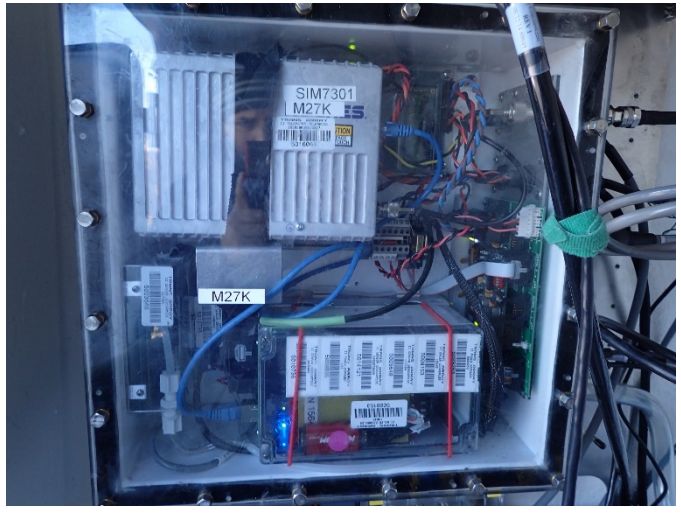
TA Station Power

TIM Meeting, 4/12/2016

Autonomous Power System – In the field



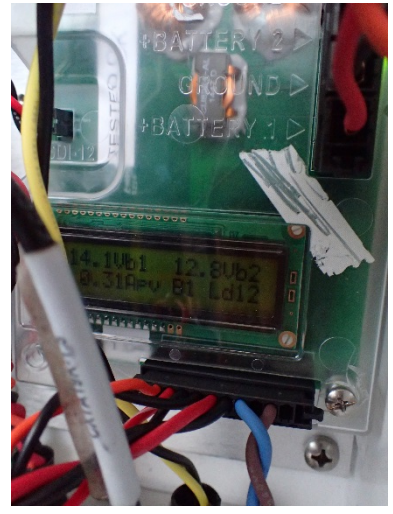
Why Lithium?

-Significant weight and volume savings (41.9Wh/lb vs 21.25Wh/lb)

