

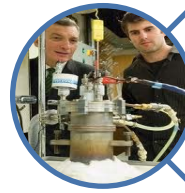
MassCEC Solar Hot Water Programs

CESA Award Webinar- November 2012

Presentation by Christie Howe

Massachusetts Clean Energy Center

- [The Green Jobs Act of 2008](#) created the quasi-public MassCEC
- MassCEC Divisions:
 - Investments in Clean Technology
 - Market Development Support
 - **Renewable Energy Generation**



Advance Clean Energy
Technology



Create Jobs



Develop a Trained
Workforce



Accelerate Deployment
of Clean Energy

Commonwealth Solar Hot Water Pilot Programs

- Residential: February 2011 – June 2012
- Commercial: August 2011 – June 2012
- Pilot Program Objectives:
 - Collect system, market and performance data on SHW systems
 - Create a well-qualified installer base
 - Create a well-educated inspector base
 - Build market momentum and the supply chain
 - Establish long term program based on assessment of the MA solar thermal market through pilot program

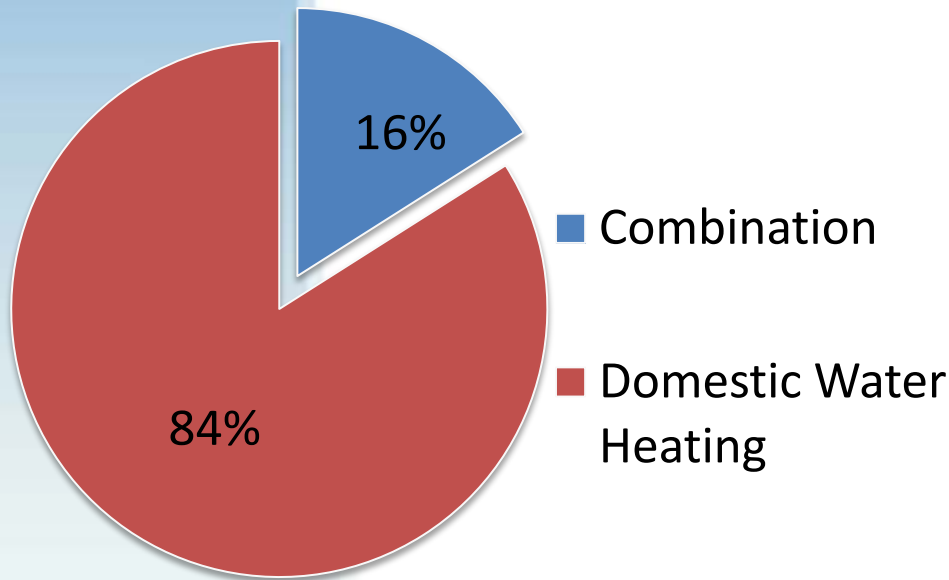
Solar Thermal Incentives

Federal and State Incentives	
Federal Tax Credit	30% of total installed costs
Accelerated Depreciation	5 year MACRS
Mass State Tax Credit	15% of total installed costs up to \$1,000 (residential)
MassSave Heat Loan Program	0% loans up to \$25,000 (residential) or \$100,000 (commercial) terms up to 7 years
MassCEC CSHW Rebate	~15% of total installed costs

