Energy conservation, TOU and user engagement research: Current activities and interests

Paul Parker, Ian Rowlands
23 March 2011
Outline

• brief summaries or research projects
  – REEP (Residential Energy Efficiency Project)
    • Results
    • Community engagement
  – Solar purchasers
  – Energy Hub Management System project
  – Other research activities / interests
ENERSOURCE Conservation –TOU questions

• LDCs have mandatory conservation targets, and are also mandated to implement TOU rates

• Customers aren’t responding as planned. Rates? Behavioural analysis? How do we engage customers?

• “Customers will conserve at first (right thing to do), but won’t stay in the game long-term unless there’s an ROI. Compliment with rates”
REEP (Residential Energy Efficiency Project)

• Origin
  – 1999 Climate Change Action Project
  – Partnership (UW, ECEE, 4 utilities, 4 councils)

• Goal
  – Achieve higher participation rates
    • 1998: 1200 evaluations across Canada
    • Target 1000/yr in Waterloo
  – Combine technical tool EnerGuide for Houses with community engagement
REEP Early Results

• Year 1: Innovators - 827 households
  – No financial incentives

• Survey results
  – Top 20% ‘Conservation Heros’
    • “I did everything on the list!”
  – Bottom 20% ‘Conservation Procrastinators’
    • “Very informative, I just haven’t had a chance to do it yet.”
  – Majority (60%) Took one or more actions
Community engagement

- Over 50 events / year
- Combine
  - enthusiasm of students with
  - expertise of energy evaluators
- Promote trusted third party advice
- **REEP-organized Events**
  - Energy Saving Renovation Workshops
  - REEP House Contractors Open House
  - Well Aware Information Provider Workshop
  - Stormwater Management Community Car Wash
  - Solar Information Night in partnership with CREW
Attend community events

- Preston High School Environmental Expo
- Woolwich Healthy Communities Green Tech Fair
- Festival of Neighbourhoods Kitchener Finale
- City of Cambridge City Green Workshop
- KW Community Foundation Celebration of Giving
- Greater KW Chamber of Commerce Energy and Environment Forum
- Your Kitchener Market Blooming Earth Festival
- Waterloo Earth Day
- Energy Conservation Week with Kitchener-Wilmot Hydro & Waterloo North Hydro
- Cambridge Home Depot event with Union Gas
- WLU Commuter Challenge event
- Alternatives Journal concert with Bob Wiseman
- CREW Solar Energy and You forum
- GRCA Rural Routes Heritage River event
- Maplesoft Environmental Fair
- Laurel Creek Headwaters Association meeting
- KW Twin City Home and Garden Show
- KW Home and Garden Show
- KW Twin City Fall Home and Leisure Show
- Wellesley Home and Garden Show
- Heffner Spring Garden and Activities Show
- Wellesley Fall Fair
- Peter Benninger Coldwell Banker Concierge Show
- Fresh Ayr Festival
Education: Lunch & Learn

- MCC Solar Energy Information Night
- YNCU Should I Stay or Should I Go Green event
- Region of Waterloo ECO FEST
- ReThink Waterloo workshops and conference
- Canada Revenue Lunch ‘n’ Learns and Eco Fair
- Your Kitchener Market Lunch ‘n’ Learn
- GRCA Water Conservation Workshop
- Beechwood Park Housing Association presentation
- Western Ontario Municipalities Conference
- Regional Heritage Advisory Planning Committee
- The Working Centre Green Energy Act panel
- The Working Centre New Green Economy panel
- UW Environment and Business Conference

KidSpark children’s festival
COM DEV Lunch ‘n’ Learn
GRCA Lunch ‘n’ Learn
GRCA Water Forum
Probus Club presentation
HRAI Breakfast Meeting
UW Staff Conference
WLU “Reaching In” workshops
Celebration!

• Congratulations, Waterloo Region!
• Since 1999, home energy retrofits by REEP customers have resulted in:
  • A reduction of 18,142 tonnes of greenhouse gas emissions annually
  • Retrofit for the
  • Next generation
REEP Decade Results

• Years 9-11: Early Adopters (11 year total over 10,000)
  – 780 follow-ups from 2627 initial households
  – ecoENERGY and Ontario Home Energy Savings incentives

• Follow-up evaluation results
  – Average savings 35%
  – Top 25% ‘Conservation Heros’
    • achieved >90% of recommended savings
      – “I did everything on the list!”
      – 25% took single action (Furnace)
      – 75% took multiple actions “Home as a System”
Energy behaviour research

- integrated approach acknowledges that energy consumers do not necessarily behave as rational economic actors
- Consumers affected by
  - personal capabilities, knowledge,
  - information retrieval, decision making
  - social groups and social status
  - structural and socio-technical context
Goals

• 1. Increase participation rates
  – Enable more people to become actively engaged
  – From ‘Conservation Procrastinator’
  – To ‘Conservation Hero’

• 2. Increase depth of action
  – From 30% savings to near Net Zero
REEP House, Waterloo Region, Canada.

