DE-FOA-0002687: Request for Information on Industrial Decarbonization Priorities

Submitted by:

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The National Insulation Association® (NIA) is a not-for-profit educational trade association representing merit and union contractors, distributors, laminators, fabricators, and manufacturers that provide thermal insulation, insulation accessories, and components to the commercial, mechanical, and industrial markets throughout the nation. Since 1953, the northern Virginia–based association has been the voice of the mechanical insulation industry and is dedicated to keeping the commercial and industrial sectors up-to-date on the latest industry trends and technologies.

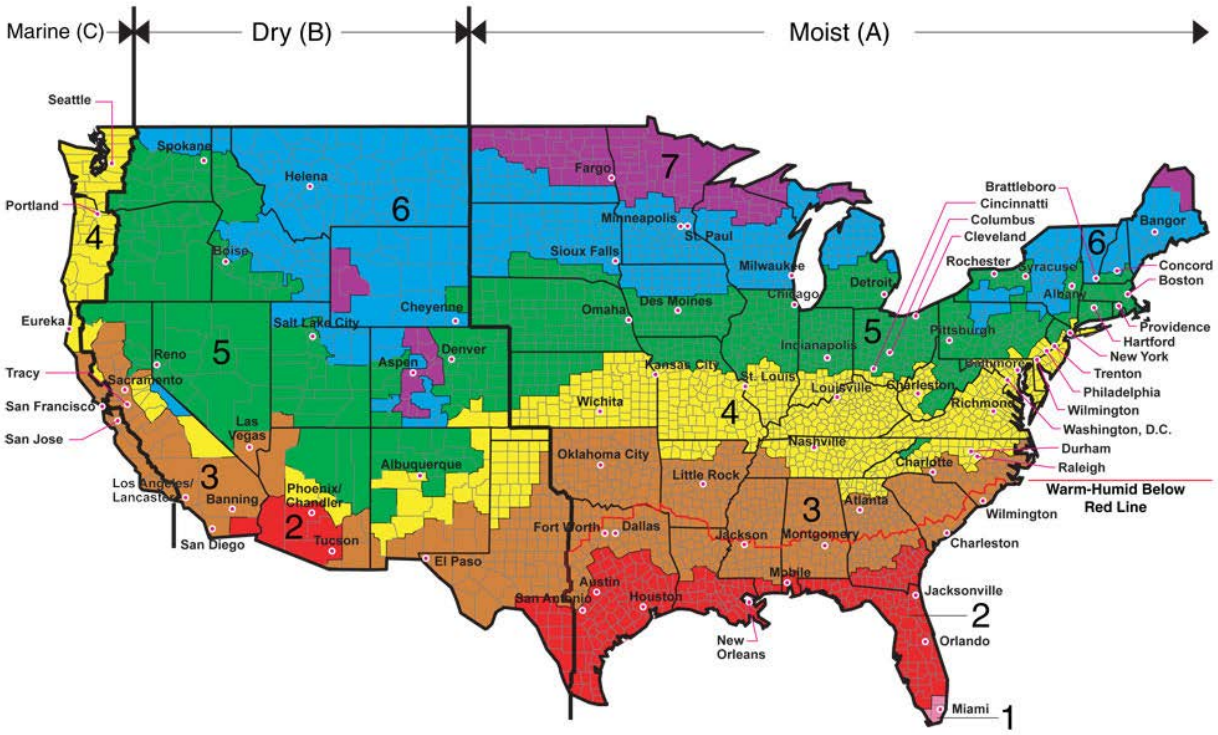
Categories 1–6, 8, and 9. See responses below in our Category 7 response.

C7.1 See C7.5: The challenges outlined in C7.5 are more pronounced in small- to medium-sized facilities and manufacturers with even fewer resources/dedicated personnel/training available.

Many industrial processes emit gaseous carbon as a by-product of the process. Reducing the release of carbon from the process or implementing carbon-capture technology requires significant development work, capital asset modification, and assured market channels for the recovered and contained carbon. These considerations require significant investment resources that are not typically available to the small-to-medium manufacturer. Insulation is a known energy and carbon saver for small- to medium-sized plants and resulted in 5–6% overall reduction in CO_2 emission in one Georgia Pacific pulp and paper plant.[1]

NIA would welcome the opportunity to work with DOE and help train and educate personnel in these small- to medium-sized manufacturers.

