



How to Win the International Laboratory Freezer Challenge

Produced By My Green Lab With Funding Support From:





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Introduction

The International Laboratory Freezer Challenge (Freezer Challenge) is a global competition for laboratories designed to promote best practices in cold storage management. As a program partnership between the [International Institute for Sustainable Laboratories \(I²SL\)](#) and [My Green Lab](#), the Freezer Challenge harnesses the spirit of competition within and between laboratories to achieve greater energy efficiency, sample integrity, risk prevention, and cost savings.

Freezer Challenge participants have joined from over 27 countries worldwide from academia, government, and industry to better understand and reduce their environmental impact in this fun, annual competition. To date, Freezer Challenge participants have already saved a cumulative 23.7 million kWh since 2017, with the impact continuing to grow. According to the United States Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator, that's enough to offset the carbon emissions associated with driving over 41 million miles in a passenger vehicle!

This guide is intended to deliver the basics of the Freezer Challenge Competition, including concepts and actions participants can utilize in the Freezer Challenge to reduce their environmental impact. Freezer Challenge participants are encouraged to use this guide in conjunction with other updated and in-depth materials provided on the Freezer Challenge website, www.freezerchallenge.org.





Part I: Understanding How the Freezer Challenge Works

Who Can Participate in the Freezer Challenge?

The Freezer Challenge welcomes any laboratory in the world with cold storage units, making it a unique competition that brings together laboratory representatives from academia, government, healthcare, and industry from all over the globe.

When is the Freezer Challenge?

The Freezer Challenge is an annual event that takes place over a six-month time span between January 1st and July 1st every year. Participants can join anytime during the six-month window and are encouraged to prepare before the January 1st date. Despite the Freezer Challenge being a six-month long competition, labs can count any efforts they have made with their cold storage from August of the previous year until July 1 of the current year.

What are the benefits of participating in the Freezer Challenge?

Freezer Challenge participants will benefit from:

- Reducing energy consumption, costs, and environmental impact of the lab.
- Learning and applying proper cold storage maintenance techniques to help avoid future failures.
- Removal of unneeded or unviable samples from cold storage units, freeing up that space for new samples without having to purchase additional refrigerators and freezers.
- Reduced costs associated with maintaining extraneous cold storage units.
- Improved researcher access to and security for viable samples.
- Development of ongoing cold storage management practices that support efficiency and maximize lab space utility.
- Participation recognition, plus awards!

How Much Does the Freezer Challenge Cost?

There is no cost for participants of the Freezer Challenge thanks to the generosity of our global Freezer Challenge Sponsors.

When Can I Sign Up for the Freezer Challenge?

Anytime between January 1st to July 1st, but labs are encouraged to register as early as possible to ensure adequate time for team participation. Labs can even indicate their interest to join before January by signing up on the Freezer Challenge website. When the competition launches, labs will be notified via email.

Where Can I Sign Up for the Freezer Challenge?

Participants can sign up at www.freezerchallenge.org.

When

January 1-
July 1

Every Year

Cost

Free

Sign up

www.freezerchallenge.org

For the latest information, be sure to sign up for [My Green Lab's monthly newsletter](#).



Does The Freezer Challenge have Awards?

The Freezer Challenge recognizes top award-winning organizations and laboratories in each of four sectors:

Academia

Pharmaceutical
and biotech

Government

Clinical, hospital,
private research,
or other

Top organization award winners in each sector receive a commemorative plaque, lab winners receive certificates, and all receive international marketing recognition through My Green Lab and their marketing partners. Furthermore, the organizations and labs that do exceptionally well two years in a row are eligible for the “Winning Streak Awards” if they won the competition last year and beat their energy savings target from

the previous year in the current year. All winners are recognized at the annual [International Institution for Sustainable Laboratories \(I²SL\)](#) annual conference, which takes place in September or October subsequently after the Freezer Challenge event. Finally, winners are highlighted in a digital news article. For 2022, this will be in the Lab Manager magazine.

How is the Freezer Challenge Scored?

Freezer Challenge participants utilize a scoring rubric, capturing the actions teams take to reduce their cold storage impact. The rubric and more information regarding Freezer Challenge scoring can be found at <https://www.freezerchallenge.org/how-scoring-works.html>. In July, when the competition ends, My Green Lab reviews the lab’s data and estimates the energy savings resulting from the lab’s efforts. Participants receive communication about their impact in August.

