

FIMER



Whitepaper

The Risks of Longterm Storage of Solar Inverters



Executive Summary

Projects that do not account for the long-term storage needs of sensitive electronics are open to non-warranty liabilities and project delays.

To contend with the complexities in renewable energy projects with supply chain, project finance and incentives, safe harbor of long lead capital equipment has become the norm.

However, not all equipment is alike, and there needs to be special consideration when considering sensitive electronics. Specifically, with solar inverters and converters, there are steps to consider maintaining product longevity and quality if long term storage is required.



Background

The risks of safe harbor are prolonged storage of equipment, which was intended to be operated and maintained under continuous supervision, can exceed the exposure limits of the components and accelerate degradation of components to the point of premature failure. In addition, the lack of constant monitoring can hide underlying issues that can progress beyond the point of repair.

The 4 primary killers of components are:

- Dirt, dust, debris
- Vermin infiltration
- Moisture
- Premature aging of components

Dirt that can accumulate through broken seals can accumulate inside areas of sensitive equipment. Dirt can inhibit the efficiency of the cooling system, which can lead to overheating and accelerated ageing of components.



IMAGE 1: Example of filter with excessive debris



Similarly, mice and insects can gain access to equipment through these same broken seals. Mice not only directly damage equipment through chewing wires and nesting; their droppings can damage sensitive circuit boards and are considered a biohazard, making cleanup difficult if not impossible.

Moisture can come in 2 forms, direct exposure and condensation.

Condensation can form due to the lack of active dew point management. The desiccant that is used for transportation is intended only for a short duration. Desiccant is not a substitute for active dehumidification. In addition, any protective wrapping used for transportation can prevent the flow and drying of moisture against the surface of the equipment, which can lead to premature corrosion.

Condensation can also come from subsurface, if stored on grass or other surfaces that are not well drained.

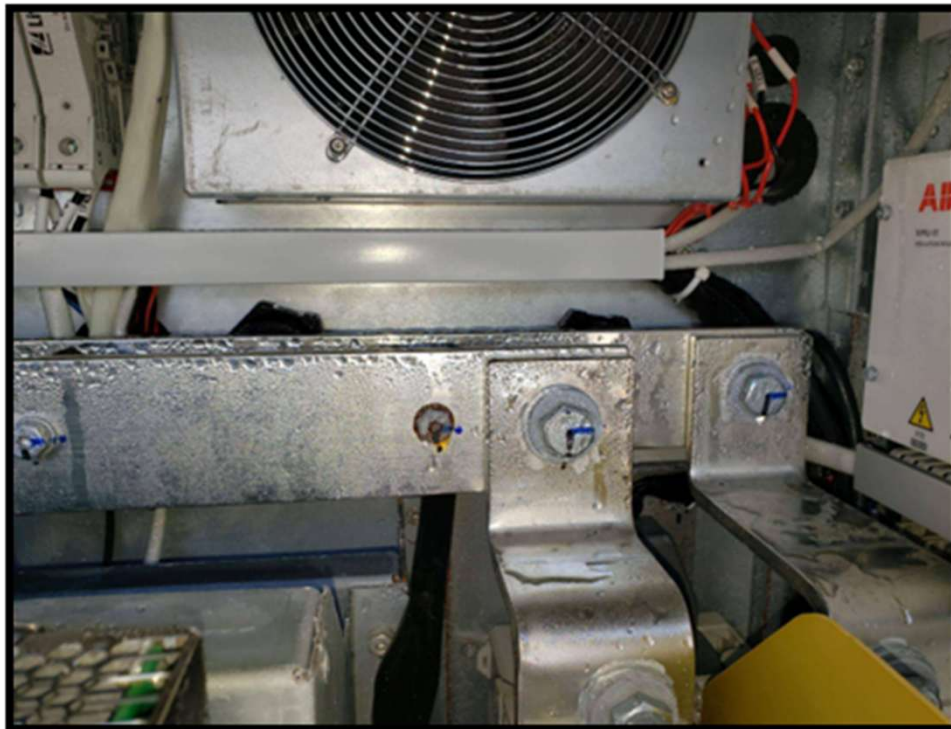


IMAGE 2: Example of condensation buildup

In addition, any protective wrapping used for transportation can prevent the flow and drying of moisture against the surface of the equipment, which can lead to premature corrosion.



IMAGE 3: Example of premature corrosion

Water leaks can occur through these same seals. When combined with dirt and debris, can compound to make it more difficult to clean, as it can form a hard sludge. Water leaks can occur if factory seals are removed, or if door gaskets are not fully engaged. In addition, storing on a slope can allow water to enter gaskets in directions that are not intended and prevent designed drainage paths.

Finally, capacitors have a shelf life of 2 – 5 years, technology dependent. When stored in uncontrolled and unconditioned environments, electrolyte loss and oxide layer thinning can lead to reduced ratings and will not perform as intended.



Takeaways

If long term (> 6 weeks) is a requirement, the following best practice guidelines should be considered:

- To prevent damage to the inverter, keep it in the protective packaging that it is shipped in.
- Always store the inverter in the upright position. Never place it on its side or back
- To avoid condensation inside the inverter, it is recommended to store the inverter indoors in a dry (heated) warehouse.
- Supply power to the internal heaters to keep the inside temperature of the inverter above the outside temperature.
- If power is not available, add humidity desiccant bags inside the inverter. Use desiccant bags if the unit is stored for more than two weeks without using electric heaters. Use 200g desiccant per week. For example, for four weeks of storage, use 800g of desiccant bags. Replace the bags with fresh bags every four weeks and do not open the doors unnecessarily during the storage period. Examples of suitable desiccants: Xdry desiccants “H model” or Clariant® “Container Dri® II- Pole”. When it leaves the factory, the inverter has desiccant bags inside.
- The air inlets and outlets of the inverter are sealed. If it is not required, do not open or remove any protective packaging.
- Make sure that the ground under the inverter is solid, flat, dry, and vegetation-free. Make sure that the ground gives support to the inverter evenly from below. There must be no twisting or stress. Do not put the inverter directly onto bare ground because this can lead to paint damage and corrosion.
- If the inverter is stored outside for an extended period, this can cause damage to protective packaging. If the inverter is kept in the packaging condition for more than 6 weeks from the date of dispatch, it is recommended to change the desiccants after the 6th week and thereafter using 800g desiccant for every 4 weeks.