

CONDENSER

Leading the Way

HOW IIAR'S REGULATORY RELATIONSHIPS CREATE VALUE FOR THE INDUSTRY AND AGENCIES



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HOW IIAR'S REGULATORY RELATIONSHIPS CREATE
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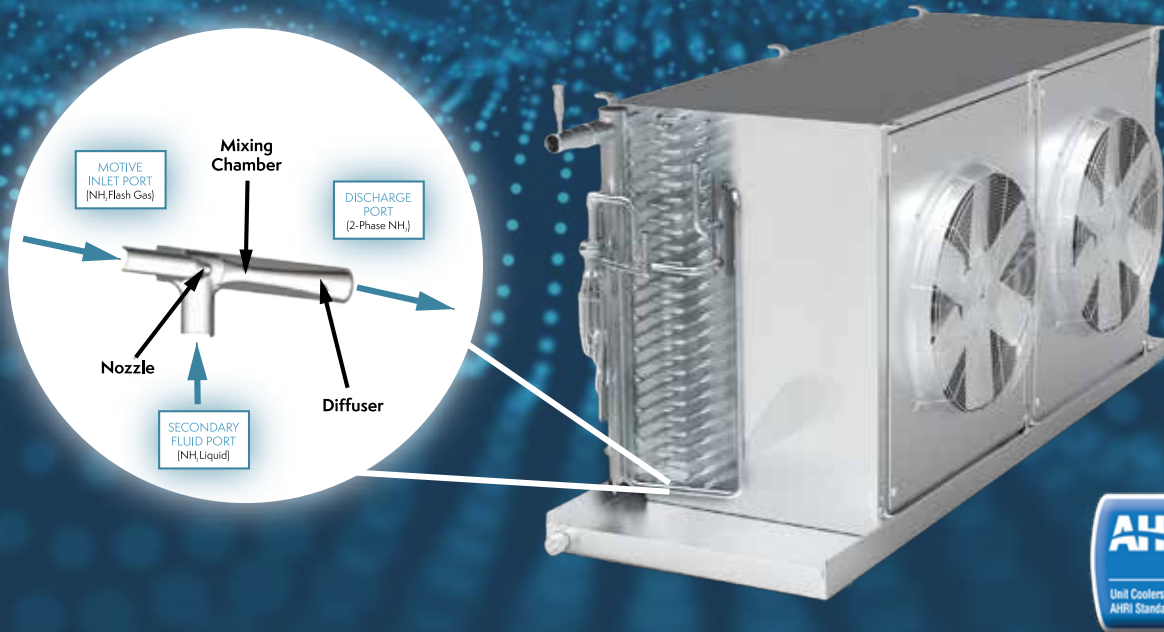


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Cybersecurity Remains a Critical Concern as System Connectivity Increases

Cybersecurity is taking on greater importance in the refrigeration industry due to the increasing integration of smart technologies and the growing threat of cyberattacks. Cyberattacks can lead to operational disruptions, safety hazards and financial losses.

“Industrial refrigeration systems are becoming more and more automated. The internet is touching almost every part of the business now,” said Lowell Randel, senior vice president of government and legal affairs at the Global Cold Chain Alliance. “As such, if that is compromised, it can influence your refrigeration systems, production, all of your data, and all of your financials, so having an eye toward cyber defense is something everybody needs to do.”

Randel said several companies within the cold chain have been hit with cyberattacks,

which disrupted operations. “The effects can be significant,” he said.

Any system that is tied into the internet is at risk, such as production systems, transportation management systems, warehouse management systems and industrial refrigeration system. Verizon’s latest Data Breach Investigations Report found that exploitation of vulnerabilities as an initial point of entry almost tripled from the previous year, accounting for 14% of all breaches.

The segments of the refrigeration industry most vulnerable to attack are any locations where employees aren’t being vigilant. “Most of the vulnerability lies in inadvertent human error and the sophistication of the hackers is getting more and more hard to discern a legitimate message from hacker, spam or phishing,” Randel said. Verizon reported that most breaches — 68% —

whether they include a third party or not, involve a non-malicious human element, which refers to a person making an error or falling prey to a social engineering attack.

“The persistence of the human element in breaches shows that there is still plenty of room for improvement with regard to cybersecurity training, but the increase in self-reporting indicates a culture change that destigmatizes human error and may serve to shine a light on the importance of cybersecurity awareness among the general workforce,” said Chris Novak, senior director of cybersecurity consulting for Verizon Business.

To help stay current on risks, the Department of Homeland Security’s Cybersecurity and Infrastructure Security Agency provides timely advisories, tips, and resources. They also have tools that can help identify system vulnerabilities.

ACCORDING TO CISA, BEST PRACTICES INCLUDE:

Implementing Strong Authentication Protocols: Multi-factor authentication, which requires users to provide two or more verification factors to gain access to an account or application, reduces the risk of unauthorized access, even if a password is compromised.

Regular Software Updates and Patch Management: Keeping software up to date is critical in defending against cyberattacks. Cybercriminals often exploit known vulnerabilities in outdated software. CISA advises organizations to establish a systematic patch management process to ensure that all software, including operating systems and applications, are regularly updated with the latest security patches.

Employee Training and Awareness Programs: Human error is a significant factor in cyber incidents. Comprehensive cybersecurity training and awareness programs can educate staff about common threats such as phishing and ransomware and provide guidelines on how to recognize and respond to potential cyber threats.

Network Segmentation and Access Control: Network segmentation involves dividing a network into smaller, isolated segments to limit the spread of cyberattacks. The agency advises implementing strict access controls to ensure that only authorized personnel can access sensitive information, which reduces the potential impact of a cyber breach by containing it within a limited segment of the network.

Regular Backups: Data backups are essential for recovery in the event of a cyberattack. CISA recommends regular backups of critical data and ensuring that these backups are stored securely and tested regularly.

Incident Response Planning: A well-defined incident response plan should outline the steps to take if a cyber incident occurs, including communication protocols, how to mitigate risk, and recovery procedures.

Engage in Threat Intelligence Sharing: Collaborating with other organizations and sharing threat intelligence can improve a company’s ability to defend against cyberattacks. The Department of Homeland Security encourages groups to participate in information sharing and analysis centers (ISACs) and other cybersecurity communities to stay informed about the latest threats and best practices.

Conduct Regular Security Assessments and Penetration Testing: Regular security assessments and penetration testing help identify vulnerabilities. CISA has a team of professionals across the country who can provide specific guidance to companies and help assess their weaknesses. CISA has ten regional offices based on states. They are listed at <https://www.cisa.gov/about/regions>.



Leading the Way

HOW IIAR'S REGULATORY RELATIONSHIPS CREATE VALUE FOR THE INDUSTRY AND AGENCIES

For regulators and their industry partners, developing relationships can benefit both groups as they work towards improving safety, ensuring compliance, and shaping future regulatory requirements. As an association, IIAR is focused on advocacy and ensuring the industry has a voice.

"If we don't use our voice, that voice isn't going to be heard," said Lowell Randel, senior vice president of government and legal affairs at the Global Cold Chain Alliance.

IIAR's most important regulatory relationships include those with the Occupational Safety and Health Administration, the Environmental Protection Agency, and Homeland Security. All three agencies have direct regulations that affect the use of ammonia and other refrigerants.

Regulators and those in the industry share the same goal of keeping workers and the environment safe. "We may have different ideas of how to get there, but we start with our shared goals and priorities," he said. "My philosophy is you really have

to realize these agencies are made up of people. You need to get to know them, build relationships, and build trust."

While regulatory agencies, regulators and industry representatives aren't always going to agree, coming together with mutual respect and build mutual relationships enable them to work through challenging situations.

"We have well-established lines of communication, so when we have an issue or when a member has an issue, we can go to these agencies, ask the right questions, and identify potential solutions," Randel said.

BENEFITS OF SUCCESSFUL RELATIONSHIPS

There are different categories of success that can result from strong relationships. "One is stopping bad things from happening," Randel said. "Those are ones that don't make the headlines, and you don't publicize them, but when you get wind of a potential change or issue, heading that off at the pass and stopping something

negative from gaining momentum is really valuable."

Another benefit is advancing regulations that benefit the natural refrigerant industry and working with regulatory agencies as they draft requirements. Randel said the AIM Act is a great example of this. "Getting a petition to EPA, getting it accepted by EPA, and having a seat at the table as the AIM Act regulations were being developed is one of those very identifiable accomplishments over the past several years where we've made significant strides," he said.

There are other more granular accomplishments associated with rule-making around the Risk Management Program. "We've been through several rulemakings in the past ten years and have actively participated in those rulemakings. We've submitted comments, worked with members, and worked with coalitions to magnify our position," Randel said. "While we didn't get everything we wanted, you can see some of the recognition of concerns we raised and policies that could have been worse."

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Additionally, Randel said the EPA was trying to identify the minimum safety attributes of existing facilities, which go along with IAR-9. “We were successful in working with and helping to ensure what EPA put forward was well informed from an industry perspective,” he said. “While we didn’t necessarily endorse the policy, we did feel like they listened and took our input and helped make for a better product.”

There have been times when IAR and other associations have seen indications or trends of how agencies were interpreting or enforcing particular regulations or standards that the industry felt was counter to the letter of the regulation.

“We were able to go to the agency and say, ‘Our members are experiencing this, and we’re not really sure that is the intention.’ We were able to work through those issues and get headquarters to communicate back to the field,” Randel said, adding that as a result, regulators in the field avoided misunderstandings on the policy and enforcement technique.

IAR has worked with the Global Cold Chain Alliance and the Ammonia Safety and Training Institute to address concerns that regulators were inspecting industrial refrigeration facilities more like they would a petroleum refinery and provide training.

“Over the years, I think we have very successfully gotten EPA and OSHA to acknowledge the importance of IAR standards, and they are training OSHA inspectors about our standards and the uniqueness of industrial refrigeration facilities,” Randel said.

There are times when industry feedback may not have been accepted by regulators, but the industry provided insights and information. “I think a good example there is the Risk Management Program rulemaking that began during the Obama administration,” Randel said. “We made a lot of comments into that process. They didn’t do many of those things we suggested, but we had a change in administration, and the Trump administration did a reconsideration rule.”

IAR once again submitted its comments. “Having that already being communicated on the record made that process even easier to say, ‘If this is going to be reconsidered, our position has been consistent, and we want to reiterate it,’” Randel said. “We’re not going to win them all, but you never know which piece of communication will have an impact. Even

if 90% of what we’ve asked for doesn’t happen, that 10% we made them think about and helped them have a better understanding of is worth it.”

GETTING INVOLVED

IAR’s members and those working within the refrigeration industry are critical, and it is important for them to share their firsthand experiences, submit comments, and provide position statements during the rulemaking process.

“If we’re not out there as an industry telling our story and what we believe the right policy should be, then the only voices and loudest voices are from non-industry representatives who don’t live and breathe industrial refrigeration on a regular basis,” Randel said.

When EPA or OSHA are going through a rulemaking process, the volume of input that they get from consumer groups, environmental groups or non-industry voices is significantly more than what they get from industry. “We have to make sure that as an industry that our voice is heard,” Randel said.

When stakeholders share their expertise, the policies themselves are better informed and industry has a chance to make positive changes to the policies.

“We’re able to impact how those policies are enforced on the ground,” Randel said.

Trust is an essential part of a successful relationship. Part of building trust is providing regulators with solid, reliable information, answering their questions, and being a resource for them when needed. “We want to be in a position where the agencies are going to come to us and see us as a trusted resource,” Randel said.

FUTURE INVOLVEMENT

In addition to past wins, there are also several regulatory issues that will need attention going forward, including the compliance preparation phase of changes to the Risk Management Program.

“Something that members need to have on their radar making sure they’re ready for May of 2027 when the major provisions within that rule are going to be due for compliance,” Randel said.

Another issue is the AIM Act, which is continuing to be implemented. “We want to stay engaged on that,” Randel said, adding that other possible issues include Process Safety Management regulations and the Chemical Facility Standards Authority Program.

BEST PRACTICES FOR FORMING POSITIVE AND COLLABORATIVE RELATIONSHIPS

Forming relationships with regulators or enforcement agencies may seem overwhelming at first, but there are several ways to establish and strengthen relationships.

Be Proactive: Reach out to introduce your company and its commitment to compliance and safety. Establish open lines of communication and regularly update regulators on your company’s activities, especially those related to safety, environmental protection, and regulatory compliance.

Invite Regulators to Your Facility: Invite regulators to tour your facility. Show them your operations, safety measures, and compliance protocols. You can also demonstrate new technologies or processes that improve safety, efficiency, or environmental impact. This helps build trust and allows regulators to see your commitment firsthand.

Attend Meetings and Workshops: Take advantage of meetings with regulatory bodies to discuss ongoing compliance, upcoming regulations, and industry trends. If possible, you can host workshops or training sessions with regulators to educate them about your operations and advancements.

Submit Comments: Participate in public comment periods for proposed regulations affecting the refrigeration industry. Provide constructive feedback based on your industry expertise. Use data and evidence to support your positions and suggestions. Demonstrate how proposed regulations may impact the industry and propose feasible alternatives.

Serve in an Advisor Roles: There may be opportunities to serve on advisory committees or working groups that contribute to policy development.

Participate in Industry Groups: Participate in industry associations and groups that work with regulators on your behalf. IAR is always working with regulators so those in the industry can spend their time focusing on their core business objectives.