Anything Else Important to Know?

A laboratory participating in the Freezer Challenge is defined as a group of scientists that work and collaborate in a similar physical space while accessing the same fleet of cold storage equipment. For scale, all members of a lab should know the other members of their lab. If you wish to be considered for a Lab-Level Award in the Freezer Challenge, you must fill out your scoresheet reflective of the actions your one single lab has accomplished since August of the previous year. If you indicate that your scoresheet reflections actions from more than one lab, you are not eligible to win a Lab Award, only overall Organization Awards.

Where Can I Find Additional Resources to Compete?

My Green Lab has developed and updated a Freezer Challenge [Participant Kit](#) which all participants can utilize. Participants are encouraged to visit www.freezerchallenge.org and subscribe to the [My Green Lab's monthly newsletter](#) for regular updates.

Additional resources include information for [Freezer Challenge Site Coordinators](#), which is a critical role for Freezer Challenge participation, and [tips for how to run successful internal competitions](#).



Part II: Setting Your Team Up for Freezer Challenge Success

What's Your Motivation?

With hundreds of laboratories around the world doing the Freezer Challenge, it's inevitable that labs will have different motivations for participating. Successful Freezer Challenge participants often identify a key reason for their team's interest, which helps to establish buy-in from their organization and laboratory peers.

For past participants, reasons to participate include:

- Tackling sustainability in the lab head-on by saving energy.
- Getting their lab's cold storage sample management under control.
- Improving their lab culture by working toward a common goal.
- Reducing risk through preventative maintenance.
- Progressing an organization or team's current sustainability efforts.
- Encouraging an organization or team's first step in their sustainability journey.
- Having fun and trying something new!

No matter what a team's reasons are for becoming a Freezer Challenge participant, all participating labs should identify a team "Why" that brings them together around their sustainability goal.





Do You Have Organizational and Team Buy-in?

The Freezer Challenge is a fun, no-cost opportunity to bring new sustainability practices into your organizational culture and lab space — but new things are often hard to accomplish in a work environment. As such, making sure your Freezer Challenge team has approval and support from your laboratory supervisors and the organization is an important step early in the competition. Successful ways team have built internal support for participation in the Freezer Challenge include:

01

Establishing a schedule or plan so not all Freezer Challenge actions are done at the same time, and instead are spread out over six months.

02

Discussing the Freezer Challenge early with supervisors and staff to ensure concerns about workflow and production are minimized.

03

Building a coalition of people interested in the Freezer Challenge to gain internal momentum and excitement.

04

Highlighting the benefits of the Freezer Challenge to the workplace, including energy savings, better laboratory practices, and employee engagement.

Who Are Your Freezer Challenge Internal Champions?

Not only is getting buy-in from your organization and laboratory team important to ensure success but often establishing a Freezer Challenge lead or “champion” is a great way to make sure your Freezer Challenge team is on track and progressing towards their goals.

The good news is that a Freezer Challenge champion can be anyone on your team who is excited to make a positive change in your lab’s environmental impact. The designation can be as informal or formal as you wish, but making sure you’ve got someone (or multiple people!) who is eager to lead your team’s efforts is a best practice that sets your team up for success.



Part III: Reducing Your Cold Storage Impact

Let's get down to it, The Freezer Challenge is about one main thing: Reducing your cold storage impact! While this seems straightforward, laboratories must weigh many variables unique to their laboratory, meaning that each Freezer Challenge participating team will have a unique roadmap to success.

Preventative Maintenance

One of the easiest and most obvious actions laboratories can take for cold storage is routine maintenance. Like a car, your lab freezers will require some degree of maintenance to keep them running smoothly (and efficiently) year after year, but often freezers are overlooked for maintenance until it is too late.

As such, some of the first things you should consider as you implement your freezer challenge activities are:

- Understanding what cold storage units (and how many) you have in your lab.
- Understanding any preventative maintenance (PM) programs your organization already has in place.

The key to a good baseline is, thus, understanding where you already are in your cold storage process — how many and what kind of units do you have, and how are they currently being (or not being) maintained. This is usually the beginning conversation in your Freezer Challenge journey, opening a dialogue about Preventative Maintenance (PM) activities between your laboratory personnel and your facilities or operations team at your organization, and ideally setting you up for long-term collaboration around your freezer practices. It is likely that your building, operations, or facility team will be thrilled to hear that your lab is hoping to get a better handle on your laboratory cold storage.

