



GEF Solar Chill

Training Module 3

COMMISSIONING & OPERATION





MONITORING GOAL

- SolarChill monitoring
 - Cold chain equipment needs proper function
 - Vaccine quality is maintained and secured
 - Safe costs and ensures health



Photo: commons.wikimedia.org



Photo: thermodata.us

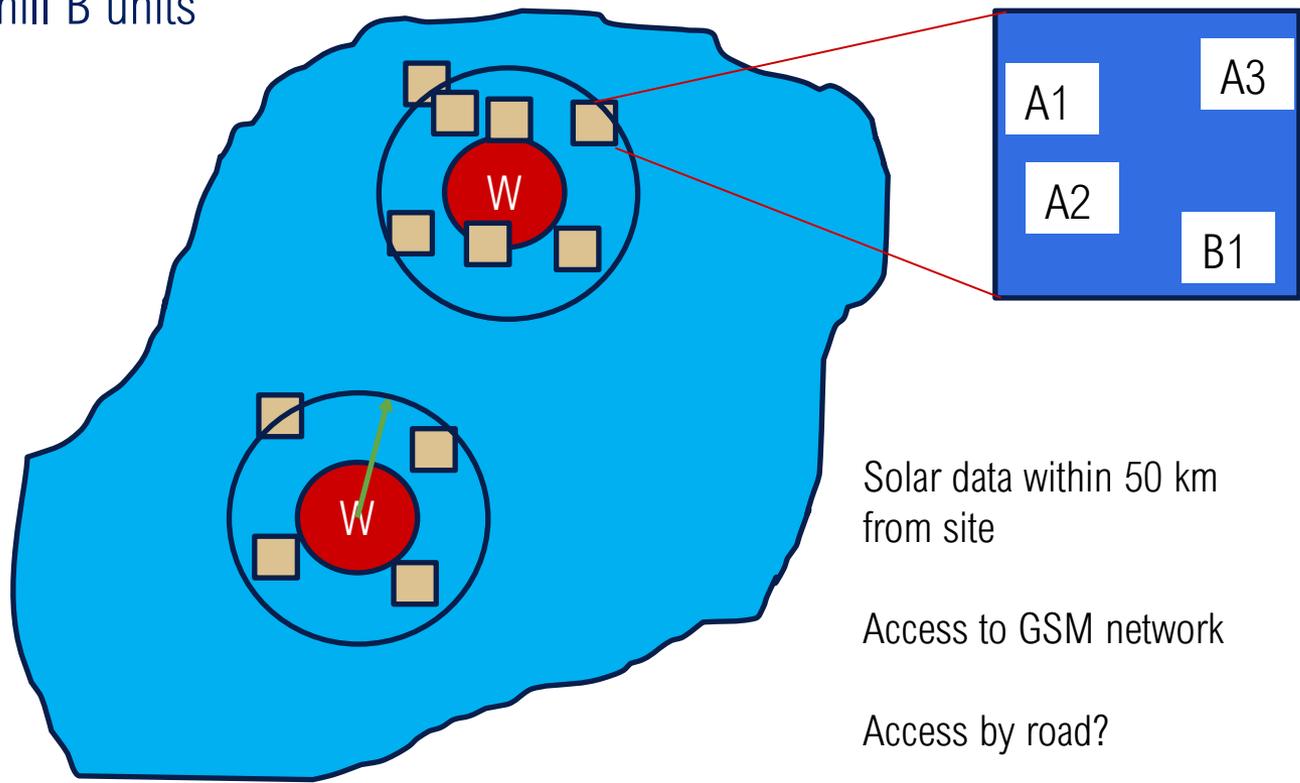


MONITORING EQUIPMENT

- SolarChill monitoring components
 - Remote Terminal Unit (RTU) connected to the local mobile phone network via internal SIM card
 - Sensors for internal temperature
 - Sensors for ambient temperature
 - Other relevant parameters (solar irradiance, humidity...)

