Behavior Program Measures for Submission to 2015 MEMD
- Year Three Energy Savings
- Demand Savings

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Introduction

- Michigan has adopted deemed values for Home Energy Reports type Residential behavior programs based on the actual savings observed in two large-scale pilot programs conducted by DTE Energy and Consumers Energy
  - Year One savings values were added to the MEMD for 2013
  - Year Two savings values were added to the MEMD for 2014
- Similarly, Consumers Energy and DTE Energy are submitting Year Three savings values for inclusion in the 2015 MEMD
  - Again they are based on the combined actual experience of the two companies on-going pilots
  - Preliminary results/whitepapers were submitted to the Technical Subcommittee April 1
  - Savings values to be update with full 12-months post data by June 1
- The companies are also submitting proposed Peak Demand Savings values based on analysis of AMI data from a number of different companies, including Consumers Energy
Agenda

- MEMD Process for Residential Behavior Measures
  - Year three Savings
  - Peak Demand Savings
Behavior and hardware have different approaches to measuring savings

Behavior savings are measured *ex post* using experimental design

Hardware savings are deemed *ex ante* using a database of approved values

Random Allocation

Targeted households in utility footprint

Control Group

Statistically equivalent groups

Test Group

Receive Reports

Energy Usage

KWh

No Reports

With Reports

70 kWh
Deem and verify, a hybrid approach

**Process**

1. MEMD
   - Include behavior in MEMD

2. Calculate savings
   - Model savings of program for first year

3. Measure savings
   - Measure actual savings using experimental design to verify calculations

4. Adjust savings
   - Adjust program savings for second year based on first year results

**Example calculations**

- **MEMD methodology**
  - Savings rate (%) x Total usage (kWh)

- **Savings calculation**
  - 1% x 1,000 kWh = 10 kWh savings

- **Actual savings**
  - Treatment - Control = 15 kWh savings

- **Adjusted savings**
  - 1.5% x 1,000 kWh = 15 kWh savings

**Notes:**
** All savings figures and calculations are demonstrative abstractions, rather than real numbers
Results Improve Over Time
Results from 7 Midwest deployments show consistent improvement from Year 1 to Year 2, and continued improvement in Year 3
Savings Rates Over Time, Midwest Deployments
MEMD Update Process

2012

Sept 2012
Include Y1 savings value in MEMD

2013

June 2013
Measure Y2 savings results via program evaluation

Sept 2013
Include Y2 savings value in MEMD

2014

June 2014
Measure Y3 savings results via program evaluation

Sept 2014
Include Y3 savings value in MEMD
Benefits of Deem and Verify Approach

**Summary**
The deem and verify hybrid approach:

» Provides **consistency** with both the existing approach in Michigan and the accepted best practice for behavioral programs

» Creates **certainty** for regulatory treatment of behavioral programs similar to the certainty that applies to hardware

» Uses experimental design to **verify** savings values on an ongoing basis

» Provides a mechanism for **adjusting** savings as needed going forward
Agenda

- MEMD Process for Residential Behavior Measures
- Year three Savings
- Peak Demand Savings
## Updated MEMD Savings Rate Values

**Year 1 to Year 3 Results Side-by-Side**

<table>
<thead>
<tr>
<th></th>
<th>Year 1 Savings Rate</th>
<th>Year 2 Savings Rate</th>
<th>Year 3 Savings Rate</th>
<th>Usage Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric High Usage Band</td>
<td>1.20%</td>
<td>1.68%</td>
<td>1.82%*</td>
<td>9k – 11k kWh</td>
</tr>
<tr>
<td>Electric Average Usage Band</td>
<td>1.05%</td>
<td>1.34%</td>
<td>1.44%*</td>
<td>7k – 9k kWh</td>
</tr>
<tr>
<td>Gas Usage Band</td>
<td>0.64%</td>
<td>0.71%</td>
<td>0.79%*</td>
<td>900 – 1,100 therm</td>
</tr>
</tbody>
</table>

**Notes:**
* DTE and CMS Year 3 annual results are based on measured values for May 2013 through February 2014 and forecasts from March 2014 through end of April 2014 based on reported historical usage; numbers have been adjusted to back out increases in participation in other programs attributable to the behavioral programs using Y2 participation rates as placeholders.
## Updated Electric High Usage Band

**DTE and Consumers Y3 program results (electric), May 1 2013 to April 30 2014**

<table>
<thead>
<tr>
<th></th>
<th>Consumers</th>
<th>DTE</th>
<th>Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings Rate</td>
<td>1.57%*</td>
<td>2.07%*</td>
<td>1.82%**</td>
</tr>
<tr>
<td>Usage Band</td>
<td></td>
<td>9,000 to 11,000 kWh</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

* DTE and CMS annual results are based on measured values for May 2013 through February 2014 and forecasts from March 2014 to end of April 2014 based on reported historical usage; numbers have been adjusted to back out increases in participation in other programs attributable to the behavioral programs.