Understanding Your Cold Storage Units

First step first- what sort of cold storage units do you have in your lab, and how many? To find out, you need to look at your freezer's nameplate to discover its make and model and start an inventory of your current units. The nameplate for many refrigerators and -20°C freezers is usually readily accessible, placed inside the opening of the main door. For ultra-low temperature freezers, the nameplate is usually on the back or side of the unit.

The best way to embark on doing Preventative Maintenance of your freezers is to first check your make/model's user manual, published by the manufacturer, for what is recommended. If you have misplaced the hardcopy user manual, you can usually find a copy online on the manufacturer's website or check with your facilities manager.





Now that if you know how many freezers you have, and what type — you're better prepared for what's next — understanding what best practices are to keep your freezers maintained and operating properly. Refer to the user manual for what is recommended and how frequently. If the user manual is light on PM recommendations, form your own schedule with the resources provided below. Above all, find out what, if any, PM tasks are already being done for you by your facilities, maintenance, operations, or building team. You may be surprised! But if nothing is being done, it's good to find that out too, right?

Filter, Coil, and Intake Maintenance

There are many PM measures a laboratory should routinely accomplish to ensure the optimum freezer operations, but the most frequent and easy to identify activity is making sure your filters, coils, and intake are clean and free of debris. Dust and other particles naturally build up on your filters, coils, and at air intake overtime, which reduces your freezer's ability to dissipate heat. Ultimately this leads to your freezer cycling more frequently, being less efficient, and consuming more energy.

Luckily, these activities are not too complicated or time-consuming. Filters can be removed, vacuumed, or washed in a sink. Condenser coils can be vacuumed **gently** to remove dust. Intake areas on your freezers can be wiped clean, brushed, or vacuumed to remove built-up dust. Simple preventative maintenance can often lead to real savings. For more information on simple preventative maintenance activities such as this, My Green Lab's Freezer Challenge [Resources page](#) holds YouTube videos made by the National Institutes of Health that demonstrates some of these PM actions.

Doors, Gaskets, and Preventing Frost

Frost is another enemy of freezer efficiency, preventing proper freezer sealing and air circulation that can lower the overall efficiency of your cold storage units. As part of your PM routine, frost prevention is an easy to see, easy to manage activity that can reduce your laboratories impact as well as gain you points in the Freezer Challenge.

The focus of your frost prevention activities should be to prevent thick, hard frost build-up from occurring. This can happen quickly as freezers are utilized, so PM is key. The most basic way to do this it to brush the frost from the interior of freezers as needed, but ideally on a weekly or monthly basis. Even if you've never done this before, utilizing the Freezer Challenge to set up new routines is a great way to ensure proper maintenance and functionality. If you keep on top of this PM task, hard, thick ice shouldn't form, leading to a freezer that is running optimally.

To "brush the frost", you will need the right tools, which are easy to find and inexpensive. Gloves, a soft brush, and an ice scraper (yes, like what you'd use on your car) will be enough to get the job done for all but the thickest ice buildup. Even then, with your soft brush you can gently tap any hard ice built up with the back of your brush, which might break up the ice that you can then brush away.

Tackle all surfaces, like the outer door, inner doors, shelves, and walls (when accessible), perhaps over the course of a day so you don't leave your freezer door open too long. Remember to be gentle and go slowly- while you may be eager to clear ice buildup from your cold storage, you do not want to damage the unit.



Typical Gloves, Soft Brush & Ice Scraper



As in all preventative maintenance, keeping an eye on your freezers is critical. Thick ice can build up quickly and often is a symptom of other issues such as a broken door seal or your freezer door being left open for a long time.

It is also important to ensure your door gaskets (soft, malleable plastic pieces along the inside of the freezer door) are also free of ice — but be careful when touching these! You don't want to rip, tear, or otherwise injure them. A door gasket is very expensive to replace. **We recommend never using a scraper on the door gasket.**

Keep in mind that if you have a -20°C freezer that is auto-defrost, you may never get frost or ice build-up. But many -20°C freezers, and all ultra-low temperature freezers, are manual defrost, so ice will build up over time.

