
- *LEED* provides owners and operators the tools to have an immediate and measurable impact on their buildings' performance.
- *LEED* promotes a whole building approach to sustainability by recognizing performance in five key areas:

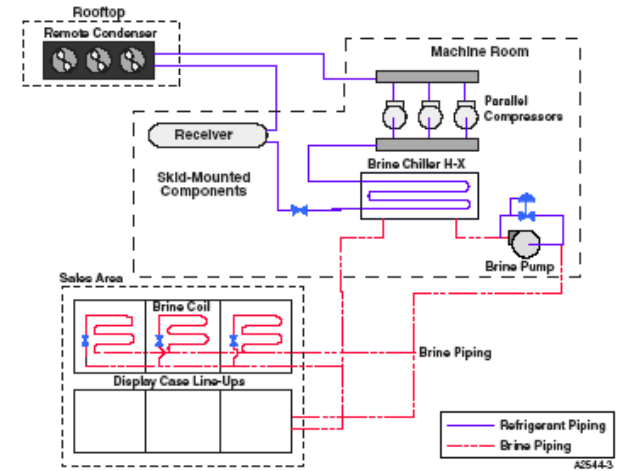
1. <i>Sustainable Site Development</i>	14
2. <i>Water Savings</i>	5
3. <i>Energy and Atmosphere</i>	17
4. <i>Materials and Resources</i>	13
5. <i>Indoor Environmental Quality</i>	15
6. <i>Innovation</i>	5
	<hr/>
	69 Total Possible Points

LEED Levels For New Construction

- Certified 26–32 Points
- Silver 33-38 Points
- Gold 39-51 Points
- Platinum 52-69 Points



Energy & Atmosphere



Energy & Atmosphere (EA)

Credits

17 Points

- | | |
|-----------------------------------------------------------------------------------|----------|
| <input type="checkbox"/> Fundamental Commissioning of the Building Energy Systems | Required |
| <input type="checkbox"/> Minimum Energy Performance | Required |
| <input type="checkbox"/> Fundamental Refrigerant Management | Required |
| <input type="checkbox"/> Optimize Energy Performance | 1 – 10 |
| <input type="checkbox"/> On-Site Renewable Energy | 1 – 3 |
| <input type="checkbox"/> Enhanced Commissioning | 1 |
| <input type="checkbox"/> Enhanced Refrigerant Management | 1 |
| <input type="checkbox"/> Measurement & Verification | 1 |
| <input type="checkbox"/> Green Power | 1 |

EA Prerequisite 1

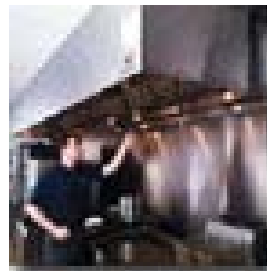
Fundamental Commissioning of the Building Energy Systems

Intent:

Verify that the building energy related systems are installed, calibrated and perform according to the owners project requirements, basis of design and construction documents

Benefits of Commissioning include:

- Reduced energy consumption
- Lower operating cost
- Reduced contractor callbacks
- Better building documentation
- Enhanced occupant productivity



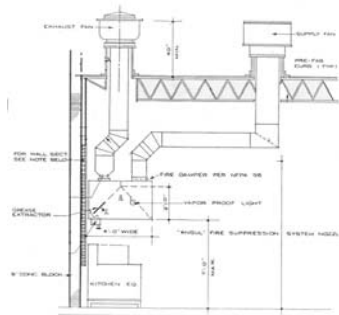
EA Prerequisite 2

Minimum Energy Performance

Intent:

Establish the minimum level of energy efficiency for the proposed building and systems

- Design and building project must comply with both:
 - Mandatory provisions of ASHRAE 90.1 – 2004
 - Prescriptive requirements or performance requirements of ASHRAE 90.1 – 2004
 - Projects pursuing points under EA Credit 1, computer simulation models must be used to confirm satisfaction of this prerequisite



