University of Florida
Unifying Home Asset & Operational Ratings: Adaptive Management via Open Data & Participation

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Student: Hal S. Knowles, III (Ph.D. Student, UF School of Natural Resources & Environment)

Description: Recent environmental, social, and economic challenges are fostering a wave of interest in maximizing energy efficiency and conservation (EE+C) in existing U.S. homes. Long standing programs, ratings, and metrics are being reapplied into new stimulus initiatives such as the Recovery through Retrofit program. Simultaneously, electric and gas utilities are expanding their demand side management (DSM) programs from weatherization and conventional technology replacement incentives to include conservation behavior campaigns with “recommendation algorithms” designed to assist in homeowner energy retrofit decision making. Furthermore, loan programs are emerging to address the financial barriers that commonly limit initiation of the necessary retrofits.

Collectively, these approaches most often project future home energy performance based on engineering models of the physical characteristics of homes (i.e., “asset ratings”). Yet to date, the marketplace is inadequately integrating historical household energy consumption patterns (i.e., “operational ratings”) into the decision tree to optimize retrofit program efficacy and consumer benefits. Moving toward the unification of asset and operational ratings is crucial for successful program management, proper monitoring/measurement/verification (MMV), loan risk assessment, and for the persistence of reduced home energy use over time. However, unification will not be easy. This research project combines qualitative and quantitative research methods in social science and building science using Florida case studies to evaluate the opportunities and constraints of asset and operational rating unification and the steps necessary to get there. Relationships between our project and the collaborative, transparent, and participatory nature of “open government” initiatives are also being explored.

Budget: $24,000 over two years ($12,000 from 01/01/2011 to 12/31/2011 and $12,000 from 01/01/2012 to 12/31/2012)
Universities: UF
External Collaborators: Nick Taylor (Ph.D. Student, UF School of Natural Resources & Environment), Jennison Kipp (Assistant In, UF Program for Resource Efficient Communities)

Progress Summary:

1. Annual Progress: Summary from October 1, 2011 through September 30, 2012
   As reported in the 2010/2011 annual progress report, extensive qualitative data were procured via a series of focus groups conducted in February and March, 2011. These data are being transcribed, analyzed, and integrated into a more cohesive research plan and prospective grant proposals. During the 2011/2012 project year, a complementary quantitative data approach has been delineated through literature reviews, research proposal formulation, and preliminary data analysis.

   Collectively, the qualitative and quantitative approaches related to asset and operational ratings for residential buildings have been combined into a dissertation that proposes to investigate the following questions: (1) are homes complex adaptive systems (CAS) as evidenced by nonlinear, scale invariant patterns of energy consumption over time; (2) do nonlinear energy consumption patterns correlate to weather variability; and (3) do individuals and groups differentially perceive of the privacy

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considerations and usability of conventional home energy consumption feedback displayed in a novel online tool. Research outcomes will suggest alternative methods to evaluate home energy consumption patterns and will inform new narratives to engage utility customers in verbal, written, and graphical forms.

2. **Funds Leveraged/New Partnerships Created (This Period)**

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<tr>
<th>New collaborations</th>
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<tr>
<td>Partner name</td>
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<td>Building Media, Inc.</td>
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<td>Various local and community banks in Florida</td>
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<th>Proposal #1</th>
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Hal Knowles, Co-PI and the primary supported person on this FESC project was the main University of Florida Program for Resource Efficient Communities (UF/PREC) contributor to the development of this new proposal. UF/PREC proposed the following:

1. **What do you propose to do? [20 words]**
Study the cultural implications of complete transparency of monthly residential energy consumption data as comparative benchmarks to generate peer pressure.

2. **How will your project make data more useful? [50 words]**
Technological innovation in geographic information systems, the World Wide Web, computer-assisted data visualization, and utility advanced metering infrastructure are converging within a

²http://newschallenge.tumblr.com/
rapidly evolving residential energy efficiency feedback industry. Our project fosters a more
democratic dialogue on data sharing and social norm experimentation while finding common ground
for privacy protection.

3. How is your project different from what already exists? [30 words]
The primary companies within this industry (e.g., http://opower.com/) currently control comparative
feedback via “black box” algorithms. Our tool makes disaggregated usage history visible at the
address-scale enabling adaptive, user-defined comparisons.

4. Why will it work? [100 words]
Cultural consensus analysis, a cognitive anthropology method, tests for consistent domains of
knowledge within cultures around topics by evaluating degrees of agreement on sets of questions.
Our project would apply this method to our existing online tool to improve consistency and consensus
on the following questions: (1) what underlying rules govern culturally acceptable social norms on
household energy consumption; (2) how can and/or should utility billing data be used to promote
energy efficiency via these norms; and (3) who should have access to what data and why?

5. Who is working on it? [100 words]
Acceleration.net and the University of Florida Program for Resource Efficient Communities
(UF/PREC) collaborated via a public-private partnership to build the first (and believed to be only)
monthly, individual meter disaggregated, open access, online, residential energy consumption
mapping and benchmarking platform. This market transformation tool lets “everybody see
everybody.” Ryan Davis (Acceleration.net, Director of Programming), Nick Taylor, and Hal
Knowles (both UF/PREC PhD Students and Faculty), are working with multiple Florida utilities on
energy efficiency and conservation benchmarking and consumer visualization with varying degrees of
data access as we navigate questions of privacy, social norms, and culture change.

6. What part of the project have you already built? [100 words]
The most transparent online tool (http://gainesville-green.com/) is already built and allows access to
monthly electricity, natural gas, and water billing data for all residential addresses in a single North
Central Florida utility. A more filtered online tool (http://oei.compareandconserve.com/) is currently
in an “alpha” stage of development and allows more constrained access to electricity billing data for
two Central Florida utilities. Collectively, these tools offer an existing path to both conduct our
proposed research, as well as, to apply our findings through user interface refinements including, but
not limited to, data sharing rule determination, social norm self-organization, and comparison
network delineation.

7. How would you use News Challenge funds? [50 words]
With these funds, Dr. Chris McCarty (UF, Director of the Bureau of Business and Economic
Research), Ryan Davis, Hal Knowles, and Nick Taylor would: (1) develop add-ons to the online
tools; (2) conduct cultural consensus analysis via these add-ons; and (3) democratically share findings
of social norm form and function.

8. How would you sustain the project after the funding expires? [50 words]
These online tools would be sustained through a TBD mix of utility conservation program budgets,
advertising revenue, premium content fees, and/or other funding sources. Additionally, our project
findings would be openly shared and expected to alter the future course of technologies and industries
leveraging data on household lifestyles.