** Michigan-wide savings figure based on average of results from Consumers and DTE results
## Updated Electric Average Usage Band

DTE and Consumers Y3 program results adjusted for average usage in territory (electric), May 1 2013 to April 30 2014

<table>
<thead>
<tr>
<th></th>
<th>Consumers</th>
<th>DTE</th>
<th>Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings Rate</td>
<td>1.22%*</td>
<td>1.67%*</td>
<td>1.44%**</td>
</tr>
<tr>
<td>Usage Band</td>
<td></td>
<td>7,000 to 8,999 kWh</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- * DTE and CMS annual results are based on measured values for May 2013 through February 2014 and forecasts from March 2014 to end of April 2014 based on reported historical usage; numbers have been adjusted to back out increases in participation in other programs attributable to the behavioral programs.
- ** Michigan-wide savings figure based on average of results from Consumers and DTE results
# Year Three Savings

## Updated Gas Usage Band

**DTE and Consumers Y3 program results (gas), May 1 2013 to April 30 2014**

<table>
<thead>
<tr>
<th></th>
<th>Consumers</th>
<th>DTE</th>
<th>Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings Rate</td>
<td>0.94%*</td>
<td>0.64%*</td>
<td>0.79%**</td>
</tr>
<tr>
<td>Usage Band</td>
<td>900 to 1,100 therm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

* DTE and CMS annual results are based on measured values for May 2013 through February 2014 and forecasts from March 2014 to end of April 2014 based on reported historical usage; numbers have been adjusted to back out increases in participation in other programs attributable to the behavioral programs.

** Michigan-wide savings figure based on average of results from Consumers and DTE results
Agenda

- MEMD Process for Residential Behavior Measures
- Year three Savings
  - Peak Demand Savings
Summer intraday loadshapes were very similar across 10 HER deployments at 4 utilities with AMI metering.

Analysis found savings in summer peak hours were 1.52 times the daily average rate for the four utilities.

Consumers Energy (Green Line) had nearly identical results, 1.5 time the average savings rate.

Thus it is reasonable to assume on-peak hours have 1.5 times the energy (and, by extension, demand) savings of the average daily savings rate.
The consistency of these results make this logic supportable even when AMI data is unavailable

- Peak savings results are consistent
  - Summer and winter (in colder climates)
  - Weekday and weekends
  - AMI and billing data powered reports
  - Electric only and dual fuel
  - Multiple climate zones and customer types
  - Sustained results over multiple program years
- Including benefits from peak savings should be the rule rather than the exception
Calculation of On-Peak Multiplier:

1. Gather AMI data history from 10 deployments at 4 utilities located in the west coast, midwest, and east coast, including 1 deployment at Consumers Energy

2. For each deployment and calendar month, calculate average kW savings/customer for each hour of the day using a difference-in-differences calculation (calculation outlined on p. 3 of work paper)

3. Normalize kW savings for each deployment by dividing the kW savings within each hour by the total kW savings across the day (grey lines in appendix A of work paper)

4. For the month of August, stack these normalized kW savings into a single graph and calculate an average normalized kW savings for each hour of the day (red dotted line in appendix A of work paper)

Results:

Average kW savings from 2pm - 6pm is 1.5 times higher than average hourly kW savings across the entire day

This 1.5 multiplier persists across all days of the week (appendix B of work paper) and all summer months (appendix C of work paper)
Calculation of the Peak Demand Savings

1. Determine actual summer month average kW savings/customer (within current program year)
   a) Difference in differences analysis (Treatment vs. Control) using current and prior year’s summer month(s)’ usage to get summer month(s) energy (kWh) savings/customer
   b) Convert kWh savings to average demand savings (kW) by dividing the savings/customer by # of hours in summer month(s) included in the analysis

2. Calculate average on-peak summer month average kW savings/customer
   Multiply the average summer month demand savings/customer by the deemed on-peak multiplier of 1.5
   
   Note: the multiplier is the only “deemed” part of the calculations. Using this allows us to accurately estimate on-peak demand savings until AMI meters are fully deployed and it can be directly measured.

3. Calculate total kW savings for all actively participating customers
   Multiply the average on-peak summer month demand savings/customer by the number of active participating customers
Next Steps

- **Technical Subcommittee:**
  - Review preliminary work papers and results
    - Gain understanding of the concepts and approaches
    - Bring questions back to sponsors, CECo and DTE
  - Wait for/review June 1 submission of final numbers and work papers
    - Final Year 3 savings numbers based on full 12 months post data
    - DTE Energy data issues resolved
  - Approve “deeming” of both measures
    - Year 3 energy savings % (probably close to preliminary value of 1.82%)
    - Peak Demand Savings: approval of the 1.5 on-peak multiplier and calculation methodology

- **Incorporate proposed measures in 2015 MEMD**