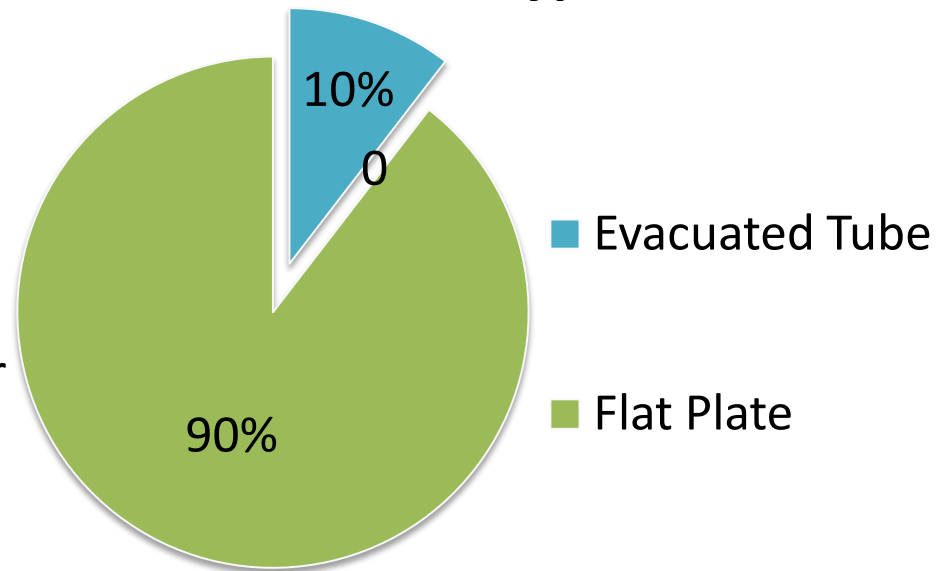
CSHW Pilot Program Results

- \$535k Rebates awarded: 315 Residential; 5 Commercial
- 38 Commercial-scale feasibility studies awarded \$360k

