Creating A Cleaner Energy Future For the Commonwealth

Acts 2014, Ch. 251

Renewable Thermal Technologies in the Alternative Portfolio Standard

Stakeholder Meeting
November 17, 2014
Boston, MA
Agenda

• Context
• Regulatory process
• Key issues
  - Metering guidelines
  - Credit calculation and minting
  - Biomass/gas/fuels requirements
Technologies – per the Statute

• **Add** any facility that generates useful thermal energy using:
  - Sunlight, biomass, biogas, liquid biofuel or naturally occurring temperature differences in ground, air or water
• **Strike** carbon capture and storage, gasification, paper derived fuel
• Additionally **exclude** construction & demolition debris
Specifications in the Statute

1 credit (MWh) shall be earned for every 3,412,000 Btu of net useful thermal energy produced and verified through an on-site utility grade meter or other means satisfactory to the department.

- Non-emitting on-site renewable thermal technologies can get a credit for less than 3,412,000 Btu, or in essence, a credit multiplier.

DOER has to establish for biomass, biogas and liquid biofuel technologies (with MassDEP):

- Air emission performance standards for PM2.5 and CO;
- A requirement of 50% reduction in life-cycle GHG emissions;
- Requirements for thermal storage or other means to minimize deterioration of efficiency or emissions due to boiler cycling, if feasible;
- Fuel conversion efficiency performance standards;
- Requirements that fuel shall be provided by means of sustainable forestry practices (with DCR).

Enters into force 1/1/2015
Prior Analysis

• Massachusetts Renewable Heating and Cooling, Opportunities and Impacts Study, Meister Consultants Group for DOER/MassCEC, 2012
• Heating and Cooling in the Massachusetts Alternative Portfolio Standard, Report to the Legislature, EEA/DOER with assistance from Meister Consultants Group and MassCEC, 2012
• Commonwealth Accelerated Renewable Thermal Strategy, Navigant/Meister for DOER, 2014
CHP projections versus APS minimum standard

- CHP low
- CHP high
- APS Min. Standard

Creating A Cleaner Energy Future For the Commonwealth
Gap between APS Minimum Standard and CHP projections

Potential Market Value (cumul. to 2020)
Investment Volume: $550M – 950M
Installation numbers: 20,000 – 35,000
DOER Regulatory Process

• Stakeholder/industry engagement
  ➢ Meeting preceding formal regulatory process
  ➢ Formal public hearing and comment period
  ➢ Subgroups on metering and biomass

• Regulatory proceeding
  ➢ Draft regulations before end 2014
  ➢ Final regulations by summer 2015?

• Use guidelines according to RPS/APS custom
Questions?
Eligible Technologies

- Active solar heating
  - Space heating, domestic & process hot water
- Heat pumps
  - Air source, ground source, water source
- Automatically fed biomass boilers and furnaces
  - Wood pellets, chips
- Blended or pure biogas (methane) and biofuels (liquids)
- Other?
**Net Energy Generation**

\[ E_{\text{net}} = E_{\text{thermal, out}} - E_{\text{non-renewable, in}} \]

- Energy calculated as primary energy
  - Taking into account average heat rate and transmission/distribution losses for electricity (ISO-NE)
- 1 Alternative Energy Credit = 1 MWh = 3.412 MMBtu
  - Solar multiplier: 1 AEC = 3.412 MMBtu / X
  - Basis for X = bring simple payback in line with other renewable thermal technologies
### Example Residential Installation

#### Building characteristics

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<tbody>
<tr>
<td></td>
<td>BIO</td>
<td>ccASHP</td>
<td>GSHP</td>
<td>Solar Combi</td>
</tr>
<tr>
<td>Efficiency/COP</td>
<td>0.85</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Load served</td>
<td>%</td>
<td>100%</td>
<td>80%</td>
<td>100%</td>
</tr>
<tr>
<td>Thermal energy</td>
<td>MMBtu/y</td>
<td>115</td>
<td>112</td>
<td>140</td>
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<tr>
<td>Net useful thermal energy</td>
<td>MMBtu/y</td>
<td>115</td>
<td>20</td>
<td>54</td>
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</tbody>
</table>

*Illustrative example – actual calculation will depend on final regulations*

Electric Conversion Rate used for net energy calculation = 41%
Questions?
Metering Approach

• Large systems: continuous accurate *metering* and automatic reporting

• 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
    - Based on assessment of cost of metering compared to AEC revenue
  - Verification of ongoing operation through spot checks and run-time monitoring
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 ($\Delta T$, runtime)
  - Nominally rated system performance
    - Original equipment manufacturer (OEM) certified
Large System Metering

- **Hydronic Solar Thermal**: quantify useful thermal generation by combining
  - Metering of flow, ΔT (storage tank/collector)
  - SRCC rating of collector

- **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
Questions?
Upfront Minting of AECs

