Ontario Energy Board Smart Price Pilot
An Overview of the Results

July 26, 2007
Agenda

1. Background and Objectives

2. Price Designs

3. Pilot Approach

4. Results

5. Questions
Objectives of Ontario Smart Pricing Pilot

Determine if current RPP TOU price design (3:2:1 ratio) encourages load shifting

Assess degree of:
- Demand response (or shifting of consumption away from Critical Peak or On-Peak hours); and
- Conservation effects (or reduction in total electricity consumption, regardless of when electricity is used)

Obtain direct consumer feedback on their understanding of TOU pricing

Determine how TOU pricing communications can be refined to enhance understanding

Test critical peak pricing (CPP) as per Board commitment in December 2004
TOU Pilot Milestones

Stage 1: Pilot Design & Setup (June – July ‘06)

Stage 2: Pilot Operations (Aug 1-06 – Feb 28-07)
- Pilot Design Document finalized (September ‘06)
- Three focus groups completed (October ‘06)
- Surveys completed by 79% of participants (Dec 14th cut-off)
- Pilot extended by 2 months by Board to capture winter months (to February 28, 2007)

Stage 3: Final Evaluation and Report (July 2007)
Final Evaluation and Report

Final report consolidates analyses from:

- Consumer feedback
  - Survey of 298 participants
    - 79% response rate
    - Margin of error (at 95% confidence) for overall results is ± 5.7%
  - Focus groups
    - 44 participants in three groups

- Electricity usage evaluation
  - Demand response effect vs a control group
  - Conservation effect vs a control group

- Bill Impacts (TOU vs tiered pricing)
Pilot Team

Ontario Energy Board
- Program management and oversight
- Determined high-level pilot design (price designs tested)

IBM
- Prime contractor and complete customer surveys

eMeter Strategic Consulting (ESC)
- Data management, participant care, and focus groups

Professor Frank Wolak of Stanford University
- Pilot evaluation design and analysis

Hydro Ottawa
- Participating distributor, customer information, and interval data collection
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TOU price designs

375 Hydro Ottawa residential customers with smart meters (initially planned 225)

Placed into 3 groups of 125 each:
- RPP Time-of-Use (TOU) prices only
- RPP TOU prices + critical peak “pricing” (CPP)
- RPP TOU prices + critical peak “rebates” (CPR)

Also a 4th Control Group (RPP Tiered Prices)

First dynamic pricing pilot to simultaneously test TOU pricing, CPP and CPR
## Group 1: The existing RPP TOU prices

<table>
<thead>
<tr>
<th>Time</th>
<th>Summer Hours (Aug 1 - Oct 31)</th>
<th>¢/kWh</th>
<th>Winter Hours (Nov 1 - Feb 28)</th>
<th>¢/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Peak</td>
<td>10 pm - 7 am weekdays; all day on weekends and holidays</td>
<td>3.5</td>
<td>10 pm - 7 am weekdays; all day on weekends and holidays</td>
<td>3.2</td>
</tr>
<tr>
<td>Mid-Peak</td>
<td>7 am - 11 am and 5 pm - 10 pm weekdays</td>
<td>7.5</td>
<td>11 am - 5 pm and 8 pm - 10 pm weekdays</td>
<td>7.2</td>
</tr>
<tr>
<td>On-Peak</td>
<td>11 am - 5 pm weekdays</td>
<td>10.5</td>
<td>7 am - 11 am and 5 pm - 8pm weekdays</td>
<td>9.2</td>
</tr>
</tbody>
</table>
Group 2: Existing RPP TOU + CPP

- 30.0 ¢/kWh
- 3 to 4 hours during On-Peak period
- Invoked up to 9 times during the pilot
- Off-Peak price reduced to 3.1 ¢/kWh to ensure revenue neutrality
  - 3.2 cents more appropriate given number of events called
- Day-ahead notification at 5 p.m., day before critical day (automated phone call, e-mail, or text message)
- Trigger: Temperature of -14°C (winter) & 28°C (summer) or Humidex exceeds 30°C during peak periods
Group 3: Existing RPP TOU + CPR

