

# Interactive Workshop: Energy Efficiency at Military Installations

Roch Ducey, CEM

U.S. Army Engineer R&D Center - CERL

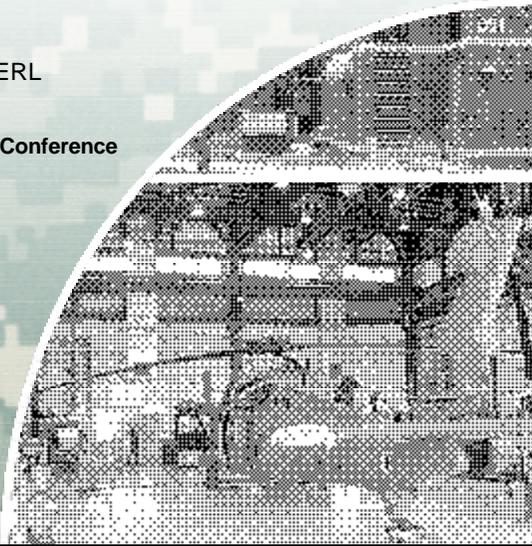
5th Annual Military Energy Alternatives Conference

Washington, DC

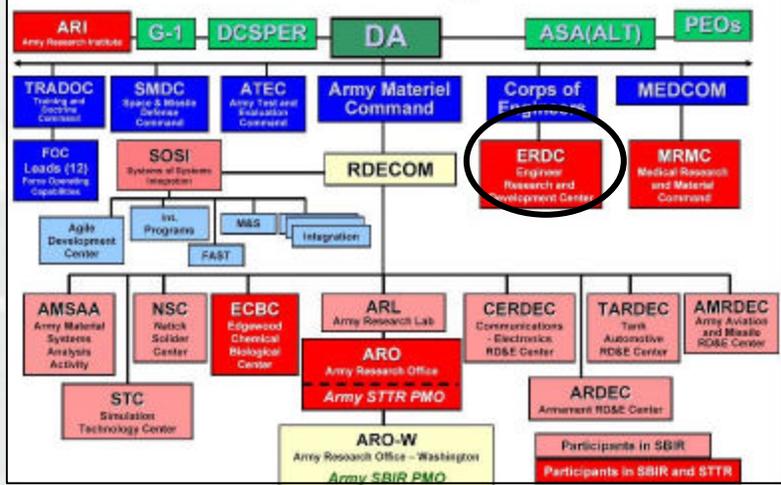
20 January 2010



US Army Corps of Engineers  
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## ARMY R&D Organizations



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# Engineer Research and Development Center (ERDC)

**CRREL Field Offices**

**European Research Office**

**Cold Regions Research and Engineering Laboratory (CRREL)**  
Hanover, NH

**Topographic Engineering Center (TEC)**  
Alexandria, VA

**Construction Engineering Research Laboratory (CERL)**  
Champaign, IL

**ERDC Headquarters, Vicksburg, MS**  
Director and Commander

- Coastal and Hydraulics Laboratory (CHL)
- Environmental Laboratory (EL)
- Geotechnical and Structures Laboratory (GSL)
- Information Technology Laboratory (ITL)




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[http://www.cecer.army.mil/techreports/erdc-cert\\_sr-09-9/erdc-cert\\_sr-09-9.pdf](http://www.cecer.army.mil/techreports/erdc-cert_sr-09-9/erdc-cert_sr-09-9.pdf)

## Net-Zero Energy (NZE) Installations and Deployed Bases Workshop

<http://www.cecer.army.mil/tips/pub/details.cfm?PUBID=8150&TOP=1>

A 2-day forum held in Colorado Springs, CO, 3-4 Feb 2009, to characterize the broad portfolio of technologies needed to achieve net zero energy community systems, with these major thrust areas:

- Renewables
- Thermal & Electrical Energy Storage
- Power & Energy Architecture
- Physical Architecture
- Energy Conservation
- Building Envelope and Materials Sciences
- Tools & Systems Analyses Methodologies



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## Net-Zero Energy Workshop

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CERL NZE Initiatives

### Net-Zero Energy (NZE) Installations & Deployed Bases Workshop

2-4, February, 2009  
Colorado Springs, CO

The goal of the workshop was to characterize the broad portfolio of technologies needed to achieve ultra-low or net zero energy community systems. The agenda was then divided into the below noted technology thrusts. Desired workshop outcomes included identifying: 1) the state of maturity of these technology thrusts for NZE applications; 2) the technical barriers to further technology advancements; 3) candidate applied research to solve the technical barriers. Out of these, a draft consensus technology roadmap will be developed for research and development investment decision making. To this end, we will also seek out visions of NZE implementations along with subject matter experts' assessments of essential NZE technology thrust areas.

