National Defense Center for Energy and Environment

Technology Experts • Sustainability Trailblazers • Collaborative Problem Solvers

Multi-Year Review
The National Defense Center for Environmental Excellence (NDCEE) was established by Congress in 1991 with a directive to "serve as a national leadership organization to address high priority environmental problems for the Department of Defense (DoD), other government organizations, and the industrial community." In May 2008, the Program was re-designated from the National Defense Center for Environmental Excellence to the National Defense Center for Energy and Environment to ensure that the Center’s mission recognizes and addresses the strategic interdependence of energy and environmental technology requirements within an overall sustainability framework in support of our installations, weapons systems, and war fighters.

The NDCEE Program has evolved into a national resource for demonstrating, validating, and transitioning innovative Environmental, Safety & Occupational Health and Energy (ESOHE) technologies. This Program is managed by the Army on behalf of the Assistant Secretary of Defense for Sustainment.

The United States (U.S.) Army’s broadly encompassing and growing mobile, personal, and stationary technological requirements include infrastructure, alternative and synthetic energy, training lands, emerging contaminates, transportation, systems integration, personnel well-being, and others. Further, to train as we fight, validated ESOHE technologies need to be available and implemented at Army installations. The NDCEE will continue to demonstrate, validate, and transfer these technologies supporting our integrated environment, safety, occupational health, and energy objectives to enable mission, readiness, innovation, lethality, and modernization to ensure our soldiers maintain a technological advantage over our adversaries.

This multi-year report highlights the accomplishments of the technologies the NDCEE program has supported since fiscal year 2015. Through their invaluable demonstration/validation efforts performed, the DoD can improve operations, reduce risks and costs, and enhance energy, environmental, and safety stewardship.
Years of Technology Transition for the DoD

Our Mission ~

As a critical component of the DoD’s environmental quality investment strategy, the NDCEE investigates, demonstrates, and helps field viable, mission-driven solutions that reduce total ownership costs and fulfill DoD environmental, energy, health, safety, and sustainability requirements.

Through DoD-wide participation in the NDCEE program development and application of the process, the following benefits are achieved:

1. Addressing DoD Priorities/Challenges - Proactively identify and focus on current and emerging issues; develop service-wide programs for joint initiatives
2. Leveraging Resources - Share information and successes, synergize Research, Development, Testing, and Evaluation (RDT&E) execution, and enhance coordination among the services while minimizing duplication of effort
3. Transfer of Tools and Technologies - Apply and propagate solutions in support of warfighter / mission requirements
4. Providing Value-Added / Measurable Benefits - Assess the business case to optimize return on investment; reduce life-cycle costs while enhancing readiness and sustainability

Since its inception by Congress in 1991, the NDCEE has successfully executed hundreds of tasks to improve operations, reduce risks and costs, and enhance energy, environmental, and safety stewardship.

A message from

The Office of the Executive Agent

“Over the past three decades, the NDCEE has become increasingly more effective in providing an agile program construct that does a better job of increasing multi-service benefits and leveraging opportunities to ensure alignment to current (and future) priorities. With a focus on mission, readiness, and modernization, NDCEE remains a critical part of this organization dedicated to identifying and solving ESOHE challenges. The NDCEE provides a productive platform for research, demonstration, validation, and transition of sustainable technologies, all which contribute toward a more resilient and strong future. In this review, you will see the range of ESOHE collaborations and the engagement of all services, as well as the impact that the successful technology transitions have provided. Through this, the NDCEE and the services have and will continue to safeguard the warfighter, saving lives and protecting our environment.”

Hon. Rachel Jacobson
Assistant Secretary of the Army
Installations, Energy and the Environment

“As the NDCEE surpasses a milestone of providing 30 years of technology transition to the DoD, the program continues to prove its value today. Within the past two to three years, NDCEE has increased technology partnerships, enhanced multi-service participation, and increased program transparency with a new digital platform for real-time data. All these efforts have resulted in maximized effectiveness and enhanced provision of service to the DoD. The program’s ability to comprehensively tackle our military’s most pressing issues related to energy, environment, and occupational health and safety within a collaborative structure supports the warfighter, protects our resources, and generates resilience. Continued investment in NDCEE will ensure we remain strategically and technologically positioned for the next 30 years.”

Ms. Amy L. Borman
Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health
Lead Agent for NDCEE
NDCEE is a DoD Technical Resource

The NDCEE was established to help DoD and the warfighter achieve performance advantages, enhance efficiency and cost-effectiveness, and comply with regulations for its installations, ranges, and weapon systems. Our mission is to transition technology solutions in support of the DoD as it strives to maintain readiness, meet sustainability goals, and support warfighters at home and abroad.

NDCEE projects demonstrate and validate high-priority ESOHE technology requirements and transitions them to the technology transition partners who will integrate them into end-user programs and processes.

Trusted

NDCEE’s unique collaborative structure allows us to be the voice of the warfighter to the ESOHE community, ensuring that the DoD is informed, responsive, and capable of solving real-world problems with enhanced, technology-informed, and mission-ready solutions.

Situationally Aware

Through ESOHE focus group discussions, quarterly Technical Working Group meetings, and annual Executive Advisory Board forums, as well as maintaining connections with project collaborators and DoD leaders, the NDCEE program remains aligned to ESOHE challenges and needs.

Engaged

The NDCEE has created a joint project selection process that is conducted annually and coordinated with other DoD and ESOHE agencies. By funding technology demonstrations and ensuring technology transitions back into the ESOHE community, the program elevates the DoD’s ability to sustainably provide the warfighter with the right tools and resilient technologies for mission success.
Technological Advancements

NDCEE has invested resources to demonstrate and evaluate new technologies that have been developed through DoD investments or taking off-the-shelf technologies to determine suitability and effectiveness at bridging technological gaps for the warfighter, operational safety, and mission requirements. In working with leading DoD researchers, industry subject matter experts, universities, and installation personnel, new and emerging technologies were validated and have resulted in reduction of regulatory restrictions. For each year of projects funded by NDCEE, there is an average overall ROI for DoD of 400% with $100M in savings over five years.

From environmental to safety stewardship, these efforts have increased fidelity and decreased costs associated with detection, sample analysis, remediation, and mitigation. The demonstration and evaluation of new technologies within this report have improved occupational health and safety for DoD servicemembers and civilians. In addition, they have resulted in improved capability to reduce mitigation efforts.

Technology Experts

NDCEE investments have resulted in new technologies that can now be applied at the installation and tactical level. Results from demonstration/validation of battery storage and charging technologies for tactical efforts have resulted in longer storage life, less waste, and increased flexibility. Treatment technologies for wastewater, drinking water, and contaminated soils demonstrated and validated by NDCEE are modifying installation approaches.

Adoption of new technologies and methodologies for conservation and regulatory monitoring for compliance have resulted from NDCEE investments. These investments have improved operations, reduced risks and costs, and enhanced energy, environmental, and safety stewardship.

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**Sustainable Progress**
NDCEE is a trailblazer in sustainability and has continued to lead and forge new paths towards a sustainable future. Funding and leveraging the small scale to regional partnership efforts have resulted in low-cost resilient systems for mission readiness. Demonstration and validation of approaches and technologies have determined transition potential, improved adoption, and resulted in DoD modernization. Projects have focused on simple to complex solutions that will continue to place the DoD at the forefront of sustainability. The DoD is invested in the protection of our natural resources, facilities, soldiers, and civilians. NDCEE prides itself on investment into projects that will help achieve sustainability goals.

Support of new low-impact and low-cost monitoring and analysis approaches for the detection of Threatened and Endangered Species (TES) has resulted in significant improvements to best management practices in the field.

Investment in sustainable approaches and solutions provides the DoD with the ability to make sound ecological decisions to support the warfighter and environmental stewardship.

