Unifying Home Asset & Operational Ratings: Adaptive Management via Open Data & Participation
FESC Project Update October 18, 2013

1. <u>Project Description</u>
   PI: Mark Hostetler (Associate Professor, UF Department of Wildlife Ecology & Conservation)
   Co-PI: Hal S. Knowles, III (Change Agent, UF Program for Resource Efficient Communities)
   Supported Student(s): Hal S. Knowles, III (Ph.D. Candidate, UF School of Natural Resources & Environment)

   External Collaborators: Nick Taylor (Ph.D. Student, UF School of Natural Resources & Environment),
   Jennison Kipp (Assistant In, UF Program for Resource Efficient Communities)

   Description/Abstract: 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[1]* 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.

   The secondary supplemental research will expand on themes and insights gained through the first phase of this existing FESC project. Specifically, these insights suggest that even when adding operational data to building asset data, the reductionist approach to evaluating home energy performance by controlling for known variables may continue to offer an incomplete picture of the complexities of performance trends and the influence of unknown and/or misunderstood variables. Furthermore, the home improvement industry may need to consider the possibility that the magnitude of total energy consumption, while a worthwhile metric and with its net reduction a worthwhile goal, is also an incomplete indicator of home energy performance optimization.

   Budget: Original = $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). Supplemental = $32,000 over 18 months (from 04/01/2013 to 09/30/2014) to cover a portion of the salary (at a rate of $22.20/hour) and fringe benefits (at a rate of 26.9%) for Co-PI, Hal S. Knowles, III. This equates to 36% (14.6 hours, or effectively 2 weekdays) of this Co-PIs weekly salary and fringe for the 18 month period.

   Universities: University of Florida

   External Collaborators: Nick Taylor (Ph.D. Student, UF School of Natural Resources & Environment),
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[1] See, http://www.whitehouse.gov/assets/documents/Recovery_Through_Retrofit_Final_Report.pdf

2. <u>Summary of Progress Since April 15, 2013</u>

Collaboration with both Talgov Utility Billing Services Division and JEA in Jacksonville is underway. Some preliminary data has been exchanged (e.g., energy conservation and demand side management participation records) and Hal Knowles has begun to clean and consolidate the data in order to generate a treatment group from these conservation programs and to generate a control group from stratified random samples across both utility service territories. As previously reported, we anticipate a few hundred homes with the highest resolution 15-minute or hourly interval smart meter billing data. However, we also anticipate a much larger sample of approximately 2,500 to 5,000 homes with daily interval smart meter billing data from both utilities. After evaluating the R statistical software, Hal Knowles has determined that MATLAB is a better fit for the project research and analysis needs. Project methodology is being adjust as appropriate to work within the MATLAB statistical software. Plans are to analyze these large data sets of home energy consumption to detect how homes follow weather patterns and respond to weatherization efforts.

<u>Funds Leveraged/New Partnerships Created</u>

New collaborations		
Partner name	Title or short description of the collaboration	Funding, if applicable
Djundi Tjindra	UF/PREC is providing intellectual, data sharing, and logistical support for a related master's thesis and Djundi is providing new insights and visualizations into residential energy consumption in relation to residential density and urban development pattern	Not applicable
FAIRWINDS Credit Union	As seeded by the Osceola Energy Initiative (OEI), an ARRA funded program, UF/PREC has entered a 10-year partnership with FAIRWINDS Credit Union to administer a 7-county, $5 million residential energy efficiency finance program.	Tied to revenue from the delivery of the loan program
Several Building Contractors	UF/PREC is currently building partnerships with building professionals to serve as "Participating Independent Contractors" in the loan program.	Tied to revenue from the delivery of the loan program

Proposal #1						
Title	Agency	Reference Number	PI, Co-investigators and collaborators	Funding requested	Project time frame (1 year, 2 years, etc.)	Date submitted
NOT APPLICABLE DURING THIS REPORTING PERIOD						

Grants / Contracts Awarded #1					
Title	Agency	Reference Number	PI, Co-investigators and collaborators	Period of Performance	Funding awarded
The BEERE Menu: Pre-Packaged Technology Retrofit Options for PACE Financing	US DOE Better Buildings	DE-FOA-0000829 CFDA #: 81.086	PI: EcoCity Partners Co-PI: Hal Knowles, Craig Miller, Nick Taylor Collaborators: Pierce Jones and Jennison Kipp	3 year	$128,420.89 (UF Subcontract portion on a $669,102 overall proposal)

Hal Knowles, Co-PI and the primary supported person on this FESC project was a University of Florida Program for Resource Efficient Communities (UF/PREC) point person and contributor to the development of

this new successfully awarded federal grant. UF/PREC will provide the following major services as a subcontractor for this energy efficiency financing and retrofit program: (1) energy pre-screening; (2) retrofit package specification development and standardization; (3) quality control; and (4) measurement and verification. As summarized on the proposal abstract:

"This project seeks to accelerate commercial property assessed clean energy (PACE) financing by small commercial building owners. We will simplify pathways to project completion and finance by designing and offering standardized, pre-packaged technology retrofit options arranged by building type and size, business type, climate zone and other factors. We will prove the reliability of pre-project estimates of energy and cost savings through post-project audits, monitoring & verification. This will enable us to develop critical informational resources for building owners to select from a menu of options for buying energy-efficiency and renewable energy solutions (the "BEERE Menu").

Successful projects included in the BEERE Menu will generate a minimum of 20% energy savings and be capable of accurate estimation. This will facilitate scalability of small commercial energy-efficiency solutions using PACE financing by streamlining pre- and post-energy audit requirements, and will simplify underwriting, approval and financing. Finally, the project will facilitate easier aggregation of PACE projects for pooled financing arrangements. The results will be made available to other PACE program administrators through a white paper and an industry-targeted webinar.