Emergency Release Reporting Best Practices Ensure Compliance

There are multiple regulatory requirements surrounding the use of ammonia in industrial refrigeration applications, including emergency release reporting requirements. Under the requirements, accidental releases must be promptly reported and managed, but it is important for users to avoid both under and over reporting.

“According to EPA regulations, a facility must report any leak or leaks that exceed the chemical’s reportable quantity (RQ) — 100 pounds (within 24 hours) for anhydrous ammonia — immediately upon becoming aware of the leak,” said Bent Wiencke, principle at ChillOn LLC. “The EPA has established through precedent that ‘immediately’ means ‘within 15 minutes.’”

NAVIGATING A RELEASE

Many scenarios involving larger release amounts are often complex. Determining an accurate release amount requires extensive data gathering, an understanding of the release dynamics, such as if they were instantaneous, intermittent or continuous, and possibly a detailed investigation into the cause of the release.

“In some cases, it may not even be possible to approach the leak source to gather information about the type of leak and size of the leak opening and consequently to conduct an initial estimation of the leak quantity,” Wiencke said. “A 15-minute timeframe is not sufficient to fully understand the situation and provide an initial release amount.”

For example, a 110-pound release over 24 hours will likely have minimal or no off-site consequences, whereas a 10,000-pound instantaneous release is a completely different story. “Consequently, in the latter case, simply reporting that the release was likely over 100 pounds is not very useful for responders,” (but both require reporting nonetheless) Wiencke said.

The need for accuracy is relative to the total release amount. “For small release amounts, a difference of a few pounds can determine whether reporting is required. However, when dealing with large release amounts, such as over 10,000 pounds, a few pounds difference has no real bearing,” Wiencke said.

Mike Chapman, director of business operations for IIAR, said with a high-flow release device, meaning it is very easy to get to 100 pounds in a short period of time and a release likely means something is wrong. “If it is a pressure relief valve that releases, just call it in,” he said.

“You have to protect yourself from liability and enforcement and also the public pressures of bad press.”

If the EPA determines that a facility has not reported a leak above the reportable quantity within 15 minutes, the facility may be subject to significant fines, which are based on the size of the leak and the delay in reporting.

“There is a general concern that erring on the side of caution and reporting every leak, regardless of quantity, may attract the attention of regulators and trigger an audit. Essentially, the concern is that you may be punished for being a good neighbor trying to do the right thing,” Wiencke said.

As a result, some facilities may prefer not to report leaks hope to fly under the radar. However, Wiencke said this strategy can only go so far and may backfire when employees decide to call hotlines due to unsafe conditions.

Chapman said knowing when to report boils down to education. “If you understand the types of releases and how to calculate them, you can get a good representation of what a reportable release is and what is not,” he said.

MEASURING RELEASES

Wiencke has been in the refrigeration industry for more than 30 years and has seen first hand release estimating tools that use questionable calculation methods or unknown sources.

“Consequently, when tasked with performing release calculations, users employing their own unique tools often generate results that vary greatly from one another. This inconsistency has caught the attention of regulators, who have challenged the results accordingly,” he explained.

In response, the IIAR created an industry-specific tool, leading to the development of the Guideline for Estimating Accidental Refrigerant Releases. The guideline and its related software tools are a comprehensive resource for those in the industry. While it cannot cover every possible release scenario, it addresses the most common ones.

As a best practice, users should familiarize themselves with the tool before a leak occurs rather than waiting until an incident happens. Additionally, users should complete the provided training modules and tests to demonstrate proficiency in using the tool to estimate release amounts.

“When the guideline was created, significant attention was given to structuring it in a way that allows users to have an ‘easy’ and systematic start when applying the guideline and tool,” Wiencke explained.

For example, a section within the guideline provides an easy-to-use “quick screening method” to quickly determine if the leak is likely to be below or over 100 pounds within 24 hours. If the release is over 100 pounds, guidance is provided on the next steps to take. “Within the industry, there are different schools of thought, but I believe that the right approach is to ‘report when in doubt,’” Wiencke said.

In some facilities, associates may face a chain-of-command challenge. “It can be intimidating for a non-managerial associate to report a leak to authorities and regulators without first informing upper management,” Wiencke said. “There have been instances where a facility manager learns about a major incident in their own facility from the local news station, which is far from ideal.”

BEING PROACTIVE

In addition to learning how to use the Guideline for Estimating Accidental Refrigerant Releases, Chapman recommends that those in the refrigeration industry get to know their local regulators, first responders, and law enforcement.

“Developing a relationship with those individuals is critical. If there is an incident or someone makes a report, regulators are more likely to come to you with better situational awareness and an open mind,” Chapman said, adding that there is more time to educate emergency response and regulatory personnel before a suspected incident occurs.

“If you educate them, they’ll know there is a difference between a smell of ammonia and emergency,” Chapman said. “Share what you’re trying to do to prevent incidents. Those relationships are invaluable any time a facility has an anomaly.”

Relationships with local regulators and first responders go unnoticed far too often, but they are invaluable and shouldn’t be overlooked. “Education is the common denominator to make sure people understand what to do, how to approach something, how to perceive something with a tempered perspective and be able to look at it with an open mind and make the right judgment,” Wiencke said.

Work on the AIM Act Continues



The U.S. Environmental Protection Agency continues to move forward with regulations under the American Innovation and Manufacturing (AIM) Act, which will restrict the use of hydrofluorocarbons. The agency is currently working on Subsection (h), which focuses on managing hydrofluorocarbons (HFCs) and substitutes.

Tristram Coffin, co-founder of Effecterra and president of sustainability, policy, and technical services, said the EPA doesn't have a statutory date for finalizing the Subsection.

The AIM Act relies on the EPA's ability to interpret and apply the law in managing HFCs and other pollutants.

As part of Subsection (h), EPA will establish regulations to maximize the reclamation and minimize the release of HFCs and their substitutes from equipment. This includes implementing practices related to the servicing, repair, disposal, and installation of equipment.

Although the AIM Act was enacted in 2020, Coffin said there is still a general lack of awareness about many of the requirements. "There is a sophisticated group of people that exist in the commercial refrigeration space that have been held to certain rules—historically Section 608, but now with Subsection (h), it opens it to a much wider swath of industries that need to be considering this in their regulatory concerns," he said.

IIAR has information on the AIM Act phasedown and resources available at https://www.iiar.org/IIAR/IIAR/Government_and_Code/What_is_the_AIM_Act.aspx.

The AIM Act has focused on three areas: production and consumption, technology and transitions, and refrigeration management. Each use sector has different timelines and refrigerant global warming potential levels for reduction and phaseout. IIAR has information on the AIM Act phasedown and resources available at https://www.iiar.org/IIAR/IIAR/Government_and_Code/What_is_the_AIM_Act.aspx.

POTENTIAL CHALLENGES

Coffin said the recent Supreme Court ruling to overturn the Chevron doctrine could have significant impacts on federal regulatory efforts and implementation of the AIM Act.

The Chevron doctrine, established in 1984, required courts to defer to federal agencies' interpretations of ambiguous statutes. Now, federal courts have more authority to independently interpret laws without deferring to agency expertise. "It will be interesting to see if anyone tries to leverage that against the AIM Act," Coffin said.

Overturning the Chevron doctrine could mean that the EPA would face more legal challenges when implementing regulations. The AIM Act relies on the EPA's ability to interpret and apply the law in managing HFCs and other pollutants.

Without Chevron deference, the EPA's regulatory actions under the AIM Act could be more easily contested in court, potentially leading to a patchwork of rulings and increased uncertainty in regulatory enforcement.

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GOVERNMENT RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

OSHA PROPOSES EXPANSION to Emergency Response Requirements

In February 2024, the U.S. Occupational Safety and Health Administration (OSHA) proposed new rule that would expand the reach of its emergency response standard. OSHA stated it has undertaken the rulemaking because it believes current OSHA emergency response and preparedness standards are outdated and incomplete.

According to OSHA, current regulations do not address the full range of hazards facing emergency responders, lag behind changes in protective equipment performance and industry practices, conflict with industry consensus standards and are not aligned with many current emergency response guidelines provided by other U.S. federal agencies (e.g., Department of Homeland Security/Federal Emergency Management Agency).

The proposed rule seeks to ensure that workers involved in emergency response activities get appropriate protections from the hazards they are likely to encounter while on the job. The proposed rule would replace OSHA's existing Fire Brigades standard, 29 CFR 1910.156, which was originally promulgated in 1980 and covers only a subset of today's emergency responders – firefighters.

The focus of the proposed emergency response rule is to provide basic workplace protections for workers who respond to emergencies as part of their regularly assigned duties. The expansion of the rule could bring some IIAR member facilities under the regulation.

The updated standard proposes a category of employers called Workplace Emergency Response Employers (WERE) and a category of employees called Workplace Emergency Response Teams (WERT).

WORKPLACE EMERGENCY RESPONSE EMPLOYER

The proposed rule defines this term as an employer who has a workplace emergency response team; and whose employees on the team, as a collateral duty to their regular daily work assignments, respond to emergency incidents to provide service such as firefighting, emergency medical service or technical search and rescue.

WEREs are typically for-profit entities engaged in industries such as manufacturing, processing and warehousing. They have a workplace emergency response team to respond to emergency incidents at the facility.

Workplace Emergency Response Team (WERT). The proposed rule defines this term as a group of employees (known as team members) who, as a collateral duty, prepare for and respond to emergency incidents in the WERE's workplace. This term, and variations of it, are currently in use in multiple industries, with varying degrees of application.

OSHA is providing this proposed definition to clearly identify what it means by the term WERT. In the proposed rule, team members are workers who would typically be engaged in an activity related to the employer's primary business function and leave that position when alerted to an emergency requiring the worker's service as a WERT team member.

Under the proposed rule, WEREs would be subject to a list of requirements related to facility planning, maintenance of facilities and equipment and training. Some of the requirements are consistent with practices already in place to meet other existing OSHA standards or national consensus standards. Others introduce new requirements specific to the proposed rule.

The proposed rule seeks to ensure that workers involved in emergency response activities get appropriate protections from the hazards they are likely to encounter while on the job.



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Below is a summary of key areas of requirements being proposed:

- Develop and implement a written Emergency Response Plan (ERP) that provides protection for each of its employees designated to operate at an emergency incident.
- Conduct a vulnerability assessment of their facility for the purpose of establishing its emergency response capabilities and determining its ability to match the facility's vulnerabilities with available resources.
- Specify the resources needed, including personnel and equipment, for mitigation of emergency incidents identified in the facility vulnerability assessment.
- Establish and implement a process to involve team members and responders in developing and updating the ERP, in implementing and evaluating the ERP and in the review and change process.
- Develop and implement a written comprehensive risk management plan based on the type and level of service(s) that would be established to ensure that risks to the team members' and responders' health and safety have been identified and evaluated.
- Implement medical and physical requirements to ensure that responders are physically and mentally capable of performing their duties without injury to themselves or their fellow responders and identify and address physical and mental health effects resulting from emergency response activities.
- Require initial and follow-up training for responders and team members, as well as requirements for maintaining proficiency in the necessary skills and knowledge through regular – at least annual – skills checks.
- Ensure that WERE facilities are safe for team members by addressing

issues including: egress, emergency lightning, exit marking; decontamination, disinfection, cleaning, and storage of PPE and other equipment; and fire detection, suppression and alarm systems.

- Conduct a PPE hazard assessment and ensure the proper provision, maintenance and use of equipment and PPE.
- Ensure vehicle safety, both in preparation and operation, in both emergency and nonemergency incidents.
- Develop Pre-Incident Plans (PIPs) for locations within the facility where team members may be called to provide service. The PIPs are based on the facility vulnerability assessment and the type(s) and level(s) of service(s).
- Develop an incident Management System (IMS) for managing and directing incident scene operations and activities. IMS should establish functions for managing incidents, describe the roles and responsibilities to be assumed by team members and responders, and standard operating procedures to be utilized.
- Establish requirements for incident command and management based on current industry practices, as reflected by NFPA consensus standards and FEMA's "National Incident Management System."
- Develop and implement SOPs for emergency events likely to be encountered, based on the type and level of service.
- Conduct a Post-Incident Analysis (PIA) to determine the effectiveness of the WERT's response after a significant event such as a large-scale incident involving multiple WERTs; a significant near-miss incident; a team member, responder injury or illness requiring off-scene treatment; or a team member or responder fatality.
- Evaluate the adequacy and effectiveness of the ERP at least annually. Identify and implement recommended changes to the

ERP and provide a written timeline for correcting identified deficiencies.

OSHA recognizes in the proposed rule that there are multiple other OSHA standards that address aspects of emergency response, including Process Safety Management (PSM). The proposed rule states that it is OSHA's intention that the protections of those standards apply instead of the protections of the proposed rule. So, if an emergency response employer limits its activities exclusively to activities covered by those other standards (such as PSM), it may not be subject to any provisions of this proposed rule. It is also important to note that the proposed rule specifically would not apply to Hazardous Waste Operations and Emergency Response (HAZWOPER). OSHA notes, however, that most employers engaged in activities covered by those other standards are likely to also engage in other emergency response activities and would therefore need to comply with the proposed standard in order to prepare for and respond to covered emergency incidents. As a result, the proposed rule could apply to IIAR members who have employees that perform emergency response functions as part of their duties.

