Biomass Thermal Initiatives
March 15, 2017
Outline

- Mass Energy Policy Background
- Clean Heating & Cooling with Biomass
- Wood Stove Change Out Program
- Residential Central Heating Program
- Commercial Central Heating Program
- Alternative Portfolio Standards (APS) Program Update
Electric Restructuring Act
- Renewable Energy Systems Benefit charge assessed by utilities established
- Renewable Energy Trust Fund (“RET Fund”) created, administered by Massachusetts Technology Collaborative (MTC)

Green Jobs Act
- Establishes MassCEC to accelerate job growth and economic development in the state’s clean energy industry
- Creates Massachusetts Alternative and Clean Energy Investment Trust Fund

Act Relative to Clean Energy
- Designates control of RET Fund to MassCEC and adds to its mission of supporting installation of renewable energy projects throughout the Commonwealth
Mission

Build sustainable industry to create jobs, long-term economic growth

Cultivate a robust marketplace for innovation in clean technologies

Accelerate cost reduction for clean energy technology

Support training and education to build a skilled workforce
Clean Heating & Cooling

- Heating: 30% of total MA energy use
  - GHG emissions
- MA has aggressive GHG goals:
  - 25% by 2020, 80% by 2050

---

- August 2015: 5-year, $30 Million commitment
- $1.8m 2017-19 WSCO
- DOER Infrastructure Grants & Initiatives
  - Multi-pronged market strategy
  - Performance based
The Cost of Conditioning
Clean Heating & Cooling Technologies

- Solar Thermal
- Biomass Heating
- Cold-Climate Air-Source Heat Pumps
- Ground-Source Heat Pumps
Economic Benefits of Biomass Heating

- **Local Jobs:** Out of $62 million gross output for forestry and logging in MA, $24.5 million is for payroll.

- **A Market:** Low-value forest products keep forest land economically viable
  - Roughly 25% of the volume, but over 90% of the value is in the high value products;
  - Massachusetts harvests far less than our forests produce – we harvest an amount equal to a quarter of our new growth;
  - From 2007-2013 the carbon stored in Massachusetts’ forests increased 7%.

(Source: the Massachusetts Forest Alliance)
MassCEC’s Biomass Heating Programs

1. Wood-stove Change-out Program
   - (6 rounds, 1,400 units, since 2012)

2. Residential Central Biomass Heating
   - Residential pilot program (May 2014)
   - Residential rebate program (since Nov. 2014)

3. Commercial Central Biomass Heating
   - Commercial pilot program (2013-2014)
   - Full-scale commercial program (July 2016)
### 2017 WSCO Program Rebate Levels

<table>
<thead>
<tr>
<th>Stove Type</th>
<th>Maximum PM$_{2.5}$ Emissions (g/hr)</th>
<th>Standard Rebate</th>
<th>Income-Based Rebate</th>
<th>Efficiency Adder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pellet Stove</td>
<td>≤2.0</td>
<td>$1,250</td>
<td>$2,250</td>
<td>$500</td>
</tr>
<tr>
<td>Catalytic Woodstove</td>
<td>≤2.0</td>
<td>$1,000</td>
<td>$2,250</td>
<td></td>
</tr>
<tr>
<td>Non-Catalytic Woodstove</td>
<td>≥3.0 and ≤3.5</td>
<td>$500</td>
<td>$1,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;2.0 and &lt;3.0</td>
<td>$1,000</td>
<td>$2,250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≤2.0</td>
<td>$1,250</td>
<td>$2,500</td>
<td>$250</td>
</tr>
<tr>
<td>Fully Automated Woodstove</td>
<td>≤2.0</td>
<td>$1,500</td>
<td>$2,750</td>
<td></td>
</tr>
</tbody>
</table>

* Items in green are new for 2017. Red arrows represent change from 2016.

- Efficiency adder – Available for stoves that are at least 65% efficient.
- New tier for non-catalytic stoves with PM <2.0 g/hr.
  - Aligns with the 2020 EPA emissions standard.
- New tier for fully automated woodstoves.
## Total WSCO Program Volume

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Awards</th>
<th>Total Award Amount</th>
<th>Low-Income Awards</th>
<th>Total Low-Income Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-13</td>
<td>70</td>
<td>$139,536</td>
<td>70</td>
<td>$139,536</td>
</tr>
<tr>
<td>2013</td>
<td>378</td>
<td>$477,000</td>
<td>99</td>
<td>$198,000</td>
</tr>
<tr>
<td>2014</td>
<td>376</td>
<td>$489,423</td>
<td>166</td>
<td>$331,923</td>
</tr>
<tr>
<td>2015</td>
<td>305</td>
<td>$398,250</td>
<td>77</td>
<td>$156,000</td>
</tr>
<tr>
<td>2016</td>
<td>306</td>
<td>$445,750</td>
<td>87</td>
<td>$196,750</td>
</tr>
<tr>
<td>Total</td>
<td>1,435</td>
<td>$1,949,959</td>
<td>499</td>
<td>$1,022,209</td>
</tr>
</tbody>
</table>
Residential Central Biomass Heating
Residential Central Biomass Heating

- 50 Awards
  - 45 retrofit, 5 new construction
  - Of the retrofit, 73% have been replacing oil
- Average project cost: $26,787
- Average MassCEC rebate: $12,524