MONITORING EQUIPMENT TYPES

- Remote monitoring
 - W = advanced monitoring incl. weather data
 - A = SolarChill A units
 - B = SolarChill B units





BASIC MONITORING STATION

- Brand is not finally selected (being tested)
- May be integrated in cabinet
- Only temperature measurements (internal and external)
- Battery or power supply from fridge PV



ColdTrace temperature monitoring unit with up to 5 sensors with extremely flat cables, which can easily pass under the lid of the fridge without causing an air leak

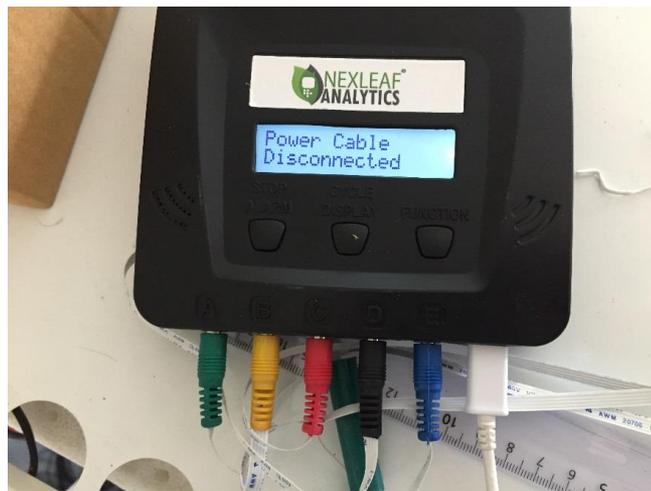
BASIC MONITORING STATION

- Sensor designation
 - A: Ambient (room) temperature
 - B: Top of storage compartment
 - C: Middle of storage compartment
 - D: Bottom of storage compartment



BASIC MONITORING STATION: FIXTURE

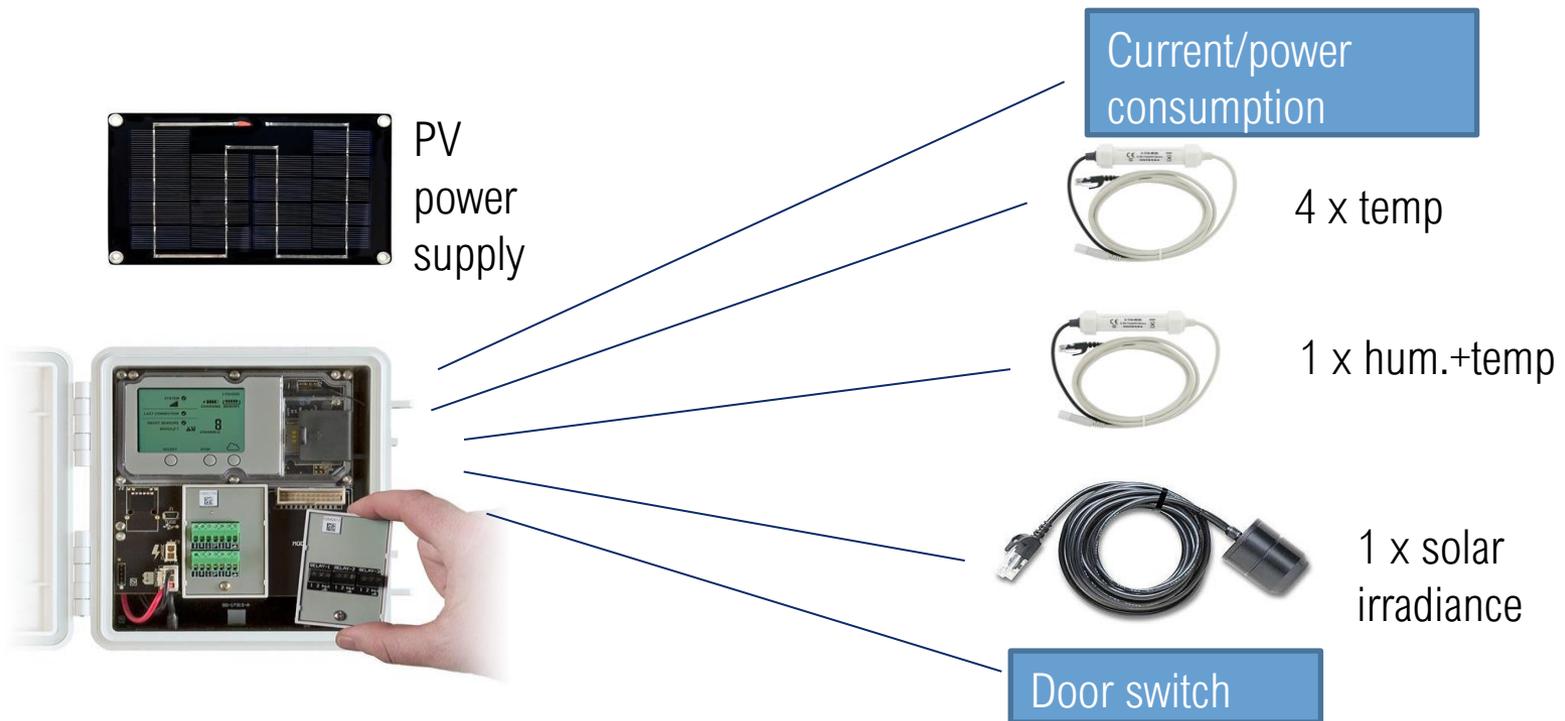
- Check for best GSM signal strength
- Use self adhesive pads (clean surface first)
- Use nylon binders to fix the RTU and cables
- Roll up and fix unused cable length