C7.2 A mechanical insulation (MI) system is uniquely designed to address a specific facility's needs and challenges using a variety of MI technologies. Each MI system is designed to operate under a given set of operating and environmental conditions, which vary by geographic regions, including humidity and temperature ranges, especially as they relate to process temperatures and indoor/outdoor facilities/spaces. See Climate Zone Map.[2]



All of Alaska in Zone 7 except for the following Boroughs in Zone 8: Bethel, Dellingham, Fairbanks, N. Star, Nome North Slope, Northwest Arctic, Southeast Fairbanks, Wade Hampton, and Yukon-Koyukuk

Zone 1 includes: Hawaii, Guam, Puerto Rico, and the Virgin Islands

Proper evaluation of the prospective benefit of enhanced insulation to a given facility is a hurdle, long experienced by geographically remote and small- to medium-sized manufacturing businesses. Many times, owners and managers are not aware of how to access appropriate resources. Service providers with the capability to quantify the benefit of additional insulation need to experience sufficient financial return for the resources expended, which traditionally has not been attainable. The more remote geographies in which many facilities are located may inhibit effective collection and transport efforts, to more suitable locations that can prepare the recovered carbon, in a manner that is feasible for market dynamics.

Portable training courses on how to quantify carbon reduction are needed to reach all locations. NIA can work with the DOE on providing adequate remote training to allow these locations to benefit.

C7.5 One critical challenge related to decarbonization: While MI is an existing component in industrial facilities, these facilities frequently are under-insulated or insulated to outdated code minimums, instead of current or maximum efficiencies and carbon reduction levels. As established in NIA's previous partnership with the DOE, the research found that 10–30% of insulation is missing after 1–3 years from installation and that the insulation is rarely replaced once it is taken off or damaged.[3] To take full advantage of this proven and readily available technology for all the industrial categories covered by this RFI, it is essential to begin thinking differently about mechanical insulation and for those facilities to adopt the mindset that insulating mechanical systems is necessary, not an option.

What are the barriers for industrial and process facilities to implement an aggressive and continuous MI system maintenance process that would increase energy savings and reduce carbon emissions every year for the life of the facility?

- Many decision makers lack detailed knowledge about MI systems, their benefits, and the risk of not maintaining them in an effective and timely manner as they work silently in the background.
- Every plant, facility, or company needs a MI "champion"—trained personnel in inspection and assessing insulation system technology.
- Good or best practices in one unit/plant need to be widely dispersed within and between organizations.
- Decision makers need motivation to allocate attention and resources. Financial modeling prescriptive to mechanical insulation should be considered as part of the decision process.
- Timely and effective insulation maintenance is an investment, not an expense, especially since the return on investment (ROI) is so quick and can help fund additional improvements. The real expense is the energy waste and the extra GHG and carbon emissions released due to neglected systems. The damage or cost caused by reduced focus on MI is often not identified in technical and/or financial terms until it is too late.
- There is usually pressure from competing and often more "glamorous" or widely accepted carbon-reducing initiatives. NIA proved that "Insulation Is Greener Than Trees" more than a decade ago in Christopher P. Crall's January 2009[4] article and the September/October 2021 updated version[5] published in *Insulation Outlook* magazine at *www. insulation.org/io/archives*). See Comparison of Insulation and Trees in Reducing Carbon.

There are several challenges faced and MI systems positively impact and reduce carbon emissions for key unit operations equipment in industrial/commercial facilities and are essential to controlling process temperatures (-450–1,800°F). MI is a clean, proven, and green technology that can be used across multiple subsectors (including the critical sectors referenced in the other categories in this RFI) to reduce GHG emissions and save energy, thereby contributing to the decarbonization of the industrial sector. In addition to reducing energy consumption and GHGs, MI systems are an important part of sustainable design initiatives, personnel protection safety programs, and manufacturing/facility productivity. If MI systems are designed, installed, and properly maintained, they also reduce corrosion under insulation (CUI) and control condensation and mold growth. A properly specified and installed MI system on bare process lines and equipment can increase the efficiency of a process system by as much as 95% or more. Insulation is used to maintain process temperatures, improve product quality control, and improve operating safety.[6]

Resources in these plants and facilities is another challenge. There are little-to-no job functions within industrial facilities that are exclusively dedicated to the MI systems, their function, and their maintenance. If there is anyone identified and responsible for this area, they have no formal education or training on thermal insulation. Unfortunately, insulation systems are not seen as a high priority or a technology that requires expertise.

How could these barriers be overcome? NIA suggests establishing a national education/training program and developing a job program to train new or existing personnel in understanding the inspection and assessment of MI systems. NIA has existing training programs that could readily be scaled up and is ready to work with DOE to deploy this training.

