ENERGY POLICY & SUSTAINABILITY RESEARCH IN THE FACULTY OF ENVIRONMENT

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AGENDA

- Energy research in the Faculty of Environment
- Overview of my research
 - » Introduction & Background
 - » Research Objectives & Methods
 - » Results
 - » Conclusions



ENERGY RESEARCH: FACULTY OF ENVIRONMENT

- Energy storage
- Consumer engagement & social marketing
- Renewable energy strategies in remote communities
- Smart homes and smart communities
- Transitions of utility companies
- Renewable energy policy
- Energy policy and governance
- Residential energy retrofits and carbon mitigation
- Green economy and local economic development



ENERGY RESEARCH: FACULTY OF ENVIRONMENT

School of Environment, Enterprise and Development Department of Geography and Environmental Management

School of Planning

School of Environment, Resources and Sustainability

Department of Knowledge Integration



MY RESEARCH THEME

- Residential consumer engagement with smart grid technologies to identify opportunities for:
 - » Technological development
 - » Policy development
 - » Program development
- Utilizing mixed-methods research



ASSESSING THE INFLUENCE OF SMART GRID INTERVENTIONS ON SUBURBAN RESIDENTIAL ENERGY CULTURES

An example of research done in the Sustainable Energy Policy Group



INTRODUCTION: THE SMART GRID

"Connecting consumers to control rooms" (IESO, 2015)



Elements

- Smart meter
- Communication infrastructure
- Control devices

Difference between 'conventional system'

- Real-time feedback
- Control mechanisms
- High-granularity of feedback → circuitlevel

(Depuru, Wang, & Devabhaktuni, 2011)



INTRODUCTION: THE SMART GRID

- Energy consumption is sociotechnical
 - Technology and behaviour interact and co-evolve (Darby, 2006)
- Important to introduce parallel behaviour change programs (Anda & Temmen, 2014)
- Interventions assist energy conservation behaviour (Abrahamse, et al., 2007)

Good design of smart grid → synergy between technology and behaviour Multidisciplinary research needed to combine technical & behavioural knowledge (Froehlich et al., 2010)





INTRODUCTION: ENERGY CULTURE



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BACKGROUND: EHMS

- 25 households in Milton, Ontario
- Change to material culture:
 - » Smart-panel technology
 - » High-resolution consumption data
- 13 interventions from June 2011-April 2016
- 15 Interviews conducted (n=15), focusing on 7 behavioral-focused interventions
- Objective: to investigate the impact of interventions on residential energy cultures through qualitative feedback of participants

Intervention	
Goal setting	Self-set goals throughout project
Webinars	One-time educational component
Scheduling	Opt-in schedule to turn off circuits
Incentivized control	Opt-in system control of A/C during July & August
Reminder emails	Gave a prompt to log-in
Weekly electricity report	Weekly feedback compared to past consumption & other participants provided by email
Web portal	On-line portal with circuit-level feedback, scheduling and control

CONCLUSION: 'SMART' ENERGY CULTURE



INTERVENTION EFFECTIVENESS

Intervention	Feedback
Goal setting	X Difficult to meet, and know how to improve
Scheduling	X Inconvenient, used appliances anyways
Webinars	 Information to properly engage
Incentivized control	 Maintained desired comfort
Reminder emails	Gave a prompt to log-in, but more information needed
Web portal	 Provided more awareness
Weekly electricity report	 Useful feedback provided and convenient delivery method



CASE STUDY 2: IN-HOME DISPLAY STUDY

Developing a smart residential energy culture through real-time energy displays

- 8297 households
 - » 5275 participant and 3022 control
- Central Ontario
- Connected to smart meters
- IHD real-time smart meter feedback
- Quantitative analysis
 - » Overall reductions & TOU Shifts
 - » Studying overall & sub-cultures of consumption
 - » Influence of IHD on particular sub-cultures of consumption



(Aztech, 2015)



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THANK YOU

Interested in collaborating? Contact us!

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