EA Prerequisite 3

Fundamental Refrigerant Management

Intent:

Reduce Ozone Depletion – Zero Use of CFC based Refrigerants



EA Credit 1: Optimize Energy Performance

Intent:

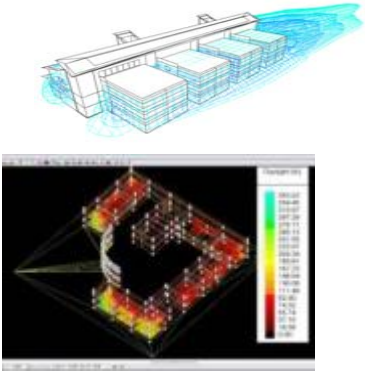

Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use

- Demonstrate a percentage reduction in energy cost compared to a baseline building per ASHRAE 90.1 – 2004, Appendix G

% Energy Cost Savings (Minimum)		
New Building	Existing Building	Points
10.5%	3.5%	1
14.0%	7.0%	2
17.5%	10.5%	3
21.0%	14.0%	4
24.5%	17.5%	5
28.0%	21.0%	6
31.5%	24.5%	7
35.0%	28.0%	8
38.5%	31.5%	9
42.0%	35.0%	10

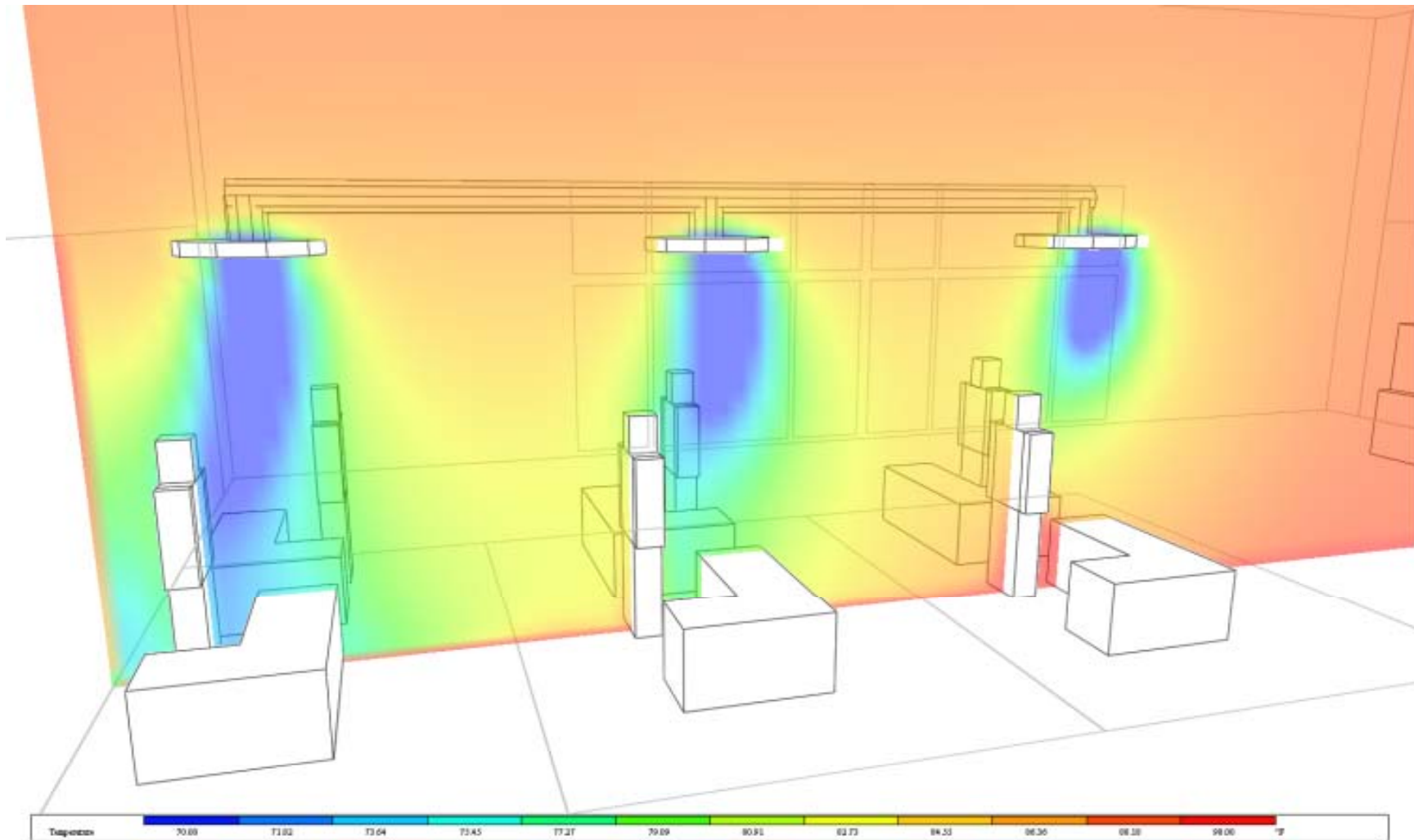
Demonstrated via a “Whole Building Energy Simulation”