NDCEE has invested in low-cost and simple approaches to evaluate acquisition changes that will reduce contamination, energy, and improve waste management and water quality. Validation of sustainable solutions to commonly purchased goods provide green, low-impact acquisition solutions.

Support of new low-impact and low-cost monitoring and analysis approaches for the detection of Threatened and Endangered Species (TES) has resulted in significant improvements to best management practices in the field.
Collaborative Solutions

The structure of the NDCEE program and project alignment with transition partners across the DoD services is aimed at ensuring projects are developed and executed collaboratively. The structure of program oversight, project selection, funding, and in-progress/close-out reviews are geared to function at the strategic level. The lead agent, executive advisory board, program director, and selection committee all ensure that the technology and transition process is operational. The program management office, focus groups, and the technical advisory group provide feedback throughout the project. The transition goal is to provide a technology that is immediately usable by the transition partners and the end user. From start to finish, the process is collaborative. This ensures that the end result can be used across the DoD in any applicable target environment, assuring cost savings, environmental sustainability, mission readiness, and safety.
The NDCEE serves as a national resource for advancing technologies and processes that address high-priority environmental, safety, occupational health, and energy (ESOHE) challenges. Created by Congressional mandate in 1991, the NDCEE works to integrate ESOHE decisions into the life-cycle planning of DoD activities.

Proven technologies that are beyond the research stage are considered strong project candidates. Projects must meet the basic eligibility requirements and clearly address four scoring criteria:

1. Mission/readiness
2. Technical quality
3. Transition potential
4. Modernization/innovation

NDCEE provides a direct funding process for DoD agencies seeking to demonstrate, validate and transition commercially available off-the-shelf as well as recent laboratory innovations for military application. Funded projects typically range from one to two years with an average annual cost below $100k, up to $500k. A Support Agreement is signed by the DoD Installation willing to demonstrate the technology, and a DoD Transition Partner is required to ensure the successful project is implemented DoD-wide.

Desirable NDCEE project attributes align with the goals of the program:

- Project transition time-frame within two years
- Multi-service and/or multiple DoD partners is preferred
- Commercially available off-the-shelf (COTS) technologies are preferred to avoid production challenges for DoD-wide uptake
- If the proposed project has a signed technical transition agreement prior to final selection, that assists in reducing funding risk by assuring that technology transfer is set up and has a high likelihood of being successful

Environment (ENV)
Projects within the Environmental focus area work to lessen the impacts that DoD has on natural resources, and increase sustainability and resiliency. Subjects include, but are not limited to: water use and intensity reduction, contamination cleanup, reduction and/or replacement of hazardous materials and waste, monitoring TES.

Safety & Occupational Health (SOH)
The Safety and Occupational Health focus area funds projects that enhance safety, minimize warfighter exposure to hazardous substances, and decrease risk of injury and death. Subjects include but are not limited to: modernizing and modifying equipment technology to decrease safety and health risks, tool modifications, workplace protection technologies, and self-provisioning in austere environments.

Energy (ENG)
Projects funded within the Energy focus area maximize efficiencies, improve service flexibility, increase safety, and better manage and conserve energy for the DoD across all activities and locations. Project topics include but are not limited to: battery container technologies, energy conversion and power capability technologies, fuel cells, fuel management, and renewable energy.

Each NDCEE focus area has a dedicated facilitator to help project teams throughout their time in the program. The facilitators are subject matter experts who are responsible for coordination, oversight, and execution of NDCEE projects in support of Army and other service-specific program areas and initiatives.
Challenges

NDCEE is always looking to improve program management and project funding workflow with the interest of providing the best possible service to the DoD and the warfighter. The biggest challenges have historically been in ensuring transition and tracking the projects post-transition to better understand the beneficial impacts and ROI coming after technology transitions. There are ways that the program can improve before, during, and after project funding that can improve both of these issues, and the NDCEE continues to adjust its processes and project requirements to tackle these challenges.

Project Transition & Tracking:

One of the bigger elements of project transition is the technology transition agreement (TTA). The best project transitions occur when there is a signed TTA prior to or at the point of project funding. This ensures that the transition partner is able and ready to adopt the new technology once the Dem/Val is completed.

Typically projects that are able to utilize COTS technology without further applied or developmental research also fare better. Dem/Val of COTS is also more successful if the full lifecycle of the project and transition path is understood at the outset. The ability to anticipate any technology/software maintenance, housing, components issues is also very helpful, as well as being able to avoid manufacturing unforeseen bottlenecks that might occur when pushing out the technology or components nationwide/DoD-wide. Equally, any security issues that might arise should be flagged and addressed during project funding review.

For real property project assets, there should also be a plan toward the transfer of the technology to installation real property. Funding for future maintenance and day-to-day upkeep is a typical requirement of some project technologies, but the installation must be able to fund future upkeep needs for the technology transition to be truly successful long-term.

Other Useful Points:

Financial management of projects can sometimes be challenging as well, since DoD services use different financial accounting systems. This can cause issues with obligation/disbursement rates. Meeting OSD funding disbursement targets can also be a challenge, especially with yearly funding disbursal occurring late in the FY.

Path Forward

The NDCEE looks forward to future years of providing leadership and technological solutions to the DoD to maintain readiness, meet sustainability goals, and support warfighters. Broad program-level goals include increasing visibility and funding levels, as well as continuing to promote the program's successes and cost savings across all DoD services. Multi-service participation continues to be a high priority, for both engagement of services receiving project funding as well as the diversity of services engaged as transition partners for technology dem/val. A successful transition partner is one that has funding to purchase these technologies within the DoD. The inclusion of more acadamia and private industry entities is also welcome to further develop the reach of the NDCEE program and maximize cost savings for the DoD in the long term. The challenges of ensuring project transition and post-transition tracking will also be addressed at every level.

NDCEE is also adapting to and responding to Federal climate change and sustainability priorities. This year, in addition to the traditional ESOHE topics, submissions focused on climate resilience and sustainability were invited in response to recent Executive Orders (EOs). These include EO 14008 (Tackling the Climate Crisis at Home and Abroad) and EO 14057 (Catalyzing Clean Energy Industries and Jobs through Federal Sustainability). Submission topics included increased energy and water efficiencies, reduced waste and pollution, reduced greenhouse emissions, and obtained net-zero emissions from buildings, campuses, installations, and fleet. This sets precedent for NDCEE to continue to focus on Federal priorities in future out-years in order to maximize the impact of NDCEE funding within the Department of Defense as well as in response to Federal compliance targets, maximizing the impacts of increasing readiness and sustainability for warfighter support.

Executive Order on Tackling the Climate Crisis at Home and Abroad

Executive Order on Catalyzing Clean Energy Industries and Jobs through Federal Sustainability
Effective Technology Transfer

NDCEE has over 30 years of established technology transfer. It was established in 1991 to “address high priority environmental problems” for DoD, other government organizations, and industry. In 2008 the focus areas of Energy and Safety and Occupational Health Challenges were included. Due to the nature of this program targeting high-priority problems, the proposed solutions were, by nature, funded to demonstrate and validate innovative technologies. The short two-year project timeframe also supports fast dem/val which will immediately benefit the targeted recipient (initially the transition partner but post-validation the technologies are meant to transfer DoD/service-wide, wherever applicable). This technology transfer approach is meant to maximize ROI, emphasize multi-service benefits, and leverage opportunities wherever they exist.

NDCEE is integral in the development of solutions towards the interdependency of national security, energy & water supply, cost savings, environmental resiliency, and human health and safety.

Screening criteria ensure: projects support mission and readiness; are of high technical quality; have strong transition potential; and support modernization and innovation. NDCEE is working to increase multi-service transition, and technology transfer status of all projects is tracked through project close-out and beyond.

