# Program Innovation in the C&I Sector

September 21, 2016

# C&I Committee Architecture

## C&I Management Committee

### Innovation & Technology

- MTAC
- Combined Heat & Power

- New Buildings & Major Renovations
- Small Business
- Medium & Large Business
- Multifamily
- Upstream

### Workforce Development

# Massachusetts Technical Assessment Committee

Bob Laurence

www.MassSave.com/MTAC

# Agenda

- MTAC Purpose and Participants
- Review Process
- Technology Scorecards
- Technology Implementation
- List of Exclusions

# Who sits on MTAC?

- ✓ **Representatives from MA Program Administrators (PAs)**

- ✓ Collaboration with Connecticut and New York

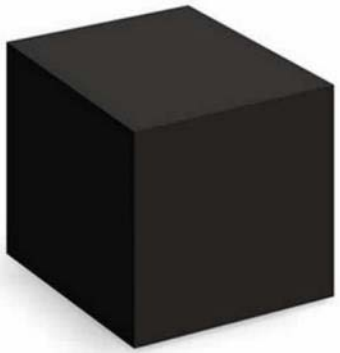
# What We Do!

- Provide a mechanism to incorporate new commercially available energy efficiency technologies statewide
- Provide assessment of new residential and non-residential technologies which have the potential to cost effectively save energy
- Welcome suggestions from vendors & entrepreneurs for the residential & commercial/industrial market sectors

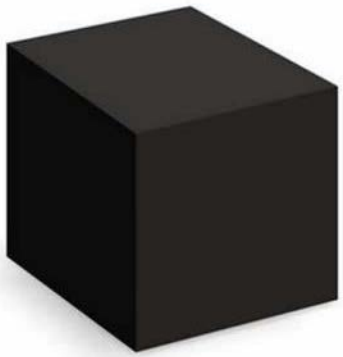
# Proactive Efforts

- MTAC members attend various conferences in order to discover emerging technologies
  - Energy Exchange
  - ABx
  - AEE Globalcon
  - California Emerging Technology Summit
  - E Source Forum
- MTAC members conduct independent research
- Benchmark MTAC against other states' technology assessment programs/committees

