



SURGE



ENERGY ACADEMIC GROUP QUARTERLY NEWSLETTER SUMMER 2023

Highlights

- EAG DEVELOPING OF MASTER'S DEGREE
- CLIMATE SECURITY GAPS
- RENEWABLE ENERGY RESEARCH
- NPS THESIS SPOTLIGHT
- ENERGY EFFICIENCY IN MILITARY OPERATIONS



CLIMATE AND SECURITY

Joint Tabletop Exercise Tackles Climate Change

By Kristen Fletcher, Faculty Associate–Research, Energy Academic Group

In April 2023, NPS hosted the second Department of the Navy (DoN) Climate Tabletop Exercise (TTX) in partnership with the Stanford Doerr School of Sustainability. NPS and the Doerr School work together under an Educational Partnership Agreement signed in December 2022.

The event convened a diverse group of participants from the Department of Defense, federal agencies, Congress, think tanks, non-governmental organizations, and the private sector with a scenario-based activity to generate solutions in support of the DoN climate strategy, *Climate Action 2030*.

In the strategy, Secretary of the Navy Carlos Del Toro identified climate change as “one of the most destabilizing forces of our time, exacerbating other national security concerns and posing serious readiness challenges.” Through the strategy, the Secretary charged the

DoN with building a climate-ready force by increasing climate resilience and reducing the climate threat. These calls mirror those in the National Security Strategy and several Executive Orders.

To meet these calls to action, TTX participants concentrated on three focus areas – water security, energy security, and coastal resilience. They worked in facilitated small groups to imagine what is possible in the climate realm through innovative partnerships. On the morning of Day 2, the teams briefed their results to senior leaders including the Honorable Meredith Berger, Assistant Secretary of the Navy (Energy, Installations, and Environment); NPS President retired Vice Adm. Ann Rondeau; and Dr. Arun Majumdar, Dean of the Doerr School of Sustainability.

Challenges and solutions were identified including lowering barriers to establish and strengthen partnerships

and conducting joint applied research to inform solution development. The DoN climate team is developing a plan of action and milestones across participant stakeholders on how to accomplish solutions identified during the exercise. An after action report will be made available in the summer.

LEARN MORE

The event was organized through the Climate and Security Network. Join at: nps.edu/climate

The full After Action report can be viewed at <https://tinyurl.com/39mmtt2c>

Contact: Kristen Fletcher at kristen.fletcher@nps.edu



From the Chair

Dan Nussbaum, Chair of the Energy Academic Group

At the beginning of Shakespeare's *Henry the Fifth*, we find the request for “....a Muse of fire, that would ascend the brightest heaven of invention”. While the Bard was calling for an inspiration as bright and brilliant as the element of fire, in our day we can easily say we need a brilliant breakthrough in batteries. Our problem is that demand-driven DoD and civilian activity is outpacing supply-side response for lithium batteries, and “normal” market activity is unlikely to adjust in a timely manner. The U.S. is highly reliant on adversarial sources for all the materials required for these batteries. For example, the U.S. administration has a goal of 50% of all new passenger cars and light trucks sold by 2030 be zero-emission vehicles, which is a 15x increase over current output; yet we know that reaching only a 20% goal by 2030 will require that domestic EV manufacturing surge by 6x. Also, the vast majority of value in the current battery value chain goes to China, which has a demonstrated pattern of using economic power in critical markets to harm the U.S./allied industrial base. Therefore, a U.S. goal is to re-shore and recapture that value.

To that end, NPS has formed, with OSD, a Battery Workforce Development Consortium, organized and directed by Drs. Arnold Dupuy and Mary Sims of EAG. Consortium members include representatives from academic, government, and industrial communities. The consortium's focus is to educate individuals to be able to discover, mine, refine, deploy, and recycle strategic minerals, as well as to continue to educate individuals

in the directed energy sector with associated technologies to enact advanced battery solutions.

We were delighted to host Peter Zeihan at NPS to talk with students and faculty. Peter is an expert in geopolitics who has a vast store of knowledge that he integrates into thought-provoking and entertaining theses and forecasts. One of his seminars drew over 150 participants, and the conversations were thoughtful and lively. We will bring Peter back to campus in mid-December.

Two important accomplishments (kudos to Dr. Kristen Fletcher and her team) from the EAG Climate Security Pillar were the April DoN Climate Change Tabletop Exercise II (TTX II), and the May joint workshop on the Impacts of Climate Change on Operations.

