

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
  - $\triangleright$  Metering of flow,  $\Delta T$  (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
  - $\triangleright$  Directly metered values ( $\Delta T$ , 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

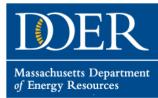


# **Biomass - Large Systems Metering**

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

