

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



Laura Biszko
Special Projects Team
NSRDEC
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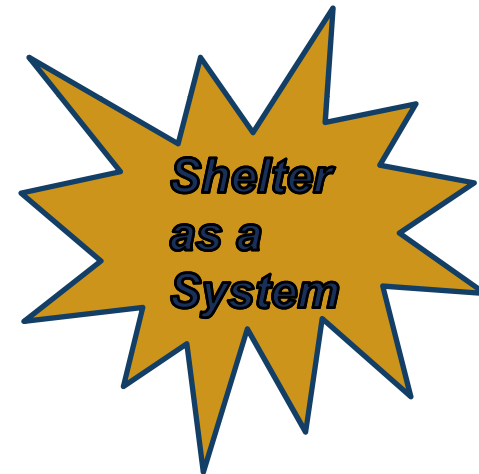
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- Objective
 - Determine the best combination of advanced shading, insulation and lighting systems for the most energy efficient shelter.
- Optimized technologies
 - Solar Barrier systems
 - High Efficiency Lighting Systems
 - Advanced Insulation
- 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"> • Aerogel Liner • Gas Filled Panel Insulation • Radiant Barrier • Honeycomb Insulation | <ul style="list-style-type: none"> • TEMPER Insulated Liner • Laminated Liner • Quilted Liner • Airbeam Insulated Liner |
|---|---|



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)