NPS co-hosted the TTX with the Assistant Secretary of the Navy (Energy, Installations, & Environment) and the Stanford Doerr School of Sustainability, bringing together over 80 subject matter experts in energy security, water security, and coastal resilience. The agenda included an Executive Summit in which senior leaders engaged with participants to explore sustainable climate security solutions.

In June 2023 EAG partnered with the Center for Naval Analysis (CNA) to deliver a joint workshop at NPS, led by EAG's Marina Lesse. The in-person workshop was focused on ground-truthing research conducted by both NPS and CNA researchers and brought together operational subject matter experts (SMEs) from NPS and the Indo-Pacific region via a virtual platform.

Here is an update on EAG's four specialized distance learning energy certificates (Operational Energy, Refuel Logistics, Directed Energy, Persistent and Autonomous Systems) and two

more general Operational Energy courses (OE-1 and OE-2). The purpose of all these offerings is to provide foundational knowledge and experience for warfighters, and a thorough comprehension of the basis of OE (fuel, power generation and distribution; power storage; energy management and measurement; command and control). Three of the four certificates are being offered right now, and the fourth will begin later this year. Beta classes for OE-1 and OE-2 will be offered this fall. You can contact the NPS POC, Mike Davis, at michael.a.davis@nps.edu.

EAG is also actively developing a stackable OE program which we hope to launch sometime in 2024. The successful completion of three of our energy certificate courses will be the basis for granting a master's degree in Operational Energy. Information can be seen at <https://www.nps.edu/web/eag/education>, and the NPS POC is Dr. Colleen McHenry. You can contact Dr. McHenry at colleen.mchenry@nps.edu.

There is much going on, and I encourage you to reach out to me and to the POCs in this article. I would be happy to hear your ideas.

Dan Nussbaum
Chair, Energy Academic Group



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Master's Degree in Operational Energy Tentatively Planned to Launch in 2024

By Colleen McHenry, DBA
Faculty Associate-Research,
Energy Academic Group

The Naval Postgraduate School has tentative plans to launch a Master of Science degree in Operational Energy (OE) in 2024 via a distributed learning (DL) degree program that aims to equip graduates with the essential skills and knowledge to enhance their effectiveness in the modern battlespace.

As envisioned, the OE degree will be completed by combining a sequence of NPS graduate-level certificates in areas related to computing, such as: operations research, energy, war and peacetime logistics, autonomous systems, and defense energy. The program's

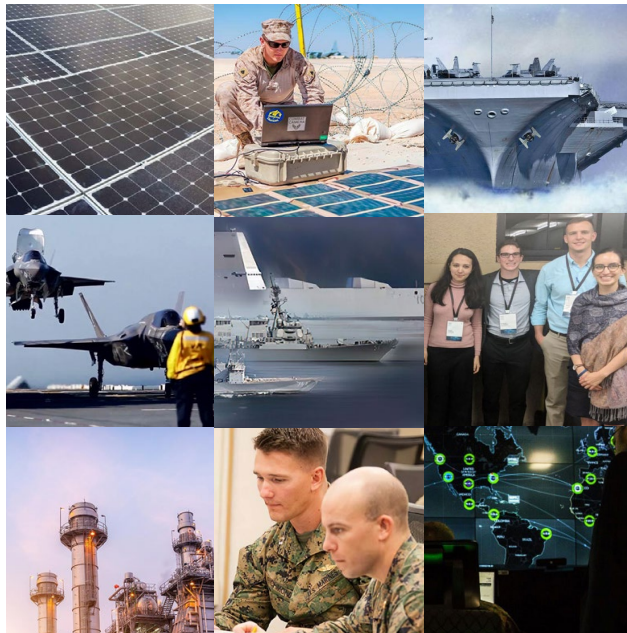
flexible design provides sponsoring agencies and students the ability to achieve specific professional education goals by selecting a tailored combination of certificates.

Those students who have completed an Operational Energy certificate with NPS may continue their education in pursuit of their master's degree. Three certificates qualify for the degree program.

The Master's of Operational Energy degree program will be open to all U.S. military officers and U.S. government civilians, as well as international students and defense contractors who are eligible for entry to NPS certificate programs. The OE program is designed to be completed within five years. EAG tentatively plans to launch this program in January 2024.

LEARN MORE

Email Dr. Colleen McHenry at colleen.mchenry@nps.edu for additional information about this degree program.



