A new energy rate design to effectively reduce energy efficiency barriers and criticisms

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Outline

1. Rapid review: evidence that there is an energy efficiency (EE) gap
2. Rapid review: summary of barriers and criticisms preventing closure of this EE gap
3. Introduction of a new energy rate, strategically designed to reduce or eliminate the major barriers and criticisms
Evidence of the “Energy Efficiency Gap”
(Energy Efficiency Alberta CPR, Navigant, 2019)

Figure 5-8. Cumulative Lifetime GHG Emissions Reduction by Potential for Electricity and Natural Gas, Lifetime tCO₂e

Source: Navigant analysis
Market Barriers
(IEA Mind the Gap, 2007)

• **Energy as a low priority** (e.g. energy costs are low relative to other costs)
• **Access to capital $$**
• **Incomplete market for energy efficiency** (e.g. EE features “bundled” with something else such as Energy Star computer models may not have features desired)
Market Failures in EE
(Mind the Gap, 2007)

- **Information**: insufficient &/or inaccurate. e.g. consumers believe efficient technology is always more expensive
- **Externalities**: costs not reflected in the price of commercial energy
- **Principal Agent problems** such as split incentives: parties in an economic exchange have different goals or incentives e.g. tenant-landlord
# Cognitive Barriers, a few examples

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<tr>
<th>Cognitive Bias</th>
<th>Description</th>
<th>Example</th>
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<tbody>
<tr>
<td><strong>Loss aversion</strong></td>
<td>Avoiding losses is often preferred to acquiring gains</td>
<td>Presenting a heat pump purchase as avoiding a $500 annual loss induces more buyers than presenting it as a chance to profit $500 per year.</td>
</tr>
<tr>
<td><strong>Anchoring and adjustment</strong></td>
<td>Gravitation towards a predefined reference, regardless of its relevance</td>
<td>Researchers used a reference point of a 100 W lamp operating 1 hour (100 watt-hours), which led subjects to underestimate differences in energy consumption of computers.</td>
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<tr>
<td><strong>Hyperbolic discounting</strong></td>
<td>Smaller, immediate rewards are selected over larger, delayed ones</td>
<td>Offered $50 now or $100 in 1 year, many people choose $50 now. However, few people can double their money in 1 year.</td>
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Criticisms of EE Policies

• **free rider**: taking subsidy for something you would have done anyway (e.g. pulp mill accepts federal Green Transformation $$ for project would have done anyway)

• **rebound (take-back) effect**: increased level of energy services (and energy consumed) in response to efficiency gains (e.g. buy a Prius, drive more km’s). Some claim “backfire” rebound $\geq 100\%$
EE “Critics” persist (Regulation Spring, 2019)

A Cautionary Tale About Energy Efficiency Initiatives

If these programs are such bargains, then why does government mandate them and energy utilities push for them?

By Kenneth W. Costello
EE “Advocates” also persist
(Regulation Spring, 2019)

Utility Energy Efficiency Initiatives Are Good Policy

These programs address important market failures and have been shown to be cost-effective.

BY MARTIN KUSHLER, ED VINE, AND KEN KEATING
Summary of EE Barriers & Criticisms

Barriers: 4 categories
1. Financial
2. Hidden Costs
3. Split Incentives
4. Information

Criticisms: 2 major limitations
1. Free ridership
2. Rebound effects
New Energy Rate Design

1. Applies to stationary facilities (e.g. electricity, natural gas, steam, hot water, ...)

2. Set of rules to reduce barriers and criticisms to become minor or negligible effects
New Energy Rate Design Rules

Basic rate rules:

• Mandatory energy audits/studies for all customers, funded out of basic charge, *except residential opt-out* (e.g. household every 5 years @ $300 = $5/month)

• Identify cost-effective energy savings (CEES), which is a collection of qualified Energy Saving Measures (ESM’s)

• Two tier rate:
  Tier 2: all CEES
  Tier 1: total energy & demand costs, *less CEES*

• Mandatory on-bill finance offered by utility, amortized over the time \( \leq \) persistence of ESM savings
New Energy Rate Design Rules

• Choice architecture:
  Customer responsible for ESMs opts to either:
  a) Agree to implement CEES via on-bill or their own funding
  b) Pay Tier 2 per unit energy, where **Tier 2 $/unit > CEES cost $/unit**
     (e.g. CEES cost threshold = $0.08/kWh vs. Tier 2 = $0.12/kWh).

• Ownership of CEES (again, CEES = collection of ESMs):
  a) 100% owner occupied, then 100% ownership of ESM’s
  b) Tenant occupied:
     Tenant-authorized ESMs: tenant uses choice architecture
     Owner-authorized ESMs: owner uses choice architecture

• Setting rates
  a) Tier 1 rate set by utility based on traditional *Cost of Service*
     (increased Tier 2 revenue reduces Tier 1 rate).
  b) Tier 2 rate > Tier 1, and includes *eligible social costs*
Screening ESMs

• Defining energy savings

Energy savings are defined as a reduction in energy consumption for a specified system over a defined period of time due to an intervention, and adjusted for direct rebound effects where applicable. Savings are quantified relative to a baseline, where the quantity and quality of energy services after the intervention are the same, better, or otherwise deemed acceptable (e.g. based on a standard or stakeholder survey).

• ESM meets accuracy for:

a) energy-savings (e.g. minimum kWh/yr)
b) implementation costs (e.g. maximum $/ESM)
Three ESM tests

To qualify as CEES:
• #1: Are expected quantity and quality of services acceptable? (sufficient evidence of performance, match to site-specific stakeholder requirements, meet applicable codes and standards).
• #2: Accuracy of energy savings? E.g. to -10%?
• #3: Accuracy of implementation costs? E.g. to +15%?

ESMs which do not pass these tests, these can be implemented using other funding sources (e.g. subsidy programs, energy service contracts, ‘green’ loans, owner-finance, etc.)
How this rate design addresses barriers & criticisms

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<th>Barrier or Criticism</th>
<th>How the rate design mitigates or eliminates</th>
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<td>Financial</td>
<td>• Eliminated via guaranteed on-bill finance offering</td>
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</table>
| Hidden Costs         | • ESM based on quality & quantity of service  
                      | • Site specific audit technical & cost accuracy |
| Split Incentives     | • Divide ESM’s into tenant-authorized and owner-authorized |
| Information          | • Site specific audit: technical & cost accuracy  
                      | • Auditor delivery to address cognitive barriers |
| Free Ridership       | • Customer pays for 100% of ESMs, so zero free ridership |
| Rebound Effects      | • Direct rebound mitigated through customer engagement, applying behavioural economics, social marketing & related tools |
Essential elements of effective rate design

For social & political acceptance:
• Energy utility trust, credibility & transparency of energy utility
• Integrity of dispute resolution process
• Consumer choice architecture

For delivery:
• EM&V planning
• Employment: sufficient capacity to deliver credible audit/study services, installation & contracting, supply chains, and training.
• Effective financing resources to guarantee on-bill finance option
Research Team

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