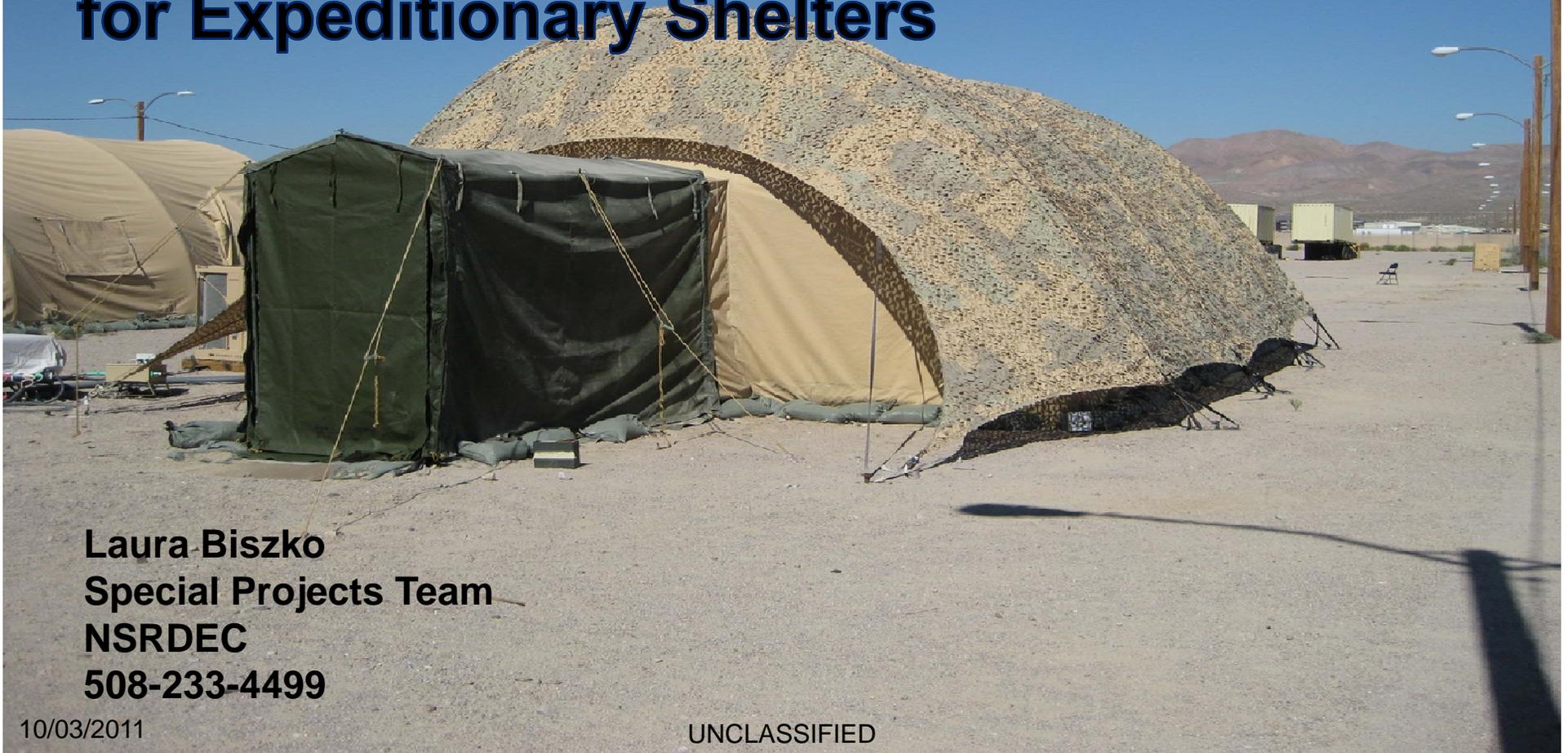
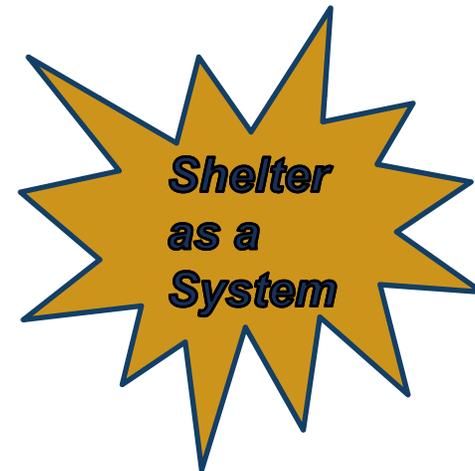


