



Department of Defense **INSTRUCTION**

NUMBER 4170.11

December 11, 2009

Incorporating Change 2, August 31, 2018

USD(A&S)

SUBJECT: Installation Energy Management

References: See Enclosure 1

1. **PURPOSE.** This Instruction:

a. In accordance with the authority in DoD Directive (DoDD) 5134.01 (Reference (a)), reissues DoD Instruction 4170.11 (Reference (b)) to reflect changes in Public Laws 110-140 and 109-58 (References (c) and (d) respectively) and requirements of Executive Order (E.O.) 13693 (Reference (e)).

b. Implements policy established in DoD Instruction 4140.25 (Reference (f)) and provides guidance, assigns responsibilities, and prescribes procedures for DoD installation energy management.

2. **APPLICABILITY.** This Instruction:

a. Applies to OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities in the Department of Defense (hereafter referred to collectively as the "DoD Components"). The term "Military Services," as used herein, refers to the Army, the Navy, the Air Force, and the Marine Corps.

b. Pertains to all phases of administration, planning, programming, budgeting, operations, maintenance, training, and materiel acquisition activities that affect the supply, reliability, and consumption of facility energy.

3. **POLICY.** In accordance with References (f), it is DoD policy that:

a. Installation energy management shall satisfy all goals and policies established by References (b) through (e), and in accordance with sections 8251 et seq. and 6361 et seq. of Title 42, United States Code (Reference (g)).

- b. DoD utility infrastructure be secure, safe, reliable, and efficient.
- c. Utility commodities are procured effectively and efficiently.
- d. The Department of Defense maximize energy and water conservation efforts.
- e. The Department of Defense invest in cost effective renewable energy sources and energy efficient facility designs and regionally consolidate Defense requirements to aggregate bargaining power to achieve better energy pricing.
- f. This Instruction, including the requirements in References (c), (d), and (e), shall be applied to all facilities that use U.S. funding, both appropriated and non-appropriated, for construction, sustainment, renovation, maintenance, or operation, without regard to the location of those facilities.
- g. Readiness and sustainability policies and installation missions are considered and facilitated as part of installation energy management practices.

4. RE(V)SPONSIBILITIES. See Enclosure 2.

5. PROCEDURES. See Enclosure 3.

6. INFORMATION REQUIREMENTS

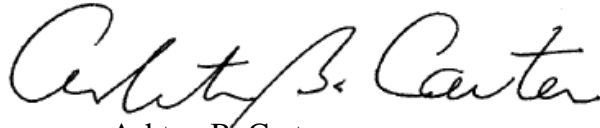
a. The Annual Energy Management Report, referred to in paragraph 2.a. of Enclosure 3 of this instruction, has been assigned report control symbol DD-AT&L(A)1529 in accordance with the procedures in Volume 1 of DoD Manual 8910.01 (Reference (h)). The expiration date of this information collection is listed in the DoD Information Collections System at <https://apps.osd.mil/sites/DoDIIC/Pages/default.aspx>.

b. The Energy Conservation Investment Program, referred to in paragraphs 1.d.(3) and 3.d.(3) of Enclosure 2 and paragraphs 2.b, and 3(b)2. of Enclosure 3 of this instruction, has been assigned report control symbol DD-AT&L(A)2603 in accordance with the procedures in Reference (h). The expiration date of this information collection is listed in the DoD Information Collections System at <https://apps.osd.mil/sites/DoDIIC/Pages/default.aspx>.

7. RELEASABILITY. **Cleared for public release.** This Instruction is available on the DoD Issuances Website at <http://www.esd.whs.mil/DD/>.

8. SUMMARY OF CHANGE 2. This change reassigns the office of primary responsibility for this Instruction to the Under Secretary of Defense for Acquisition and Sustainment in accordance with the July 13, 2018 Deputy Secretary of Defense Memorandum (Reference (i)).

