The Case for Home Energy Efficiency Measures

BASEA
Proposed topics for this discussion

• Macro view: Why saving energy in households is important

• Micro view: How saving energy can help you

• Why aren’t more homeowners doing this?

• What Energy Efficiency companies need to do...now

Are there other topics you would like to hear about?
Macro view: Residential buildings account for 15.3% of greenhouse gases

U.S. GHG emissions flow chart
McKinsey identified energy efficiency as a significant savings opportunity.
Some quotes from leading media sources on the benefits of home energy efficiency

“Obviously, game-changing technologies will...be essential to achieving the reductions in greenhouse gas emissions...But as it frames its strategy to deal with both problems, the Obama administration cannot overlook the low-hanging fruit — the gains to be had from making existing technologies more efficient...most of the carbon abatement needed between now and 2030 could be achieved with existing technologies, things like insulating homes, improving fuel efficiency...


“Correct those [air leak] flaws, and heating and cooling costs are typically cut by 20 percent to 30 percent, a saving of more than $1,000 annually in some households. In addition, carbon dioxide emissions and the strain on the national electric and gas systems are reduced.


“Whereas the burning of fossil fuels releases greenhouse gases, which contribute to global warming, and nuclear plants generate life-threatening waste, the only by-product of energy efficiency is wealth, in the form of lower fuel bills and less spending on power stations, pipelines and so forth....

Micro view: How much can individual homeowners benefit from energy efficiency?

Example monthly energy bill (all energy sources)

<table>
<thead>
<tr>
<th>Before EE upgrades</th>
<th>After EE upgrades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating (electric, gas, oil, etc)</td>
<td>$320</td>
</tr>
<tr>
<td>Electricity</td>
<td>$100</td>
</tr>
</tbody>
</table>

Avg monthly savings of ~$65

Average annual return on investment over 5 year period

EE upgrades: 107%
100 year stock market average: 10%
NSL experience: 30%-200%

Source: Buildings Energy Databook 2004; EnergyStar.gov; EERE.gov; aceee.org
So if Energy Efficiency upgrades are such a home run, why don’t more people do them?

• **Many people don’t realize their homes are inefficient**
  - The costs of excess energy usage are mostly invisible
    - e.g. air conditioned air leaking out of homes
  - We all may have an idea about what our monthly energy usage should be (based on previous houses), not knowing that nearly all houses in the US are inefficient
    - Homes are built with an eye towards costs and deadlines, not efficiency
  - We think mainly of transportation when we try to figure out ways to cut our footprint

• **Even those who realize their homes are inefficient may find it difficult to act**
  - Each house has a unique footprint with specific savings opportunities
  - Identifying the highest impact changes takes specialized training and equipment
  - Once the right changes are identified, it can be burdensome to enact solutions
  - Overall savings are either unclear or not seen as worth their efforts

Chances are...your home is inefficient. Now what?
Market landscape needs to evolve—EE companies need to become data-driven and action-oriented.

- **Ideal service**
  - Analytic home assessment (using blower door and infrared camera) with detailed, quantified savings opportunities
  - Extensive actions implemented (driven by home assessment)

- **Building diagnostic companies**
  - Detailed home performance assessment
  - No on-the-spot improvements

- **Utility sponsored audits**
  - No analytic tools used (no blower door, no infrared camera)
  - Few on-the-spot improvements

- **General contractors**
  - No home assessment
  - Actions implemented if already identified (homeowners often need multiple contactors)

The image uses a matrix to illustrate the thoroughness of home assessment and the extent of actions implemented, comparing different service providers.
In other words, EE companies have to make it easy for you through a simple step-by-step process

1. **Diagnose**
   - Review with customer a survey completed prior to visit that outlines current energy usage behavior and needs
   - Conduct an analytical and rigorous assessment of the home laying out prioritized changes needed

2. **Create customized plan**
   - Show consumer clear menu options of savings measures and estimated savings over time:
     - Immediate efficiency upgrades (e.g. door sealing and weather stripping, hot water pipe insulation, CFL replacement, etc.)
     - Longer payback efficiency options identified in the assessment (e.g. attic insulation upgrades, air circulation fan installation, appliance upgrades)
     - Behavior changes (e.g. turn off lights when not in a room; automatic sleep mode for computers)

3. **Execute upgrades**
   - Immediately implement efficiency (Level 1) upgrades in the home that day
   - Provide level II attic air sealing and insulation for those who choose this service

4. **Follow-up**
   - Calculate and track energy/carbon savings
   - Provide customer updates about new upgrades applicable to their home
   - Provide recommended contractors for larger jobs
EE company services should target main drivers of home energy usage

U.S. Residential Buildings Primary Energy End-Use Splits, 2004

Total Energy Consumption:
21.07 Quadrillion Btu

- Space heating: 31%
- Water heating: 13%
- Lighting: 12%
- Space cooling: 11%
- Refrigeration: 8%
- Electronics: 5%
- Cooking: 5%
- Other: 14%

Source: Buildings Energy Databook 2004
Our service does this, and we hope others will soon follow

**NSL Step 1 Energy Saving Services**

- If possible, turn off anti-moisture switch
- Raise the ambient refrigerator temp.
- Replace most used light bulbs with CFLs
- If possible, turn off auto heating on dishwasher
- Insulate hot water pipes
- Lower water heater temp.
- Install low flow shower heads
- Install efficient faucet aerators
- Seal as many high impact leaks as time allows

**Step 1 measures should result in 10-20% annual savings**

Source: Buildings Energy Databook 2004; EnergyStar.gov; EERE.gov; aceee.org
Just as critically, EE companies need to track data to ensure that customers are saving.