The proposed rule has raised numerous questions and concerns from both industry and first responder organizations. As a result, the rulemaking process has slowed down and the comment period was extended from the original deadline of May 6, 2024 to July 22, 2024. In addition, OSHA has announced that it will hold an informal public hearing on the proposed rule on November 12, 2024. More information on the rulemaking and public hearing can be found on the OSHA website at: <https://www.osha.gov/emergency-response/rulemaking>. IIAR members are encouraged to review the proposed rule and their current emergency response activities to determine potential application of the new standard should it be finalized.



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Guess Who's Coming to Visit?

BY KEM RUSSELL

In the industrial ammonia refrigeration industry, we make a considerable effort to stay informed and up to date on programs that should be followed. The effort put into these programs varies depending on factors such as the specific system design and operation; the resources (people) available; the effort that can be done on programs due to other commitments; or if no one has a really good understanding of requirements. Whatever the situation, there likely will come a time of reckoning when some outside agency wants to review what is in place.

Recently I received a call from a company I was helping to develop and maintain their OSHA Process Safety Management (PSM) and EPA Risk Management Plan (RMP).

The conversation went something like this:

"I just got a letter that EPA is coming to visit in 10 days!"

"What's the date they are coming," I asked.

"August 15th, and I'm out of town on vacation that whole week," he replied.

Couple of learning points here:

- 1) EPA typically gives a two-week notice, but it sometimes may seem shorter as it did in this case. Part of the challenge is who does the notice go to? I have seen some notices ending up taking several days before they actually got to a person who understood what it meant.
- 2) It doesn't matter if you are on vacation or attending an important event somewhere. Someone must be on site to properly represent your program to the EPA. It is important that more than just person at your business has a good grasp of the entire program.

Our conversation continued with my reply, *"When can we get together?"*

I know several companies that have people dedicated specifically to oversee programs such as the PSM and RMP. These people and companies put in the continuing

effort needed to keep all sections of these programs in "current" condition so they can be seen as "living," not dust-collecting stacks of papers and books.

After I hung up, I wondered who else might be getting a visit? The answer came quickly when another customer called. Their inspection would be three days later. The gentleman calling felt very unprepared and wanted to meet ASAP.

EPA inspections for a Risk Management Program typically have three parts.

- 1) After an introductory discussion on the inspection agenda, they ask to be taken on a tour of the refrigeration system of your facility, including the machine room(s) and several of the cold rooms or refrigeration processing areas. One of the people in the EPA group will likely be taking photos to document what was actually seen as they tour.
- 2) They divide all of the sections of your program among however many inspectors there are. From my experience, there have always been three inspectors. First impressions of your program do make a difference. A lesson to learn is that your program presentation should be well organized, with each section easily identified, and that all the appropriate information can easily be found. It has worked best when most of the sections (or elements) are in their own binder, although some of the smaller sections might be combined into a single binder with easy-to-understand separation between the sections. I have seen facilities that have placed everything into a couple of large binders. These were very thick and hard to handle, and made it challenging to find information quickly.
- 3) They hold a wrap-up meeting with the company. Depending on the inspectors and how and what they found, they may spend some time in a private conversation before informing you of their preliminary findings. In other

LESSON

LEARNED?

cases, where the inspection has found relatively little, a private meeting might not be held and the wrap-up is fairly quick.

It is important to understand that what the EPA inspectors note when going through their checklists are preliminary findings, and their inspection reports are turned over to another EPA person or group to analyze and eventually make recommendations and/or issue a fine notice that will be sent to you at a later date—maybe in several weeks or much longer.

With the notice of an upcoming inspection, EPA typically sends along their "RMP Program Level 3 Process Checklist." This document is presently 25 pages and covers 40 CFR Part 68 in good detail. This document can be helpful as companies compare the checklist to their current program, finding out where things seem to be in good shape or may be deficient.

Consider the following as you prepare for an EPA inspection:

- The refrigeration system and facility in general should be fairly clean so it can be seen it is being well maintained. Again, first impressions do help.
- The system and its components should be properly labeled (See ANSI/IIAR 2-2021, Appendix Q (Informative) Guidelines for the Identification of Ammonia Refrigeration Piping and

When someone of authority comes to inspect your PSM and RMP programs, the best way to be prepared is by constantly keeping these programs as current as possible.

LESSONS learned

System Components). Inspectors are typically familiar with industry standards and guidelines. How does your system compare to the standards and guidelines?

- Drawings, Piping and Instrumentation Diagrams (P&IDs) should be accurate. I have been on inspections where the EPA inspector got information from the P&IDs then went to the field to verify it was the same. Also, taking information from the field and verifying it was the same on the P&IDs. Drawings should be field verified for accuracy before any inspectors see them.
- How are all of the PSM/RMP sections presented? As mentioned above, the best documentation presentations seem to be when each section of your program is distinctly separated. Usually, this means that each section is in its own binder. This makes it much easier for the inspectors and also for you when you are asked where something is. I have seen several inspections where most of the sections were combined into one or two large notebooks. These inspections were much more stressful. You may know your program very well, but under the stress of having multiple inspectors looking at you for answers you may find you have momentarily lost several grades of intelligence. Be very organized beforehand so you have to put less thought into where materials are located, whether in binders or electronic files.
- Be truthful, helpful and forthcoming when asked questions. Answer questions without stating information beyond what is needed. Do not dig a hole you can fall into.
- Be pleasant. I can't think of an EPA inspector that hasn't been pleasant to work with as they do the job they came to do. Don't create the impression that you have more important things to do than sit here with the inspectors or spend time on the PSM/RMP programs.

Regarding the two inspections I mentioned, one did much better than the other. The first inspection did not have documentation as well organized as it could have. There were some duplicate sections, and sometimes in multiple places. The feeling was, "Don't throw anything away." That may work sometimes, but for these programs and inspections you want the current version of each section. Older information should be archived, possibly electronically, and retrieved if needed to show a history of compliance.

You should be familiar with the retention time for sections of the RMP. In 40 CFR Part 68.200 Recordkeeping it states, "The owner or operator shall maintain records supporting the implementation of this part at the stationary source for five years, unless otherwise provided in subpart D of this part."

There is information in some sections that should be kept for other periods of time. For example, you should retain the two most recent "Compliance Audits" along with documentation of tracking of resolutions to all recommendations; every "Process Hazard Analysis"

(PHA) that has been done including documentation of tracking of resolutions to all recommendations for the life of the process. For other sections of the programs, when in doubt, keep the information for five years.

When someone of authority comes to inspect your PSM and RMP programs, the best way to be prepared is by constantly keeping these programs as current as possible. Keep relevant information as up to date as feasible. This will help you, your team and company have a much less stressful cortisol flowing experience when OSHA or EPA come to visit.



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States Target HFCs with New Regulations

The refrigeration industry is experiencing regulatory pressures to transition away from HFC refrigerants at all levels.

“While federal regulations under the AIM Act are a key factor in the shift away from HFCs, policymakers in California, New York, and Washington are sending an even stronger signal to move to future-proof refrigerants as quickly as possible,” said Danielle Wright, executive director of the North American Sustainable Refrigeration Council.

Caroline Halter, communications manager for the climate pollution reduction program at the Washington Department of Ecology, said HFCs are greenhouse gases that can be thousands of times more powerful than carbon dioxide.

“HFCs were designed to be less harmful to the earth’s protective ozone layer, compared to chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). But now, HFCs are quickly building up in the atmosphere. If their use isn’t reduced, HFC emissions will increase to 7–19% of global GHG emissions by 2050,” Halter said.

States Washington, California, and New York have set ambitious climate targets that are driving their decisions to go beyond the regulatory requirements at the federal level. “In some cases, achieving those climate targets means eliminating HFC emissions and transitioning to zero and near-zero GWP solutions like natural refrigerants,” Wright said.

CALIFORNIA ADDRESSES HFCS

California was the first state to implement HFC regulations beyond the federal regulatory requirements under the AIM Act. “It established a 150 GWP limit for new refrigeration equipment >50 lbs. in new facilities and created two pathways to catalyze the transition of existing facilities away from HFCs,” Wright said.

Additionally, California’s SB 1206 established a sales ban on virgin high-GWP refrigerants that will become more stringent over time. “The same regulation requires CARB to publish an assessment report detailing a strategy to transition the state’s economy away from HFCs by 2035,” Wright explained.

WASHINGTON STATE SETS SPECIFIC TARGETS

Washington has finalized a regulation that set a GWP limit of 150 on new equipment >50lbs starting in 2025. Starting in 2029, the same 150 GWP limits will apply to refrigerant retrofits, which will essentially eliminate a gas retrofit option.

“Policies that target HFCs are critical to meeting Washington’s legal limits on greenhouse gas emissions and combating climate change globally,” Halter said.

In May 2021, Washington’s governor signed a law that expanded 2019

hydrofluorocarbon restrictions and directed Dept. of Ecology to reduce greenhouse gas emissions from HFCs by transitioning to less damaging chemicals in certain new foam, aerosol, refrigeration and air conditioning uses.

Under the governor’s direction, the department was also tasked with establishing global warming potential requirements for refrigerants used in refrigeration and air conditioning equipment, including heat pumps. It will apply the same emission control requirements to HFCs that apply to ozone-depleting substances (ODSs) and establish a refrigerant management program for existing equipment.

Tristram Coffin, co-founder of Effecterra and president of sustainability, policy, and technical services, said it is important to note that Washington includes HVAC applications, which California does not. “HVAC is often a more distributed impact, but, overall, it is a larger impact to refrigeration,” he said.

As part of the regulation, Washington facilities with refrigeration and air conditioning systems containing 50 pounds or more of refrigerant, with a GWP of at least 150, to conduct and report periodic leak inspections, promptly repair leaks, and keep service records on site. “They may continue

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to operate their equipment if it remains in good operating condition and leaks of refrigerants are promptly repaired,” Halter said.

The Refrigerant Management Program also requires those performing installation, maintenance, service, repair, or disposal of a refrigeration or air conditioning system that meets the 50-pound threshold to minimize refrigerant emissions in their practices. Additionally, it requires distributors, wholesalers, and reclaimers of refrigerants that sell, supply or distribute any amount of refrigerant with a GWP of 150 or higher to register, keep records, and report annually to Ecology.

All facilities that meet the 50-pound threshold will be required to register with the Dept. of Ecology for the RMP. This requirement is being phased in over time based on equipment size. “As of now, only facilities with 1,500+ pounds of refrigerant or more must register with the program. The threshold is determined by each facility’s largest piece of equipment,” Halter said.

Even though small and medium equipment users aren’t yet required to register for the RMP, all equipment users, regardless of

size, are required to comply by repairing leaks on systems containing 50 pounds or more of refrigerant and a GWP of at least 150, retrofitting and retiring existing equipment that cannot be repaired and keeping certain records.

Halter said important dates for small and medium equipment users to keep in mind are Jan. 1, 2026, which is the required registration date for facilities with 200-1,499 pounds of refrigerant, and Jan. 2, 2028, which is the required registration date for facilities with 50-199 pounds of refrigerant. “The threshold is determined by each facility’s largest piece of equipment,” she added.

NEW YORK MOVES FORWARD

New York is still in the proposal stage of its regulation. Similar to California and Washington, the state’s proposed regulation sends a very strong signal to the industry to transition away from HFCs and towards the lowest possible GWP refrigerants as quickly as possible.

“We expect that New York will finalize their rules soon,” Coffin said, adding that New York has taken numerous public comments,

and the state’s rules go even further than California and Washington have, using a GWP 20 metric rather than GWP 100. “It is looking to go further using the latest and greatest science.”

STATE VS. FEDERAL REQUIREMENTS

Several other states are considering HFC restrictions (the North American Sustainable Refrigeration Council has a map available at <https://nasrc.org/hfc-policy>). Coffin said more states may pursue regulatory requirements if they don’t feel that there is going to be strong guidance at the federal level.

“If the Democrats hold office, I think states will continue to follow the federal government. If they don’t, I think more states will jump in,” he said, adding that having multiple state regulations creates more of a patchwork approach. “It feels like it can be a moving target, but we always argue for following the latest science.”

Halter said natural refrigerants are a solid solution. “Natural refrigerants have low global warming potentials and can reduce GHG emissions, energy, gas, and water consumption,” she said.

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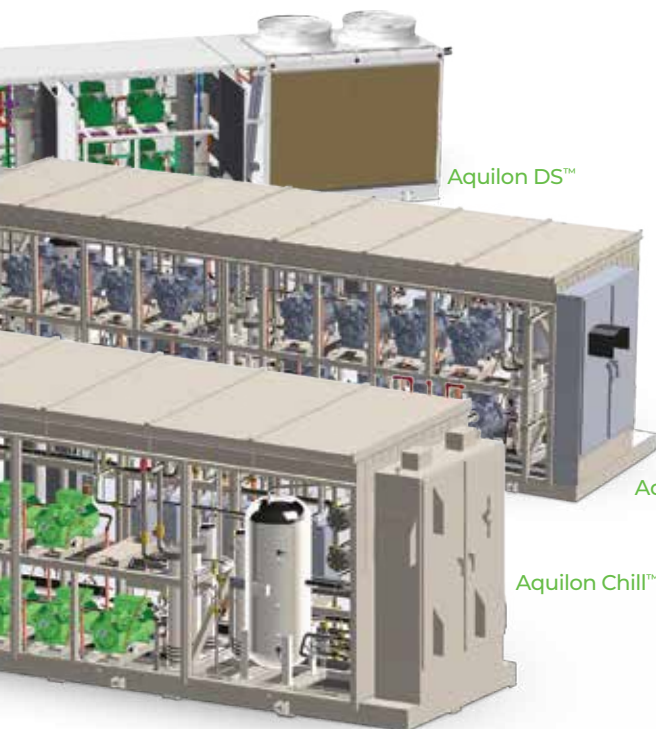


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States, Regulatory Agencies Focus on PFAS

A growing number of states and federal regulatory agencies are examining the effects of perfluoroalkyl substances, known as PFAS, and regulatory frameworks are evolving due to concerns over their persistence in the environment and potential health impacts.