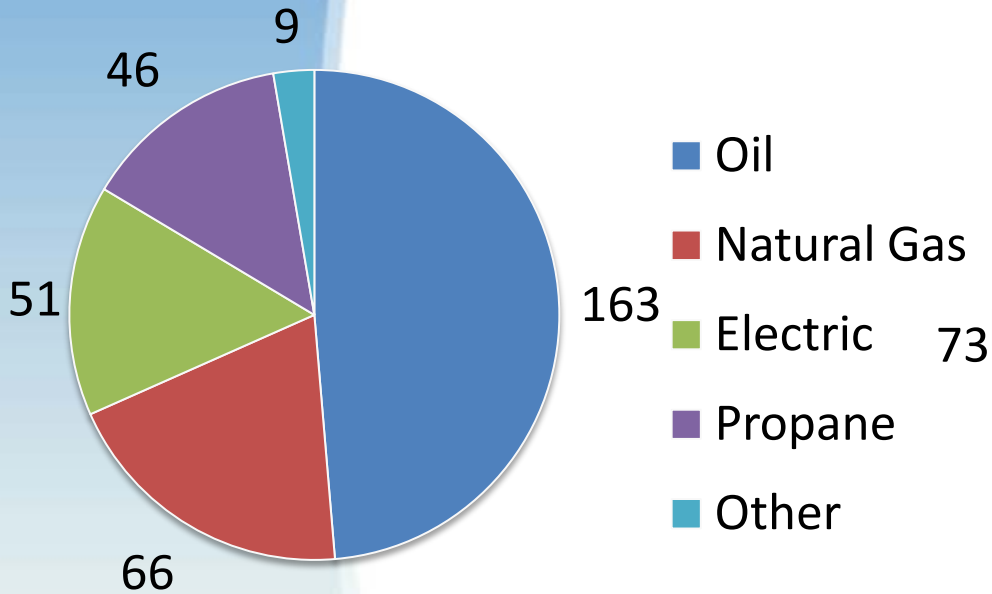
System Use



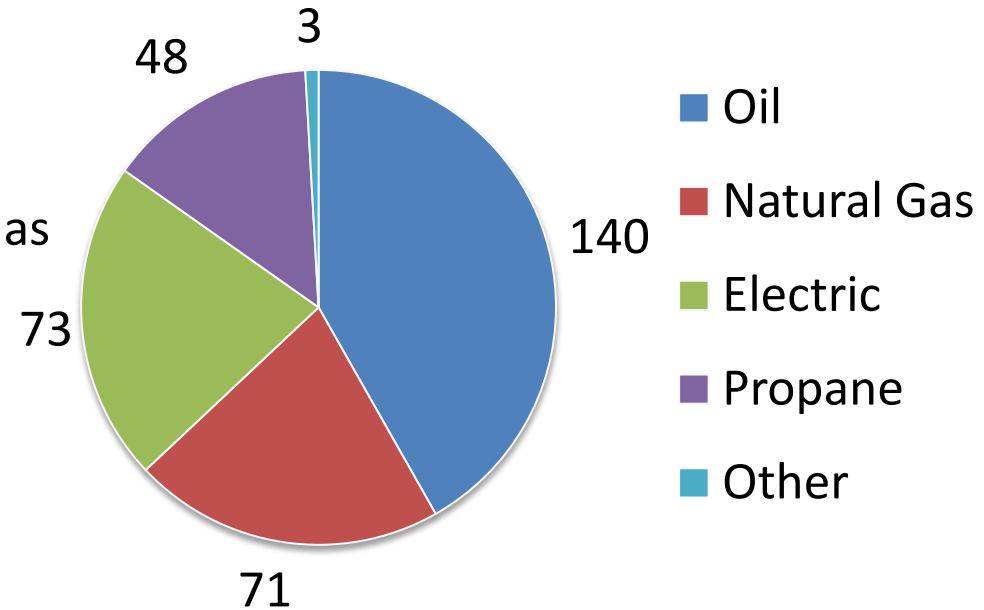
Collector Type



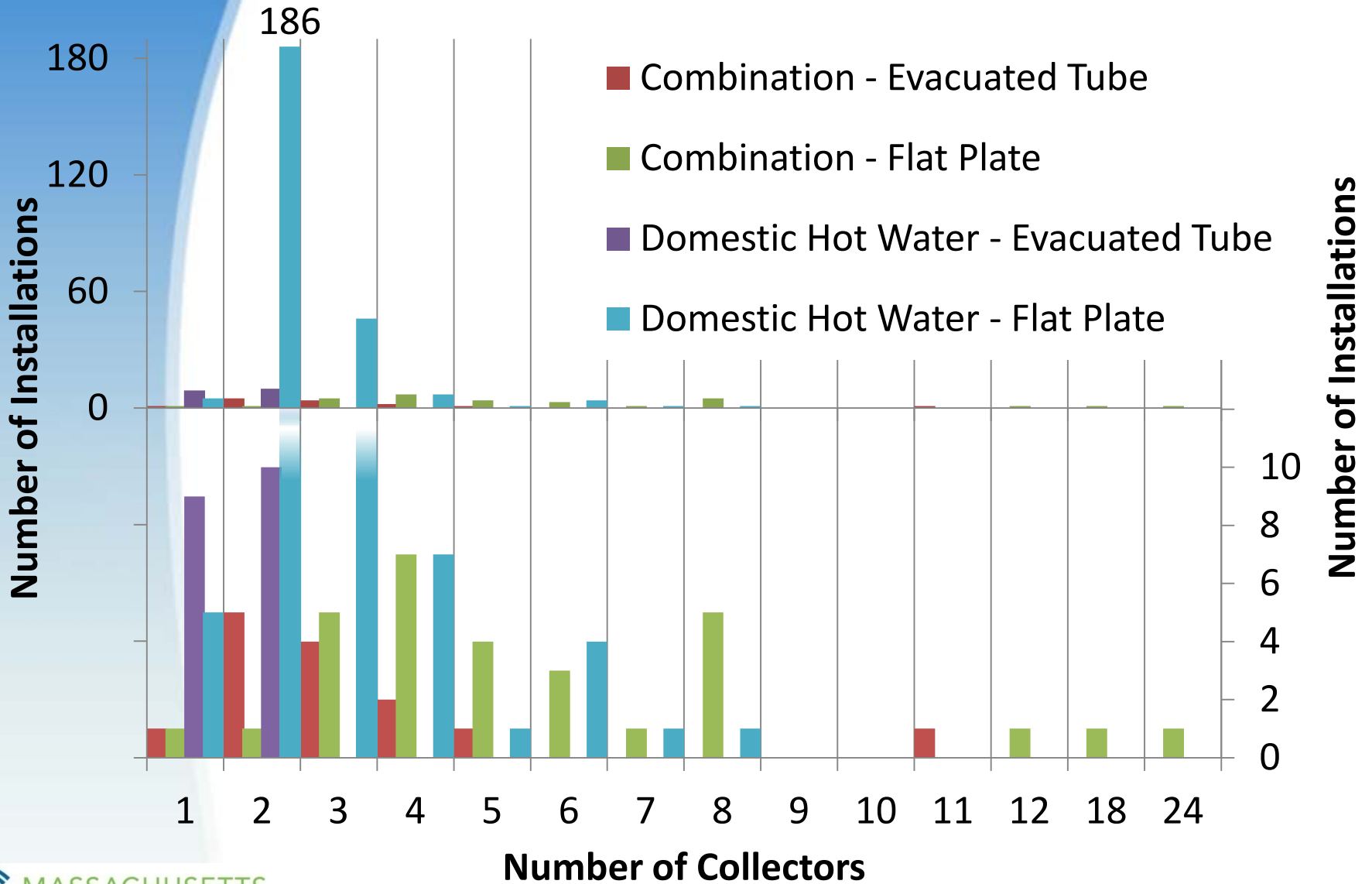
Residential Fuel Prior to SHW Installation