Interested in Energy-related Thesis Research?

Since 2013, NPS and the EAG have supported a plethora of student thesis research in the area of energy. Publicly viewable student theses can be searched from the Resources page of the EAG website at nps.edu/web/eag/resources. The EAG's extensive resources, intellectual capital, and connections with multi-disciplinary faculty and energy professionals provide students enhanced support for energy-related research. If interested in energy research, please reach out to the EAG team!



nps.edu/energy

CLIMATE AND SECURITY

The Blindspot: Gaps in Climate Security and Strategic Competition

By Major Alexander Kenna and
Major Matthew Alexander, USA

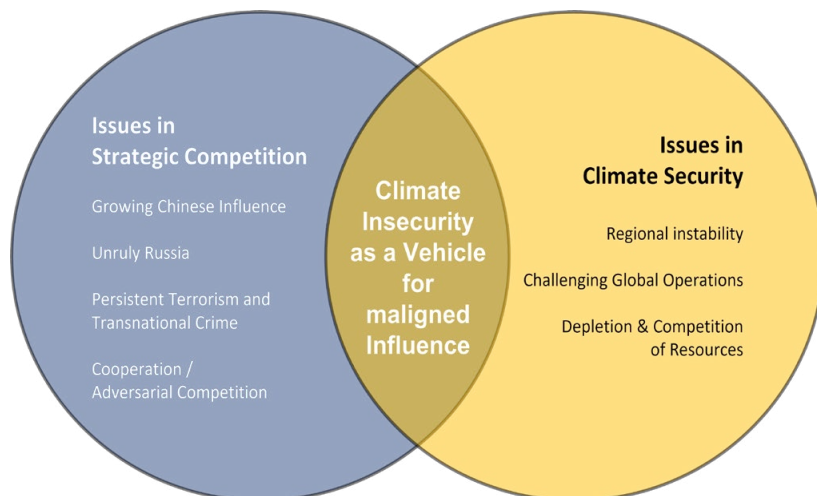
Adversaries of the U.S. have been influencing vulnerable states for years, and the U.S. is losing ground in the dynamic environment of strategic competition. Climate insecurity has become a shared threat across the world as an increase in global temperatures has, and will continue to, lead to a rise in the number and strength of natural disasters, extreme weather events, floods, heatwaves, wildfires, warming oceans, severe drought, rising sea levels and reduced access to reliable energy. The threat of climate insecurity has been and will continue to be a point of leverage for state and non-state actors for regional influence.

This thesis analyzes climate security gaps in three case studies: Syria, Central America, and Pacific Island

Nations. These regions demonstrate that climate insecurity has geopolitical implications as adversaries leverage the vulnerabilities for their benefit. Analysis shows that neglect of the near-term consequences of destructive climate events allows adversaries to capitalize on vulnerable states for economic, military, and political advantages.

The 2022 National Security Strategy focuses heavily on global competition and the impact of climate instability, but not in conjunction. U.S. climate insecurity efforts are focused primarily on domestic and operational resiliency and contributing to reducing greenhouse gases. Neglecting international efforts to combat climate insecurity will further the loss in adversarial competition while endangering U.S. national security.

The DoD's Climate Action Plan would benefit from an additional effort that is proactive and international at its base. A "defend forward" effort, like the one for U.S. Cyber Command, with a whole of government approach would benefit the U.S. in both strategic competition and climate security efforts. For specific application, the recommended efforts consist of a whole of government approach with a three-step model of Identify, Prioritize, and Mobilize, utilizing existing organization and government funding and relying on existing resources like the Special Operations Forces Civil Affairs.



LEARN MORE

Read the thesis produced for completion of the Master of Science in Information Strategy and Political Warfare from NPS in December 2022: <https://tinyurl.com/y9tucd65>

Read a related article: <https://tinyurl.com/3z334hj2>

Hear the authors interviewed in a podcast: <https://tinyurl.com/4tnnkj6>

View the 2022 Briefing: <https://tinyurl.com/3fn8d3mj>

Contact: Kristen Fletcher at kristen.fletcher@nps.edu

ENERGY RESEARCH

DOE's WPTO Launches InDEEP Prize to Foster Renewable Energy Research

By Mr. Bill McShane
Marine and Hydrokinetic Technology
Water Power Technologies Office
Department of Energy, Office of Energy
Efficiency & Renewable Energy

The U.S. Department of Energy's Water Power Technologies Office (WPTO) (water.energy.gov) enables research, development, and testing of emerging technologies to advance marine energy as well as next-generation hydropower and pumped storage systems for a flexible, reliable grid. To reduce marine energy costs and fully leverage hydropower's contribution to the grid, WPTO invests in research and technology design; validates performance and reliability for new technologies; develops and enables access to necessary testing infrastructure; and disseminates objective information and data for technology developers and decision makers.