9. EFFECTIVE DATE. This Instruction is effective December 11, 2009.



Ashton B. Carter
Under Secretary of Defense for
Acquisition, Technology, and Logistics

Enclosures

1. References
2. Responsibilities
3. Procedures

Glossary

ENCLOSURE 1

REFERENCES

- (a) DoD Directive 5134.01, "Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L))," December 9, 2005, as amended
- (b) DoD Instruction 4170.11, "Installation Energy Management," November 22, 2005 (hereby cancelled)
- (c) Public Law 110-140, "Energy Independence and Security Act of 2007," December 19, 2007
- (d) Public Law 109-58, "Energy Policy Act of 2005," August 8, 2005
- (e) Executive 13693, "Planning for Federal Sustainability in the Next Decade," March 19, 2015
- (f) DoD Instruction 4140.25, "DoD Management Policy for Energy Commodities and Related Services," June 25, 2015
- (g) Sections 8251 et seq. and 6361 et seq. of title 42, United States Code
- (h) DoD Manual 8910.01, Volume 1, "DoD Information Collections Manual: Procedures for DoD Internal Information Collections," June 30, 2014
- (i) Deputy Secretary of Defense Memorandum, "Establishment of the Office of the Under Secretary of Defense for Research and Engineering and the Office of the Under Secretary of Defense for Acquisition and Sustainment," July 13, 2018
- (j) Executive Order 13221, "Energy Efficient Standby Power Devices," July 31, 2001
- (k) Section 317 of Public Law 107-107, "National Defense Authorization Act for Fiscal Year 2002," December 28, 2001
- (l) National Institute of Building Sciences Whole Building Design Guide¹
- (m) Part 434 of title 10, Code of Federal Regulations
- (n) American Society of Heating, Refrigerating, and Air Conditioning Engineers Standard 90.1-2013
- (o) Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding," January 24, 2006²
- (p) Unified Facilities Criteria (UFC 3-400-01), "Energy Conservation," July 5, 2002
- (q) U.S. Green Building Council's Leadership in Energy and Environmental Design rating system (current version)
- (r) Assistant Secretary of Defense for Logistics Memorandum, "Energy Conservation Investment Program Guidance," March 17, 1993
- (s) Unified Facilities Criteria (UFC 3-500), Electrical Series³
- (t) DoD Directive 3020.40, "DoD Policy and Responsibilities for Critical Infrastructure," January 14, 2010
- (u) Unified Facilities Criteria (UFC 3-540-01), Engine-Driven Generator Systems for Backup Power Applications⁴
- (v) DoD Instruction 6055.17, "DoD Installation Emergency Management (IEM) Program,"

¹ The Whole Building Design Guide is a DoD-sponsored, Web-based application available at www.wbdg.org

² Available at http://www.epa.gov/oaintrnt/documents/sustainable_mou_508.pdf

³ Available at http://www.wbdg.org/ccb/browse_cat.php?c=4

⁴ Available at http://www.wbdg.org/ccb/browse_doc.php?d=9689

January 13, 2009⁵

- (w) Deputy Assistant Secretary of Defense for Logistics Memorandum, “Department of Defense Energy Security Policy,” January 14, 1992
- (x) National Institute of Standards and Technology Handbook 135, Life Cycle Costing Manual⁶
- (y) “Department of Defense Energy Manager’s Handbook,” August 25, 2005
- (z) Presidential Memorandum, “Energy Conservation at Federal Facilities,” May 3, 2001⁷
- (aa) Deputy Secretary of Defense Memorandum, “Revised Guidance for the Utilities Privatization Program,” October 9, 2002⁸
- (ab) Under Secretary of Defense for Acquisition, Technology, and Logistics Memorandum, “Supplemental Guidance for the Utilities Privatization Program,” November 2, 2005⁹
- (ac) Under Secretary of Defense for Acquisition, Technology, and Logistics Memorandum, “Supplemental Guidance for the Utilities Privatization Program,” March 20, 2006¹⁰
- (ad) OMB Circular A-94, “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs,” October 29, 1992

⁵ Available at <http://dtic.mil/whs/directives/corres/pdf/605517p.pdf>

⁶ Available at http://www.wbdg.org/ccb/browse_doc.php?d=8097

⁷ Available at <http://www.gpo.gov/fdsys/pkg/WCPD-2001-05-07/pdf/WCPD-2001-05-07-Pg698-2.pdf>

⁸ Available at http://www.acq.osd.mil/ie/irm/irm_library/Oct9_2002_DepSecDef.pdf

⁹ Available at http://www.acq.osd.mil/ie/irm/irm_library/UPSuppGuidance2005-3793-ATL_signed.pdf