Residential Fuel After SHW Installation

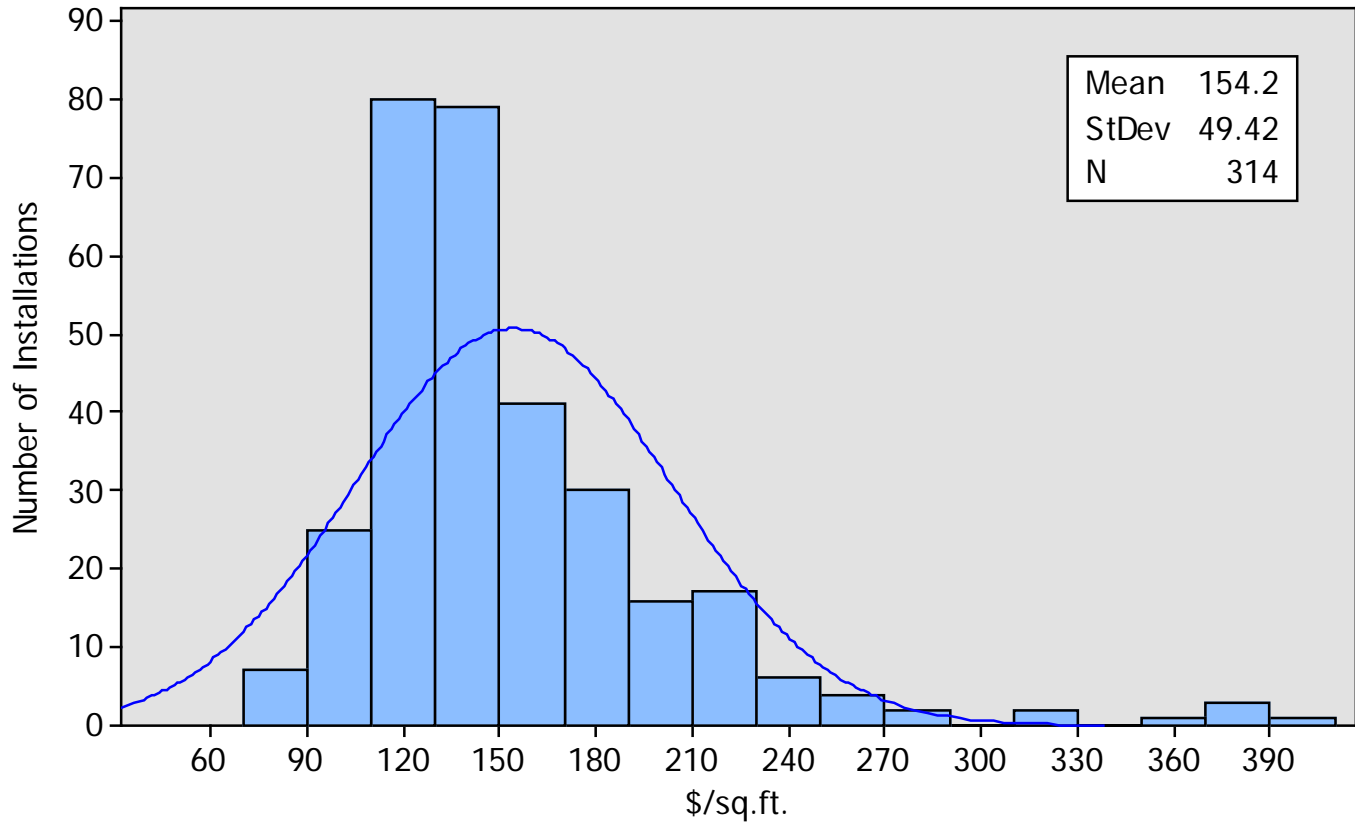


Residential SHW Collector Quantity

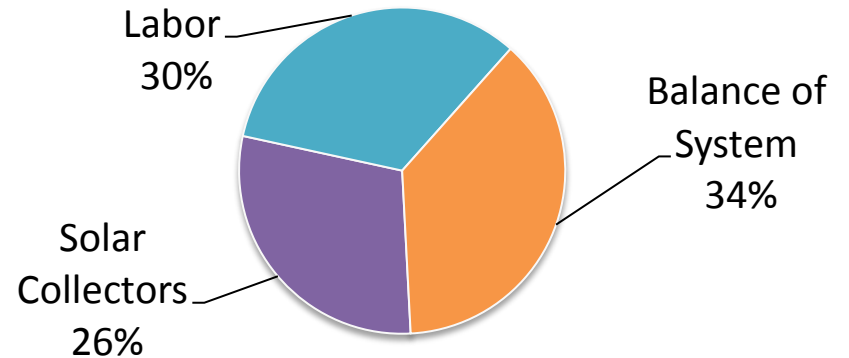


	Residential Pilot			Commercial Pilot		
	Average	Range		Average	Range	
Total System Cost	\$ 12,358	\$ 4,622	\$ 115,359	\$ 40,200	\$ 13,851	\$ 51,100
