



Power and Energy

*Reducing
Vulnerabilities*





Developing and Applying Effective Energy Solutions

The NDCEE is assisting the Department of Defense (DoD) with reducing its energy-related vulnerabilities. As the nation's largest energy user, spending an estimated \$19 billion in 2013 on fuel and electricity, the DoD has substantial energy requirements and faces complex energy sustainability risks.¹ The NDCEE finds and transitions energy solutions that promote operational and installation readiness, have lower energy requirements, and mitigate security risks. Our solutions assist the DoD and its Services in meeting their energy goals as delineated in DoD Directive 4180.01, DoD Energy Policy, as well as in each Service's energy strategy.

¹Source: <http://energy.defense.gov/>

For more than 20 years, the NDCEE has been identifying, demonstrating, evaluating, and fielding technologies in support of DoD readiness, sustainability, and the Warfighter. The project descriptions are examples of our recent assistance to the DoD in meeting its energy goals. Other energy-related technology support has included:

- Operated a test and evaluation center to advance fuel cells for military applications
- Evaluated a machining technique to increase diesel engine performance efficiency while maintaining or decreasing emissions
- Demonstrated and validated the use of alternative fuels and renewable energy systems such as biodiesel for generators, geothermal energy for heat pumps, and wind turbines for powering buildings
- Used energy modeling to assist builders with designing and constructing structures that meet or exceed a LEED Silver rating
- Demonstrated 4 densification technologies for producing refuse-derived fuel (RDF) and 3 WTE systems using the RDF
- Evaluated energy-efficient and zero-energy building technologies, including daylighting, house coatings, radiant barriers, solar attic fans, solar thermal radiant floor heating, and building envelope materials.



Energy Security/Surety

- Energy conservation evaluation
- Leadership in Energy and Environmental Design (LEED®) requirement design
- Infrastructure assessment
- Vulnerability assessment
- Renewable energy siting
- Facility condition assessment
- Lifecycle assessment
- Modeling and simulation
- Microgrid design

Technology Design, Integration, Demonstration, Sustainment

- Renewable energy
 - Photovoltaic
 - Geothermal
 - Wind turbine
 - Waste-to-energy (WTE)
- Vehicle hybridization/electrification
- Smart grids/microgrids
- Zero-energy housing
- Energy-efficient technology
- Energy storage
- Fuel cells/hydrogen
- Alternative fuels

Strategic Planning, Guidance, Roadmapping

- Energy planning
- Energy security implementation
- Energy dashboard metric tracking
- Green energy management
- Energy policy analysis/development

Public-Private Collaboration

Demonstrated a collaborative business approach leveraging private and utility investments for constructing and operating utility-scale energy projects on Army lands. The approach was designed for renewable and alternative energy projects of at least 10 megawatts (MW). We have assisted the Army Energy Initiatives Task Force (EITF) with applying this approach to more than 12 projects—including an 18-MW solar photovoltaic project at Fort Huachuca, Arizona, that broke ground in 2014.



Energy Security Assessments

Developed an Energy Security Assessment (ESA) Methodology to assess critical missions/associated threats and proactively eliminate risks. Our approach identifies potential single points of failure (SPFs) and solutions, prioritized based on each SPF's threat frequency, duration and impact. We demonstrated and validated our ESA approach at 8 Army installations through 2014, finding 53-128 SPFs per site. In the worst case, 983 risks were associated with a site's SPFs. Most risks can be mitigated, improving an installation's energy security posture.



Mission Critical Utility Infrastructure

Developed a conceptual design template for a customized, self-sustaining electrical power infrastructure called Mission Critical Utility Infrastructure (MCUI). Demonstrated at 5 sites, the MCUI design capitalizes on planned infrastructure improvements and energy projects to augment an installation's energy security posture. Coupled with the ESA Methodology, the design aids installations with ensuring long-term continuity of critical missions during power outages through the use of microgrids.



Coconut Shell Power

Designed, constructed, and demonstrated an off-grid renewable energy power system that provides 80 kilowatt-hours of electricity over a 6-hour operation period from coconut shells (or other wood-based biomass). Deployed at a U.S. Southern Command's dining facility in El Salvador, where waste coconuts are abundant, the system produces and stores electricity, imports/exports energy to an electrical grid, and produces syngas to decrease fuel consumption by electrical generators.



Net Zero Strategic Support

Aiding the Army's Net Zero (NZ) Initiative that integrates policy and technical solutions spanning energy, water, and waste. The NZ strategy reduces and offsets resource consumption. We created and tested a methodology that serves as a template on how to plan, implement, and monitor installation success in meeting NZ goals. Our NZ plans for Fort Bliss, Texas, and Camp Buehring, Kuwait, prioritize actions based on mission and NZ impacts, budgets, and implementation feasibility.



Energy Operational Awareness

Developed and deployed energy awareness training along with the Air Force Enterprise Energy Management Framework Dashboard (AFEEFD), an interactive web-based reporting tool. Accessible by all Air Force personnel, AFEEFD enables oversight of energy management across the enterprise. Training provides airmen with a better understanding of what role they play in energy consumption and energy security, assisting the Air Force in fostering culture change in which energy is not taken for granted.



Your Energy Decisions Matter

We depend on energy. For instance, our daily lives are disrupted when the electric distribution system is offline or gasoline stations run out of fuel. The DoD and industry recognize the liabilities of energy dependence. For the DoD, reducing energy needs extends the operational range of ships, planes, tanks, and other equipment. It lessens logistical vulnerabilities, especially for the Warfighter when operating in hostile areas. Furthermore, reducing energy conserves resources and allows energy funding to be applied to other mission priorities. By finding opportunities to increase energy efficiency and reduce energy consumption, you are helping to sustain operations and eliminate vulnerabilities.

- Does your organization know how much energy is consumed for each mission activity?
- Does your organization know which activities are critical and require uninterrupted power?
- Have energy security and corresponding risk assessments been conducted for your organization?
- Is your organization aware of the single points of failure in your energy supply chain?
- Does your organization know the impact to operations and quantifiable loss due to a utility disruption? Short term? Long term?
- How are personnel being educated and trained on the value and importance of energy to the mission?
- Do you need technological or process improvements to reduce energy consumption to increase capability or reduce costs?
- Have energy goals, possibly Net Zero, and a roadmap to achieve them been created for your organization?
- Are energy conservation opportunities being prioritized and pursued?
- Does your organization need assistance in diversifying into renewable energy and alternative fuels? To meet energy goals? To improve energy security?

How may we help your organization solve energy concerns?

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