### NSL customer energy tracking software

<table>
<thead>
<tr>
<th>Month</th>
<th>KWH Usage</th>
<th>Therm Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2007</td>
<td>700.00</td>
<td>784</td>
</tr>
<tr>
<td>January 2008</td>
<td>548.00</td>
<td>431</td>
</tr>
<tr>
<td>February 2008</td>
<td>456.00</td>
<td></td>
</tr>
<tr>
<td>March 2008</td>
<td>340.00</td>
<td></td>
</tr>
<tr>
<td>April 2008</td>
<td>310.00</td>
<td></td>
</tr>
<tr>
<td>May 2008</td>
<td>300.00</td>
<td></td>
</tr>
<tr>
<td>June 2008</td>
<td>280.00</td>
<td></td>
</tr>
<tr>
<td>July 2008</td>
<td>270.00</td>
<td></td>
</tr>
<tr>
<td>August 2008</td>
<td>250.00</td>
<td></td>
</tr>
<tr>
<td>September 2008</td>
<td>240.00</td>
<td></td>
</tr>
<tr>
<td>October 2008</td>
<td>230.00</td>
<td></td>
</tr>
<tr>
<td>November 2008</td>
<td>220.00</td>
<td></td>
</tr>
</tbody>
</table>

Sample customer electricity usage before and after NSL Step 1 service, in kwh

<table>
<thead>
<tr>
<th>Month</th>
<th>Annual electricity savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2007</td>
<td>~$700</td>
</tr>
<tr>
<td>December 2008</td>
<td>~$350</td>
</tr>
</tbody>
</table>

Source: Buildings Energy Databook 2004; EnergyStar.gov; EERE.gov; aceee.org

Tracking data will ensure that the EE service is always optimized.
Customer savings data: 15 most recent customers

Estimated annual customer savings by type of measure, most recent 15 customers

<table>
<thead>
<tr>
<th>Customers</th>
<th>Air sealing</th>
<th>Insulation</th>
<th>Materials ordered on the spot</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>228</td>
<td>1</td>
<td>362</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>199</td>
<td>1</td>
<td>321</td>
<td>240</td>
</tr>
<tr>
<td>3</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>220</td>
</tr>
<tr>
<td>4</td>
<td>314</td>
<td>1</td>
<td>314</td>
<td>210</td>
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<tr>
<td>5</td>
<td>296</td>
<td>1</td>
<td>321</td>
<td>190</td>
</tr>
<tr>
<td>6</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>180</td>
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<td>7</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>170</td>
</tr>
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<td>8</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>160</td>
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<td>9</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>150</td>
</tr>
<tr>
<td>10</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>140</td>
</tr>
<tr>
<td>11</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>130</td>
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<tr>
<td>12</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>120</td>
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<td>13</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>110</td>
</tr>
<tr>
<td>14</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>100</td>
</tr>
<tr>
<td>15</td>
<td>314</td>
<td>1</td>
<td>317</td>
<td>90</td>
</tr>
</tbody>
</table>

Average across all customers: $408

Estimates are based on 2009 Dept of Energy estimates for fuel prices (e.g. $2.22 per gallon for oil)
Case Study: Wrapping Attic AC and replacing CFLs led to 28% savings

Typical 3 bedroom home in Needham

- **Diagnosis and changes**
  - Made standard changes within 3 hours on one visit
  - Audit also identified AC in attic as uninsulated and costly

- **Results**
  - Client immediately started saving $75 in electricity alone each month.
  - They are on track to save even more in winter heat and light bills
  - All the work was done by top notch certified auditors and contractors

Other test homes are in the 15-33% savings range

*28% is over two months, average*
Since we know where the opportunities are, it’s important for EE companies to do on-the-spot implementations. The diagram illustrates the different levels of thoroughness and the next steps for various types of companies:

- **Building diagnostic companies**
  - High thoroughness
  - Detailed home performance assessment
  - No on-the-spot improvements

- **Utility sponsored audits**
  - Low thoroughness
  - No analytic tools used (no blower door, no infrared camera)
  - Few on-the-spot improvements

- **General contractors**
  - Low thoroughness
  - Actions implemented if already identified (homeowners often need multiple contactors)

- **Next Step Living**
  - High thoroughness
  - Analytic home assessment (using blower door and infrared camera) with detailed, quantified savings opportunities
  - Extensive actions implemented (driven by home assessment)
Here’s why it makes sense to use us!