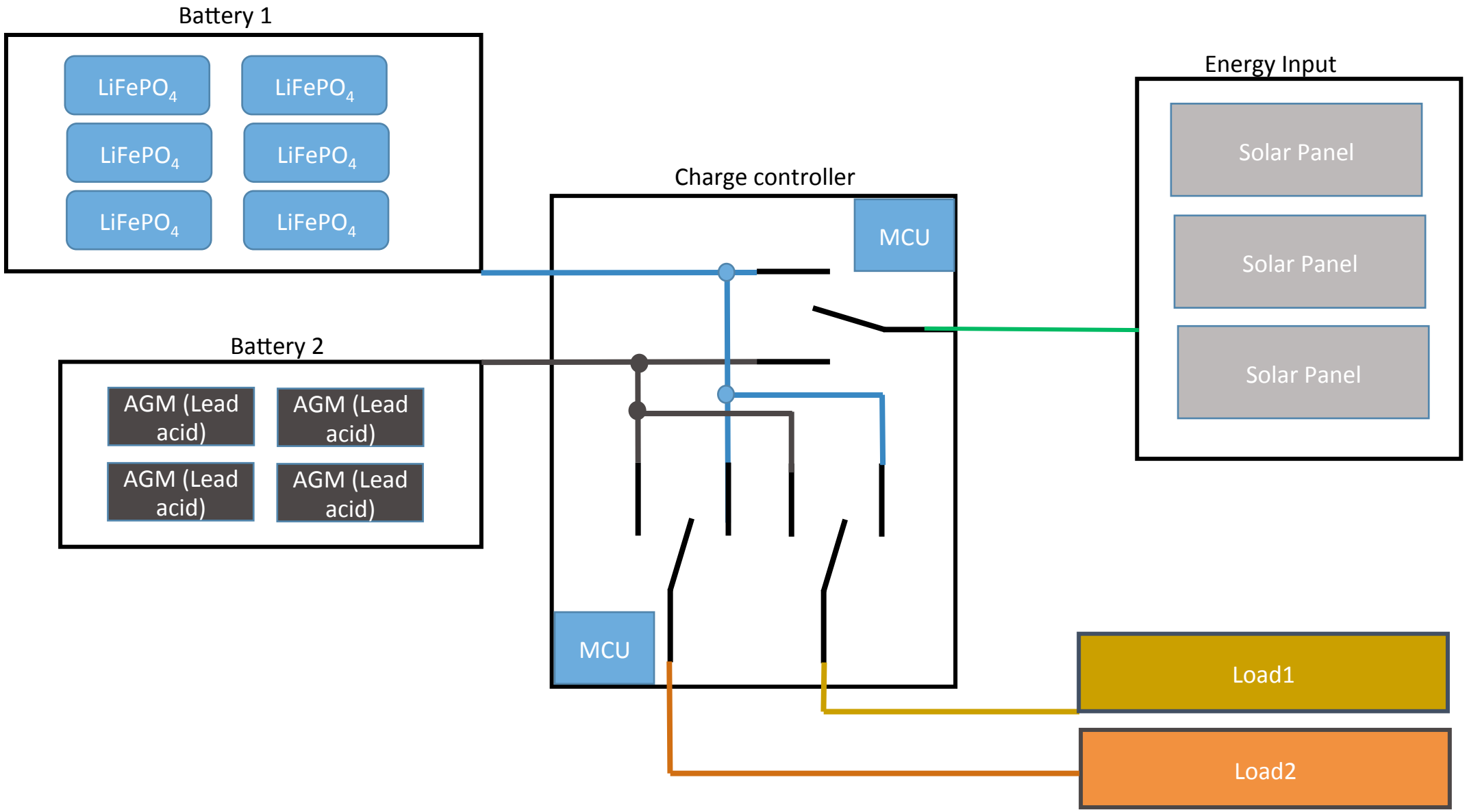
-Improved cold weather and self discharge performance