NDCEE has evolved into a recognized source of service-ready technologies that immediately benefits the DoD. These technologies range from knowledge-based products like best management practices and strategies, to supportive widgets and tangible innovative products. Completed projects inform a program of record, assist installations to be more efficient, transform workflows, solve safety challenges, create force multipliers, and provide the warfighter adaptive solutions that enhance mission readiness across the DoD.

Achievements

Supporting...

...Our Future
Funding:
NDCEE is a DoD Program; the Army is designated as the lead agency responsible for planning, programming, budgeting and execution. NDCEE thus provides a direct funding process to DoD agencies for researchers and shelf-ready technologies seeking demonstration, validation, and transition at DoD installations. Typical projects range from one to two years with a range of annual costs from $20K - $500K. Eligibility requirements ensure that there is a multi-service need and an official transition partner. Selection process ensures that projects support mission/ readiness, are of high technical quality, have strong transition potential, and support modernization / innovation.

Project categories are: Energy, Environment, and Safety & Occupational Health

The U.S. Army’s broadly encompassing and growing mobile, personal, and stationary technological requirements include: infrastructure, alternative and synthetic energy, training lands, emerging chemicals, transportation, systems integration, personnel well-being, and others. Further, to train as we fight, validated ESOHE technologies need to be available and implemented at DoD installations. The NDCEE will continue to demonstrate, validate, and transfer these technologies supporting our integrated environment, energy, safety, occupational health, and energy objectives to enable mission, readiness, innovation, lethality, and modernization to ensure our soldiers maintain a technological advantage over our adversaries.

The Return on Investment (ROI):
ROI is captured to understand how this project may have technological benefits and result in cost avoidance or cost savings over time, with target levels of at least 15% savings if applicable. As NDCEE funds 6.4 Advanced Component Development and Prototypes work, it is typically not practical to determine an accurate ROI at the start or even at the end of the 6.4 effort. Therefore, the NDCEE closeout process includes a 6-month and 12-month follow up. Depending on the timeline associated with achieving a particular technology’s fielding, a follow up ROI check may be necessary at a later date.

For More Information:
Projects submittal details are included in the “How to do Business with NDCEE” guide on our website.
https://denix.osd.mil/ndcee/home
Direct questions to the “Contact Us” link on the website and the NDCEE Program Manager will respond to you.

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Project categories are: Energy, Environment, and Safety & Occupational Health

The Office of the Assistant Secretary of the Army for Installations, Energy, and Environment (Environment, Safety and Occupational Health) is the Lead Agent, and the U.S. Army Environmental Command executes Program Management.
The Army is currently responding to the following climate change policies to build climate resilience:

- Executive Order (EO) 14008
- DoD Climate Adaptation Plan
- 2020 Directive 4715.21
- Army Directive 2020-08
- Army Climate Strategy
- Army Climate Action Plan

The Army Climate Strategy’s “End State” goals are to reduce emissions and increase its sustainability activity to align with the Nation’s commitments to:

- Reduce greenhouse gas pollution by 50-52% by 2030
- Reach net zero emissions by 2050
- Comply with the federal clean electricity and vehicle procurement strategy
- Ensure climate change adaptation and resilience are integrated across all Army programs, management of real property, and financial services

NDCEE supports projects that contribute toward Army Climate Resilience across all funding categories thus increasing warfighter readiness.

**Energy:** Projects target power extension and battery power, increased power transmission capabilities and reduced reliance on generators, efficient power flow management, enabled transport of charged batteries, and soldier relief from having to spend downtime recharging or carrying extra batteries on extended missions. Energy projects enhance energy efficiency, improve service flexibility, and increase safety.

**Environmental:** Projects focus on water use, by decreasing remote area water requirements, reducing water demand, and increasing water management functions. This in turn decreases water use intensity, reducing potential natural resource limitations.

**SOH:** Projects increase safety, with a particular focus on reducing warfighter exposure and risk of loss of life in remote areas and extreme environments. One particular element of this is increasing water and energy self-provisioning. Regulatory compliance is also increased, which also reduces environmental risks to soldiers.

Climate Change is defined as: Variations in average weather conditions that persist over multiple decades or longer that encompass increases and decreases in temperature, shifts in precipitation, and changing risk of certain types of severe weather events.

Resilience is defined as: Ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.

“Today, no nation can find lasting security without addressing the climate crisis. We face all kinds of threats in our line of work, but few of them truly deserve to be called existential. The climate crisis does... Climate change is making the world more unsafe and we need to act.”

- Secretary of Defense Lloyd Austin, President Biden’s Leaders Summit on Climate, Earth Day, April 22, 2021
Current Climate Resilience
NDCEE Project Contributions

1. Autonomous and Robotic Remote Refueling Point (AR3P) Objective Field Prototype (OFP)
   Delivers ground based autonomous unmanned refueling capability and reduces soldier exposure, increases combat radius of existing rotary-wing aircraft. The integration of this technology will allow for operation in ruggedized environments with hostile climates and for Sling Loading Operations in support of aerial delivery/emplacement methods. By placing fuel forward, operational reach is extended and demand and volume are reduced. [Energy - FY21]

   This project will enable the capability to convert 120VAC 20amp circuit common on military power distribution equipment to 600VDC to transmit over a power line. The higher voltage will eliminate the issues with line loss at the higher distances and enable the removal of spot generators from the battlefield, saving fuel and reducing the logistic burden on the warfighters. [Energy - FY20]

3. Intelligent Battery Tray for Small-and Medium-sized EOD Robots
   Project will design a battery tray which will manage BB-2590 power flows and ensure resilient, predictable, and flexible power to achieve optimal Common Robotic System - Heavy (CRS-H) mission time and performance. Technology developed also applies to Man Transportable Robotic System Increment II (MTRS Inc II), CRS-Individual, TALON, and Packbot. Potential cost savings are also significant as each new set of CRS-H batteries costs up to $5,400 each saving $5M/year for a 1000 robot fleet. [Energy - FY22]

4. Multi-Service Lithium Battery Charging, Transport, and Storage
   Enables fully charged battery transport increasing readiness and reducing downtime during recharge with ROI of >$1M per unit based on approximately 24hrs saved per deployment of air-carried systems using Li-ion batteries with additional savings in prevention of battery fires. [Energy - FY17]
5. 6T Hybrid Power Energy Router (6T-HYPER) - 6T Based Bidirectional Inverter Cap
The 6T-HYPER will be a one-man carry device that can both harvest energy from any AC or DC source and supply clean AC/DC power from a 6T Li-Ion battery, from the 24VDC bus of a vehicle and from any AC power source up to 10kW. [Energy - FY22]

6. Marine Corps Secure Tactical Advanced Mobile Power (MCSTAMP) Hybrid Dashboard
Integrated power generation, distribution, energy storage, metering, control systems and on-board power from mobile tactical platforms capable of forming into an AC/DC micro-grid will enhance resiliency, mobility and flexibility of advanced units to execute distributed cross-domain maneuvers in multi-domain operations. [Energy - FY22]

7. Distributed Low-Energy Wastewater Treatment (D-LEWT) 2.0 to Enhance Energy and Water Security and Resiliency
A 10,000 gallon/day modular/scalable containerized wastewater treatment system which generates hydrogen and methane for energy production with the potential for an 80% energy reduction compared to traditional aerobic treatment systems. [Energy - FY20]

8. Charging-capable Li-ion Autonomous Safe Storage Container
Design and produce a standard footprint container capable of transporting, charging and storing various non-portable Li-ion batteries safely on aircraft and other DoD platforms allowing for electrification of the force safely. [Energy - FY20]

