**Driving Forces Restraining Forces:** Serrafix Report

- OPower© norm. messages that mix descript with injuct change behavior

- University Research Behavior Change Campaigns

- Friendly Competition + Cooperation

- Achievement

- missing or badly designed Driving Forces

Schultz, Cialdini

- lack of pro-environmental motivation

- lack of motivation to participate : SERRAFIX: low understanding and/or interest for EE, Indifference to energy efficiency

- SCARCITY

- SURPRISE + REMARKABLE, g-o-line

- RECIPROCITY, mutual benefit

- REWARDS are meaningful, personally relevant

- easy + simple + graphics

- PERPETUAL BETA, control and empowerment

- FEEDBACK: consumers learn consequences, reduce uncertainty of new behavs (frequency, granularity, units, graphic design, location, comparisons, recommendations, social sharing)

Abrahamse  
Froelich  
Fischer  
Karen Ehrhardt-Martinez

- time

- money

-other priorities

Working together to achieve best results

‘craft our secret sauce’

Create a supportive environment – help throughout the process

f

GE Treasure Hunt

Entergy Calculators

- websites

- apps 🡪 quick, at a glance

- software

Positive Emotional Engagement

- LIKING, build rapport

- cultivate CONNECTIONS to others

- community leaders add AUTHORITY

- organizations add AUTHORITY, MassSave, Entergy got 8,900 calc regists

- IDENTIFY thought leaders, create a buzz, celebrities add SOCIAL PROOF

- people shine with PERSONAL RECOG, stories, fotos

Financial Options to mitigate financial barriers (0% loans, on-bill financing)

References: 7 references in total

1. **Social Norms - Schultz et al (2008) + Cialdini: Influence**

**Schultz et al (2008)**

**Three experiments on normative social influence:** Normative messages can cause a change of behavior.First experiment shows the influence of printed normative messages designed to promote towel reuse by hotel guests. Aligning of the injucture and description elements of a normative message increases its impact. Second extends the finding to guests in a timeshare condo. Third shows that normative information about both generic and reference groups can affect behavior.

**Cialdini’s Six Principles of Influence**

Reciprocity: give them reward for what they do, will make them feel indebted

Commitment: use target audience ideas to design, allow them to commit with a small ‘taster’, and easily opt out

Social Proof: use influential people and testimonials on social media to create a buzz

Liking: build trust and rapport, don’t try to hard

Authority: get support from influential and powerful people (see French and Raven’s 5 forms of power)

Scarcity: highlight urgency and limited availability by rewarding those who get started early, explaining that others are already up and running

created by Robert Cialdini, Regents' Professor Emeritus of Psychology and Marketing at Arizona State University.

1. Reciprocity

As humans, we generally aim to return favors, pay back debts, and treat others as they treat us. According to the idea of reciprocity, this can lead us to feel obliged to offer concessions or discounts to others if they have offered them to us. This is because we're uncomfortable with feeling indebted to them. For example, if a colleague helps you when you're busy with a project, you might feel obliged to support her ideas for improving team processes. You might decide to buy more from a supplier if they have offered you an aggressive discount. Or, you might give money to a charity fundraiser who has given you a flower in the street.

2. Commitment (and Consistency)

Cialdini says that we have a deep desire to be consistent. For this reason, once we've committed to something, we're then more inclined to go through with it. For instance, you'd probably be more likely to support a colleague's project proposal if you had shown interest when he first talked to you about his ideas.

3. Social Proof

This principle relies on people's sense of "safety in numbers." For example, we're more likely to work late if others in our team are doing the same, put a tip in a jar if it already contains money, or eat in a restaurant if it's busy. Here, we're assuming that if lots of other people are doing something, then it must be OK. We're particularly susceptible to this principle when we're feeling uncertain, and we're even more likely to be influenced if the people we see seem to be similar to us. That's why commercials often use moms, not celebrities, to advertise household products.

4. Liking

Cialdini says that we're more likely to be influenced by people we like. Likability comes in many forms – people might be similar or familiar to us, they might give us compliments, or we may just simply trust them. Companies that use sales agents from within the community employ this principle with huge success. People are more likely to buy from people like themselves, from friends, and from people they know and respect.

5. Authority

We feel a sense of duty or obligation to people in positions of authority. This is why advertisers of pharmaceutical products employ doctors to front their campaigns, and why most of us will do most things that our manager requests. Job titles, uniforms, and even accessories like cars or gadgets can lend an air of authority, and can persuade us to accept what these people say.

6. Scarcity This principle says that things are more attractive when their availability is limited, or when we stand to lose the opportunity to acquire them on favorable terms. For instance, we might buy something immediately if we're told that it's the last one, or that a special offer will soon expire.