Rebate	\$ 1,489	\$ 490	\$ 3,500	\$ 6,334	\$ 2,587	\$ 11,215
Total Cost Offset by Rebate	13%	3%	25%	16%	9%	22%
Estimated Payback	8 years	2.2 years	24 years	7.4 years	5 years	9 years

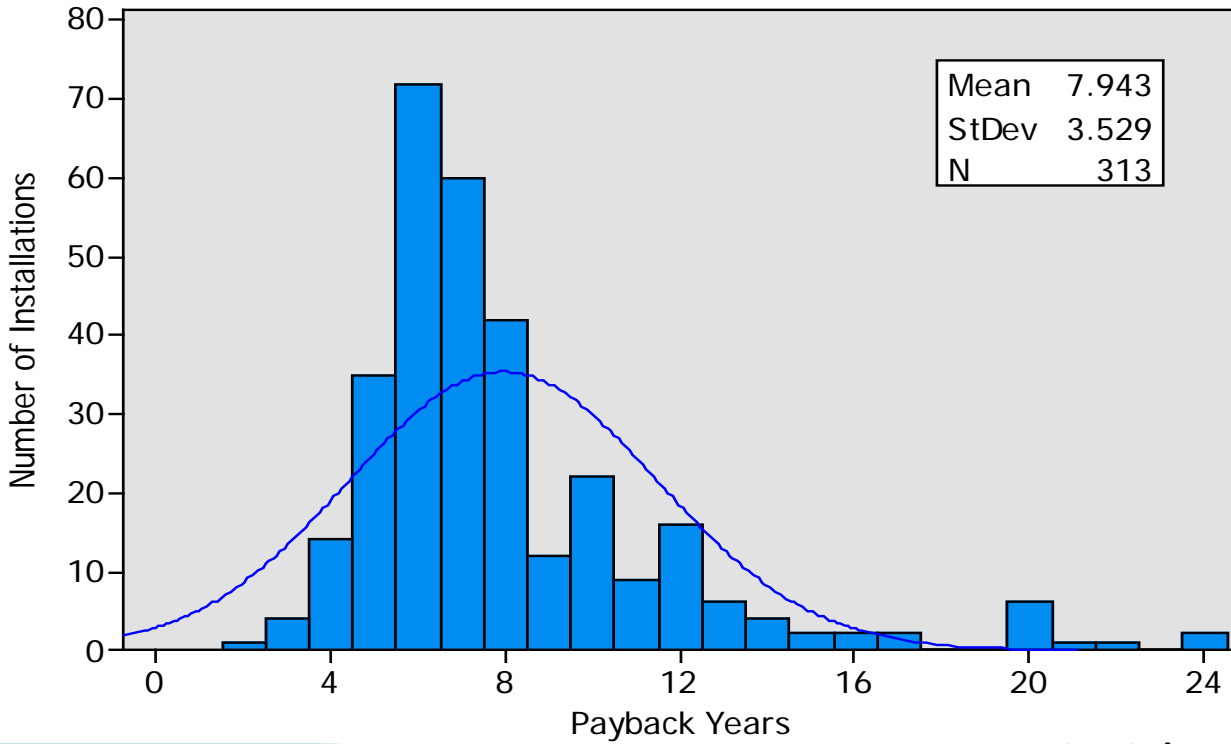
Residential SHW Total System Cost per Sq. Ft. of Collector



