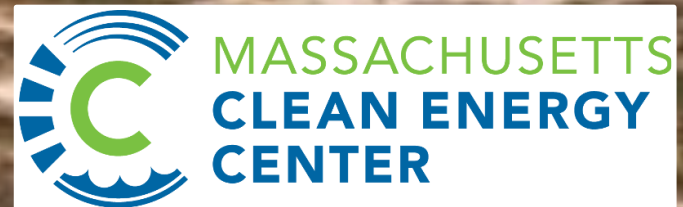
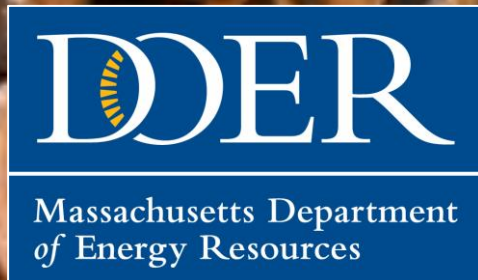


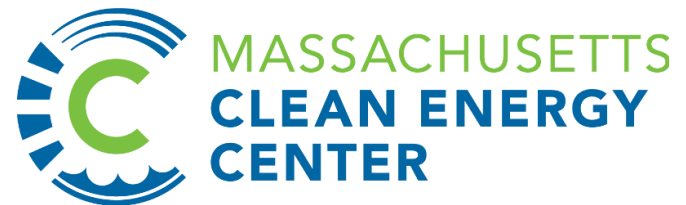
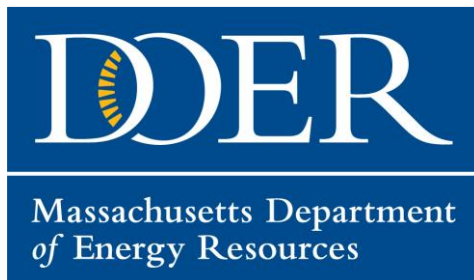
# Biomass Thermal Initiatives

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**



# History

1997

- ***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)

2008

- ***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

2009

- ***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



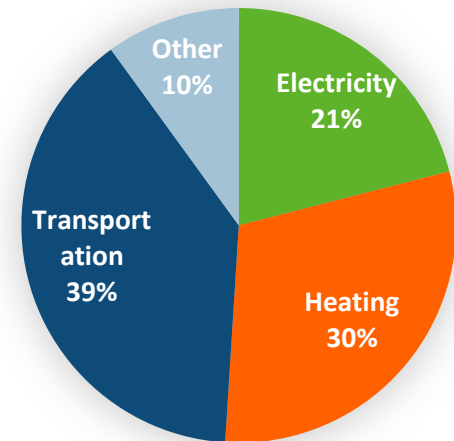
**Support** training and education to build a skilled workforce

# Clean Heating & Cooling

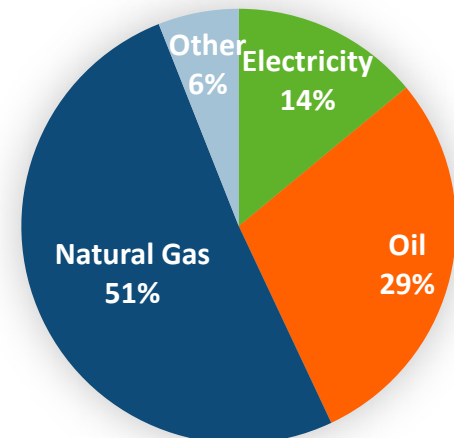
- Heating: 30% of total MA energy use
    - GHG emissions
  - MA has aggressive GHG goals:
    - **25% by 2020, 80% by 2050**
- 

- August 2015: 5-year, \$30 Million commitment
- \$1.8m 2017-19 WSCO
- DOER Infrastructure Grants & Initiatives
  - Multi-pronged market strategy
  - Performance based

