Renewable Energy Quest
in.termit...ten...cy
It ain’t so simple: Complexity
Ever wish you could take control of your energy costs?

Benefits:
- Lower rates
- Greener choices
- Reduced greenhouse gases
- Local control
- Investing in our community
Capturing Wind with Thermal Energy Storage – Summerside’s Smart Grid Approach

Steven Wong, Member, IEEE, Greg Gaudet, and Louis-Philippe Proulx

Abstract—The City of Summerside, PE, Canada, has 21 MW of wind capacity from which it meets almost half of its electric energy demand. At times, wind power exceeds what is needed locally. To avoid exporting the excess wind to the bulk grid at unfavourable prices, an innovative smart grid program for active control of thermal energy storage systems has been designed and implemented. On the utility-side, fibre has been wired through multiple feeders to coordinate real-time control of load. On the client-side, consumers are incentivized to install ToU or real-time controlled electric thermal storage or water heater units in place of oil appliances. To quantify program impacts, a system model is created for simulating many what-if scenarios using system data from 2013 to 2015. It is found that there are compelling, measurable benefits to utility and consumer finances, GHG emissions, and wind integration with little negative impact.

A. Thermal Energy Storage

Thermal energy storage systems (TES) are devices that store energy as heat for later use in mediums such as water, ceramics, and rocks. Classification, design, application, and evaluation of TES in building applications are thoroughly explored in [1], [2]. The DR potential of various TES systems are explored in a German context in [3]; it finds that devices intrinsic to households (e.g., heating/ventilation and refrigeration) can be used for peak shaving but are not suitable for balancing wind variability, for which dedicated TES is needed. Related to TES are thermostatically controlled loads (such as air conditioners), which can provide DR through temperature...
Renewables Penetration (46%)
Building Optimization Analytics

1. Fault Detection and Diagnostics
2. Equipment Performance Monitoring
3. Control System Optimization
4. Energy Management

...to Next Generation Energy Optimization
SHIP (Smarter Homes Incentive Program)

LED Street Lights

Smart Meters

Fiber connectivity to the Summerside Grid

Car Chargers

Rebates for Heat for Less (Thermal Storage)

Consultations on Smart Homes
If you install them, will they come?

Catherine McKenna, Environment and Climate Change Minister
Nourish Next-Gen Renewable Quests

Daniel, Jordan & Erik – UNB Engineering Students
Nourish Next-Gen Renewable Quests

...and next-next gen
Renewable Energy Quest
Confounds, Variables and Biases

• Community-owned electric utilities extremely uncommon in Canada
  • Regulatory regimes do NOT favor distributed electrical generation/distribution

• Public policy shops emaciated at all levels of government over last 30 years
  • Supplanted by independent think tanks (independent, but unbiased? Hmmm)

• Public policy slow-footed uptake of behavioral/cognitive sciences to catalyze change

• Electric utility industry driven by conservative values—ROI trumps public good

• Luxuries of North American “bigness” hard to give up—historical frontier culture
  • E.g. big houses, big spaces, big cars, big super-highways, big suburbs, big consumption, big oil, all contributing to big carbon