Agenda

• 2017-2019 evaluation and update
• Review measure findings and draft workpapers
• Next meeting / next steps
• Q/A
TRM Evaluation & Update

• Three major tasks:
  – Evaluation and update for 2017-2019
  – Generate load profiles
  – Build Smart Measures
TRM Evaluation & Update

- Major deliverables

<table>
<thead>
<tr>
<th>Date</th>
<th>Deliverable</th>
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<tbody>
<tr>
<td>January 30, 2015</td>
<td>Kick-off meeting with the Department and TRMAC</td>
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<tr>
<td>June 1, 2015</td>
<td>List of codes and standards changes</td>
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<tr>
<td>November 13, 2015</td>
<td>Draft TRM delivered</td>
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<tr>
<td>December 11, 2015</td>
<td>Final TRM delivered</td>
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<tr>
<td>December 11, 2015</td>
<td>Smart Measure library complete</td>
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<tr>
<td>December 11, 2015</td>
<td>Electric and gas load profiles delivered</td>
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</table>
TRM Filing Schedule

- Program Modification Filing
- Minnesota Rules 7690.1430
- Docket # E,G999/CIP 15-896

<table>
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<th>Date</th>
<th>Deliverable</th>
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<tr>
<td>November 13, 2015</td>
<td>TRM 2.0 Initial Filing</td>
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<tr>
<td>November 30, 2015</td>
<td>Written Comments Due</td>
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<tr>
<td>December 10, 2015</td>
<td>Reply Comments Due</td>
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<tr>
<td>January 14, 2016</td>
<td>Commissioner Decision</td>
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Measure Categories

- Lighting
- Electric and Gas HVAC
- Gas Non-HVAC and Envelope
- Other Electric Measures
- Codes and Standards Changes
Lighting

• General Items
  – CI Lighting Format
  – T8 Ballast Standard
  – CF review
  – ISRs – Residential lighting
  – Residential Motion Sensors
  – Costs
  – Codes and Standards
  – Requirements
Lighting

– CI Lighting Format
  • General lighting section with common information
  • Algorithm, tables of values (IF, CF, Hrs, ML)
  • Specific technology sections
  • LED troffers in App B, description to be added to ‘T12 up to 4 foot’ section
  • Wattage table, adding fluorescent to LED high bay mostly unchanged
  • Adding High Bay Fluorescent to High Bay LED section
Lighting

  • Effective 11/14/2014
  • Introduces Ballast Luminous Efficiency (BLE) standards
  • Minimum BLE levels comparable to Premium T8 / High Performance T8 levels

– Add legislation information to measure
– Recommendation – Keep as is for 2017, update in annual updates
Lighting

– CF review – current data is consistent
– ISRs – Residential lighting
– Residential Motion Sensors
  • New detailed study shows savings by room type
– Costs
  • Bulk of costs complete, to be added to App B
  • LED pricing is largest change
Lighting

– Codes and Standards
  • Updates for controls,
  • NC new LPD table
  • Incandescent, Final EISA adjustments
  • T8s
  • Minnesota specific requirements - NC

– Requirements
  • ENERGY STAR or Design Lights Consortium (DLC)
HVAC Gas and Electric

- Draft Workpapers (*Updated since last time*)
  - Boilers
  - Boiler Modications
  - Condensing Unit Heater
  - DCV
  - ERV
  - Parking Garage Fan Control
  - Guest Room Energy Management (GREM)
HVAC Gas and Electric

• Draft Workpapers
  – Duct Sealing
  – Furnace and Boilers
  – Furnace Tune-up
  – Forced-Air Heating Maintenance
  – Mini-Split
  – Res GSHP
  – Commercial Air Conditioning, Heat Pumps
HVAC Gas and Electric

- Thermostats
- QI/QM
- General Items
  - HDD vs EFLHrs
  - Steam Trap Hours
    - Some type of control using EFLH heating
    - Some using all heating hours
Residential Thermostats

Algorithm

– Three tiers
  • Tier I: Programmable
  • Tier II: Communicating
  • Tier III: Analytics Capable

– Savings factors for Tier II, Tier III derived from Navigant study for DTE
  • Considered pilot studies, manufacturer claims and engineering judgement
  • Adopted in Michigan Energy Measures Database
Residential Thermostats

• Algorithm continued
  – Tier I is based on current programmable thermostat measure, consistent with Xcel and CPE deemed savings
  – Simplified from current measure; no dependence on direct vs. non-direct install
  – Average heating and cooling weather-normalized energy use is needed
Residential Thermostats

• Recommendations
  – Use measure for planning purposes but use EM&V for claimed savings
  – Update measure as more pilot studies completed and new ENERGY STAR rating is issued
Residential HVAC QI/QM

• Algorithm
  – Based on HVAC SAVE program
  – Similar to furnace and A/C equipment-only measures except rated efficiencies are multiplied by conversion efficiencies (CE_base and CE_prop)
    • CE is measured in-field from temperature, enthalpy and airflow measurements
    • CE represents the ratio of actual Btu’s delivered to rated Btu’s
    • An assumed value for CE_base is used for Replace on Fail and New Construction based on IA field study
      – CE_base = 62% (A/C)
      – CE_base = 72% (Furnace)
  – Existing equipment can be used as a baseline
  – No electric impacts in furnace measure
Residential HVAC QI/QM

- Measure Life
  - Equals life of equipment for Replace on Fail or New Construction
  - Equals 1/3 of the life of the equipment for Replace Working or O&M

- Incremental Cost
  - Includes equipment cost, in-field adjustment and verification labor (provided by ESI), installation labor for Replace Working
  - Need installation labor for A/C

- Unknowns
  - Are assumed baseline conversion efficiencies accurate for MN given longstanding QI programs?
Residential HVAC QI/QM

• Differences from A/C and furnace tune-up measures
  – Existing tune-ups are based on standard “clean and check”
  – Many programs do not include airflow adjustments
  – SAVE model includes in-field verification

• Recommendations
  – If interest in pursuing SAVE model, start with smaller scale pilot programs
    • Could add duct sealing/optimization to measure
  – Update assumed baseline conversion efficiencies periodically from field data
  – Use measure for planning purposes but use EM&V for claimed savings
  – Update measure as more pilot studies completed
Other Electric Measures

• Draft Workpapers
  – Ag Engine Block Heater
  – Ag Fans
  – Ag Lighting
  – Ag Livestock Waterer
  – Compressed Air Leak Repair
  – ECM Circulators Res and CI
  – Heat Pump Water Heaters
  – VSD Pool Pumps
Gas Non-HVAC and Envelope

• Draft Workpapers
  – Commercial Water Heater
  – Commercial Dishwasher
  – Thermostatic Shower Valve
  – Loading Dock Seals
Gas Non-HVAC and Envelope

– Commercial Water Heater
  • New standard
  • Savings vary by size, under and over 55 gal

– Commercial Dishwasher
  • ENERGY STAR calculator and assumptions
  • Many types and options, but savings vary considerably
Code and Standard Changes

• Summary Spreadsheet
• Main updates 2015/2016
• Main updates 2017/2019
• Minnesota Requirements
  – Three options for NC
Wrap-up

• Next Meeting/Next steps
• Questions/comments?

Thank you!

Mark.Garofano@state.mn.us
651.539.1864