The workshop also synthesized relevant undertakings by others in the following technology areas with respect to application to NZE community systems:

- Renewables for NZE
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Energy Policy

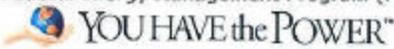
<http://dodfuelcell.cecer.army.mil/NZE.php>



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# Dr. Alexander Zhivov – 2009 Awards

U.S. Department of Energy - Energy Efficiency and Renewable Energy  
Federal Energy Management Program (FEMP)



**Energy Champion - Dr. Alexander Zhivov**  
United States Army

Exemplary Twenty-First Century Citizenship is being pioneered by research engineers like Dr. Alexander Zhivov of the Army Corps of Engineers' Engineer Research and Development Center who - by leading installation-wide energy analyses; developing and implementing new technologies; and promoting underutilized energy conservation technologies in new construction and facilities retrofits - is helping the Department of Defense meet its energy goals and enhance energy independence.



Leader

U.S. DEPARTMENT OF ENERGY  
FEDERAL ENERGY MANAGEMENT PROGRAM



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# Dr. Alexander Zhivov – 2009 Awards

**THE ENERGY CONVERSATION**  
Listen Learn Connect Share Collaborate

NEXT CONVERSATION

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**The Energy Conversation Recognizes...**

Posted Mon, 11/16/2009 - 4:35pm by Michelle Shevin

The Energy Conversation Award is given to an individual or individuals who show profound excellence in leadership - showing the way to work within the system to help make change for the common good along The Energy Conversation mandate of "Listen, Learn, Connect, Share, Collaborate".

This month the award winners are **The USDA Energy Matrix Team** and **Dr. Alex Zhivov** of the US Army.



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## Workshop Description

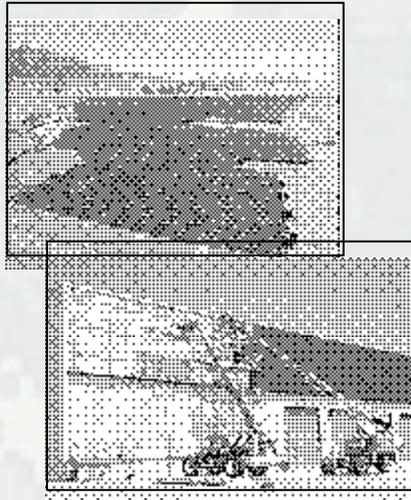
The workshop hosted approximately 80 participants from leading research universities, U.S. Department of Energy national laboratories, domestic and international energy industry groups, the Office of the Secretary of Defense (OSD), U.S. military facility commands and research organizations, and others from key stakeholder groups and prospective user communities.



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## Pre-Workshop Tour at Fort Carson

Vince Guthrie, the Energy Manager at Fort Carson, provided a tour of their 2-MWp photovoltaic power station project and a solarwall application at a helicopter maintenance hangar.



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## Workshop Goals

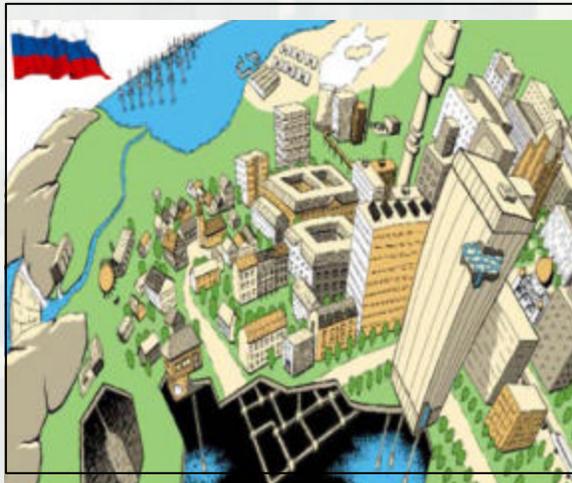
Each session provided workshop participants with a better understanding of:

- the state of technology maturity
- technical barriers to the next generation of solutions
- prospective applied research projects to overcome technical barriers
- opportunities to network multiple categories of technology into an advanced suite of ultra-low-energy tools and methodologies for military facility and logistical operations



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## Keynote Speaker



Dr. Reinhard Jank from Volks Wohnung, Karlsruhe, Germany, provided the keynote address, "Energy Efficient Community Systems".



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## Renewables

- Renewable Energy Optimization for Net-Zero: Session Chair Andy Walker, National Renewable Energy Laboratory
- Zero Energy Buildings: Robert Boehm, UNLV
- Case Study of Privatized Net-Zero Homes at Fort Campbell: Heidi Anne Kaltenhauser, Concurrent Technologies Corporation
- Building-Integrated Photovoltaics for NZE Installations & Deployed Bases: Cecile Warner, NREL
- Wind Energy Technology & Applications: Tony Jimenez, NREL



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## Thermal & Electrical Energy Storage

- Overview of Electric Energy Storage Systems: Session Chair Dan Rastler, Electric Power Research Institute
- Energy Storage for Wind Energy Integration and Smart Grid: Frank Novachek, Xcel Energy
- Energy Surety Approaches for Military Applications: John Boyes, Sandia National Laboratories
- Ice Bear® Storage: Brian Parsonnet, ICE Energy
- Overview of Cooling Energy Storage Technologies: Scot Duncan, Retrofit Originality Incorporated



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## Power & Energy Architecture

- Overview of Power & Energy Architecture: Session Chair Bob Lasseter, UW – Madison
- Electrical Systems and Loads for Sustainable Buildings: Tom Jahns, UW – Madison
- Combined Heat and Power: Clifford Haefke, UIC Energy Resources Center
- Thermal Management: Stephan Richter, GED
- Biofuels & Bioenergy on U.S. Military Bases: Chris Zygarlicke, Energy & Environmental Research Center



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## Physical Architecture

- Overview of Physical Architecture: Session Chair Tom Hartranft, ERDC-CERL
- U.S. Passive House Projects: Net Plus Energy Homes Katrin Klingenberg, Passive House Institute, USA
- Passive Houses World-wide - Adaptation To Special Climatic Regions: Berthold Kaufmann, Passive House Institute, Germany
- Passive Houses in Germany - Conceptions, Designs, Best Practices: Georg Zielke, Architekturbüro Zielke Passivhäuser



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## Energy Conservation

- Energy Conservation Technologies for NetZero Buildings: Session Chair Alexander Zhivov, ERDC-CERL
- Energy Efficient HVAC Design Optimization: Scot Duncan, Retrofit Originality Incorporated
- M-Cycle beyond Comfort Cooling: Alan Gillan and Valeriy Maisotsenko, Coolerado
- Heat Pump Optimization: John Shonder, ORNL
- Advanced Lighting Systems: Gert Bruning, Philips



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## Building Envelope and Materials Sciences

- Overview of Building Envelope & Materials Technology: Session Chair Bill Rose,
- Flexible Photovoltaics for Deployed Bases: Steven Tucker, U.S. Army Natick Soldier Center
- Materials - Foam, Air Tightness, Compliance: Henri Fennell Building Envelope Solutions, Inc.
- High Performance Aerogel Insulation For Shelters Elizabeth Swisher U.S. Army Natick Soldier Center



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## Tools & Systems Analyses Methodologies

- Engineering Analysis of Fuel Cell and Integrated Hybrid Technologies for Support of the NZE Concept: Session Chair Jack Brouwer, NFCRC – UC Irvine
- Modeling, Simulation, and Measurement of Building Energy Performance: Ron Judkoff, NREL
- Case Study in NZE Design for Affordable Housing: James Meacham, CTG Energetics
- Automatic Disaggregation of Total Electrical Load from Nonintrusive Appliance Load Monitoring: Lucio Soibelman, Carnegie Mellon University



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## Conclusions

- improved **community system** modeling capabilities that can process data from many software programs
- improved metering and sensor technologies that display real-time data to individual users and engineers in a manner that will show if **community systems** are operating in alignment within the parameters of the established model
- improved controls that allow **community systems** to be adjusted in accordance with the established model
- integrated NZE **community system** standards housed in a Web-based knowledge repository, to allow innovative collaboration that enables rapid development and distribution of repeatable actions
- facilities simulation laboratories that enable testing of NZE **community systems**.



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## Recommendations

- Systems integration
- Holistic design and implementation
- Standards documentation
- Simulation modeling
- Metering, sensors, and controls
- NZE conferences

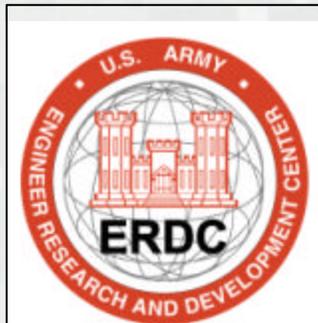


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## Contact Information

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# Questions?



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[http://www.cecer.army.mil/techreports/erdc-cerl\\_sr-09-9/erdc-cerl\\_sr-09-9.pdf](http://www.cecer.army.mil/techreports/erdc-cerl_sr-09-9/erdc-cerl_sr-09-9.pdf)



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