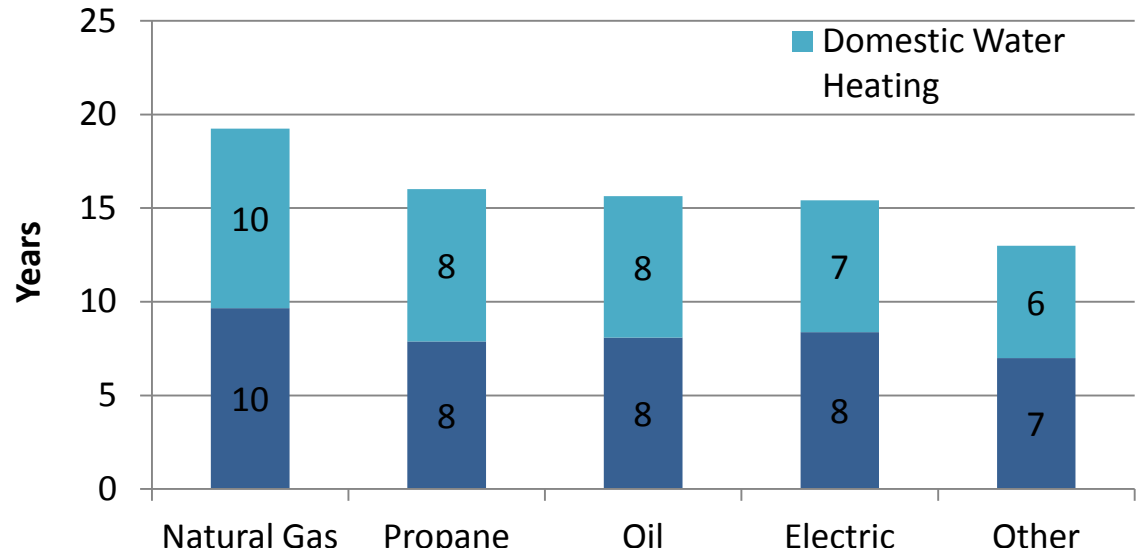
Residential Total Cost Breakdown



Residential SHW Estimated Payback (Years)



Average Payback (Years) by Backup Fuel and Use Type



Commonwealth Solar Hot Water Program

- \$10 million over 4.5 years, through end of 2016
 - Year 1: \$1.5 million budget; grows annually
- For any residential, multi-family or commercial building*
 - Displace all fuel types; for all types of applications**
- MassCEC funding is in addition to any other funding
 - Fed and state tax credits and rebate cover > 50%
- No pre-approved contractor list
 - First 2 systems must have design review & inspection
- Plumbing inspector and contractor trainings
- Performance monitoring: res optional; comm required