# Net Zero Plus JCTD Results : Evaluation of Energy Saving Technologies for Expeditionary Shelters



**Laura Biszko**  
**Special Projects Team**  
**NSRDEC**  
**508-233-4499**

- Objective
  - Determine the best combination of advanced shading, insulation and lighting systems for the most energy efficient shelter.
- Optimized technologies
  - Solar Barrier systems
  - High Efficiency Lighting Systems
  - Advanced Insulation
- The joint demonstration includes shelters and technologies from the Army, Air Force and Marine Corps. All of the branches are collecting and sharing data from the demonstration.



- **Goals**
  - Compare baseline energy usage to energy efficient technologies
    - Evaluate various configurations for optimization
    - Relevant environmental conditions
  - Create a comparative and comprehensive report
    - Power usage will be primary metric
    - Measure KW used by ECU and Internal shelter load
    - Draw conclusions on recommended shelter system configurations
- **Compare results to current baseline tents**
  - TEMPER Baseline onsite and TEMPER Airbeam Baseline on site
- **Actual Fuel Usage NOT Measured**
  - As practiced in the field, measuring amount of fuel delivered would not work because we had multiple fuel sources (on site soldiers did refueling which wasn't tracked)
  - Measuring fuel into generator would only be marginally effective because COTS generators were used and have no direct correlation to the mil-std TQGs used in the field
  - In addition, multiple generators were added as site expanded which were not originally planned for
  - EPCC system also used power and therefore would not accurately reflect fuel used for tents

# LSA Warrior Site



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- **Technologies**

- Solar Barrier Systems:

- Ultra Lightweight Camouflage Net System (*ULCANS*)
- Advanced Solar Shades
- Power Shade (including Photovoltaic Panels (2kW))



**ULCANS Solar Shade for an Airbeam**

- Lighting Systems:

- Fluorescent Lights
- Light Emitting Diodes (Three Sets)
- Electroluminescent Panels



**Shelter LED Lighting with Ambience**

- Advanced Insulation:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Aerogel Liner</li> <li>• Gas Filled Panel Insulation</li> <li>• Radiant Barrier</li> <li>• Honeycomb Insulation</li> </ul> | <ul style="list-style-type: none"> <li>• TEMPER Insulated Liner</li> <li>• Laminated Liner</li> <li>• Quilted Liner</li> <li>• Airbeam Insulated Liner</li> </ul> |
|---|---|



**Electroluminescent Lighting System**



**Aerogel Silica Mesh Insulation**

- Pyrolysis Solid Waste Disposal
- Solar-Powered Advanced Refrigerated TriCons (SPARTs)

- EPCC

- Electronic Power Control Conditioning Module

- Micro-grid Systems

- 1 MW with AC/DC capability
- Energy efficient generators
- Accommodates multiple inputs
- Power quality (conditioning)