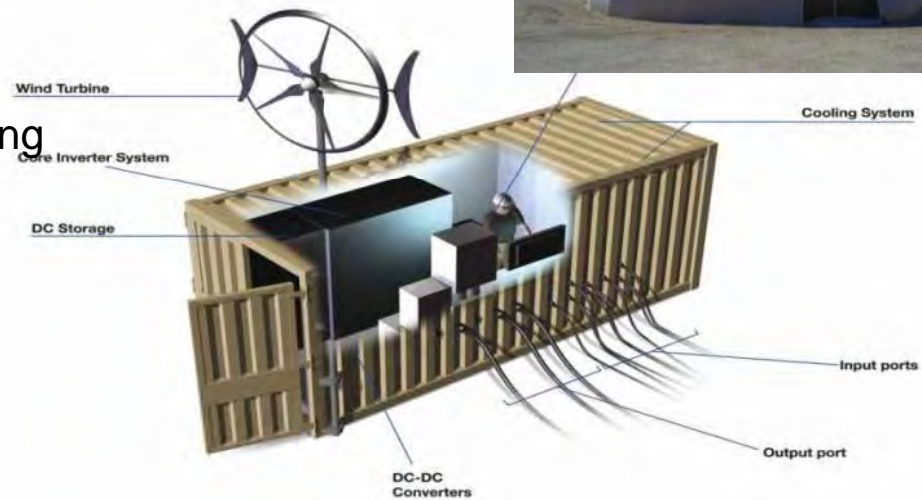
- Exterior Spray Foam

- Tents, buildings

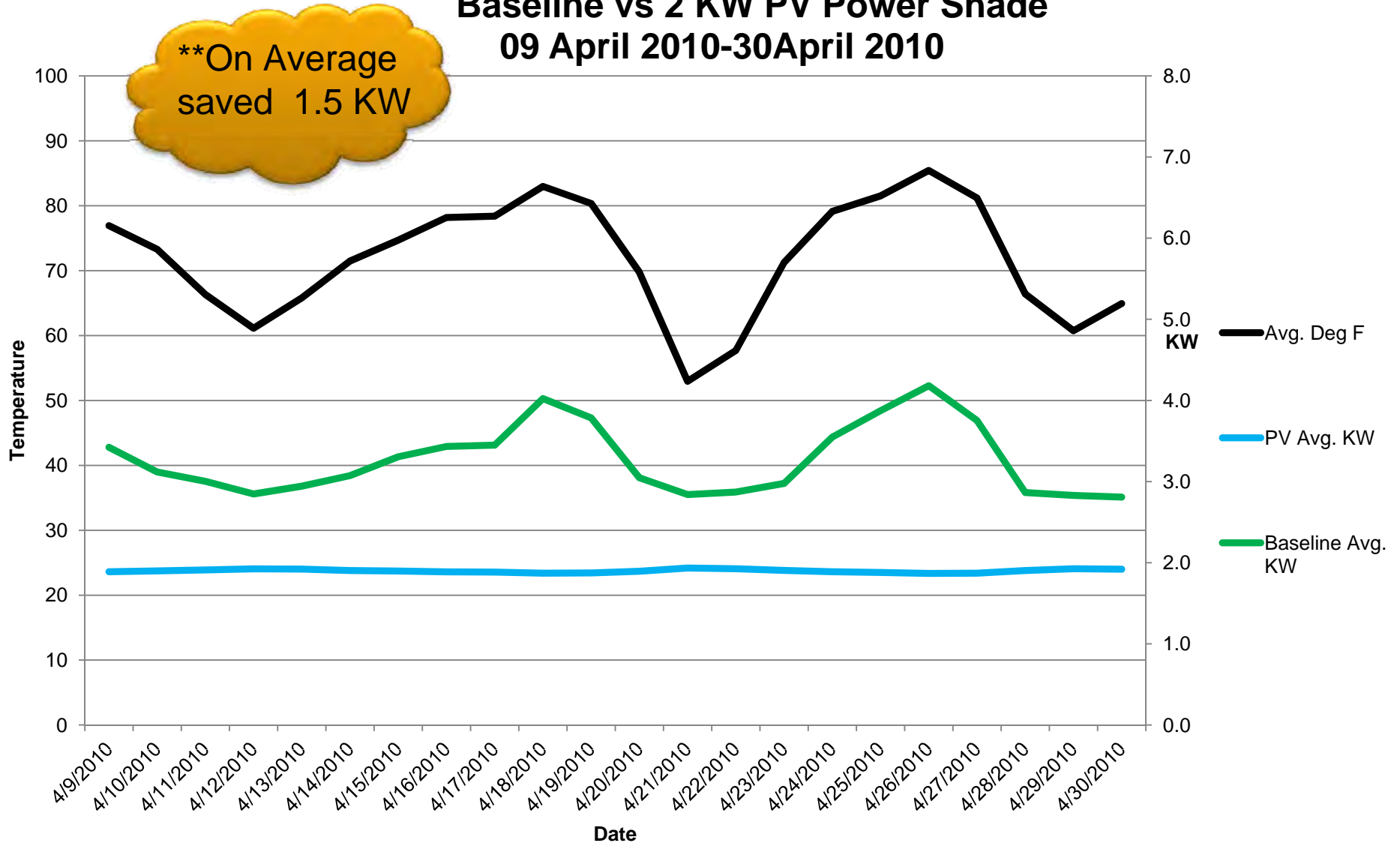
- DREAM

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

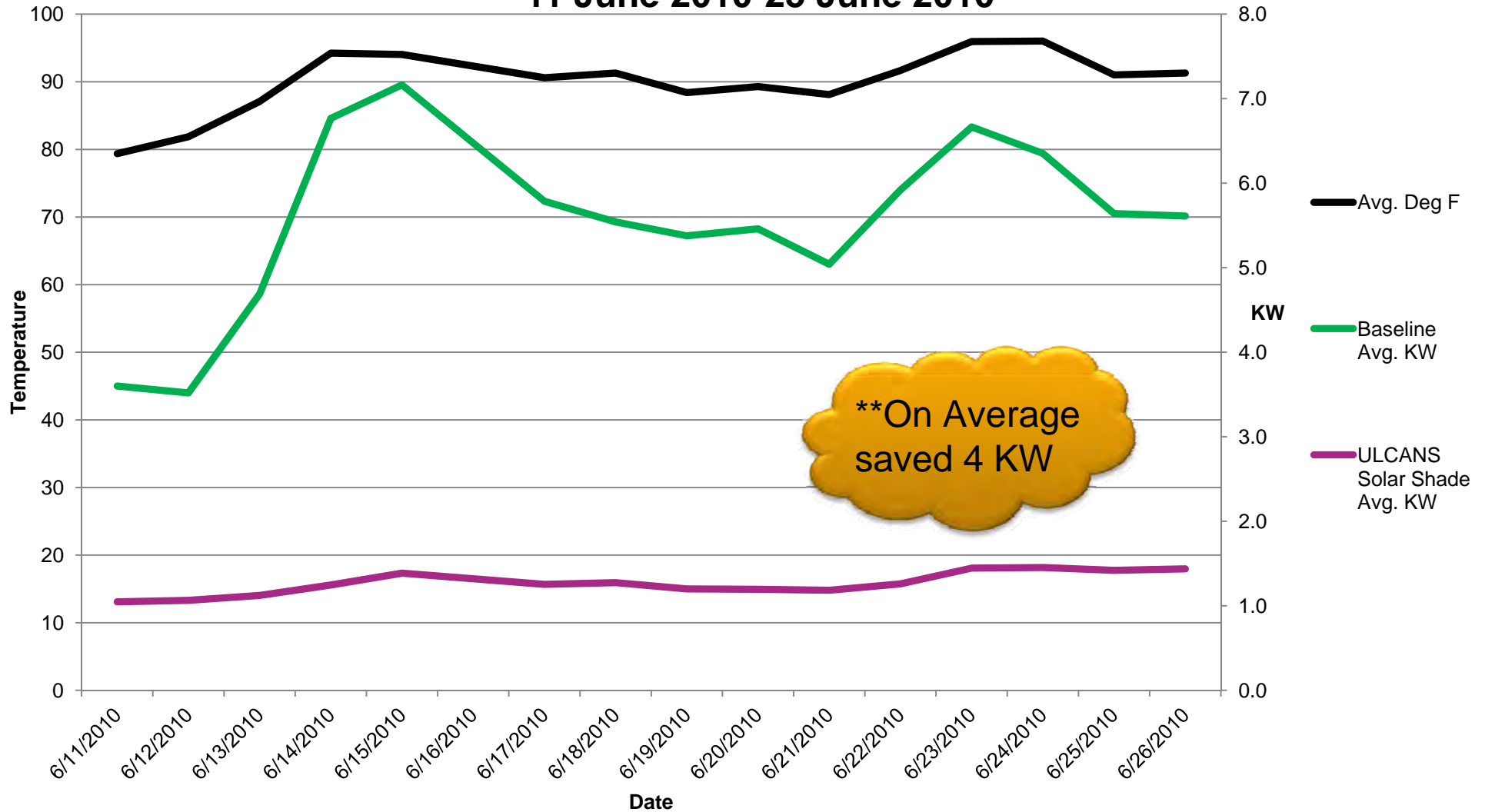
The EPCC Module - Electronic Power Control & Conditioning