*That pay into the RETF

**Except residential pool heating

Two Types of Funding Offered

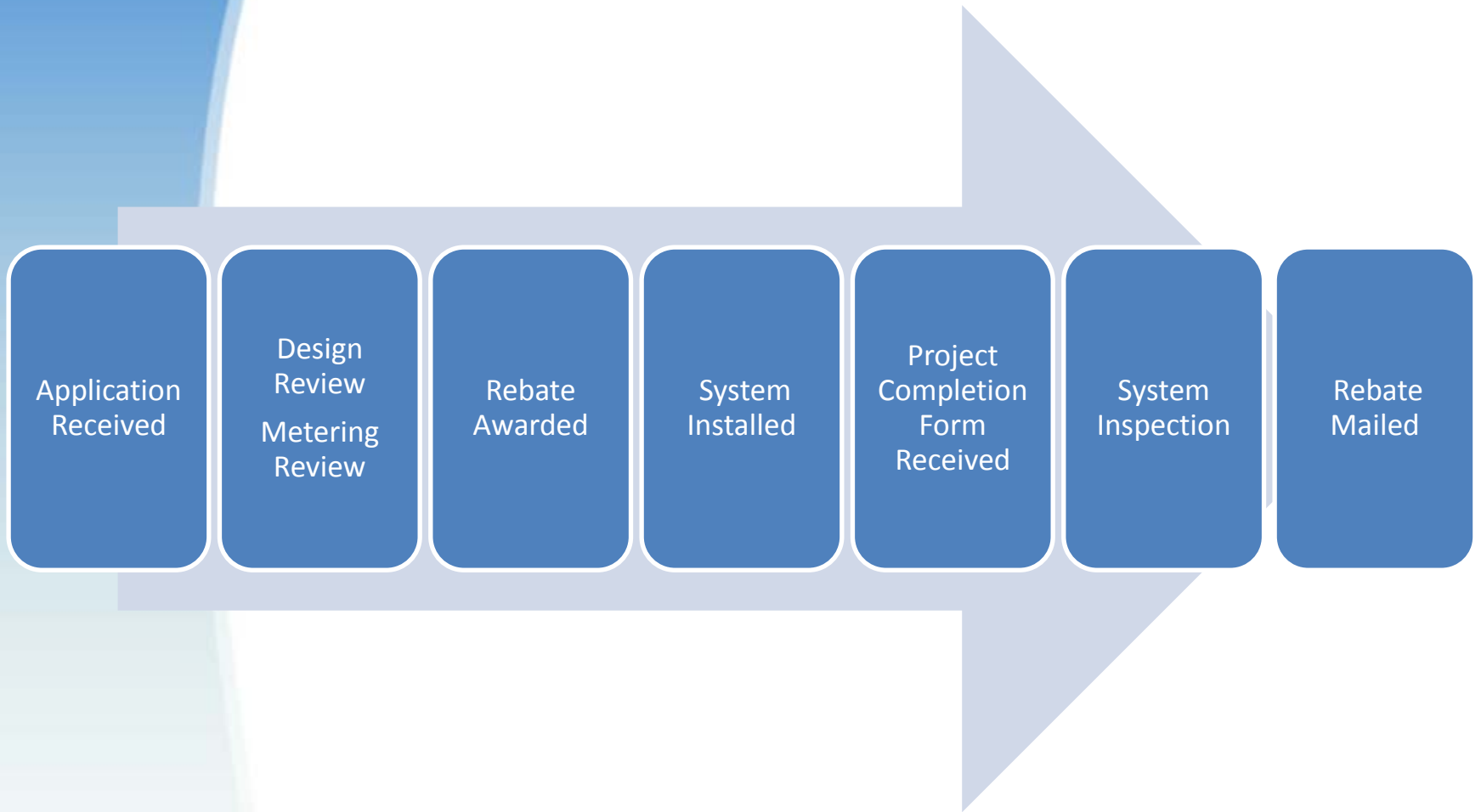
1. Feasibility Study Grants (commercial-scale only)
 - Help building owners assess the potential costs and benefits
 - Up to \$5,000/project
2. Construction Rebates
 - Help system owners with the upfront capital costs
 - Up to \$3500 (residential) or \$50,000 (commercial)/system
 - Additional funding for MA manufactured components, moderate home value or moderate income, homes affected by a natural disaster, metering

Feasibility Study Funding

- Building owner must procure an experienced consultant
- Proposed SHW System can displace any fuel type except natural gas
- Feasibility Study should analyze: site, roof structure, hot water load (to be measured through metering), project economics and specify potential system design.
- Funding:
 - Up to \$5,000 available
 - 25% cost share for private;
5% for public



CSHW Construction Rebate Process



Low-Income Solar Thermal Program

- Managed by Low-Income Energy Affordability Network (LEAN), with two technical consultants



PARADIGMPARTNERS

- Multi-family residential & nonprofit facilities serving low income residents and participants
- Year 1 (2011): \$2 million budget, 16 completed projects
- Year 2 (2012): \$2 million budget, estimated 16 projects
- Most systems fully funded: Design, Bid, Construction Management, Monitoring