9. DCPD Direct Current Power Distribution (DCPD)
This project will enable Army Multi-Domain Operations (MDO) and USMC Expeditionary Advanced Base Operations (EABO) warfighting concepts, as the services need improved flexibility, speed and efficiency of distributing Small Unit Power. DCPD will change the paradigm of power at the tactical edge by reducing reliance on large AC generators, therefore reducing fuel requirements and minimizing transported equipment needs for the fight. [Energy - FY21]

Soldiers on extended missions will not need to carry extra batteries or recharge batteries; they simply refill the fuel cell saving on energy costs and improving safety. The HB50 is a 50 Watt Reformed Methanol Fuel Cell (RMFC) system which generates power by converting the chemical energy in a methanol/water mix (fuel) to electrical energy. [Energy - FY21]
11. Greywater Treatment and Reuse System (GWTRS)
Decreases remote area water requirements by 60% and increases energy efficiency. Transitioned to Product Manager (Petroleum and Water Systems) and will commence usage at Fort Leonard Wood with projected ROI of $2.2M. [Environment - FY16]

12. Deployable Water Metering and Monitoring System for Multi-Domain Operations (KETOS)
This project will increase military capabilities for integrated metering and monitoring of water supplies in Multi-Domain Operations (MDO) and resilient installations to better manage water and energy resources. [Environment - FY19]

13. Greywater Reuse Pretreatment Module for the Lightweight Water Purifier
A system to reduce water demand by treating greywater for non-potable reuse at the point of use with existing equipment. [Environment - FY21]

14. Remote Emergency Generator Monitoring
Project demonstrates a custom system for remotely monitoring air permitted emergency generators reducing air emissions and labor costs at the installations. [Environment - FY20]
Achievements

The NDCEE continues the critical mission it began over 30 years ago: Identifying, demonstrating, evaluating, and fielding technologies in support of DoD readiness, sustainability, and the warfighter.

Doing Business with the NDCEE

The NDCEE is available to DoD and all federal agencies. Our customers benefit from leveraging the Army’s investment in the NDCEE Program infrastructure and its streamlined contract management and project execution. There is no administrative fee for using the NDCEE contract vehicle, allowing stakeholders to receive the maximum return on their RDT&E investments.

FY20 Highlights

- Managed & tracked 49 projects
  - 10 FY19 projects transitioned
  - 8 projects closed-out
  - 16 FY20 continuing projects
  - 6 FY21 new starts
  - 9 FY21 continuing prior-year projects

- Enhanced multi-service participation
- Doubled the number of project proposals, with 53 submitted in FY21
- Successfully obligated $3M Congressional Add
- Engaged in various marketing efforts
- Redesigned DENIX website to include project fact sheets
- Increased program funding transparency with real-time data platform
- Presented NDCEE 101 at the SERDP Symposium and other DoD Conferences

FY21 Highlights

- Managed & tracked 45 projects
  - 3 FY20 projects transitioned
  - 6 FY21 continuing projects
  - 9 FY22 new starts
  - 33 continuing prior-year projects

- Increased technology partnerships and leveraged funding
- Continued multi-service participation
- Increased the number of project proposals, with 65 submitted in FY22
- NEW Digital Platform used for project submissions for FY22 funding cycle
- Conducted 4 site visits to view demonstrations and promote transition to technology partners
- Presented NDCEE 101 at the SERDP Symposium and other DoD Conferences

PROJECT SELECTION

- Valid User Requirements
- Sources Drive the Process
- Joint participation with DoD, industry, and academic partners
- Structured selection process to ensure Joint benefits and transition success
- Focus reporting to ensure Dem/Val completion in accordance with plans
- Ultimate goal is to transition viable technologies to end-users

Proposals Due

1 APRIL

Project Selection

JULY

Project Start

When funds are available; Typically Nov-Mar.

In-Progress Reviews

QUARTERLY

Project Transition

OCTOBER + 2 years

Transition Tracking

OCTOBER + 2.5 - 3 years

Notes:

Projects must be eligible for Budget Activity 4, must be at a Technology Readiness Level (TRL) of 5-6 at entry and progress to 8-9 upon exit. There must be a valid multi-service need, and a technology transition partner must sign a transition agreement. Projects must also be completed within two years. Projects should utilize DoD / service installations if a locational presence is required to demonstrate the technology and/or prove successful tech transfer.
**Energy Efficient Expeditionary Small Unit Water Purifier (SUWP)**

**Project Purpose**
Dem/val a commercial SUWP system that provides safe drinking water from multiple water sources through energy efficient, reverse osmosis. This will enable warfighter readiness. Water is required by every warfighter to maintain both proper health and readiness. The logistics of transporting water for 30 persons varies between 945-1950 lbs. of water per day. Producing water at the point of need would represent a novel way to eliminate the need to haul water, reduce supply logistics, extend mission length, and create a more agile and effective force. The E3-SUWP is a fully functional reverse osmosis water purification system, can purify any water source, HMMWV transportable, and utilizes a high efficiency energy recovery pump to reduce power consumption.

**Project Impact**
Stakeholder/Beneficiaries include U.S. Army Africa (USARAF), Sustainment Capabilities Development and Integration Directorate (CDID), and the U.S. Marine Corps. All ground troops will benefit from a secure and readily available water supply. The successful outcome of this NDCEE project will result with the E3-SUWP which can produce 20-26 gal/hr. from any water source while using only an average of 275-485 W of energy. This will reduce the amount of water transported for a three-day operation by 90-95%.

**Special Notes / DOD ROI**
Stakeholder/Beneficiaries include USARAF, Sustainment CDID, and the US Marine Corps. All ground troops will benefit from a secure and readily available water supply. The successful outcome of this NDCEE project will result with the E3-SUWP which can produce 20-26 gal/hr. from any water source while using only an average of 275-485 W of energy. This will reduce the amount of water transported for a three-day operation by 90-95%.

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**Project Purpose**
Convert 120VAC circuit common on power distribution equipment to 600VDC to transmit over a ruggedized power line to extreme distances. This effort developed a product that provides the capability to run power from its current maximum of 300’ to a longer distance 4000’. This will enable remote sensors, weapon systems, and power loads to be run from the more efficient central power generation source and eliminate the need to run an extra generator set for one load in a remote area. This product will take the normal 120VAC 20amp circuit into the transmitter box and convert the 120VAC to 600VDC to transmit over a ruggedized power line to the receiver box which will convert it back to 120VAC for the local load to plug into. Converting to the higher voltage will eliminate the issues with line loss at the higher distances and enable the removal of spot generators from the battlefield, saving fuel and reducing the logistic burden on the warfighters.

**Project Impact**
PEGS reduces the number of required generator sets while providing increased power reliability and availability by running from the main grid or central power generation source. It increases the readiness of the warfighter across all the services, increases the operational flexibility of the battle commander, reduces the logistic burden on the warfighter, and reduces the fuel needed on the battlefield. The operation and maintenance of the system requires minimal specialized or additional training for an Army 91D or other services maintenance personnel. PEGS is DoD- owned, with all firmware, source code, and drawing packages belonging to the Army.

**Special Notes / DOD ROI**
Completion of this project will result in a transition of Hardware, a Tech Data Package, and/or Purchase Description to Project Manager–Expeditionary Energy & Sustainment Systems. PM-E2S2 holds the DoD charter for power generation and distribution. Upcoming major activities include demonstrations, field evaluations, soldier touch-points, and mil-spec testing.
**Autonomous Robotic Remote Refueling Point for Rotary Wing Aircraft (AR3P)**

**Project Purpose**
The AR3P is a robotic refueling system for both manned and unmanned rotary-wing and VTOL aviation systems. Program goals are to re-introduce the Forward Airing and Refueling Point (AR3P) concept using autonomous capabilities in order to a) reduce warfighter exposure and b) improve combat radius / increase the range of key existing rotary wing manned and unmanned aircraft. System deployment will reduce or eliminate warfighter exposure at forward air refueling points (FARP). By placing fuel forward, operational reach is extended and demand and volume are reduced. During the current phase of the effort, technology maturation includes modification of the robotic arm and end effector fuel delivery system. Additionally, warfighter-recommended updates will be made to the large-diameter fuel hose, COTS standard high flow rate fuel nozzle, and small mount manifold. The integration of high flow rate safety features to minimize fuel spillage such as emergency cutoff valves will also be conducted. Testing of the existing end effector static abatement circuit will be performed to increase the overall TRL level of the end effector design.

