Practical Energy Savings for Main Street Businesses

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SEDAC Client Profile

- Medium Sized Small Businesses
  - 8,000 sf floor space
  - $50k/yr utility bills

- Public Sector Businesses
  - City Buildings
  - Schools (K-12, community colleges)
Main Street Businesses

- 1-2 story brick
- > 50 yrs
- 2400 sf
- Common walls
- Single pane windows, minimal insulation
- Office, Retail, Restaurant, Residential
Energy Issues

- Increasing Costs
- Depleting Supplies
- Increasing Dependence on Foreign Sources
- Increased Environmental Cost – Pollution, Climate Change, Wastes
- Disproportionate Use compared to population & supplies
Energy Facts

- We have 5% of the world’s population, we use 25% of its production.
- Increasing Competition from growing world population & increased standards of living.
- Domestic Supplies (Reserves/Consumption):
  - 3.4 yrs oil, 8.4 yrs natural gas.
The Path to Energy Sustainability

- Efficiency
- Renewable Energy
- Economic Attitude Adjustments
  - Recognition of External Costs/Benefits
  - Life Cycle Costing
  - Management of Cash Flows
Efficiency

Cost of efficiency down, price of energy up.

- Efficiency = cleanest, cheapest, safest, and most secure source energy we have.
- Substantial efficiency potential untapped.
- Incentives EPAct 2005 = tax deductions and credits for energy efficiency and renewable energy.
- IL Utility Rebates (Commercial Sector already reserved in ’08. IL total: $53M, Next appropriation 6/09:$111M, ’10: $171M)
Life Cycle Costing

- Recognition that first cost of equipment is not the only bill to pay

Additionally…

- Operations (fuel and labor)
- Maintenance (parts and labor)
- Removal
- Disposal or Salvage
Management of Cash Flows

- Pay more now, save year after year
- Allow savings to pay for financing
- Roll Quick Savings into Long Term Investments
Game Plan

ENERGY STAR Guidelines For Energy Management

1. Make Commitment
2. Assess Performance & Set Goals
3. Create Action Plan
4. Implement Action Plan
5. Evaluate Progress
6. Recognize Achievements
7. Re-Assess

This cycle represents the continuous improvement process in energy management.
Performance Assessment

- Accounting of Energy Use and Costs
- Comparison with Similar Facilities
- Goals

Tools:

- Energy Star Target Finder
  - (>5ksf)
- Business Energy Analyzer
  - www.energyguide.com
## Energy and Cost Performance Indicators – EUI, ECI

<table>
<thead>
<tr>
<th>Principal Building Activity</th>
<th>EUI kBtu/sf/yr</th>
<th>ECI $/sf/yr</th>
<th>Target Max LPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential (IL)</td>
<td>54</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td>74</td>
<td>1.93</td>
<td>1.3W/sf + 0.9W/sf display</td>
</tr>
<tr>
<td>Office</td>
<td>93</td>
<td>2.23</td>
<td>0.9W/sf</td>
</tr>
<tr>
<td>Food Service</td>
<td>258</td>
<td>6.33</td>
<td></td>
</tr>
</tbody>
</table>

**Typical Energy Costs**

<table>
<thead>
<tr>
<th>$/kwh Elec</th>
<th>$/ therm NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.11</td>
<td>$1.20</td>
</tr>
</tbody>
</table>

**Target Svgs**

<table>
<thead>
<tr>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
</tr>
</tbody>
</table>
Energy Use Intensity

\[ \text{EUI} \left( \frac{\text{Energy}}{\text{Cost}} \right) = \frac{\frac{h}{\text{Energy}} \times 3.412 + \frac{\text{Cost}}{\text{Cost}}}{\text{Cost}^2} \times 100 \]

Energy Cost Intensity

\[ \text{ECI} \left( \frac{\text{Cost}}{\text{Energy}} \right) = \frac{\text{Cost} / \text{Energy}}{\text{Cost}^2} \]
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### Business Basics

- **Business Type:** Office Building - Office Space
- **Size (Sq. Ft.):** 2400
- **ZIP Code:** 60640
- **E-Mail Address:** (Your e-mail address can be used to log-in for return visits. Please select 'yes' to opt-in to our e-mail communication that can be beneficial for your business.
  - Yes

Please review and update the following to better match your business...