- **We back our services with a 100% Satisfaction Guarantee**
  - If your energy usage doesn’t **drop by at least 10%** for the 12 months following our service, we’ll come back and make sure you get there—Guaranteed

- **We save you more for less**
  - The average annual return on our services ranges from 30% to 200% over a 5 year period
  - Studies show changes implemented from a free audit save homeowners 5-10% vs. **10-20%+** from our services. **Our services also cost less** than buying all these services independently

- **We save you time and hassle**
  - One point of contact versus several
  - Fewer visits to your home

- **We quantify and make the options simple for your specific home**

- **We bring financing options and all rebates** to your doorstep

- You have an **ongoing advisor you can trust** when considering other projects because we know your home and **we advise against projects that don’t make sense for you!**

- **Our field personnel are experienced and professional**
Savings from NSL’s Level 1 service are ~50% higher than savings from implementing changes recommended by typical free audits.

*Assuming annual energy expense of $4500

![Bar chart comparison between Typical free audit and Next Step’s Level 1 service](chart.png)

**Typical free audit**
- Cost: $550
- Expected annual savings:
  - Savings (average): $450
  - Savings (high-end estimate): $450

**Next Step’s Level 1 service**
- Cost: $609
- Expected annual savings:
  - Materials: $609
  - Savings (average): $675

Expected annual savings for free audit based on 5% savings rate (actual independent study) and 10% savings (from Residential Conservation Services Roundtable study; Free audit cost to implement includes time to search for good contractors (3 hours at $50/hr), Labor cost to implement changes, and retail cost of materials. Source: Buildings Energy Databook 2004; EnergyStar.gov; EERE.gov; aceee.org
Our Step 1 service will identify the problem areas in your home, and we’ll give you a custom report prioritizing the projects based on savings potential!

**Rigorous assessment includes infrared camera to find areas in your home where heat escapes**

**Sample report output**
Here’s why it makes sense to use us!

- **We are obsessed with achieving the best results for our customers**
  - We back our services with a 100% Satisfaction Guarantee
    ‣ If your energy usage doesn’t drop by at least 10% for the 12 months following our service, we’ll come back and make sure you get there—Guaranteed
  - We track your savings and share the results with you to make sure you are satisfied and that our services are working
    ‣ The average annual return on our service ranges from 30% to 200% over a 5 year period—significantly higher than the average annual stock market return of 10%

- **We make it easy for you**
  - We save you time and hassle
    ‣ One point of contact versus several
    ‣ Fewer visits to your home
  - We quantify and make the options simple for your specific home
  - We bring financing options and all rebates to your doorstep
  - We are your ongoing advisor for considering other projects because we know your home and we advise against projects that don’t make sense for you!

- **We guarantee the best-trained and most customer friendly workforce available**
  - Our field personnel are trained by the most experienced master auditors in the state and certified by us to meet best of industry standards
  - All employees receive intensive customer effectiveness training to ensure the best possible experience for you
Top seven benefits for Employers

1. Ability to offer a new and unique benefit

2. In difficult times puts $30-$100 per month back in employees’ wallets

3. Low ONE TIME cost of $0-$599 depending on subsidy level; average ~$415 per employee

4. An offset to other benefits being cut and/or premiums being increased

5. Significant PR value from press covering this issue and Next Step Living

6. Employer gets total dollars and greenhouse gases it saved (NSL compiles)

7. Nearly always an improvement on existing green programs
   - Easy for HR to administer; outsourced to NSL
   - Simple billing; no receipts to approve
   - Usually 10-100X more environmental benefit per dollar
Employers can choose their funding level; financing options are flexible

<table>
<thead>
<tr>
<th>Option</th>
<th>Cost to employer</th>
<th>Cost to Employee</th>
<th>Benefit to Employer</th>
<th>Benefit to Employee</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full Subsidy</strong></td>
<td><strong>100% Subsidy</strong>: $599 + Materials</td>
<td>$0</td>
<td>Maximizes adoption rate, greenhouse gas savings number, and amount saved to employees</td>
<td>Saves 100% of energy cost reduction each month</td>
</tr>
<tr>
<td></td>
<td>Only $187 for National Grid and Nstar gas customers in MA*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Means employers can serve all employees for ~$350 each if ~half are gas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Partial Subsidy</strong></td>
<td><strong>50-75% subsidy plus interest</strong></td>
<td>Monthly loan payments likely $10-15</td>
<td>Strong adoption rate if promoted by employer; High employee satisfaction; moderate “green” factor</td>
<td>Immediate payback since cash flow positive from day one; Monthly savings of $30-$120&gt; monthly loan payments of $10-$20</td>
</tr>
<tr>
<td></td>
<td>Employer subsidizes some of cost and creates a guaranteed “loan” for remainder through paycheck reduction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Loan to employee</strong></td>
<td><strong>0% subsidy plus interest</strong></td>
<td>Monthly loan payments likely $15-$20</td>
<td>Moderate adoption rate if promoted by employer; Employer serves as a conduit for payment</td>
<td>Doesn’t need to front the money for the audit</td>
</tr>
<tr>
<td></td>
<td>Employer loans 100% of upfront cost to employee and earns interest from loan</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*National Grid and NSTAR gas customers now qualify for 75% off the price of this service plus any additional work up to $2,000. This means employers pay ~$180 for each customer in this category (usually ~50-60% of employee base)