

# State Mechanical Insulation Assessment Program



## Mechanical Insulation Energy Assessment Program Webinar

**Kate Marks – Managing Director  
National Association State Energy Officials  
Alexandria, VA**

# Webinar Presenters

**Kate Marks** — Managing Director  
National Association State Energy Officials  
Alexandria, VA

**Rima Oueid** — Policy Advisor, Office of Energy Efficiency and Renewable Energy  
U. S. Department of Energy  
Washington, DC

**Lou Moore** — Chief, Energy and Pollution Prevention Bureau  
Montana Department of Environmental Quality  
Helena, MT

**Ron King** — Past President and Consultant  
National Insulation Association  
Reston, VA

# Webinar Agenda

- **ARRA Funding Potential**
- **Mechanical Insulation Energy Assessment Program Objective**
- **Defining Mechanical Insulation**
- **State of Montana Case Study**
- **Mechanical Insulation Energy Assessment Program Overview**
- **Questions and Answers**
- **Contact Information**

# Department of Energy

## Rima Oueid

The American Recovery and Reinvestment Act of 2009 (ARRA) outlined the following goals: to work toward achieving energy independence and a transition to a clean energy economy, create “good green jobs,” spend the money quickly, and maintain full transparency and accountability in spending taxpayer dollars.

Meeting the Department of Energy’s (DOE’s) deadline to complete the work – April 30, 2012 – is an important metric that will help demonstrate the success and capabilities of the state energy offices.

The Mechanical Insulation Energy Assessment Program, as you will see today from the Montana assessment results, is a great example of meeting ARRA’s objectives and use of ARRA and other funding.

The program is designed to identify opportunities, quantify and qualify the savings potential, and potentially allow implementation to begin within a 30-90 day window. Mechanical insulation is a proven technology that can be implemented in weeks versus years and addresses ARRA’s objectives. Given the urgency to identify and implement initiatives, it is a solution that you should consider implementing sooner rather than later.

The data shared by NIA demonstrates that mechanical insulation typically provides a double-digit return on investment and makes it even more attractive.

# State Mechanical Insulation Assessment Program



## NASEO – State Mechanical Insulation Energy Assessment Program Webinar

June 28, 2011

Assessments@insulation.org



# State Mechanical Insulation Assessment Program Industry & Program Introduction

## An Unprecedented Alliance

**The National Insulation Association (NIA) and International Association of Heat and Frost Insulators and Allied Workers (International) created an unprecedented alliance (Alliance) in May 2009 to work together to educate industry on and promote the benefits of mechanical insulation. Mechanical insulation is a proven technology that can dramatically improve energy efficiency, reduce carbon emissions, increase personnel safety, and reduce costs, all while creating tens of thousands of green jobs. The Alliance encourages establishing public-private partnerships to provide public education and awareness regarding the benefits of mechanical insulation.**



# **State Mechanical Insulation Assessment Program**

## **Objective**

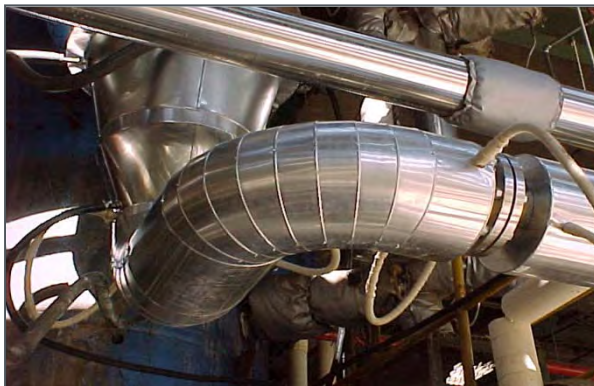
**The Mechanical Insulation Energy Assessment Program is designed to demonstrate the energy savings, emission reduction, job creation, and other mechanical insulation opportunities through properly designed and maintained insulation systems in existing state buildings.**

- Retrofit - maintenance opportunities**
- Short term implementation – “Shovel Ready”**
- Using proven technology and DOE sanctioned software**
- Excellent use of ARRA or other funding**
- Provides attractive ROI, is environmentally friendly and an economic stimulus**
- In most cases, it can be completed without workplace disruption**

# State Mechanical Insulation Assessment Program

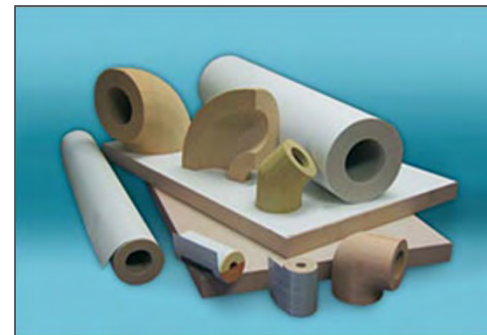
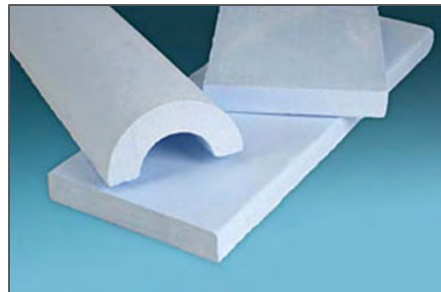
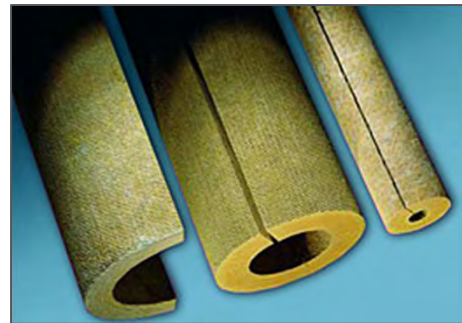
## Defining Mechanical Insulation

**Mechanical insulation is defined to encompass all thermal, acoustical, and personnel safety requirements for insulation of mechanical piping and equipment, hot and cold, and heating, ventilating and air conditioning (HVAC) applications in the commercial building and the industrial markets.**



# Defining Mechanical Insulation

## Multiple Material Systems are Available



# State Mechanical Insulation Assessment Program

## General Program Overview

- **It includes actual field assessment of facilities selected by the State**
- **Energy information required for the assessment is provided by the State**
- **Joint State and insulation assessment team inspects mechanical insulation systems for missing insulation or damaged areas (other conditions may also be identified) and then determine the scope of the assessment**
- **The insulation assessment team conducts the analysis and provides the State a detailed report of the findings – Important to note the assessment team is unbiased , not a contractor, manufacturer, etc.**
- **The State determines the next course of action**
- **The State implements the work plan and executes the work**

# The State of Montana Case Study

## The State of Montana Mechanical Insulation Energy Appraisal

A State's Look at the Value of  
Mechanical Insulation

The total report is available at  
[www.insulation.org/downloads/pdf/mimi/Commercial  
Buildings\\_Report\\_5-2011.pdf](http://www.insulation.org/downloads/pdf/mimi/Commercial_Buildings_Report_5-2011.pdf).



State Capital – Helena, MT

# The State of Montana Case Study

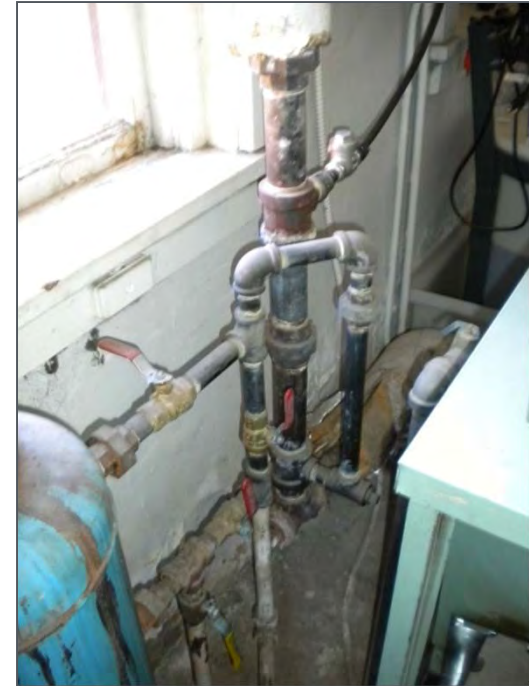
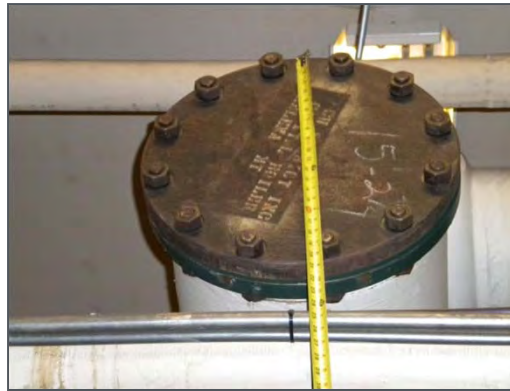
## Summary Findings – Little Things Matter

- **Estimated energy savings – 6 Billion BTUs per year**
- **Overall payback period was 4.1 yrs or 24% annual return**
- **Projected savings represent roughly 8% of the total natural gas consumption of the facilities analyzed**
- **Reductions in CO<sub>2</sub> emissions are 300 Metric Tonnes per year**
- **On a square foot of gross building area basis, the energy savings averaged 4.6 kBtu/sf/yr and energy cost savings were \$0.043/sf**

The payback period and internal rate of return were based on actual operating conditions, 80°F ambient temperature, service temperature, and hours of operations, which in many cases are less than six months per year.

It was determined extrapolations to similar state-owned facilities, universities, hospitals, and similar facilities are possible.

# The State of Montana Case Study



**Examples**  
**25 Buildings – 56 Mechanical Rooms**  
**3,500 Items were identified**

# The State of Montana Case Study

## The Facilities

- **25 facilities = 1.3 Million sq. ft.**
- **Upgrading existing insulation systems was not considered**
- **56 mechanical rooms**
  - **Mechanical systems within occupied spaces not considered**
- **Piping and equipment for hot systems**
  - **Cooling systems not considered**
- **Not an Energy Audit**
  - **Envelope/lighting/controls/ventilation/equipment was not considered**

# The State of Montana Case Study

## Walt Sullivan Building had the fewest items

- **14 items**
- **\$138/yr in energy savings**
- **\$600 to insulate**
- **4.3 yr payback**

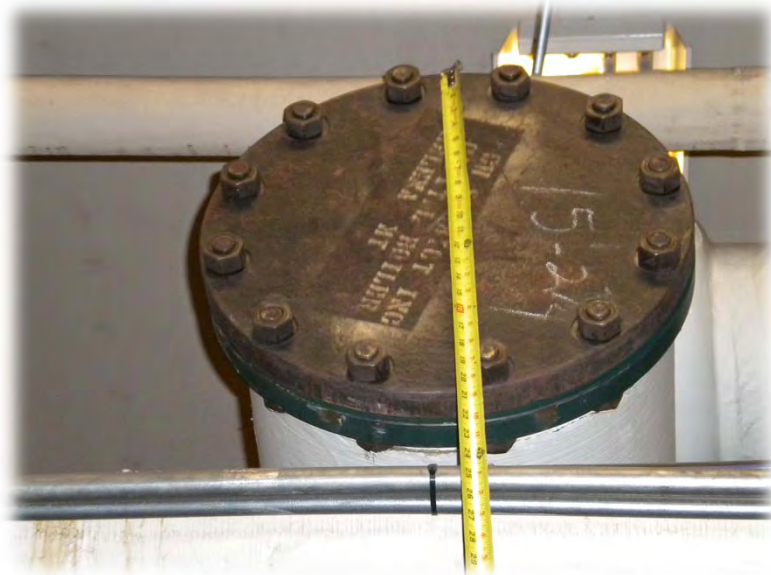
## Main Boiler Plant had the most items

- **400 items**
- **\$8,800/yr in energy savings**
- **\$35,000 to insulate**
- **4.0 yr payback**

# The State of Montana Case Study

## Main Boiler Plant

**Flanged Joint on 12" Steam Header  
= Potential Savings \$107/yr**



**Flanged End Cap on 12" NPS Steam Header  
= Potential Savings \$89/yr**

# The State of Montana Case Study

## Capitol Building



**HHW Circulation Pumps  
Savings \$137/yr**

## Main Boiler Plant and Tunnels



**2 LF of 2 1/2" NPS Line –  
Potential Savings = \$40 /yr**

# The State of Montana Case Study

## Original Governor's Mansion

**6" Valve Bonnet  
Potential Savings = \$51/yr**



**3, 1 1/2" Unions  
Potential Savings = \$17/yr**

# The State of Montana Case Study

## Montana Law Enforcement Academy

**4" Valve Bonnet  
Potential Savings = \$50/yr**



**4" Flanged Pair  
Potential savings = \$68/yr**

# The State of Montana Case Study

| 2                               | 7                             | 8                      | 11              | 13                 | 14                   | 15                   |
|---------------------------------|-------------------------------|------------------------|-----------------|--------------------|----------------------|----------------------|
| Name                            | Avg Natural Gas Usage, DKT/yr | Energy Savings, DKT/yr | Savings, \$/yr  | Estimated Cost, \$ | Payback, yrs         | Rate of Return, %    |
| Museum                          | 6,440                         | 644                    | \$5,773         | \$10,600           | 1.8                  | 54%                  |
| Corrections                     | 1,377                         | 301                    | \$2,768         | \$5,900            | 2.1                  | 47%                  |
| Old Board of Health             | 995                           | 63                     | \$612           | \$1,400            | 2.3                  | 44%                  |
| Original Governors Mansion      | 605                           | 158                    | \$1,486         | \$3,600            | 2.4                  | 41%                  |
| Capital Building                | 10,122                        | 869                    | \$7,799         | \$29,000           | 3.7                  | 27%                  |
| Law Enforcement Academy Complex | 12,222                        | 739                    | \$7,434         | \$27,800           | 3.7                  | 26%                  |
| Metcalf Bldg                    | 1,387                         | 245                    | \$2,198         | \$8,300            | 3.8                  | 26%                  |
| Boiler Plant and Tunnels        | NA                            | 977                    | \$8,768         | \$35,000           | 4.0                  | 25%                  |
| Subtotals →                     |                               | 3996                   | \$36,838        | \$121,600          | 3.3                  | 30%                  |
| Walt Sullivan Bldg              | 3,479                         | 15                     | \$138           | \$600              | 4.3                  | 23%                  |
| Helena OMS                      | 1,361                         | 100                    | \$902           | \$4,000            | 4.4                  | 22%                  |
| Justice Building                | 2,672                         | 41                     | \$475           | \$2,200            | 4.6                  | 21%                  |
| Old Livestock Bldg              | 387                           | 130                    | \$1,265         | \$6,000            | 4.7                  | 21%                  |
| DPHHS                           | 3,066                         | 35                     | \$314           | \$1,500            | 4.8                  | 20%                  |
| Aviation Support Facility       | 4,152                         | 588                    | \$5,237         | \$26,000           | 5.0                  | 20%                  |
| HQ Building                     | 8,440                         | 223                    | \$2,634         | \$13,400           | 5.1                  | 19%                  |
| Scott Hart                      | 4,035                         | 175                    | \$1,567         | \$8,600            | 5.5                  | 17%                  |
| Mitchell Bldg                   | 6,304                         | 116                    | \$1,037         | \$6,000            | 5.8                  | 16%                  |
| Subtotals →                     |                               | 1423                   | \$13,569        | \$68,300           | 5.0                  | 19%                  |
| Fish, Wildlife & Parks HQ       | 1,037                         | 147                    | \$1,318         | \$8,000            | 6.1                  | 16%                  |
| Executive Residence             | 536                           | 88                     | \$780           | \$5,200            | 6.7                  | 14%                  |
| 5 Last Chance Gulch             | 1,387                         | 75                     | \$689           | \$4,600            | 6.7                  | 14%                  |
| Historical Preservation         | 295                           | 60                     | \$642           | \$4,500            | 7.0                  | 13%                  |
| FWP Parks                       | 116                           | 21                     | \$222           | \$1,700            | 7.7                  | 12%                  |
| Subtotals →                     |                               | 391                    | \$3,651         | \$24,000           | 6.6                  | 14%                  |
| Dept of Natural Resources       | 843                           | 95                     | \$932           | \$7,600            | 8.2                  | 11%                  |
| Helena Job Service              | 1,423                         | 55                     | \$488           | \$4,600            | 9.4                  | 9%                   |
| Diane Bldg                      | 128                           | 32                     | \$459           | \$4,900            | 10.7                 | 7%                   |
| Subtotals →                     |                               | 182                    | \$1,879         | \$17,100           | 9.1                  | 9%                   |
| <b>Total</b>                    | <b>72,809</b>                 | <b>5,992</b>           | <b>\$55,937</b> | <b>\$231,000</b>   | <b>Wghtd Avg 4.1</b> | <b>Wghtd Avg 24%</b> |

# The State of Montana Case Study

## Why is insulation missing or damaged?

- **Damaged or removed during maintenance and not replaced**
- **Sustained physical or mechanical abuse**
- **Maintenance is not a priority – insulation taken for granted**
- **Never insulated (“old school thinking”)**

## Lessons Learned

- **Little Things are Important (3,500 items add up!)**
- **Distribution Losses are Important!**  
(especially for district energy systems)

# State Mechanical Insulation Assessment Program

## Simple Calculators

### Mechanical Insulation Resources

Example  
Simple Calculators  
Websites Located at :

- DOE's Industrial Technologies Program Software Tool's  
or
- National Institute of Building Sciences – Mechanical Insulation Design Guide

| Input Information                                 |                           |
|---|---------------------------|
| 1. Length of Piping Run, ft.                      | 1                         |
| 2. Select Pipe Size, NPS                          | 4                         |
| 3. Operating Temperature, °F                      | 200                       |
| 4. Ambient Temperature, °F                        | 75                        |
| 5. Wind Speed, mph                                | 2                         |
| 6. Select Insulation                              | Fiberglass (0°F to 450°F) |
| 7. Installed Cost Multiplier                      | 1.00                      |
| 8. Emittance of Surface                           | 0.90 - All Service Jacket |
| 9. Expected Useful Life of Insulation System, yrs | 20.0                      |
| 10. Operating Hours per Year                      | 8320                      |
| 11. Efficiency of Fuel Conversion, %              | 80                        |
| 12. Select Fuel                                   | Natural Gas               |
| 13. Cost of Fuel, \$/Mcf                          | 8.00                      |

| Results            |                   |                   |                      |                     |                  |               |                                   |
|--------------------|-------------------|-------------------|----------------------|---------------------|------------------|---------------|-----------------------------------|
| Thickness (inches) | Surface Temp (°F) | Heat Loss (Btu/h) | Cost of Fuel (\$/yr) | Installed Cost (\$) | Payback (months) | Annual Return | CO <sub>2</sub> Emissions (MT/yr) |
| 0                  | 200               | 432               | \$35.02              | \$0.00              | NA               | NA            | 0.24                              |
| 0.5                | 93                | 69                | \$5.59               | \$18.83             | 8                | 156%          | 0.04                              |
| 0.75               | NA                | NA                | NA                   | NA                  | NA               | NA            | NA                                |
| 1                  | 85                | 43                | \$3.52               | \$21.32             | 8                | 148%          | 0.02                              |
| 1.5                | 82                | 32                | \$2.63               | \$23.78             | 9                | 136%          | 0.02                              |
| 2                  | 80                | 27                | \$2.16               | \$28.20             | 10               | 117%          | 0.01                              |
| 2.5                | 79                | 23                | \$1.86               | \$30.74             | 11               | 108%          | 0.01                              |
| 3                  | 78                | 20                | \$1.63               | \$33.46             | 12               | 100%          | 0.01                              |
| 3.5                | 78                | 18                | \$1.48               | \$38.68             | 14               | 87%           | 0.01                              |
| 4                  | 77                | 17                | \$1.37               | \$42.53             | 15               | 79%           | 0.01                              |

# The State of Montana Case Study

## Extrapolation to Other Montana Buildings:

### ■ Factors for Projections to Similar Facilities

- Energy Savings ~ 8% of Heating Fuel
- Energy Savings 4.6 kBtu/sf/yr
- \$ Savings \$0.043/sf/yr
- Payback 4.1 years
- Return 24 %

**We would expect similar conditions and installation costs, so extrapolation of annualized returns to other state facilities is a reasonable assumption**

# The State of Montana Case Study

## Montana's Interest in the State Mechanical Insulation Energy Assessment Program

- **Governor Schweitzer's focus on efficiency in government**
- **Emphasis on energy efficiency in state agencies**
- **Green Jobs/Energy Economy**
- **Public-Private Partnership**
- **Needed projects that could be completed quickly**
- **Large savings for small investment**

# The State of Montana Case Study

## Montana State Agency Involvement

- **Department of Administration: General Services Division, Architecture and Engineering Division**
- **Department of Environmental Quality--Montana State Energy Office**
- **Agencies that provided buildings**
  - **Department of Labor & Industry**
  - **Department of Military Affairs**
  - **Department of Justice and**
  - **Department of Transportation**



# The State of Montana Case Study

## Energy Assessment Requirements

- **Accurate cost data**
- **Accurate energy savings estimates**
- **Enough detail to be ready to design a project**
- **Process that was transferable—planned to expand after the pilot to other agencies**

# The State of Montana Case Study

## Results from the Energy Assessment

- **Excellent quality of the energy assessment**
- **Well documented projects on a building-by-building basis**
- **Good cost data and energy savings estimates**
- **Sufficient detail to move directly into design**
- **Process was replicable—already using on our university campuses**

# The State of Montana Case Study

## Changing Results from the Original Energy Assessment

- **Natural Gas Contract Re-Bid for 2011**
  - **Costs decreased for 2011-2012**
- **Payback lengthened to 6.5 years**
  - **Savings reduced to \$34,933 per year**

**\*Still one of the most cost effective projects for the State Buildings Energy Conservation Program\***

# The State of Montana Case Study

## Financing the Project

- **State Buildings Energy Conservation Program – Self-financed revolving program using ARRA funds**
- **Cost estimate of \$160,000**
- **4-year agreement with DOA at 3% interest**
- **Some agencies will use their own money**



# The State of Montana Case Study

## Status of the Project

- **Contract completed with an engineering firm to prepare the project for bid using the energy appraisal**
- **Open competitive solicitation this Summer**
- **Expect bids in July**
- **Work to be completed over the summer – early fall**



# The State of Montana Case Study

## Expanding the Pilot

- **Contracted with an engineering firm to conduct analyses on a university campus using NIA mechanical insulation calculators.**
- **Using pre-approved engineers from states list of design consultants**
- **Focusing on steam insulation from boilers because of the high energy savings potential**
- **First campus took about 6-8 weeks for the engineering analysis. Will have the project out to bid this summer and expect completion time to be just a few months.**

# The State of Montana Case Study

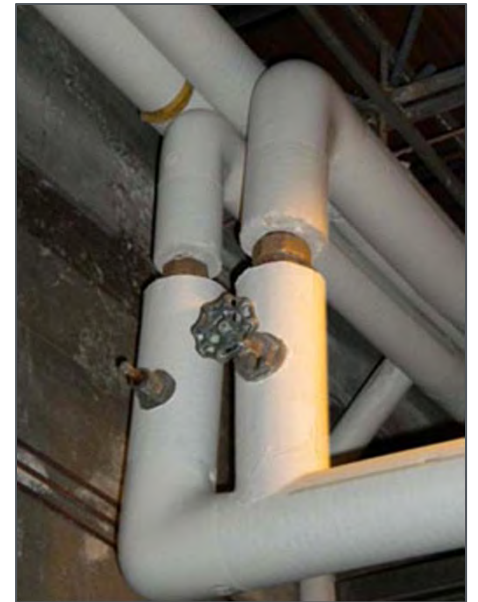
## Tips to Move Quickly

- **Utilize the NIA Mechanical Insulation Pilot to show actual savings in your state**
- **Partner with the state's Architecture and Engineering Group and utilize their list of approved design engineers**
- **Look to engineering contract specifications for procuring services and if possible have someone selected to do the bid documents while the pilot project is going on.**
- **Have A&E group bid the project using their established processes.**

# The State of Montana Case Study

## Lessons Learned

- **Mechanical insulation provides opportunities for quick projects with good energy savings**
- **Pilot is easily transferrable to other buildings**
- **Look for opportunities on all building projects**
- **Small items add up to large savings**



# The State of Montana Case Study

## Conclusion

- **Montana had an excellent experience with the Mechanical Insulation Appraisal**
- **Committed to insulating 25 buildings in summer of 2011**
- **Expect to invest \$160,000 and recover that investment in 6 years**
- **Will continue to assess savings opportunities and insulate more buildings in the future because of the pilot**
- **One additional campus project is already underway**

# **State Mechanical Insulation Assessment Program**

## **Summary – How it Works**

- 1. State representatives develop a facility priority listing that have the greatest potential of energy efficiency with mechanical insulation repair, replacement or even upgrading.**
- 2. An assessment schedule is established and a joint State and insulation assessment team inspects mechanical insulation systems for missing or damaged areas and determines scope of assessment**
- 3. Energy assessment information is provided by the State**
  - Type of service, operating parameters and similar topics**
  - Source/type of energy and total energy cost for the respective facility**

# **State Mechanical Insulation Assessment Program**

## **Summary – How it Works**

- 4. Insulation assessment team conducts the analysis off site and provides State a detailed report of the findings**
  - Estimated energy savings**
  - Estimated emission reduction**
  - Return on investment (ROI), which includes estimated cost**
  
- 5. State determines course of action**
  
- 6. State develops and implements a work plan and executes the work**

# State Mechanical Insulation Assessment Program

## Summary – How it Works

### Administrative Topics:

- **Permission is requested to publish photographs and the results of the program, individually or in conjunction with similar assessments, in articles, case studies, and similar publications. This information will be first submitted to the State's designee for review and written approval prior to submission for publication.**
- **Other administrative requirements will need to be addressed on a State by State basis.**

# **State Mechanical Insulation Assessment Program**

## **Summary – How it Works**

**Estimated cost for this Mechanical Insulation Energy Assessment Program is \$12,500**

**The mechanical insulation industry has committed to contribute 20% of that estimate**  
**A Public – Private Partnership**

**More extensive assessment programs can be explored on request.**

# State Mechanical Insulation Assessment Program

# Questions



# State Mechanical Insulation Assessment Program

## Getting Started & Contact Information:

NIA was the lead coordinator of the Montana Mechanical Insulation Energy Appraisal Program and will continue that role. Working with its alliance partners, NIA welcomes the opportunity to explore working with other states on a similar program.

**Contact NIA**

**703-464-6422**

**[Assessments@insulation.org](mailto:Assessments@insulation.org)**

**National Insulation Association**

**12100 Sunset Hills Road, Reston, VA 20190**

**[www.insulation.org](http://www.insulation.org)**

# State Mechanical Insulation Assessment Program

## Mechanical Insulation Resources:

- Simple Energy Calculators can be found at the Department of Energy's Industrial Technologies Program's Software Tools website at <http://www1.eere.energy.gov/industry/bestpractices/software.html>
- *DOE Save Energy Now*  
<http://www1.eere.energy.gov/industry/saveenergynow/assessments.html>
- National Insulation Association  
[www.insulation.org](http://www.insulation.org)
- International Association of Heat and Frost Insulators & Allied Workers  
[www.insulationleaders.com](http://www.insulationleaders.com)
- National Association of State Energy Officials  
[www.naseo.org](http://www.naseo.org)
- National Institute of Building Sciences, Mechanical Insulation Design Guide  
[www.wbdg.org/midg](http://www.wbdg.org/midg)

# State Mechanical Insulation Assessment Program

## Thank you!

### Mechanical Insulation Energy Assessment Program Webinar



Kate Marks - Managing Director  
National Association State Energy Officials  
Alexandria, VA