To help build energy resilience in coastal cities and support President Biden's goal of net-zero carbon emissions by 2050, the WPTO is launching the Innovating Distributed Embedded Energy Prize (InDEEP) which seeks innovations that blend materials

and renewable energy research to help convert wave energy to usable electricity. This prize is the first step in exploring the potential for distributed embedded energy converter technology (DEEC-Tec) for ocean wave energy conversion.

DEEC-Tec combines many small energy converters, often less than a few centimeters in size, into a single, larger ocean wave energy converter. This larger system could convert energy from a wide range of ocean locations and wave types. Successful DEEC-Tec concepts developed through this prize are those that show the greatest techno-economic potential to contribute to grid-scale power systems.

InDEEP will challenge innovators from within and beyond wave energy to design and develop novel materials for marine energy applications that will lay the foundation for generating electricity at the grid scale.

InDEEP is a three-phase, two-year competition that offers a combined

cash prize pool up to \$2.3M. Teams will also receive technical support, teaming support, and other forms of mentorship throughout the prize to enable their success. Mentorship support includes that provided by the National Renewable Energy Lab (NREL) and Sandia National Lab (SNL).

LEARN MORE

For more information about this research and InDEEP, visit the prize page at <https://www.herox.com/indeep/> or contact Mr. Bill McShane at william.mcshane@ee.doe.gov.

⚡ STUDENT ENERGY RESEARCH SPOTLIGHT

Digital Dead-Time Compensation to Reduce the Electromagnetic Emissions in Grid-Connected Inverters

By Capt Robert Tubbs, USMC

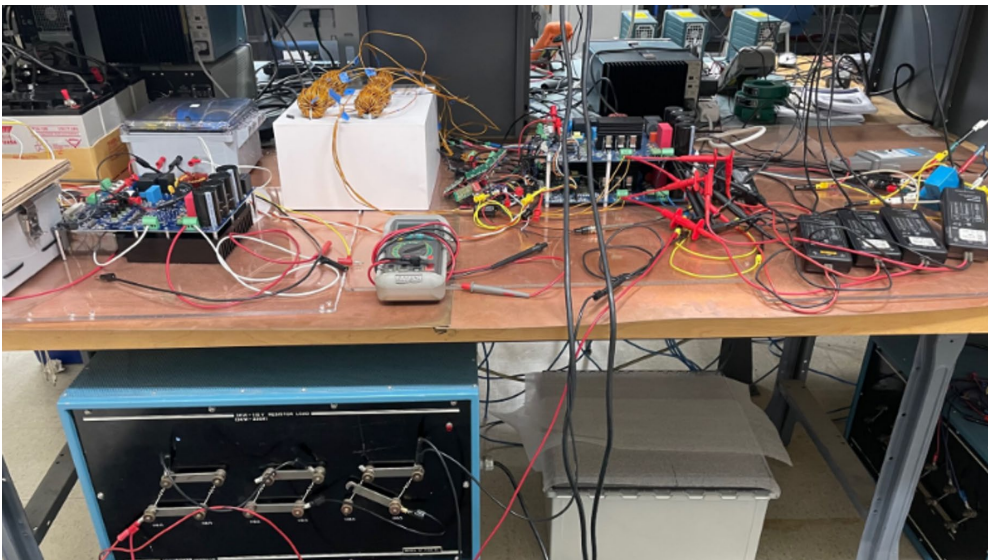
Grid-connected power converters are a key enabling technology to increase the use of renewable energy resources and decrease subsequent fossil fuel consumption. Their application in shipboard power systems that interface with distributed energy resources mean these devices are essential in modern power electronic circuits. These converters produce electromagnetic interference (EMI) which can negatively affect nearby electronic and mechanical systems. As a result, EMI filters have been incorporated into these circuits to reduce the EMI generated which has in turn increased the size and weight requirements for these circuits. The use of these filters poses a potential burden to naval applications as the presence of these components take up valuable space and weight allocations that could be better served for weapon, radar, or other military applications. This

thesis explores removing these filters in three-phase, four-leg grid following inverters by eliminating common mode (CM) voltage through the use of software controlled switching techniques for the inverter. This is accomplished through the combination of pulse density modulation (PDM) paired with a dead-time compensation algorithm that evaluates the circuit during operation to provide the corrected switching behavior necessary to reduce EMI.