"More than 30 states have introduced or adopted regulations related to PFAS, but until recently, refrigerants were not at the forefront of those discussions. That is starting to change," said Danielle Wright, executive director of the North American Sustainable Refrigeration Council.

There is also European legislation coming, and the European Union's Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) proposal related to PFAS will be finalized in 2025. Proposed regulations in Europe would impact almost all new and current lower GWP HFC/HFO refrigerant blends.

"They may ban 10,000 chemicals that have PFAS," said Tristram Coffin, co-founder of Effecterra and president of sustainability, policy, and technical services. "That would also have a direct impact on refrigerants, including the synthetic alternatives coming to the table as 95% of them would be classified as PFAS."

PFAS have been incorporated into some refrigerants to enhance their stability and performance. Wright said the industry is still awaiting clarity on which refrigerants would be designated as PFAS in the U.S.

PFAs is a class of chemicals, some of which have been known to be persistent, meaning they don't break down slowly in the environment.

FEDERAL REGULATIONS

The U.S. Environmental Protection Agency has rolled out several requirements limiting PFAS, including a record-keeping and reporting rule under the Toxic Substances Control Act (TSCA).

Under the EPA requirement, any entities, including small entities, that have manufactured, including imported, PFAS in any year since 2011 will have to report PFAS data to EPA beginning in November 2024. Small manufacturers will have to begin reporting in November 2025. Under this rule, there are civil penalties and criminal prosecutions that can be levied against those who fail to report.

Under the TSCA rule, there is no minimum reporting requirement, so even trace amounts of PFAs are still under scope for reporting.

Other EPA requirements include the first-ever national, legally enforceable drinking water standard to protect communities from exposure to PFAS, which was passed earlier this year. Additionally, EPA's PFAS Strategic Roadmap outlines actions from 2021-2024 to research, restrict, and remediate PFAS. This includes enhancing PFAS testing, expanding cleanup efforts, and prioritizing protection for certain communities.

WHAT IS PFAS?

PFAs is a class of chemicals, some of which have been known to be persistent, meaning they don't break down slowly in the environment. While speaking during an Association of Equipment Manufacturers webinar, Justin Prosser, senior product compliance specialist at Danfoss, said each of the current laws requiring reporting a restriction of PFAS has its own PFAS definition.

"The TSCA 8(a)(7) includes a structural definition which allows us to investigate individual chemicals, but it doesn't give us a complete definitive list of these chemicals, which is part of the struggle," Prosser said.

To meet requirements, Prosser said a redesign of products is potentially needed. "We don't want to be in a position where your product is obsolete and you weren't

ready for that," he said. "So, we need to understand those risks, which means we need to know where PFAs is used in our products and how much. If we do this, we can be confident that our designs and our end product solutions are going to have futures."

THE SIGNIFICANCE OF SUPERMARKETS

The use of refrigerants containing PFAS in the supermarket industry may become a concern given leak rates in supermarkets, which average about 12-15% in the best-case scenario to 25-30% on the high side, Coffin said.

Wright said there are proven, technically viable PFAS-free, climate-friendly refrigerant solutions available to the supermarket refrigeration sector today. "By contrast, the HVAC sector currently has fewer low-GWP PFAS-free options. As a result, supermarkets face higher regulatory pressures to transition to the most future-proof refrigerants as quickly as possible," she explained.

A LONG-TERM PLAN

Refrigerant end-users need a future-proof solution to permanently halt the ongoing cycle of costly and logistically challenging refrigerant transitions. Natural refrigerants are not at risk of implications from future PFAS regulations and are the only future-proof solution for the industry. "The most important thing we can do is provide real solutions that help ease and accelerate the transition to natural refrigerants," Wright said.

When alternatives to refrigerants containing PFAS are available, they should be strongly considered, Coffin said.

"In my mind, CO2 chillers are a possibility," Coffin added. "There are cases where certain obstacles need to be addressed, but can they work as well or better in a chiller? I believe so, and the research and evidence coming out of the refrigeration space shows it is possible, so why are we looking at another synthetic refrigerant that will probably be on the chopping block at some point in time?"

MEMBER benefits

IIAR Unveils Enhanced Membership Benefits

IIAR has a wide range of benefits available to members, from professional development opportunities to industry networking, and as of July 1, 2024, members have access to even more than they did before.

"Our members get access to the most reliable up-to-date information about the refrigeration industry, best practices, and ongoing education," said Lisa Berryman, member services manager for IIAR.

"We are constantly looking at new ways to provide value, which is why we now include more training and unlimited access to technical information as part of membership."

Mike Chapman, director of business operations for IIAR, said people tend to think of membership as a tool to get a discount on annual conference registration, but there is much more to it. "A lot of people aren't taking advantage of all of the benefits," he explained. "From a development standpoint, there are a lot of resources to help them grow professionally."

Here are some of the key benefits:

TECHNICAL PAPERS, BULLETINS, AND STANDARDS

IIAR members receive exclusive access to more than 400 technical papers as well as bulletins and industry standards free via IIAR's e-library. Members can view documents in eBook format using their Bookshelf account through VitalSource/eVantage, making them portable. If members would like to purchase a hard copy of documents rather than viewing in eBook format, they receive up to a 50% discount on purchases.

PROFESSIONAL DEVELOPMENT AND EDUCATION

IIAR offers a variety of training programs, including workshops, seminars, and certification courses designed to enhance the skills and knowledge of refrigeration professionals at all levels.

As part of the enhanced benefits, members have access to all IIAR Training Videos, Series 1, 2 and 3. Historically if members wanted access, they would have to buy the additional two sets.

Additionally, members now get two free Academy of Natural Refrigerants courses per year, up from one free course. Members can also receive a discount for any additional training they'd like to take.

WEBINARS AND EDITORIAL CONTENT

Access to all IIAR webinars is free for members, and the webinars are recorded for those who don't attend live.

MEMBERSHIP DIRECTORY

All members have access to the membership directory, which has added features for group members to create a group membership directory and highlight business members.

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NATURAL REFRIGERATION DIRECTORY

This is a member benefit available to every company that has a Group Company Membership with IIAR. The Natural Refrigeration Directory is a compendium of companies listed by type of organization (contractor, manufacturer, end user, etc.). It allows potential customers to see listings of verified IIAR group member organizations, along with their company contact and descriptive information, and explore the Natural Refrigeration community. IIAR has also invested in digital advertising resources to drive traffic to the Natural Refrigeration Directory.

ANNUAL CONFERENCE & EXHIBITION

IIAR's annual conference is a premier event for ammonia refrigeration professionals, and members receive a discount on attendance. The conference provides a platform for individuals to connect with others in the industry, share knowledge, and explore the latest industry innovations.

REGULATORY ADVOCACY

IIAR represents the interests of its members by engaging with regulatory bodies and policymakers. The organization advocates for sensible regulations that promote safety without imposing unnecessary burdens on the industry.

MEMBERSHIP PRICING

IIAR has created several different membership tiers to meet a wide range of needs. Individual Company membership is a single membership where a member is registered under their company of employment.

If additional employees from the company would like to join, companies can upgrade to a Group Membership, which includes up to 25 members. If companies would like to add more than 25 employees, they can do so at a significantly discounted rate. "If they have dozens of technicians or a lot of people in the plant that can use training, the value proposition is the significant benefits for the lower cost," Chapman said.

IIAR also offers special membership at a discounted rate to affiliates, such as regulators and first responders, academics, students, and retirees.

"We can work with prospective members to help them find the best membership category for their needs, and we're also happy to review benefits with existing members to ensure they're taking advantage of all that IIAR offers," said Natalie Clay, membership coordinator for IIAR.

"We can work with prospective members to help them find the best membership category for their needs, and we're also happy to review benefits with existing members to ensure they're taking advantage of all that IIAR offers."





Paraguay Becomes Latest Country to Adopt IIAR Standards

The Board of Directors of the International Institute of All-Natural Refrigeration, during the Institute’s last meeting in June 2024, approved an agreement with Paraguay’s Institute of Standards and Metrology. The Institute of Standards and Metrology said it will start adopting IIAR standards as Paraguay’s national standards.



Paraguay has one of the largest meat and dairy industries in Latin America. The country exports their products worldwide, including to Brazil, which is the largest exporter in the world of meat products. Paraguay relies heavily on ammonia refrigeration systems, but like many countries with developing industries reliant on all-natural refrigerants, Paraguay is working to codify and improve safety.

The government’s initial reaction to safety issues was to ban the use of ammonia. However, that course of action became untenable due to the important role natural refrigerants play in the country’s economy.

IIAR Argentina Chapter Chair, Luis Adur, traveled to Paraguay and successfully advocated for the industry, resulting in a substantial shift in the government’s perspective on natural refrigerants. Now, the Paraguay government, industry stakeholders, and end users have begun the process of closely working with IIAR to learn more about the industry’s best practices and utilize IIAR standards to make this important industry safe and sustainable.

In a recent statement, Paraguay’s Institute of Standards and Metrology said, “We are excited about this strategic alliance and are confident that it will strengthen our ability to meet our society’s health, safety and environmental needs. Through close collaboration, we will work to improve the quality of life of Paraguayans and contribute to the development of a sustainable economy.”

“This agreement is a step forward towards a safer, more efficient and environmentally friendly future in the field of refrigeration. We will continue to work together to achieve meaningful results and benefit our community.”

Meanwhile, IIAR announced that new IIAR International Committee Regional Vice Chair, Luis Adur would take the lead on furthering IIAR’s international safety and standards goals.

“Based on all his advocacy work in the region, not only recently in Paraguay, but also in Argentina, Uruguay, Bolivia and Brazil, we are happy to announce that Luis Adur, (owner of Bombadur, ammonia pumps manufacturer and current IIAR Argentina Chapter Chair), has joined the International Committee as the new Vice Chair for the southern LATAM region, (i.e., Merco Sur, plus Bolivia),” said Yesenia Rector, Meetings and International Program Director for IIAR. “Luis also was key in implementing the newest IIAR Chapter in the Region in Brazil, (whose current chair is Rodrigo Barion, owner of Valvugas, Brazil).”

TECHNICAL PAPER #12

Carrots to Sticks – Carbon Tracking for Cold Storage

JIM MAJSAK, SALES ENGINEERING MANAGER, CROSSNOKAYE

ABSTRACT

This paper provides an overview on the basics of carbon counting and how they may apply to carbon counting within the cold storage industry. It will also cover opportunities to take advantage of newer technologies available to improve the accuracy of carbon reporting data, and the ability to generate reports for your customers as part of their sustainability goals.

THE FOLLOWING TOPICS WILL BE COVERED:

- Why track carbon now? – Justification for developing a carbon tracking program before it is required by regulation.
- Carbon counting basics – Terms used, key concepts and calculation methods.
- Regional emissions data – Traditional and real-time data sources.
- Scope 1, 2 and 3 Emissions – Definitions and sample calculations.
- Carbon counting in the cold storage industry.
- CO2-reporting challenges.
- Best practices, challenges, and rewards.

The goal of this paper is for readers to gain a basic understanding of the topics listed above areas and have clear path on the next steps needed to define their carbon counting strategies:

- Educate others on the status of carbon counting in the cold storage industry.
- Relate energy used in different areas of the facility to carbon counting categories.
- Quantify energy efficiency kWh savings to carbon avoidance values.
- Develop a carbon tracking and reporting strategy.

Introduction

When it comes to sustainability goals and regulations, eventually all carrots will become sticks!

At the current time, carbon counting requirements within the cold storage industry are mostly voluntary. Many companies have made the decision to take a proactive approach and perform the groundwork to develop a carbon counting strategy in anticipation of being mandated by local, state, or federal requirements. This includes implementing measures that make sense act as soon as possible, including the following actions:

- Low cost/no-cost measures to reduce energy usage and carbon emissions.
- Capital projects that make good economic sense from the energy savings alone.
- Carbon tracking as part of customer retention.

Decision makers must consider if they want to be proactive and experiment with carbon tracking while it is still voluntary or wait until they are mandated to do so. It appears this time is rapidly approaching when we look at how the European market has responded to the challenge of meeting the carbon reductions agreed to in the 2015 Paris Agreement, which is a legally binding international treaty on climate change. The U.S. is not far behind, with some jurisdictions seeing the development of a similar carbon trading market, as well as some penalties already being enforced for non-compliance at regional levels.

Carbon Counting Basics – Why are we even counting carbon?

The term “carbon footprint” came from the concept of an “ecological footprint,” which was developed in the early 1990s at the University of British Columbia.

