GETTING A BIOBANK "FIT FOR BLACKOUT" – A REQUIRED INVESTMENT OF RESOURCES?

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In 2022 Biobank Graz – a partner of BBMRI.at - initiated an evaluation of its infrastructure‘s durability during a multi-day power outage. The evaluation aimed to determine critical infrastructure and assess emergency power supply as well as possibly required infrastructural upgrades. The ultimate goal of this study was to make the Biobank Graz "Fit for Blackout" for up to 14 days.

MATERIALS AND METHODS

During the evaluation process, several steps were taken.

1 Definition of critical infrastructure and personnel

Table 1: Schematic table to evaluate the Biobank's critical infrastructure. We considered all our electrical devices and evaluated their importance regarding sample storage. In addition, safety-related infrastructure, such as gas-alarm detectors, and common infrastructure such as elevators (and the existence of an emergency drop) were taken into account. (Y – yes; N – no; UPS – uninterruptible power supply)

Device	Critical/not critical	UPS (Y/N/upgrade necessary)	Emergency Power supply (Y/N/upgrade necessary)	Comments/open questions
A	Critical			
B	Critical?			
C	Not critical			

2 Evaluating the complete- and effectiveness of the emergency power supply

At first, we ascertained which devices are already secured by the emergency power supply. Based on this information we evaluated, with extensive technical support of the Facility Management of the Medical University of Graz (OE-FM), whether non-secured critical infrastructure can either be connected to the emergency power generator or replaced by another, secured system.

Furthermore, the effectiveness of the power generator was examined. Therefore, the power consumption of the critical infrastructure needed to be determined; respective information was only partially available in technical data sheets. To gain more precise data, the OE-FM conducted an electric power consumption measurement (Fig. 1).

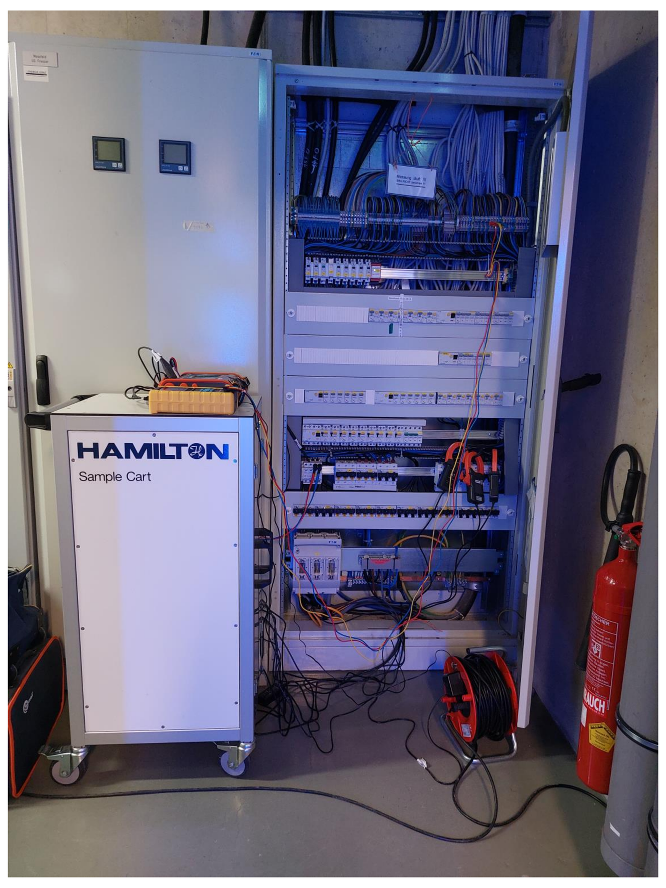

Figure 1.: Electric power consumption measurement of the major refrigeration infrastructure

3 Assessment of options to upgrade the biobank infrastructure in order to ensure the functionality of essential devices in case of a multi-day power blackout

CONCLUSION

During the process of evaluating the blackout-fitness of our biobank, we identified infrastructural weak points which may already become critical in case of a local, short term power outage.