The elimination of CM voltage in three-phase hard switched inverters using PDM has been recently proposed. However, the high frequency CM EMI measured in the CE102 frequency range requires that additional filters be used to meet the conducted emissions radio frequency standard associated with military standard 461G.

To remedy this situation, a software approach through the digital control

hardware nested within a Field Programmable Gate Array (FPGA) is presented to provide the real time control necessary to affect the CM voltage of the circuit. The goal is to impose a switching sequence that implements a purposeful control of switch operations (dead-time) based on active circuit criteria that removes the need for the passive filters. Preliminary laboratory tests have proved the efficacy of this novel compensation method which has been evaluated on a laboratory prototype built with SiC MOSFETs. This technology and its subsequent application present the desired effect of increasing energy density, efficiency, and cost savings of shipboard and avionic power systems while meeting current military standards.



ABOUT THE AUTHOR

Capt Robert Tubbs is a USMC Officer and is an MSEE candidate at NPS. For more information about this research contact Prof. Giovanna Oriti at goriti@nps.edu

⚡ STUDENT ENERGY RESEARCH SPOTLIGHT

Analysis of Alternatives: Cost Effectiveness of the Airlander 10 in the Arctic

By Capt Timothy M. Socha, USMC

The Arctic is a challenging operating environment. However, owing to the melting ice cap, the Arctic is becoming increasingly accessible and therefore more broadly used by international shipping. This thesis investigated the potential utility of a hybrid airship for some missions in the Arctic.

Hybrid airships are a new but well-tested technology with a long history. They use principles of conventional lift generation, but the entire fuselage becomes a lift-generating surface in place of a wing. The lift generated by the streamlined fuselage containing helium gas is enough to compensate for heavier-than-air characteristics, which increases stability while retaining the ability to land and take off without a runway, including from the sea or on ice. These characteristics of hybrid airships also mean they use on average approximately 70% less energy than conventional aircraft, making them cheaper to operate than alternatives.

The study analyzed the Hybrid Air Vehicles (HAV) Airlander 10 airship, finding it may be well-suited to some

specific challenges the Navy faces in the Arctic.

The Airlander 10, a 10-ton variant, is capable of long-endurance airborne missions operating from remote, austere sites without the need for roads, runways or other infrastructure. Its characteristic minimal noise and vibration provide a stable platform for sensors and communications equipment. The study simulated an Airlander 10 operating from Eielson Air Force Base in Alaska on a mission totaling just over four days, covering 2,684 nautical miles.

A cost-benefit-analysis compared the Airlander 10 to alternative platforms and found it outperforms other platforms in this specific Arctic mission by having a lower life-cycle cost, being multi-mission capable, staying on station longer than conventional aircraft, deploying remote sensors such as UAS and UUVs, consuming less fuel and having greater mobility than any surface-bound alternative.

Due to the limited number of icebreakers and the limited ice-breaking

capability of USN destroyers, the study concluded the Airlander 10 stands to be of the most benefit to the Navy's surface fleet. Using the Airlander 10 frees the surface fleet to concentrate on missions that require its unique capabilities. If other systems continue to operate in the region, the Airlander 10 can improve the overall capability the DoD is able to deploy in the region or provide the same mix of capabilities at lower cost.

This is the third study under a Cooperative Research and Development Agreement between NPS and Hybrid Air Vehicles (HAV), a United Kingdom company.

ABOUT THE AUTHOR

Capt Timothy M. Socha is a USMC officer and graduated from NPS' Department of Defense Management in March 2023 with a Master of Science degree in Defense Systems Analysis. Capt Socha's research received an NPS' "Outstanding Thesis" award and can be found at <https://hdl.handle.net/10945/72056>

EAG released a related study on Arctic governance related to these systems which can be viewed at <https://tinyurl.com/37uvfyay>

LEARN MORE

Contact Dr. Nick Dew at ndew@nps.edu for more information about this research.

Due to the limited number of icebreakers and the limited ice-breaking capability of USN destroyers, the study concluded the Airlander 10 stands to be of the most benefit to the Navy's surface fleet.