MA GHG Sources

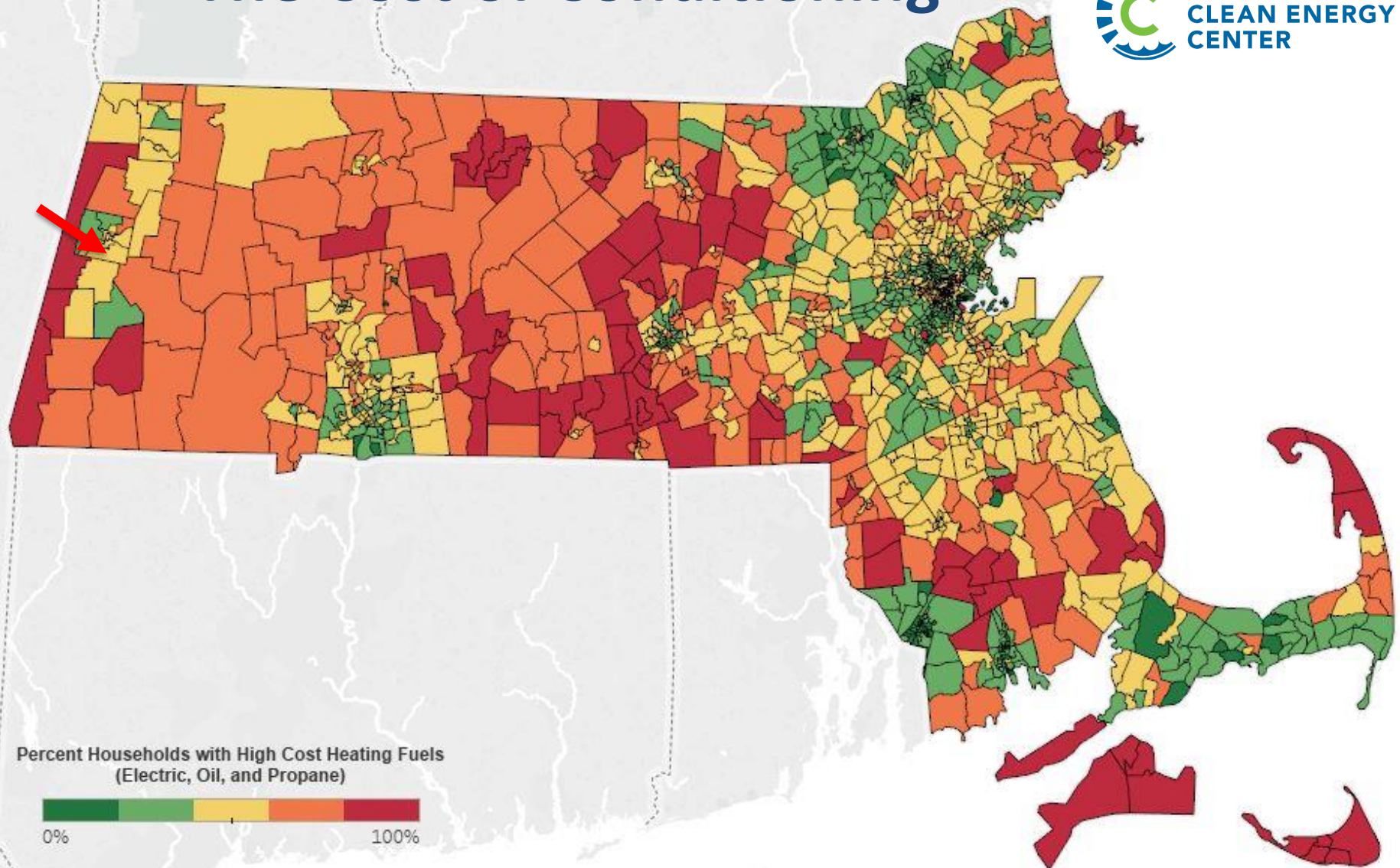


MA Residential Heating Fuel



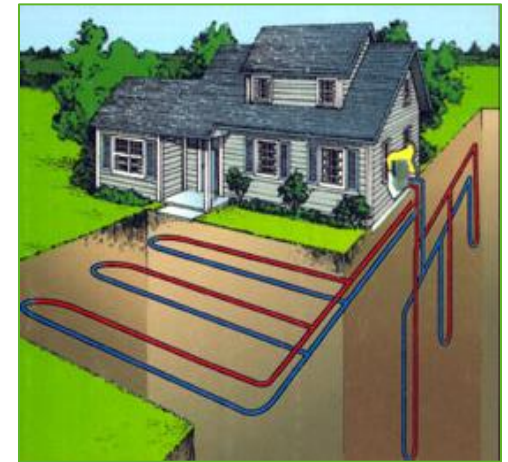


# The Cost of Conditioning



# Clean Heating & Cooling Technologies

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





# Economic Benefits of Biomass Heating



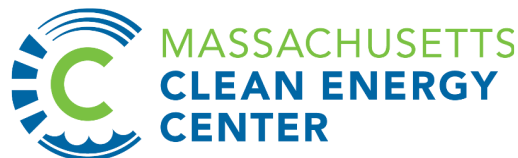
- **Local Jobs:** Out of \$62 million gross output for forestry and logging in MA, \$24.5 million is for payroll.
- **A Market:** Low-value forest products keep forest land economically viable
  - Roughly 25% of the volume, but over 90% of the value is in the high value products;
  - Massachusetts harvests 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