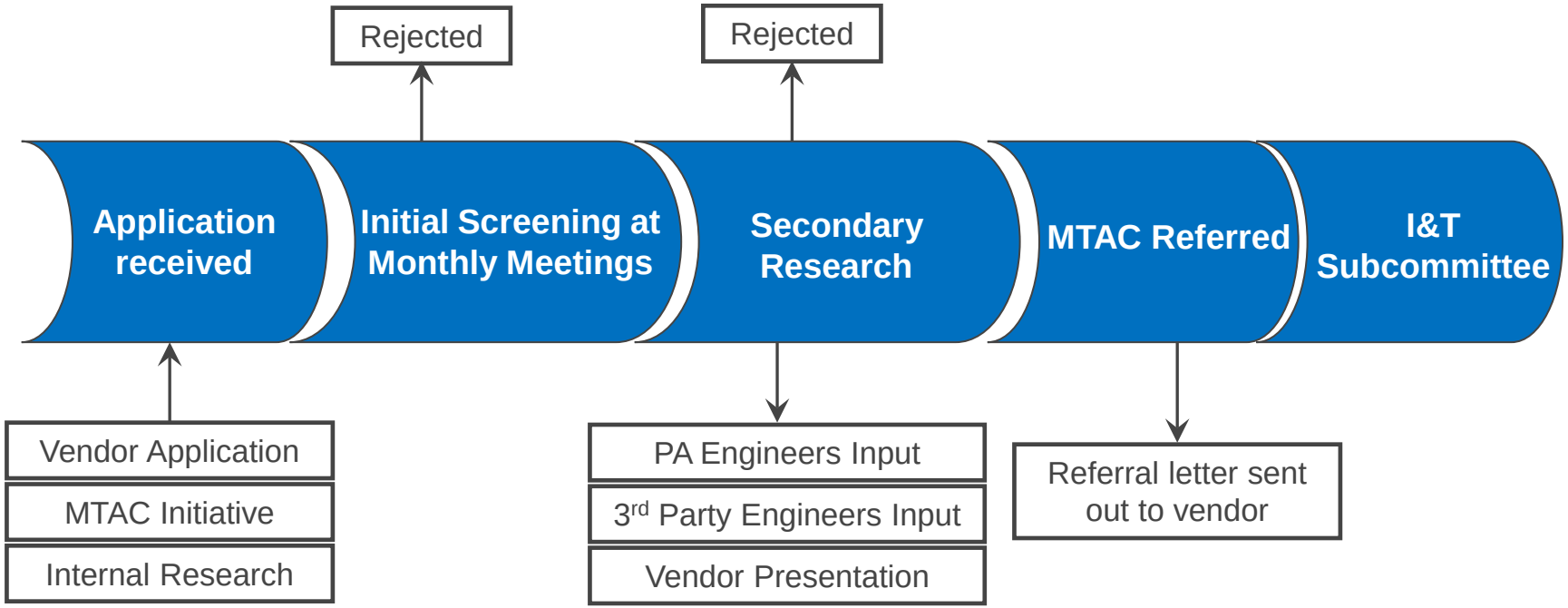
# *'Black Box'* Assessment



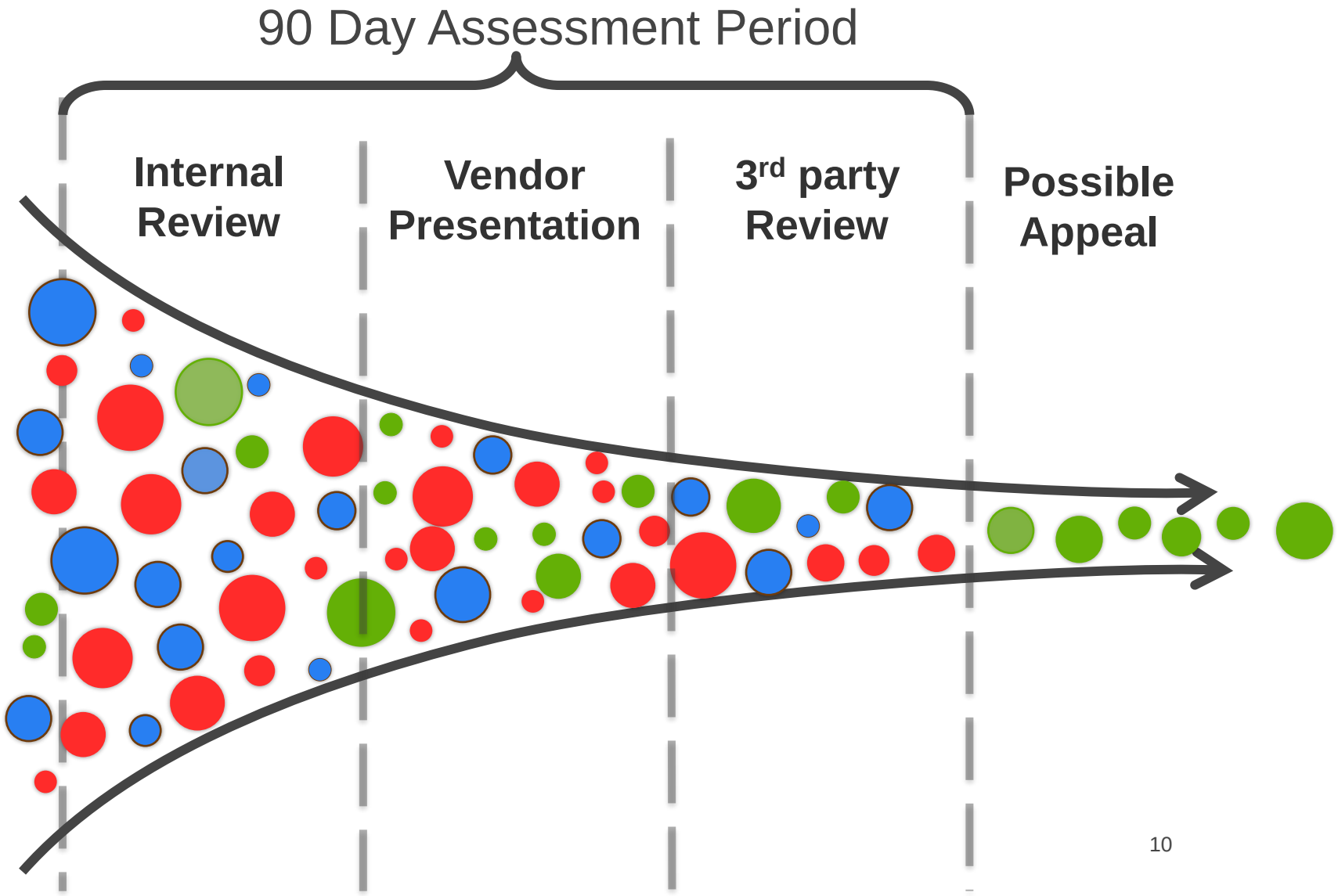
## So What Does This Really Mean?



# MTAC Technology Review Process



# How MTAC Filters Technologies



# Consideration Requirements*

1. **General Equipment Requirements**
   - Tested by recognized agency for safety
   - Commercially available
   - Meets applicable codes
   - Does not void warranty of equipment being applied to

2. **Energy Savings Requirements**
   - Energy savings calculated using industry accepted methods
   - Energy savings measured & documented
   - Predictable & repeatable saving values (therm/kWh)
   - Installed & proven at multiple installations

**All information can be found on [www.MassSave.com/MTAC](www.MassSave.com/MTAC)*

# List of Exclusions from MTAC

Excluded from MTAC*:

- Retrofit Energy Conservation Devices
  - Power quality & conditioning
- Product Performance Enhancer
  - Refrigerant additives
- Normal Maintenance Procedures
  - HVAC tune-up
- Incremental Improvements
  - More efficient LED bulb
- Safety Issues
  - May result in personal injury

* Though ineligible for MTAC's consideration, these technologies may be eligible for incentives through the custom application.