If you have thick ice (not frost) built up inside your freezer, it might be time to consider a full defrosting of the unit. The [Resources Webpage](#) on the Freezer Challenge website has more information about ice prevention for your Freezer Challenge team.

Full Freezer Defrost

As mentioned, sometimes ice accumulation in a lab freezer may be the result of a serious equipment or usage problem, such as a leaky door gasket or frequent door openings. Regular preventative maintenance can help your team quickly identify and remedy such issues, but sometimes your cold storage will require a full defrost to eliminate ice buildup that is either persistent or too thick to remove with simple tools. If you have ice build-up thick enough that you can't brush or scrape it out, or you're having trouble accessing your samples, then it is time for a Big Thaw.

You may have heard the myth that ice build-up in lab freezers is a good thing — that ice build-up 'proves that the freezer is working' or 'insulates the freezer when the door is opened'. We've heard it too. But what we know is that rather than protecting the freezer, large amounts of ice force your freezer to work harder to maintain temperature and may lead to warm pockets due to poor air convection. This not only forces your freezer to

work harder, but due to uneven cooling, can put your samples at risk.

The Freezer Challenge is the perfect opportunity to do a defrost on your laboratory freezers that you've identified require it through your PM, something that can benefit your whole lab. If you find units in need a full defrost, here are some recommended steps you can take:

Step 1: Plan Ahead

Consider doing a defrost at the end of the work week so the freezer can remain off and ajar over the weekend to completely dry out. Remember, all the built-up ice will turn to water — so be ready to come back to that, and ideally, you have a floor drain in the room.

Before turning off your freezer, it's also overlooked but best to make sure you alert anyone that should be notified. Who would that be? This can include others in

your laboratory that may use the freezer being defrosted, but also your building maintenance team. Many freezers have a temperature monitoring system installed which alerts someone when the freezer is powered down, so notifying whoever manages the alarm system is a good idea. Simply put, clear communication to anyone who might care about a freezer being defrosted is a best practice, that way, there are no surprises or disruptions during your defrosting session.



Step 2: Protect Your Samples

All those frozen samples will need a new, temporary home — so make sure to plan in advance where to temporarily store your samples. This can be placed, such as, in backup freezers at your department or institution, or by asking nearby labs if they have any space to spare. Make sure that if you move your

samples to another laboratory freezer, you coordinate and notify that team appropriately. Alternatively, you can place samples in coolers with dry ice, though be sure to do so in a room with sufficient ventilation. You know your samples, so make sure you have a plan in place to protect them appropriately!

Step 3: Do the Defrost!

We have gathered [several resources on the Freezer Challenge website](#) from the competition sponsors, as well as others like the National Institutes of Health, that provide details of how to do full defrosts of freezers. In addition, below are some step-by-step ideas for how to do a full defrost on a freezer:

- Remove all your samples from the unit, safely storing them in other freezers with available space.
- Place water collection basins, or absorbent towels in front of the freezer to collect any water that pools during the defrost process. Collapsed cardboard boxes can even work for this purpose - just ensure they fully dry back out before returning them to a recycling bin.
- Power down your freezer and unplug it.
- Prop the door open with a spare freezer rack or other object.
- Let the freezer warm up and dry out over the weekend.
- Once completely dry, you can use a mild detergent to clean the freezer shelves and walls if desired.
- Close the freezer door and turn the unit back on.
- Clean up any water from the floor around the unit.
- Once the freezer reaches set-point again, you can put your samples back in the freezer. You may need to do this in batches to prevent large temperature fluctuations.
- If applicable, ensure your temperature alarm system gets reactivated once the defrost process is complete.

Final Thoughts on Preventative Maintenance

Performing PM on a regular basis allows a freezer's compressors or engine to work more efficiently, leading to longer compressor life, longer freezer life, and reduced energy use.

If you take the actions mentioned above, be sure to record them on the Freezer Challenge scoresheet in the "Cold Storage Maintenance Best Practices" section. We estimate that doing these best practices results in about a 10% energy savings on an annual basis.



Inventorying and Sample Management

Inventorying samples can be tough — especially when the samples you're sorting through belong to people who have long since left the lab — not to mention that it can be tedious (and chilly) work. Being said, it's a no-cost opportunity to help your lab be more efficient with valuable cold storage space. Here are a few of our favorite reasons to commit to inventorying your samples:

- **Management:** If you can't read what is on the tube/box/vial, it's likely no one else on your team will be able to either! Either add it to the inventory with an expiration date or dispose of it properly!
- **Access:** Updating the lab's inventory now will make it much easier to find samples you need quickly and efficiently later.