-Improved lifespan

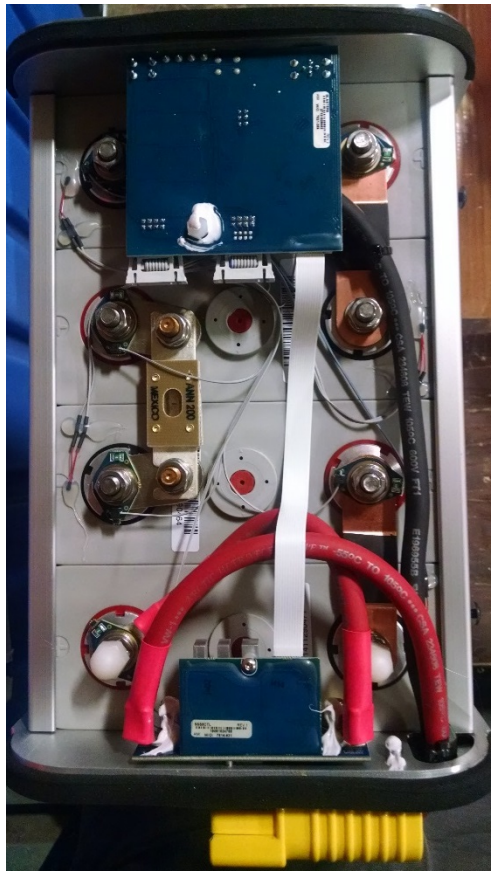
-Increased cost and complexity

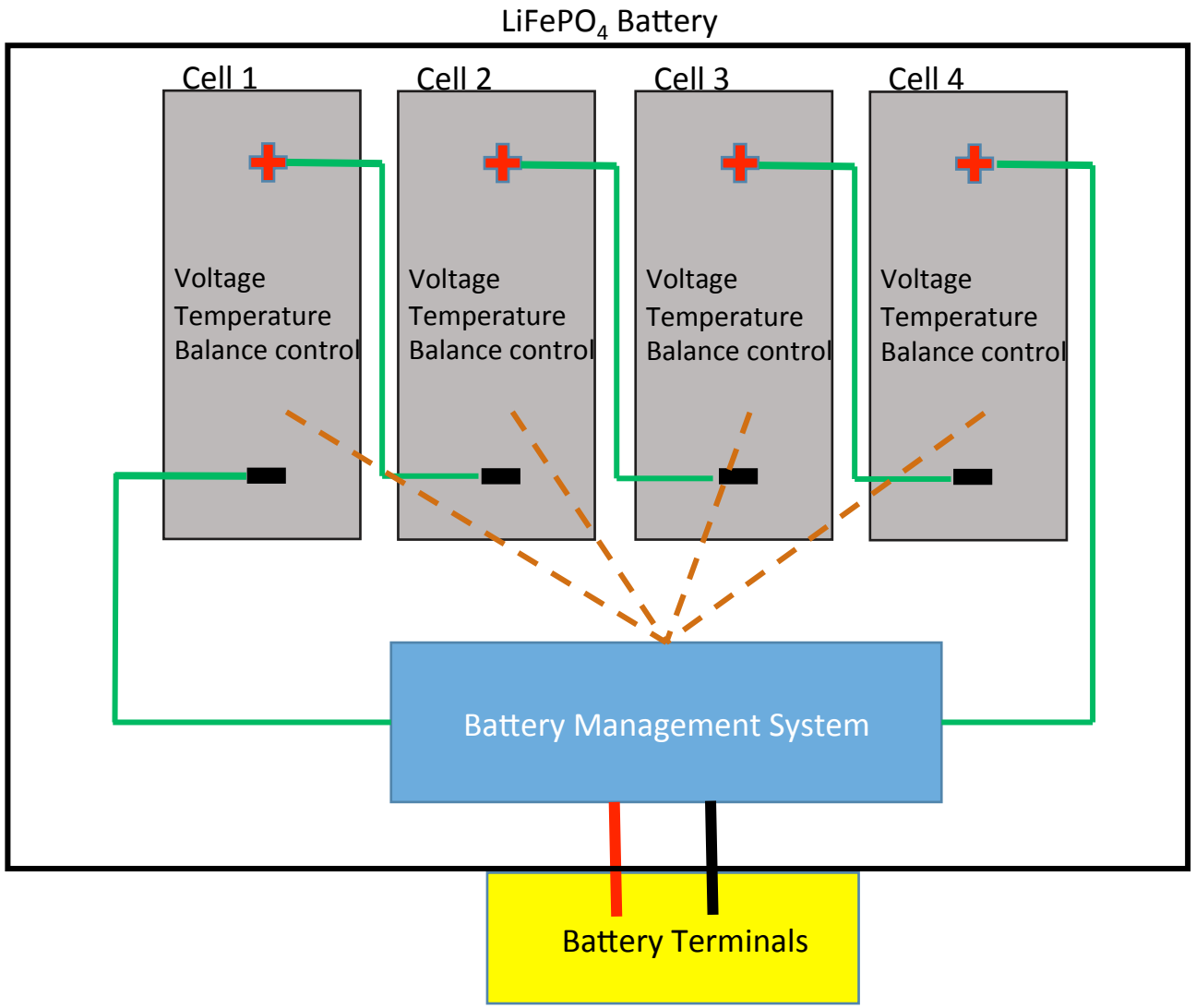


Autonomous Power System Block Diagram



Lithium Battery Block Diagram





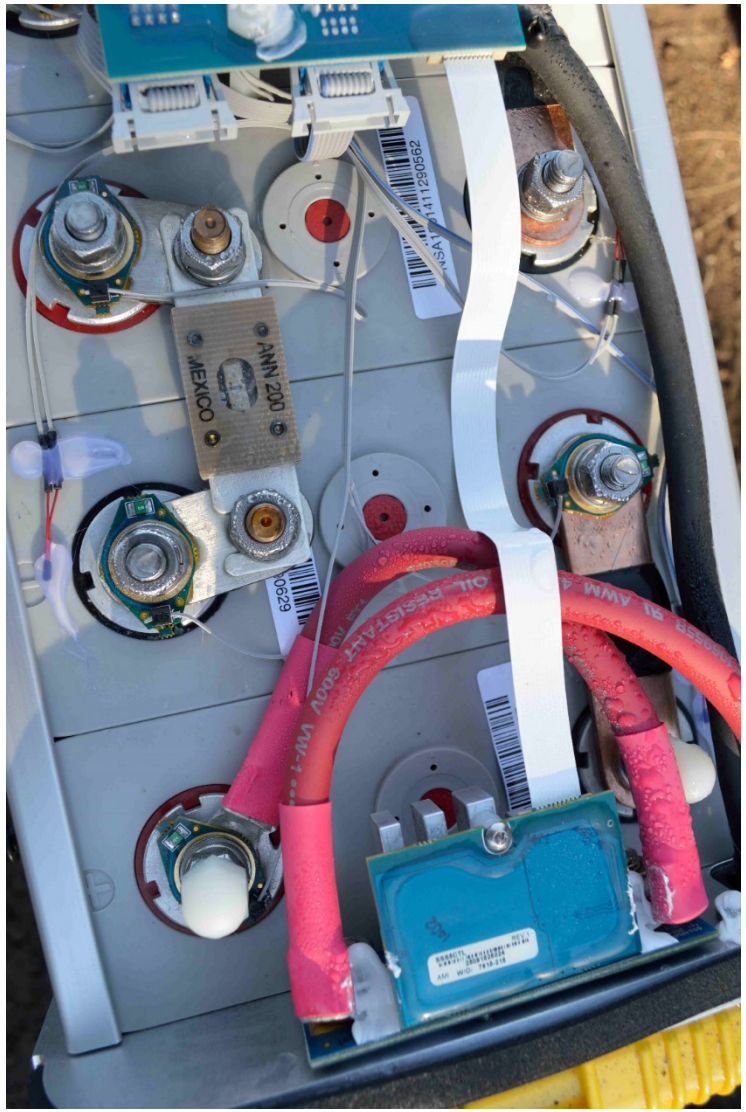
- Four 3.4V, 180Ah cells in each battery