# Technologies Reviewed

- From 2014 to current date, out of 49 technologies reviewed, 32 are via vendor application and 17 are via internal effort
- 19 technologies have been referred: www.masssave.com/mtac
  - 10 of those technologies were received via internal effort

| Internal Effort | Vendor Application |
|---|---|
| Drain Heat Recovery | Green Cooling Tower |
| Heat Pump Dryer | Battery Charging Equipment |
| Air Operated Double diaphragm Pump Control | Window Glaze |
| Energy Recovery Filter | Ceramic Epoxy Pump Coating |
| HVAC and Boiler Controls | Ductless Fume Hoods |
| Transportation Block Heater Smart Controls | Washing with Beads Washer |
| Commercial Laundry Detergent | Energy Recovery for Greenhouses |
| Block Heater | Electrochromic Glass |
| Transportation Block Heater Smart Controls | High Velocity Fans |
| Q Sync Permanent Magnet Sync Motors | |

# Technology Scorecards

**Massachusetts Technology Assessment Committee (MTAC)**

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**Electrochromic Windows**

Date reviewed: 06/18/2015

| Description of Technology | Energy Saving Opportunity | |
|---|---|---|
| Electrochromic windows have the ability to control the amount of light and heat passing through windows when a charge is applied. A burst of electricity is needed for changing its opacity and SHGC, but no constant electricity is needed to maintain those properties. The effects can be controlled via a wall switch or smartphone app. | Sector(s): | ☑ Residential<br>☑ Commercial & Industrial |
| | Applicability Criteria: | Buildings with ample sun exposure |
| | Efficiency Improvement: | Change window properties to deduce lighting and cooling load |
| | Energy (%) Savings Potential: | Highly variable |
| | Demand (%) Reduction Potential: | Highly variable |

| Strengths | Weakness |
|---|---|
| • Allowing visible light to pass through windows without letting any heat through, therefore reducing cooling and lighting needs<br>• Flexible control logarithm allow for different sequences depending on building need<br>• Electrochromic windows can reduce glare without the need for shades or blinds | • The time it takes for electrochromic windows to change from clear to opaque and back again may feel long to building owners and occupants<br>• As stated in a third party analysis, technology works well in "warm sunny climates, but the intelligent control of window tint may has a negative impact in cold climates, through the loss of passive solar heating" |

| Third Party Analysis/ Previous MTAC Reviews | Suppliers Known to MTAC | MTAC Status |
|---|---|---|
| • Demonstration Program for Low-Cost, High-Energy-Saving Dynamic Windows report (ESTCP Project EW-201252)<br>• The Energy-Savings Potential of Electrochromic windows in the US Commercial Buildings Sector | SAGE Electrochromics<br>EControl-Glass<br>View Dynamic Glass | Acknowledged to have energy savings potential and recommended to individual PA for their own EE program consideration |

| Market Development Issues | |
|---|---|
| Cost: | Varies |
| Market Risk and Barriers: | May be hard to justify cost in cold climates |
| Time to Market: | Currently on market |
| Simple Pay-back: (Years) | Varies |

## Technology Scorecards

- Scorecards are available on www.MassSave.com/MTAC
- MTAC referred technologies are also included in the Quarterly Reports with links to their associated scorecards on MassSave.com

## Example

- Electrochromic Windows
- http://www.masssave.com/~/media/PDF/Electrochromic%20Windows%20MTAC_011.pdf

# Implementation of Technologies

- **Pump Coating**
  - Promote this technology with Chesterton
  - Pumping coating is part of Eversource and MassDEP's collaboration in Pump Systems Optimization
- **Electrochromic Glass**
  - Several lab projects in Cambridge
- **Q Synch Motors**
  - Internal groups are working on implementation
    - Boston University
- **Block Heaters**
  - Harvard University
  - Massachusetts Water Resources Authority

# Thank you

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BERKSHIRE GAS
BLACKSTONE GAS COMPANY
Cape Light Compact
Columbia Gas of Massachusetts
A NiSource Company
EVERSOURCE
Liberty Utilities
nationalgrid
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Unitil
energy for life

# Identifying, Assessing and Deploying New Opportunities:

Amit Kulkarni, Eversource

David Gibbons, National Grid

September 21, 2016

# Agenda

- Opportunity Identification and Assessment
  - I&T Subcommittee Responsibilities
  - Process Overview
  - Example: Emerging Technology
- Case Study: Roof Top Unit (RTU) Controllers
  - Technology Overview
  - Roadmap / Opportunity Identification
  - Testing & Assessment
  - Launch History
  - Results

# Responsibilities

## Opportunity Identification & Assessment

| | |
|---|---|
| **Investigate, select, and develop EE opportunities** | • Go-to-market strategy: delivery model, savings estimates and budgets, target markets, incentive levels |
| **Strategic focus** | • Technology, Customer segmentation, Value/supply chain efforts |

**Communicate findings and recommendations to relevant Subcommittee(s) and C&I MC**

# What's not In-scope

- One-offs that are better handled by specific programs
- Re-runs (i.e., ongoing campaigns)
- New technology assessments (MTAC)
- Marketing/communications
  - Collateral development
  - Events

# Process Overview

## Stage 1 Definition

- What is the timeframe?
- What analysis is required?
  - Customer segment(s)
  - Technology
  - Supply/Value chain
- What are the potential savings?

## Stage 2 Assessment

- Technology
  - Savings potential
  - Price premium
  - Performance / technical barriers
- Customer Segment(s)
  - Define by sector / segment / sub-segment
  - Value proposition
- Value Chain
  - Relevant manufacturers & market share
  - Distribution channels
  - Partnership opportunities

## Stage 3 Recommendation

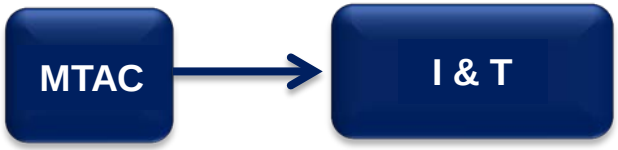
- What is the opportunity?
- What organizations do we need to work with?
- What needs to be done to test the opportunity?
  - How resource intensive will that be?
  - How long will it take to develop?
- How will this affect other initiatives?
- What are the next steps?

# Process Overview:
## Emerging Technology Example

**MTAC**

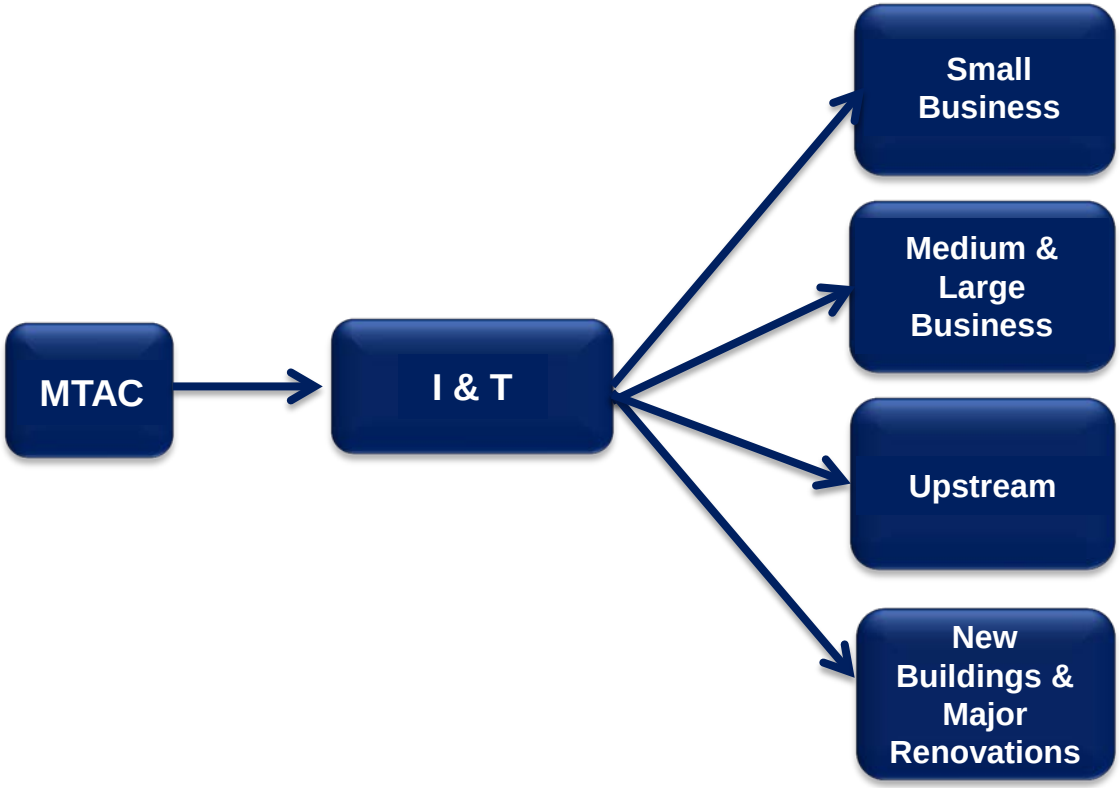
- Evaluate emerging technologies
- Determine technical viability and potential energy savings
- Communicate findings to I&T

# Process Overview:
## Emerging Technology Example



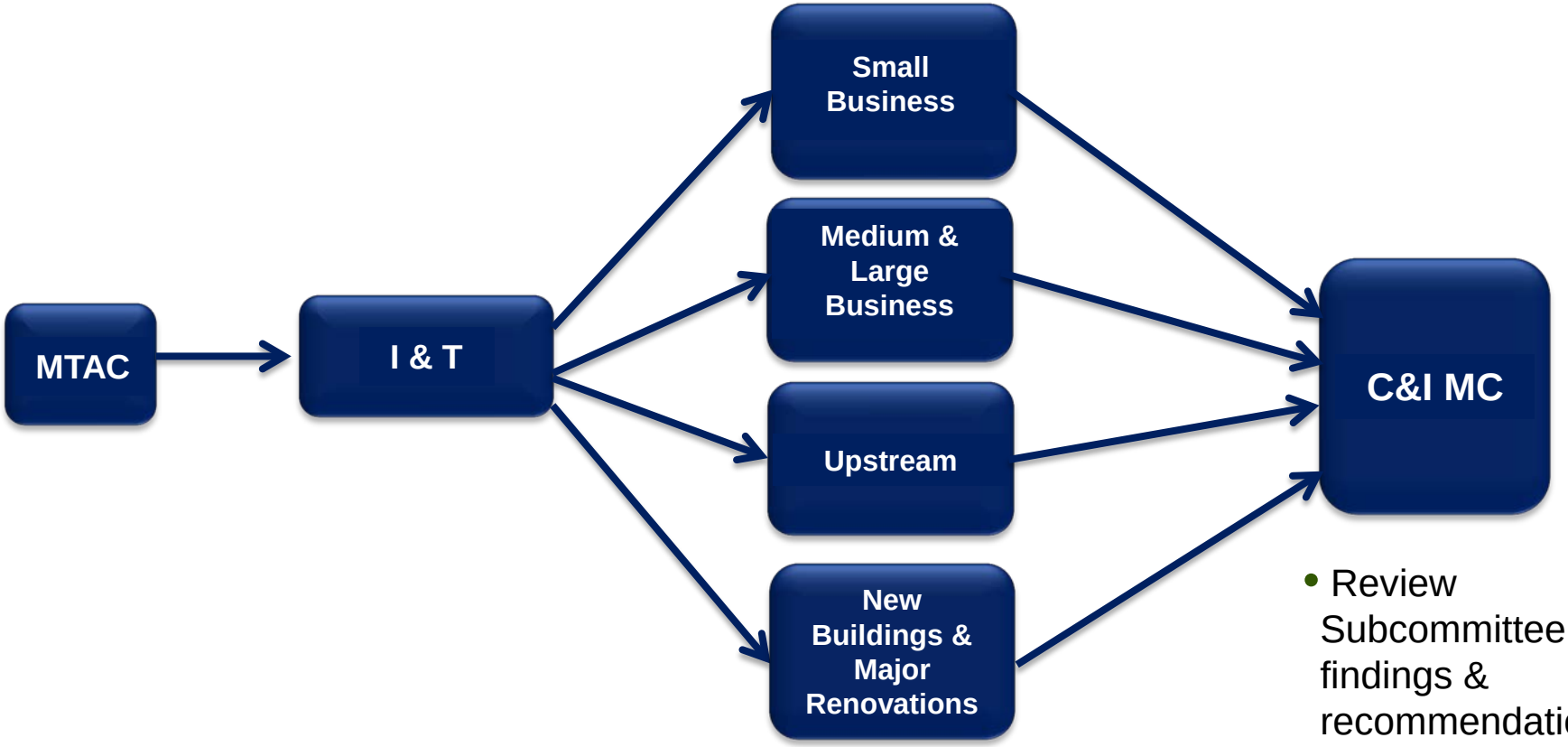

- Determine commercial viability of emerging technologies
  - # of potential customers
  - Potential savings (Collaborate with EM&V)
  - Target customer segment(s)
- Analyze existing deployments, models, etc.
- Communicate findings and recommendations to relevant Subcommittee(s)
  - Delivery model, savings calculations & potential, target markets, incentive levels

# Process Overview:
## Emerging Technology Example




- Review I&T findings
- Recommend proper delivery model
- Recommend proper incentive structure
- Inform C&I MC of decision

# Process Overview:
## Emerging Technology Example

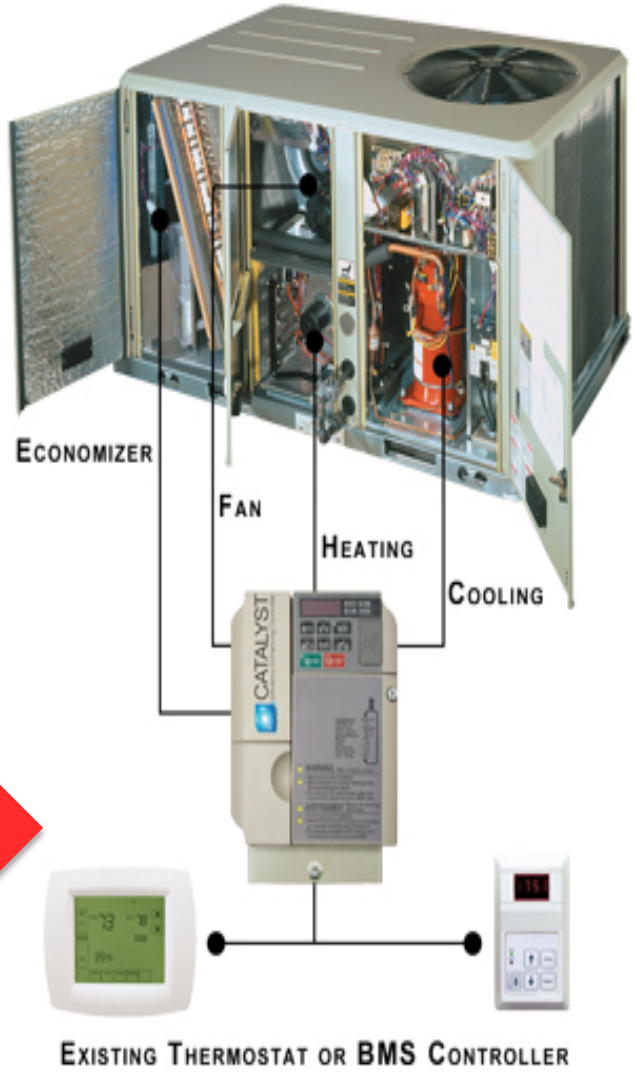



- Review Subcommittee findings & recommendations

# Example:
# Roof Top Unit (RTU) Controllers

# Technology Overview

**Roof Top Unit (RTU):**
Equipment that provides comfort cooling and heating in buildings




- Packaged Control System
  - Communicating over Internet Protocol (IP) with many different capabilities

# Roadmap

2010
Opportunity Identified
2012
Technology Assessment and Demonstration
2013
Program Launch and Implementation
2015
Maturing as a Custom Measure

# Opportunity Identified

- **2010**: MTAC members attended CA Emerging Technology Summit
  - Innovative Technology: Packaged EMS system for constant volume RTUs
  - Business Need: Controls on existing constant volume RTUs for small/medium business customers
  - Intersection of innovation and business need
- **2010**: Internal PA discussions and innovator presentations
- **2011**: Market assessment of opportunity size and readiness of this technology
- **2011**: Proactive review technology by MTAC→ Technology confirmed to save energy
- **2011**: Technology recommended to PAs for demonstration and inclusion in C&I programs

# Testing/Assessment

- **2012**: Demonstration project at retail warehouse in Hyannis
- **2012**: Review of demonstration studies by other utilities in United States

**Demonstration Results**: Confirmation of energy savings, ease of implementation, customer satisfaction

- **2012**: Discussions with technology companies, OEMs, trade allies, and implementation vendors to determine market readiness
- **2013**: Implementation guidelines issued by MTAC

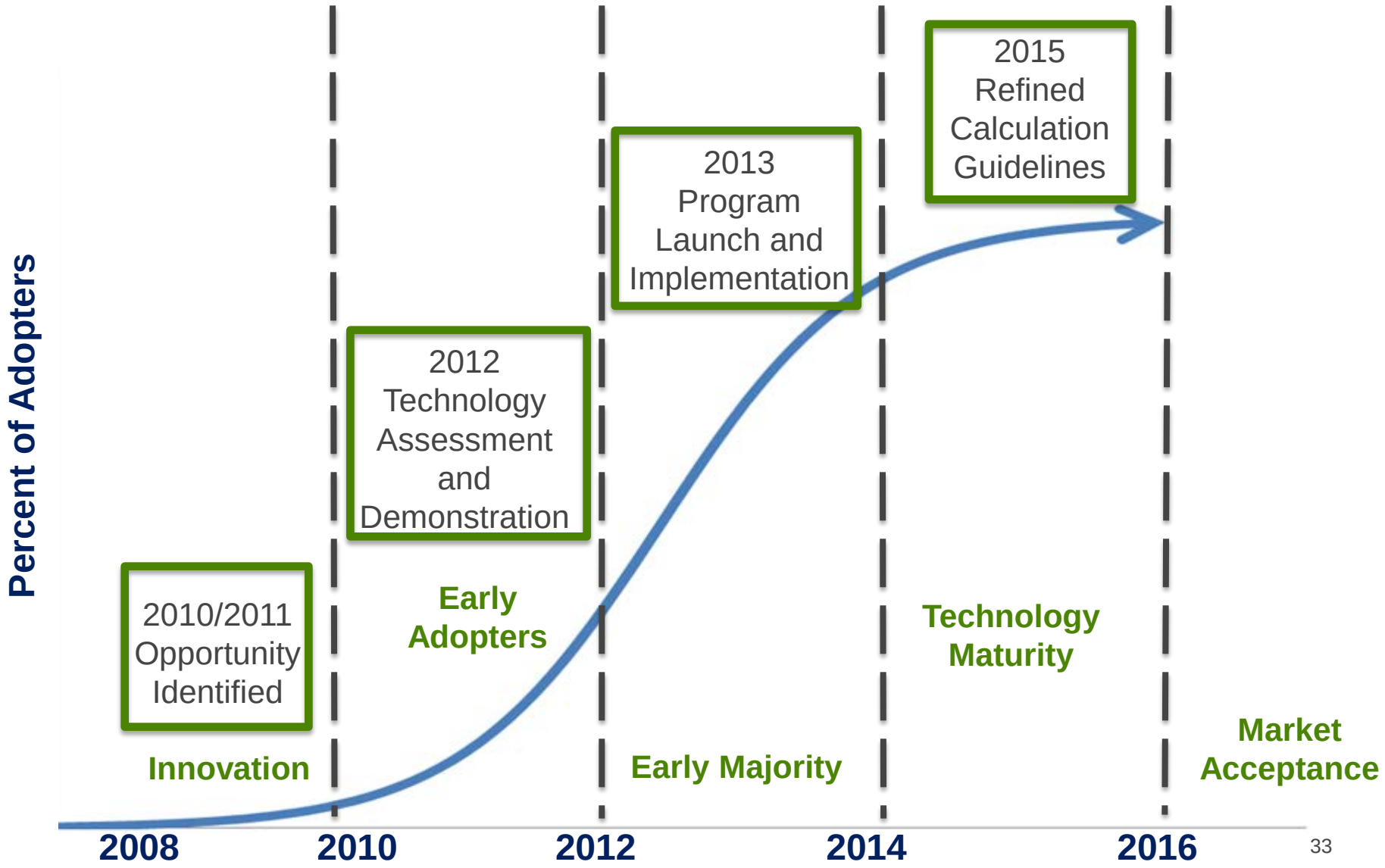
# Launch

- **2013**: Creation of ‘Custom Express’ calculator by all PAs.
  - Saves time for vendors, increased accuracy and consistency of savings calculations
- **2013**: PAs conducted training (internal staff and trade allies):
  - Application of technology, use of custom express tool and value/sales proposition
- **2013**: Technology launched. Targeting small & medium businesses
- **2014/2015**: Implementation of projects and stakeholder feedback led to refining value proposition approach and updating custom express calculator
- **Current Status**: Approved custom measure gaining maturity in small and medium business sectors

