Environmental Health and Safety
General guidance for cold storage integrity during a power outage

Cold storage integrity must be maintained in a laboratory during a power outage to minimize damage to stored materials while power is out. Download the LiveSafe mobile app for emergency notifications. This document includes guidelines for the following:

- Emergency backup measures, such as dry ice usage.
- Immediate actions upon power loss.
- Temperature fluctuation documentation.
- Temperature monitoring procedures.

Before a power outage

Download the LiveSafe mobile app and follow these procedures to prepare for a power outage:

- Create an emergency contact list:
  - Determine and assign designated personnel who will respond during any power outage.
  - Ensure the contact information of the responding personnel is accurate, included in CEMS and posted on the cold storage unit.
  - Have a contingency plan if lab personnel are unavailable.
- Designate critical samples that are highly sensitive to temperature fluctuations or have a higher priority status for maintenance and, therefore, require immediate attention during a power outage.
- Determine sample placement. Place critical samples towards the back of the freezer so that the temperature can be maintained for a longer time.
- Determine the approximate volume of dry ice to maintain samples during a power outage. Email EHS or call 480-965-1823 with questions.
- Develop a lab-specific standard operating procedure to protect materials and research from damage during a power outage, as appropriate.
- Establish critical temperatures and associated actions based on the samples stored in the cold storage unit, length of outage and other considerations.
- Evaluate available backup power sources like generators or cooling options, such as dry ice.
- Identify backup power outlets and confirm equipment containing critical samples is plugged into the backup power sources where applicable.
- Monitor temperature logs regularly to identify any cold units that are not functioning optimally and service as necessary.
  - Maintain detailed records of cold storage unit temperatures. Track any deviations and identify potential issues. An external temperature display is preferred to avoid opening the freezer during a power outage.

Important notes

In the event of a power outage, the university provides guidelines for dry ice usage.

- Be extremely cautious when opening the freezers after the power outage.
- Do not stand directly in front of the door swing.
- Have a buddy system in place when reopening the freezers.
- Limit dry ice usage to the following for each 24-hour period, as dry ice quantities vary based on the freezer type and space available within the freezer:
  - **Bottom-freezer**: 15–25 lbs.
  - **Chest or upright single-unit freezer**: 40–50 lbs.
  - **Side-by-side freezer**: 30–40 lbs.
  - **Top-freezer**: 20–30 lbs.

- Maintain and calibrate all cold storage units properly to function optimally during power outages. Verify battery pack temperature displays are operational.
- Regularly train laboratory personnel on cold storage emergency procedures and update emergency plans as needed.
- Tailor guidance to the unique needs of the samples stored, considering their sensitivity to temperature changes.

ASU Environmental Health and Safety advises against storing dry ice in refrigerators, coolers or freezers unless specifically designed for dry ice storage during normal operations. One pound of dry ice can produce up to 250 liters of gaseous carbon dioxide. This can result in a pressure buildup inside the unit and a potential for over-pressurization in a sealed container due to thermal expansion: In an emergency situation dry ice may be used to maintain temperatures for critical units.

During a power outage

Perform these procedures during a power outage:

- Immediately minimize door openings.
    - During a power loss, avoid opening cold storage units unless absolutely necessary. Most freezers will maintain temperatures at or below freezing for up to 10 hours if kept closed and properly sealed.
- Monitor temperature readings from all cold storage units having external temperature displays at regular intervals.
- Use dry ice if the power outage is prolonged. Place dry ice packs strategically within cold storage units to maintain low temperatures. Follow dry ice safety instructions provided in this document.

Contact EHS at 480-965-1823 with questions or concerns.

Communication and reporting

Notify relevant personnel immediately and inform designated emergency contacts about the power outage. Document all actions taken and steps to manage cold storage units during the power outage as appropriate.

After power restoration

Perform the following steps after power has been restored:

- Assess the integrity of stored samples and reagents, considering the duration and temperature fluctuation during the power outage.
- Clean up water condensation collected around the unit to avoid slip hazards.
- Discard any samples[1] that may have been compromised due to temperature excursions using the appropriate waste stream, if necessary.
- Report any losses to the ASU Office of Risk Management within 24 hours to initiate insurance loss coverage if available.
- Review and update the standard operating procedures, as applicable. Analyze the power outage event and update the SOP based on lessons learned.
- Thoroughly check the temperature of all cold storage units to ensure the units have recovered and maintain temperature.

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[1] Researchers will ultimately decide when to dispose of the temperature-sensitive materials. Considerations include manufacturer recommendations, viability of organisms, etc.