Stove Type	Maximum PM <sub>2.5</sub> Emissions (g/hr)	Standard Rebate	Income-Based Rebate	Efficiency Adder
Pellet Stove	≤2.0	\$1,250 ↓	\$2,250 ↓	\$500 ↑
Catalytic Woodstove	≤2.0	\$1,000	\$2,250	\$250 ↑
Non-Catalytic Woodstove	≥3.0 and ≤3.5	\$500	\$1,500	
	>2.0 and <3.0	\$1,000	\$2,250	
	≤2.0	\$1,250	\$2,500	
Fully Automated Woodstove	≤2.0	\$1,500	\$2,750	

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

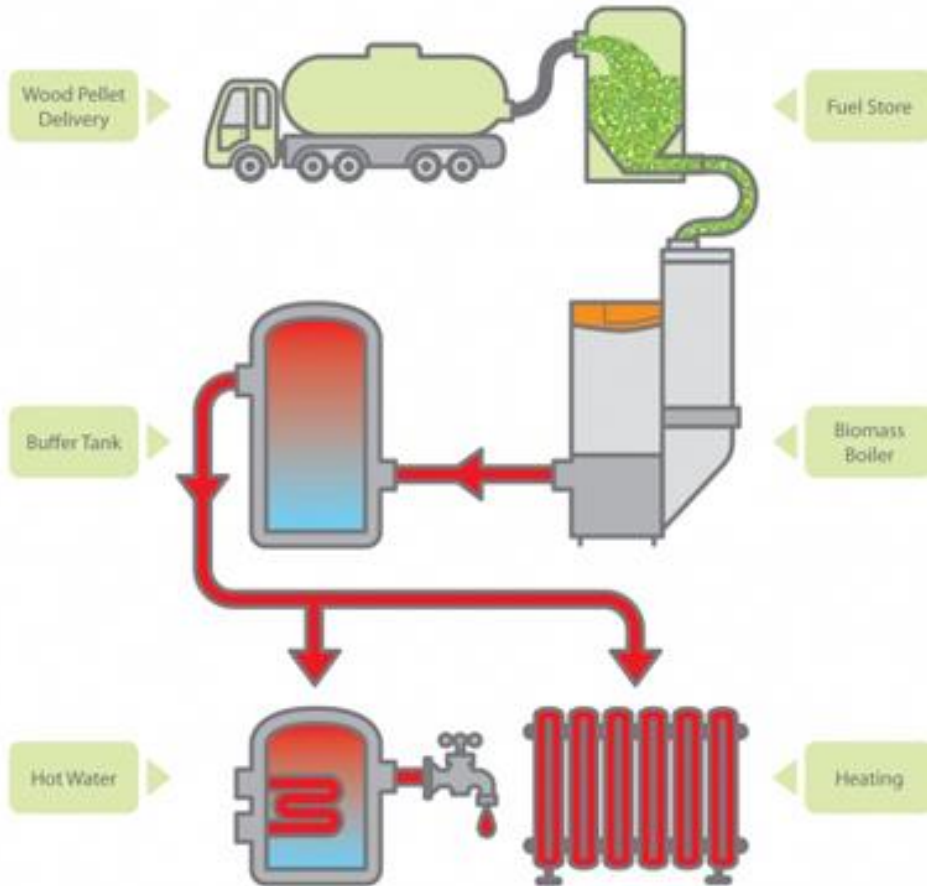
- Efficiency adder – Available for stoves that are at least 65% efficient.
- New tier for non-catalytic stoves with PM <2.0 g/hr.
  - Aligns with the 2020 EPA emissions standard.
- New tier for fully automated woodstoves.

# Total WSCO Program Volume

Year	Total Awards	Total Award Amount	Low-Income Awards	Total Low-Income Amount
2012-13	70	\$139,536	70	\$139,536
2013	378	\$477,000	99	\$198,000
2014	376	\$489,423	166	\$331,923
2015	305	\$398,250	77	\$156,000
2016	306	\$445,750	87	\$196,750
Total	1,435	\$1,949,959	499	\$1,022,209