**Project Impact**
The transition products will be: An Objective Fielding Prototype (OFP) system and design, technical drawing package, and performance specifications. Future demonstrations will include one or more of the following aircraft the SH-60, MH-6, MV-22, CH-53. Successful rotors turning demonstrations involving a USMC K-MAX and an S-70 (UH-60A) (helicopters) were conducted in September and October 2020. The AR3P system is service-agnostic, and may also be leveraged by coalition/partner forces.

**Special Notes / DOD ROI**
The AR3P program will reduce soldier exposure to zero, increase survivability of flight crews during long range missions by providing “pit stop” capability, support demand reduction of associated log support on the battlefield, and provide improved time on station for reconnaissance. It will also provide a robotic system with remote fuel certification techniques. The system satisfies the need of the Army for autonomous refueling and rearming in austere locations; also the needs of the Navy in an improved range for littoral operations.

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**Smart Universal Static Line Snap Hook**

**Project Purpose**
During static line airborne operations, a towed jumper can occur when an airborne soldier does not separate from aircraft, which may lead to serious injury or death of the airborne soldier. – A towed jumper may not be identified immediately, which may cause injury and/or death by striking the aircraft or other jumpers exiting the aircraft. – The SUSH detection device will be an adapter-type visual and/or audio notification device which will attach to currently used equipment to notify on-board safety personnel of the towed jumper.

**Project Impact**
The primary stakeholder for this technology is the static line airborne soldier and his or her Unit. The airborne soldier will benefit from this technology by reducing the risk of injury when executing a static line airborne operation and the soldier’s unit will benefit from this technology by increasing mission readiness through a reduction of risk and potential injury during static line airborne operations. Other DoD stakeholders include the US Navy, Marine Corp and Air Force and US Forest Service, who also conduct static line jump operations and experience towed jumper malfunctions.

**Special Notes / DOD ROI**
There is historically an average of approximately one towed jumper event per year. Resulting in risk/injuries that can range from permanent partial disability (Class B) or fatality/permanent total disability (Class A). This capability significantly reduces the severity of injuries resulting from towed paratroopers by reducing the time to detect a towed paratrooper event, which will allow the jumpmaster and/or safeties to stop following jumpers from exiting more rapidly and reduce the time a towed paratrooper is exposed outside the aircraft.

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**Project Showcase - Energy (FY19)**

**Project Showcase - SOH (FY18)**
Human Vibration
Exposure Directory (HVED)

Project Purpose
This project combines existing technology and data to develop an online platform that is accessible by Occupational Health and Safety (OHS) personnel. The platform will house a directory of whole-body vibration and hand-arm vibration exposure measurements made on DoD equipment used by DoD personnel. This effort will develop, populate and deploy a web-based, searchable directory of human vibration exposure measurements of DoD power tools and vehicles for use in the estimation of soldiers’ and civilians’ exposures.

Project Impact
Once this project is complete, OHS personnel will be able to estimate exposure measurements and enter data into the Defense Occupational and Environmental Health Readiness System (DOEHRS) and document an individual’s longitudinal exposure record.

Special Notes / DOD ROI
The directory becomes a force multiplier by allowing OHS personnel the ability to search other installations’ efforts to determine if equipment was previously measured under similar conditions. Worker exposure can then be estimated and quickly compared to recognized standards to determine if further investigation is warranted.

Improved Bucking Bar to Maximize Worker Performance and Health

Project Purpose
The purpose of this project is to determine if a new bucking bar designed with vibration dampening materials will reduce the level of hand-transmitted vibration (HTV) riveters are exposed to as part of their normal job responsibilities. Workers using manually operated riveting tools (riveting hammers and rivet bucking bars) are exposed to significant levels of hand-transmitted vibration. Riveters are at risk of developing components of hand-arm vibration syndrome as they can install thousands of rivets in a work week when performing maintenance on aircraft. This effort will field test a new bucking bar design that incorporates use of a spring, urethane and tungsten inserts as vibration dampeners to minimize the vibration exposures.

Project Impact
All DoD services perform pneumatic percussive riveting and use bucking bars in the maintenance of aircraft. Literature indicates that gloves do a poor job of protecting the hands at less than 250 Hz. The literature also notes that it is very difficult to find or make a glove that could reduce the vibrations transmitted to the fingers in this frequency range. This study therefore, focuses on reducing the finger-transmitted vibration by developing a better bucking bar tool, and will provide impacts reaching across the DoD if successful.

Special Notes / DOD ROI
This project will help the DoD determine if there is a benefit to using bucking bars that possess vibration dampening properties. This study looks at human health impacts relative to potential decrease in hand-arm vibration levels, decrease in muscle activity, decrease in perceived exertion, and decrease of error rates. If this project is able to prove health benefits to workers, vibration dampening bucking bars could replace current bucking bars. ROI would be seen in human health/safety, likely also in cost decreases due to decrease in error rates and increase in work rates due to decrease in perceived exertion.
PFAS Effluent Treatment System (PETS)

Project Purpose
ERDC's Environmental Laboratory has developed a mobile treatment system to remove Per- and polyfluoroalkyl substances (PFAS) from water. The PETS can be effectively applied to relatively small quantities (250,000 gallons or less) of collected PFAS contaminated water. The water sources can be areas collecting runoff water from AFFF equipment, wash off and Aqueous Firefighting Foam (AFFF) equipment decommissioning areas, PFAS contaminated groundwater from Investigative Derived Wastes (IDW), small groundwater pumping sites where PFAS contaminated groundwater is collected in a storage system, and in construction dewatering operations involving sites with PFAS contamination. This dem/val project was successful in providing a mobile system to effectively treat collected contaminated water at multiple sites.

Project Impact
AFFF are an established source of PFAS environmental contamination. The U.S. Air Force, Navy, Marine Corps, and Army have numerous facilities where AFFF was used for training and stored for future use. Many of these facilities have recovery systems that collect the contaminated water. Although some of these can have large water volumes, (>1 million gallons), many of these systems are relatively small, ranging from 500 to 250,000 gallons. A mobile system to periodically treat the contaminated water from these systems will be useful.

Special Notes / DOD ROI
As part of the NDCEE project, the system was completed and successfully demonstrated at Hurlburt Field (Air Force) in Florida, and Millington, TN. Following the NDCEE project, advanced versions of the PETS were successfully demonstrated for two projects at Air Force and Marine Corps bases in Japan. The system (including every component) is approximately $200,000. The maintenance cost will be merely on the replacement of the ion exchange resin media. The Return on Investment on using a PETS to treat water from an 150,000 gallon pond was calculated to be over 14:1 compared to pumping it out and incinerating the collected water, and is recognized due to the mobility, versatility, and compatibility of treating the smaller contaminated water systems periodically and as necessary.

Picogrid: Satellite-Connected Remote Monitoring for Field Sensor Suite Deployment

Project Purpose
The primary objective of this project is to clearly demonstrate the effectiveness and efficiency of the Picogrid satellite-based technology at transmitting data collected from remote ground sensors to a secure internet site, from which data can be readily accessed by the end-user. This project will prove the technology’s capability to operate with a wide range of existing sensors and equipment to enable rapid, cost-effective integration into array of applications. The goal of the project is to develop a process using the Picogrid technology that provides the DoD a cost effective and efficient enterprise-scale method for accessing and transferring ground-based sensor data in remote areas without the need for physical data retrieval.

Project Impact
The current state of the art technology for accessing data in remote areas without cellular service often requires complex, ground-radio networks or frequent manual access. Deploying field-equipment with Picogrid terminals enables faster installation and greater reliability than ground radio networks since each terminal is independently solar powered and maintains a dedicated satellite internet connection. The frequency of manual access is reduced through network connectivity. This technology enables federal land managers, including DoD range management offices, environmental divisions, and a live, real-time connection to the field. The dem/val site location for this project is Luke AFB/56 RMO in Arizona where it will augment existing environmental field operations. Other DoD (Naval Base Ventura County) and non-DoD organizations (Alert Wildlife, Seychelles Dept. of Foreign Affairs, Pacific Gas & Electric, and various fire departments have also expressed interest in this technology.

Special Notes / DOD ROI
The Picogrid Lander is a fully self- contained, grid-independent remote monitoring terminal designed to supply persistent power and to secure, high- bandwidth connectivity to sensors and remote field equipment for years without maintenance. This capability will alleviate the reliance on physical data retrieval in remote areas, which provides warfighter safety. It also reduces the amount of ground equipment that is required, thus also reducing costs. Finally, it is possible to utilize this technology in sensitive environmental sites, away from power sources or other connectivity infrastructure, which assists in environmental compliance and stewardship.

Project Showcase - Environmental (FY19)

Project Showcase - Environmental (FY20)
Citric Acid Passivation (CAP)

Project Purpose
The Army must mitigate the impacts of hexavalent chromium (Cr6+) on our workforce and our processes to ensure sustainment of readiness capability. Cr6+ is a known human carcinogen. Corpus Christi Army Depot (CCAD) uses nitric acid passivation (NAP) for corrosion protection on retainers, spacers, mounts, and other SS components. NAP requires the use of nitric acid (NOx) in wastewater and Cr6+ from the passivation process. This project is one of several projects designed by AMCOM G-4 to eliminate the use of Cr6+; it is a demonstration/validation project of Citric Acid Passivation for corrosion resistant steel (CRES) weapons system components.

Project Impact
The use of CAP will eliminate risk for workplace exposure to NOx and Cr6+. CAP will be incorporated as a critical process for jet engine overhaul, impacting all aviation platforms processed at CCAD including UH 60, AH 64 and CH 47, as well as aviation platforms at other DoD activities as applicable.

Special Notes / DOD ROI
This chemical cleaning process improves weapons systems corrosion resistance, and reduces both hazardous waste generation and greenhouse gas emissions. CCAD will realize $200,000 in annual cost avoidance using the CAP process as it reduces: process time and labor, chemical material, disposal, and treatment costs, the number of scrapped parts from etching, and labor for bath maintenance for test and disposal. CAP is safer, faster, cheaper, more environmentally friendly, and imparts superior corrosion resistance over NAP for the seven stainless steel alloys which are immersion passivated at CCAD. All this combined contributes to increased mission readiness through improved employee safety and health.

Novel Bioaugmented Sorption Treatment Technology for CVOCs and 1,4-Dioxane

Project Purpose
Chlorinated volatile organic compounds (CVOCs) and 1,4-dioxane are persistent chemicals that often co-occur in groundwater at DoD sites. Conventional treatment methods such as advanced oxidation are very expensive, while sorption or air stripping are typically ineffective for the complete removal of both CVOCs and 1,4-dioxane due to the hydrophilicity of 1,4-dioxane. The project objective was to demonstrate an ex-situ adsorption/biodegradation treatment train to irreversibly remove CVOCs and 1,4-dioxane from waters at a DoD site using bioaugmented adsorbents. The goal was to limit the cost associated with existing pump and treat technologies (e.g. advanced oxidation) by minimizing costs from energy inputs and/or chemical inputs (e.g. costs from UV sources and chemical oxidants), as well as to use this process for other remediation efforts.

Project Impact
The hybrid biological/physicochemical process provides sustainable realtime sorbent bioregeneration, with low costs, longer operational lifetime, and minimized RCRA waste to ensure minimal toxic byproducts. There is also minimized leaching concerns associated with potential secondary release (landfilling) due to biodegradation of 1,4-dioxane and some CVOCs.

Special Notes / DOD ROI
A tool provided by the Navy Environmental Sustainability Development to Integration Program was used to understand lifecycle savings for this process versus existing pump and treat systems (including RCRA waste disposal cost). Project costs were scaled over 30 years of treatment life cycle across 50 potential sites. The study found a RDTE cost effectiveness ratio of 16.11, an extended present value of savings of $9,990,300 and a savings-to-investment ratio of 10.08.
Environmental DNA Surveillance of Threatened
/Endangered Species on Military Ranges

Project Purpose
The project goal is to develop standardized environmental DNA (eDNA) sampling protocols and guidance materials to facilitate widespread adoption of eDNA surveillance techniques for monitoring threatened/endangered species (TES) on military ranges. Environmental DNA analysis has emerged as a rapid, cost-effective option for detecting and monitoring rare, cryptic, and/or elusive species. This technology can detect and identify species from the DNA that they have shed into the environment, without requiring animals to be physically present at the time of sampling. Specific project objectives include 1) demonstration of the use of eDNA on military ranges, 2) construction of a database of currently available eDNA assays for DoD species and 3) provide detailed guidance on use of eDNA.

Project Impact
Endangered Species Act mandates often require extensive survey and monitoring efforts for threatened/endangered species on DoD installations which can be time intensive and expensive. The use of eDNA can drastically improve survey efficiency, resulting in cost and time savings for installation managers and minimizing impacts of TES encroachment on military training.

Special Notes / DOD ROI
This project is demonstrating the use of eDNA conducted within standardized protocols across a variety of military relevant challenges and contexts including single species assays, community level assays and variable habitats (standing water, flowing water and terrestrial). This demonstration, in combination with detailed guidance developed and informed via these efforts, as well as an eDNA database, will facilitate adoption of this technology for more cost effective monitoring of TES on DoD lands.

Cost-Effective Autonomous Monitoring of Military Ranges for Threatened/Endangered Species

Project Purpose
Autonomous cameras have been used for decades to monitor wildlife species, however, the development of accompanying software that would allow automated animal identification from cameras images has lagged. Recently developed deep learning software has shown great promise with >90% accuracy for animal identification. This project used autonomous cameras to photograph wildlife in remote field locations, then used deep learning software to identify the species present. This project demonstrated the successful capability of integrating monitoring hardware and deep learning software for monitoring of threatened and endangered species (TES) on military lands.

Project Impact
The presence of TES on military lands can be costly, in terms of species management costs but, also and more importantly, through the potential for training restrictions. Effective management, and thus avoidance of restrictions, is dependent on detailed information on where species occur on the installation. This project demonstrated the combination of remote, autonomous cameras and machine learning for image identification, allowing highly cost-effective monitoring of endangered species across military installations and enabling regulatory compliance.

Special Notes / DOD ROI
By providing detailed, step-by-step guidance on how to transition DoD datasets to available animal ID programs and identifying limitations to their use, we have enabled adoption of this technology by Installation Natural Resource Managers interested in a wide variety of at-risk species and with varying technical skills. Further, we have initiated an equipment loan program in FY21 whereby interested DoD installation land managers can borrow game camera equipment to pilot the technology.
<table>
<thead>
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<th>Year</th>
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**Live Round Interrupter (LRI)**

This is a device attached to the barrel of a gun that locks the barrel and prevents live rounds from firing due to the depth of the firing pin strike. It is for use in blank fire training operations to reduce injuries and accidental deaths. The device also aids realism, increases performance, and reduces wear and tear on operations. More testing and work is required on integrating the device with the Military Infrared Laser Engagement System (MILES) which also uses it on the rifle.