<table>
<thead>
<tr>
<th>MassCEC Central Heater Requirements</th>
<th>Pellet Systems</th>
<th>Wood Chip Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal efficiency (HHV)$^3$</td>
<td>≥85% at nominal output</td>
<td>≥75% at nominal output*</td>
</tr>
<tr>
<td>Particulate emissions</td>
<td>&lt;0.08 lb PM2.5/MMBTU$<em>{input}$ at nominal output (&lt;0.03 lb PM2.5/MMBTU$</em>{input}$ at Sensitive Receptor Sites)</td>
<td>&lt;0.10 lb PM2.5/MMBTU$<em>{input}$ at nominal output (&lt;0.03 lb PM2.5/MMBTU$</em>{input}$ at Sensitive Receptor Sites)</td>
</tr>
<tr>
<td>CO emissions</td>
<td></td>
<td>270 ppm at 7% O$_2$</td>
</tr>
<tr>
<td>Startup</td>
<td>Automatic (i.e., electric ignition)</td>
<td></td>
</tr>
<tr>
<td>Modulation/shut off</td>
<td>The system must automatically modulate to lower output and/or turn itself off when the heating load decreases or is satisfied</td>
<td></td>
</tr>
<tr>
<td>Pressurized portion of the system</td>
<td>ASME certification required</td>
<td></td>
</tr>
</tbody>
</table>
Survey Responses - residential

How did you finance your system?

- 56% Cash, check, or credit card
- 44% MassSave Heat Loan
- Other loan
- A combination of finance options (please specify)
Residential Biomass Projects

Biomass Projects by Zip Code

Number of Projects
1
2

Massachusetts
Connecticut
Rhode Island
Commercial Central Biomass Heating

- Joint DOER/MassCEC pilot program (2013-2014)
  - Supported 6 biomass construction projects
  - Total awards $1,132,924
  - 3 out of the 6 projects were district energy systems
- Full-scale program launched this summer
Commercial Central Biomass Heating
### Commercial Central Biomass Heating

#### MassCEC Commercial-Scale Central Biomass Heating Grant Structure

<table>
<thead>
<tr>
<th>Award Component</th>
<th>Rebate or Adder as a Percent of Total Eligible Project Costs</th>
<th>Maximum Dollar Value per Award Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Grant</td>
<td>35%</td>
<td>$175,000</td>
</tr>
<tr>
<td>Thermal Storage Adder</td>
<td>5%</td>
<td>$25,000</td>
</tr>
<tr>
<td>Cascading Systems Adder</td>
<td>2.5%</td>
<td>$12,500</td>
</tr>
<tr>
<td>Distribution System Efficiency Adder</td>
<td>2.5%</td>
<td>$12,500</td>
</tr>
<tr>
<td>Public, Non-Profit, and Affordable Housing Adder</td>
<td>5%</td>
<td>$25,000</td>
</tr>
<tr>
<td>Maximum Rebate</td>
<td>50%</td>
<td>$250,000</td>
</tr>
</tbody>
</table>

---

[DOER] Massachusetts Department of Energy Resources

[MassCEC] Massachusetts Clean Energy Center
## Commercial Central Biomass Heating

### MassCEC Commercial-Scale Central Biomass Heating System Requirements

<table>
<thead>
<tr>
<th></th>
<th>Pellet Systems</th>
<th>Wood Chip Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal efficiency (HHV)</td>
<td>≥85% at nominal output</td>
<td>≥75% at nominal output*</td>
</tr>
<tr>
<td>Particulate emissions</td>
<td>&lt;0.08 lb PM2.5/MMBTU\text{input} at nominal output (&lt;0.03 lb PM2.5/MMBTU\text{input} at Sensitive Receptor Sites)</td>
<td>&lt;0.10 lb PM2.5/MMBTU\text{input} at nominal output (&lt;0.03 lb PM2.5/MMBTU\text{input} at Sensitive Receptor Sites)</td>
</tr>
<tr>
<td>CO emissions</td>
<td>270 ppm at 7% O\text{2}</td>
<td></td>
</tr>
<tr>
<td>Startup</td>
<td>Automatic (i.e., electric ignition)</td>
<td></td>
</tr>
<tr>
<td>Modulation/shut off</td>
<td>The system must automatically modulate to lower output and/or turn itself off when the heating load decreases or is satisfied</td>
<td></td>
</tr>
<tr>
<td>Pressurized portion of the system</td>
<td>ASME certification required</td>
<td></td>
</tr>
</tbody>
</table>

*Projects must commit to use wood chips with equivalent or less moisture content than the submitted test data

---

### Thermal Storage Requirement

- All thermal storage systems must have a minimum of 2 gallons of capacity per 1,000 Btu/hr of heating capacity installed

### Fuel Quality and Sustainability*

<table>
<thead>
<tr>
<th></th>
<th>Pellets</th>
<th>Chips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calorific value</td>
<td>&gt; 8,000 Btu/lb</td>
<td>&gt; 5,950 Btu/lb</td>
</tr>
<tr>
<td>Moisture</td>
<td>&lt; 6%</td>
<td>&lt; 30%</td>
</tr>
<tr>
<td>Ash</td>
<td>&lt; 1%</td>
<td>&lt; 3%</td>
</tr>
<tr>
<td>Source materials</td>
<td>Only wood pellets or wood chips. Grass, construction &amp; demolition waste are excluded</td>
<td></td>
</tr>
</tbody>
</table>

* When the Alternative Portfolio Standard (APS) is finalized, MassCEC will align with the APS sustainable sourcing regulations
Other State Efforts

- SAPPHIRE, Leading by Example, LEAN funding
- MassSave Heat Loan
- Infrastructure grants
- Research & Studies
- Alternative Portfolio Standard (APS)
Questions?

Jonathan Parrott. Ph.D.- Program Coordinator at DOER
jonathan.parrott@state.ma.us

Meg Howard- Program Manager at MassCEC
mhoward@masscec.com

Leslie Nash- Project Administrator at MassCEC
lnash@masscec.com