The *Break the Ice* project

Green Fund End of Year Check-In
04/15/2016

*Team Break the Ice!*

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The problem

Laboratories consume lots of resources
• About 20% of the space on campus is devoted to labs, but they consume around 44% of campus energy (Stats from Harvard)

Freezers are energy hogs
• Ultra Low Temperature (ULT) freezers normally use as much energy as a single family home.
• Energy efficiency further decreases with time due to frost and dust build up.
• But they are vitally important for storing sensitive biological samples
The solution

Provide researchers a swing freezer to use during maintenance and defrosting

Financial implications:
- Energy costs for a ULT freezer are ~$1,700/yr
- ~15 freezers in the pilot; ~70 on Morningside; ~475 uptown
- Defrosting and maintenance improves efficiency by about 10%

Added benefits:
- *Break the Ice* by engaging researchers
- Spread knowledge of best storage practices
- Generate data about campus ULTs
Other universities are engaged in similar work

Similar programs:

• Dartmouth – very similar to *Break the Ice*

• Harvard – 21% reduction of greenhouse gas emission by improving maintenance and subsidizing more efficient freezer purchases

• U. Colorado – increased the temperature of half the on campus freezers to -70 °C, generating ~25% energy savings per freezer

• Stanford – decreased annual campus wide refrigerator and freezer energy usage by 406,058 kWh (vs. 12,000 kWh for a typical single family home)
**Survey:** We surveyed the Chemistry Dept. research groups who have ULT freezers in order to gauge interest in and need for the *Break the Ice* program, and to collect specs on the freezers we would be defrosting in order to make an informed storage ULT freezer choice.

**Site approval:** We identified several sites for the freezer, worked with Pete and Dave to determine whether sufficient electrical and ventilation existed for a new freezer, and got approval from the Chemistry Dept.’s Building and Operation Committee.

**Faculty interviews:** We spoke with faculty members about how to best advertise the ULT freezer and engage the research community. We also discussed freezer administration, financing, and the possibility of integrating the new freezer into existing shared facilities.
Working out the details

A proposed defrost cycle:
1. Sign up for time in
2. Baseline energy use
3. Transfer contents to CLEEN freezer
4. Defrost and maintain freezer
5. Refill freezer
6. Measure energy use after defrosting

Metering: Electronic metering of how much energy freezers use before and after de-frosting is crucial to quantifying the impact our program will have.

Pamphlet: A how-to guide outlining the defrost cycle protocol was created as a useful resource for lab groups.
Immediate next steps

**Freezer selection and purchasing:** Based upon the survey data, we have preliminarily identified several models (e.g. So-low PV85-21)

**Sign-up system and protocol finalization**

- [Browser: Home / Freezer](#)

  **FREEZER**

  This service will become available to the Columbia community soon.

**Building buy-in:**
- Tabling in research spaces
- Demonstrating defrosting effectiveness
Further down the road

- Expand scope beyond pilot
- Convince labs to raise freezer temperatures
- Incentivize transition to newer technologies

Conventional vs. Stirling
Thank you!!!