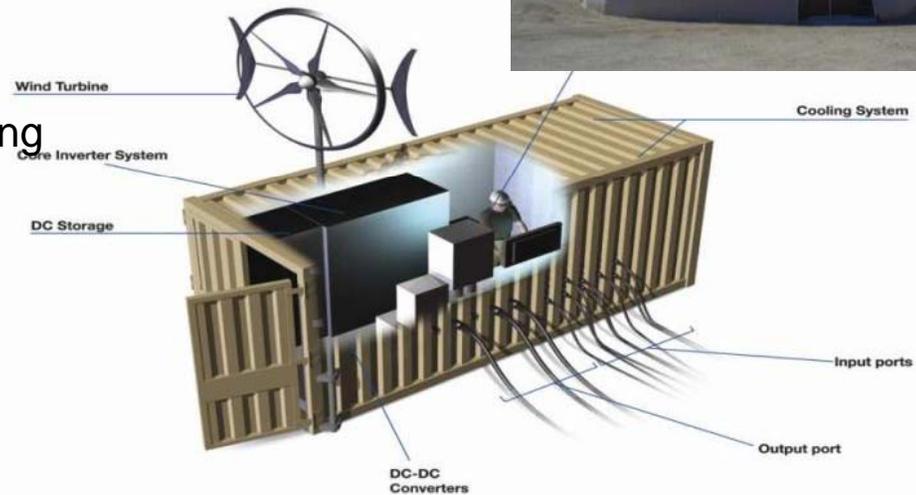
- Exterior Spray Foam

- Tents, buildings

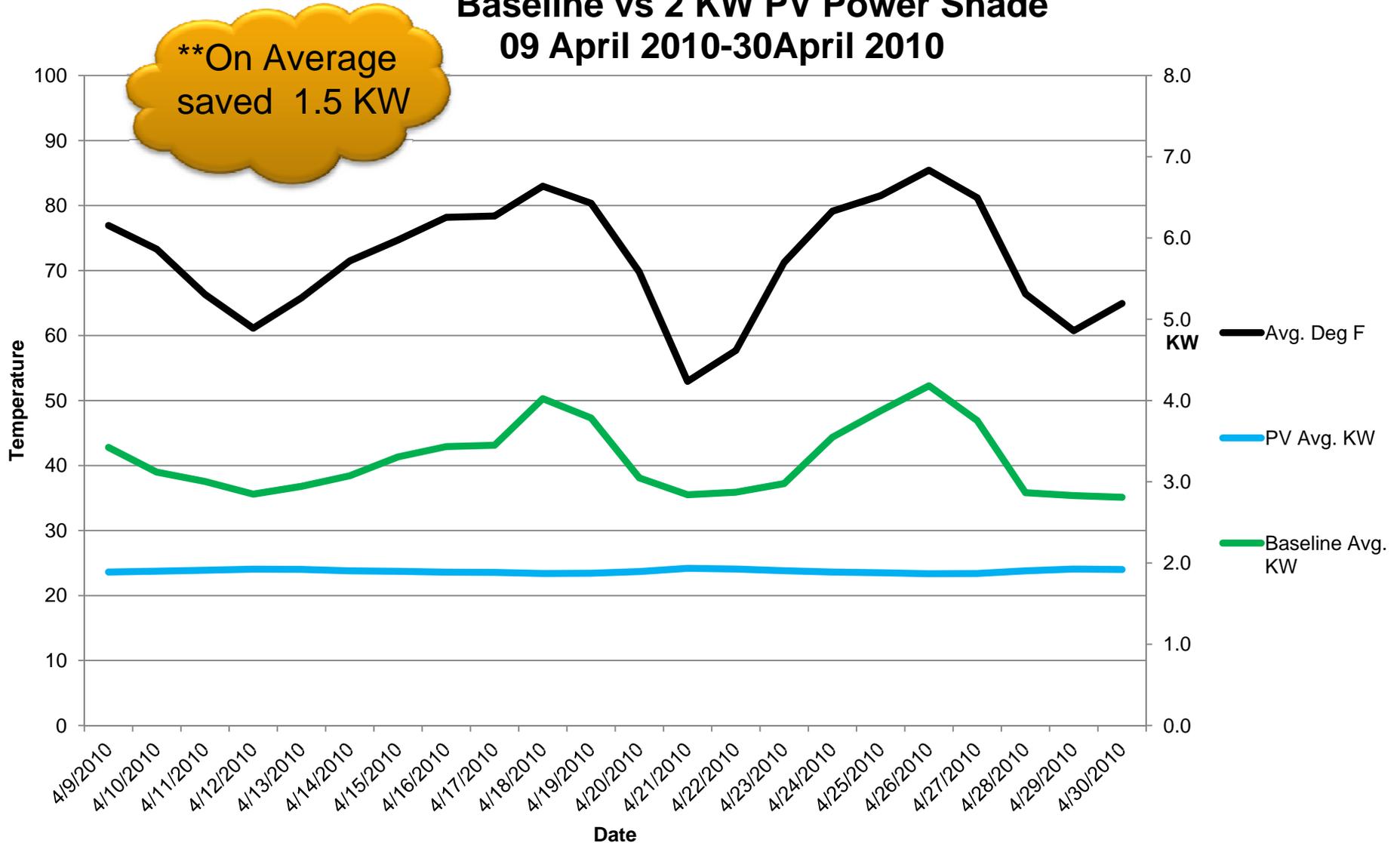
- DREAM

- LTT-MCC Trailer