**2. Weatherization:**

**Serrafix report:** Hard-to-Reach / Hard-to-Serve Market for the Mass Save®, includes discussion of ‘big idea’, list of barriers and solutions

Summary of Barriers

Pre‐weatherization

Physical corrections to existing buildings required before weatherization can proceed

Prior work is an obstacle

Financial

Lack of discretionary money for co‐payment or pre‐weatherization measures

Difficulty accessing credit

Lack of understanding of energy efficiency (EE) benefits and payback or low or no perceived value for EE

Low awareness of HEAT loan program

Program caps result in high‐cost project(s) requiring multiple years of participation

Confusion caused by multiple programs with different qualifications

High cost to reach and serve low density rural populations

Time Constraints

Program hours conflict with customer's work schedule

Multiple visits required by program, compete for Customer's time

Drop‐outs due to delays between initial contact, energy survey, measure installation

Lack quick response for equipment/emergency replacement HVAC Split incentives between landlords, tenants and homeowner or condo associations ‐ Additional barriers for each group are noted below.

Who pays the bill for EE vs. who sees the benefit

Difficult to access and serve

Landlords

Hard‐to identify ‐ not always listed in utility records/databases for the property

Lack of program awareness or understanding how to qualify

Lack of perceived benefits/lengthy payback and depreciation

Financial investors – no incentive for further investment in property

Time and hassle to coordinate with program, lead vendors, tenants

Fear of exposure of existing code violations on the property

Building access is difficult at non‐owner occupied properties

Conflicts with tenants affect landlord willingness to participate

Tenants

Lack authority to make capital decisions

Lack of program awareness or understanding how to qualify

Do not understand their energy use and efficiency opportunities

Fear of inspections/don't want others in home

Not interested – move frequently

Fear of incurring additional costs

Income verification requirements (may have unreported income)

Fear of landlord reprisals

Home/Condo‐Owner Associations

Capital expenditures from general funds have unequal benefits among units

Need to get decision from Board of HOA (in multi‐unit buildings)

Neighborhood politics or conflicts

HVAC contractors’ impact on program's ability to reach and serve customers

Poorly informed about the programs available and energy‐efficient product options

Unfamiliar (or misinformed) with high‐efficiency equipment

Low/No value for the HVAC and plumbing contractors to offset "hassle factor" (paperwork, time, etc.) when replacing failed equipment

Contractor specialization – no interest in cross‐selling of other efficiency measures

Language

Traditional (English speaking) marketing channels are not effective

**Low understanding and/or interest for energy efficiency**

Lack of marketing and media materials in multiple languages

Program literature too technical

Lack of translation assistance throughout process

Lack of trained/trusted community insiders to advocate within the community

Culture and Social Norms

Lack of understanding by program team, of unique cultural/social business practices

Economic status (high or low)

**Indifference to energy efficiency**

**Mistrust (of both the message and the messenger)**

Perceived Hassle Factor

Confusion about income qualifications (e.g., who's is counted, tenant or landlord)

Confusion when tenants in multi‐unit buildings qualify for different programs

Differing program formats and inconsistent program materials across PAs

Long lead times and lack of follow‐up

Resistance to go through program a second time for increased benefit

Multiple and/or changing contacts for one project (assessor or contractor)

Summary of Solutions Suggested

Pre‐weatherization (see also Financial)

Evaluate economics and legality of funding lower cost pre‐weatherization costs

Financial

Improve incentives for multi‐unit residences to 100% or develop a tiered scale

Improve incentives for all middle income customers including raising income levels for free incentives

Improve incentives in exchange for landlord concessions (i.e., rent freeze for a period)

Prioritize individual census blocks based on predominant income levels ‐ All residents are prequalified and receive additional incentives

Develop "Pay for Performance" incentives tied to energy savings

Expand HEAT loan to cover pre‐weatherization measures with TRC>1

Develop method to review and approve high cost projects (over program limit) for completion in a single program year

Create micro‐loan program utilizing foundation dollars

Provide on‐bill financing that stays with the home

Time Constraints

Provide evening and weekend assessments and appointments

New "single‐visit" assessment protocol including audit, instant upgrades, safety tests and Scope of Work for weatherization

Piggyback on other renovation programs (combine with lead abatement program)

Split incentives: Create programs that split the savings between owner and renter

Landlords

Develop a clear definition of the process with a single step‐by‐step guide

Produce standardized forms for landlord‐to‐tenant and landlord‐to‐PA communication

Develop landlord outreach program, charrettes, targeted ads, use of MRHA and property management firms

