International Center for Appropriate and Sustainable Technology

Sustainable Development for Communities
To provide economic, environmental, and social benefits to communities in a way that builds local capacity
The iCAST Model

Educational Institutions

Industry Experts

Government and NGO's

Communities
ResourceSmart

- Turn-Key Services
  - Residential & Commercial
  - EE, Water, IAQ, Education
  - Contractor Training
  - Financing
1 Initial Contact
Interested customers contact us to sign up for assessment
✓ We work with you to find a time that best fits your schedule

2 Energy Assessment
BPI-certified energy assessor conducts a complete assessment of your home or business
✓ Comprehensive tests including insulation, lighting, HVAC, air sealing, infrared camera tour, and more ensures we gather a complete picture of your energy usage.

3 Report with Findings and Explanation
Receive detailed report with costs, savings and paybacks
✓ Core areas of improvement recommendations along with visual snapshots of areas experiencing energy loss
✓ Investment and payback details highlighted to show your true savings potential

4 Explore Financing Opportunities
Rebate/incentives and financing packages available if needed
✓ Financing loan packages reduce initial costs so you see positive savings from day one
✓ iCAST tracks and files all available rebates for highest savings

5 Decide and Finalize
You decide what improvement measures to implement
✓ Assess level of investment and costs vs. savings potential and agree to terms

6 Contractors Hired
iCAST finalizes contractors, pricing and schedule for you
✓ Network of trained contractors and volume discounts ensures you receive the best pricing

7 Work Begins
iCAST manages all contractors and work
✓ Create a timeline, orders supplies, performs quality checks, and keeps you updated on the progress of the entire scope of project

8 Work Completed, Quality Control
Work is approved and completed
✓ Final quality check of upgrades to ensure standards were met
✓ iCAST performs all project close out reporting and final invoice approval with contractors for you

9 Sit Back and Enjoy Your Upgrades
Watch your savings increase year after year!
✓ Enjoy a safer, more comfortable home/business environment while savings continue to build as energy costs rise each year!
Energy Usage in the US - Residential

2001 Residential Buildings Energy End-Use Splits

- Space Heating: 30%
- Water Heating: 17%
- Space Cooling: 10%
- Refrigeration: 9%
- Lighting: 12%
- Electronics: 5%
- Wet Clean: 5%
- Cooking: 4%
- Computers 1%: 4%
- Other: 4%
- Adjustment to SEDS: 3%

Total Energy Consumption: 20.12 Quadrillion Btu
Energy Usage in the US - Residential

Average Annual Expenditure per Household, by Year ($2010)

Average Expenditure

US Department of Energy Buildings Energy Data Book  buildingsdatabook.eere.energy.gov
Building Stock in the US - Residential

• There are 130,112,000 residential housing units in the U.S.
• The median age of ‘the American home’ is 36 years

<table>
<thead>
<tr>
<th>Year of Construction</th>
<th>Total Housing (in millions)</th>
<th>Total (quadrillion Btu)</th>
<th>Per Household (million Btu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1940</td>
<td>14.4</td>
<td>1.59</td>
<td>110.2</td>
</tr>
<tr>
<td>1940 to 1949</td>
<td>5.2</td>
<td>0.50</td>
<td>96.8</td>
</tr>
<tr>
<td>1950 to 1959</td>
<td>13.5</td>
<td>1.32</td>
<td>97.1</td>
</tr>
<tr>
<td>1960 to 1969</td>
<td>13.3</td>
<td>1.17</td>
<td>87.9</td>
</tr>
<tr>
<td>1970 to 1979</td>
<td>18.3</td>
<td>1.45</td>
<td>79.0</td>
</tr>
<tr>
<td>1980 to 1989</td>
<td>17.0</td>
<td>1.31</td>
<td>77.0</td>
</tr>
<tr>
<td>1990 to 1999</td>
<td>16.4</td>
<td>1.43</td>
<td>87.7</td>
</tr>
<tr>
<td>2000 to 2009</td>
<td>15.6</td>
<td>1.42</td>
<td>91.4</td>
</tr>
</tbody>
</table>

=> Opportunity for EE in homes exists – at 30% saving = $78B
Energy Usage in the US - Commercial

Average Annual Energy Expenditure per Square Foot, by Year ($2010)

- $0.50
- $1.00
- $1.50
- $2.00
- $2.50
- $3.00

Energy Waste

ENERGY STAR findings:

1. Energy waste is widespread — residential, commercial, education, and government entities are equally guilty.

2. Although “building components are 30% more efficient since 1980,” there has been little improvement in overall energy consumption.

Buildings have become more efficient, but not less wasteful.

=> Opportunity to reduce waste / EE exists
Water Conservation

By installing water-saving features:

- water use could decrease by 30 percent,
- saving 5.4 billion gallons per day.
- Saving more than $4 billion per year.