¹⁰ Available at http://www.acq.osd.mil/ie/irm/irm_library/UPguidance_20March06.pdf

ENCLOSURE 2

RESPONSIBILITIES

1. ASSISTANT SECRETARY OF DEFENSE FOR ENERGY, INSTALLATIONS, AND ENVIRONMENT (ASD(EI&E)). The ASD(EI&E), under the authority, direction, and control of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), shall:

a. Oversee the Department's implementation of References (c), (d), and (e).

b. Represent the Department of Defense on Federal Interagency Sustainability Steering Committee and will continue to contribute to other standing working groups as a non-leader member agency established by Reference (e).

c. Implement policies and provide guidance to the DoD Components for managing facility energy resources in the Department of Defense and serve as the primary adviser for facility energy policy matters.

d. Provide for energy conservation and resource management, including:

(1) Goals. Establish departmental energy conservation program goals and develop procedures to measure energy conservation accomplishments by the DoD Components.

(2) Annual Guidance. Provide annual programming guidance and oversight for the achievement of DoD energy goals and objectives.

(3) Investment. Establish criteria, program and budget for, and monitor the execution of the Energy Conservation Investment Program (ECIP).

(4) Reporting. Develop policy guidance consistent with References (c), (d), and (e), to report energy and water use and results of conservation accomplishments against Federal energy conservation and management goals.

2. DIRECTOR, DEFENSE LOGISTICS AGENCY (DLA). The Director, DLA, under the authority, direction, and control of the USD(AT&L), through the Assistant Secretary of Defense for Logistics and Materiel Readiness, shall:

a. Perform energy management responsibilities assigned to DLA and the Defense Energy Support Center (DESC) according to Enclosure 3 of this Instruction.

b. Maintain a DoD energy database to provide petroleum and alternative fuel data required for fulfilling the reporting requirements of References (c), (d), and (e). Fuel supplied by the General Services Administration (GSA) will not be entered into this database.

c. Monitor energy markets to determine existing or potential adverse conditions and advise DoD Components utilizing DLA energy programs.

3. HEADS OF THE DoD COMPONENTS. The Heads of the DoD Components shall:

a. Execute defense installation energy policies in paragraph 3.e. according to the procedures described in Enclosure 3.

b. Designate and assign qualified Government personnel to represent the DoD Component in national, international, Government, or industry organizations engaging installation energy policy matters. Any contacts with international organizations or foreign governments will be coordinated in advance with the Under Secretary of Defense for Policy.

c. Designate and assign qualified personnel as energy managers for covered facilities in accordance with the requirements of Reference (c). Designated energy managers shall be responsible for implementing the requirements of all applicable statutes, E.O.s, and DoD issuances at their covered facilities.

d. Establish and execute an energy program management structure to:

(1) Provide program and budget funds sufficient to meet energy and water conservation goals.

(2) Implement DoD-established policies and procedures to measure progress in meeting energy and water conservation goals.

(3) Report energy and water use and progress in meeting conservation goals and program costs and ECIP program execution. The report data are also used for calculating greenhouse gas emissions.

(4) Develop programs that result in facilities that are designed, constructed, operated, maintained, and renovated to achieve optimum performance and maximize energy efficiency according to sustainable design principles.

(5) Provide facilities with trained energy program managers, operators, and maintenance personnel for lighting, heating, power generating, water, ventilating, and air conditioning plants and systems. Conduct training programs, as required, to ensure energy efficient operation and maintenance (O&M) of sustainable facilities.

(6) Require facility leases for Government-owned, contractor-operated facilities to include the implementation of sound energy conservation procedures; allow contract modification to accommodate energy efficiency improvements; and measure and report energy use and the resulting savings.

- e. Develop internal energy awareness programs to:
- (1) Publicize energy conservation goals.
 - (2) Disseminate information on energy matters and energy conservation techniques.
 - (3) Emphasize energy conservation at all command levels and relate energy conservation to operational readiness.
 - (4) Promote energy efficiency awards and recognition.
 - (5) Continue to promote energy awareness at the workplace.
 - (6) Encourage command or installation to observe October as energy awareness month.