This “ecological footprint” calculated the demands an activity had on the ecosystem to help businesses, governments, and institutions monitor resource use and advance sustainable development.

This concept did not get much notice until the early 2000s, when the oil company BP used the term “carbon counting” as part of a campaign to rebrand itself as an environmentally friendly company. This was basically a “greenwashing” campaign using the slogan “It’s time to go on a carbon diet” and included the world’s first carbon footprint calculator.

Carbon Counting Is Showing Up Everywhere

Carbon counting is now showing up in numerous industries. A good example of this is how airlines are starting to post the carbon consumed for every flight, as shown in Figure 1.

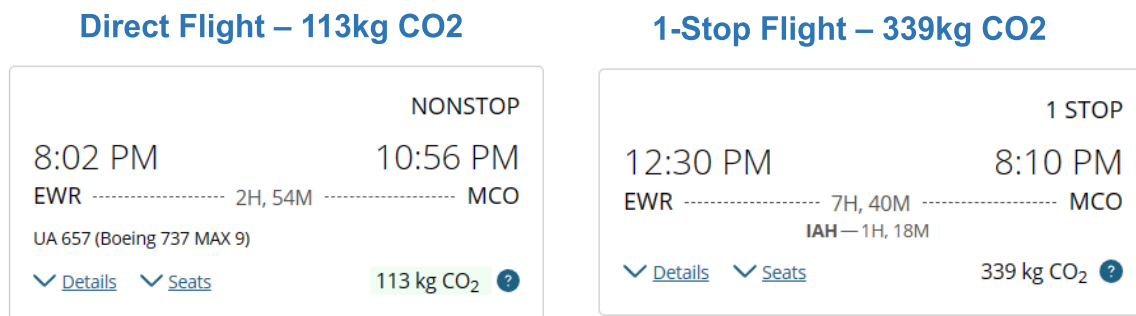


Figure 1. Carbon impact of two flights to the same destination.

Notice that the direct flight uses one-third of the carbon as the flight with a connection. Will it someday be possible to justify the extra cost of the direct flight due to the carbon savings?

There are also companies that now require employees to purchase carbon offsets for every flight booked. This can be done through various online companies that provide calculators and a store to purchasing offsets. User can enter either the total travel time of the flight, or the amount of CO₂ produced, if known. A typical cost is \$16.49/Ton, or \$.0.1649/kg of CO₂.

Counting Carbon in the Food Supply Chain

The carbon resulting from food waste has also been getting more attention lately. Studies have estimated that 30%-40% of all food produced is lost at some point in the supply chain. The sources of these losses are summarized in Figure 2.

Food Production	Food Transportation and Storage
<ul style="list-style-type: none"> • Weather events • Insects and Rodents • Late Harvesting • Labor Issues and Shortages • Harvesting Damage 	<ul style="list-style-type: none"> • Food Processing Waste • Packaging Specifications • Transport & Handling • Inadequate Cold Storage • Grocery Store Stocking

Figure 2. Sources of waste in the food supply chain.

The cost of investing in new technologies and resources to eliminate food waste could be much less than the cost the agricultural production required to replace lost food. carbon impact of replacing wasted food.

For every source of food waste listed above, actions can be taken to make reductions. These actions can range from better training on food handling to the enablement of new technologies to optimize food processing and reduce waste. For the cold storage

industry, let's focus on "Inadequate Cold Storage." For this particular issue, it is estimated that 12% of all food produced is lost due to insufficient cold storage.

Savings can come from both the construction of new facilities to increase cold storage capacity as well as energy optimization at existing facilities to reduce their current carbon footprints.

For cold storage facilities, CO₂ is typically generated by two different emissions sources: Direct emissions and indirect emissions. Direct emissions are the result of actions taken at the site, like the burning of fuels to generate electricity or steam, as well as refrigerant leaks from onsite equipment. Indirect emissions are the result of emissions generated at the power plants that provide the electricity to operate the facility.

Counting Carbon in Your Meal Choices

Even at restaurants and at home, consumers can make meal choices based on their carbon impact. There are numerous websites that provide carbon counts for different foods. How soon before restaurant menus show it (Figure 3)?

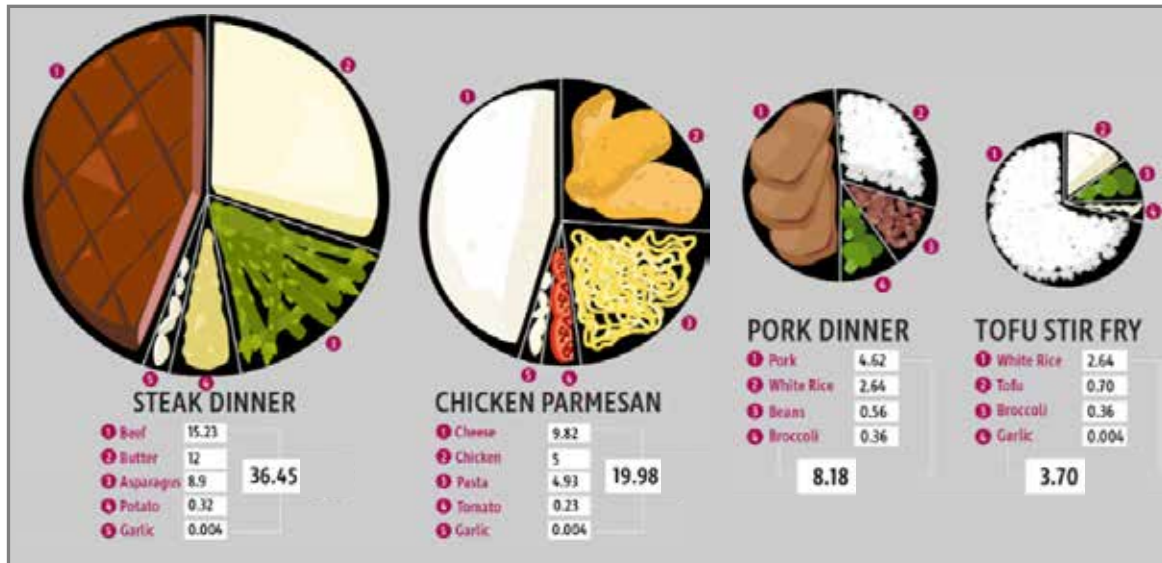


Figure 3. Typical meal carbon counts (kg CO₂).

Note how the carbon count for a chicken dinner (19.8kg CO₂) is about half that of a steak dinner, and a vegetarian tofu meal is about a tenth.

These numbers shown in the figure above for carbon counts are based on very rough estimates using industry data. We are also seeing certain manufacturers promoting sustainable methods that range from having renewable energy production onsite to cultivated meat production, so these numbers can also be very product specific. Manufacturers that promote sustainability will typically post carbon content for the foods they produce.

Processing Methods Matter

Even at home, the way consumers prepare and process food can have an impact. Figure 4 shows that using an automatic drip coffeemaker takes about twice the carbon of using a French press. It's definitely more work for the consumer, but the coffee probably tastes better.

CARBON STATEMENT COMPARISON		
COFFEE AT HOME		
GENERAL SPECS	HIGH	LOW
Type:	Arabica	Arabica
Origin:	Tanzania	Tanzania
Destination:	Germany	Germany
Preparation:	Automatic Machine	French press
Use:	One cup prepared at home	One cup prepared at home
Lifespan:	1 use	1 use
CARBON EMISSIONS PER USE (CO₂e*)	102 g	52 g
PRODUCTION STAGES	39 g	39 g
Agrochemicals production	26 g	26 g
Cultivation on plantation	6 g	6 g
Pre-processing	1 g	1 g
Milling, packaging and transport	3 g	3 g
Roasting and distribution	3 g	3 g
CONSUMPTION STAGES	63 g	13 g
Grinding and purchase	2 g	2 g
Preparation	60 g	10 g
End-of-life disposal	1 g	1 g
DAILY CARBON QUOTA**	0.6%	0.3%

Figure 4. Coffee preparation carbon counts.

The Improved Cold Chain

Why is the food cold chain an area of focus? Twelve percent of all food produced is lost due to insufficient storage. The cost and carbon impact of improving the food chain to eliminate waste could be much less than the cost of the agricultural production required to replace lost food.

For cold storage facilities, CO₂ is typically generated from two different types of sources: Direct emissions and indirect emissions.

Direct emissions are the result of actions taken at the site, like the burning of fuels to generate electricity or steam, as well as refrigerant leaks from onsite equipment. Indirect emissions are the result of emission generated at the power plants that provide the electricity used by the facility.

Savings can come from both new construction to increase cold storage capacity as well as energy optimization at existing facilities.

Technological Advances in the Cold Chain

There are also some new technologies coming into the cold storage market that can help with the optimization of facility energy usage. This includes, but is not limited to, the following:

Thermal Storage – You don't need a battery to store energy! This technology is already used to help cool large commercial buildings and is now available to the cold storage industry. Thermal storage systems can do this by using less expensive off-peak power to freeze blocks of engineered materials. This bank of cold materials can then be used to keep areas cool while equipment is turned down, or off during peak power periods. Think of your plastic cooler blocks on a much larger scale.

Advanced Sensors and Controls – Better data equals better decisions! There have also been many advances in wireless technology that allow cost-effective projects to monitor the status of cold room doors and take more temperature readings within the rooms themselves. Many of these systems also allow monitoring of data through a web-browser for remote alarming and reporting.

AI and Machine Learning – The future of optimization. The cold storage industry is on the edge of a new industrial revolution that is using new technology to create advanced refrigeration controls that leverage external data and physics-based machine learning to optimize facility operations. Automated processing of large amounts of data from multiple sources to better manage operations to reduce energy consumption by up to 40%. Imagine a software model of a facility where operational changes can be fully tested before being implemented at the facility.

Basic Carbon Counting Terms

Below is a listing of basic terms used as part of carbon tracking projects. Understanding these terms will provide a good foundation for understanding how carbon tracking applies to a given facility.

Greenhouse Gases (GHGs) – Gases that trap heat in the atmosphere: Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF₆) and Nitrogen trifluoride (NF₃).

CO₂ – Carbon dioxide enters the atmosphere from burning fossil fuels and other materials. Also be a result of certain industrial chemical reactions (cement production). In the U.S., CO₂ accounts for 75% of all the greenhouse gas emissions from human activities. This is why it gets the most focus. Generation of electricity is the second largest source of CO₂ emissions in the U.S., accounting for 31% of total CO₂ emissions.

CO₂e – Used to describe the many different types of greenhouse gases in a single common unit of measurement based on the equivalent Carbon dioxide (CO₂).

Green Power – The purchasing of renewable electricity credits to meet climate targets and sustainability claims.

Greenwashing – Companies spend more time and money on marketing themselves as environmentally friendly than actually minimizing their environmental impact.

Emissions Factor – A representative value that relates the quantity of a pollutant released to the atmosphere for a specific activity.

Fugitive Emissions – Gasses released into the air accidentally. For refrigerants, these often include HCFCs and HFCs (not ammonia).

Avoided Emissions – Savings from CO₂ reduction projects. Includes energy efficiency and fuel switching.

SBTi (Science-based targets) – A global initiative with a clearly-defined path to reduce emissions in line with the 2015 Paris Agreement goals, which is a legally binding international treaty on climate change. More than 4,000 businesses around the world are already enrolled.

A Deeper Look into Emissions Factors

A solid understanding of emissions factors is key to carbon counting.

The main function of emissions factors is to relate fuel and electric consumption to carbon. For carbon calculations related fuel consumption, the resulting units are “lbs CO₂/gal” for liquids or “lbs CO₂/ft³” for gases. For carbon calculations related to electric consumption, the resulting units are “lbs CO₂/kWh,” or for larger consumers like power plants, “lbs CO₂/MWH.” The higher the emissions factor is, the higher the pollutants are from the source of energy production.

Figure 5 shows a few examples of typical emission factors.

Fuel Emission Factors:	kWh Emission Factors:
Gas = 19.37lbs CO ₂ /Gal	Based on regional power plants
Diesel = 22.23lbs CO ₂ /Gal	CA = 480.50 lbs. CO ₂ /MWh
Nat Gas = .12lbs CO ₂ /Ft ³	KY = 1,739.8 lbs. CO ₂ /MWh
	FL = 837.50 lbs. CO ₂ /MWh

Figure 5. Samples of a typical emission factor.

Where Do Emission Factors Come From?

In the United States, emission factors have been historically managed by the EPA and published in a database known as eGRID, which stands for “Emissions and Generation Resource Integrated Database.” There is also an online interface to the eGRID database that allows users to browse all emissions data, which can be found at (<https://www.epa.gov/egrid>)

The eGRID database contains the environmental characteristics of almost all electric power generators in the United States. It is published every 1-2 years and is the most commonly accepted database for emissions data in the United States. The data provided includes emission rates, generation, heat input, resource mix, and other attributes. Data can be sorted by fuel type or GHG type and shown at the regional, sub-regional, state, and individual plant levels.

eGRID Regions

At the regional level, eGRID emission factors are segmented by defined areas that roughly follow the NERC (North American Electric Reliability Corporation) regions

used to manage electric grid interconnection and reliability (Figure 6). Emission factors can vary widely with the current highest carbon emitting region being Hawaii (77% of power from burning mostly oil and coal) to the lowest carbon emitting region being upstate NY (73% hydroelectric power).

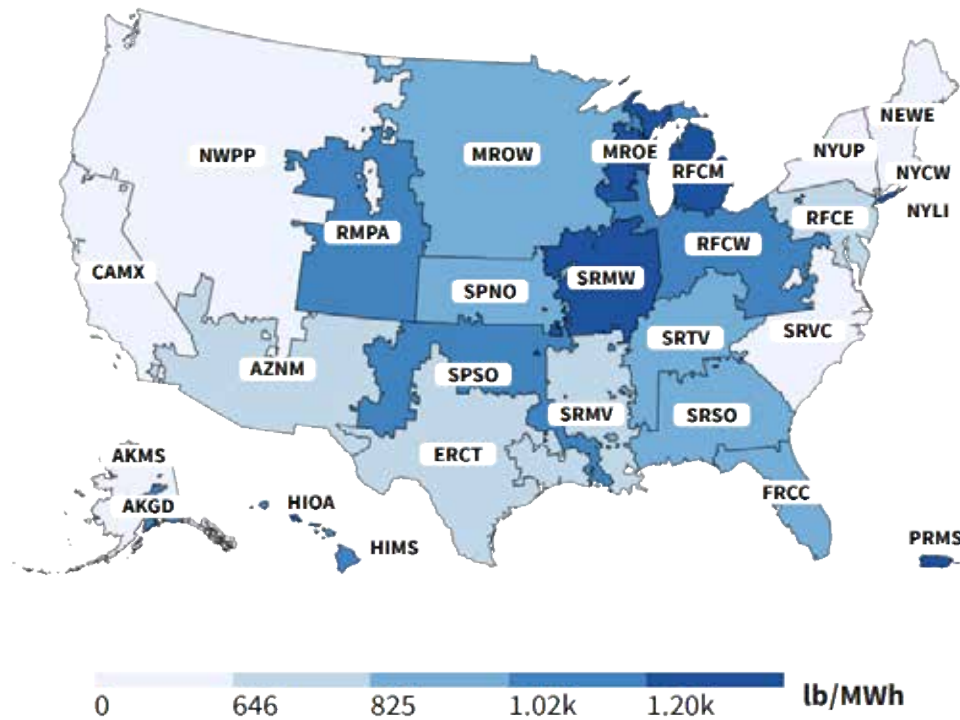


Figure 6. eGRID Defined Regions of Operation

In addition to regional data, eGRID also publishes state emissions data (Figure 7). Similar to regions, state emissions factors vary widely with the current highest carbon emitting state being West Virginia (91% coal-fired power plants) to the lowest carbon emitting state being Vermont (almost 100% renewable energy in 2021).

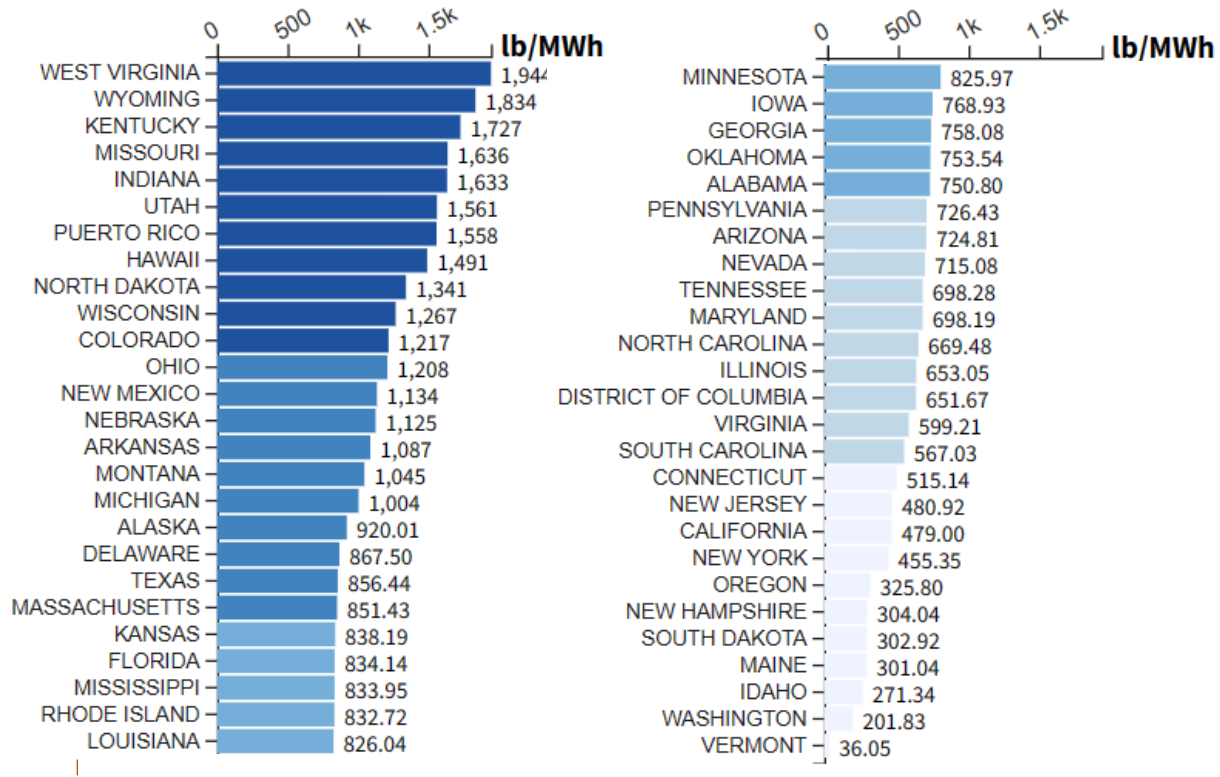


Figure 7. eGRID states of operation.

eGRID Baseload Designations

When viewing eGRID CO₂ data, users will see a differentiation on numbers based on “Baseload” vs. “Non-Baseload” power plant operations. It is important to understand the difference between these two types of numbers.

Power plants that run at 100% capacity for baseload demand and have no extra capacity to contribute at other times are considered “baseload” facilities. This includes a majority of nuclear, hydro, solar, geothermal and wind generators.

Power plants that do not normally run at 100% capacity and have extra capacity to contribute at times of peak demand are considered “non-baseload” facilities. These are also sometimes referred to as “peak power plants” or “peaker plants.”

Since most energy efficiency projects are designed to avoid energy usage during the time when cost is highest, these types of projects will affect peak demand, not baseload demand. For this reason, the “non-baseload” emissions rates are used to calculate carbon output.

Figure 8 shows that although these two numbers are close to each other, the non-baseload numbers will always be slightly higher since these plants run at times of peak generation, which results in peak operational costs.

1. Subregion Output Emission Rates (eGRID2021)

eGRID subregion acronym	eGRID subregion name	Total output emission rates lb/MWh							Non-baseload output emission rates lb/MWh							Grid Gross Loss (%)
		CO ₂	CH ₄	N ₂ O	CO ₂ e	Annual NO _x	Ozone Season NO _x	SO ₂	CO ₂	CH ₄	N ₂ O	CO ₂ e	Annual NO _x	Ozone Season NO _x	SO ₂	
AKGD	ASCC Alaska Grid	1,067.70	0.091	0.012	1,073.70	5.5	6	0.377	1,229.60	0.12	0.016	1,237.50	6.6	7.2	0.524	4.40%
AKMS	ASCC Miscellaneous	485.2	0.025	0.004	487.1	7.5	7.1	0.576	1,531.30	0.066	0.012	1,535.50	24.5	23.5	2.136	4.40%
AZNM	WECC Southwest	619.7	0.052	0.007	623.1	0.5	0.5	0.126	1,227.60	0.067	0.009	1,232.00	0.7	0.6	0.162	4.40%
CAMX	WECC California	531.7	0.031	0.004	533.6	0.5	0.5	0.008	1,047.50	0.049	0.006	1,050.60	0.8	0.8	0.057	4.40%
ERCT	ERCOT All	813.6	0.054	0.008	817.2	0.5	0.5	0.587	1,177.40	0.065	0.009	1,181.50	0.8	0.7	0.728	4.40%
FRCC	FRCC All	632.9	0.053	0.007	636.3	0.3	0.3	0.167	1,016.50	0.054	0.007	1,020.00	0.4	0.3	0.204	4.50%
HMS	HCC Miscellaneous	1,134.40	0.135	0.021	1,143.90	7.2	7	2.976	1,649.40	0.176	0.027	1,661.90	11.3	11.1	4.106	4.80%
HDA	HCC Oahu	1,633.10	0.176	0.027	1,645.50	3.0	3.0	6.532	1,784.00	0.172	0.027	1,795.30	4.5	4.5	7.706	4.80%
MROE	MRO East	1,562.10	0.148	0.022	1,592.30	0.9	1	0.362	1,555.90	0.153	0.019	1,565.00	1.2	1.2	0.37	4.50%
MROW	MRO West	995.6	0.107	0.015	1,003.10	0.8	0.8	0.961	1,808.30	0.163	0.026	1,820.60	1.4	1.4	1.715	4.50%
NEWE	NPCC New England	539.4	0.072	0.009	544	0.3	0.3	0.004	900.5	0.073	0.009	905.1	0.4	0.4	0.13	4.50%
NWPP	WECC Northwest	634.6	0.058	0.008	636.5	0.6	0.6	0.342	1,545.70	0.139	0.02	1,555.20	1.5	1.5	0.766	4.40%
NYCW	NPCC NYC/Westchester	816.6	0.019	0.002	817.9	0.2	0.3	0.011	930.8	0.02	0.002	932	0.3	0.3	0.011	4.50%
NYLI	NPCC Long Island	1,210.90	0.126	0.016	1,215.90	0.9	0.9	0.264	1,317.30	0.04	0.005	1,319.80	0.9	0.9	0.324	4.50%

↑
 Baseload
 Values

↑
 Non-Baseload
 Values

Figure 8. Baseload vs. non-baseload values.

Realtime Emissions Factors

Technical advances have led to the availability of real-time emissions factors. In most cases, this means five-minute data updates, compared to a one-to-two-year delay before changes are made to the eGRID emissions data.

The companies providing this type of data are typically software-based and also provide APIs (Application Programming Interface) to allow the integration of this data into other software packages. These providers are also advocating a program called “The Open Grid Emissions Initiative” that is designed to fill a critical need for high-quality, publicly accessible, hourly grid emissions data that can be used for GHG accounting, policymaking, academic research, and energy attribute certificate markets.

For each region, real-time data is trended at five-minute intervals. Carbon emissions data can be seen in a historical trend chart as well as a real-time generated fuel mix.

Figure 9 shows real-time data for the California CALISO region, which highlights the impact of solar production, or lack thereof, throughout the day. Having access to this data through a software API could allow end-user to modify their usage patterns to minimize their carbon footprint at times when the power is moving from “green to brown.”

Also note the line “eGRID Regional Value” added to the trend to show the difference between using eGRID data vs. real-time data for carbon calculations. With the static eGRID data, there is no opportunity to respond to actual changes from sustainable energy production or a change in operations at regional power plants.

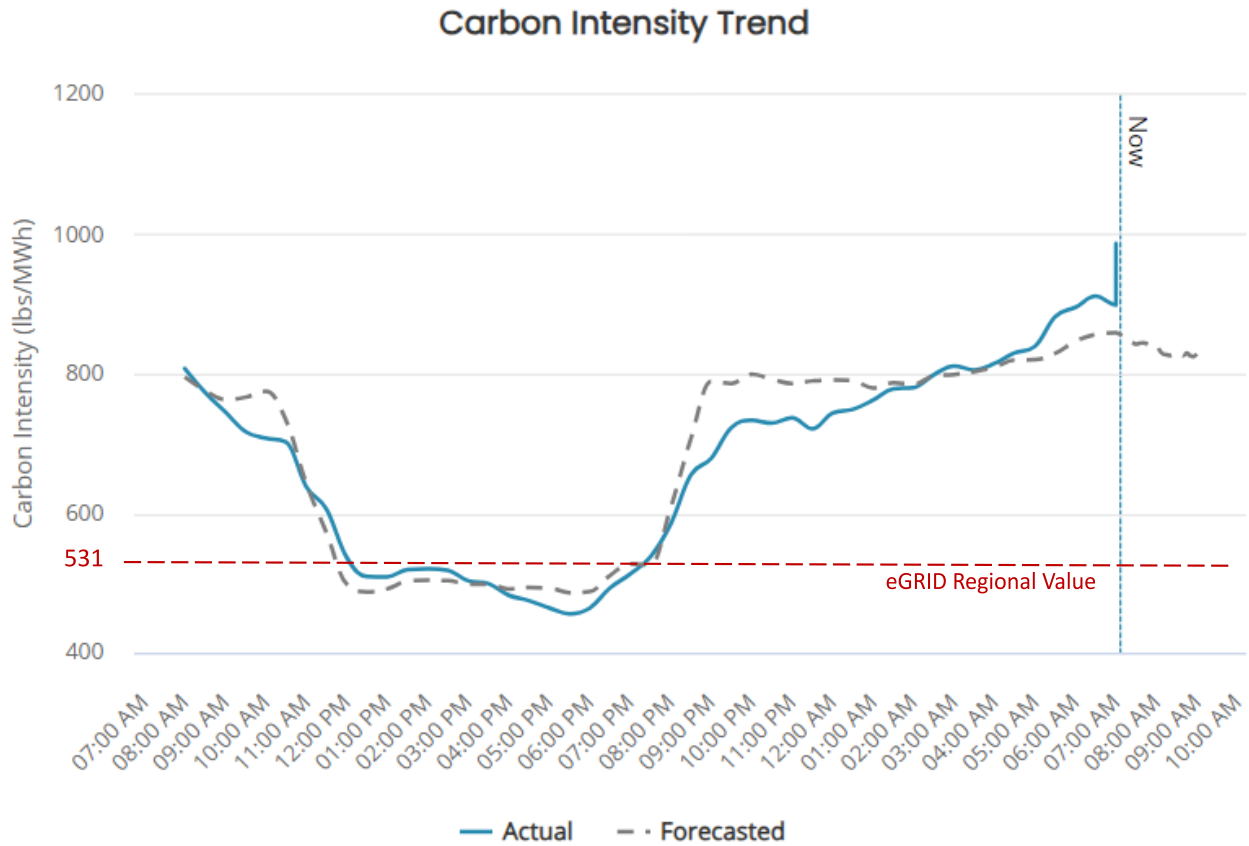


Figure 9. Real-time emissions data and eGRID comparison.

Carbon Counting in the Cold Storage Industry

Larger, multi-site cold storage organizations are starting to take notice of carbon counting concepts. They are getting pressure from their Fortune 500 customers to provide carbon data for the products they are storing on their behalf, and realizing carbon counting may be important for customer retention.

An illustrative quote making this very clear was recently encountered during a discussion of project payback on a controls upgrade project:

“I don’t give a [REDACTED] about energy savings! What I give a [REDACTED] about is tracking carbon per pallet.”

—Anonymous Cold Storage Corporate Engineer

This shows some of the frustration of being tasked by senior executives to account for carbon across the facility and not having the resources to do so.

The First Step: Defining Reduction Targets

One question that can always be asked to gauge a company’s commitment to carbon reduction is “Have you committed to science-based targets?”

“Science based target” is a term created by the organization monitoring company’s commitments to the Paris Agreement to limit global warming. Participating companies are asked to commit to defining reduction levels, then have 24 months to develop a plan for reductions with actual target levels defined. This is a popular program in Europe and gaining ground in the U.S.

Why should any company do this? There is no direct financial compensation in the U.S. for now, but companies will run more efficiently in an effort to reduce carbon emissions and will also be recognized by their financial institutions and customers as committed to being a green organization.

Carbon Emissions Scopes – Scope 1, 2 and 3 Emissions

Carbon Emission Scopes are designations that segment carbon generation by facility function.

The terms “Scope 1, 2 and 3” come from the need to break down GHG emissions into different categories in order to facilitate the work of assessing a site’s overall carbon footprint.

Here are definitions for these three scopes:

Scope 1 Emissions – Emissions generated by a company/facility, such as burning natural gas, driving company cars, or refrigerant gas leaks.

Scope 2 Emissions – Emissions caused indirectly by consuming electricity and other energy that is generated outside a facility.

Scope 3 Emissions – Indirect emissions (also known as upstream/downstream value chain emissions) that occur from sources the company/facility does not own or control.

It is important to note that while a facility may not have any Scope 3 emissions, suppliers may have Scope 3 emissions that should be accounted for. A facility may also have Scope 3 emissions that its customers must account for. A company’s ability to provide details of any Scope 3 emissions to its customers may be a valuable resource that set them apart from the competition.

In addition, there may be a new scope on the horizon, Scope 4 emissions. These are “avoided emissions” that occur outside the value chain or life cycle of a product.

Measuring and reporting Scope 4 emissions is challenging due to the lack of universal standards and varying calculation methods and substantiated data is needed to support claims and avoid the appearance of greenwashing, so most companies are not yet focusing on this new designation.

Scope 1 Calculations

Figure 10 shows an example of how Scope 1 emissions would typically be calculated for emissions generated at a facility:

A company purchased 714 gal of gasoline, 212 gal of diesel fuel and 3mm ft3 of natural gas. What are the associated Scope 1 emissions?	
Emission factors:	Gasoline: 714 gal * 19.37 lbs. CO ₂ /gal = 13,830 lbs. CO ₂
Gas = 19.37lbs CO ₂ /Gal	13,830 lbs. CO ₂ / 2,204.6 lbs. per MT = 6.27 MT CO ₂
Diesel = 22.23lbs CO ₂ /Gal	Diesel: 212 gal * 22.23 lbs. CO ₂ /gal = 4,713 lbs. CO ₂
Nat Gas = .12lbs CO ₂ /Ft ³	4,713 lbs. CO ₂ / 2204.6 lbs. per MT = 2.14 MT CO ₂
Lbs. To Metric Tons:	Nat Gas: 3MM Ft ³ nat gas * .12 lbs. CO ₂ / Ft ³ = 360,000 lbs. CO ₂
2,206.6 lbs. per MT	360,000 lbs. CO ₂ / 2,204.6 lbs. per MT = 163.29 MT CO ₂
	Total: 6.27MT + 2.14MT+ 163.29MT = 172 MT CO₂

Figure 10. Typical Scope 1 emissions calculations.

Scope 2 Calculations

Figure 11 provides an example of how Scope 2 emissions would typically be calculated for emissions generated at the regional power plants supplying electricity to a facility:

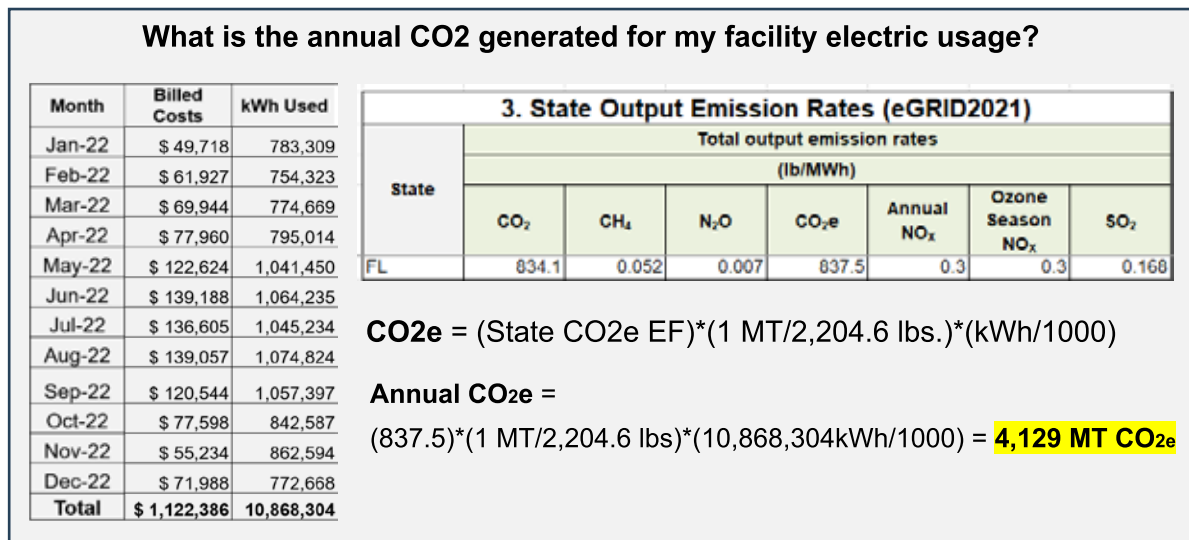


Figure 11. Typical Scope 2 emissions calculations.

Scope 2 calculations may also include documenting the avoidance of emissions as a result of energy efficiency projects. For these cases, the kWh reduced will result in a reduction of CO₂. Figure 12 offers an example of these types of calculations:

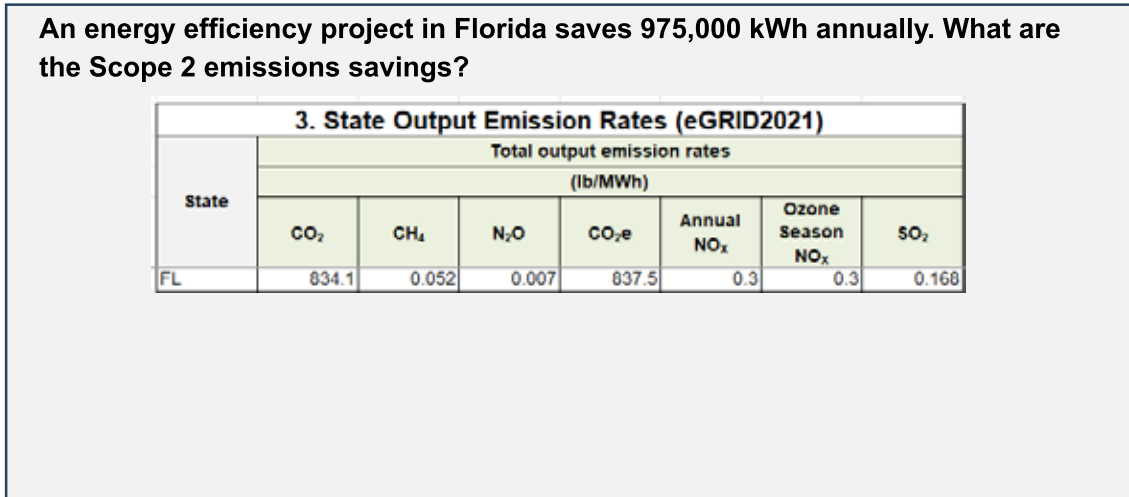


Figure 12. Typical Scope 2 energy efficiency project emissions calculations.

How do avoided emissions translate to cost savings? Beyond the kWh savings, if a company places a value on carbon there will also be carbon cost-savings. Figure 13 outlines a company that values carbon at \$51.00/Metric Ton.

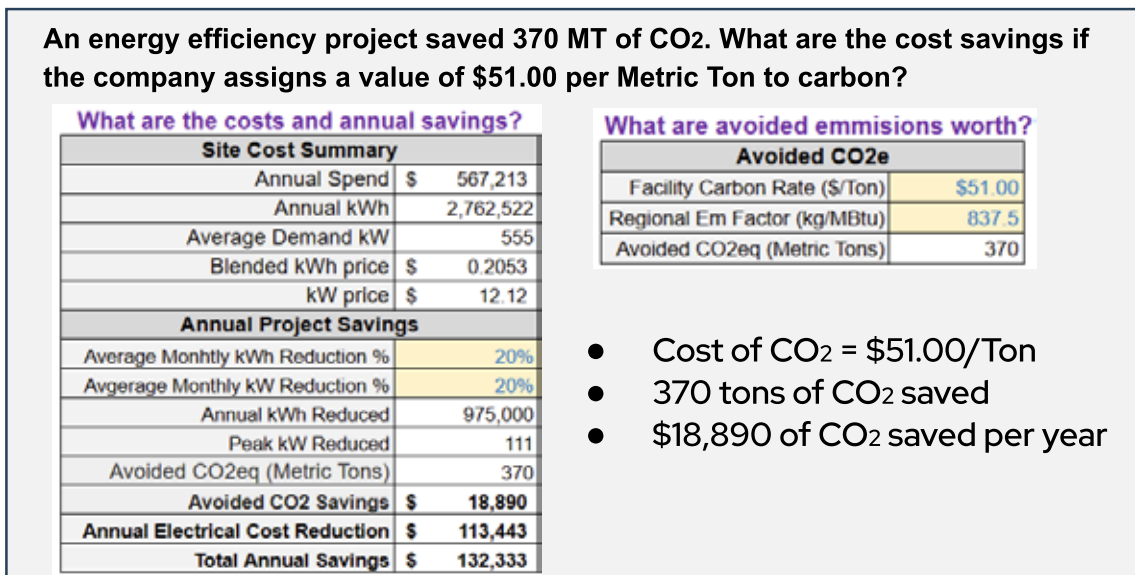


Figure 13. Assigning cost savings to Scope 2 Avoided Emissions.

The markets for monetizing this reduction are still being developed in the US, but companies that are early adopters may still account for this and include it as part of the project ROI.

Scope 3 Calculations

While valuable, Scope 3 emissions are very difficult to account for due to the level of tracking required throughout the facility. Basically, energy usage must be tracked as it is used across the facility. All energy related to customer product must be separated and converted to CO₂.

It is also important to understand that Scope 3 emissions should not only include electricity use related to customer products, but also any electricity used to generate other types of energy used to handle, store or transport customer product. This includes ammonia for cooling and steam for keeping product warm while being stored in your warehouse.

For example, a refrigeration evaporator uses both electricity to run the fan as well as electricity to generate the ammonia running through the evaporator coils.

Figure 14 shows the type of electric sub-metering typically required to track Scope 3 carbon across the facility:

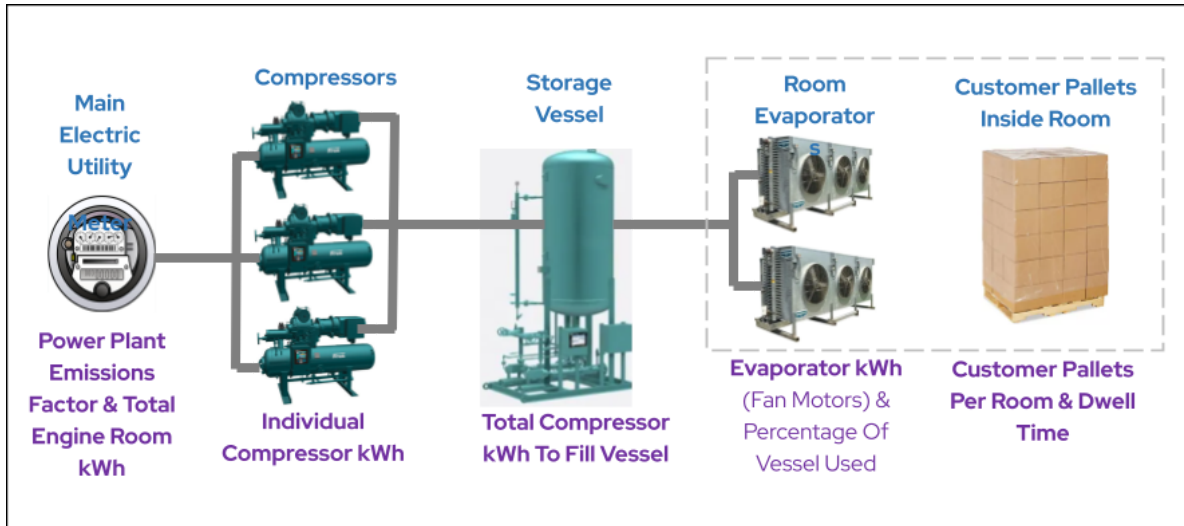


Figure 14. Scope 3 carbon tracking across the facility.

Once a Scope 3 tracking strategy is in place, the next step is to develop customer reports. A good Scope 3 report will include not only the total Scope 3 CO₂ but will also show tracking of how the value was developed. This is important for customer accounting and validation of the data provided.

Figure 15 is an example of a detailed Scope 3 emissions report showing customer values and the supporting data for the calculations.

Monthly Scope 3 Emissions - ABC Food Services					September 2022
Area	Total kWh	Total CO ₂ (MT)	Average Total Pallets	Average Customer Pallets	Customer Scope 3 CO ₂ (MT)
Facility Usage	842,587	320.09			
Comp LT1 Operation	181,863	69.09			
Comp LT2 Operation	147,516	56.04			
Comp LT3 Operation	30,513	11.59			
Comp HT1 Operation	203,783	77.41			
Comp HT2 Operation	168,809	64.13			
Low-Temp Vessel Feed	359,892	136.72			
High-Temp Vessel Feed	272,591	103.55			
Freezer 1 Storage Room	215,935	82.03	524	135	21.13
Freezer 2 Storage Room	143,957	54.69	385	72	10.23
Cooler 1 Storage Room	136,296	51.78	328	54	8.52
Cooler 2 Storage Room	136,296	51.78	354	-	-
Total Monthly Scope 3 CO₂ (MT) :					39.89

Figure 15. Scope 3 carbon tracking report.

Carbon Tracking Best Practices

There are a few recommended best practices to follow when tracking carbon.

Leveraging the data generated by carbon tracking and reporting activities is also beneficial. This includes the following:

- Sub-meters for equipment energy usage
- Cold room door status
- Pallet counts and associated dwell times
- Battery charger status
- Emergency generator operation
- Real-time regional emissions factors

It is worth considering additional instrumentation to collect more granular data. One indirect benefit of doing this is the data collected may also be valuable for optimizing facility operations and maintaining product quality.

Carbon Tracking Challenges

Just like any other initiative, there will always be challenges. One very common problem in the cold storage industry is properly allocating energy across multiple customers sharing common storage space. Changes in product weight, location and time spent in the room can result in varying carbon calculations. Since tracking these differences between products would be time-consuming and nearly impossible to keep up with, it is recommended that a few assumptions be made to simplify the calculations.

- The weight difference between pallets is negligible.
- All pallets in the facility are handled or processed in a comparable fashion.
- Pallet duration time (dwell days) are averaged for the reporting period.

Another common problem in almost every industry is the sharing of data across multiple platforms (Figure 16). This will be a key part of carbon tracking and should be addressed as soon as possible to help define the scope of a carbon tracking project.

The ability to acquire external data and integrate it with in-house systems is valuable and worth the time and cost required to implement it. Combining data from the refrigeration control system with operational data from office systems is a critical part of delivering accurate Scope 3 reports.

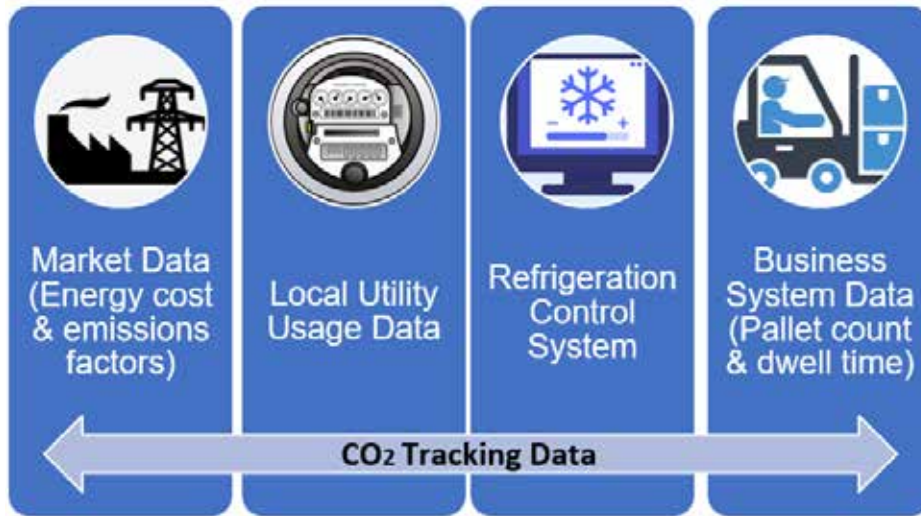


Figure 16. Carbon tracking data flow across systems.

Conclusion

The reward of implementing a successful carbon tracking project will be having a system that provides CO₂ awareness across the facility. While in most cases, operational decisions will still be made based on cost savings, this will provide the opportunity to make the operational changes based on carbon savings as well.

As new regulations come into the market, a company with a robust carbon-tracking program will be well-prepared to respond to the requirements and not have to start from ground zero.

From a corporate perspective, if a carbon tracking project is rolled out to multiple sites, there is an opportunity to provide a corporate dashboard where data from multiple sites can be normalized and used for corporate monitoring, site-to-site comparisons, and reporting on regional reduction targets (Figure 17).

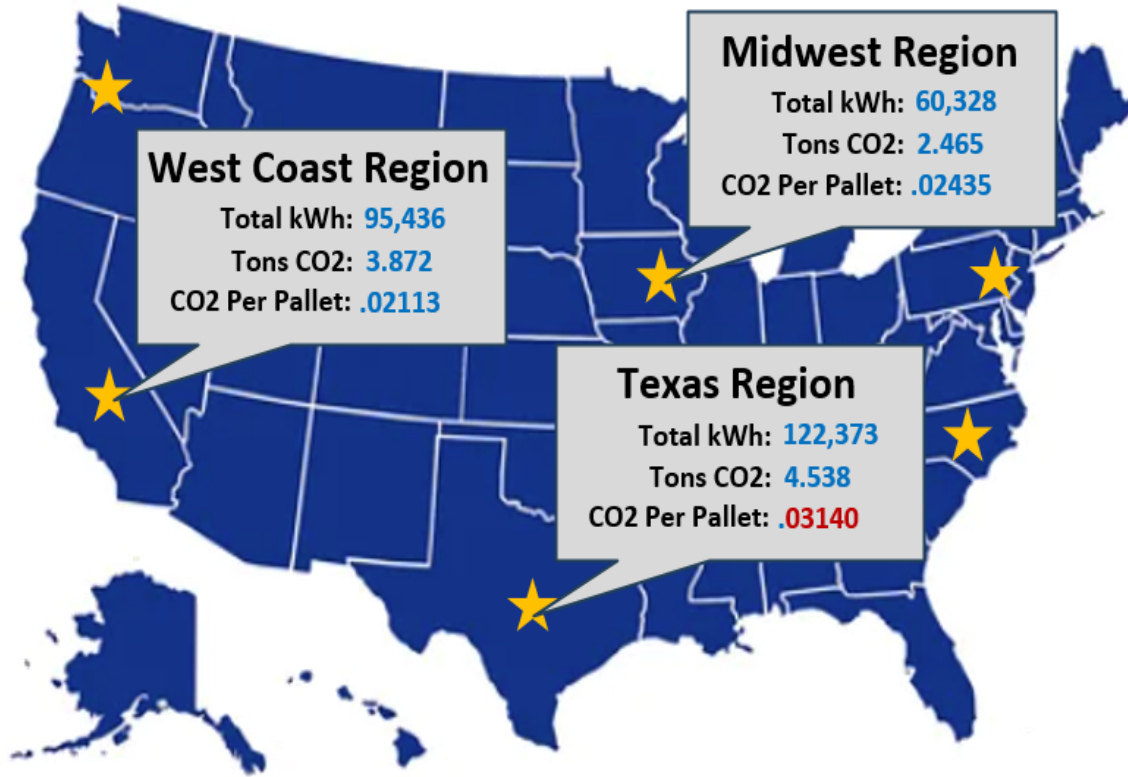
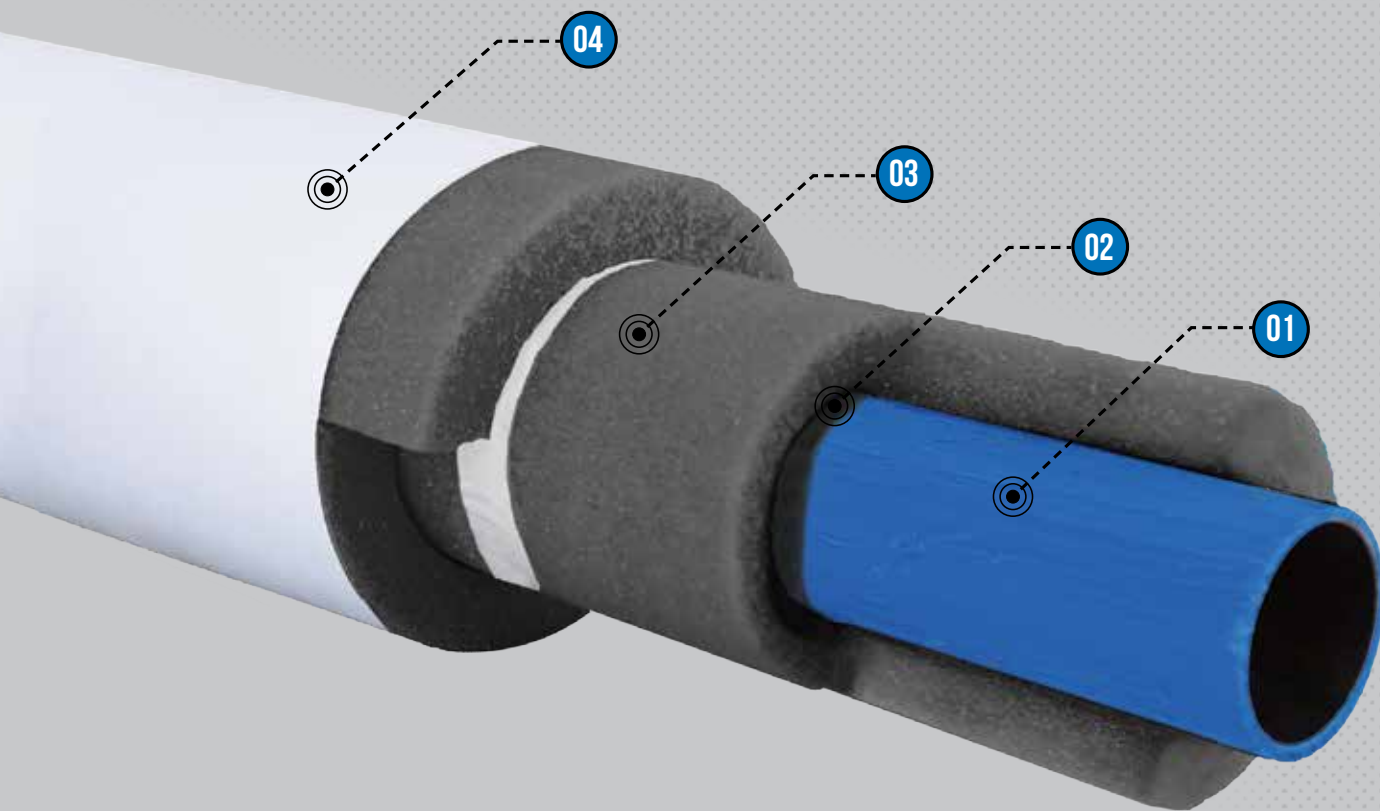


Figure 17. Corporate carbon tracking with KPIs.

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- 02** VaporGuard™ for use as a vapor stop on sub-freezing insulation systems.
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- **Decreases operating costs** – Replacing fossil fuel based-heating systems with a highly efficient heat pump lowers operating costs.
- **Reduces carbon footprint** – Reducing or eliminating fossil fuel with a heat pump paves the way towards zero-emission targets.
- **Meets sustainability goals** – It's a future-proof investment, especially as stricter guidelines develop on carbon emissions and environmental compatibility.



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