ENERGY EDUCATION

Battery Workforce Development

By Mary Sims, PhD
Faculty Associate-Research,
Energy Academic Group

Technology is playing an ever-increasing role in society as the planet shifts toward a more sustainable future driven largely by electricity, and batteries are becoming more important than ever. NPS' Energy Academic Group (EAG) and the Battery Workforce Development program are helping to ensure the U.S. stays "current."

As the U.S. competes against near-peer adversaries and pursues a carbon-free infrastructure, batteries become increasingly important. The battery industry will require nearly 3.5 million U.S. workers over the next decade, and by 2030 the worldwide lithium battery

market will multiply by a factor of 5 to 10. Increasing demand for consumer electronics and the rise of electric vehicles are expected to drive the growth. Skills and knowledge gaps in the U.S. ranging from mining to refining to recycling will result in over 2 million of those jobs going unfilled, and each one of those gaps - for any one of the end products or for the aggregated deficiencies - can become a national security vulnerability.

China has already taken the lead in the production of batteries. According to the Washington Post, China had 93 "gigafactories" manufacturing lithium-ion battery cells in 2021 compared to the

United States' 4. By 2030, China's lead is expected to grow to 140 gigafactories, compared to 17 in Europe and 10 in the U.S. China is already the world's undisputed major producer of batteries.

The NPS Battery Workforce Development Program, sponsored by the Office of the Under Secretary of Defense for Acquisition & Sustainment (OUSD(A&S)), will identify gaps in the current battery workforce and develop a roadmap to refine the workforce required to support the battery and strategic mineral manufacturing ecosystem. The Program will identify targeted education and training programs, as well as internships, apprenticeships, and other workforce development programs to further the strength and sufficiency of the battery workforce, manufacturing supply chain, and therefore, U.S. national security.

LEARN MORE

Contact Mary Sims at mjsims@nps.edu for more information about this program.



Enrollment Open for Defense Energy Certificate Program

The Naval Postgraduate School's (NPS) Energy Academic Group is pleased to announce the sixth offering of its Defense Energy Certificate program. This offering (cohort) began 27 March 2023. The certificate program is free to all students, but applications must be submitted, transcripts received, and a Participation Agreement signed before NPS can process the application.

FOR MORE INFORMATION OR TO APPLY

Email Kevin Maher at kjmaher@nps.edu or call 831-656-2691. Detailed instructions are also posted on the EAG website at <https://nps.edu/web/eag/defense-energy-certificate-program>

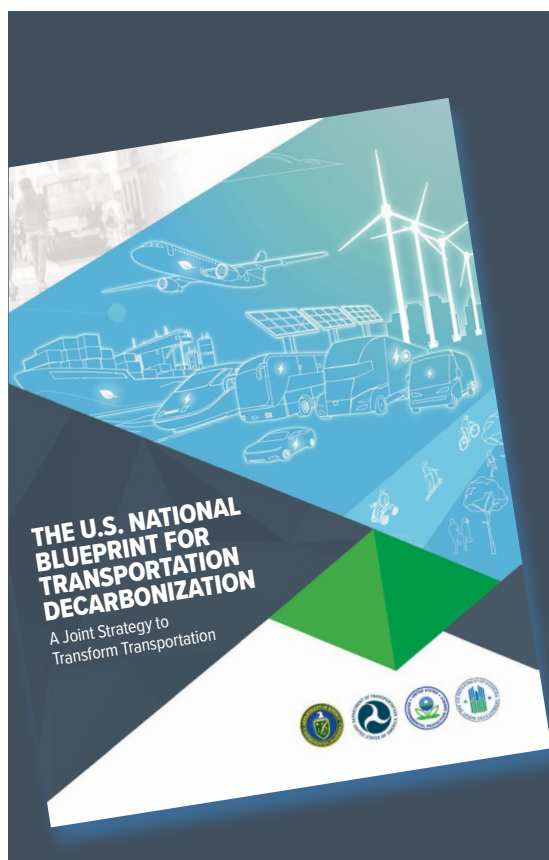
EAG Welcomes New Team Member

Mary J. Sims has been a part of NPS since the summer of 2009. Prior to joining NPS, she served over twenty years of her Navy career in Surface Warfare, primarily in Europe. During that time, she served on both combat logistics force ships and amphibious ships, served as a liaison officer to both UK and German forces, led a U.S. base in Italy in support of the U.S. 6th fleet flagship, and worked within the Office of Defense Cooperation in Athens, Greece. Having used her NPS degree in National Security Affairs extensively during her naval career, she then earned a PhD in Organizational Management (Leadership) and finished her active duty career as NPS Director of Programs.