LEED “Green” Building Techniques Make Sense

	Prime Benefits
Modeling 	<ul style="list-style-type: none">• Understand the building energy requirements and carbon emissions prior to construction• Analyze thermal and day-lighting impacts• Perform “what if” analyses to understand holistic impact of various technologies/strategies on the building• Forecast annual building utility and energy costs
Commissioning 	<ul style="list-style-type: none">• Mandatory requirement for LEED• Ensure building energy consuming systems are installed, calibrated and perform per the design criteria• Reduced contractor callback• Enhanced documentation• Ensure greater energy efficiency



CFD Analysis (Cooling)



Air Temperature



Daylight Harvesting



What Is Daylight Harvesting?



Controlled admission of natural light into the space with the intent of limiting or eliminating electrical lighting

Toplighting: Skylights

- Lighting from above is generally natural and efficient
- Complete uniformity can be achieved



Optical Systems: Light Tubes

- A round tube lined with highly reflective material leads the light rays through a building, starting from an entrance-point located on its roof.



Advantages of Daylight Harvesting

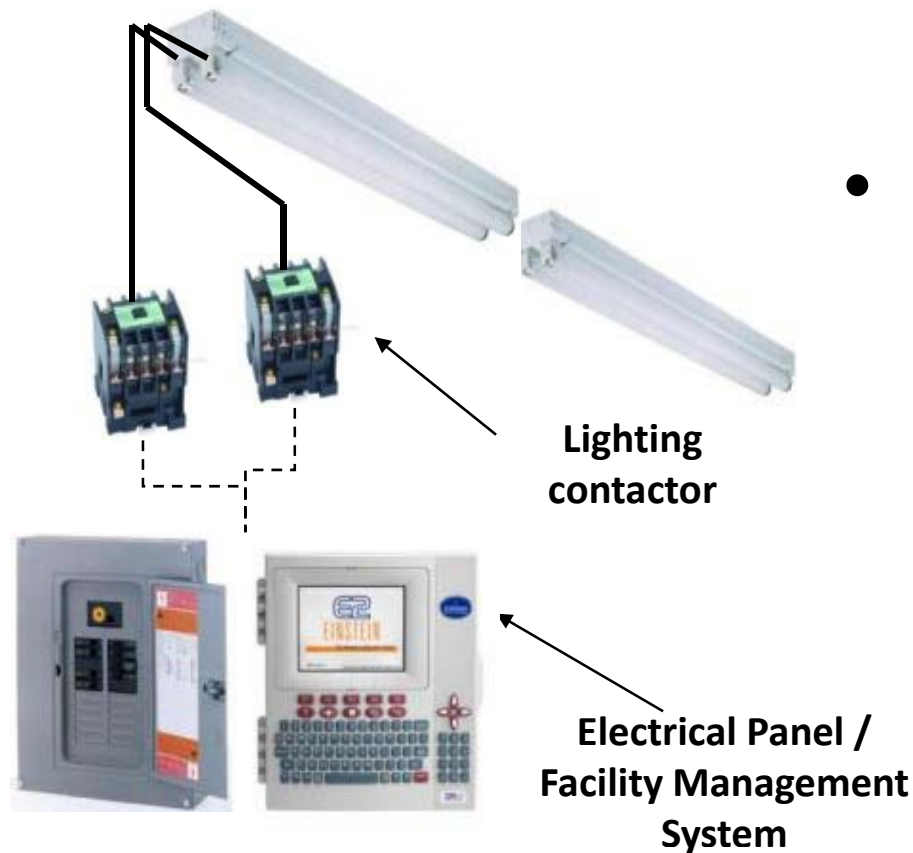
- **Energy reduction**
 - 35-60% reduction in annual energy reduction for lighting *
 - Generally during periods of peak demand
- **Improved environment for building occupants**
 - Increased sales **
 - Increased productivity
 - Better health and greater occupant comfort
- **Highest quality light for merchandising**
 - Color Rendering Index (CRI 100)
- **Code compliance**