**Environmental Toolkit for Expeditionary Operations (ETEO)**

Detects contaminants real-time in the field to reduce exposure risks to soldiers and personnel. Now available to the warfighter anywhere. Environmental conditions need to be monitored or controlled to support larger payloads. System is still in development.

**Mobile Electric Hybrid Power Sources (MEHPS)**

Hybridizes existing DoD generators with high efficiency Li-ion batteries and a lightweight photovoltaic technology. Benefits include additional load is supported by solar, reducing no load fuel consumption and utilizes renewables to reduce liquid diesel requirements. The MEHPS system extends the time needed between fuel supply by about a week.

**Sulfur Tolerant Solid Oxide Fuel Cell (SOFC)**

Sulfur tolerant solid oxide fuel cell stack for military ground vehicle auxiliary power units that enables the development of an SOFC system capable of operating with JP-8 logistic fuel which enables longer mission durations and can support larger payloads. System is still in development.

**Grey Water Treatment & Reuse System (G-WTRS)**

G-WTRS (‘gee-waters’) provides grey water reuse to reduce logistics requirements and shower water heat recovery technology to reduce fuel usage. End-users could save water requirements reduced shower systems. End-users could save water usage by up to 50% G-WTRS transferred to FUM in Spring 2021; projected ROI is $2.2M.

**馏分水处理与回收系统（G-WTRS）**

G-WTRS（‘gee-waters’）提供灰色水再利用，以减少后勤需求和洗澡水的热量回收技术降低燃料消耗。

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Automated Driver OE Training and Tracking Tool
Dem/val of a digital telematics device, also development of requirements documents and algorithms to track driver performance via software attached to a Ground Tactical Vehicle. The purpose is to improve driver operational energy accountability through driver awareness and feedback an operator’s experience, remediation needs, and training. Findings indicated that improved driver performance yielded 13-18% fuel savings.

Towable Load Following 60 kW (T-60) Generator Set with Integrated Microgrid
This is a HMMWV / .50TV towable 60kW power system with a self-contained microgrid that provides variable output, follows loading, and operates in grid tie and standalone power modes in tactical environments, using open source control signals and a universal microgrid interface. Variable speed technology could reduce fuel transportation casualties in theater by reducing the fuel consumption by 25%.

Low Cost Acoustic Monitor (LCAM)
Device monitors military noise environments with enhanced technological capabilities at a lower maintenance cost, improved source localization accuracy with customizable environmental noise classifiers for noise source identification to better support training and readiness. The $10K cost of the LCAM provides a 75% cost reduction in purchase price vs. the previously used $40K COTS device.

Novel Bioaugmented Sorption Treatment Technology for CVOCs and 1,4-Dioxane
This project demonstrates the use of a hybrid biological/physicochemical treatment process that simultaneously and irreversibly removed CVOCs and 1,4-dioxane from groundwater at a DoD site, where microbial growth of 1,4-dioxane was consistently removed. A Savings to Investment Ratio (SIR) of 10.08 was reached when comparing operating savings to capital costs.

Non-propagating Lithium Battery Module for Navy Shipboard Multifunction Energy Storage
Dem/val of a Li-ion battery module that prevents thermal failure propagation and leads to total catastrophic failure on military platforms. While successful within NDCEE, additional research is required in the future to enable overall electrical bus stability with shipboard power generation systems.

DBx-1 Green Primary Explosive Demonstration in Detonators to Reduce Lead
Optimize the current coating method and demonstrate coated DBX-1 as a lead azide and a lead styphnate replacement in detonators such as the C70 used in the M213 Fuze (in the M67 Hand Grenade). Within this technology, printer will be loaded via automation for homogeneous loading and reduced operator exposure. Technology validation is still ongoing.

Elimination of Perchlorate and volatile Organic Chemicals (VOCs) from the M662 Red Star Parachute Signal
The M662 Red Star Grenade Cartridge is a low-velocity rifle-launched 40mm cartridge that contains a high-sensitivity propellant charge and provides a 35-second illumination display. The developed perchlorate-free, aqueous alternate cartridge will need additional formulation adjustment testing, followed by static and ballistic tests of 40mm cartridges.

Visual Indicator for Hydrogen Fluoride (HF) Produced from Extinguishing Fires with Hydrofluorocarbon Fire Suppression Technologies
Visual Indicators dem/val to detect HF from extinguishing fires to minimize worker exposure. Results confirmed technology needed to detect HF within seconds of HF/C discharge, but further development of coatings requires is required to resolve the sensitivity and response time.

Cost-Effective Autonomous Monitoring of Military Ranges for Threatened/Endangered Species (TES)
Integration of autonomous cameras and deep learning software for improved autonomous surveying of TES on military lands will greatly improve TES monitoring to >95% accuracy with artificial intelligence recognizing the presence of animals. Result will allow greater access and flexibility for military training.

PFAS Effluent Treatment System (PETS)
Commercial SUWP system dem/val to provide safe drinking water from multiple water sources through energy efficient, reverse osmosis to enhance and enable warfighter readiness. The project resulted in a patent-pending invention for reducing the need of physical filters by 66%. Licensing evaluation and production plans to supply the E3-SUWP to the military and for humanitarian assistance are underway with the manufacturer.

Green Machining of Multi-Service Weapons By 3D Waterjet
Modernize and demonstrate the usage of 3D Abrasive Waterjet (AWJ) technology by expanding the machining capability to new weapon systems and components. This technology avoids the use of environmentally toxic chlorinated lubricants, and the life cycle disposal costs.

Deployable Water Metering and Monitoring System for Multi-Domain Operations (KETOS)
Determine public health officials and sustainment operations by remotely monitoring water quality, proactively addressing potential safety issues, and ensuring that water meets compliance and sustainability standards. The annual cost savings is $445K based on $1K per site cost for grab samples and lab analyses.
Improved bucking bar to maximize worker performance and health
Demonstration of a bucking bar designed with vibration damping materials to reduce the level of hand-transmitted vibration (HTV) that riveters experience from job duties. While the goal of reducing vibration levels was achieved, design consideration should be considered as the newer bucking bar is more than twice the size of a traditional bucking bar and may not fit into the riveting spaces.

Charging-capable Li-ion Autonomous Safe Storage Inter-service Centralized Charging
Design and production of a container capable of charging, transporting, and storing man-portable Li-ion batteries safely on aircraft and other DoD platforms. Projected benefits are thousands of hours saved in deployment times due to needing to discharge batteries prior to flight, and millions of dollars saved due to the protection from battery fires offered by the container.

Agile Power Extender for Remote Operations: Power Extender-Grid Source (PEGS)
Project will enable the capability to convert 120VAC/20amp circuit common on military power distribution equipment to 600VDC, enabling operation over a ruggedized power line. A single system will replace the 5kW AMMPS being used for spot generation at an immediate saving of $145 per unit. More savings will be realized via cost savings including transport, fuel, and maintenance of the legacy generators.

Assessment of ZARGES BatterySafe™ products and prototyping cost-effective large lithium battery charging containers
Investigate and develop man-portable lithium battery containers for use as hazard mitigation while on board surface/subsurface/air platforms. The COTS system was successful with the 2.5kV batteries but total system was not. Additional 5kW prototype development with 5kW is required.

Human Vibration Exposure Directory
Project developed, populated, and deployed a web-based searchable directory of human vibration exposure measurement resources. Provides DoD tools and vehicles for use in the estimation of soldier and civilian exposures. Eliminates need to conduct vibration surveys and rental of vibration meters for data inside of system ($1,720 savings per vibration survey).