Develop ways to capture landlord contact information via tenant and lead marketing efforts

Develop energy efficient certification seal to help market rental properties

Support legislation requiring improved energy efficiency in rentals

Offer "one stop shopping" day for landlords to connect with lead vendors, contractors

Tenants

Better publicize availability of building energy‐use information

Engage renters to network with other renters, offer incentives for contacts

Try GroupOn offer with discount and timing bonus

Conduct neighborhood promotions

Leverage rental agencies

Use Craig's List (or similar channels) to make program announcements

**Provide education/information to help understand energy use and costs**

Contractor's impact on program's ability to reach and serve customers

Improve training for programs

Add diversity training and sales training

Expand efforts to establish Local Trusted Contractor (LTC) Program

Language

Develop targeted lingual and culturally appropriate media channels

Provide language specific collateral materials to serve non‐English speaking customers

Culture and Social Norms

Develop culturally sensitive messages and messengers

Mistrust (of both message and messenger)

Improve safety messages (physical, safety from legal issues, quality of work, privacy)

Develop or communicate program ID badges for use by all program providers

Provide program contact where children of the elderly can get information

Be honest about cost and time commitments and point out the investment value

Use trusted individuals (e.g. Mayor) to provide testimonials

**Use a community approach utilizing outreach through social service agencies, churches, schools, social organizations, council on aging, doctors' offices etc.**

Provide local offices and/or contacts

Implement market research to better understand causes of distrust

Set expectations properly "See if you have one of the most efficient homes..."

Perceived Hassle Factor

Standardize process across all PAs and provide a process map for customers to follow

Standardize collateral materials across the program

Simplify the process ‐ use a single Account Manager (Concierge)

Provide on‐line sign‐up and scheduling

Enforce follow‐up on drop‐outs to document why they quit (and use to improve...)

**3. Framing: Froehlich (2009) + Fischer (2008) + Abrahamse (2007)**

**Froehlich:**

The United States consumes one quarter of the world’s energy resources, despite accounting for less than five percent of the world’s population (US Department of Energy, 2002).

The residential sector accounts for 21% of the nation’s energy use and the average American household spends nearly $2,000 on energy bills per year (US Department of Energy, 2006).

Home energy and personal transport are the top two contributors of the average American’s CO2 emissions into the environment (Weber and Matthews, 2007), accounting for over 50% of their total carbon footprint.

To date, the primary methods applied to improving energy efficiency and/or reducing energy usage been technological and economic (Armel, 2008). For example, the production of hybrid or hydrogen vehicles has been emphasized as a major solution to CO2 reduction and oil dependence.

However, there is growing evidence that a human-centered, behavioral approach should also be pursued to educate, inform, and motivate energy efficient human behaviors.

In a study evaluating the energy consumption of 10 identical Habitat for Humanity all-electric homes outfitted with the same appliances and equipment, homes were found to exhibit a large range in energy consumption, with the most energy intensive home consuming 2.6 times more energy than the least (Parker et al., 2008).

Indeed, it has been consistently found that energy use can differ by two to three times in identical homes, occupied by people with similar demographics (Socolow, 1978; Winett et al., 1979). Such findings reveal how differences in human behavior can significantly affect energy consumption and suggest that intervention strategies to promote sustainable behaviors could result in significant energy savings.

A 10% reduction in all energy intensity implies that 8.5 quads of fossil fuels are not used, reducing CO2 emissions by 8.5% which is equivalent to doubling the nuclear power output in America (Armel, 2008). In-home feedback technology has been shown to reduce energy use by 10-15% on average, with significant decreases linked to more frequent feedback and higher data granularity (e.g., specific energy usage data on appliances).

The Feedback Design Space – Ten Design Dimensions

1. Frequency: Several studies have demonstrated the benefit of frequently updated feedback to reduce consumption. Bittle et al. (1979) placed feedback cards that described the amount of kilowatts consumed the previous day into residential mailboxes. The feedback group used an average of 1-9% less electricity than the control group. In a more recent study, homes that used a computerized feedback display of real-time electricity usage reduced electricity consumption by 12.9% (Dobson and Griffin, 1992).

2. Measurement Unit: Often, computerized feedback systems can be configured to use the consumer’s preferred units. The Energy Detective (Figure 2), for example, can display information in kilowatts, dollars per hour ($/hr), energy consumed so far today, current voltage and the current energy rate in dollars per kilowatt hour. Many displays also calculate a carbon footprint and translate that into equivalent but more comprehensible units (e.g., number of car trips, number of flights). Displaying a particular measurement dimension will inevitably frame the problem in different terms for the user, making certain characteristics of consumption more salient over others, and thus activate different motives and personal and social norms (Fischer, 2008).