* TIAX LLC Study for DOE June 2008

** Heschon Mahone Study



Design Considerations: Control



- **Stepped Control**
 - Lighting can be controlled through stages with contactors.
- **Dimming Control**
 - Lighting can be controlled uniformly through a dimming system to maintain a constant level of lighting.
 - This method offers the greatest energy savings but has the highest first cost.
 - Only fluorescent and incandescent lighting can be practically dimmed.

Energy Conservation Opportunities

Efficient Refrigeration Systems

25% to 35% of the Total Energy Consumption



Energy Conservation Opportunities

Efficient Refrigeration Systems

- Compressors-high EER
- Digital capacity control
- Optimally sized condensers

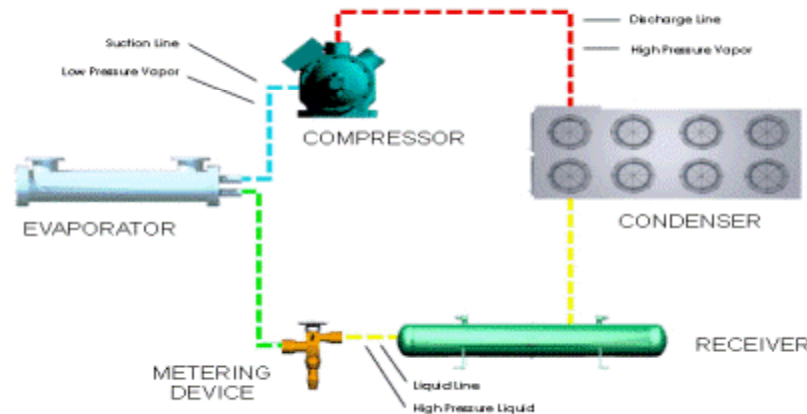


Energy Conservation Opportunities

- **Refrigeration/HVAC Condensers**
 - Transfer rejected heat from the refrigeration process
 - Play a pivotal roll in the refrigeration & HVAC performance & energy consumption
- **Insist on:**
 - “oversized condensers” max 15°f “T.D.”
 - Fin spacing no greater than 10 fins per inch
 - Low winter discharge pressures



**Significant
Energy
Savings**



Energy Conservation Opportunities

Efficient Refrigeration Systems

- Compressors-high EER
- Digital capacity control
- Optimally sized condensers
- Properly selected cooler evaporator coil
- Application of premium efficiency fan motors
- Piping designed for minimal pressure drop and good oil return
- Consider remote parallel refrigeration systems