- 250 x BB-2590 U Li-Ion Batteries

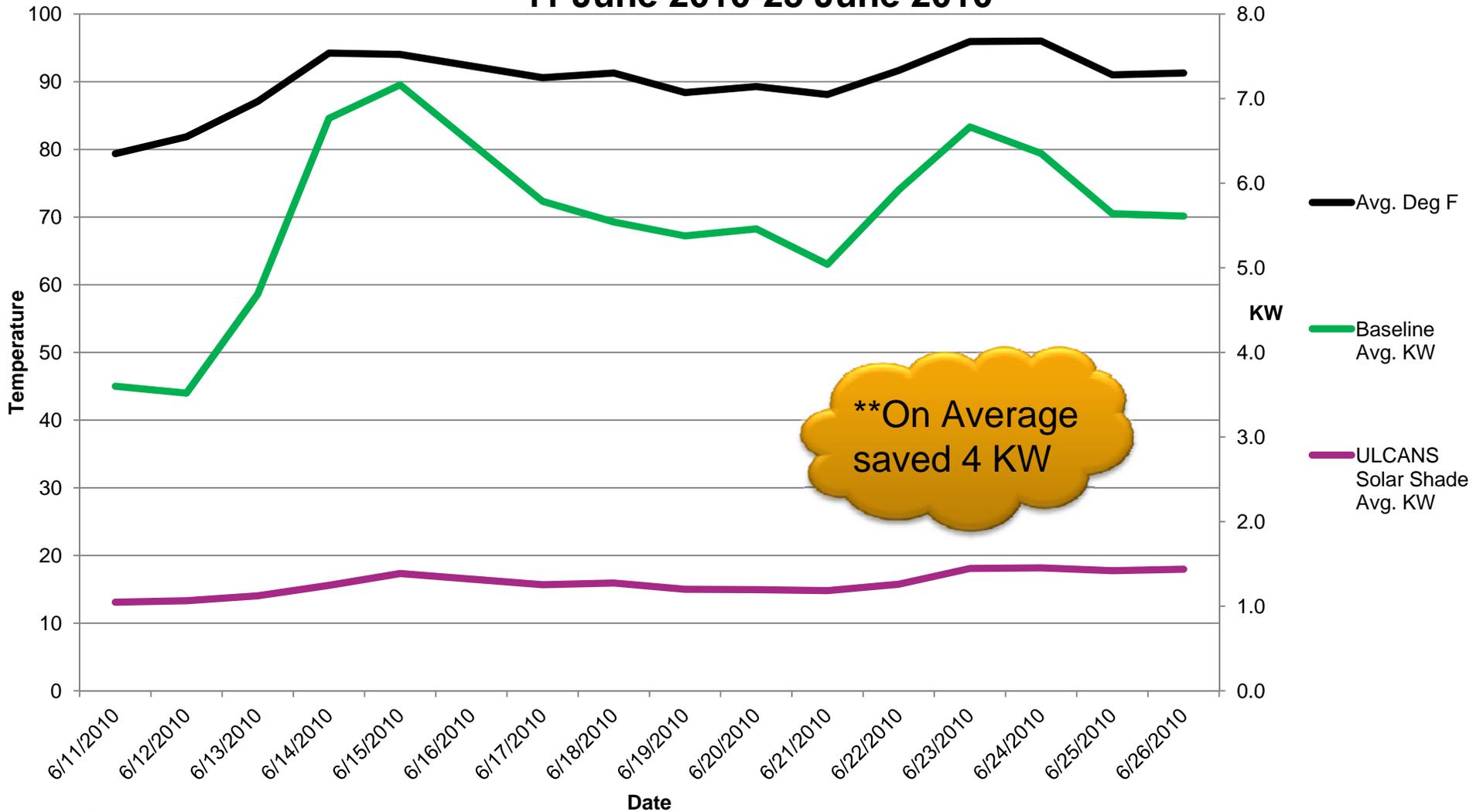
 **The EPCC Module - Electronic Power Control & Conditioning**