AMATS: Ruggedized Automatic Critical Power Transfer Switch
Design and production of a composite enclosure and reliable power to critical mission loads on the tactical battlefield. The AMATS system monitors an existing power generation source (military generator, microgrid, host national power grid, or commercial generator) for power loss, then it automatically commands a military standard Advanced Modular Power Source (AMMPS) generator set to power critical loads within 10 seconds.

Compact High Density Tactical Energy Storage (CHDTES)
Development of a composite enclosure for two Liion BT batteries and related deployed equipment in expeditionary missions. System reduces the need for resupply through reduced generator ownership cost (TOC) via reduction of generator maintenance and battery life improvement, and makes important progress toward USMC 2025 objective of using fuel for mobility only.

Environmental DNA (eDNA) Surveillance of Threatened/Endangered Species (TES) on Military Ranges
Development of standardized eDNA sampling, analytical protocols, and guidance materials to facilitate widespread eDNA surveillance adoption. This technology surveyed amphibians, reptiles, bats, and freshwater mussels with a two to 70 times cost reduction over traditional methods resulting in substantial time and cost savings.

Mobile PFAS Removal System to Support Warfighter Aircraft and Carriers
Demonstrate/validate a system that can effectively remove PFAS chemicals from AFFF impacted waters at 20 gallons per minute. Final results will be published in a technical report.

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Remote Emergency Generator Monitoring
Project is demonstrating a custom system for remotely accessing operational and conditional aspects of emergency generators. All equipment has been delivered and software development has been finalized. Reduced compliance and engine maintenance cost results in an ROI of 2.5 years. This system will also avoid compliance enforcement fines through immediate notification of non-permitted use.

An Innovative Plasma Technology for Treatment of PFAS Impacted Waters
Field demonstration and validation of a mobile plasma treatment system for the treatment of PFAS-impacted waters at DoD fire training areas. System provides rapid destruction of PFAS and other contaminants without chemical additions or production of residual waste. Final PFAS-contaminant destruction to be documented in final report; cost estimates are significantly less than existing alternatives.

The Destruction of PFAS using Supercritical Water Oxidation
PFAS/AFFF contaminated groundwater was processed through an industrial high temperature supercritical water oxidation (iSCWO) demo facility to measure destruction efficiency (DE). The iSCWO achieved ~99.992 DE for PFAS. ROI varies, with an initial start-up cost coupled with a treatment operation cost of $1.5 million, capital costs may be recovered 40 - 53 months after installation, dependent on the amount of PFAS-laden water present.

Picogrid: Satellite-Connected Remote Monitoring for Field Sensor Suite Deployment
Innovative satellite-connected technology demonstrator for remote environmental data collection that is transmitted to the cloud for real-time access by natural and cultural resource managers, and exercise management security office DoD personnel. An ROI of less than 1 year, which varies based on size of land area and monitoring frequency.
Improved riveting hammer to maximize worker performance and health

The project is performing field validation of a new riveting hammer design that incorporates a zero rebound polymer handle and a tungsten piston to minimize vibration exposure to riveters. Preliminary results indicate no significant vibration difference between the non-vibration dampening hammer and the vibration-dampening tool.

6T Hybrid Power Energy Router (6T-HYPER)

The 6T-HYPER will be a one-man carry device to harvest AC or DC source energy and supply clean AC & DC power from a 6T Li-ion battery, from the 24VDC bus of a vehicle and from any AC power source up to 10kW. This will reduce the need for the warfighter to procure/transport added generators and fuel needed for operations, enabling the use of multiple power sources, converting and providing man-portable power on the battlefield.

Intelligent Battery Tray for Small- and Medium-Sized EOD Robots

This effort will design a battery tray for BB-2590 Lithium-Ion batteries that will function in the Common Robotic System-Heavy (CRS-H) to manage power flows and ensure resilient predictability of flexible power to achieve optimal performance and reduce time spent on changing the life of BB-2590 batteries.

DoD Sustainable Materials Alternatives Recommendations Tool (SMART)

This project will further develop and validate a prototype enterprise-wideromium-free technology tool, by incorporating additional available data and expanding functionality to accommodate other toxic metals to transition to safer materials, reduce exposure, and respond to regulations. The end product will be an operational tool on a DoD website.
Collaborative Relationships are an integral component of the NDCEE’s success at identifying, demonstrating, validating, and implementing solutions for the DoD. From the onset of each project, the NDCEE works closely with stakeholders to understand their unique concerns, challenges, and needs. Wherever appropriate, the NDCEE collaborates with other entities to achieve a cost-effective, technically viable solution that is most appropriate for each project. The NDCEE partners with a wide variety of organizations and programs; over the past 30+ years the organizations and programs that the NDCEE has worked with includes but is not limited to the following:

Air Force Safety Center
Air Mobility Command Fuel Efficiency Division
Air National Guard
Alliant Techsystems Inc.
Anniston Army Depot, AL
Arlington County, VA
Arlington National Cemetery, VA
Army & Air Force Exchange Service
Aviation and Missile Research Development and Engineering Center
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Base Camp Integration Lab, Fort Devin, MA
Blue Grass Army Depot, KY
The Boeing Company
C-130 System Program Office
Camp Buehring, Kuwait
Camp Lemonnier, Djibouti, Horn of Africa
Cape Canaveral Air Force Station, FL
Center for Environmental Management of Military Lands
Cherry Point In-Service Support Center, NC
Combatant Command - Cultural Heritage Action Group
Corpus Christi Army Depot, TX
Defense Commissary Agency
Defense Logistics Agency Distribution Hill, UT
Defense Logistics Agency Distribution Norfolk, VA
F-16 System Program Office
Fisher House Foundation
Fleet Readiness Center Southeast, Jacksonville, FL
FRC Southwest, North Island, CA
Forest Glen Annex, MD
Hill Air Force Base, UT
Holston Army Ammunition Plant, TN
Joint Base Andrews, MD
Joint Base Charleston, SC
Joint Base Langley-Eustis, VA
Joint Base Lewis-McChord, WA
Joint Base Pearl Harbor Hickam, HI
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Fort Hood, TX
Fort Huachuca, AZ
Fort Hunter Liggett, CA
Fort Indiantown Gap, PA
Fort Irwin, CA
Fort Knox, KY
Fort Lee, VA
Fort Leonard Wood, MO
Fort Polk, LA
Fort Stewart, GA
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National Geospatial Intelligence Agency
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Naval Air Systems Command
Naval Air Warfare Center
Naval Base Coronado, CA
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Office of the Assistant Secretary of the Army for Installations, Energy and Environment
Office of the Deputy Assistant Secretary of the Air Force, Energy
Office of the Deputy Assistant Secretary of the Army for Energy & Sustainability (DASA[E&S])
Office of the Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health
Office of the Deputy Under Secretary of Defense Installations and Environment
Office of Naval Research
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Oklahoma City ALC, OK
Pacific Disaster Center
Pennsylvania Department of Environmental Protection
Pentagon Reservation, VA
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Product Manager Soldier Clothing and Individual Equipment
Program Executive Office Ammunition
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Tripler Army Medical Center, HI
U.S. Air Force 18th Air Support Operations Group
U.S. Air Force Civil Engineer
U.S. Air Force Life Cycle Management Center, Wright-Patterson Air Force Base, OH
U.S. Air Force Materiel Command
U.S. Air Force Office of Logistics Readiness
U.S. Air Force Operations, Plans, and Requirements
U.S. Air Force Research Laboratory
U.S. Army XVIII Airborne Corps
U.S. Army 82nd Airborne Division
U.S. Army Africa
U.S. Army Armament Research, Development and Engineering Center
U.S. Army Aviation and Missle Life Cycle Management Command
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