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"The Missing Link in Energy Programs: Human Behavior"

Scott G. McNall
Institute for Sustainable Development
California State University, Chico
smcnall@csuchico.edu

Residential Energy Consumption

- Residential energy use has increased 23% over last decade.
- Projected to grow another 24% by 2030.
- Reasons:
  - Population growth.
  - Populations moving to West and South, with increased demand for HVAC.
  - Housing retrofits: going to whole-house air conditioning.
  - Increase in dwelling size.
  - More electronic equipment: televisions, computers, etc.

Source: U.S. DOE, Annual Energy Outlook 2009.

The Energy Efficiency Gap

The "gap" refers to the fact that current technologies which could reduce energy consumption are not used because people don't know about them (lack **relevant** information), have limited access to capital to use them, or do not believe the incentives to use them are sufficiently attractive.

•It has been estimated that $120 trillion could be saved through 2020 with an investment in efficiency of $520 billion.

•The savings in industrial and commercial sectors have been maximized; residential represents a potential 35% reduction in current energy use.

•"Some 71 percent of end-use potential (53% of total energy potential) resides in improving the building shell and heating and cooling equipment in existing homes."

Source: McKinsey Corporation, "Unlocking Energy Efficiency in the U.S. Economy."

However. . . .

We don't know what is actually going on in people's homes or apartments.

The Energy Performance Score, 2008, prepared for the Oregon energy trust compared models that predict energy performance (based on an energy audit, performance standards for new equipment and weatherization) were off by 25% to 135% in terms of accuracy.

Therefore,
We must focus on human behavior.

Behavioral Barriers to Change

- People do not make rational choices.
- People can only worry about a limited set of factors at any given time.
- People focus on short-term, not long-term threats.
- More information does not necessarily lead to a desire outcome; it can lead to confusion.
- Most consumption behavior is driven by habit (the great flywheel of society) or emotion.
- People receive conflicting messages.

Source: Scott G. McNall, "Public Policy and Leadership," in Woodrow Clark, II, Sustainable Communities Design Handbook. New York: Elsevier, 2010.

Barriers to Change (continued)

- Simply unaware there is a problem.
- Believe somebody else should act.
- Believe actions will make no difference.
- Think they are doing things that help, but do not.
- Not sure it will work; is safe; will cost too much; a waste of time.

Source: American Psychological Association, Psychology and Climate Change, 2009.

Opportunity, Economic, and Market Barriers

•Trusted "holistic" contractors not available. This is a cognitive barrier.

•It is estimated that 90% of all HVAC systems are installed sub-optimally, reducing potential savings by 20-30%.

•Capital constraints. Core spending accounts for 91% of average household budget of $51,000.

•Cost effectiveness. Most people expect investments to pay back in 2.5 years; which would represent a discount rate of 40%.

Sources: EU Behavior Change Project; McKinsey.

What does not work.

- Most media campaigns are ineffective. Can motivate but do not produce measurable results.
- A focus on greenhouse gas emissions only drives actions of a small number of people.
- Information alone is not effective.
- A focus on conservation is less effective than a focus on efficiency.
- Laundry lists of things to do confuse people.

Source: Gerald Gardner and Paul Stern, "The Short List: The Most Effective Actions U.S. Households Can Take to Curb Climate Change."

What will work?

Study for the Minnesota Department of Commerce and Office of Energy Security:

- Behavior change processes:
  1. Realize there is a problem: deviation from peers.
  2. Realize relevance of behavior to problem.
  3. Realize possibilities to influence problem.
  4. Weigh motives: personal, social, comfort.
  5. Evaluate conflicting motives.
  6. Take action: repetitive prompts essential.

- Program:
  1. In-home devices that provide real-time feedback.
  2. Customized, regular feedback to customers.
  3. Dynamic pricing.

BC Hydro:

Setting a specific goal is important.

Hunt Allcott:

Social comparisons between neighbors can result in a 2% base-line reduction, but these savings degrade over time and between letters. What is needed is programs targeted to those most likely to change. (Allcott, "Social Norms and Energy Conservation." MIT, October 2009.

The Chico Carbon Challenge: Using Social Media to Change Behavior

•Partnership between:

1. SAP, software that can "measure" plug load.
2. Dot UI, real-time meter provider.
    - Standard data from any smart meter according to ISO/IEC 24752
    - Use social media formats to make people aware of their resource use on TVs, mobile devices, PCs, or internet-enabled tables.
    - Enables feedback loop.

3. Green Campus/Energy Alliance
4. Institute for Sustainable Development at California State University, Chico.

•Project examines what happens when people have second-by-second data on their energy use provided to their Facebook Accounts. Study explores:

1. Commitment to the planet, GHG.
2. Competition with friends.
3. Wanting to be like others.
4. Cost savings.

The Chico Carbon Challenge: Using Social Media to Change Behavior

•Real-time meters installed in two sorority houses, two fraternity houses, and 30 (4 person) residential units at the University Village.

•Findings to date:

1. Price not relevant in university housing, as students don't pay; they are relevant in the fraternity houses.
2. Women are more likely to participate.
3. Simplicity is key.
4. Challenges are important but degrade over time.
5. Carbon footprint calculators are not useful.
6. Customized information, with appliance monitoring, important.

