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

Brant Lagoon
Project Lead
NSRDEC
Presented to JOCOTAS
4 November 2009
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<th>1. REPORT DATE</th>
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<th>3. DATES COVERED</th>
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<th>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</th>
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12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
6th Bi-Annual DOD JOCOTAS Meeting with Rigid & Soft Wall Shelter Industry & Indoor & Outdoor Exhibition, 2-4 Nov 2009, Panama City Beach, FL

15. SUBJECT TERMS

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   b. ABSTRACT unclassified
   c. THIS PAGE unclassified

17. LIMITATION OF ABSTRACT
   Same as Report (SAR)

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Standard Form 298 (Rev. 8-98)
Prepared by ANSI Std Z39-18
Net Zero + JCTD – NSRDEC Purpose

- Leverage NSRDEC Energy Savings Technologies
  - Photovoltaics
  - Advanced Insulation
  - LED-based Lighting
  - Solar Shades
- Need for foam alternatives
  - Force Provider, Field Hospitals
  - Cost
  - Safety
  - Redeployment
- Quantify added value
- Transition plan
  - PM Force Sustainment Systems
  - Joint PM Collective Protection
  - Army Medical Department

Solar Covers Block 60% of Radiant heat. Modular from 900 sf to 10,000 sf

Aerogel Silica Mesh Insulation

L’ Garde Air Cell Insulation

Shelter LED Lighting with Ambience

MBPS meets Unified Facilities Criteria for Blast Over Pressure

Small Tactical Airbeam Tent Deployed as Force Provider 150 Soldier Base Camp

Electroluminescent Lighting System

PowerShade (1 - 3KW) also blocks 90% of radiant heat

BB2950 Battery charger for Comms and Sensors

QUADrant units & Balance of Systems covert DC to AC and stores reserves

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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 – Generator and fuel usage
    - Draw conclusions on recommended shelter system configurations

- **Compare results to foam data**

- **Technologies**
  - Solar Barrier Systems:
    - Ultra Lightweight Camouflage Net System (*ULCANS*)
    - Advanced Solar Shades (new config)
    - Power Shade (including Photovoltaic Panels (2kW))
  - High Efficiency Lighting Systems:
    - Light Emitting Diodes (Three Sets)
    - Electroluminescent Panels
  - Advanced Insulation:
    - Aerogel Liner
    - FiFoil Insulation
    - TEMPER Insulated Liner
    - Improved Tent Liner (with solar barrier material)
LSA Warrior Site Today

TEMPer w/FiFoil & ULCANS

TEMPer w/Solar Shade

Airbeam w/new configuration solar shade

Baseline TEMPer

Airbeam w/Power Shade

Baseline Airbeam

TEMPer w/Radiant Barrier

CLOAK

EPCC

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

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Baseline vs Solar Shade

- Outside Amb.
- Tent 8 Avg. KW ECU
- Tent 7 Avg. KW ECU

Max KW Baseline: 8.275
Max KW Solar Shade: 6.918
PV Solar Production

86994 SRP-7-1.5M 0-25MA
86994 SRP-7-1.5M 0-25MA (2009-9-2 19:44:38)

Graph showing the DC current (ADC) over time from 9:15 AM to 10:00 PM on August 27, 2009.
Tent 3: EL Lamps Power Usage Vs. Temperature

- EL Lamps Power Usage
- Outside Temp
- Inside Temp
Current Status

- Seven Shelter Systems Established
  - SOF compound at LSA Warrior at NTC
  - All seven tents now have air conditioning, data collection is being built currently, install planned for 16-20 Nov
- NSRDEC making monthly visits to the evaluation site
  - Download data and change out technology configurations
  - EPCC installed, ULCANS for fuel and water bladders
- Soldier involvement is wild card; soldier feedback
- Next Steps
  - Develop remainder of evaluation matrix
    - Challenge of winter
  - Changing out configurations
  - Air Force adds four tents – Nov
  - Priorities for FP are to field solar shade for airbeam and develop LED spec
    - Foam tents as baseline to aim for
  - Continue to analyze data for impacts on power and fuel usage
  - Run return on investment and life cycle cost analysis
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