Therefore, *we can strongly recommend to critically evaluate a biobanks infrastructure from the "Blackout point of view".*

During the course of the evaluation process we faced a potential requirement of substantial investments in order to make our Biobank "fit for blackout".

Biobankers are responsible for sample quality assurance. However, considering that a long-term blackout might never happen, we critically raise the following questions:

Where does our responsibility for sample quality end and our responsibility for our environment begin, and do we have environmentally more sustainable storage options?

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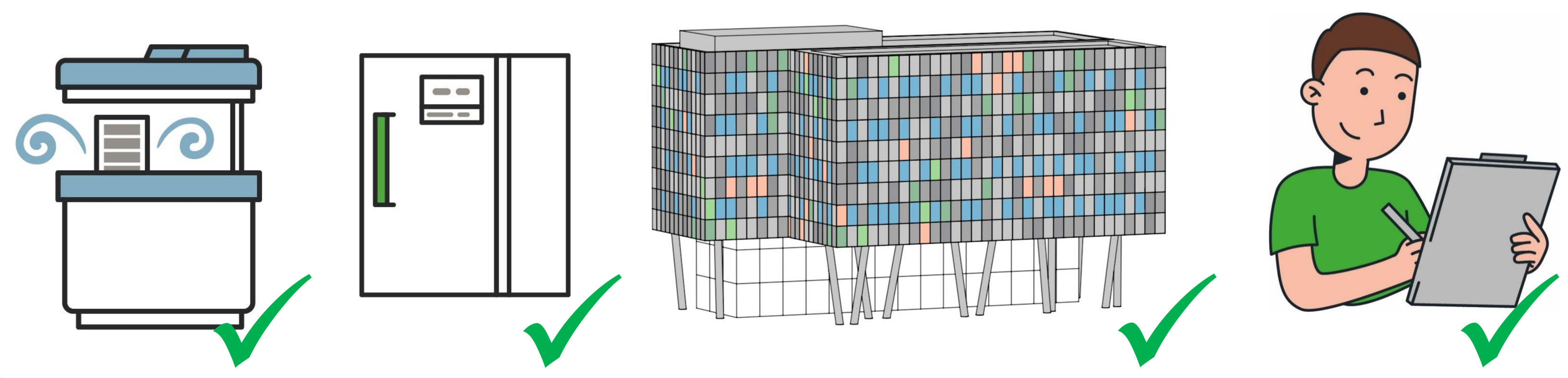
RESULTS

1 Critical infrastructure and personnel

- Everything that is needed to keep the stored samples within our specifications
  - „primary" infrastructure such as cryogenic tanks and freezers
  - „secondary" infrastructure such as facility compressed air, cooling water circuits, and city water (i.e. the cooling water backup in case of a short term power outage)
- Everything that is needed to maintain a safe working environment (such as gas leak detectors)
- „Blackout Concept" in hard copy, including checklists and nominated, trained staff (with residence nearby the biobank) in case of emergency



2 Completeness and effectiveness of the existing emergency power supply

✓ All refrigerated storage systems and safety related systems such as gas leak detectors are provided with emergency power.

✗ Some additional technical facilities needed to operate long-term -80°C storage systems, such as pumps for the cooling water circuit, which are not supported by emergency power (city water is not an option in case of long-term power outage)

✗ As a result of the power consumption measurement the capacity of the emergency power generator needed to be re-evaluated.

3 Required infrastructural adaptions

The evaluation of the critical infrastructure and the existing power supply led to the result that *adaptions are required*.

In order to keep up the functionality of our refrigeration infrastructure during a multi-day blackout, the OE-FM elaborated a *feasibility study*.

Implementation of the feasibility study is a *work in progress*.