- Voltage and temperature sensing on each cell
- Active cell balancing to prevent capacity mismatch
- Sub millisecond control of output terminals
  - Short circuit, under/over voltage, under/over temperature protections

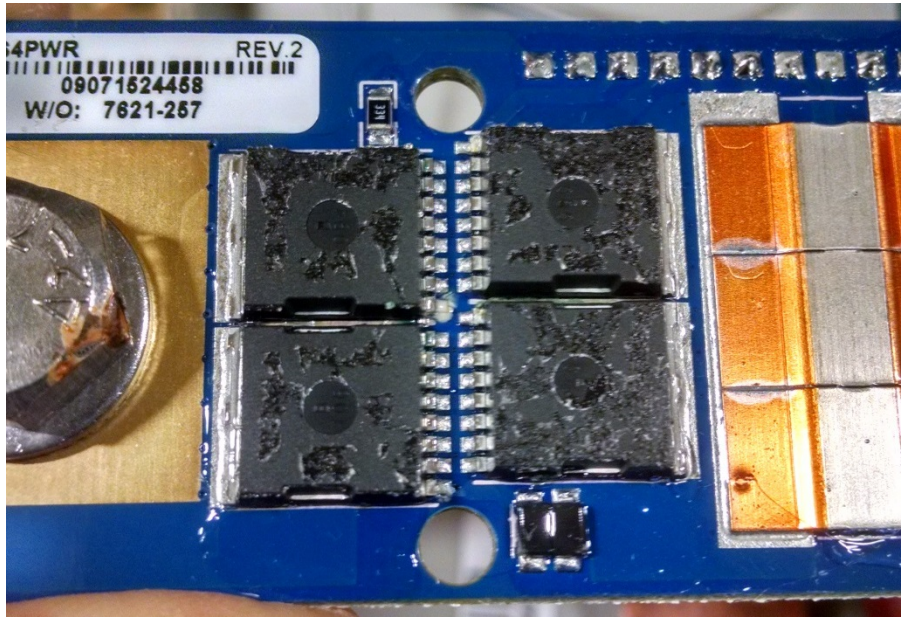
Issues:

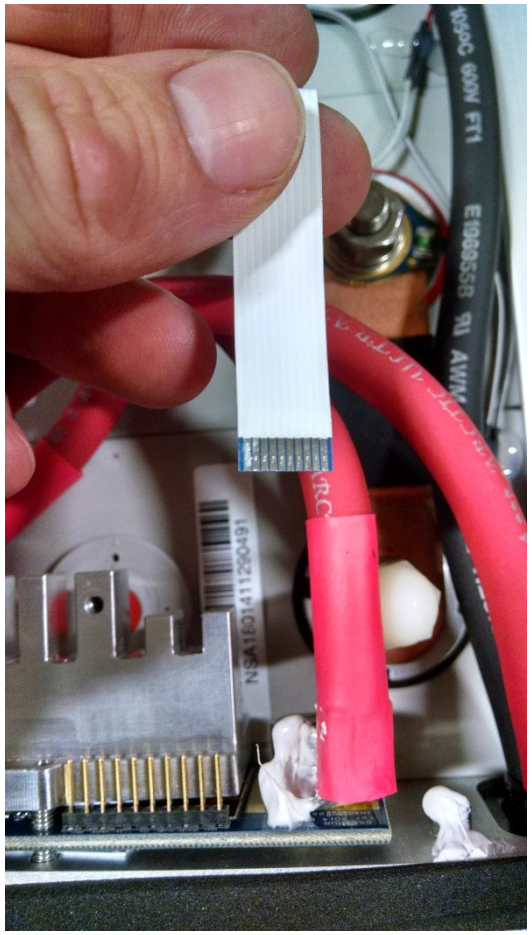
1. Switch that controls battery output has failed in many batteries deployed in the field

Lithium Battery Failures in the Field

- Corrosion build up due to liquid water on the batteries (evaporation/condensation cycle in the huts)
- Susceptibility of MOSFET devices to damage (environment caused failure? Part failure? Combination of both?)