- **Number of floors:** 2
- **Age of building:** more than 50 years

Please tell us about your energy bill:

<table>
<thead>
<tr>
<th>Energy Use</th>
<th>Don't Have / Don't Pay</th>
<th>Electric</th>
<th>Gas</th>
<th>Propane</th>
<th>Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating (primary)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating (secondary)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling (primary)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling (secondary)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Heating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigeration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **What percentage of total area is...**
  - **Heated?** 100%
  - **Cooled?** 100%

**Opening Time / Start-up**

**Closing Time / Shut-down**
Utility Cost Breakout

Office

- Ltg 38%
- Htg 11%
- Clg 12%
- Eqpt 20%
- Refrigeration 1%
- Vent 7%
- ISHW 4%
- Other 7%

Retail

- Ltg 46%
- Htg 19%
- Clg 11%
- Eqpt 6%
- Refrigeration 6%
- Cook 1%
- Vent 5%
- SHW 3%
- Other 7%

Restaurant

- Ltg 15%
- Cook 33%
- Eqpt 20%
- Refrigeration 2%
- Htg 6%
- Clg 3%
- Vent 5%
- SHW 7%
- Other 9%
Benchmark-Comparison

We've displayed your annual energy use on a benchmark scale, developed from a national survey of similar businesses.

We've made adjustments for weather conditions, building size, fuel utilization, and other basic characteristics that you told us about your business. Every business is different, but we've tried to level the playing field to see how your business compares.

Use these performance benchmarks to assess: how much energy improvement is reasonable, and (if your business uses multiple fuels) which energy sources have room for improvement.
Energy Guide - ECRMs

These are initial results, based upon the initial set of questions that you've answered about your business. To learn more about an energy management opportunity, click on its title in the table below.

<table>
<thead>
<tr>
<th>Add to My PLAN</th>
<th>Savings Opportunity</th>
<th>Estimated Annual Savings</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>Heating Install High-efficiency Boiler</td>
<td>$280-$420</td>
<td></td>
</tr>
<tr>
<td>☐</td>
<td>Heating Install New Furnace.</td>
<td>$180-$270</td>
<td></td>
</tr>
<tr>
<td>☐</td>
<td>Lighting &quot;T-8&quot; Energy-efficient Fluorescent Lighting</td>
<td>$150-$230</td>
<td></td>
</tr>
<tr>
<td>☐</td>
<td>Cooling Install a High-efficiency Air Conditioner</td>
<td>$150-$220</td>
<td></td>
</tr>
<tr>
<td>☐</td>
<td>Lighting Install Compact Fluorescent Lamps</td>
<td>$140-$210</td>
<td>No/Low Cost</td>
</tr>
</tbody>
</table>
Create and Implement a Plan

- Energy Cost Reduction Measures (ECRMs)
  - Apply Tried and True Measures
  - Get Specialized Assistance
Sure Bets for Energy Savings

- Clean it up
- Tune it up
- Turn it down
- Turn it off
- Seal it up
# Investment Horizons

<table>
<thead>
<tr>
<th>ECRM</th>
<th>Typical Return of Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion Sensors</td>
<td>0.5 yr</td>
</tr>
<tr>
<td>Tune Up</td>
<td>1 yr</td>
</tr>
<tr>
<td>Programmable T-Stat</td>
<td>1 yr</td>
</tr>
<tr>
<td>Lighting</td>
<td>1-5yrs</td>
</tr>
<tr>
<td>Sealing</td>
<td>2 yrs</td>
</tr>
<tr>
<td>Window Films/ Film Windows</td>
<td>3 yrs</td>
</tr>
<tr>
<td>Insulation</td>
<td>7 yrs</td>
</tr>
<tr>
<td>HVAC replacement</td>
<td>12 yrs</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>20 yrs</td>
</tr>
<tr>
<td>Windows</td>
<td>25 yrs</td>
</tr>
</tbody>
</table>
Recommended ECRMs

- **Upgrade Lighting**
  - Zone Lighting
  - Change to more efficient sources (from incandescent and old fluorescent to Super T8, CFL, LED, CMH, HIR – display only)
  - Add Lighting Controls (Occupancy, photo, dimmer, timers)

- **Improve Operation and Control of HVAC**
  - Heater tune-up,
  - Programmable T-stat,
  - Radiator valves,
  - Zoned HVAC

- **Upgrade Envelope** (sealing, insulate, window treatments)

- **Upgrade HVAC and Appliances**
Recommended ECRMs-Restaurant

- **Kitchen Energy Management**
  - Reduce Idle

- **Refrigeration**
  - Plastic strip doors
  - High efficiency fan motors
  - Floating heat pressure