# Residential Central Biomass Heating



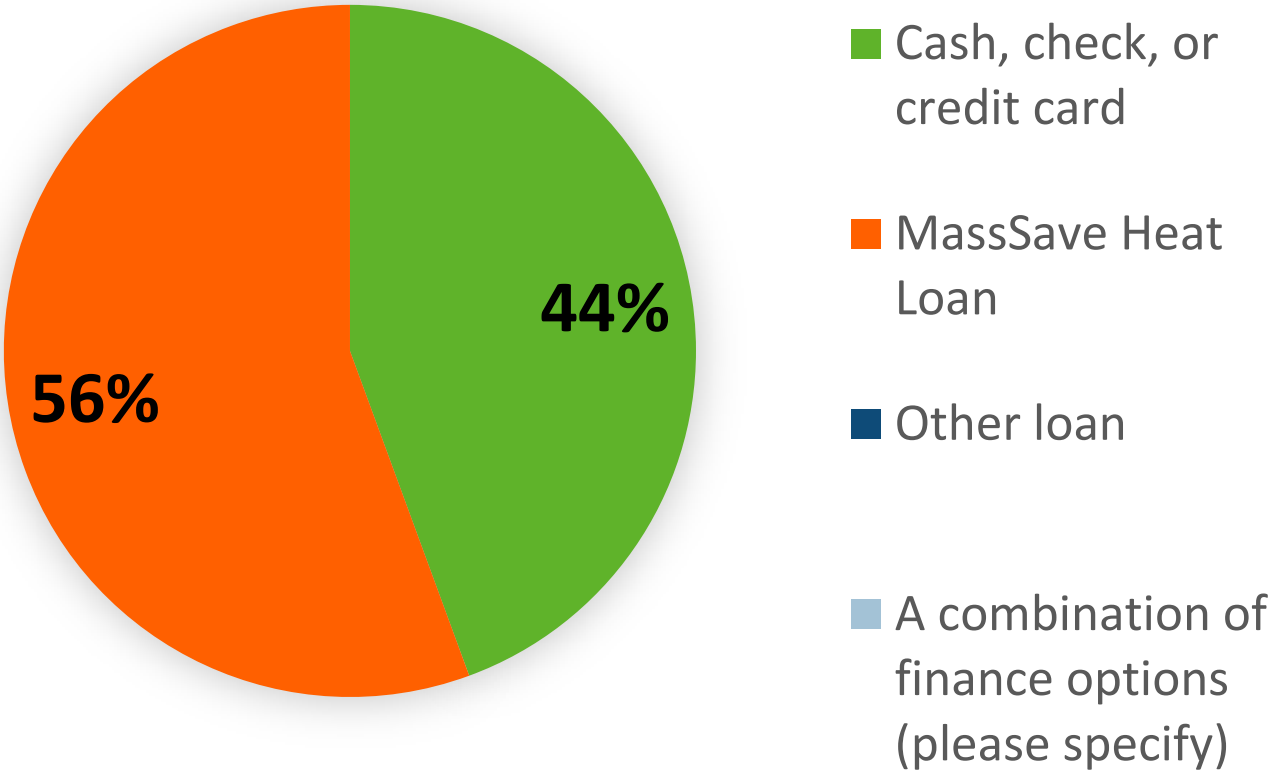
# Residential Central Biomass Heating

- 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

MassCEC Central Heater Requirements		
	Pellet Systems	Wood Chip Systems
<b>Thermal efficiency (HHV)<sup>3</sup></b>	≥85% at nominal output	≥75% at nominal output*
<b>Particulate emissions</b>	<0.08 lb PM2.5 <sup>4</sup> /MMBTU <sub>input</sub> at nominal output (<0.03 lb PM2.5/MMBTU <sub>input</sub> at Sensitive Receptor Sites)	<0.10 lb PM2.5/MMBTU <sub>input</sub> at nominal output (<0.03 lb PM2.5/MMBTU <sub>input</sub> at Sensitive Receptor Sites)
<b>CO emissions</b>	270 ppm at 7% O <sub>2</sub>	
<b>Startup</b>	Automatic (i.e., electric ignition)	
<b>Modulation/shut off</b>	The system must automatically modulate to lower output and/or turn itself off when the heating load decreases or is satisfied	
<b>Pressurized portion of the system</b>	ASME certification required	