In addition, to further build upon the data point from previous research that 10–30% of insulation is missing or damaged after 1–3 years after installation, a system-wide insulation inspection and energy appraisal should be performed, at minimum, annually at each facility to determine the true energy reduction, environmental savings, and cost-benefit to the individual location. One potential solution would be to develop a hybrid certification based on two existing NIA certification programs, which now focus on (1) inspection of new and existing facilities and (2) insulation energy appraisals.

C7.6 In addition to being a proven technology with decades of supporting data, MI products and systems are an ever-emerging technology—not only because it is underutilized but also because manufacturers' products are continuously evolving and improving, e.g., smart jackets, anti-corrosion coatings, nanotechnology, higher efficiency, thin insulations, and easier-application solutions. There are new products developing due to new technologies and the need for insulation systems at extreme temperature range, especially LNG and hot petro- chem processing.

Regarding transparent data, MI manufacturers share data such as an Environmental Product Declaration (EPD) and Life Cycle Analysis/Assessment (LCA) that can help one identify products that have been vetted for environmental impacts using standardized methods. For example, one manufacturer alone repurposes 10 rail cars of recycled glass each day.[7] One recycled glass bottle can make 3,500 miles of fiber for fiber glass insulation.[8]

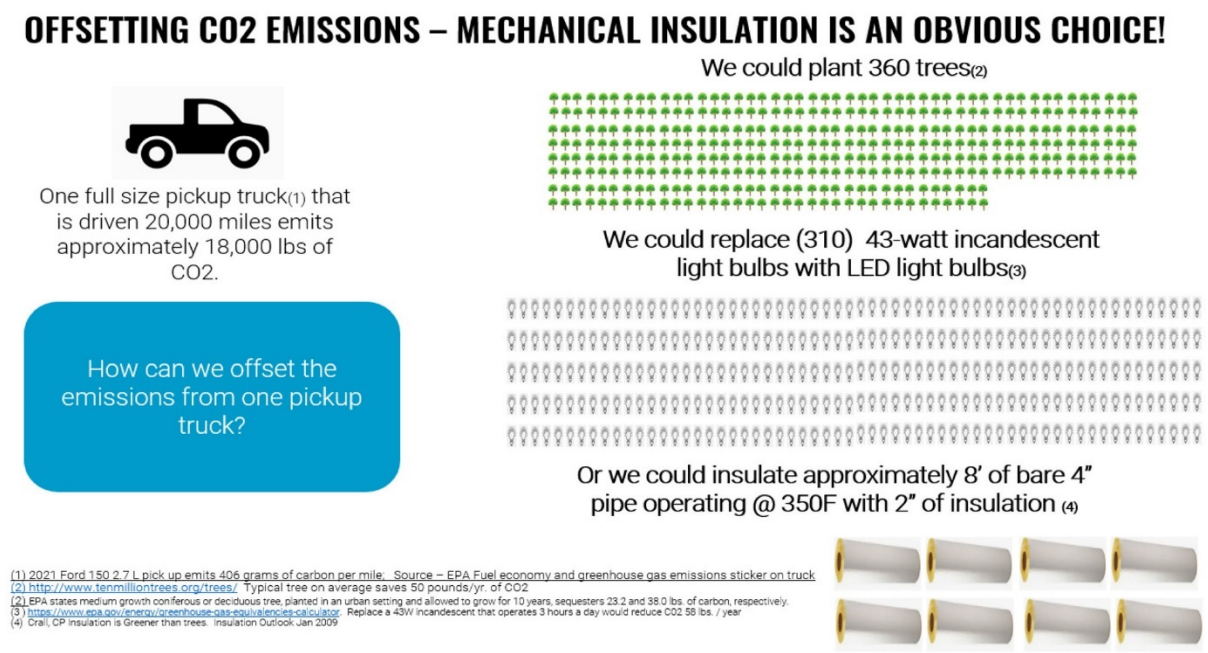
Another benefit of these products is that they are applied by people, and increasing their use also increases jobs. NIA estimated this maintenance work would create more than 27,000 jobs per year for insulation contractors, of which 90–95% are small businesses, in all 50 states. Those 27,000 jobs support other industry channels with job opportunities of more than 13,000, bringing the total job creation opportunity to 40,000. NIA also noted that 95% of materials required for these opportunities are made in the United States, with most of the balance made in Canada.[9]

The data on the opportunity needs to be updated, expanded, and combined with a national educational program. NIA is ready to work with the DOE to develop educational programs and manage data collection.

