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

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

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Net Zero Plus JCTD

• 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.
**Evaluation Overview**

- **Goals**
  - Compare baseline energy usage to energy efficient technologies
    - Evaluate various configurations for optimization
    - Relevant environmental conditions
  - Creative 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

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LSA Warrior Site

Objective

- Demonstrate the best combination of advanced, sustainable, efficient, secure, and effective sheltering systems for joint operations.
- The joint demonstration includes shelters and technologies from the Army, Air Force, and Marine Corps. All branches are collecting and sharing data from the demonstration.

Optimized technologies

- Solar Barrier systems
- High Efficiency Lighting Systems
- Advanced Insulation

Demonstration through April 2009 – March 2011
• **Technologies**

  – Solar Barrier Systems:

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

  – Lighting Systems:

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

  – Advanced Insulation:

    • Aerogel Liner
    • Gas Filled Panel Insulation
    • Radiant Barrier
    • Honeycomb Insulation
    • *TEMPER* Insulated Liner
    • Laminated Liner
    • Quilted Liner
    • Airbeam Insulated Liner
Other Net Zero + Technologies

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

**On Average saved 1.5 KW**
Baseline vs ULCANS SolarShade
11 June 2010-25 June 2010

**On Average saved 4 KW**
Results

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

**On Average saved 2KW

Baseline
Outside Avg. Deg F

Baseline Avg. KW

ULCANS w/ Insulated Liner Avg. KW

Date

Temperature
60 70 80 90 100

KW
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0

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Key Findings

- 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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