Energy Conservation Opportunities

Remote Parallel Refrigeration Systems

- **Self-Contained Refrigeration Fixtures:**
 - Relatively inefficient
 - Noisy
 - Difficult and expensive to maintain
 - Always rejecting heat into the store – discomfort
- **Parallel Compressor Systems**
 - Significantly more efficient (15 to 20%)
 - Significantly better temperature control
 - Removes noise and heat from sales area
 - Failure of a single compressor will not cause product loss
 - Easier to maintain and control
 - Ideal for store heat reclaim (hot water and space)
 - Use optimum refrigerants



Energy Conservation Opportunities

Efficient Refrigeration Systems

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HVAC Systems

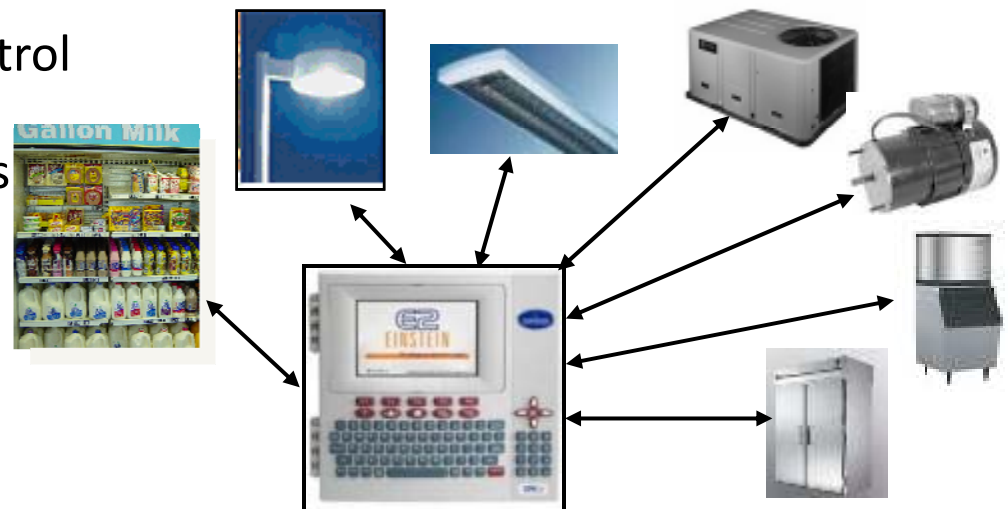
- Select high SEER units
- Able to control both humidity and temperature
- Manage the fresh-air requirements
- Effective control



