

# SURGE



EAG QUARTERLY NEWSLETTER **SPRING/SUMMER 2018**

## Highlights

NPS EAG TEAMS WITH FEMA  
AIR FORCE USES DATA TO  
IMPROVE FUEL PERFORMANCE  
NPS STUDENT RESEARCH:  
NAVY ENERGY PROJECT  
TECHNOLOGY ADOPTION



*Destroyed Solar Farm on St. Thomas: 4.2 MW capacity; provided 5% of daylight power needs. Photo by Jocelyn Augustino/FEMA.*

## NPS EAG Teams with FEMA for Hurricane Recovery in US Virgin Islands

The Energy Academic Group (EAG) will provide subject matter expertise to the Infrastructure Systems Recovery Support Function (RSF) and the Community Planning and Capacity Building RSF resulting from Hurricane Irma and Hurricane Maria in the territory of the US Virgin Islands. The EAG will manage coordination, training, and convening activities with local utilities and government representatives, while the Center for Infrastructure Defense

(CID) will manage modeling and analysis on the identification, analysis, and development of a proposed energy infrastructure recovery and priorities in the US Virgin Islands. This will include developing courses of action relative to critical power infrastructure resilience. Key objectives of this partnership include:

- Work with the FEMA-appointed Federal Disaster Recovery Coordinator (FDRC) and applicable Territorial Lead(s) to coordinate Federal support for Territory identified energy recovery needs.
- Work across the Federal Inter-agency to identify and analyze energy-related issues impacting the Territory.
- Identify Federal agencies with authorities, resources, and programs to execute energy recovery support.

- Assist the Infrastructure Systems Recovery Support functions to effectively restore a viable and sustainable community.
- Promote Community Planning that support the needs of the entire community and contribute to its sustainability and resilience.

This project is led by Dr. David Alderson from CID and Mr. Alan Howard from EAG and includes prospective student thesis work by LCDR Brendan Bunn and US Marine Capt John Dommert. Stay tuned to future editions of *SURGE* for updates to this project.



### LEARN MORE

Email Alan Howard at [arhoward@nps.edu](mailto:arhoward@nps.edu) or call 831.656.3855



# Principal Thoughts

## IS ENERGY AN IMPORTANT TOPIC WITHIN DoD?

If so, how important is it? If it is important, how do we determine if the DoD is structured to support the issue of energy, and what are the foci, what are the emphases, of this organizational structure? Finally, how do we create a community of interest (COI) within this energy arena?

So, is energy important within the DoD? Unequivocally, the answer is YES. One major indication of its importance is the posture of James Mattis, who, as a theater commander, as well as in his Secretary of Defense nomination hearings, and in his current role as the SecDef, has consistently maintained that defense energy investments will have to show how they support the Department's missions. In addition, he emphasizes a need for a positive return on investment, a connection to national security, strong support for combat readiness, and a reduction of risk to fielded forces. Further, this applies not only to issues in operational energy, but will be true for investments at

fixed bases as well.

A second indication that energy questions are important within DoD is (the dry issue of) organizational structure. DoD and the Services are organized to support this appetite for understanding and addressing energy issues. At the OSD level, there is an Assistant Secretary of Defense, The Hon. Lucien Niemeyer, whose portfolio includes both Operational and Installation Energy. Similarly, each service Secretariat has an Assistant Secretary for Energy Installations and Environment. For the Navy, the Hon. Phyllis Bayer serves in that role. OPNAV, too (and this applies to the AF and Army staffs) has organized to address this topic within N45, the Energy and Environmental Readiness Division.

How do you go about creating a community of interest (COI), which we want so that we can share best practices, insights, data, problems, and research agendas. For the past four years, NPS, working with OSD and ONR, created and has run the Energy Education and Training Working Group (EETWG). This group has met quarterly and has also run quarterly monthly webinars. Similarly,

NPS maintains about 25 energy seminars with distinguished experts as speakers which are video-recorded, archived, and can be accessed at <http://www.nps.edu/web/eag/seminars>. Please note that some of the recordings are restricted to those with NPS login accounts.

The creation of a new all distance-learning Defense Energy Certificate program was just approved at NPS and will be offered for the first time this April. We believe this is the first and only such program in existence within the DoD. My POC for this program is Kevin Maher at [kjmaher@nps.edu](mailto:kjmaher@nps.edu).

In future issues, I will talk about some of the exciting research on energy topics at NPS supported by ONR and OSD. As always, more to follow.



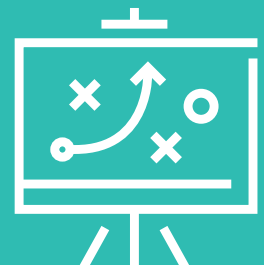
**DAN NUSSBAUM**  
*Principal, Energy Academic Group*  
[danussba@nps.edu](mailto:danussba@nps.edu)

## Summer Interns Support Research Efforts

This summer, the Energy Academic Group (EAG) will employ three college level and six high school level interns to assist with research efforts relating to the transport of bulk fuels. The students will work with the EAG to develop computer models, wargames, and other tools to explore the issues surrounding the challenges of transporting fuel from ships at sea to the warfighters on the ground. These tools will support a

Naval Research Program study for the Navy and Marine Corps, and will have additional uses beyond the study. The wargame and computer model are both taking previous EAG products and repurposing them to analyze different solutions to delivering fuel from ship to shore. The computer model is based on a previous program called FUSED, and will be used to explore how the Combat Logistics Fleet meets the fuel needs of the surface combatants and

how fuel is distributed between units. The wargame is based off a previous table-top exercise that demonstrates how an adversary can target supply lines in a contested environment.



# NPS EAG “Ground Zero” for Naval Innovation Process Adoption (NIPA) Pilot



*Silicon Valley in California's south end of San Francisco Bay / NPS EAG's Naval Innovation Process Adoption Pilot aims to connect the Silicon Valley's innovation culture and mindset to the Department of Defense and Intelligence Community.*

The Energy Academic Group and the Naval Postgraduate School (NPS) will serve as “ground zero” and launch site for the Naval Innovation Process Adoption (NIPA) Pilot to be held at NPS 19–21 May 2018.

NIPA borrows from Stanford’s Hacking for Defense (H4Di), a new university sponsored class that allows students to develop a deep understanding of the problems and needs of government sponsors in the Department of Defense (DOD) and Intelligence Community (CI). The H4D approach brings together teams

of engineers, scientists, MBAs, and policy experts using “Best Practices” to connect the Silicon Valley’s Innovation Culture and Mindset to DOD and CI, inspiring new ways to think about, organize, and build and deploy national security people, organizations, and solutions.

The March NIPA Pilot at NPS will serve as the kick off for an Executive Boot Camp attended by selected representatives from the Department of Defense. Participants will explore the process and value of this innovative approach to rapidly producing solutions that address

the nation’s emerging threats and security challenges.

The March NIPA Pilot is the first in a multi-phased effort to explore the value of this entrepreneurial and innovative approach to solving some of our nation’s most serious threats. Two additional train-the-trainer events are scheduled for May and June 2018.



## LEARN MORE

Email Lois Hazard at [lkhazard@nps.edu](mailto:lkhazard@nps.edu) or call 831.656.6219

## DL Defense Energy Certificate Kicks Off

The Naval Postgraduate School’s Academic Council approved the Energy Academic Group’s Distributed Learning version of the Defense Energy Certificate. Approval occurred on 31 January 2018 and was assigned the official curriculum number of “236”. Cohort I is scheduled to begin on 2 April, 2018 for Academic Year 2018, Quarter 3 (018/3). NPS received 54 applications across the Army, Navy, and Marine Corps and our

remarkable Admissions and Registrar’s offices worked diligently to process numerous applications and fill every seat in order for the cohort to begin on time. EAG would like to acknowledge and thank the Director of Innovation, DASD Operational Energy, Office of the Assistant Secretary of Defense for Energy Installations & Environment for funding for the first cohort.

The four courses associated with the Defense Energy Certificate are:

- Fundamentals of Energy (PH3700)

- Electrical Energy: Present and Emerging Technologies (EC3110)
- Energy Logistics in Warfare Operations (OA4613)
- Energy Security and Geopolitics (NS4960)

Those interested in future cohorts should visit <https://my.nps.edu/web/eag> to learn more about the DL Defense Energy Certificate and application process.



## LEARN MORE

Email Kevin Maher at [kjmaher@nps.edu](mailto:kjmaher@nps.edu)



*NATO sponsored Table Top Exercise (TTX) to be conducted in Vilnius, Lithuania.*

## **EAG to Support NATO TTX in Vilnius, Lithuania** *Wanted: Interested NPS Students*

The Energy Academic Group (EAG) is currently supporting the planning and development of a NATO sponsored Table Top Exercise (TTX) to be conducted in Vilnius, Lithuania. The exercise is currently scheduled for December 2018. The EAG is partnered with the NATO Energy Security Center of Excellence to assist with exercise concept design, scenario development, and detailed planning.

The TTX will contain a regional scenario focused on “New” NATO (the eastern flank) with an objective to assess the risks and vulnerabilities of regional energy supply chains to support collective defense and potential NATO reinforcements in the event of military operations. In addition to the regional approach, the event will

include: military defense planners, logisticians, civil emergency planners, energy operators (public/private), and diplomats from NATO delegations. Participating nations are anticipated to include: Lithuania, Latvia, Poland, Romania, Estonia, Slovakia, Hungary, and the Czech Republic.

Beyond supporting the development and planning of the TTX, the NPS EAG will lead the Evaluation Group during the exercise with a robust team comprised of: NPS Faculty, Students, and SMEs from the Services as necessary. The EAG will select interested students based on professional and curricular backgrounds that best align with TTX topic areas such as energy supply chains, energy security, military planning, logistics,

and emerging hybrid threats (to include cyber warfare). Interested students will require support from their department and Service chain of commands and should contact Lawrence Walzer at [lmwalzer1@nps.edu](mailto:lmwalzer1@nps.edu).



**LEARN MORE**

Email Lawrence Walzer  
at [lmwalzer1@nps.edu](mailto:lmwalzer1@nps.edu)



*Naval Postgraduate School's Energy Academic Group (EAG) supported the first Persian Gulf regional training course in Critical Energy Infrastructure Protection/Resilience to the NATO-Istanbul Cooperation Initiative (ICI) in Kuwait.*

## EAG Supports Critical Energy Infrastructure Protection Course in Kuwait

From 11-15 February, 2018, Naval Postgraduate School's Energy Academic Group (EAG) supported the first Persian Gulf regional training course in Critical Energy Infrastructure Protection/Resilience to the NATO-Istanbul Cooperation Initiative (ICI) Regional Center in Kuwait. This course involved more than 30 participants from the region and aimed to raise awareness of the criticality of energy's role in national security and the fragility and vulnerabilities of critical energy infrastructure. Throughout the week-long course, instructors from the Naval Postgraduate School, Georgetown University, NATO's Energy Security Center of Excellence, and NATO School Oberammergau came together to focus on enhancing participants' understanding of the importance of critical infrastructure defense through utilizing game theory to anticipate possible threats and to devise methods of hardening potential targets before adversaries, or the elements, are able to exploit weaknesses to critical energy infrastructure.

This course was co-organized by the Kuwaiti authorities, the Naval Postgraduate School, the NATO School in Oberammergau, the NATO Energy Security Centre of Excellence in Vilnius, NATO's Emerging Security Challenges Division, and with the support of the NATO Science for Peace and Security Program. It demonstrates the success of the NATO ICI Regional Center as a regional hub for energy training and education cooperation between NATO and its ICI partners in the Persian Gulf, including Kuwait, Bahrain, the UAE, Saudi Arabia, Oman, and Qatar.

Dr. Dan Nussbaum, Principal of the EAG, emphasized the importance of this course, stating that "Critical Energy Infrastructure Resilience is an important topic to the Navy, particularly for islanded and remote locations, because the Navy relies on these locations for logistical support. For this reason, EAG has been working to develop a short-course focused on this topic, and the program in Kuwait provided EAG a great opportunity to pilot this material with our NATO partners."

EAG continues to enhance its course offerings and, at the request of FEMA (Federal Emergency Management Agency), is planning to head to the U.S. Virgin Islands in late March—along with two NPS students—to work with local authorities on assessing critical energy infrastructure decimated by the 2017 hurricane season (see full article on front page). Courses such as this assist local authorities in understanding how to invest limited time and resources to ensure local critical infrastructure is more resilient to withstand future storms, while concurrently meeting NPS's core mission of Naval education and research.



### LEARN MORE

Email Alan Howard at [arhoward@nps.edu](mailto:arhoward@nps.edu) or call 831.656.3855



## STUDENT ENERGY RESEARCH SPOTLIGHT

# Case Studies on Technology Adoption on Navy Energy and Environmental Technology Projects

By Kristi Gordon, LT, CEC, USN

In 2015, the Naval Postgraduate School, along with the Naval Facilities Engineering Command (NAVFAC) Expeditionary Warfare Center (EXWC) and the Navy's Space and Naval Warfare Systems Command (SPAWAR), developed the Adoption Readiness Levels (ARL) framework to assist Science and Technology (S&T) professionals with cradle-to-grave planning for the integration of technologies into mainstream use on naval installations.

My goal is to assist NAVFAC with improving energy and environmental technology adoption on Navy installations. My research investigates the technology integration, stakeholder, and process dimensions of ARLs to determine what role ARLs can have in improving technology adoption. To do this I am creating and analyzing several case studies on technology adoption in Navy technology and validation demonstration projects. I am applying a qualitative approach to identifying common themes in the Navy's struggle to adopt technologies demonstrated in these projects.

**“I am applying a qualitative approach to identifying common themes in the Navy's struggle to adopt technologies demonstrated in these projects.”**

As part of the research I have already interviewed several subject matter experts about how their program defines technology adoption and what processes are used to facilitate its transition to the field. Additionally, I am working on the links between ARL elements and the general findings we already have from research on innovation adoption. I'll use both the cases and insights from pre-existing research to analyze what impact ARL-identified factors have on technology adoption.



*NoFoam System Nozzle Discharge Check at NAS Lemoore (Source: Kudo, Rance. TR-2329-ENV NoFoam System for Automotive Fire Apparatus Vehicle Foam Discharge Check. April 2010.)*



*Magnetic Bearing Chiller at Naval Base San Diego (Source: Kistler, Paul. Transition of Magnetic Bearing Chiller Compressor to Navy-Wide Use. Presentation to Tri-Service Facility Technology Transition Collaboration Meeting. March 2011.)*



## About the author

LT Gordon is a student in the Master of Business Administration Financial Management – Energy Program in the Graduate School of Business and Public Policy at the Naval Postgraduate School. She is a Navy Civil Engineer Corps officer and registered as a Professional Engineer in the State of Louisiana. She can be reached at [klgordon@nps.edu](mailto:klgordon@nps.edu).



*F-22 Raptor aircraft have been used in Air Force Operational Energy missions to assess if flying at an increased speed could optimize operational energy consumption. Photo courtesy US Air Force.*

# Data enables the Air Force to ‘fuel more fight’

By Corrie Poland, Air Force Operational Energy

Data collection and analysis have been critical to maintaining the effectiveness and lethality of the Air Force for decades, and are more important than ever in the age of big data, machine learning, and the complex challenges of the 21st century.

For Air Force Operational Energy, championing data initiatives is the cornerstone of their vision: to create an energy optimized Air Force that maximizes combat capability for the warfighter. “Data informs our decision-making and helps us better understand how to get more performance out of our fuel,” said Roberto Guerrero, Deputy Assistant Secretary of the Air Force for Operational Energy.

One of the biggest priorities for Air Force Operational Energy is to improve the collection of fuel data on all aircraft, enabling better understanding of fuel burn and the result of carrying extra weight on aircraft.

Recent Air Force Operational Energy efforts to collect and analyze fuel data have proven valuable. Studies revealed that on an average mobility or heavy aircraft, carrying excess fuel reduces overall efficiency by 2–5 percent. Air Force Operational Energy worked with one aircraft community and found that they were habitually landing with an average of 30,000 pounds more fuel than required reserves. Using data to inform leadership resulted in process changes that decreased fuel loads by roughly 25 percent, leading to an increase of range and performance of nearly 1 percent. Even small changes can amount to significant benefits for the Air Force.

The advantages of a data oriented approach span across all areas of Air Force Operational Energy, from fuel logistics and mission planning, to aerodynamics and engine design. The data quest of Air Force Operational

**“Data informs our decision-making and helps us better understand how to get more performance out of our fuel.”**

Energy is just beginning. “The possibilities of data are limitless and worth the investment,” said Guerrero. “By focusing on data collection systems, we are building the foundation for the future of the Air Force.”



## LEARN MORE

For more information about Air Force Operational Energy, visit <http://www.safie.hq.af.mil>



# EAG Calendar of Events

## APR

**April 2, 2018**  
Spring Quarter Begins

**April 2, 2018**  
Distributed Learning  
Defense Energy  
Certificate Course begins

**April 2 - June 8, 2018**  
Cyber Network Security  
Course in Moldova

**April 6, 2018**  
Defense Energy Seminar  
Mr. William Levis

**April 13, 2018**  
Defense Energy Seminar  
Ms. Anita M. Salem

**April 27, 2018**  
Defense Energy Seminar  
Mr. Joshua Binus

## MAY

↪ **TENTATIVE**  
**May 1-3, 2018**  
Energy Education and  
Training Working Group  
(EETWG)  
Pentagon PLCC,  
Washington DC

**May 4, 2018**  
Defense Energy Seminar  
Mr. Morris G. Hayes Jr.

**May 18, 2018**  
Defense Energy Seminar  
Dr. Anthony Gannon

**May 19-21, 2018**  
Naval Innovation Process  
Adoption (NIPA) Pilot  
The Energy Academic  
Group and the Naval  
Postgraduate School

(Continued from previous column  
will serve as "ground zero"  
and launch site for the  
Naval Innovation Process  
Adoption (NIPA) Pilot

## JUN

**June 11-15, 2018**  
Energy Efficiency in  
Military Operations  
(EEMOC) Course in  
Lithuania

**June 18-22, 2018**  
NATO Partnership for  
Training and Education  
Centers Meeting in  
Finland

**June 18-21, 2018**  
MORS 86th Symposium,  
"Supporting a Balanced  
Modern and Ready Nation"  
The 86th Symposium will  
include 500+ sessions  
taking place in 33 Working  
Groups, 7 Composite  
groups, Distributed Working  
Groups, Special Sessions,  
Demos, Tutorials and CEU  
Courses over the four-day  
program. More info at <http://www.mors.org/events/Symposium/86th-Symposium>

## Upcoming

↪ **SAVE THE DATE!**  
**July 16-20, 2018**  
Energy Security  
Awareness Caucasus  
Regional Course in  
Baku, Azerbaijan



## Interested in Energy-Related Thesis Research?

Over the past five years, NPS and the EAG supported a plethora of student thesis research in the area of energy. A compilation of abstracts on student thesis and other research is available on the EAG website: [www.nps.edu/energy](http://www.nps.edu/energy). 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!



## Connect with EAG

The Energy Academic Group is located in Quarters D, Bldg 281 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 about the Energy Academic Group, please contact one of the principal EAG faculty members:

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## Contribute to Surge

If you would like to contribute or have your research/work published in the SURGE newsletter, please contact Jack Templeton via email at [jctemple1@nps.edu](mailto:jctemple1@nps.edu) or phone 919.696.1398.