# Results

- **Number of projects**: 75+ projects since 2013
- **Energy Savings**: 3 million+ annual kWh savings
- **Demand Savings**: 700 + kW
- **Simple Payback Period**: 6 years before incentive/ 3 years after incentive
- **Applicable Sectors**: Small and Big Box Retail, Restaurants, Health Clubs, Entertainment Centers, Small and Medium Office buildings
- **Trend**: Decreasing trend in implementation costs, simplification of implementation, increasing indoor air quality comfort in buildings, included as standard option by most OEMs for newer RTUs
- **Barriers:** Age of RTUs, meeting ASHRAE 62.1 (outdoor air requirements)
- **Opportunity Identifier**: Potential of leading to early replacement of RTUs

# Adoption


Percent of Adopters
2010/2011 Opportunity Identified
2012 Technology Assessment and Demonstration
2013 Program Launch and Implementation
2015 Refined Calculation Guidelines
Innovation
Early Adopters
Early Majority
Technology Maturity
Market Acceptance
2008
2010
2012
2014
2016

# Thank you

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BERKSHIRE GAS
BLACKSTONE GAS COMPANY
Cape Light Compact
Columbia Gas of Massachusetts
A NiSource Company
EVERSOURCE
Liberty Utilities
nationalgrid
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Unitil
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# Appendix

# MTAC Technology Scorecards

**Massachusetts Technology Assessment Committee (MTAC)**

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## Standby Generator Forced Circulation Block Heaters

Date reviewed: 04/04/2016

### Description of Technology

To meet the NFPA code for EPS, block heaters are used in standby generators. Forced circulation (Pump-Driven) block heaters include a heating element and a pump to heat and circulate the generators coolant. Currently the market is dominated by Thermo-Siphon block heaters which rely on the buoyancy of warmed water to circulate heated fluid throughout the generator.

### Energy Saving Opportunity

| | |
|---|---|
| Sector(s): | ☐ Residential<br>☑ Commercial & Industrial |
| Applicability Criteria: | Standby generators |
| Efficiency Improvement: | Increased heat transfer and provides uniform temperature across the engine block |
| Energy (%) Savings Potential: | Approximately 40% |
| Demand (%) Reduction Potential: | None |

### Strengths

- More consistent block temperature for engine therefore able to meet NFPA requirements with lower heater temperature and lower energy use
- Simple to retrofit to existing block heater systems i.e. no added materials
- Supplier offers training for installers

### Weakness

- Education is needed to correctly install forced circulating block heaters. Qualified installers required
- Savings is variable dependent on the outdoor ambient temperature
- Thermo-Siphon block heaters dominate the market, creating a barrier for forced circulation block heaters, and are driven by OEM installations
- Since some standby generator manufacturers offer this technology on larger units, there is only an energy savings opportunity with retrofit applications

### Third Party Analysis/ Previous MTAC Reviews

Avista, Bonneville Power Administration, and Pacific Gas and Electric Company have conducted studies on this technology

### Suppliers Known to MTAC

Hot Start

### MTAC Status

Acknowledged to have energy savings potential and recommended to individual PA for their own EE program consideration.

### Market Development Issues

| | |
|---|---|
| Cost: | $1,000 - $4,000 |
| Market Risk and Barriers: | Technician knowledge and OEM installation of thermo-siphon block heaters |
| Time to Market: | Currently on market |
| Simple Pay-back: (Years) | Varies |

http://www.masssave.com/~/media/Files/Business/Approved%20Technologies/Block%20Heater%20with%20Circulating%20Pump.pdf

**Massachusetts Technology Assessment Committee (MTAC)**

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## Transportation Block Heater Smart Controls

Date reviewed: 04/04/2016

### Description of Technology

Diesel engines commonly use immersion type heaters that use 110v to ensure quick and smoke-free start-up during cold temperatures. Typically engine heaters are plugged in below a particular temperature and left on throughout the cold period. Smart controllers allow the block heaters to be cycled on and off dependent on the ambient air temperature.