- **Compliance:** Your EHS or SHE team will thank you for your inventorying efforts! It's safer and more compliant to know what's in your cold storage units.
- **Space:** Discarding old or expired samples will free up space for newer samples to come in. This could help your lab avoid expanding your cold storage fleet further, saving your team money, floor space, and conserving energy!
- **Exposure:** Minimize door openings of your lab's cold storage units by knowing where to look to find materials in your refrigerators and freezers — this is safer for your units and samples.

Whichever way you decide to set up your inventorying and sample management, be sure to get permission to discard unneeded lab samples and dispose of them through the proper Environmental Health & Safety or Biosafety channels at your organization.

Alerting and Monitoring Systems

Opening your freezer to look at your samples is no big deal, right? Well, that's true if it's only once in a while. However, what about the one team member who is constantly in and out of the freezer retrieving and shuffling around samples? This can be not only detrimental to the samples themselves - which need to be stored at consistent temperatures - but may be wasting an extraordinary amount of energy.

How can you figure this out? Cold storage alerting and monitoring solutions make it easy to collect data and pinpoint the root cause of freezer abnormalities in the lab. Implementing a digitally-enabled cold storage alerting and monitoring system can help you protect your samples, understand your freezer usage, and identify if your freezer sample management needs adjustment.

Get started by talking with your facilities and lab operations team about how your refrigerators and

freezers are monitored today. Discuss the features of the current system and how it is being used to actively monitor cold storage units for consistent temperature, alarms, and alerts for out-of-range temperatures and/or door open events. If you do not have an existing system or your current system is lacking key features, such as real-time alerting, talk with your team about evaluating a new cold storage alerting and monitoring solution.

An alerting and monitoring system can offer a number of powerful benefits.



Remote Monitoring and Real-Time Alerts

Your freezers work nights and weekends and never take a vacation. A weekend freezer failure can lead to irreversible sample damage. All of the energy and time that went into creating and testing those samples would also be lost with them. A system that detects out-of-range temperatures and notifies lab members via text, email, and/or voicemail can save your samples and all the work that went into them.

Best practices for monitoring and alarm systems:

- Confirm all cold storage units are actively monitored
- Verify the temperature alert thresholds against sample storage requirements
- Set all alert thresholds to identify doors left open or failures, but make sure to not cause frequent alerts for short temperature spikes.
- Ensure alerts are not just audible alarms requiring a person to be present in the area physically. Alerts should be sent via text, email, or other means that reach people even when they are not on-site.
- Review the list of people receiving alerts regularly, and ensure they can take action if needed.

Open Unit Door History & Reporting

Knowing how often a freezer is opened and how long a door is open can provide valuable insights that you can use to improve sample management and identify excess cold storage capacity. To take advantage of the data from your alerting and monitoring system, setup monthly (or weekly) reporting of door open history and review the data to identify these potential insights:

- **Utilization insights:** A report showing the number of times a door is opened can identify which cold storage units are most actively used. A unit opened infrequently may have samples inside that are no longer needed and can be disposed of to create extra space. Alternatively, a freezer opened very frequently may cause frost or other issues. Samples from heavily-accessed units can be allocated across different units to balance out access.
- **Sample Management insights:** Tracking the average time a door is open can show where samples are easy to find versus if people are struggling to find their samples quickly. Identifying the units with long average door open times can show where improvements can be made in sample management. Once the issue is identified, labs can improve inventory and sample management by implementing techniques described in this guide. Furthermore, well-organized freezers without the clutter of old or expired samples can lead to quicker access and reduced energy consumption.





Does it NEED to be in the Freezer?

One of the things the Freezer Challenge is designed to do is challenge assumptions and help share information regarding cold storage best practices so that you can optimize your freezer use. Some of the questions you may want to ask as you do your inventorying are, “Does this NEED to be in the freezer?” and “Am I storing this sample at the warmest effective temperature?”. If you do, you may find yourself surprised.

DNA Sample Storage Example

The following is an overview of just one room temperature sample storage strategy available to labs. There are other companies and systems in use around the world too, but My Green Lab may not be aware of all of them.