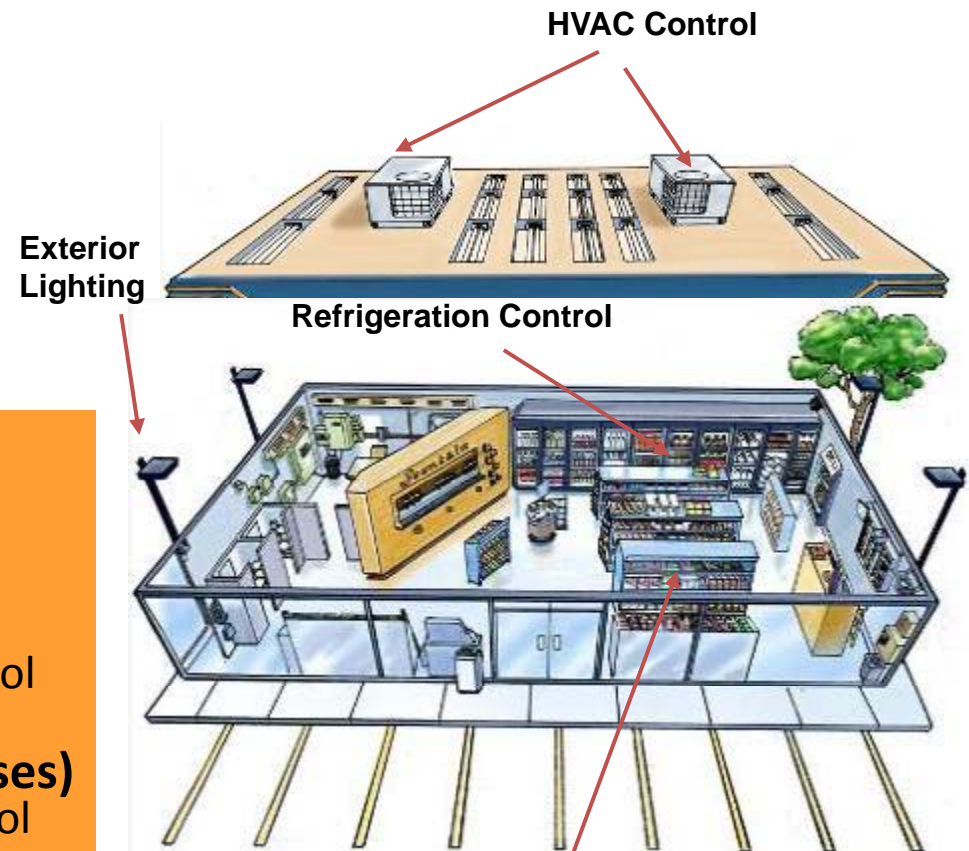
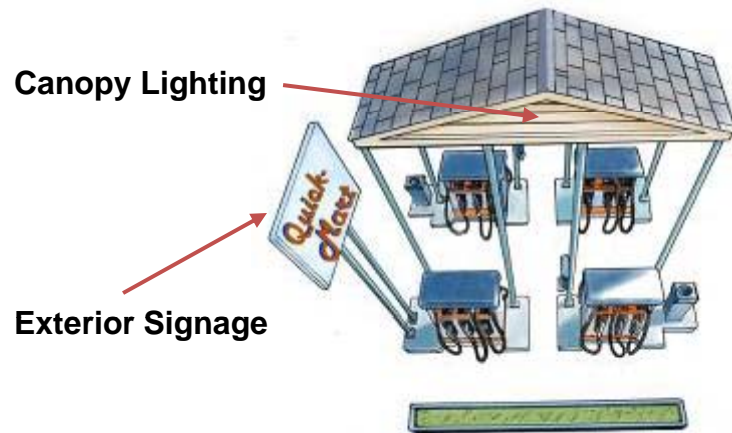
Energy Conservation Opportunities

- **Optimized control strategies offer large potential for energy reduction**

- Effective refrigeration temperature and defrost control
- Compressor control based on temperature and pressure
- Condenser and evaporator fan control
- Store temperature and humidity
- Night set-back
- Economizer control
- Anti- condensate heater control based on dew point temperature
- Cooking hood fan control
- Variable speed HVAC fan control
- KW Demand control
- Lighting and other appliances



Control of Key Store Systems



Milk / Beverage Case

- **Exterior Lighting**
 - Controlled Via Time Schedules And Light Level Sensor
- **Refrigeration (Walk in Cooler)**
 - Sequences Critical Operations
 - Product And Air Temperature Control Of Coolers And Freezers
- **Refrigeration (Sandwich / Dairy Cases)**
 - Product and Air Temperature Control
- **Glass Door Heater**
 - Pulsing vs. Consistent Heat
- **HVAC**
 - Optimized Control Of Rooftops And Split Systems

Energy & Maintenance Enhancements with Advanced Facility Controls

- 8-20% energy reduction
- Targeted approach to energy & maintenance reductions
- Enables service providers to access facilities remotely
- On condition maintenance
- Enterprise view of costs, energy performance, failure rates etc.



LEED Opportunities

- Bottom Line
 - A well designed and controlled store has the potential of reducing the annual energy expense by up to 20%!