C7.7 Through DOE development of MI data and marketing/awareness campaigns proving decarbonization, the industrial industry could be convinced to prioritize and incentivize decarbonization and energy efficiency initiatives. This may take mandates to meet current codes, develop codes, or update existing codes.

This is where MI system technologies can help. NIA has found that using examples that are easily understood and readily comprehended to be highly effective. There needs to be an awareness campaign to reach the industrial sector decision makers, stakeholders, and influencers at each facility to understand the importance and value of MI's role in decarbonization and energy efficiency, thereby adopting this essential carbon-reducing and energy-saving technology. A recent article in *Insulation Outlook* magazine, "A Carbon Message Everyone Should Copy" [10]provides two highly relevant examples.

First, the article outlines how the EPA sticker on a new truck showed that the truck emits 406 grams of carbon per mile. By calculating what the truck emits in a year (using 20,000 miles/year as a baseline), and then using the EPA's Greenhouse Gas Equivalencies Calculator[11] to get comparative values for other strategies for offsetting emissions. Against these figures, an estimate of the length of pipe that needed to be insulated to offset these emissions was created. Offsetting CO_2 Emissions summarizes the shocking results.



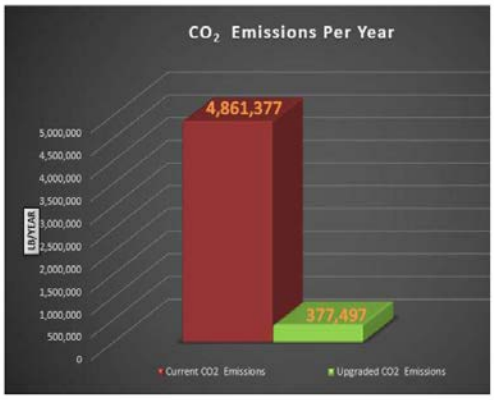
Secondly, here is a case study of how one facility was convinced to install insulation upgrades. The company has an aging facility with complex piping systems supporting hot processes.

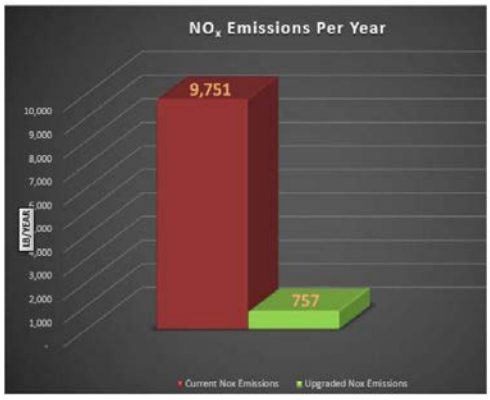
The appraisal team identified 2,300 locations of missing and damaged insulation, all of which they cataloged in NAIMA's 3E Plus® software. The customer wanted to insulate pretzel process lines, heat lines running continuously at 125°F to 140°F, and a steam station. (See Insulation Energy Appraisal Results and Reduced GHG Emissions.)

Insulation Energy Appraisal Results

Parameter Measured	Result
Estimated Savings from Upgrading Insulation on Identified Items	$93,761 per year
Cost to Operate the Identified Items as Currently Insulated	$101,651 per year
Cost to Operate the Identified Items if Upgraded	$7,890 per year
Reduction in Heat Flow	28,060,191 kBTU per year
Reduction in CO_2 Emissions	4,492,880 pounds per year
Reduction in NO_x Emissions	8,994 pounds per year

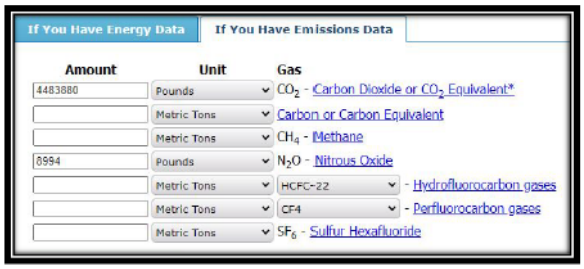
REDUCED GHG EMISSIONS





Use of the EPA's GHG Equivalencies Calculator (see below) helped to demonstrate the value of the insulation upgrades. This is another example of the value of a marketing and awareness campaign.

GHG EQUIVALENCIES CALCULATOR



One of the key comparisons is how the proposed insulation project was equivalent to the carbon sequestered by ***4,000 acres of forest***.