Today, the technology exists to move many DNA and RNA samples from the freezer to room temperature storage, resulting in a multitude of benefits without sacrificing

sample integrity. Let’s focus on just one sample type that can be brought in out of the cold immediately — DNA — with minimal investment and significant benefits. Annually, millions of DNA samples are collected for forensic investigations around the world. DNA extracts are typically required to be preserved for years and, in some cases, in perpetuity. The current standard of practice is to freeze these samples.

This process creates a multitude of logistical, technical, and financial issues that laboratories are striving to address. Many forensic laboratories describe a significant burden from growing inventories of DNA samples that must be retained. This requires the purchasing and maintaining of additional freezers, which take up valuable lab space, and there is always the risk of freezer failure, which could have downstream investigative impacts. In some instances, samples critical to ongoing and past investigations have been lost due to power outages or inventory mix-ups.

Storing DNA samples at room temperature is easily achievable. Active Chemical Protection technology has been utilized and published on for many years by laboratories storing DNA at room temperature. The technology chemically coats the DNA molecule, and once dried, can be preserved for years. No expensive equipment or environmentally controlled conditions are required. Furthermore, the process can be adapted to high volume lab automation systems to facilitate converting large banks of frozen samples to room temperature storage.

Storing DNA and RNA samples at room temperature can lead to a reduction in carbon footprint with significant energy cost savings and the ability to easily access and re-analyze valuable samples. DNA and RNA samples may only represent a portion of overall laboratory freezer inventories, but the journey of a thousand miles begins with one step.

While this brings up a specific example of DNA samples that can be stored safely outside of cold storage, as your team goes through inventorying your freezer samples as part of the Freezer Challenge, raising the question “Does it belong in the freezer?” may have some surprising (and beneficial) answers. Moving samples that do not require cold storage can lead to more efficient use of your freezer space and possibly the opportunity to reduce your cold storage needs completely at some distant point in the future.





Sharing Cold Storage Space

The Freezer Challenge is all about efficiency — not only making sure your cold storage units are running efficiently but your cold storage is being used efficiently in your day-to-day operations. The Freezer Challenge rewards teams who find ways to utilize cold storage space effectively — which can include sharing space — hopefully reducing the overall need for cold storage in your facilities.

Make sharing cold storage unit space a standard practice at your organization by “opening your freezer door” to a colleague or neighboring lab group if you have available space! Here are a few examples of why sharing cold storage might be a useful solution for your organization:

- **Limited Needs:** Your lab is brand new, and you don't yet have enough samples to fill a refrigerator or freezer, even partially.
- **Limited Resources:** Your lab doesn't need all that much freezer space, so you decide to go in on the purchase of a freezer with another lab in your department to save money and floor space.
- **Multiple Locations:** You have lab spaces in multiple buildings at your institution, so you co-locate most of your cold storage at the main lab space and share space with another lab for the satellite site.



- **Sample Redundancy:** You arrange to place irreplaceable samples in the freezer of a nearby lab in duplicate of what is in your lab's freezer instead of purchasing a second freezer for redundancy.
- **Sample Protection:** Your refrigerator or freezer isn't holding temperature well, so you send your samples to another available cold storage space until your unit is repaired and returned.

Sharing freezers is one of those win-wins that laboratories should always consider as part of their freezer management to save money, company resources, and environmental impact.

In the short term, sharing freezer space is a simple way for your colleagues to store samples while they defrost a freezer or vice versa. But, in the long term, sharing freezer space can lead to bigger savings — such as energy use and precious laboratory floor space. Additionally, sharing freezer space can lead to intangible but beneficial outcomes — things such as collaboration with other researchers and being more strategic with research funds. Finally, sharing cold storage space can also lead to a reduction in waste in your supply chain. By not purchasing new equipment, raw materials are not used to create something new, and all the resources that would have been used to run the equipment are not expended. Sharing freezer space is all about cooperation, and for those organizations that accomplish such, it can lead to big gains in their laboratories' resource efficiency.

Sharing Tip

If you have concerns about sharing cold storage space, try starting off the arrangement by setting clear expectations with everyone involved, outlining rules and responsibilities for protecting everyone's samples, and posting important contact information on the outside of the refrigerator or freezer. Be sure to consider who will pay for preventative maintenance or repairs when those are needed later! Once you consider sharing cold storage space, you can move on to evaluating what other laboratory equipment (both commonplace & comparatively inexpensive, as well as the high-cost items) your lab could be effectively sharing with nearby labs and teams.