"Power cable disconnected" appears if voltage is too low for charging and is not critical

ADVANCED MONITORING STATION (ONSET)

- Only for selected sites/systems
- Onset Corporation RTU
- Hobolink Cloud Monitoring Platform (Dashboard)





ADVANCED MONITORING STATION (ONSET)

- Sensor designation
 1. Irradiance
 2. Room temperature
 3. Top of storage compartment
 4. Middle of storage compartment (also hum.)
 5. Bottom of storage compartment
 6. Icepack or evaporator temperature
 7. Humidity (center)
 8. Door opening switch

MONITORING EQUIPMENT INSTALLATION

- Installation details
 - The delivered cable for irradiance sensor is too short and can only be extended with the additional RJ45 connector and cable. Outdoor joint must be protected with the optional connector enclosure
 - Mount sensors close to the walls, but without direct contact
 - Door switch installed with double adhesive tape
 - Flat sensor cables secured with quality tape
 - Careful – cables are delicate



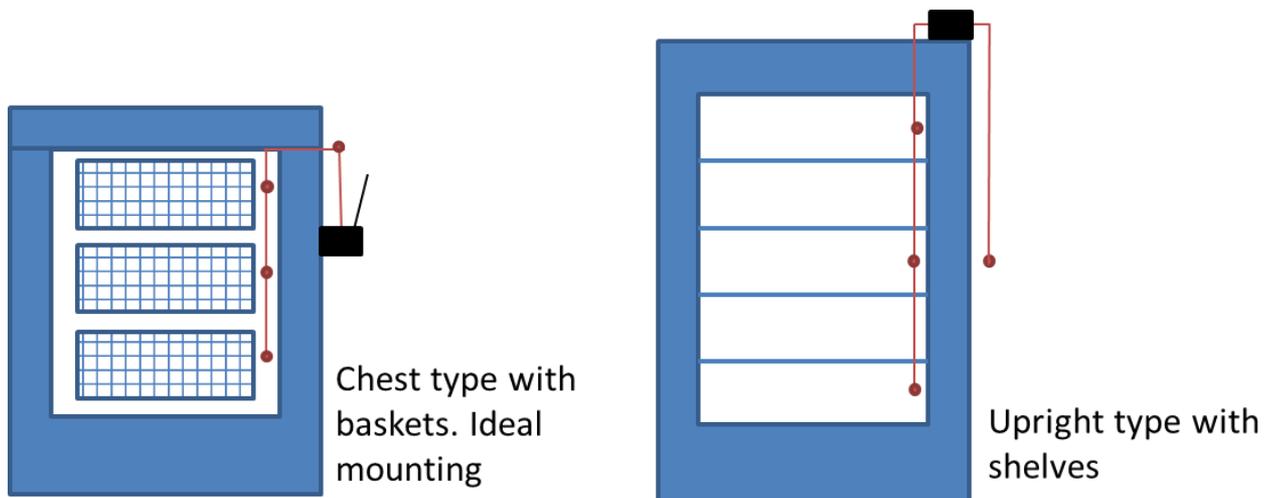


MONITORING EQUIPMENT INSTALLATION

- Mounting of internal temperature sensors