3. Data Granularity: Data granularity may be in terms of time (e.g., data can be viewed at different temporal resolutions, amount of consumption per day, per month, per year), space (e.g., specific rooms, upstairs vs. downstairs), specific source (e.g., refrigerator, washing machine, upstairs shower), or source category (e.g., kitchen appliances, lights, bathrooms). Dennis (2002) speculates that linking energy consumption to source is essential, “part of the reason that feedback is not more effective appears to be that consumers do not know what each component of their electricity consumption costs.”

4. Push/Pull: Should information always be available (e.g., via a LCD flat-panel display in the kitchen), only inform the user when excessive energy usage (or other anomalies) have been detected (e.g., via a text message or email) or only available through a portal or website that must be explicitly navigated? Even lightweight “push” mechanisms seem to be effective. In an early version of an ambient-like display for the home, Becker and Seligman (1978) investigated the effectiveness of a light that went on “in a highly visible part of the home” whenever the air conditioner was on, but the outdoor temperature was 68° F. An average of 15% savings in energy consumption was found in homes that contained the signaling device.

5. Presentation Medium: Fischer (2008) distinguishes between two types of feedback media: paper and electronic displays. Electronic displays may come in the form of meters on an appliance, personalized internet portals for the home, mobile phone widgets, or tangible ambient displays. Ambient displays such as the Energy Orb or Wattson (middle image in Figure 2) can provide low-bandwidth information (e.g., by glowing red when energy usage reaches a certain level and green otherwise). It’s unclear, however, how much time a consumer would be willing to explore their energy usage data. It’s likely that highly accessible information which is present (or nearly always present) would fair best in raising awareness. However, awareness alone does not always translate into behavior change (Latham and Locke, 1991).

6. Location: The location of the feedback may be highly localized (e.g., on the appliance itself) or completely independent (e.g., via an internet portal or paper bill). McCalley and Midden (2003) gave consumers immediate feedback about washing machine energy usage via an attached control panel and found a 21% reduction in energy use. Ueno et al. (2005) installed sensors for each home appliance and also monitored total electric power and gas consumption and found a 12% reduction in energy usage after system installation.

7. Visual Design: A household’s reaction to a particular visual design depends on its overall aesthetic, comprehensibility, graph choice, measurement units and wording choice. Pragmatic visualizations are more common and provide concrete quantitative information; however, they often require a ramp-up period to learn (i.e., visualizations are learned interfaces). Artistic visualizations are more abstract by nature and can use visual representations that the consumer may find evocative but often at a cost of explicitness. For example, in UbiGreen, Froehlich et al. found that although users appreciated artistic metaphors that represented their travel activity, they also sought more precise information that would allow them, for example, to better compare their current performance to previous performances.

8. Recommending Action: Investigations into general prompting strategies have shown it has limited influence on behavior but can be made more effective by improving specificity, timing, and placement (Geller et al., 1982). Winett et al. (1978) showed how placing signs next to doorways with specific information about when and who should turn out the lights (e.g., the last person leaving the room) resulted in a 60% reduction in days when the lights were left on compared to signs that were placed above light switches and contained general messages about saving energy. Other research suggests that humans tend to assign disproportionate weight to information that is highly concrete and personalized (Borgida and Nisbett, 1977).

9. Comparions: Providing methods for consumers to compare their current performance to past performances is essential. These comparisons could be offered at various levels of temporal granularity (e.g., day, week, month) and should be normalized based on weather. One complexity with comparison as a motivator, however, is that eventually a certain threshold of performance is reached—emphasizing improvement over historical performances may then result in frustration. In additional to self-comparisons, there is also social or normative comparisons. In Fischer’s (2008) feedback review, she offers that, “while [normative comparisons] stimulates high users to conserve, it suggests low users that things are going not so bad and they may upgrade a little. These effects probably tend to cancel out each other.” Still, social norming can be a powerful motivator. For example, Goldstein et al. (2008) found that hotel guests who were exposed to descriptive norms about towel reuse activity were 33% more likely to reuse their towels than a comparison group who were not.

10. Social Sharing: The role of Facebook and other social sharing sites in supporting social issues (e.g., grassroots political campaigning, sustainability) is a relatively new topic of research (Mankoff et al., 2007). One role that social networking sites may play is in providing accountability and pressure to be energy efficient. Pallack et al. (1980) applied this principle in a field experiment involving households. Randomly assigned households were asked for permission to publicize their names and results of their performance in the conservation study before the study began. The group that agreed to publicize their results used 15% less natural gas and 20% less electricity. It’s likely that users who share their energy usage online will similarly feel pressure to engage in energy efficient behavior.