ENCLOSURE 3

PROCEDURES

1. GENERAL GUIDANCE. Reducing energy consumption and investing in energy reduction measures makes good business sense and allows limited resources to be applied to readiness and modernization. The Department will make great strides in energy efficiency and consumption reduction to meet the DoD vision of providing reliable and cost effective utility services to the warfighter. Dramatic fluctuations in the cost of energy significantly impact already constrained operating budgets, providing even greater incentives to conserve and seek ways to lower energy consumption.

a. Governing Statutes and E.O.s. References (c), (d), and (e) require a reduction in emissions and improvement in energy management, and task the Department of Defense to provide leadership to promote energy efficiency, water conservation, the use of renewable energy, and to help foster markets for emerging technologies. The E.O. goals specifically address greenhouse gas emissions, energy efficiency, renewable energy, petroleum use, source energy consumption, and water usage. E.O. 13221 (Reference (j)) directs Federal agencies to purchase products that use no more than 1 watt in their standby mode.

b. Policy Development and Implementation. DoD policy initiatives shall be coordinated through an ASD(EI&E)-led interservice working group forum.

c. Management and Administration. Energy management on DoD installations focuses on improving efficiency, eliminating waste, and enhancing the quality of life while meeting mission requirements. Accomplishing these objectives will reduce costs and ensure that the program goals are achieved. The DoD energy program for facilities is decentralized, with the DoD Component headquarters providing guidance and funding and regional commands or military installations managing site-specific energy and water conservation programs. Funding of energy projects is multi-faceted, using a combination of Federal appropriations and private funds. Installations are responsible for maintaining awareness, developing and implementing energy projects, ensuring that new construction uses sustainable design principles, and meeting energy goals. The energy management infrastructure is composed of:

(1) E.O. 13693 Senior Sustainability Council (SSC). The ASD(EI&E) established a DoD SSC for the implementation of Reference (e). The membership of the committee contains the cross-section of DoD senior leadership necessary to make decisions needed to remove obstacles hindering compliance with the energy program. The SSC is supported by a working group, which provides programmatic logistical and technical support. The working group includes representatives from multiple areas of OSD, the Army, the Navy, the Air Force, and the Defense Agencies. Members of the working group also provide representation on a variety of other cross-functional integrated product teams and working groups. This integration of membership helps ensure a consistent approach to energy conservation throughout the Department of Defense. DoD Components are also encouraged to develop cross-functional groups at the DoD Component level.

(2) Interagency Working Groups. Representatives from the DoD Components shall be assigned to participate in interagency working groups in support of the Interagency Energy Management Task Force, as required. Established interagency working groups include, but are not limited to, renewable energy, sustainable design, ESPC, and energy efficient products.

(3) Component Energy Managers. As required by Reference (c), each DoD Component shall designate an energy manager for each covered facility who shall be responsible for implementing the requirements of all governing statutes and DoD implementing guidance and for reporting to the DoD energy manager, through the respective chain of command, on aspects of facility energy management within the DoD Component.

d. Goals

(1) General. The Department of Defense shall strive to modernize infrastructure, increase utility and energy conservation, enhance demand reduction, and improve energy resilience, thereby saving taxpayer dollars and reducing emissions that contribute to air pollution and global climate change.

(2) Program Goals. Specific program goals that correspond with the most current legislation and E.O.s (References (c), (d), and (e)) shall be published through ASD(EI&E) memorandums, if and when required.

2. REPORTING. The following reporting mechanisms shall be used to track energy conservation measures, investments, and performance against established goals.

a. Annual Energy Management Report (AEMR) and Long-Term Plan and Strategy for Conservation. The DoE, under the Federal Energy Management Program, working with the Office of Management and Budget (OMB), consolidates the separate energy management data and reports required by Reference (g) as amended by References (c), (d), and (e). Section 317 of Public Law 107-107 (Reference (k)) requires the Department of Defense to submit reports required by References (c) and (d) to the Congressional defense committees as well. The AEMR is the primary vehicle by which the Department tracks and measures its performance and energy efficiency improvement. The format for the report is prescribed annually by DoE and contains a narrative section, tables, a data report spreadsheet (quantitative data on consumption and costs), and a scorecard. The DoD Components will maintain a utility energy reporting system to prepare the data for submission of this report. Along with the AEMR, DoD Components shall also submit a long-term plan and strategy for achieving the requirements of References (c), (d), and (e). Changes and updates to the initial long-term plan and strategy shall be submitted annually in conjunction with the AEMR. The ASD(EI&E) compiles and submits the report and revisions to Department's Strategy for Conservation based on DoD Component inputs.

b. ECIP. ECIP is an OSD centrally managed, project-oriented element within the Defense-wide military construction (MILCON) account that is programmed annually and represents the primary direct DoD investment in energy and water conservation. The program requires

Congressional notification prior to project execution and periodic updates of execution status. DoD Components with active projects shall submit quarterly project status updates to the ASD(EI&E) within 30 days of the end of each fiscal quarter.

3. IMPLEMENTATION STRATEGIES. DoD Components shall manage their own energy programs to meet the requirements of this instruction. The primary objectives are to improve energy efficiency and eliminate energy waste while maintaining reliable utility service.

a. Awareness Campaign. Energy awareness programs publicize energy conservation goals, disseminate information on energy matters and energy conservation techniques, and emphasize energy conservation at all command levels and relate energy conservation to operational readiness.

(1) Training and Education. Awareness and training programs are important to the Department of Defense for achieving and sustaining energy efficient operations at the installation level. DoD personnel shall be trained through either commercially available or in-house generated technical courses, seminars, conferences, software, videos, and certifications. The DoD Components shall increase awareness and publicize program goals, tools, and progress at different organizational levels through Web sites, conferences, e-mails, displays, reports, newsletters, handbooks, and other methods.

(2) Recognition. Energy conservation awards shall be presented to individuals, organizations, and installations in recognition of their energy savings and water conservation efforts. In addition to recognition, these awards provide motivation for continued energy reduction achievements. The DoD Components shall establish and maintain their individual awards programs and incorporate on-the-spot awards and incentive awards to recognize exceptional performance and participation in the energy management program. DoD Components are encouraged to participate in the DoE's Federal Energy and Water Management Awards Program. This program recognizes organizations, small groups, and individuals for outstanding achievements in several energy-related categories within the Federal sector. Each DoD Component may also recognize one outstanding individual for overall contribution to the program. In addition to DoE and DoD Component energy award programs, the White House recognizes leadership in Federal energy management with Presidential awards.

(3) Showcase Facilities. Showcase facilities demonstrate promising best commercial practices and the use of innovative techniques to improve energy and water efficiency. The Department of Defense shall emphasize the benefit of these facilities, with a target of each Service developing at least one showcase facility for the federally sponsored program per year. The program is described at http://www1.eere.energy.gov/femp/services/awards_fedshowcase.html

b. Energy and Water Efficiency Investments

(1) Capital Investment. DoD Components shall require that all large capital energy investments in existing buildings employ the most energy efficient designs, systems, equipment,

and controls that are life cycle cost effective, in accordance with the requirements and provisions in paragraph 2.b.(1)(a)2 of this enclosure, and the requirements of Reference (c).

(a) Project Development

1. Life Cycle Cost Analysis. DoD Components shall continue to utilize life cycle cost analysis in making decisions about their investment in products, services, construction, and other projects to lower the Federal Government's costs and to reduce energy and water consumption. All projects with 10 years or less simple payback that fit within financial constraints shall be implemented. The DoD Components shall consider the life cycle costs of combining projects and encourage aggregating energy efficiency projects with renewable energy projects where appropriate. The use of passive solar design shall be required when cost effective over the life of the project. Sustainable development projects shall continue to use life cycle costing methodology and should follow all aspects of the Whole Building Design Guide (Reference (l)).

2. Facility Energy and Water Audits. Audits evaluate current energy usage and assist installations in determining the best locations to incorporate energy and water savings measures. Reference (c) requires Federal agencies to audit approximately 25 percent of their covered facilities each year. Since auditing 25 percent of DoD facilities each year may be cost prohibitive, the DoD Components are encouraged to use alternative financing through utility energy services contracts (UESCs) and energy savings performance contracts (ESPCs) to conduct their energy audits. In addition to facility audits, software such as renewables and energy efficiency planning and the Federal energy decision screening systems may be utilized to assist this process by determining the investment required to meet energy reduction goals. DoD Component energy managers are responsible for identifying facilities that are covered by the requirements of Reference (c) for purposes of planning and conducting audits, in accordance with applicable guidance. Each covered facility shall be audited at least once every 4 years. Results of audits must be entered and tracked via a DoE sponsored database in accordance with Reference (c).

3. