



Navy Energy Training & Education Plan

2 July 2015

Executive Summary

The Navy Energy Training and Education Plan is a comprehensive strategy to incorporate energy learning opportunities into the officer and enlisted Training and Education (T&E) Continuum. This plan outlines the requirements and processes for developing a training and education structure to build a Naval Force with the right knowledge and skills to ensure our energy security. New learning opportunities in energy awareness and conservation will be designed to positively inform personnel, affect their behavior, and change culture throughout Navy to one that regards energy as a combat enabler, valuable resource, and vulnerability.

Energy is fundamental to our strategic, operational, and tactical mission execution. As of FY14, 60% of Navy's energy consumption afloat and ashore is derived from fossil fuels, which is prone to both unassured access and price fluctuations and serves as an organic threat to our operational capability. Furthermore, Navy's oil-burning aircraft and ships will increasingly operate in the vast fuel-draining distances of Pacific Command, as the United States rebalances its focus toward the Asia-Pacific. Our adversaries' use of asymmetric measures, such as targeting our logistics supply chain and degrading our fuel supply, has significant potential to impact our ability to maintain persistent presence of forward-stationed forces capable of carrying out Navy's mission.

The first part of this document establishes the framework for integrating energy curricula into the T&E Continuum, providing learning objectives, identifying target audiences, and highlighting gaps in energy awareness and conservation offerings lessons. The second part proposes recommendations for the integration of energy subject matter into the following initial areas: 1) Commanding Officer, Executive Officer, Department Head; 2) Senior Enlisted; 3) Officer Accession; and 4) A Schools. Part two also outlines a timeline to transition these concepts to the development phase during the FY15-17 period and highlights how the expansion of energy learning opportunities will support the development and approval of an Energy Awareness and Conservation Navy Training System Plan (NTSP) by the end of FY17.

Although this plan is meant to be comprehensive, the T&E Continuum is a vast enterprise that cannot be enhanced with energy curricula all at once. This plan concludes by establishing a mechanism for evaluating the Continuum on a biannual basis. With commitment from all stakeholders, and an eye to the long view, our readiness and operational capability will be stronger through a new approach to how we understand and use energy.



Philip H. Cullom
Vice Admiral, U.S. Navy
Deputy Chief of Naval Operations
(Fleet Readiness & Logistics)



Dennis V. McGinn
Assistant Secretary of the Navy
(Energy, Installations & Environment)



Anne R. Davis
Assistant Secretary of the Navy
(Manpower & Reserve Affairs)
Acting

Table of Contents

Part I. Energy in the Training & Education (T&E) Continuum..... 4

1.0 Purpose..... 4

2.0 A Total Force Approach 5

3.0 Current Training & Education Opportunities 8

Part II. Recommendations 10

4.0 Training & Education Requirements 10

5.0 Implementation 12

6.0 Conclusion 13

Appendices

Appendix A: Navy Energy Training and Education Working Group Membership 14

Appendix B: Navy Energy Training and Education Continuum Structure..... 15

Appendix C: Current Energy Training and Education Opportunities in Navy 16

Part I. Energy in the Training & Education (T&E) Continuum

1.0 Purpose

Training and education in energy awareness and conservation will provide officers and enlisted personnel with the knowledge to understand the necessity of maximizing combat capability through energy efficiency measures, and provide the skills to put that knowledge into practice. This document outlines the requirements for developing energy curricula as part of the career education and training pipeline. Energy T&E will enhance the operational capability of the Navy by achieving the following objectives:

- Inform officers and enlisted personnel of the importance of energy as a critical combat enabler.
- Affect officer and enlisted behavior by informing them of best practices in energy efficiency.
- Change Navy's culture of energy consumption by influencing officers and enlisted to adopt energy-efficiency norms.

This plan directly supports the mandate established by the Secretary of the Navy (SECNAV) to develop training and education opportunities for Navy's uniformed personnel.¹ Navy's Task Force Energy stood up the Energy Training and Education Working Group in July 2013 to assess the quality and extent of energy subject matter in the T&E Continuum, and to identify training gaps for follow-on curricula recommendations.²

This plan charts the course that will ensure personnel at all levels of the chain of command receive energy awareness and conservation training to positively affect behavior and change Navy culture to one that values energy as a direct enabler of combat capability.³

¹ SECNAVINST 4101.3

² *Charter: Energy Training in Navy Training Continuum*. A list of working group members can be found in Appendix A.

³ Although this plan is primarily directed at uniformed personnel, the civilian workforce, where possible, should be permitted to enroll in any new T&E opportunities.

2.0 A Total Force Approach

Through judiciousness, ownership, and innovation, the entire chain of command must contribute for our culture to realize the full potential of energy conservation effectiveness by taking full advantage of the energy-saving technologies built into ships, aircraft, and expeditionary equipment, and capitalizing on ideas and actions.

2.1 Leadership Requirement

Navy leaders must be trained to consider energy in all phases of operational planning and execution. Raising the level of energy literacy will influence senior stakeholders to foster new policies, programs, and efficiency best practices across the Navy in requirements generation, acquisition, and operations. A cadre of Navy Energy leaders is required to ensure that best practices learned at all levels of energy training are applied with the support of the entire chain of command. Ultimately, an understanding of energy's role as a combat enabler will provide all Flag Officers and Senior Enlisted with the knowledge to lead a change in how we produce, distribute, and consume energy.

2.2 General Knowledge/Specialized Expertise Requirements

Energy T&E, much like safety training, must be effectively disseminated to officers and enlisted in such a way that it positively informs, affects behavior, and changes culture throughout the Navy. Our Navy culture must be one that regards energy as a combat enabler, valuable resource, and vulnerability. In order to achieve lasting change, Navy must formally incorporate the appropriate level of energy learning opportunities into as many aspects of the T&E Continuum as possible. This will be accomplished primarily through the integration of energy conservation subject matter and training materials into existing courses. Personnel will gain an understanding of why energy is critical to our national security and the Navy's mission and how we can improve mission effectiveness and reduce our logistical vulnerabilities with changes in our approach to energy.

2.3 Levels of Training

The Navy Energy Training and Education Working Group identified five levels of energy learning opportunities to serve as a structure for developing a comprehensive, Fleet-wide, Energy T&E Continuum. Where necessary, new learning opportunities in energy awareness and efficiency will be developed to augment existing curricula that is taught at institutions such as the Naval Postgraduate School (NPS), Naval War College (NWC), and Naval Education and Training Command (NETC) School Houses. All new energy curricula will emphasize the relationship between energy and mission success. With guidance and resourcing from the Director, Chief of Naval Operations Energy and Environmental Readiness Division (OPNAV N45) and oversight from the Deputy Assistant Secretary of the Navy for Energy (DASN (Energy)), new T&E opportunities will be designed to highlight and support the relationship between energy and Navy warfighting, global presence, and readiness.

- I. General Energy T&E: This level provides the foundation for general energy training and education designed to increase energy awareness and efficiency, upon which the subsequent levels can be built. Accession T&E (IA) will focus on Navy's sources and applications of energy; methods by which energy and power are measured; and energy conservation measures. General Military Training (GMT) (IB) will emphasize the importance of energy as a critical

mission enabler; provide an overview of basic energy conservation measures; and describe the role all officers and enlisted can take in supporting Navy's energy initiatives. Energy fundamentals will be integrated into officer and enlisted Personnel Qualification Standards (PQS) (IC) so that energy efficiency and conservation are part of professional competencies.

- IA: Accession T&E provided to all enlisted recruits, officer candidates, and Midshipmen.
 - IB: Annual GMT required for all uniformed personnel.
 - IC: Enlisted and officer PQS.
- II. Subject Matter Expertise T&E: Energy learning opportunities at this level will focus on developing entry and mid-level subject matter experts who can incorporate energy considerations into policy, readiness, and tactics. Basic specialized training (IIA) will instruct officers and enlisted in energy efficiency practices applicable to their daily tasks, such as calculating fuel consumption rates. Mid-level T&E (IIB) will emphasize the relationship between energy consumption and mission success and implement methods for incorporating energy into the decision-making process.
 - IIA: Basic specialized T&E provided to officers (O1 – O2) and enlisted (E1 – E4).
 - IIB: Mid-level T&E provided to officers (O3 – O4) and enlisted (E5 – E6).
 - III. Leadership T&E: This level will prepare Navy leaders to implement policy and direct energy initiatives. Officers assigned to Commanding Officer (CO), Executive Officer (XO), and Department Head (DH) tours and Senior Enlisted personnel will understand how to promote and foster energy efficiency to enhance specific warfare capabilities and how to adopt the ability to create and implement innovative approaches in energy management. T&E at the senior-level (IIIB) emphasizes how to apply energy considerations in requirements, acquisition strategy, and operations.
 - IIIA: Advanced leadership T&E provided to officers (CO/XO/DH tours) and Senior Enlisted (E7 – E9).
 - IIIB: Senior leadership T&E provided to Flag Officers.
 - IV. Advanced Specialized T&E: Professional learning opportunities focused on promoting energy efficiency best practices in specialty areas (detail/rating centric) within warfare communities. Training offered at this level builds upon curricula offered in Level II and should be considered an advanced version of those courses. The following list includes details and ratings that were identified by the Working Group as having a significant impact on Navy energy consumption and provides an initial selection of skillsets for which to consider new learning opportunities in energy.
 - IVA: Aviation
 - Officer: Aerospace Engineering Duty Officers, Aviation Maintenance Duty Officers, Naval Aviators, Naval Flight Officers
 - Enlisted: Aircrewmembers, Aviation Machinist's Mates, Aviation Boatswain's Mates
 - IVB: Expeditionary / Special Warfare
 - Officer: Acquisition Specialists, Architects, Civil Engineers, Explosive Ordnance Disposal Officers, Seabee Combat Warfare Officers

- Enlisted: Boatswain’s Mates, Builders, Construction Electricians, Construction Mechanics, Engineering Aides, Equipment Operators, Explosive Ordnance Disposal Technicians, Steelworkers, Utilitiesmen
 - IVC: Shore
 - Officer: Acquisition Specialists, Architects, Civil Engineers, Facility Energy Managers, Contracting Officers
 - Enlisted: Builders, Construction Electricians, Construction Mechanics, Engineering Aids, Equipment Operators, Explosive Ordnance Disposal Technicians, Steelworkers, Utilitiesmen
 - IVD: Surface Warfare
 - Officer: Chief Engineers, Combat Systems Officers, Engineering Officers of the Watch, Department Heads, Division Officers, Operations Officers
 - Enlisted: Culinary Specialists, Electrician’s Mates, Electronics Technicians, Enginemen, Fire Controlmen, Gas Turbine System Technicians, Interior Communications Electricians, Machinist’s Mates, Minemen, Operations Specialists, Quartermasters
 - IVE: Submarine
 - Officer: Engineering Officer, Navigator
 - Enlisted: Electrician’s Mate-Nuclear, Electronics Technician-Nuclear, Information Technicians-Nuclear, Machinist’s Mates, Machinist’s Mate-Nuclear, Planesman, Quartermaster, Throttleman
- V. Fleet Evaluation: Leverage Composite Training Unit Exercises (COMPTUEX) and Joint Task Force Exercises to test and evaluate the integration of energy efficiency practices into underway operations.

The above T&E levels (also outlined in Appendix B) describe model Energy T&E learning objectives and target audiences. These levels were compared to currently available energy learning opportunities to identify gaps in energy awareness, conservation, and efficiency curricula. These gaps were used to develop an initial set of recommendations for new learning opportunities as detailed in Section 4.0.

3.0 Current Training & Education Opportunities

This section provides a summary of current learning opportunities in energy for each of the five Energy T&E levels. A full list of available T&E opportunities can be found in Appendix C.

3.1 Level I - General Energy T&E

Energy learning opportunities are available as part of the officer accession curricula at the U.S. Naval Academy (USNA). USNA offers engineering courses that focus on renewable energy, alternative fuels, and the principles of propulsion systems. Enlisted accession training does not currently include references to energy awareness and conservation, nor do any GMT modules. However, an Energy GMT module is in development and will be implemented via Navy eLearning in October 2015. Energy considerations are not a part of officer and enlisted PQS.

3.2 Level II - Subject Matter Expertise T&E

NPS offers four master's degree programs with an energy focus in the following subjects: Electronic Systems Engineering; Financial Management; Naval/Mechanical Engineering; and Operations Analysis. NWC offers intermediate- and senior-level Professional Military Education courses that reference energy within the context of logistics and operational planning, illustrated by historical case studies. NWC also offers an Energy Security elective course that reviews the relationship between energy and national security.

3.3 Level III - Leadership T&E

The Leading Innovation – Energy Application Focus course at NPS provides energy training to Navy Flag officers and Senior Executives. Participants are instructed in the importance of energy to national security and how energy impacts Navy's combat capability.

3.4 Level IV - Advanced Specialized T&E

Surface Warfare Officers School (SWOS) offers engineering courses that teach officers how to identify the ships' most economical plant configuration/alignment, maximize fuel conservation, and increase energy conservation. The Shipboard Incentivized Energy Conservation Program (iENCON) provides ship COs, XO's, Chief Engineers, and Main Propulsion Assistants with energy saving strategies, including how to manage efficient fuel consumption and optimum transit speeds.⁴ The Aviation Energy Conservation Program (Air ENCON) is designed to optimize fuel consumption by naval aviation units without adversely impacting safety or mission execution to ensure the right amount of fuel is available for sustained mission readiness.⁵ Military Sealift Command's Civilian Mariner Engineering Officer (CMEO) Technical Training Program - Energy Module provides in-depth technical instruction on energy-efficient practices of operation and maintenance of shipboard systems for crew members of Combat Logistics Force and other auxiliary vessels, as well as technical shore support staff.⁶ Periodic Fleet Energy Training Events provide warfare specific training at Fleet concentration areas. These gatherings offer

⁴ For more information about iENCON: <http://www.i-encon.com/>

⁵ For more information about Air ENCON: <http://airencon.dodlive.mil/>

⁶ For more information about MSC's CMEO Technical Training Program: <http://cmeo.msc.emprisecorporation.com/courses/>. CMEO classes are available to Navy personnel upon request.

instruction in energy savings best practices and increasing awareness of energy use for shore and operational commands.

3.5 Level V – Fleet Evaluation

Energy considerations are neither a part of any Afloat Training Groups nor COMPTUEX.

Part II. Recommendations

4.0 Training & Education Requirements

This section defines recommendations to support the expansion of Energy T&E opportunities. They are based on an assessment of the current training and education landscape to identify gaps in energy awareness and conservation learning opportunities. When implemented, these recommendations will help form a cohesive system that links together all applicable Navy-wide energy curricula through a preliminary Energy T&E Continuum. The Energy Training and Education Working Group will evaluate the T&E Continuum every six months to identify areas for further T&E development. The sum of these efforts will ultimately lead to the development and approval of an Energy Awareness and Conservation NTSP by the end of FY17.

4.1 Curricula Development

Beginning in FY15, OPNAV N45 and DASN (Energy), in coordination with the Fleet, will focus on an initial selection of four T&E areas for development; derived from the T&E levels outlined by the Navy Energy Training and Education Working Group. These areas were prioritized by the Working Group due to the scope of their audiences, lack of energy learning opportunities, and influence on Fleet energy consumption. Hereafter these four areas will be referred to as Block A. All new learning opportunities will comply with the guidance provided in Naval Education & Training (NAVEDTRA) 130 series.⁷

- Apprentice (A) School Training (Level IA). A Schools provide the basis for Navy's workforce and represent an avenue to integrate efficiency lessons into the technical skills of personnel responsible for daily operations and maintenance of Navy's platforms and systems. As part of community and Type Command (TYCOM) training, specified enlisted personnel⁸ will be taught the benefits of energy efficiency at the deckplate level and job-specific measures to reduce energy.
- Officer Accession Training (Level IA). Instructing prospective officers in energy lessons provides an opportunity to influence the next generation of Navy leaders at an early stage in their careers. Students will be taught Navy Energy Policy, energy goals and Fleet energy initiatives, and an awareness of basic operational energy concepts. Officer candidates and Midshipmen will apply these lessons and enhance them through additional professional development opportunities in the T&E Continuum.
- CO/XO/DH Training (Level IIIA). Commanding and Executive Officers and Department Heads provide the oversight and support required to integrate energy efficient practices as a core component of the Navy mission. As part of community and TYCOM training, T&E at this level will instruct students in platform energy consumption and waste; the burden of energy on Operation Plans; the linkage between unit tasking, platform and shore based equipment

⁷ The NAVEDTRA 130 series of manuals provides fundamental guidance, within the Naval Education and Training Command (NETC), for the development of curricula, the delivery of instruction, and the management and evaluation of training programs. Each of the NAVEDTRA 130 series manuals is designed as a stand-alone document to serve a specific user group such as curriculum developers, instructors, training managers, or evaluators of training. The manuals are, however, interrelated and cross referenced to one another.

⁸ The enlisted ratings list in section 2.3.IV provides an initial selection of candidates for which new training can be developed.

configurations, and fuel consumption; efficient operations; and how to establish standard metrics for energy conservation and reward positive behavior.

- Senior Enlisted Training (Level IIIA). Senior Enlisted personnel are responsible for setting standards and fostering teamwork to accomplish Navy's mission. These Navy leaders are in a position to instill energy stewardship values throughout Navy's workforce. As part of community and TYCOM training, T&E at this level will instruct students in platform energy consumption and waste; the linkage between unit tasking, platform and shore based equipment configurations, and fuel consumption; burden of energy on Operations Plans; and how to establish standard metrics for energy conservation and reward positive behavior.

Energy T&E vehicles take many forms including, but not limited to, formal classroom training, webinars, e-Learning modules, training films (DVDs), and training documents. Specific delivery methods for development within the parameters of these T&E areas will be identified based on SECNAV, OPNAV, and Fleet priorities and resources. Remaining T&E areas will be re-evaluated by the Working Group to identify new learning opportunities for potential development.

4.2 Curriculum Characteristics

- Relevant. Curriculum highlights the interconnectivity of individual actions to overall mission accomplishment to ensure its relevancy to the student. Students at each level of training must understand the importance of energy conservation and how their actions impact the broader Navy mission.
- Adaptive. To pace the speed of change, instructors must consistently review and update course material to incorporate new developments in operational and shore energy.
- Continuous. The evolutionary nature of energy conservation and efficiency will drive a requirement for follow-on refresher training program to maintain core knowledge across the Fleet. As discussed above, this process will be a combination of formal (e.g., GMT, School Houses) and informal (e.g., mobile applications, online resources) training to maintain visibility on new policies, technologies, and tactics, techniques, and procedures.
- Delivered by Experts. The key to success is to ensure that instructors have operational experience and are aware of ongoing operations to maintain relevancy on the topic. Students must be able to interact with subject matter experts to obtain feedback and mentorship. This interaction between student and instructor will be beneficial at all levels of Energy T&E.
- Demonstrated Proficiency. All formal courses should have the means to measure proficiency and reinforce learning objectives (e.g., test, exercise). Minimum standards must be set and achieved to credit personnel for course completion.
- Innovative. Courses should incorporate interactive exercises to provide hands-on experience for students in a safe and structured environment.

5.0 Implementation

OPNAV N45 is the Requirement Sponsor and Resource Sponsor for the Energy T&E Continuum. As the Requirement Sponsor, OPNAV N45 will establish and codify formal requirements and provide policy guidance for energy T&E development. As the Resource Sponsor, OPNAV N45, along with DASN (Energy), will provide the necessary resources for required manpower (including Individual Account costs and Instructor costs), curricula development and execution. Subsequent to establishment of a formal requirement and provision of resources:

- Training Agents (NETC, NWC, etc.) will develop and execute formal School House curricula to meet the required training.
- Commander, U.S. Fleet Forces Command and Commander, U.S. Pacific Fleet will develop and direct unit training and incentive programs in coordination with TYCOMs and Systems Commands (SYSCOMs) as necessary to meet the established requirement.

5.1 FY15 Actions

- Energy Training & Education Plan completed.
- OPNAV N45 adjudicates requirements in the POM-17 Sponsor Program Proposal. Additional resource requirements coordinated with Navy Energy Training & Education Working Group as appropriate.
- Block A curricula development initiated.
- Navy Energy Training & Education Working Group starts development of Energy Awareness and Conservation NTSP.
- Working Group evaluates T&E Continuum to identify and resolve gaps as part of Block B development during FY16-18.

5.2 FY16 Actions

- Annual Energy GMT implemented.
- Block A curricula development completed.
- Working Group evaluates T&E Continuum to identify and resolve gaps as part of Block C development during FY17-19 cycle.

5.3 FY17 Actions

- Block A curricula delivered.
- Energy Awareness and Conservation NTSP approved.
- Working Group evaluates T&E Continuum to identify and resolve gaps as part of Block D development during FY18-20 cycle.

5.4 Working Group Meeting Schedule

Leveraging this plan as a guide, the Navy Energy Training and Education Working Group will meet twice a year to re-evaluate the T&E Continuum and develop recommendations for additional education and training areas. The Working Group will also evaluate and revise, as necessary, new T&E opportunities executed in the previous fiscal year.

6.0 Conclusion

In order to achieve lasting energy culture change, Navy must incorporate the appropriate level of energy curricula into as many aspects of the training continuum as possible. Requirements for new energy learning opportunities must be inserted into the T&E Continuum for Officers and Enlisted Sailors throughout their career timelines. Through a comprehensive energy T&E strategy and the recommendations included in this plan, Navy will enhance its combat capability across the entire spectrum of operations, both ashore and afloat.

Appendix A

Navy Training & Education Working Group Membership

Commander, Naval Air Forces (CNAF)	Naval Expeditionary Combat Command (NECC)
Chief of Naval Air Training (CNATRA)	Naval Facilities Engineering Command (NAVFAC)
Commander, Naval Installations Command (CNIC)	Naval Sea Systems Command (NAVSEA)
Commander, Naval Surface Force, U.S. Atlantic Fleet (CNSL)	Naval Education & Training Command (NETC)
Commander, Naval Surface Force, U.S. Pacific Fleet (CNSP)	Naval Postgraduate School (NPS)
Commander, Submarine Force, Atlantic (CSL)	Naval Safety Center (NSC)
Commander, Submarine Force, U.S. Pacific Fleet (CSP)	Naval Safety & Environmental Training Center (NAVSAFENVTRACEN)
Commander, U.S. Fleet Forces (USFF)	Naval Warfare Development Command (NWDC)
Commander, U.S. Pacific Fleet (COMPACFLT)	Naval War College (NWC)
Deputy Assistant Secretary of the Navy, Energy (DASN Energy)	Space and Naval Warfare Systems Command (SPAWAR)
Deputy Assistant Secretary of the Navy, Manpower & Personnel (DASN MM&P)	
Deputy Chief of Naval Operations for Manpower, Personnel, Training & Education / Chief of Naval Personnel (OPNAV N1)	
Deputy Chief of Naval Operations for Information Dominance (OPNAV N2/N6)	
Deputy Chief of Naval Operations for Fleet Readiness & Logistics (OPNAV N4)	
Deputy Chief of Naval Operations for Warfare Systems (OPNAV N9)	
Naval Air Systems Command (NAVAIR)	
U.S. Naval Academy (USNA)	

Appendix B

Navy Training & Education Continuum Structure

Level	Type	Step	Target Audience	Prospective Venues
I	General Energy Training	IA. Accession Training IB. General Military Training IC. Personnel Qualification Standards	IA. New Recruits (Seaman Recruits, Midshipmen, Officer Candidates) IB. All Uniformed Personnel IC. All Uniformed Personnel	IA. USNA, ROTC, RTC, OCS, A School, OIS IB. Navy Knowledge Online IC. Operational Units
II	Subject Matter Expertise Training	IIA. Basic Specialized Training IIB. Mid-Level Training	IIA. Officers (O1-O2); Enlisted (E1-E4) IIB. Officers (O3-O4); Enlisted (E5-E6)	IIA. School Houses (see Level IV), C School IIB. NWC, NPS, Petty Officer Indoctrination
III	Leadership Training	IIIA. Advanced Leadership Training IIIB. Senior Leadership Training	IIIA. Officers (CO/XO/Dept. HD tours); Senior Enlisted (E7-E9), Warrant (WO2-WO5) IIIB. Flag Officers (O7-O10)	IIIA. CO/XO/DH Schools, Naval Postgraduate School, Naval War College, Command Master Chief Program, Senior Enlisted Academy, Chief Petty Officer Indoctrination, Senior Enlisted Propulsion Engineering Course, Combat Systems Maintenance Courses, Senior Shore Leadership Course IIIB. NPS Executive Education
IV	Specialized Training	IVA. Aviation: Undergraduate Flight Training, Fleet Replacement Squadron, Annual Squadron Training, On-the-Job Training IVB. Expeditionary / Special Warfare: Basic Underwater Demolition / SEAL Training, On-the-Job Training IVC. Shore: Center for Seabees and Facilities Training, On-the-Job Training IVD. Surface Warfare: Center for Surface Combat Systems, Surface Warfare Officer School, On-the-Job Training IVE. Submarine: Naval Submarine School, On-the-Job Training		
V	Fleet Evaluation	VA. Intermediate VB. Advanced VC. Continuous	Fleet	VA. Composite Unit Training Exercises (COMPTUEX) VB. Afloat Training Group (ATG) VC. TYCOM Energy Management Liaisons

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

Program	Course	Venue	Audience	Description
Aviation Energy Conservation Program (Air ENCON)	Executive briefings; AO briefings	Fleet Training	Aviation squadrons	Air ENCON is designed to optimize fuel consumption by naval aviation units without adversely impacting safety or mission execution to ensure the right amount of fuel is available for sustained mission readiness.
Civilian Mariner Engineering Officer (CMEO) Technical Training Program	Energy Module	MSC- Washington, DC, MSC- Pacific, Naval Station Norfolk	Combat Logistics Force crew members and support personnel	Provides in-depth technical instruction on energy-efficient practices of operation and maintenance of shipboard systems.
Defense Acquisition	Energy Savings Performance Contracting (FAC 025)	Defense Acquisition University; online	Facility Managers (O4 & above)	Learn about Energy Savings Performance Contracting (ESPC), a contracting vehicle that allows federal agencies to accomplish energy projects for their facilities without depending on appropriations to pay for the improvements.
Elective Courses	Energy Security (EL706)	NWC	Officers (O4-O6)	Examines the relationship between energy and national security from the birth of the Hydrocarbon Age and the shift from coal to oil at the beginning of the 20th century that revolutionized global geopolitics to the ‘operational energy’ issues that defense planners and operational commanders handle.
Energy Managers Program	Senior Shore Leadership Course (S-540-1014)	Shore Leadership Training Center	Senior Military Officers (O4 & above) and Senior Civilian Supervisors	In this course, students will receive ten days of CNIC-focused education and training in functional areas, including energy conservation, typically encountered at Navy shore commands.
Flag Matters	Leading Innovation – Energy Application Focus (LI: EAF)	NPS	Flag Officers (O7-O10)	Participants learn why energy is important to national security; how energy impacts Navy’s combat capability; and how to apply energy considerations in requirements generation, acquisition, and operations.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

Fleet Energy Training Event	Warfare community briefings	Fleet Training	All officers & enlisted	Presentations by SYSCOMS and TYCOMS on energy savings practices, how to be a catalyst for culture change, and increasing awareness of energy use in the areas of shore, operational (aviation/surface), and expeditionary energy.
Incentivized Energy Conservation Program (iENCON) – in transition to Fleet as of 1 OCT 2014	Executive briefings; AO briefings	Fleet Training	COs, XOs, CHENGs, MPAs, Oil King	Provides ships with energy saving strategies, including how to manage efficient fuel consumption and optimum transit speed.
Intermediate-level Professional Military Education	Joint Maritime Operations	NWC	Officers (O4-O5)	Students examine the importance of energy as a class of supply and the criticality of factoring requirements and their effect on planning considerations.
Intermediate-level Professional Military Education	Strategy and War	NWC	Officers (O4-O5)	The analytical framework used to study a variety of case studies has nine key elements; one of them, the design, execution, and effects of operations, incorporates key elements of operational energy in an historic context.
Intermediate-level Professional Military Education	Theater Security Decision-Making	NWC	Officers (O4-O5)	Policy Analysis sub-course cites historic examples of energy as a strategic resource.
MS in Electronic Systems Engineering	Advanced Solid State Power Conversion (EC4150)	NPS	Officers (O3-O5)	Design and analysis of modern power electronic drives with particular emphasis on electric drives for present and future ship propulsion systems and variable frequency/variable speed power converters for advanced shipboard electric power distribution.
MS in Electronic Systems Engineering	Cyber Network and Physical Infrastructures (EC3730)	NPS	Officers (O3-O5)	Cyber infrastructure systems and technologies of interest to the military. Control and overlay networks such as Supervisory Control and Data Acquisition (SCADA) systems and the national power grid.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

MS in Electronic Systems Engineering	Defense Energy Seminar (EN3000)	NPS	Officers (O3-O5)	NPS' academic programs in Defense Energy are supplemented by a seminar series which provides a forum for leading voices within the field, practitioners, and other Defense Energy influencers. These professionals give presentations, engage in brown bag discussions, and facilitate informal gatherings that encourage Defense Energy faculty and students to discourse over current issues in Defense Energy, supplementing classroom teaching with practical, professional experiences.
MS in Electronic Systems Engineering	Electrical Energy: Present and Emerging Technologies (EC3110)	NPS	Officers (O3-O5)	This course presents electrical energy topics for on shore facilities, expeditionary, and ship applications divided into three categories; generation, distribution and consumption.
MS in Electronic Systems Engineering	Fundamentals of Energy (PH3700)	NPS	Officers (O3-O5)	This course provides a study of the underlying science of all aspects of energy, including energy availability, production, conversion, storage, and delivery.
MS in Electronic Systems Engineering	Introduction to Control Systems (EC2300)	NPS	Officers (O3-O5)	This course presents classical analysis of feedback control systems using basic principles in the frequency domain (Bode plots) and in the s-domain (root locus).
MS in Electronic Systems Engineering	Introduction to Electronics Engineering (EC2220)	NPS	Officers (O3-O5)	An introduction to systems engineering concepts and methods for the design and integration of complex defense systems, with emphasis on electrical engineering applications.
MS in Electronic Systems Engineering	Principles of Systems Engineering (EC4010)	NPS	Officers (O3-O5)	An introduction to systems engineering concepts and methods for the design and integration of complex defense systems, with emphasis on electrical engineering applications.
MS in Electronic Systems Engineering	Renewable Energy at Military Bases and for the Warfighter (EC3240)	NPS	Officers (O3-O5)	The course introduces participants to current energy use at military bases as well as mobile platforms power sources. Participants will be introduced to state-of-the-art renewable energy systems that would be utilized at military installations.
MS in Electronic Systems Engineering	Solid State Power Conversion (EC3150)	NPS	Officers (O3-O5)	A detailed analytical approach is presented for the operation, performance, and control of the important types of solid state power converters found in naval shipboard power systems. The course reviews the characteristics of power semiconductor switching devices.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

MS in Financial Management	Economic Analysis and Defense Resource Allocation (GB4071)	NPS	Officers (O3-O5)	Develops the tools and techniques of economic efficiency to assist public sector decision makers in analyzing resource allocation in government activities.
MS in Financial Management	Energy Economics (GB4070)	NPS	Officers (O3-O5)	Study of a variety of topics of general interest in the systems management, to be determined by the instructor.
MS in Financial Management	Simulation Modeling for Management Decision Making (GB4440)	NPS	Officers (O3-O5)	Modeling and risk analysis for managerial decision making. Case studies of simulation modeling applications to weapon system acquisition, logistics, transportation, distribution, communications and production systems.
MS in Financial Management	Strategic Resource Management (GB4510)	NPS	Officers (O3-O5)	The objective of this course is to integrate business analysis, financial analysis, and strategic analysis in solving complex management problems involving the allocation of scarce resources to achieve overall organization objectives. Resources here are not limited to financial resources but also include human and physical resources.
MS in Financial Management	Supply Chain Management (GB4480)	NPS	Officers (O3-O5)	This course is designed to provide an introduction to supply chain management Change Description (SCM).
MS in Mechanical Engineering	Advanced Energy Materials (MS4410)	NPS	Officers (O3-O5)	The course was designed for military officers in situations where they are either directly involved in the use of batteries, fuel cells, or managing similar programs where such systems are designed, developed, or procured.
MS in Mechanical Engineering	Advanced Solid State Power Conversion (EC4150)	NPS	Officers (O3-O5)	Design and analysis of modern power electronic drives with particular emphasis on electric drives for present and future ship propulsion systems and variable frequency/variable speed power converters for advanced shipboard electric power distribution.
MS in Mechanical Engineering	Applications of Heat Transfer (ME4160)	NPS	Officers (O3-O5)	Applications of heat transfer principles to engineering systems. Design topics include heat exchangers (e.g., boilers, condensers, coolers), cooling electronic components, heat pipes, solar collectors, turbine blade cooling.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

MS in Mechanical Engineering	Electrical Power Engineering (TS3000)	NPS	Officers (O3-O5)	An overview of the principles, concepts and trade-offs which form the foundation for shipboard electric power systems. The composition of electrical power systems for present and future Navy vessels is presented.
MS in Mechanical Engineering	Engineering Thermodynamics (ME2101)	NPS	Officers (O3-O5)	A comprehensive coverage of the fundamental concepts of classical thermodynamics, with insight toward microscopic phenomena.
MS in Mechanical Engineering	Fundamentals of Energy (PH3700)	NPS	Officers (O3-O5)	This course provides a study of the underlying science of all aspects of energy, including energy availability, production, conversion, storage, and delivery.
MS in Mechanical Engineering	Fundamental Principles of Naval Architecture (TS3001)	NPS	Officers (O3-O5)	The geometry, hydrostatics and hydrodynamics of monohull and other floating and submerged bodies; Froude similarity; wave and skin friction resistance; powering determination. Longitudinal and transverse stability of floating bodies. Hull girder strength. Introduction to seakeeping and passive survivability principles.
MS in Mechanical Engineering	Heat Transfer (ME3150)	NPS	Officers (O3-O5)	Introduction to the various modes of heat transfer and their engineering applications.
MS in Mechanical Engineering	Introduction to Fluid Mechanics (ME2201)	NPS	Officers (O3-O5)	Properties of fluids, hydrostatics and stability of floating and submerged bodies.
MS in Mechanical Engineering	Introduction to Materials Science and Engineering (ME4160)	NPS	Officers (O3-O5)	This is a first course in Materials Science and Engineering and emphasizes the basic principles of microstructure-property relationships in materials of engineering and naval relevance.
MS in Mechanical Engineering	Marine Power and Propulsion (ME3240)	NPS	Officers (O3-O5)	This course provides an introduction to the basic principles of power and propulsion systems, with an emphasis on performance of platforms and weapons for naval applications.
MS in Operations Analysis	Energy Cost Estimation (OA470X)	NPS	Officers (O3-O5)	TBD
MS in Operations Analysis	Energy Economics (GB4070)	NPS	Officers (O3-O5)	Study of a variety of topics of general interest in the systems management, to be determined by the instructor.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

MS in Operations Analysis	Energy Logistics in Warfare Operations (OA4613)	NPS	Officers (O3-O5)	Case studies and quantitative analysis of energy sources, distribution, and consumption focused on the sustainment of warfare operations.
MS in Operations Analysis	OA (Energy) Experience Tour (OA3900)	NPS	Officers (O3-O5)	TBD.
MS in Operations Analysis	Operations Research for Energy Systems Analysis (OS3007)	NPS	Officers (O3-O5)	A survey of operations research techniques with emphasis on techniques relevant to energy applications.
Officer Accession	Environmental Economics (FE345)	USNA	MIDN	Develops guiding economic principles for decision-making in the environmental arena. Important topics include population growth and the environment, the economics of pollution control, measuring environmental benefits, use and management of renewable and non-renewable resources, environmental justice, and the politics of environmental policy.
Officer Accession	Environmental Politics and Security (FP345)	USNA	MIDN	Examines major environmental problems currently influencing U.S. domestic and security policies, explores major theories and public policy controversies related to global warming, pollution, land, air, water degradation and scarcity, and biodiversity. The course also discusses enduring and novel ethical issues. Special emphasis is placed on DOD environmental programs.
Officer Accession	Fundamentals of Nuclear Engineering (ER301)	USNA	MIDN	An introductory course in the basics of nuclear engineering and radiological sciences. Subject areas include the basics in radiation physics, nuclear plant design, the fuel cycle and radiological health physics.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

Officer Accession	Global Climate Change	USNA	MIDN	Reviews the science of climate and the natural factors that influence global climate on different spatial and temporal scales. It will also discuss how human activities may impact local, regional, and global climate. Global climate data, past and present, will be examined from geologic and modern records including satellite data, land/sea observations, ice cores, etc. Related climate topics, such as the Ozone Hole, Greenhouse Effect, and El Nino will also be reviewed.
Officer Accession	Ocean Environmental Engineering (EN412)	USNA	MIDN	Basic principles and current issues in environmental engineering as applied to the ocean environment are introduced. Principal focus is on ocean resources: their identification, recovery, and utilization. Topical coverage includes the technological aspects of alternate energy sources; deep-ocean oil and gas recovery; desalinization; dredging and uses for dredge spoil; mineral exploitation; ocean depositories; wetlands, reefs and other coastal developments; and environmental economics, ethics, and regulatory statutes.
Officer Accession	Principles of Propulsion (EM300)	USNA	MIDN	A study of the principles of energy conversion, fluid flow and hydraulics applied to naval engineering systems, including the basic operation of steam, gas turbine and internal combustion power plants, as well as heat exchangers, air conditioning, and refrigeration.
Officer Accession	Solar Engineering (EM444)	USNA	MIDN	An introduction to solar energy conversion and utilization. Topics covered include solar radiation, collectors, energy storage, solar heating, solar cooling, photovoltaic converters and wind energy.
Officer Accession	Waste-to-Energy Conversion (EM486H)	USNA	MIDN	This course covers ways to recover useful energy from things typically viewed as "waste" and the science and technology associated with current waste-to-energy systems.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