Expansion into the Residential Sector

•Proposal to the CPUC for the City of Chico:

1. Install real-time meters in a pre-determined number of residences, e.g., 100 single-family residences; 100 multi-family dwellings.
2. Provide an initial energy consultation to a sample of the families and households and help them interpret and use the information provided on the monitor.
3. Provide a follow-up consultation to help monitor and find ways to lower energy use.
4. Customize feedback on monitors and/or cell phones and Facebook accounts.
5. For another set of dwellings, provide an energy audit.
6. Determine the cost effectiveness of consultations versus audits in helping reduce energy use.

•Connect energy upgrades to lifestyle upgrades. Many people remodel existing homes, especially kitchens and bathrooms. Have contractors provide energy audits as part of upgrade. Added cost for energy improvements is therefore a negligible part of overall lifestyle upgrade. (Wilson and Dowlatabadi).

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Computers
Energy Source
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Drag an icon from the menu and drop it here to add an item to your profile.
Total Monthly KgCO2
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Home
Public Transport
Personal Transport
What If I...
Drag an icon from the menu on to the +, or an existing profile item from the middle on to the - or the ÷ to begin a What If.
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What If I...
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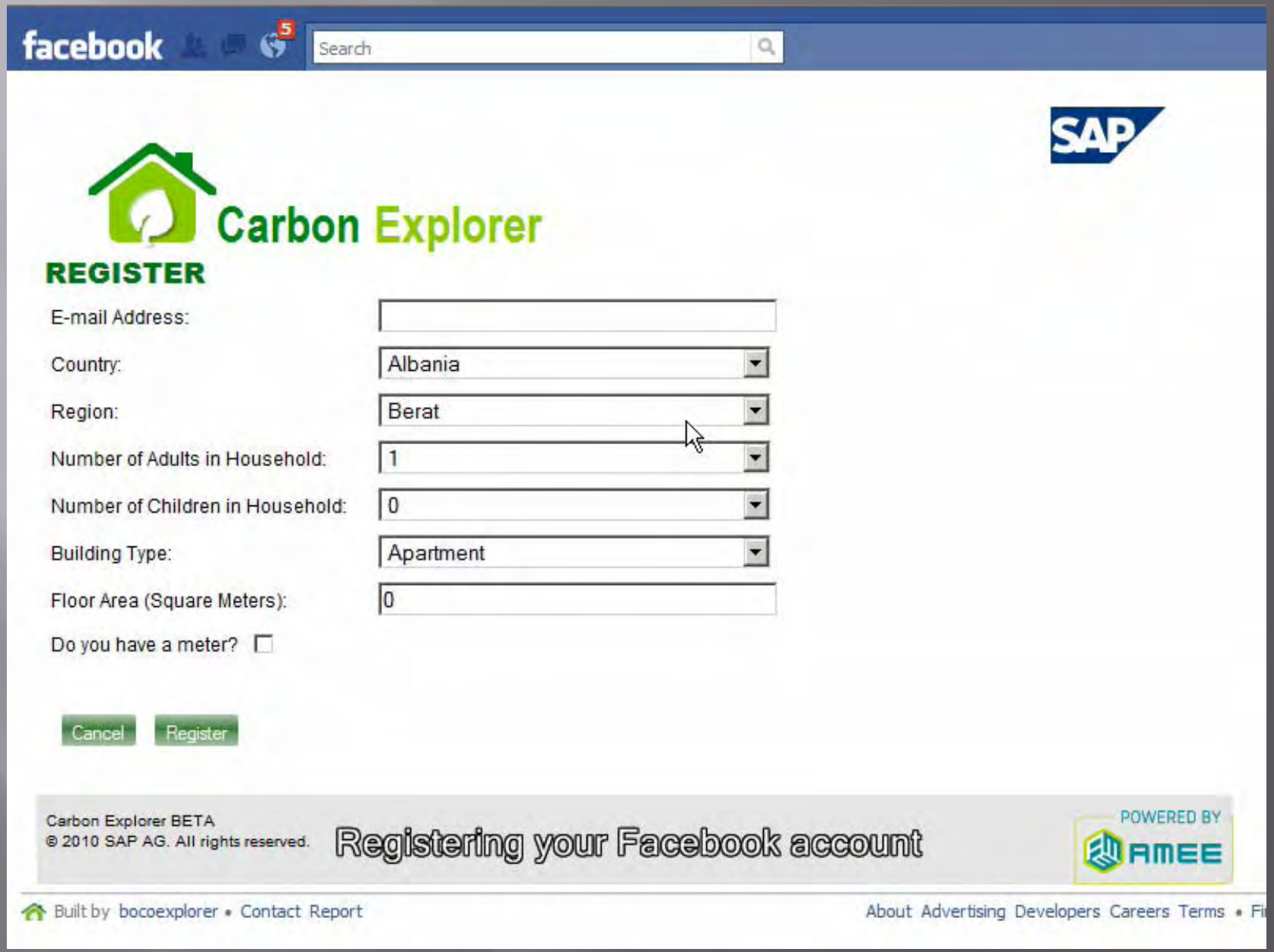
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Keep it Simple!

Very few people want to start roasting a turkey while they are at work.