Looking at the existing DOE Industrial Assessment Centers (IACs), we suggest making the program even more robust with specific attention to MI training. A hybrid course for inspection and appraisal of MI systems would benefit the facility and support the creation of a dedicated new "green" management role for personnel specific to decarbonization through MI systems and technologies. In addition, expand the IAC's mission to include larger facilities and expand

the IAC program to identify not only the savings in energy and emissions but also to identify the specific needs in personnel training and partner with industry to assist in conducting this training. In exchange for receiving the training, the facility would need to commit to performing the recommendations within 24 months and all data would need to be captured and reported.

NIA is ready to work alongside the DOE in working with the IACs to expand their scope and ensure that the reporting is acted upon.

C7.8 Industry Data: The MI industry is established, reliable, and ready to contribute to the deep decarbonization of the industrial sector. Every two years, NIA's Foundation commissions a survey to gauge the size of the MI industry, which provides valuable data regarding market size and growth rates for the U.S. commercial and industrial mechanical and laminated metal building insulation markets. The most recent survey, published in 2021 indicated growth in 2021 and 2022 is forecast at 4.0% and 6.4%, respectively. The 2022 U.S. mechanical insulation industry is forecast to return to a $10+/- billion level in 2022.[12]

Green Jobs: Insulation installers/contractors do not need a college degree, are taught on the job, and frequently are paid more starting out than other trades. According to the BLS, the median annual wage for those with a bachelor's degree is $67,140. The annual wages for many construction trades are not far behind, and in many cases are even higher. MI workers, for example, have an average annual salary of $56,570, according to May 2014 data from the BLS.[13] NIA is made up of member companies across the nation who represent the insulation manufacturers, distributors, fabricators, and contractors and most have stayed in the industry for decades, not years.

Conclusion:
In conclusion, to take full advantage of this proven and readily available technology for all the industrial categories listed (chemical, iron and steel, food and beverage, and cement) in this RFI, it is essential to begin thinking differently about mechanical insulation. Many, if not all, of the responses provided in this category could be repeated to the specific industries listed.

Mechanical insulation—a crosscutting, proven technology made in America—is available in all 50 states and initiatives can be implemented immediately to help decarbonize the industrial sector. Mechanical insulation's potential to play a significant role as a tool to reduce energy intensity and decarbonize America's industrial sector is immense. However, the lack of sufficient and current data to support its potential, combined with a deficient understanding of what mechanical insulation systems are and how they could be used, along with the need for proper and regular maintenance and specifications, impedes decision makers in the industrial sector in making a supportable case for increased use and maintenance of mechanical insulation. NIA maintains and develops a wide range of resources for mechanical insulation end users (engineers/architects and facility owner/operators) such as the

Mechanical Insulation Design Guide (MIDG), technical charts and reference guides, literature, and case studies. We appreciate this opportunity to share information on mechanical insulation's ongoing role in the decarbonization of industrial facilities. NIA is poised and ready to continue our long-standing relationship with the U.S. DOE to focus and amplify these marketing and awareness efforts through education, research, and training.

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[1] *https://insulation.org/io/articles/georgia-pacific-reaps-benefits-by-insulating-its-steam-lines*. Accessed February 23, 2022.
[2] *http://www.iaqsource.com/article.php/ashrae-climate-zone-map/?id=194*. Accessed February 22, 2022.
[3] *https://insulation.org/io/articles/find-out-where-the-dollars-are-hiding-in-your-facility/*. Accessed February 16, 2022.
[4] *https://insulation.org/io/articles/insulation-greener-than-trees*. Accessed February 22, 2022.
[5] *https://insulation.org/io/articles/insulation-still-greener-than-trees*. Accessed February 22, 2022.
[6] *https://insulation.org/about-insulation/benefits-of-insulation*. Accessed February 22, 2022.
[7] *https://www.knaufnorthamerica.com/en-us/sustainability*. Accessed February 22, 2022.
[8] *https://www.knaufnorthamerica.com/en-us/blog/fiberglass-insulation-a-sustainable-insulation*. Accessed February 22, 2022.
[9] *https://insulation.org/wp-content/uploads/2016/10/About-Insulation-By-Numbers.pdf*. Accessed February 22, 2022.
[10] *https://insulation.org/io/wp-content/uploads/sites/3/2022/02/Carbon-Article.pdf*. Accessed February 23, 2022.
[11] *https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator*. Accessed February 23, 2022.
[12] *https://insulation.org/io/articles/nia-surveys-confirm-market-expectations-and-forecast-growth-in-2021-2022/*. Accessed February 22, 2022.
[13] *http://insulation.org/io/articles/limitless-potential*. Accessed February 15, 2022.