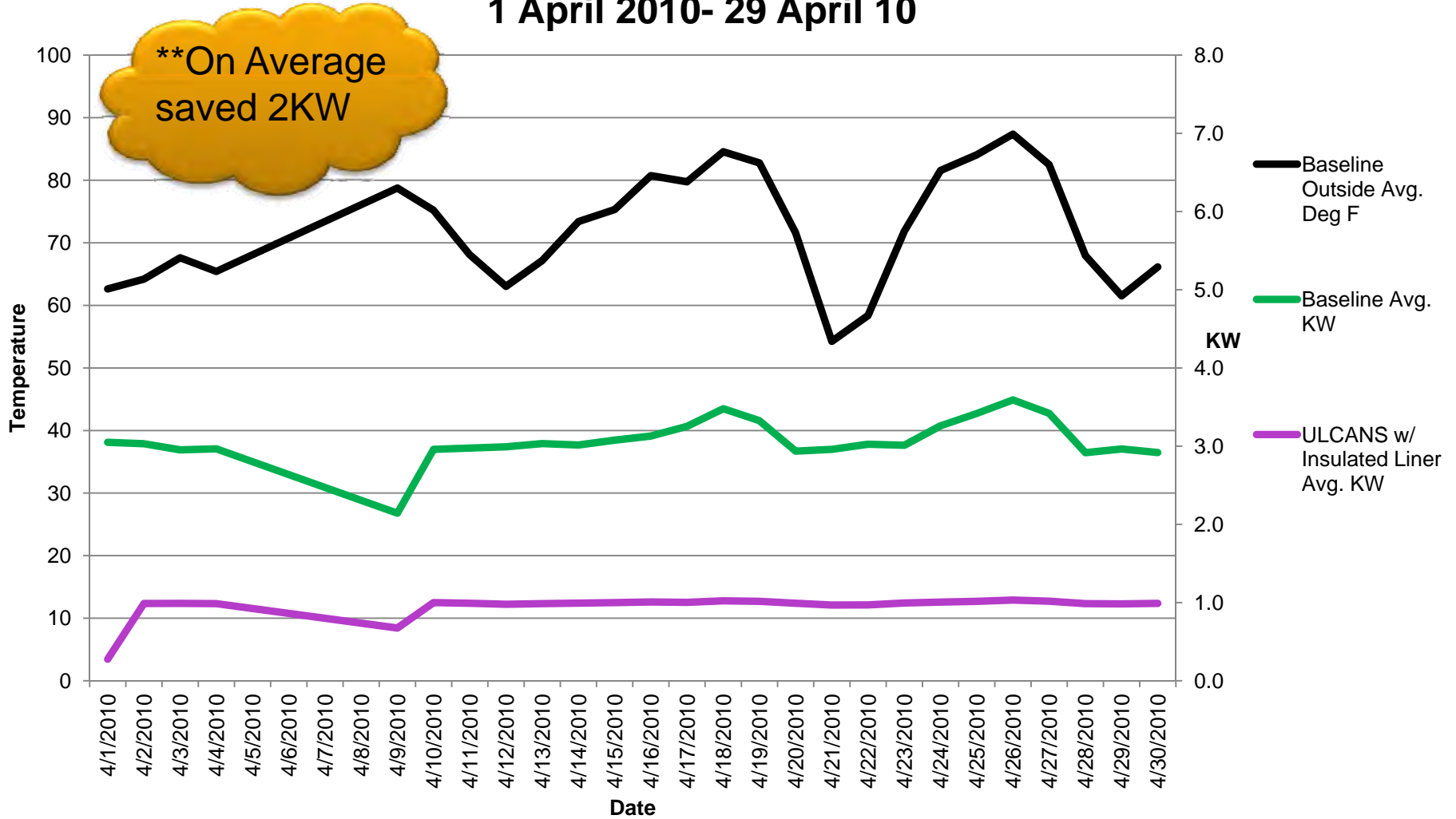
Baseline vs 2 KW PV Power Shade 09 April 2010-30 April 2010



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?

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