MINNESOTA DEPARTMENT OF COMMERCE

85 7TH PLACE EAST, SUITE 500
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TRM Technical Working Meeting
Residential and Commercial Heating Measures

November 7, 2014 8:30-10:00 am
Golden Rule Building LL35

In-person attendees:

Xcel Energy – Howard Hoffman, Joe Krekeler, Bruce Boerner, George Beatty
Missouri River Energy Services – Kurt Hauser
Great Plains Natural Gas – Jeremy Fischer
Greater Minnesota Gas – Josh Davis, Neighborhood Energy Connection
CenterPoint Energy – Nick Van Duzee, Eric Johansen
Center for Energy and Environment – Chris Plum
Fresh Energy – Will Nissen
Commerce – Mary Sue Lobenstein, Laura Silver, Joe Plummer, Mark Garofano

GoTo Meeting attendees:

Franklin Energy – George Roemer
Michaels Energy – Bryce Dvorak
CERTs – Alexis Troschinetz
MERC – Joe Rocco, Applied Energy Group
Dairyland Power Coop – Sherri Stever
Minnesota Power – Tim Gallagher
Otter Tail Power – Kevin Disse
Energy Insight, Inc. – Matt Haley
Commerce – Jessica Burdette, Adam Zoet

Presenter: Mark Garofano, Minnesota Department of Commerce

List of measures to discuss:

- C/I HVAC - Infrared Heaters
- C/I HVAC - Steam Traps
- Commercial HVAC - Commercial Boiler Modifications, Space Heating Only
- Commercial HVAC – Commercial Boilers, Space Heating Only
- Commercial HVAC – Energy Recovery Ventilator
- Commercial HVAC – Exhaust Energy Recovery
- Commercial HVAC – Forced-Air Heating Maintenance
- Residential HVAC – Furnaces Tune-up

Infrared Heaters

- Assumed 10 deg drop in space temp reasonable but highly variable

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- Xcel: there is an old ASHRAE paper that says savings are 7-14%. Will send to Commerce, Commerce will distribute to group.
- General comment for all heating measures: since the correction factor (CF) is sort of intended to approximate a 55 degree balance point, it would be cleaner and more transparent to just use HDD55 and scrap CF
  - Group recommends evaluator look into this suggestion
  - Should commercial buildings have a lower balance point due to internal heat gains?
    - For this measure, a 55 deg balance point is probably OK. Most apps for infrared are in warehouses, loading docks, etc where external wall area is relatively high compared to floor area
    - For office buildings where this ratio is lower, a lower BP may be more appropriate
    - Could try to standardize with HDD55 for commercial and HDD65 for residential and use CF where needed to adjust
  - It will be important to differentiate, define commercial and industrial
- Thoughts on measure design? Measure requires IR heater input Btu/h and project location
  - Difficult to capture variability prescriptively
  - In Illinois, developed a single average deemed savings value
  - Could consider electrical savings as well if baseline is assumed to be a unit heater with a fan
- Vendors are talking about high efficiency IR heaters. Eric Johansen will share info with group. Could be topic for future evaluation.

<u>Recommendations:</u>

- Ask TRM evaluator to investigate replacing HDD65/CF with HDD55 (applies to all measures discussed herein)
- Ask TRM evaluator to investigate electric savings for IR Heaters.

<u>Action Items:</u>

- Xcel to send Joe/Mark the ASHRAE paper on IR Heater savings *(done)*
- CPE to share info on high efficiency IR heaters

Steam Traps

- Effective Full Load Hours (EFLH) versus operating hours
  - Comment that operating hours are more appropriate since they represent the time that the total steam system is energized, EFLH represent only the space heating hours
  - Xcel differentiates between steam systems for space heating only and space plus water heating. The latter has higher hours.
  - Hours depend on location of trap in system. If downstream of control valve, EFLH may be more appropriate.

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    - Full hours may be more appropriate even if downstream of control valve because valve throttles flow. Steam pressure could be reduced though
- Orifice size is a required input. This can be difficult to get.
  - In theory, can use the size of the new traps and assume a like for like replacement.
  - Default value, say 1/8", is needed because in reality, customers may not enter the orifice size on rebate apps even if required.
  - Default orifice size may depend on high or low pressure system.
  - In theory, could train customers to provide orifice size, but difficult because traps may not be replaced very often and staff turnover
- The conversion factor between Btu and MMBTU is incorrect (inverse was used)

Recommendations

- Ask evaluator to investigate EFLH vs operating hours, orifice size issue

Action Items

- Commerce to fix error in conversion factor

Commercial Boiler Modifications

- Oxygen control incremental cost may be too high – CPE custom rebates are usually around $15,000. Consider updating.
- Turbulators will be dependent on boiler size. Consider update to a per MMBtu/h value.
- Turbulator life (20 years) may be too long. Boiler could already be more than 20 years old. Turbulator may not even last 20 years anyway. Consider updating.
- Burner life may be too long. Consider updating.
- Suggestion to change references to the original sources rather than secondary sources.

Recommendations

- Ask evaluator to investigate oxygen control incremental cost, changing turbulator cost to per MMBtu/h value, lowering turbulator life, lowering burner life
- Ask evaluator to ensure that original sources are referenced rather than secondary sources.

Commercial Boilers

- Algorithm discussion
  - Algorithm does not capture sizing change
  - The algorithm was designed to ensure that the heating load does not change between baseline and efficient cases
- Franklin will put together a few scenarios to illustrate application of the measure

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- Another issue is that some boilers are rated in terms of boiler hp which is an output. More of an issue for steam vs hot water. Measure may need to accommodate this since some customers or contractors may not be able to convert to Btu/h (input)
- In the 1/(Tindoor – Tdesign) term, why Tindoor instead of balance point temp?
  - Need to use Tindoor because of load factor – boilers sized for full heating load (design temp to indoor temp)

Commercial Energy Recovery Ventilator

- Recommend looking into adding cooling savings
  - May be a wash because of fan energy
  - Could be peak electrical demand savings (important to MRES since rebates based on peak kW savings)
  - Xcel subtracts fan consumption out of gas savings to be able to take full savings credit
- In new code, beyond some CFM minimum ERVs are required with 50% minimum efficiency
  - Are minimum efficiency ERVs really available in the market?
- Add Replace on Fail to actions
- Description says measure applies only to unitary equipment.
  - Franklin: it should work for built-up equipment too
- Recommendation to consider deeming hours by segment (building type?), not deem efficiency.
  - *Commerce clarification: ERV efficiency and heating efficiency defaults are provided, but customer values can be used.*

<u>Recommendations</u>

- Add built-up equipment to measure description
- Add Replace on Fail to actions
- Evaluator to investigate adding cooling savings
- Evaluator to investigate deeming hours by segment or building type

Commercial Forced-Air Heating Maintenance

- Most applications will probably be small businesses, most on RTUs though some residential size furnaces too
- Need to add description of maintenance procedures – could use residential furnace tune-up description
- Savings factor is 1.6%, same as commercial boiler tune-up
  - Not valid to use same savings factor as commercial boiler tune-up
  - Should savings factor be higher because many units will be outside and exposed to dirt, pollen, etc?
    - Possibly, though in theory combustion air is filtered

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    - Ask evaluator to look into
  - Savings factor is a function of measure lifetime since savings degrade over time to zero
  - For simplicity, strive for consistency between residential and commercial tune-up lifetimes
  - Suggestion to look at HVAC Save data from Iowa for savings factor

Recommendations

- Ask evaluator to investigate savings factor

Action Items

- Commerce to add description of maintenance procedures

Residential Furnaces and Boilers

- HDD values should be double-checked – Joe Krekeler from Xcel got a different number (applies to all heating measures)
  - TMY set should be consistent with new energy codes
    - TRM is already at TMY3

Action Items

- Commerce to double-check HDD values with Franklin

Residential Furnace Tune-up

- Consider creating a residential boiler tune-up measure
- Incremental cost is equal to the trip cost. Consider carving out just the portion of the trip cost that has to do with furnace efficiency
  - This could be hard to do in practice
  - Could consider a program requirement for the measure to define exactly what will be in visit
    - For example, combine furnace and A/C tune-up

Recommendations

- Ask evaluator to investigate a residential boiler tune-up measure

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General Discussion on Use of EFLH vs HDD in Heating Measures

- In comments, CPE recommended use of EFLH instead of HDD
  - Would get around the correction factor issue with HDD
  - Would be consistent with cooling measures which use EFLH instead of CDD
  - Another advantage is would allow for differentiation between buildings/applications

Recommendation

- Evaluator to investigate use of EFLH instead of HDD/CF