4 Lessons learnt

- Scrutinize all critical information („Elevator example")
- Request evidence or data
- If possible, test! („Cryogenic tank example" (Fig. 2), „Black Building test")

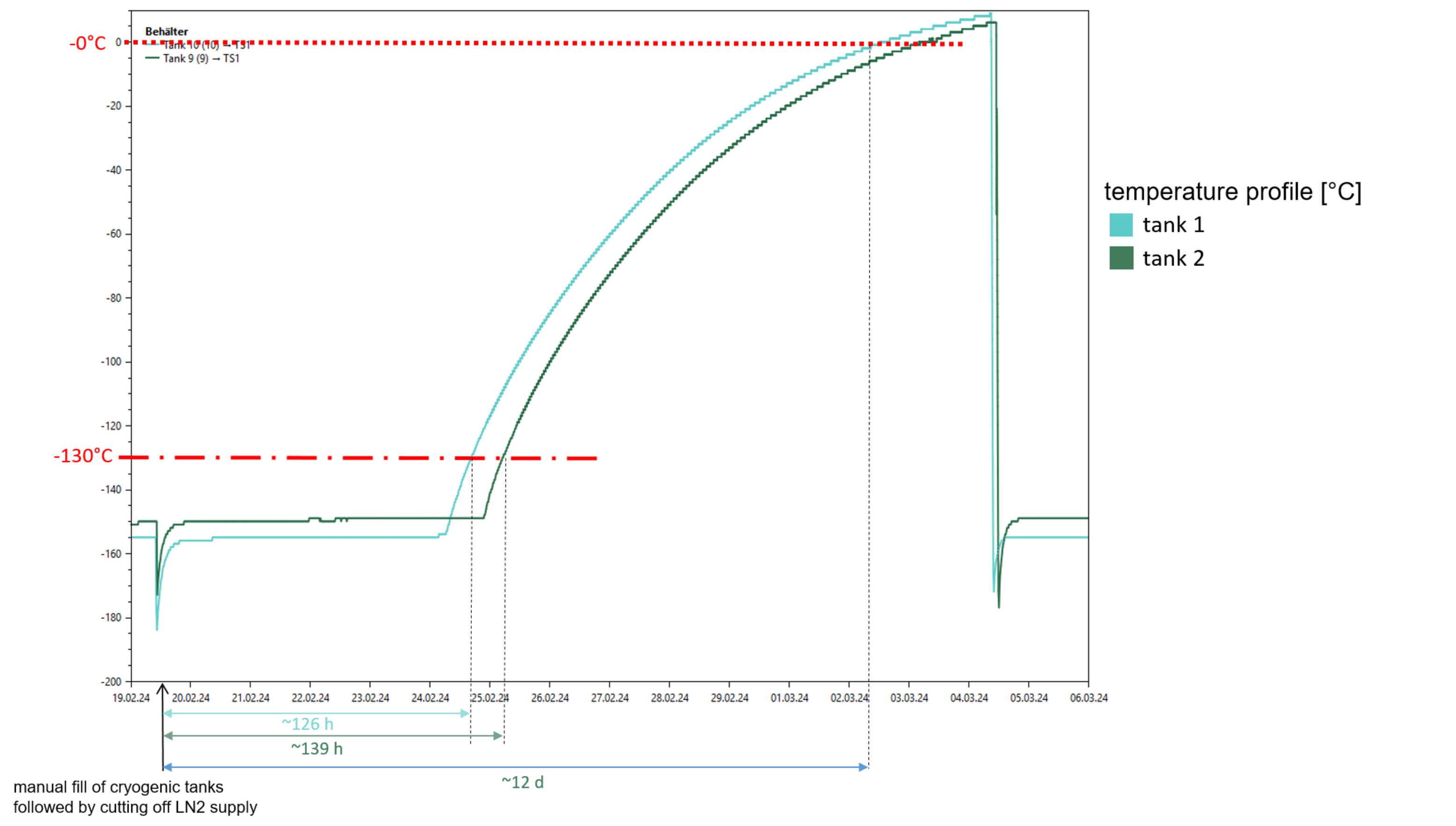


Figure 2.: „Cryogenic tank example". The time interval between manual refill and reaching -130°C and 0°C, respectively, in case of liquid nitrogen (LN2) outage was tested. Two cryogenic tanks were manually filled with 57 L LN2 prior to cutting off LN2 supply. No samples were stored in the tanks during the test period. Within approximately 5.5 days -130°C were reached. After approximately 12 days 0 °C were reached. This test result is considerably inconsistent with the initially obtained information of 50 days durability below -130°C after LN2 outage.

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