- **Modulated Kitchen Ventilation**
  - Demand Control

- **Low Flow Pre-Rise Sprayer**
Retail Lighting Zones

retail lighting elements

- accent
- ambient
- perimeter

valance
<table>
<thead>
<tr>
<th>Existing Lamp</th>
<th>Retrofit Lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 W Halogen PAR Accent Light</td>
<td>20% fewer 40W Halogen-IR PAR</td>
</tr>
<tr>
<td>50 W Halogen PAR Ambient Light</td>
<td>13W CFL PAR</td>
</tr>
<tr>
<td>60W Incandescent</td>
<td>14W CFL</td>
</tr>
<tr>
<td>20 W Exit lamp</td>
<td>1.5 W LED</td>
</tr>
<tr>
<td>0.48W Mini Incandescent Holiday Lights</td>
<td>0.08W LED Holiday Lights</td>
</tr>
<tr>
<td>Existing Lamp/Ballast</td>
<td>Retrofit Lamp/Ballast</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td><img src="image1" alt="Existing Lamp/Ballast" /></td>
<td><img src="image2" alt="Retrofit Lamp/Ballast" /></td>
</tr>
<tr>
<td>34-40W T-12 Lamps w/ Magnetic Ballasts</td>
<td>28W High Efficiency T-8 Lamps w/ Electronic Ballasts</td>
</tr>
<tr>
<td><img src="image3" alt="Existing Lamp/Ballast" /></td>
<td><img src="image4" alt="Retrofit Lamp/Ballast" /></td>
</tr>
<tr>
<td>65 W Incandescent Reflector (Dimmable)</td>
<td>Two 9W CFL w/ additional track for bi-level lighting (non-dimmable)</td>
</tr>
<tr>
<td><img src="image5" alt="Existing Lamp/Ballast" /></td>
<td><img src="image6" alt="Retrofit Lamp/Ballast" /></td>
</tr>
<tr>
<td>40W Flame Tip</td>
<td>8W Cold Cathode Flame Tip</td>
</tr>
</tbody>
</table>
Lighting Controls

- Occupancy
- Photo
- Dimming
- Timers
Improved Operation and Control - HVAC

- Heater tune-up,
- Programmable T-stat,
- Radiator valves,
- Zoned HVAC
- Free cooling
Ceiling Fans
Upgrade Envelope

Building Envelopes (beyond code):

- Increased insulation levels.
- Infiltration air sealing and duct sealing.
- Better windows (Double Pane, Low-E, U-values 0.4 or less).
Equipment Replacement

- Heating, Ventilating, & Air-Conditioning:
  - Sealed combustion high efficiency boilers and furnaces 92%+
  - High SEER/EER Air-Conditioning units, SEER15+, EER11.5+
  - Geothermal heat pumps
  - Ventilation heat recovery systems
  - Demand control ventilation, or scheduled ventilation
Upgrade Equipment

- Energy Star appliances
Window Treatments

- Low-e Window films
- 2 pane film windows
- Storm windows
- New windows
- Awnings
Energy Star – A Galaxy of Resources

- Product Labeling
- Energy Management Methods
- Benchmarking
- Recognition

ASK ABOUT ENERGY STAR
Getting Technical Assistance

- SEDAC 1-800-214-7954
  - Small Business or Public Sector
  - 8000 sf
  - > $50k/yr utility bill

- SEDAC Service Providers List
Setting Priorities

- Needs
- Technically Appropriate
- Biggest Energy Users
- Biggest Energy Costs
- Work from End Use Back to Central Plant
- Capital for Down Payment
- Rolling Quick Savings into Long Term Investments
### Economic Indicators

<table>
<thead>
<tr>
<th></th>
<th>Simple Payback (SPB)</th>
<th>Net Present Value (NPV)</th>
<th>Internal Rate of Return (IRR &amp; ROI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meaning</strong></td>
<td># of years to recoup additional costs from annual savings</td>
<td>Total value of project in today’s dollars</td>
<td>Annual interest yield of project during its lifetime</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>5 year simple payback</td>
<td>$1.5 million NPV</td>
<td>10 % IRR</td>
</tr>
<tr>
<td><strong>Criteria</strong></td>
<td>Payback &lt; n years</td>
<td>Positive indicates profitable project</td>
<td>IRR &gt; discount rate</td>
</tr>
<tr>
<td><strong>Comment</strong></td>
<td>■ Misleading ■ Ignores financing &amp; long-term cashflows ■ Use when cash is tight</td>
<td>■ Good measure ■ User must specify discount rate ■ Long time horizon</td>
<td>■ Can be fooled when cashflow goes positive-negative-positive ■ Shorter horizon</td>
</tr>
</tbody>
</table>
Financial Incentives