### Energy Saving Opportunity

| | |
|---|---|
| Sector(s): | ☐ Residential<br>☑ Commercial & Industrial |
| Applicability Criteria: | Diesel Engines |
| Efficiency Improvement: | Heating control, Electricity savings |
| Energy (%) Savings Potential: | 40% - 75% (Technology dependent) |
| Demand (%) Reduction Potential: | None |

### Strengths

- Control is dependent on temperature rather than user discretion
- Easy retrofit application. Controllers can replace existing electrical outlet or used in-line with an extension cord

### Weakness

- May need qualified installer

### Third Party Analysis/ Previous MTAC Reviews

Bonneville Power Administration, conducted studies on this technology

### Suppliers Known to MTAC

IPLC
ELEproducts

### MTAC Status

Acknowledged to have energy savings potential and recommended to individual PA for their own EE program consideration

### Market Development Issues

| | |
|---|---|
| Cost: | $190 - $500 |
| Market Risk and Barriers: | IPLC outlet dedication for block heater use only |
| Time to Market: | Currently on market |
| Simple Pay-back: (Years) | Varies |

http://www.masssave.com/~/media/Files/Business/Approved%20Technologies/Transportation%20Block%20Heater%20Smart%20Controls.pdf

# MTAC Technology Scorecards

## Massachusetts Technology Assessment Committee (MTAC)

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### Ductless Fume Hoods

Date reviewed: 11/03/2103

#### Description of Technology

Ductless Fume Hoods are used in lab environments, where harmful exhaust is presence. Unlike the conventional technology of Ducted fume hood, where the exhaust air is emptied outdoors (with or without filtration), ductless fume hoods are designed to recirculate filtered air back into the immediate environment. Ductless fume hoods use the properties of activated carbon combined with catalysts and certain neutralizers in order to filter toxic molecules

#### Energy Saving Opportunity

| | |
|---|---|
| Sector(s): | ☒ Residential<br>☑ Commercial & Industrial |
| Applicability Criteria: | Labs(with low solvent quantity usage) |
| Efficiency Improvement: | Less fans, Electricity savings |
| Energy (%) Savings Potential: | 50% per hood |
| Demand (%) Reduction Potential: | Highly variable |

#### Strengths

- Hazardous particulate are trapped in a designated filter before entering into the immediate environment. The filter can be cleaned or disposed of properly.
- Eliminating the need for make-up air system and therefore less complicated fan system
- Simpler construction lay out in labs

#### Weakness

- Education and training are required to operate and maintain due to the need change the filter at a regular basis.
- There is concerns with the hood's ability to handle high concentrations of chemical vapor, since it relies on the filter and the air gets recirculate back into the lab environment
- The face velocity is normally below 80 feet per minute, therefore disruption of turbulence may occur causing unfiltered air leakage

#### Third Party Analysis/ Previous MTAC Reviews

NYSERDA has a done a study and offers rebates for this type of technology

#### Suppliers Known to MTAC

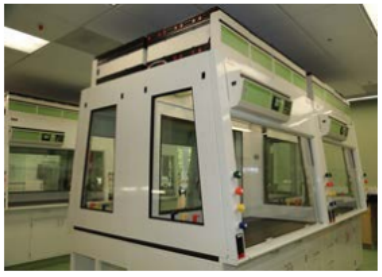
- Sentryair
- erLab
- Terra universal

#### MTAC Status

Acknowledged to have energy savings potential and recommended to individual PA for their own EE program consideration

#### Market Development Issues

| | |
|---|---|
| Cost: | $4,000-$8,000/unit |
| Market Risk and Barriers: | Low ability to handle extremely high concentration of hazardous chemical vapor |
| Time to Market: | Currently on market |
| Simple Pay-back: (Years) | Varies |



http://www.masssave.com/~/media/Files/Business/Approved%20Technologies/Ductless-Fume-Hoods-2016-03-23.pdf

## Massachusetts Technology Assessment Committee (MTAC)

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### Ceramic Epoxy Pump Coatings

Date reviewed: 10/24/2014

#### Description of Technology

Ceramic epoxy pump coatings are epoxy coatings mixed with hard-ceramic particles of alumina, silicon carbide in order to improve wear resistance.
The coating can fill cavity By applying pump coatings, pump's efficiency can be restored or even improved

#### Energy Saving Opportunity

| | |
|---|---|
| Sector(s): | ☒ Residential<br>☑ Commercial & Industrial |
| Applicability Criteria: | Industrial usage |
| Efficiency Improvement: | Increase pump efficiency, electricity savings |
| Energy (%) Savings Potential: | ~15% |
| Demand (%) Reduction Potential: | Not Applicable |

#### Strengths

- The coating can be applied in-house without sophisticated tools or equipment and minimal training
- Pumping coating restores the pump efficiency and even improves better that original efficiency.
- Increase service time of the pump

#### Weakness

- Saving potential is usually relatively low when just used by itself. However can be increased greatly if combined with other retrofit measures such as sandblasting the pumps
- Savings varies case by case and fairly limited to niche market

#### Third Party Analysis/ Previous MTAC Reviews

"***Energy Savings Through Refurbishment and Coating***" by Paul Maier and Christian King of Monroe County Water Authority

#### Suppliers Known to MTAC

- A.W. Chesterton
- Dover Pump Solution Group
- Belzona

#### MTAC Status

Acknowledged to have energy savings potential and recommended to individual PA for their own EE program consideration

#### Market Development Issues

| | |
|---|---|
| Cost: | Varies |
| Market Risk and Barriers: | Relatively short term solution to pump corrosion issues |
| Time to Market: | Currently on market |
| Simple Pay-back: (Years) | ~2 years based per manufacture data |

http://www.masssave.com/~/media/Files/Business/Approved%20Technologies/Pump-Coating-2016-03-25.pdf