Remember: If you share cold storage space with other lab groups, be sure to record that on your Freezer Challenge scoresheet!



Energy Efficient Upgrades, Rebates, and Retirements

In many labs, replacing a freezer can often be an expensive, time-consuming task. While swapping the contents to a new unit can be logistically challenging and labor-intensive, proactively upgrading an aging freezer, instead of waiting for a compressor failure, allows you to plan and prepare to move samples on your own schedule rather than in an emergency situation.

The opportunity to upgrade a freezer is also a great opportunity to discard old samples and ensure that your new freezer is organized and properly inventoried, not to mention the many benefits modern freezers offer: better capacity to footprint ratio, tighter temperature tolerances, and, of course, an improved carbon footprint through more environmentally friendly refrigerants, reduced power consumption, and lower waste-heat output. However, one challenge shared by many labs in taking this proactive step is finding room in their budget to upgrade their equipment.

While funding must be secured for cold storage upgrades or replacement, many utilities and governmental agencies offer a traditional, post-purchase rebate for qualified customers to upgrade to energy efficient freezers.

Every location is unique when it comes to cold storage funding and rebates, and Freezer Challenge participants should research to determine opportunities they may qualify for in their location. For labs in select areas of the United States (currently, MA, WA, RI, NY, CA, and MI), midstream rebates on cold storage equipment are also available, adding the opportunity to upgrade and replace their units.

These midstream rebates, also known as Instant Rebates, are handled supplier-side and are reflected as a discount on your invoice, reducing the total out-of-pocket cost. There's no need for complicated paperwork or figuring out reimbursement, as qualification and redemption are all handled between your freezer supplier and a utility program administrator. In this US case, you simply purchase your ENERGY STAR® certified ULT freezer (and, in Massachusetts or Rhode Island, a high-performance lab-grade freezer or refrigerator) from a participating supplier and see the rebate reflected right in your purchase price!

Wondering how your lab can take advantage of instant rebates? Most ULT freezers that meet ENERGY STAR® requirements qualify for these rebate programs in the US. More information can be found at <https://www.energystar.gov/buildings>

The good news is that participating suppliers know which products they offer are eligible for instant rebates. They can recommend qualifying ENERGY STAR® cold storage that meets your capacity and performance requirements. Location eligibility is determined by the utility program administrator where your lab is located. If you are unaware of your lab's electric provider, this can easily be determined by checking your address or zip code at one of the sites below. You can also reach out to your equipment supplier to confirm your lab's eligibility. In some states, even high-performance lab-grade freezers and refrigerators, such as those used for plasma or blood storage, are eligible.

Re-Examining the "Repair or Replace Decision"

Due to the high price tag of this capital equipment, older, power-intensive ULTs are often run and repaired up to the very end of their useful life until repairs become cost-prohibitive and force a replacement. During this time, the wear to the gaskets, door latch and alignment, and other wear and tear also make compressors work harder than normal, causing a larger power draw. These failures can lead to other issues, such as increasing frost and ice buildup and sweating condensation that pools around the freezer.

This makes freezers with this issue more expensive to operate with lower performance and less stable temperatures, negating any savings seen by opting for a still-costly repair instead of a replacement. Instant rebates can change the cost equation making an upgrade to a new energy-efficient ULT the smarter choice.

Proactively upgrading your ULTs as they near the end of their useful life, particularly with an ENERGY STAR® certified model, is one of the fundamentals of creating a more environmentally sustainable lab. It's a commonly cited statistic that your average older ULT consumes as much electricity as a single-family US household (1) and upgrading to an energy-efficient ULT can reduce that power consumption by up to 75% (2). HVAC savings from waste heat emitted from older models can be even more significant.



Retiring Units

The way to save the most energy through the Freezer Challenge is to get unneeded cold storage units unplugged and out of the lab. Your team could be at the point of retiring one or more units for a variety of reasons:

- Effective sample clean-outs, especially of unneeded samples, can free up enough space so that remaining samples can be moved to other units. This can allow one or more units to be unplugged or permanently retired.
- Shifting to higher density storage and smaller sample storage volumes can enable you to store more samples in less space.