- Grants
- Tax Credits
- Tax Deductions
### Commercial Tax Deduction - EPAct 2005 (thru 12/13)

<table>
<thead>
<tr>
<th>Category</th>
<th>Energy Savings (vs. ASHRAE 90.1-2001)</th>
<th>Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Building</td>
<td>50%</td>
<td>Deduction of up to $1.80/sq. ft.</td>
</tr>
<tr>
<td>Lighting, HVAC/hot water, or Envelope</td>
<td>16.7% per system</td>
<td>Deduction of up to $0.60/sq. ft. per system</td>
</tr>
<tr>
<td>Lighting savings of at least 25%</td>
<td>25-50%</td>
<td>Sliding scale: $0.30/sq. ft. for 25% savings to $0.60/sq. ft. for 40% and above</td>
</tr>
</tbody>
</table>
Rebates

- **State Rebate** –
  - Solar Thermal 30% up to $10k, 60sf+
  - Solar PV 30% up to $10k, sys> 1kW

- **Utility Rebates** – Electric Savings
  - Prescriptive Measures
  - Customized Projects

- **Rebates for NG in Future**
Illinois Portfolio Std – ECRM Rebates

- State law for Energy Efficiency (EE) and Renewable Energy (RE)

**IL Utility Requirements:**
- Elec svgs (kWh) of 0.2%-2% (2008-2015)
- Renewable Power 2-25% (2008-2015)
- Rebates of Tariffs to Customers
IL Utility Rebate Incentive Levels

**Standard**
- Set incentives for a standard list of equipment upgrades

**Custom**
- 7 cents/kWh for measures with 1-7 year payback

**Caps**
- $100,000 per program year (June to May)
- \( \leq 100\% \) of Incremental Measure Costs (added cost of increasing efficiency beyond standard replacement option)
- \( \leq 50\% \) of Total Project Costs
## Lighting Information

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Incentive/ Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Fluorescent Lamps (Screw-in)</td>
<td></td>
</tr>
<tr>
<td>15W or Less</td>
<td>$1.50</td>
</tr>
<tr>
<td>16W – 26W</td>
<td>$1.50</td>
</tr>
<tr>
<td>26 W or Greater</td>
<td>$2.00</td>
</tr>
<tr>
<td>Hardwired Compact Fluorescent Fixtures</td>
<td></td>
</tr>
<tr>
<td>20W or Less</td>
<td>$25.00</td>
</tr>
<tr>
<td>30W or Greater</td>
<td>$50.00</td>
</tr>
<tr>
<td>Permanent Lamp Removal (Pre-Approval Application Is Required)</td>
<td></td>
</tr>
<tr>
<td>Remove 4-foot Lamp</td>
<td>$6.00</td>
</tr>
<tr>
<td>Remove 8-foot Lamp</td>
<td>$8.00</td>
</tr>
<tr>
<td>Remove 4-foot Lamp with reflector</td>
<td>$12.00</td>
</tr>
<tr>
<td>Remove 8-foot Lamp with reflector</td>
<td>$16.00</td>
</tr>
<tr>
<td>High Performance 4-foot T8</td>
<td></td>
</tr>
<tr>
<td>4-foot Lamp and Ballast</td>
<td>$7.00</td>
</tr>
<tr>
<td>Reduced Wattage 4-foot T8</td>
<td></td>
</tr>
<tr>
<td>4-foot Lamp and Ballast</td>
<td>$7.00</td>
</tr>
<tr>
<td>4-foot Lamp Only</td>
<td>$1.00</td>
</tr>
<tr>
<td>Reduced Wattage 8-foot T8</td>
<td></td>
</tr>
<tr>
<td>8-foot Lamp and Ballast</td>
<td>$10.00</td>
</tr>
<tr>
<td>8-foot Lamp Only</td>
<td>$1.00</td>
</tr>
</tbody>
</table>
Review

- Impetus for Change in Energy Mgt
- Informed Response
  - Commitment
  - Audit
  - Efficiency Improvement Options
  - Technical Assistance
  - Economics
- Follow Through
Illinois Smart Energy Design Assistance Center

Web site: www.sedac.org
Contact: info@sedac.org
1-800-214-7954