Indoor Air Quality

- Carbon Monoxide
- VOCs
- Allergens (pet dander, smoke)
- Mold and Mildew
- Radon
- Asbestos
IAQ – Health Concerns

- Short- and long-term health problems
- Reduce attendance and productivity
- Hasten building deterioration
- Strains in personal relationships
- Discomfort
- Liability issues or lawsuits

Indoor Air Quality Department of Health and Human Services: [http://epi.publichealth.nc.gov/air.html](http://epi.publichealth.nc.gov/air.html)
Results of the study:

- Over 90% of benefits are health
- Admissions to hospitals for respiratory conditions drop by 43%
- Days off school reduce by 23%
- Days off work drop 39%
- Identified the costs of certain diseases
- Psychological and stress benefits
- Quantitative risks to respiratory health established
The Food We Eat as a Nation

- Travels 2000 miles to get to us
- Has 10 calories of fossil fuel for every 1 calorie of food energy (for beef it is 50:1)
- Requires 2,000-3,000 quarts of water to produce (we usually only drink 1 quart a day)
- Is 1/3 hydrogenated oil and corn sweeteners

Source: YRG Consultants
Zero Mile Produce

Source: YRG Consultants
What Drives Change?

- Equipment
- Schedule
- Habits

Design

Operation

Occupants

Staffing
Controls
Maintenance
Commissioning

Technology
Integration
Installation
Components

Source: New Buildings Institute
Behavior Change

ENERGY DISTRIBUTION with TENANT ENGAGEMENT

Source: YRG Consultants
Occupant Behavior

Source: YRG Consultants
Energy Used Last Month: 1,137 kWh

Electricity Bill: $67.12

Your Energy Use compared to your neighbors:

Source: YRG Consultants
Economic Impacts

The Economic Opportunity Value Chain of Energy Efficiency

Energy Efficiency Measures (jobs, local and high quality) → Energy Bill Savings (consumer cost savings) → Productive Spending/Local Investments (jobs, local)

Economic Impacts

Economic Impacts

<table>
<thead>
<tr>
<th>Cost of Saved Energy</th>
<th>2-5 Cents per saved kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Generated Energy</td>
<td>6-7 Cents per kWh</td>
</tr>
<tr>
<td>Total current EE program costs</td>
<td>About $2 billion annually; ~ 0.5% of utility revenues</td>
</tr>
<tr>
<td>Current EE program benefits (gross output)</td>
<td>In the range of $250 billion through 2030</td>
</tr>
</tbody>
</table>
Energy Usage in the US

- Primary energy consumption in the building sector totaled 38.87 quadrillion Btu (quads) in 2009
  US Department of Energy Buildings Energy Data Book

- $500+ Billion Energy Industry (assuming $13/Million Btu)

- Investing $500 billion in energy efficiency could save building owners $1,900 billion through energy productivity.
  Amory Lovin - Farewell to Fossil Fuels - 2012

- Energy saving opportunities worth more than $130 billion annually in the US go unrealized
EE potential for SW

- EE program for Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming.
- 21% energy savings by 2020.
- Investment of $17 billion.
- Yield energy savings plus public health benefits of $37 billion.
- Avoid or close 32 large power plants in the region.
- Reduce CO2 emissions = to taking 6.2 million passenger vehicles off the road by 2020.
- Save 18.5 billion gallons of water per year.

SWEEP Report – 2012 - $20Billion Bonanza for the Southwest
Electric only EE program
IOUs in Colorado
Cumulative savings: 805.1 GWh
Total investment to date: $166.2 million
Customers saved $3.29 per $1 invested
Reported net economic benefits of $729.2M
Jobs created should equal 3,324 during retrofit and 6,000+ from the savings

Jeff Ackermann, Colorado Department of Regulatory Agencies, October 2012
International Center for Appropriate and Sustainable Technology

- Opportunity to Retrofit/Improve Exists
- And there are Benefits to Doing So

How can we make the improvements?
Current Status

- **Current Programs**
  - Utility rebates – Energy and Water
  - Government grants - particularly for the low-income, seniors and disabled
  - Government Incentives such as tax credits, etc.
  - Health related rebates and incentives do not exist

- **Financing** – low-cost or otherwise are not prevalent

- **Business models to implement at a Community scale are not prevalent**

- **Policies are not conducive (perhaps a hurdle)**
Retrofitting Your Community

The retrofitting will require funding:

- **PSA’s for awareness**
  - Local Government investment

- **Incentives:**
  - Utility Rebates based on performance
  - Government grants based on goals/results
  - Beneficiaries to incentivize retrofits to reap health benefits

- **Loans**
  - Risk Mitigation by Government for initial years

- **Regulations and Policy**
  - Building Codes
THANKS

QUESTIONS?

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