Officer Accession	Wind & Tidal Energy (EM447)	USNA	MIDN	Covers wind and water turbine technology including design of turbine blades, analysis of flow regimes and energy conversion. The economics and policies involved in implementing these renewable energy systems will also be studied.
Senior-level Professional Military Education	Joint Maritime Operations	NWC	Officers (O5-O6)	Operational Energy is discussed in the lessons on Operational Logistics and Operational Sustainment.
Senior-level Professional Military Education	National Security Decision-Making	NWC	Officers (O5-O6)	Includes a case study on natural resource competition as a source of conflict and a case study on energy security.
Senior-level Professional Military Education	Strategy and Policy	NWC	Officers (O5-O6)	Two of the themes forming the analytical framework incorporate key elements which include Operational Energy considerations. Seven of the week-long historic cases studies and the capstone case on Maritime Seapower and Foreign Policy in the 21st Century examine such considerations.
Shore Energy Training	Advanced Public Works Department and Facilities Engineering Command Operations (A-4A-0065)	Center for Seabees and Facilities Training	Officers (O3-O5)	A five-day course designed to bring military and civilian public works managers up-to-date on current policy and programs that support the public works mission. Students will learn about current facility engineering initiatives at the Chief of Naval Operations, Naval Facilities Engineering Command, Commander Navy Installation Command, Regional and Activity levels.
Shore Energy Training	Facilities Energy Management (A-4A-0037)	Center for Seabees and Facilities Training	Officers (O1-O4)	To train facilities managers as trained energy managers as required and defined by the Energy Policy Act (Public Law 102-4860). This law defines a trained energy manager as a person who has demonstrated proficiency, or has completed a course of study in the areas of fundamentals of building energy systems, building energy codes and applicable professional standards, energy accounting and analysis, life-cycle cost analysis, fuel supply and pricing, and instrumentation for energy surveys and audits.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

SWO Training	CG PEO CG Advanced (A-4H-0158 & A-4H-0013)	SWOS/N74	Engineer Officers, Main Propulsion Assistants, and Officers in Surface Ship Engineering Billets	Manage and operate gas turbine propulsion plant and associated auxiliary support systems; interpret ships fuel consumption curves and calculate fuel burn at various speeds; describe your ships most economical plant configuration/alignment used to maximize fuel conservation and increase energy conservation.
SWO Training	DDG PEO DDG Advanced (A-4H-0178 & A-4H-0064)	SWOS/N74	Engineer Officers, Main Propulsion Assistants, and Officers in Surface Ship Engineering Billets	Manage and operate gas turbine propulsion plant and associated auxiliary support systems; interpret ships fuel consumption curves and calculate fuel burn at various speeds; describe your ships most economical plant configuration/alignment used to maximize fuel conservation and increase energy conservation.
SWO Training	Diesel PEO and Advanced Diesel (A-4H-0160, A-4H-0063 & A-4H-0009)	SWOS/N74	Engineer Officers, Main Propulsion Assistants, and Officers in Surface Ship Engineering Billets	Manage and operate diesel propulsion plant and associated auxiliary support systems; interpret ships fuel consumption curves and calculate fuel burn at various speeds; describe your ships most economical plant configuration/alignment used to maximize fuel conservation and increase Energy Conservation.
SWO Training	FFG PEO and FFG Advanced (A-4H-0159 & A-4H-0064)	SWOS/N74	Engineer Officers, Main Propulsion Assistants, and Officers in Surface Ship Engineering Billets	Manage and operate gas turbine propulsion plant and associated auxiliary support systems; interpret ships fuel consumption curves and calculate fuel burn at various speeds; describe your ships most economical plant configuration/alignment used to maximize fuel conservation and increase energy conservation.
SWO Training	LCS-1 RCO (A-4H-0005)	SWOS/N74	Engineer Officers, Main Propulsion Assistants, and Officers in Surface Ship Engineering Billets	Interpret ships fuel consumption curves and calculate fuel burn at various speeds; describe your ships most economical plant configuration/alignment used to maximize fuel conservation and increase energy conservation.

UNCLASSIFIED

Appendix C

Current Energy Training and Education Opportunities in Navy

SWO Training	LCS-2 RCO (A-4H-0007)	SWOS/N74	Engineer Officers, Main Propulsion Assistants, and Officers assigned in Surface Ship Engineering Billets	Interpret ships fuel consumption curves and calculate fuel burn at various speeds; describe your ships most economical plant configuration/alignment used to maximize fuel conservation and increase energy conservation.
SWO Training	STEAM Advanced (A-4H-0157)	SWOS/N74	Engineer Officers, Main Propulsion Assistants, and Officers assigned in Surface Ship Engineering Billets	Manage the engineering plant in a consistently high state of readiness in order to support the ship's primary mission; interpret ships fuel consumption curves and calculate fuel burn at various speeds; describe your ships most economical plant configuration/alignment used to maximize fuel conservation and increase energy conservation.