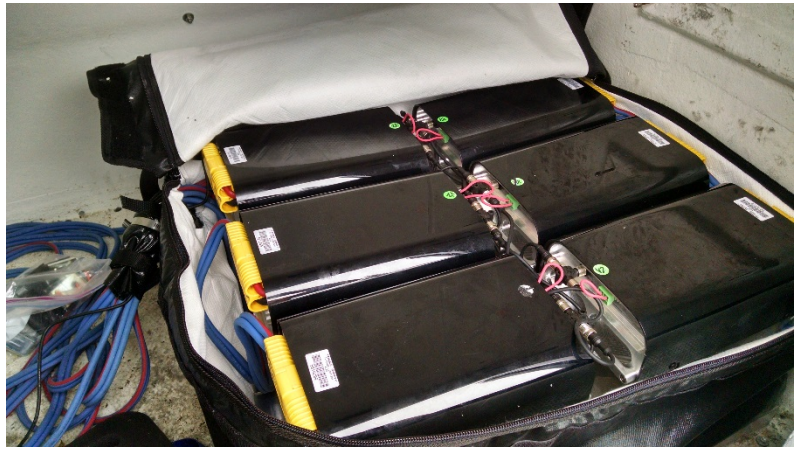




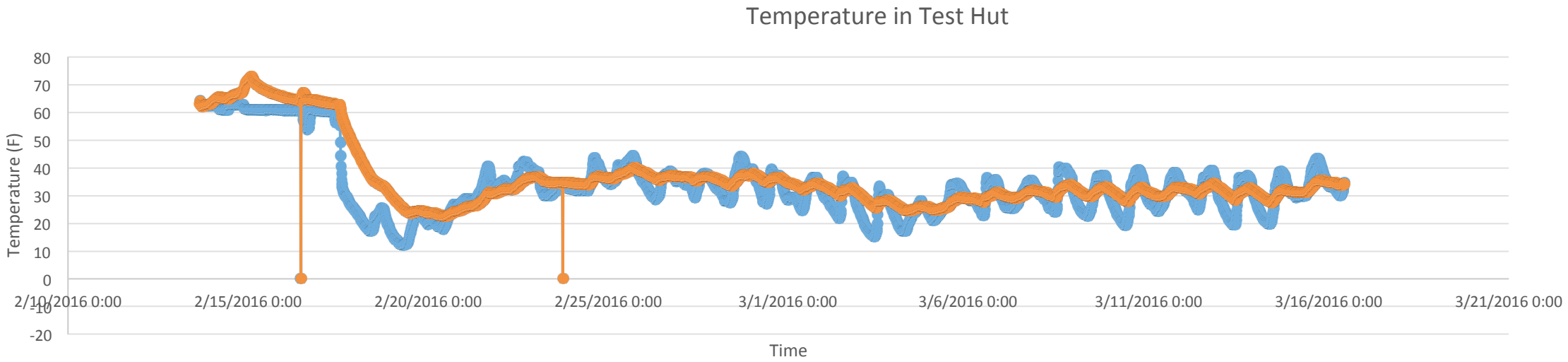
Battery Bag for Lithium Batteries

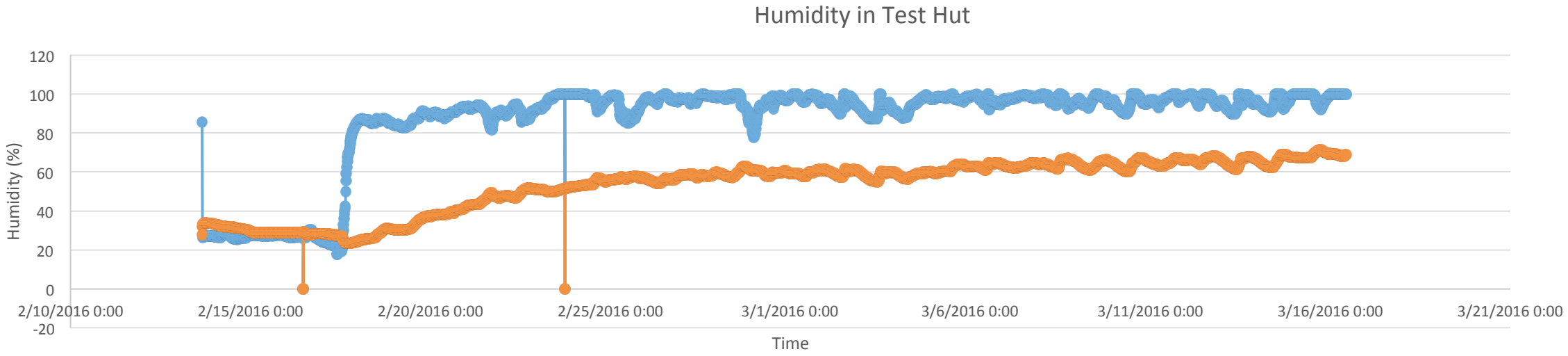
From: http://arcticoventent.com/tents/technology

- Vapex – proprietary material that allows water vapor transfer but not liquid water
- Tough outer material that protects for tears and reduces vapor permeability
- Insulate the batteries so they are not the coldest material in the hut
- Provide a barrier to prevent liquid water from getting into contact with the batteries and circuit boards



Battery bag performance in Anchorage test hut





Next Steps:

- Vent design has been chosen and will be installed in huts this season
- Improved methods of sealing the door of the hut