**Fischer:** Reviewed theory and findings from all over the discipline and integrated them into a heuristic model of environmentally relevant behavior. Feedback is most effective if it: successfully captures the consumer’s attention & draws a close link between specific actions and their effects & activates various motives that may appeal to different consumer groups, such as cost savings, resource conservation, emissions reduction, com- petition, and others.

Matthies (2005) has reviewed theory and findings from all over the discipline and integrated them into a heuristic model of environmentally relevant behavior (see Fig. 1). This integrated model can be helpful for explaining why and how feedback on electricity consumption can reduce consumption.

The model distinguishes between two types of action: routinized or habitual behavior (here presented in the form of “environmentally detrimental habits” on the bottom of the figure) and conscious decisions (represented in the mid and upper part of the figure).

From these considerations, one can deduct the hypotheses that feedback is most effective if it: successfully captures the consumer’s attention & draws a close link between specific actions and their effects & activates various motives that may appeal to different consumer groups, such as cost savings, resource conservation, emissions reduction, com- petition, and others.

Fischer_heuristicmodel.tiff

**Abrahamse:** After 5 months, households that were provided a combination of tailored information, goal setting (5%), and tailored feedback reduced energy use by 5%.

In this multidisciplinary study, an Internet-based tool was used to encourage households (N 1⁄4 189) to reduce their direct (gas, electricity and fuel) and indirect energy use (embedded in the production, transportation and disposal of consumer goods). A combination of tailored information, goal setting (5%), and tailored feedback was used. The purpose of this study was to examine whether this combination of interventions would result in (i) changes in direct and indirect energy use, (ii) changes in energy-related behaviors, and (iii) changes in behavioral antecedents (i.e. knowledge). After 5 months, households exposed to the combination of interventions saved 5.1%, while households in the control group used 0.7% more energy. Households exposed to the interventions saved significantly more direct energy than households in the control group did.

The final sample consisted of 189 households, i.e. those households who filled out the questionnaires at the three fixed times. Households in the first experimental group (N 1⁄4 71) received a combination of tailored information, individual goal setting (5% reduction), and tailored individual feedback (about own energy savings). House- holds in the second experimental group (N 1⁄4 66) received the same combination of tailored information, individual goal setting and individual feedback. In addition to this, they received a group goal of 5% as well as group feedback about average and total energy savings of all participants.

**Karen Ehrhardt-Martinez, The Persistence of Feedback‐Induced Energy Savings in the Residential Sector: Evidence from a Meta‐Review**

The Question of Persistence

What we might expect:

Why Feedback is Likely to Result in Persistent Savings: • Feedback helps consumers to learn the energy consequences of

specific behaviors, and that information reduces uncertainty about the

effectiveness of new behaviors. • Feedback helps people to establish new habits and they no longer need

to be energy conscious all the time. New behaviors become automatic. • Feedback elicits energy conserving behaviors and after a while people

adapt their attitudes to their new behaviors and energy conservation becomes a new part of their identity.

Why Feedback is Unlikely to Result in Persistent Savings • The novelty of energy feedback may wear off and people will fall back

FeedbackStudies_EhrhardtMartinez.tiff

StudyDuration1_EhrhardtMartinez.tiff

SocialEnvironment_EhhardtMartinez.tiff

**4. Company Programs:**

**GE ecoTreasure Hunt:** “A discovery process where cross-functional teams will investigate a facility’s energy & natural resource consumption to ID , quantify & recommend projects to minimize waste.”

 Annualized savings >10% in energy costs -- Operational solutions, simple to complex

 Best practice share of internal GE process

 Prioritized list of behavioral changes & investments & payback

1. ID energy streams, assemble team, & plan event

2. Find waste saving opptys with employees & experts

3. Employees prioritize & report findings to leadership

4. Implement findings to achieve savings

**PEW Center for Climate and Energy Solutions**

Entergy: 8,900CalculatorRegistrations

• 29,447,000PotentialPoundsofCO2Avoided

• $7,467,800PotentialDollarsSaved

Alcoa: 4,090CalculatorRegistrations

• 24,078,370PotentialPoundsofCO2Avoided

• $5,836,842PotentialDollarsSaved

Bank of America: 1,807CalculatorRegistrations

• 6,591,814PotentialPoundsofCO2Avoided

• $2,891,490PotentialDollarsSaved

Energy Efficiency Schools Challenge

• 8,000 people engaged over 15 schools in 4 states

• 14 million lbs CO2 and $1.7 million potential savings