- 30.0¢ rebate for every kWh reduced below a baseline
- Same days, times, and participant notification as CPP
- No reduction to Off-Peak price
- Baseline of last 5 non-event weekdays adjusted up 25%
Group 4: Control Group

- 125 Hydro Ottawa customers with smart meters before August 1, selected at random
- Continue to pay RPP threshold rates
- All treatment and control participants are RPP consumers (i.e., not on a retailer contract)
- All analysis is classic side-by-side comparison of control group versus treatment groups
- Using “fixed effects” include unchanging customer characteristics such as house size and appliances
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Incentive payments and billing

- Thank you payment of $75
  - $50 for staying on full pilot
  - $25 for completing survey
- Plus/minus any TOU pricing savings/losses (vs commodity tiered charges)
- Participants continue to receive “normal” bill from Hydro Ottawa during pilot based on tiered prices
- Also receive monthly Electricity Usage Statement (not a bill) showing commodity charges on TOU vs tiered prices
**Ontario Smart Price Pilot Program Final Statement**

<table>
<thead>
<tr>
<th>Billing Period</th>
<th>Bill on Time of Use Prices</th>
<th>Bill on Current Electricity Prices</th>
<th>Savings or (Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 2006</td>
<td>$45.19</td>
<td>$49.20</td>
<td>$4.01</td>
</tr>
<tr>
<td>September 2006</td>
<td>$29.75</td>
<td>$31.99</td>
<td>$2.24</td>
</tr>
<tr>
<td>October 2006</td>
<td>$27.84</td>
<td>$30.12</td>
<td>$2.28</td>
</tr>
<tr>
<td>November 2006</td>
<td>$28.26</td>
<td>$29.70</td>
<td>$1.44</td>
</tr>
<tr>
<td>December 2006</td>
<td>$28.26</td>
<td>$29.70</td>
<td>$1.44</td>
</tr>
</tbody>
</table>

**TOTAL SAVINGS (OR LOSS)**

$11.41

**Thank You Payment**

$75.00

**TOTAL FINAL CHEQUE AMOUNT**

$86.41
Usage chart from monthly statement

Electricity Use By Day

- Critical Peak
- On Peak
- Mid Peak
- Off Peak
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High level results

1. Consumers shift electricity use from peak times on TOU prices in the summer

2. Participants use less electricity overall on TOU prices

3. Most participants save money on TOU prices

4. Most participants like TOU prices

5. Monthly bill and TOU magnet important
1. Summer demand response: Usage shifted from On-Peak times on critical peak event days

- 7 critical peak events called during pilot:
  - 4 in summer
  - 3 in winter
- Between 6%-25% peak shifting in during summertime critical peak times
- CPP group shifted most usage, followed by CPR, then TOU-only
- TOU-only participants were not notified of critical peak days
- Shifts observed for TOU-only participants were not statistically significant
- Winter: No statistically significant shifts by any pricing group at any time including critical peak days
- No statistically significant shifts during non-critical peak days
2. Conservation impact of 6%

- Comparison of total electricity use between treatment groups and control group before and during pilot.
- Approach used makes weather differences between years a non-issue.

Bar chart showing:
- TOU Only: 6.0%
- TOU+CPR: 7.4%
- TOU+CPP: 4.7%
3. Commodity charge savings/losses: TOU vs Tiered from load shifting alone

<table>
<thead>
<tr>
<th></th>
<th>TOU only</th>
<th>TOU+ CPP</th>
<th>TOU+ CPR</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Savings (%)</td>
<td>2.1%</td>
<td>4.2%</td>
<td>2.8%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Minimum - Largest Loss (%)</td>
<td>-20.3%</td>
<td>-24.3%</td>
<td>-24.1%</td>
<td>-24.3%</td>
</tr>
<tr>
<td>Maximum - Largest Saving (%)</td>
<td>22.4%</td>
<td>25.7%</td>
<td>23.5%</td>
<td>25.7%</td>
</tr>
<tr>
<td>% of Participants Saving on TOU</td>
<td>65%</td>
<td>84%</td>
<td>77%</td>
<td>75%</td>
</tr>
</tbody>
</table>