In her civilian life, Mary served for over a decade as Associate Provost, Academic Affairs and WASC Accreditation Liaison Officer for NPS. She is now delighted to have the opportunity to move onto “the quad” as research faculty for the Energy Academic Group (EAG). Under the EAG, Mary will lead a \$6.5M, four-year project looking into the ways in which the federal government, academia, and the industrial sector might enhance the development of the battery and strategic minerals workforce in the U.S. as contributors to national security. Contact Mary at mjsims@nps.edu.



Mary J. Sims



U.S. Releases National Blueprint for Transportation Decarbonization

In 2023, the U.S. released the interagency *U.S. National Blueprint for Transportation Decarbonization* which presents a framework of strategies and actions to remove emissions from the transportation sector by 2050. The Blueprint was jointly announced by Secretary of Energy Jennifer M. Granholm, Secretary of Transportation Pete Buttigieg, Secretary of Housing and Urban Development Marcia Fudge, and Environmental Protection Agency Administrator Michael S. Regan. It offers a whole-of-government approach to meet the national goals of a clean electrical grid by 2035 and net-zero carbon emissions by 2050. DoD is partnering with these agencies to meet emission goals for systems on land, in air and at sea..

LEARN MORE

The *U.S. National Blueprint for Transportation Decarbonization* document is available for download at <https://tinyurl.com/yckfde5m>

ENERGY EDUCATION

The Energy Academic Group Conducts Energy Efficiency in Military Operations Course for NATO Partners

By LtCol Charles B. Lynn, USMC, Ret.
Faculty Associate-Research, Energy Academic Group

From 15-19 May 2023, the Energy Academic Group (EAG), in partnership with the NATO Energy Security Center of Excellence (ENSEC COE), conducted the Energy Efficiency in Military Operations Course (EEMOC) in Vilnius, Lithuania.

The overarching purpose of the course is to learn how to use energy more efficiently in planning and conducting operations, one of NATO's core energy security pillars. The course focuses on both installation energy and operational energy.

This most recent iteration of the course included thirty-eight officers and civilians representing twelve NATO nations. It featured lectures from numerous subject matter experts and industry representatives, a group project, simulations, and a panel discussion. EAG Associate

Chair, Mr. Alan Howard, presented a lecture on Operational Energy and Energy Security. EAG faculty members Messrs. Andrew Jennings and Brandon Naylor provided lectures and practical application periods on subjects including Energy Efficiency and Renewables, and Evaluating Innovative Energy Technologies. To conclude the course, Dr. Daniel Nussbaum, the EAG Chair, participated in a moderated panel discussion with other energy experts. Participants of the course also toured a military camp and a German solar panel manufacturing plant located in Vilnius to learn more about integrating renewable energy sources into operations.

For more information about the Energy Efficiency in Military Operations Course, or any of the courses offered by the Energy Academic Group, contact Charles Lynn at charles.lynn@nps.edu.



EEMOC participants from Canada, Germany, Italy, and Belgium (left to right) use the SPARK energy efficiency game to design a framework for optimal generator usage at a base camp.

LEARN MORE

Email Charles Lynn at charles.lynn@nps.edu for more information.

Energy Training Module Hosted on Navy e-Learning

After multiple stakeholder meetings, workshops, and countless hours of researching and collecting feedback, the EAG has successfully completed its effort in updating the energy training module titled *Energy - Enabling Combat Operations* (product number NPS-E-ECO-1.0). The General Military Training module is designed for both civilians and active-duty enlisted and officer members of the Department of the Navy (DoN), both sailors and Marines, and enables learners to harness a greater understanding of the DoN's operational energy focus. The learning objectives include how energy is critical to combat operations; DoN strategic energy objectives; energy challenges and best practices for different Naval Communities; and actions to take to become a more effective warrior. The GMT is a product of EAG's multi-year initiative: Naval Enterprise Energy Education and Training (NE3T).

To enroll and complete the updated GMT:

1. Log into your Navy e-Learning account at <https://learning.nel.navy.mil/ELIAASv2p/>
2. Click the 'Course Catalog' tab
3. Search 'Energy - Enabling Combat Operations'
4. Enroll, launch, and complete the course module

LEARN MORE Contact: Marina Lesse marina.lesse@nps.edu for more information.



ENERGY EDUCATION

Energy Academic Group Provides Support to the Marine Corps University

By LtCol Charles B. Lynn, USMC, Ret.
Faculty Associate-Research,
Energy Academic Group

LtCols Lexi Gerbracht & Doug Downey

1 May 23

UNCLASSIFIED

Colonel Brad Tippet, the Director of the USMC Command and Staff College, makes opening remarks at the beginning of PACIFIC CHALLENGE X

The Energy Academic Group (EAG), in partnership with the Marine Corps' Expeditionary Energy Office (E2O), is providing operational energy subject matter expertise in support of the Marine Corps University's (MCU) curriculum. As part of its mission, the E2O oversees the incorporation of energy related training and education into the Marine Corps at large. The EAG is a natural partner in this effort. As the de facto energy center of excellence for the Naval Services, the EAG is well positioned to bring its own resident expertise to bear in support of the E2O's education mission, as well as to facilitate reach back capability to the wide body of expertise available at the Naval Postgraduate School.

The support provided by the EAG is broad and includes facilitating guest lecturers on defense energy topics, mentoring student thesis papers, and supporting academic planning exercises, among other things. That last category, supporting academic planning exercises by ensuring that operational energy concerns are represented in the exercise scenarios in a realistic and beneficial way, has been a recent focus of effort. From 27-31 March 2023, EAG faculty were present in support of MCU's School of Advanced Warfighting's AGILE RESPONSE exercise, where student planners representing both U.S. and adversary forces in the INDOPACOM region planned their respective

responses to a conflict involving a territorial dispute in the vicinity of the South China Sea.

From 01-26 May 2023, EAG faculty provided similar support for MCU's Command and Staff College, this time providing a mix of in-person and virtual support to a month-long exercise called PACIFIC CHALLENGE X. The fictionalized scenario in PACIFIC CHALLENGE X involved students planning as both a combined-joint task force representing U.S. and allied forces, and a Joint Task Force representing an aggressor nation in the INDOPACOM region.

A unique aspect of both of these exercises is that once the competing student groups developed their battle plans, those plans were then input into a computerized wargaming system named Command Professional Edition which, when initiated, allows the competing student groups to "fight" each other and assess how accurate and effective their plans were.

In both of these exercise scenarios, as in the real-world conflicts that they are meant to simulate, operational energy plays a vital role in enabling commanders to achieve their operational goals. Any conflict in the INDOPACOM region would, given the vastness of the region, require the storage and distribution of enormous amounts of energy. This would likely be contested by our adversaries. After graduating, students from MCU return



Students and faculty of the USMC School of Advanced Warfighting test the plans that they developed by simulating combat operations using the Command Professional Edition wargaming system.

to the operating forces and assume key staff assignments. By ensuring that these challenges are accurately represented in their education, the EAG is preparing a generation of Marine and Joint officers to solve the myriad of challenges associated with the contested fuels problem.

LEARN MORE

Email Charles Lynn at charles.lynn@nps.edu for more information.



CALENDAR OF EVENTS

AUGUST

August 14–25, 2023

Wargaming and Critical Infrastructure
Helsinki, Finland

October 23 – November 3, 2023

Building Resilience to Hybrid Threats Residence Course
Monterey, California

NOVEMBER

November 13–27, 2023

Coherent Resilience (CORE) Tabletop Exercise
Riga, Latvia

DECEMBER

December 11–15, 2023

Energy Security Strategic Awareness Course
Oberammergau, Germany

UPCOMING

2023 Defense Energy Seminar Series

EAG is pleased to have resumed in-person presentations for its Defense Energy Seminar lecture series. Watch for upcoming dates and full event details as they become available on the EAG website at nps.edu/web/eag/seminars.



ENERGY ACADEMIC GROUP
NAVAL POSTGRADUATE SCHOOL



Connect with the Energy Academic Group

The Energy Academic Group is located in Room 101A, Spanagel Hall on the NPS campus in Monterey, California. A wide range of NPS faculty are affiliated with the energy program, actively participate in energy graduate education, energy executive education, and energy research. For questions, please contact one of the principal EAG faculty members:

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Contribute to an issue of *Surge*

If you would like to contribute an article or have your research/work published in the *Surge* newsletter, please contact Lois Hazard via email at lkhazard@nps.edu.

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Frank Chezem
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