- Upfront minting will be default for non-metered (small) systems
  - In lieu of lifetime AECs, systems will receive a one-time strip of AECs, equivalent to 10 years projected output
    - AECs will be year of APS qualification vintage
    - Upfront minting allowed as far as APS minimum standard can accommodate
  - DOER contracts with Third Party (Agent)
    - Default AEC aggregator
    - System verification
  - DOER is considering market options to enable purchase of pre-minted AECs to provide up-front project capital
Output Projections for Pre-Minted AECs

• Based on thermal load served in building and rated capacity and performance of system
• Biomass
  ➢ OEM rating and average fuel energy content
• Solar thermal
  ➢ SRCC calculation, taking into account shading and orientation
• Air/Ground Source Heat Pump
  ➢ OEM rating (AHRI) and site specific parameters
Example Residential Installation

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<tr>
<td>Heat Load</td>
<td>MMBtu/y</td>
<td>100</td>
</tr>
<tr>
<td>Cool Load</td>
<td>MMBtu/y</td>
<td>40</td>
</tr>
<tr>
<td>Domestic Hot Water Load</td>
<td>MMBtu/y</td>
<td>15</td>
</tr>
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Illustrative example, without multiplier for non-emitting – actual calculation will depend on final regulations

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<td>80%</td>
<td>100%</td>
<td>40%</td>
</tr>
<tr>
<td>AEC/year</td>
<td></td>
<td>34</td>
<td>6</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Pre-minted AEC value</td>
<td>$</td>
<td>$5,056</td>
<td>$886</td>
<td>$2,370</td>
<td>$2,022</td>
</tr>
</tbody>
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Calculation assumes 10 years pre-minted AECs are sold at $15/AEC
Questions?
Biomass Sustainability

• Need to demonstrate sustainable forest management
  ➢ Sustainability certification of fuel feedstock
    ▪ MA pellets: Commonwealth Quality Program (DAR/DCR)
    ▪ Import from outside MA: ENPlus, Sustainable Forestry Initiative, Forest Stewardship Council, Tree Farm, Canadian Standards Association...
  ➢ Option to use qualified list of fuel suppliers
• Combine with fuel quality (NESCAUM)
Biomass Sustainability

• Verification

➢ Qualified biomass systems required to keep record of invoices to demonstrate eligible fuel is used
  ▪ Spot audits by DOER or Agent

➢ DOER tracks and reports on average aggregate share of residues/thinnings from large wood chip users and pellet producers
Biomass GHG balance

• Need to demonstrate 50% lifecycle GHG savings compared to default traditional heating source
  ➢ DOER calculation, no individual reporting
    ▪ Based on representative reported mix of residues and thinnings
    ▪ Include in sustainability criteria
  ➢ Residue share in pellet feedstock should be at least 40% to 65% depending on the fossil fuel offset by the pellets

(Indicative results based on the MA RPS Class I GHG Calculation Guideline)
Biomass/gas/fuels performance

DOER to establish with MassDEP: best in class commercially feasible technologies

- **Air emission performance standards** for PM$_{2.5}$ and CO
  - Max. 0.1 lb PM/MBtu heat output for small systems
- **Requirements for thermal storage** or other means to minimize deterioration of efficiency or emissions due to boiler cycling, if feasible
  - No storage needed if boiler can operate with minimum emissions / efficiency loss at 20% of capacity
  - Review based on results of MassCEC metering
- **Fuel conversion efficiency performance standards**
  - Min. 80% efficiency
Biogas

• Allow for blending of biogas with natural gas in distribution system
  - Similar to RPS Class I
    - Deliverability into MA
  - AEC calculation taking into account transmission and distribution losses and receiving entities’ conversion efficiency

• Upstream qualification?
  - Biogas supplier qualifies and gets credits
  - Tracking through supply contracts
Biofuels

• Biofuel blended with heating oil or used unblended for heating

• Biofuels need to be “advanced” biofuels
  ➢ 50% lifetime GHG savings
  ➢ Currently only organic waste derived biodiesel
    ▪ Other feedstocks considered case-by-case

• Upstream qualification?
  ➢ Biofuels vendor (retail seller? producer?) qualifies and gets credits
  ➢ Tracking using RINs
Questions?
Technical Subgroups

• DOER is establishing dedicated subgroups for more in-depth technical discussions
  ➢ Metering subgroup
    ▪ First meeting 11/21, 2PM, DOER
  ➢ Biomass subgroup
    ▪ First meeting 11/24, 2PM, MTC, Westborough, MA
  ➢ Biofuels subgroup
    ▪ (to be convened)

• Stakeholders welcome to step forward
  ➢ Subgroup size needs to allow for active technical discussion
Stakeholder Comments

• Stakeholders invited to provide written feedback on this presentation
  ➢ Comments, suggestions, information resources
  ➢ E-mail before 11/26/2014 to bram.claeys@state.ma.us
Thank you!