- 75% “saved” across all three pricing groups (vs tiered pricing)
- Average savings was 3.0% of commodity charge ($10.13 over full pilot or $1.44 / month)
- Highest individual “savings” extreme at $136.64 (or $19.52 / month)
  - 95th percentile was $46.90 (or $6.70 / month)
- Greatest individual “loss” was $41.37 (or $5.91 / month)
  - 5th percentile much less extreme at $11.30 (or $1.61 / month)
3. Conservation increases TOU savings

Including conservation effect, 93% of participants estimated to be better off on TOU pricing (vs 75% due to shifting alone)

<table>
<thead>
<tr>
<th>Savings Source</th>
<th>Average Monthly TOU Bill Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Shifting</td>
<td>$1.44</td>
</tr>
<tr>
<td>Conservation</td>
<td>$2.73</td>
</tr>
<tr>
<td><strong>Total Average Monthly Bill Savings During the Pilot Period</strong></td>
<td><strong>$4.17</strong></td>
</tr>
</tbody>
</table>
4. Most participants like TOU prices

- 78% of participants surveyed would recommend TOU pricing to friends; 6% definitely would not
- Only 17% would want to return to two-tiered pricing
- Top 3 reasons for recommending TOU:
  - More aware of how to reduce bill
  - Greater control over costs
  - Benefits the environment
- 71% feel Off-Peak to On-Peak price differential is about right; 16% say no
5. Communications feedback

- Fridge magnet and monthly statements most important tools
- Most valuable part of statement was daily usage breakdown by TOU price
  - priority to add to “normal” HO bill, when mandatory TOU pricing
- Bi-monthly billing frequency not seen as adequate for TOU pricing
- TOU pricing “easy”
- Concerned about ability to shift during winter peak periods and complexity
- No one felt TOU prices were a “money grab” or “gouging” that many had feared and/or perceived going into pilot
- “Rule of thumb” for a “critical peak event” was only “non-negotiable” appliances (e.g., refrigerators) run. However, many also felt they had already pared back usage in response to On-Peak price
- No desire to change to a 2-period (from current 3-period) TOU structure
## ONTARIO SMART PRICE PILOT / CRITICAL PEAK REBATE PERIODS AND RATES

<table>
<thead>
<tr>
<th>Day of the Week</th>
<th>Time Heures</th>
<th>Period Périodes d'utilisation</th>
<th>Price/Prix* (c/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekends &amp; Holidays</td>
<td>All Day / Toute la journée</td>
<td>Off-peak / Période creuse</td>
<td>3.1 c</td>
</tr>
<tr>
<td>Summer Weekdays (May 1st - Oct 31st)</td>
<td>7 am to 11 am / 7 h à 11 h</td>
<td>Mid-peak / Période moyenne</td>
<td>7.5 c</td>
</tr>
<tr>
<td></td>
<td>11 am to 5 pm / 11 h à 17 h</td>
<td>On-peak / Période de pointe</td>
<td>10.5 c</td>
</tr>
<tr>
<td></td>
<td>5 pm to 10 pm / 17 h à 22 h</td>
<td>Mid-peak / Période moyenne</td>
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<tr>
<td></td>
<td>Upon notification / Sur la notification</td>
<td>Critical peak / Pointe critique</td>
<td>30.0 c per kWh reduced / réduit</td>
</tr>
<tr>
<td>Winter Weekdays (Nov 1st - Apr 30th)</td>
<td>7 am to 11 am / 7 h à 11 h</td>
<td>On-peak / Période de pointe</td>
<td>10.5 c</td>
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<td></td>
<td>8 pm to 10 pm / 20 h à 22 h</td>
<td>Mid-peak / Période moyenne</td>
<td>7.5 c</td>
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</tr>
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</table>

* Critical peak occurs for 3 or 4 hours during the on-peak period, on weekdays only. The maximum number of such days in the pilot will be 9.

* La pointe critique arrive pour 3 ou 4 heures pendant les heures de pointe, sur les jours de pointe critiques seulement. Le nombre maximum de tels jours dans le pilote sera 9.
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