 - Most critical part of the installation process: crucial that the sensors are located in exactly the same way in all units of a given fridge model. (Ideally, the sensors should measure the temperature of the stored goods, but a position in the open space of the storage chamber would make it difficult to take stuff in and out)
 - A position at least 5 mm from the wall is suggested. The sensors must NOT touch the inner cabinet directly. Specific guidelines will be made for each model.
 - In some cases, the sensor cables are too thick to pass under the door sealing without causing an air leak. In this case, a hole must be drilled through the sealing strip or through the bottom of the fridge cabinet. Specific instructions will be given for each type. Sometimes there is already a hole for draining water

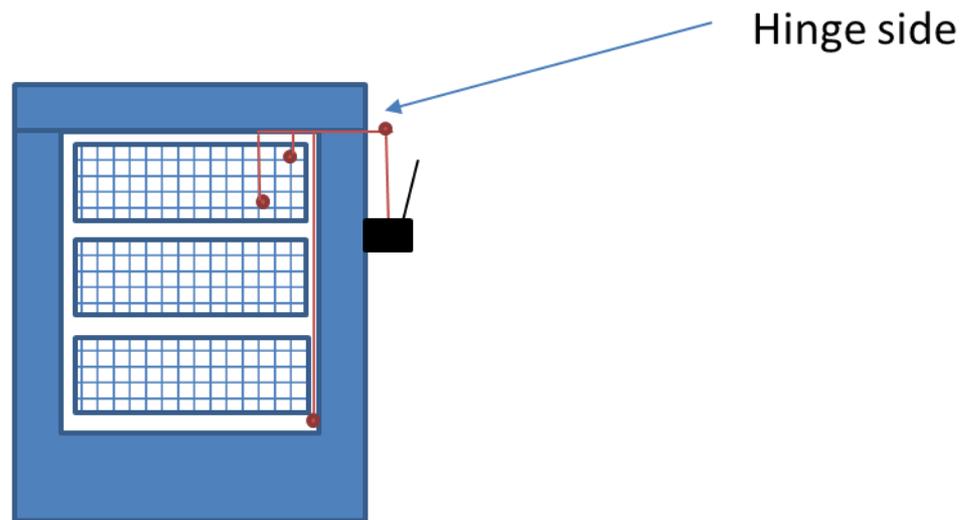
MONITORING EQUIPMENT INSTALLATION

- Mounting of temperature sensors
 - Depends on cabinet construction. Temperature is measured at top- middle and bottom of storage compartment. An additional sensor may measure ice storage temperature.
 - Room temperature sensor is attached to the outside of the cabinet.
 - Sensors should not touch the wall directly but should also not disturb normal use.



MONITORING EQUIPMENT INSTALLATION

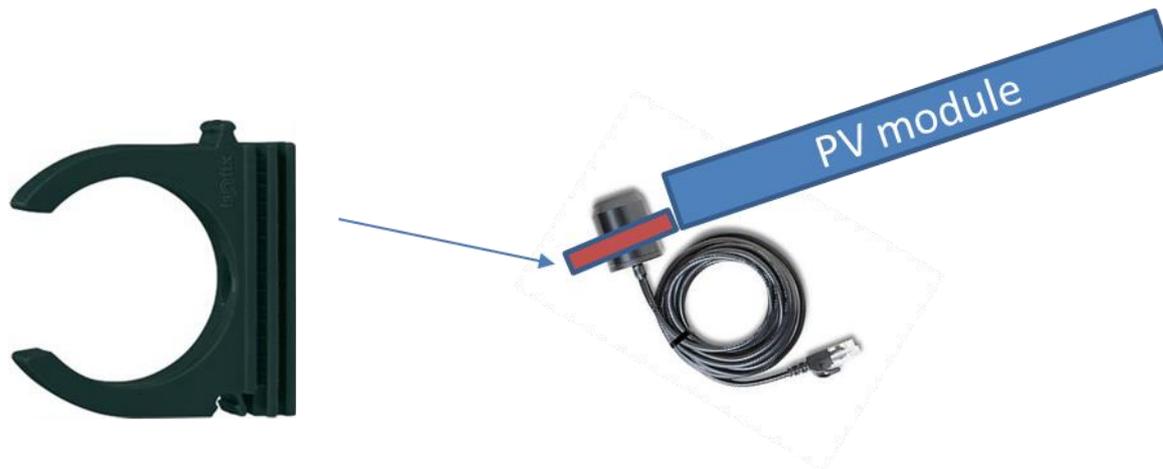
- Mounting of temperature sensors
 - If space is insufficient, let the top sensors hang down from the lid



Chest type with baskets.
Modified sensor positions

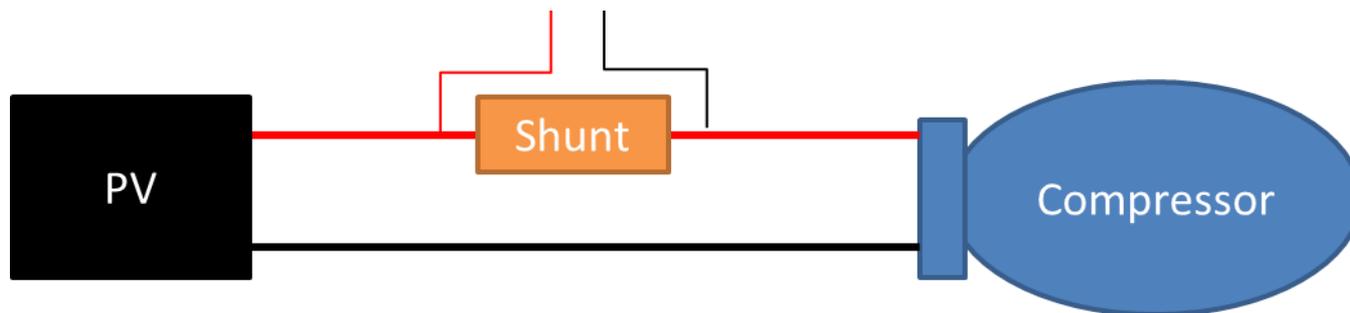
MONITORING EQUIPMENT INSTALLATION

- Mounting of Irradiance sensor
 - This must be placed in the same angle and orientation of the PV system, usually pointing towards the equator and having an angle of 10-30 degrees to horizontal
 - A simple 32 mm pipe fixture holds the circular sensor head
 - It is important that the irradiance sensor is not shaded by any objects, and that it is cleaned on a regular basis



MONITORING EQUIPMENT INSTALLATION

- Mounting of Current sensor
 - The current is measured with a shunt resistor, which is inserted between the compressor + connector and the cable.
 - DTI will prepare a set of cables with appropriate connectors. In worst case, the power cable must be cut and screw connectors be used for the installation.





MONITORING EQUIPMENT INSTALLATION

- Mounting of Open/close contact
 - This is a simple spring-loaded switch that is glued directly to the edge of the lid so that it is activated at each door opening event.
 - A special counter sensor is used to convert the signal for the Onset datalogger



MONITORING EQUIPMENT INSTALLATION

- Installation of RTU
 - Indoor mounting is preferable in order to limit the length of sensor cables and protect the RTU.
 - Mounting directly on the cabinet with Velcro adhesive tape may be the best option
 - If the mobile signal is very weak, it is recommended to mount the RTU in a window sill or search for a location where the signal is better (can be seen on the display)



MONITORING EQUIPMENT INSTALLATION

- Performance monitoring of SDD refrigerators

1. Physical parameters and technical performance

- Automatic data transfer to DTI
- Manual data readings + e-mail (optional energy meters)

2. User experience and actual utilization of fridges

- How many times is the refrigerator loaded or unloaded during the day?
- For combined units, how many icepacks are exchanged per day?
- Reporting of specific problems, such as condensation or mechanical failure of sensor fixtures etc
- General questionnaire / interview of daily users of the appliances and other relevant persons

COMMISSIONING OF MONITORING SYSTEMS

- There are several challenges
 - Correct mounting of cables and sensors
 - Correct connection to power supply (Own PV minipanel or tapping from compressor power line)
 - Correct type and installation of prepaid data SIM card for the local network operator
 - Correct software settings in data logger. DTI will preferably check this before shipment
- Once the installation is in place, DTI will check if the device is active on the relevant internet site



Thank you for your attention!