Performance Monitoring Program

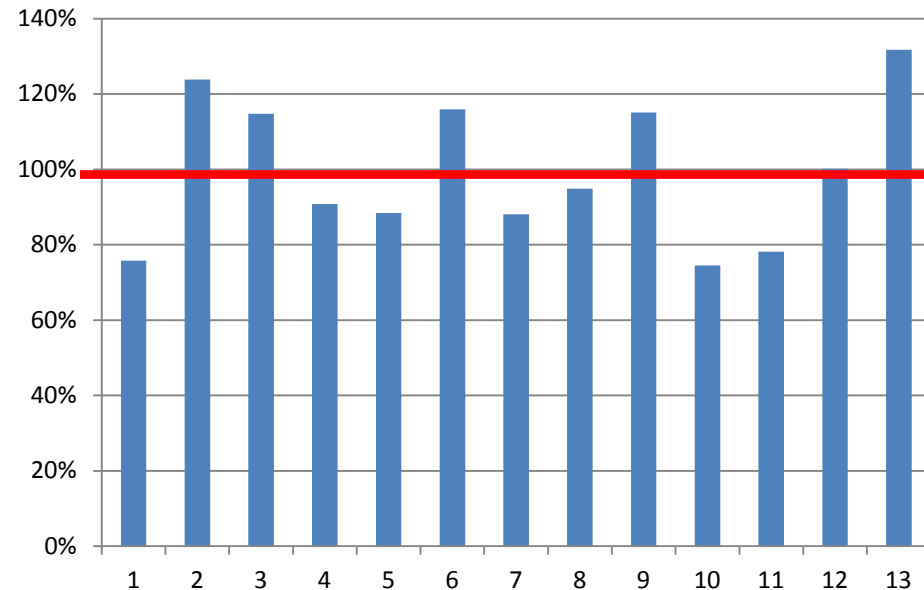
- Offer up to \$1,500 for installation of metering equipment
 - Pilot: 40 Res Systems; >20 Commercial & Low Income Systems
 - All project performance is internet accessible in real time
- Program Goals:
 - Understand actual system performance of diverse systems in MA
 - Identify appropriate methods, equipment and installation practices for accurate monitoring of solar thermal production and use
 - Improve system performance!
 - Compare actual energy production with predicted energy production (SRCC and energy models)

Common Performance Monitoring Issues

- Temperature sensors not wrapped
- Flow meters not correctly grounded
- Online setup only partially completed
- Internet access can be intermittent
- Installation uncertainties can supersede sensor uncertainty, so installation guidelines must be included in any “Standard” being developed

Commercial & Low income Monitoring Results

Project	Average	Example Issues
1	76%	
2	66%	Internet Out
3	58%	Temp Sensors Loose
4	124%	
5	51%	VFS Issue
6	115%	
7	91%	
8	88%	
9	116%	
10	88%	
11	24%	Glycol Leak
12	259%	Flow meter inputs swapped
13	95%	
14	115%	
15	75%	
16	27%	Shutdown
17	78%	
18	100%	
19	132%	
20	173%	
Average	97%	



- Eliminating known outliers, we are at 95-100% of expected production values (nice!)
- Would be substantially lower if monitoring did not catch major operational issues found in roughly 25% of projects.
- Monitoring value to recouped investment is over \$750,000 in project costs.

Residential Monitoring Results

- In the process of validating, so expect numbers to tighten
- Higher variability is expected due to lower number of individuals served
- Few projects performing near expected – sensors errors can produce both overproduction or underproduction values

Project	Average
1	150.7%
2	145.0%
3	64.1%
4	81.6%
5	82.9%
6	86.9%
7	10.8%
8	531.8%
9	50.5%
10	132.4%
11	43.6%
12	189.1%
13	41.1%
14	38.3%
15	106.4%
16	49.1%
17	46.9%
18	131.7%
Average	110.2%

Keys to Program Success

Keep it Simple

- Easy to understand
- Minimal paperwork

Measure Performance

- Understand system performance
- Create case studies with real data

Marketing and Education

- Spread awareness
- Educate contractors and inspectors

Long Term Commitment

- Provide consistency & reliability in market
- Allow companies to grow their business

Next Steps

- Performance Monitoring:
 - Continue collecting & validating data (12 mos/system)
 - Release second interim PM report winter 2012
- Encourage other financing mechanisms
- Continue building contractor and inspector SHW expertise
- Expand support for renewable thermal
 - Pilot incentive programs for biomass thermal & high efficiency heat pumps coming soon

Thank you!

- Visit our website: www.masscec.com/solarhotwater
- Sign up for our email distribution list
- Contact us at solarhotwater@masscec.com



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Email:

