Creating A Cleaner Energy Future For the Commonwealth

DOER
Massachusetts Department of Energy Resources

225 CMR 16.00

Renewable Thermal Technologies in the APS

Metering Subgroup Meeting

November 21, 2014

Boston, MA

Agenda

- Introduction
- Metering of technologies
  - Solar thermal
  - Air Source Heat Pumps
  - Ground Source Heat Pumps
  - Biomass Pellet Boilers

Accuracy? Methodology?

Goal of Metering

- Calculate appropriate incentive credits
- Ensure long-term and optimal operation
- Avoid rebound effect

  - Right (accurate), Reliable, Replicable, Reported
    - Metering heat, steam, fuel
    - Standards
  - Reasonable (cost, effort)

Heating and Cooling in the Massachusetts Alternative Portfolio Standard, Report to the Legislature, EEA/DOER with assistance from Meister Consultants Group and MassCEC, 2012

Metering Approach

- Large systems: continuous accurate **metering** and automatic reporting
  - Available equipment / standards / industry practice
- Small systems: **calculate** projected output
  - Cut-off large/small = 400 kBtu/h (total system capacity)
    - Meant to cover residential, small multi-family and small commercial
  - Verification of ongoing operation through spot checks and run-time monitoring

Solar Thermal – Large System Metering

- Hydronic Solar Thermal: quantify useful thermal generation by combining
  - Metering of flow, ΔT (storage tank/collector)
  - SRCC rating of system
    - System vs. collector
    - Which climate zone
- Solar hot air systems?

Solar Thermal – Large System Metering

- Systems with solar heated only storage tank in series with traditional hot water heater
  - A Btu Meter consisting of
    - Flow meter at either city water inlet or hot water outlet to the solar storage tank
    - A pair of thermal sensors: one at the city cold water inlet and the other at the hot water outlet of the solar water storage tank
    - A Btu computer that converts the metered flow and temperatures to Btus

Solar Thermal – Large System Metering

- Systems with a single tank with supplementary non-solar heating and constant panel flow
  - A thermal sensor on the supply and return for the collector loop, along with flow meter.
  - A Btu computer that converts the metered flow and temperatures to Btus

Accuracy?
Standards?
Equipment?

Heat Pumps - Large System Metering

- **Air/Ground Source Heat Pumps**: quantify the consumption of the site grid electricity and the supply of renewable heat energy terms by combining
  - Directly metered values (ΔT, runtime)
  - Nominally rated system performance
    - Original equipment manufacturer certified (AHRI)
    - Need for performance data (COP) at different temperature ranges

Heat Pumps - Large System Metering

- ASHP
  - Outside temperature
  - Delta T of Working fluid across loop?
  - Unit runtime
- GSHP
  - Incoming/returning water temperature
  - Unit runtime

Accuracy?
Standards?
Equipment?

Biomass - Large System Metering

- **Biomass pellet/chip**: quantify useful thermal generation based on
  - OEM Rated efficiency of boiler
  - Parasitic power meter (if >25kW)
  - Btu meter in water/steam loop and/or volume and energy content of fuel use

Biomass - Large Systems Metering

Large (> 100 BHP = 3.3 MMBtu/h)

- BTU Metering
  - Steam or Hot Water Supply & Feedwater Return
  - Flow, Temperature
  - Btu module converts flows and temperatures to Btus
- Parasitic grid power
  - kWh meter for boiler feedwater pumps if full load demand is > 25kW
- Fuel (do we need this if BTU meter?)
  - Volume and energy content of fuel (pellets/chips) consumed

Biomass - Large Systems Metering

Small (<3.3 MMBtu/h, >400kBtu/h)

- Volume and energy content of fuel (pellets/chips) consumed
- OEM Rated efficiency of boiler

Accuracy?
Standards?
Equipment?

Next Questions

- Modeling for small systems
  - Large/small cut-off
  - Modeling approach
  - Verification of ongoing operation