PROJECT SUMMARY
Retrofit to house; multiple contracts
Educational project for energy retrofit
by Waterloo Region Green Solutions
Funded by various sources
Reduction of primary energy: 85%

SPECIAL FEATURES
High insulation levels
Solar thermal and Solar PV

PROJECT TEAM
REEP Green Solutions
Graham Whiting Design, Architect

OWNER
Regional Municipality of Waterloo

IEA – SHC Task 37
Advanced Housing Renovation with Solar & Conservation
REEP House - Demonstration Home: Compare Insulation Options and Heating Bills
Solar Innovators

• Compare purchasers to non-purchasers
  – WISE community solar initiative (pre-FIT)
  – Purchasers
    • Social context
      – Shared local information network
    • Personal context
      – Pro environment attitude
    • Technical context
      – Low average electricity consumption
  
• Sherk and Parker 2010 Attributes of PV Purchasers vs. Non-Purchasers: A Stakeholder Report with Lessons and Opportunities Drawn from an Urban Canadian Case Study (WISE)
Smart Grid Tools

• Goals
  – to understand the user’s interaction with alternative electricity technologies and interfaces
  – to understand the user’s motivations (and barriers)
  – to enable active and informed participation
Energy Hub Management System

• project vision
Energy Hub Management System

• project’s projected contributions
  – development of cutting-edge intellectual property
    • models integrated into unique hardware-software systems
  – increased understanding of customer engagement with energy management technology
  – identification of key commercial opportunities, across various sectors
  – training of a new generation of energy professionals
Other research activities

• Solar Buildings Research Network
  – at what orientation (tilt and azimuth) should solar panels be set to maximise ‘good’?
  – does a geographical distribution of solar panels smooth out the generation profile?
  • in other words, is it ‘always sunny somewhere’?

www.solarbuildings.ca;
http://worldclimateissues.wordpress.com/2010/01/16/using-solar-panels/
Other research activities

• internationalising the smart grid
  – challenges and opportunities
Two research ideas

• 1) Impact of ToU rates on consumption
  – Context

The cost impacts of a mandatory move to time-of-use pricing on residential customers: an Ontario (Canada) case-study

Ian H. Rowlands • Ian M. Furst
Two research ideas

1) Impact of ToU rates on consumption
   - Proposal
     - access to data would allow matched-pairs analysis to see the impact of a ToU ‘intervention’

- match homes on consumption characteristics, when both on two-tier rates
- determine differences in consumption after one has gone on to ToU rates
Two research ideas

• 2) Valuing residential electricity services
  – Context
    • relatively little is known about the so-called ‘elasticity of demand’, regarding residential electricity services at a household level. … even less is known at the appliance level.
    • it would be useful to understand better what services are ‘critical’ and what are ‘discretionary’
Two research ideas

• 2) Valuing residential electricity services
  – Proposal
    • install a ‘smart panel’ in 10-20 homes, assign ‘cut-off’ (‘demand response’) values for individual appliances (electricity loads), put people on spot prices, and see how their values are revealed

Current research interests

• how do people value not only the ‘energy service’ provided by the kW (kWh), but also the ‘non-energy’ services?

• how does thinking about the ‘rhythm’ of the house help? … both within the energy ecosystem and beyond
Current research interests

- energy/money/carbon
  - how will interests/priorities be balanced?
    - ‘budget’ and ‘monitor’ on different metrics (kWh, $, g CO2e)

---

**Friday, 12 Nov. 10 in Ontario**

upload.wikimedia.org/wikipedia/commons/thumb/c/ce/Balanced_scales.svg/400px-Balanced_scales.svg.png; www.ieso.ca
Conclusions

• Presenters’ contact details

Paul Parker
pparker@uwaterloo.ca
(519) 888-4567, ext. 32791

Ian Rowlands
irowland@uwaterloo.ca
(519) 888-4567, ext. 32574