To receive points in the "Retirement Without Replacement" section of the Freezer Challenge scoresheet, you must plan to have refrigerators or freezers unplugged for at least one year or be in the process of disposing of a unit. If you can, prioritize disposing of your oldest, most energy-consumptive units first. Remember that the "Retirement Without Replacement" section is different and separate from the "Energy Efficient Upgrades" section of the Freezer Challenge.

Crash Course on HFCs

HFCs, or hydrofluorocarbons, are a class of potent greenhouse gases that are commonly used in refrigeration systems, air-conditioning units, building insulation, fire extinguishing systems, and aerosols. They have come into use as a replacement for other chemicals that are ozone-depleting; however, HFCs pose issues of their own. Namely, they have a high global warming potential (GWP) — anywhere from 1,000 to 9,000 times greater capacity to warm the Earth's atmosphere than carbon dioxide. Since HFCs are still common, they might be in your laboratory's

cold storage units' refrigerators, freezers, and cold rooms. You can look on the nameplate of your unit for the exact make and model number of your refrigerator or freezer, and from there, look up the refrigerant used online.

Better refrigerant management worldwide is one of the top ten most impactful climate change solutions in terms of gigatons of carbon dioxide reduced/sequestered, according to [Project Drawdown](#). "Refrigerant Management" means avoiding leakage of refrigerants into the atmosphere and the effective destruction of refrigerants at their end of life.

Worldwide, proper refrigerant management could reduce carbon dioxide emissions by approximately 57 gigatons by 2050. Managing refrigerants in these ways has a much larger impact on mitigating climate change than recycling, electric cars, geothermal power, and forest protection combined.

Final Thoughts on Repair or Replace

If you're retiring a refrigerator or freezer this year, take an interest in its end of life. Ask your facilities management team or equipment recycling team how the refrigerants are being removed and inquire into what will happen to the refrigerants next. Furthermore, make sure your freezer is disposed of expeditiously — you don't want it to start leaking!

If your lab is purchasing a new freezer, avoid purchasing units that contain HFCs. There are laboratory cold storage options now that use hydrocarbons or other materials, which have a small fraction of the global warming potential of HFCs. Ask your preferred supplier or cold storage manufacturer if they use natural refrigerants in their products!





Part IV: Recognition for Your Efforts

Congratulations — your Freezer Challenge team has identified and completed a series of activities designed to reduce your overall energy use and carbon footprint — now it's time to submit your scoresheet!

If you haven't already, it may be helpful to formulate a plan with your lab on how to tackle the remaining time in the Freezer Challenge as you prepare to submit your scoresheet. If you're the Freezer Challenge "Champion" on your team, this is a great time to reach out to your laboratory colleagues to make sure everyone is ready for the final steps in the process. Here are some ideas on how to finish strong:

- Establish a "Freezer Friday" each month until the end of the challenge and spend the afternoon completing scoresheet actions.
- Divide & conquer- ask other lab members to each go through their own freezer boxes, discarding unneeded or expired samples (ask everyone to keep a record!) by a deadline you set — then add those group actions to the scoresheet.
- Set aside a particular week where you and your lab team will focus on all your lab's cold storage at once.
- Commit to spending just one hour a week on Freezer Challenge actions.

The bottom line is coordinate, communicate, and make time to accomplish what you set out to do!

Conclusion

The Freezer Challenge is a great opportunity to not only engage your team in a fun and impactful project but a way for your laboratory to take agency over your equipment that can lead to real environmental change. My Green Lab in partnership with I2SL sees the Freezer Challenge as a way to not only make real immediate gains in energy efficiency but hope the program will be utilized as a part of your organization's annual effort as you aim to achieve positive environmental change year after year. Furthermore, as you likely already realize, doing the Freezer Challenge is excellent for your scientific research and lab environment, too, improving your access to samples, making your lab more resilient, and allowing for a bit of time devoted to this essential equipment category.

We believe small, collective changes can lead to large, global impact- and My Green Lab and I2SL are here to support the scientific industry's journey forward in environmental sustainability. To continue to find ways you can make a difference in laboratory sustainability, visit www.MyGreenLab.org and www.I2SL.org.

Scoresheets can be accessed and submitted at <https://www.freezerchallenge.org/> before the July 1st deadline to receive team credit for the Freezer Challenge competition.



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