# Survey Responses- residential

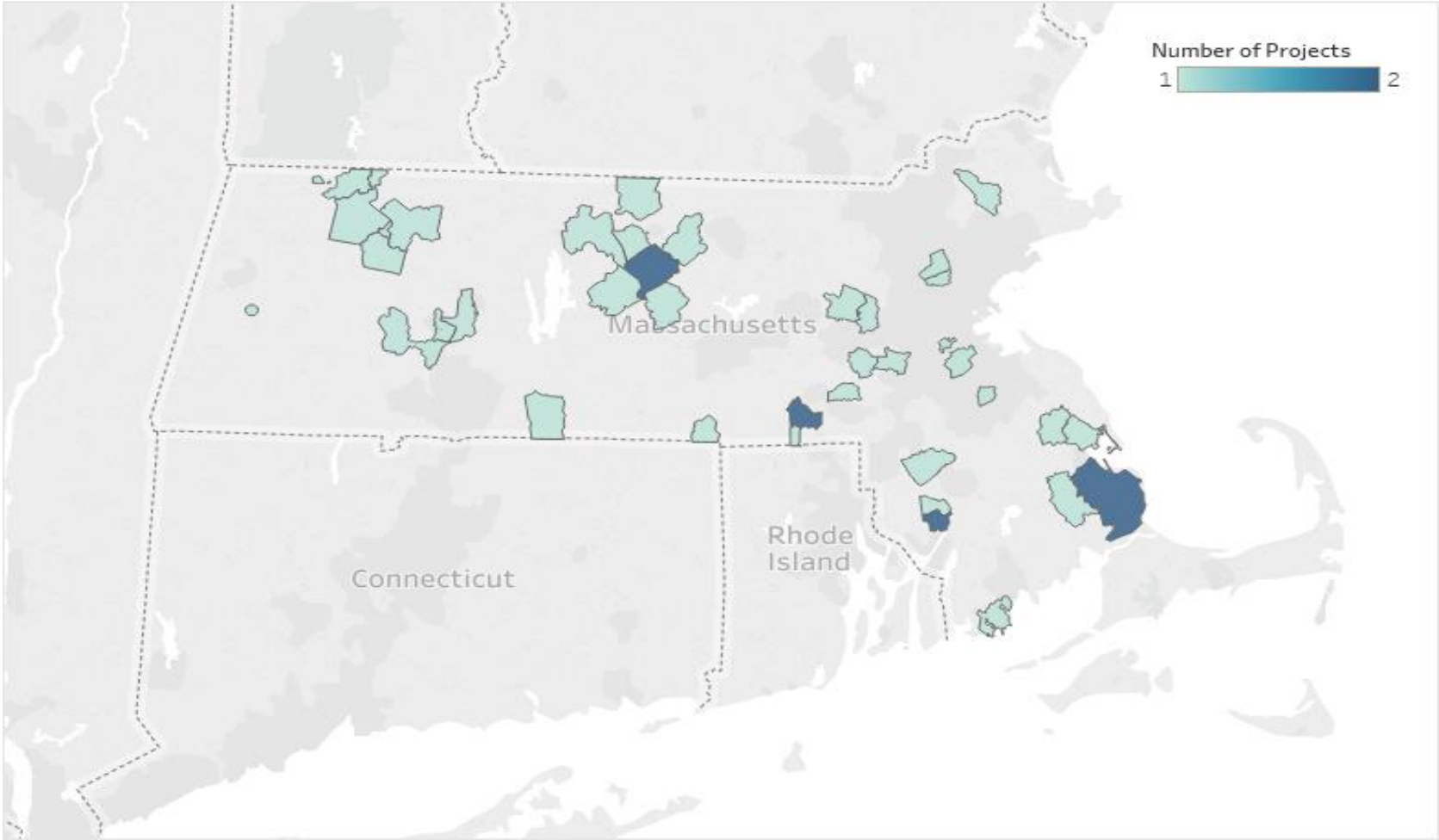
How did you finance your system?





# Residential Biomass Projects

Biomass Projects by Zip Code



# 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

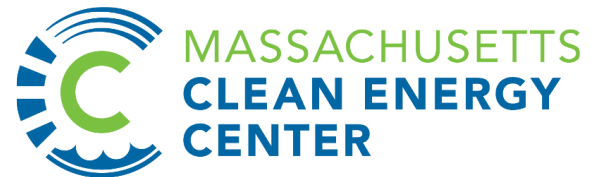




# Commercial Central Biomass Heating

## MassCEC Commercial-Scale Central Biomass Heating Grant Structure

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



# Commercial Central Biomass Heating

## MassCEC Commercial-Scale Central Biomass Heating System Requirements

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

\*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\*

	Pellets	Chips
Calorific value	> 8,000 Btu/lb	> 5,950 Btu/lb
Moisture	< 6%	< 30%
Ash	< 1%	< 3%
Source materials	Only wood pellets or wood chips. Grass, construction & demolition waste are excluded	

\* 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)



Hawlemont School

UMass  
Clean Energy  
Extension

Research  
& Outreach



# Questions?



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