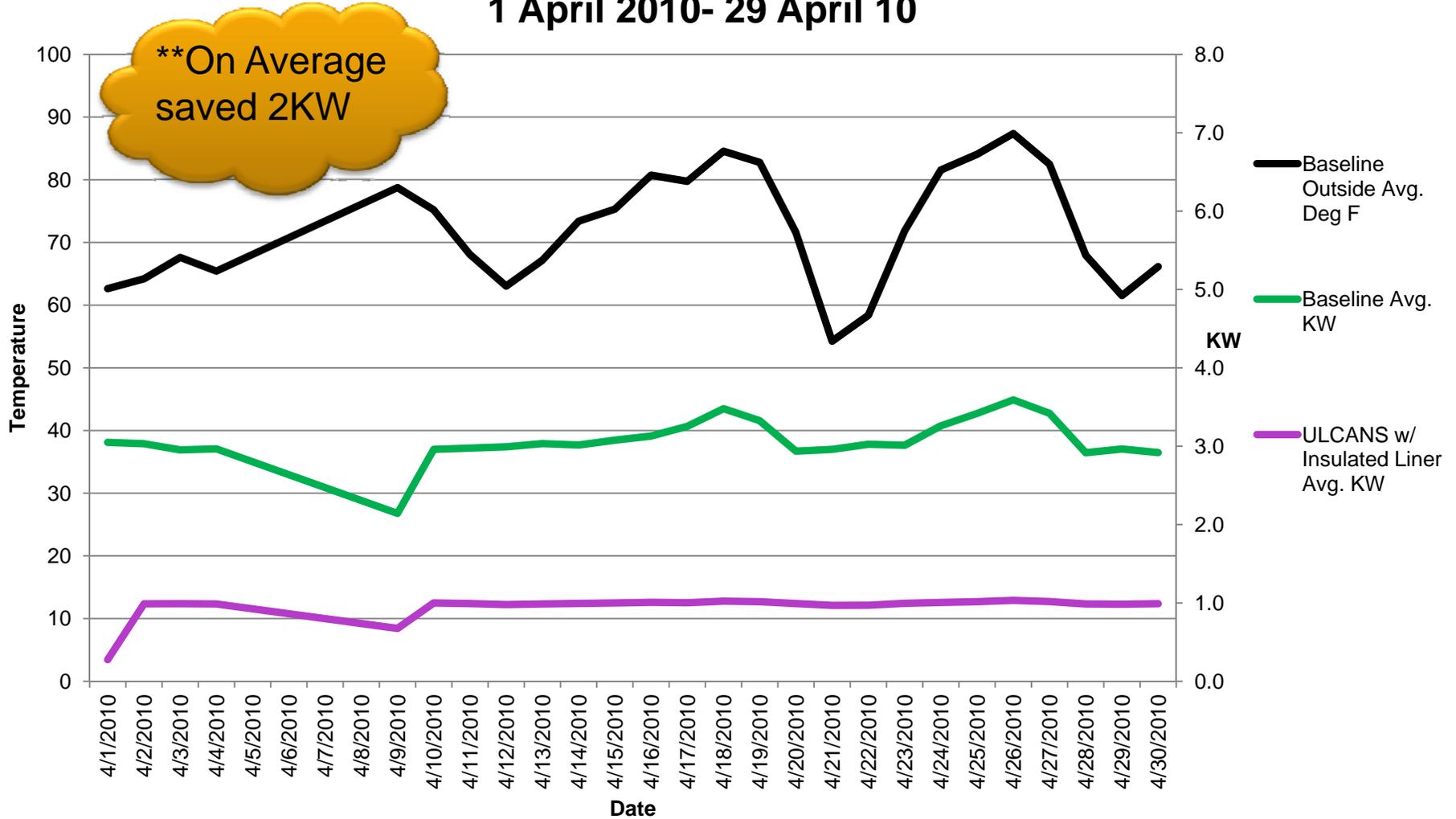
## Baseline vs 2 KW PV Power Shade 09 April 2010-30 April 2010



## Baseline vs ULCANS SolarShade 11 June 2010-25 June 2010



## Baseline vs ULCANS w/ Insulated Liner 1 April 2010- 29 April 10



- **Shading systems are critical in the summer months for reducing power consumption up to 30%**



- **Insulation is critical in the winter months for reducing power consumption up to 30%**

- **Received Soldier feedback on the technologies**

- **Soldier Preference**

- LED Lights



- **LED prototype systems did not significantly save power.**

- Technology is improving rapidly
- Continually watching the technology for improvements

- **Transition new configuration of ULCANS to PM-FSS– Reduced foot print**

- **Evaluated multiple Liners For PM-FSS**

# Questions?

**Net Zero Plus JCTD:  
Evaluation of Energy Saving  
Technologies for  
Expeditionary Shelters**

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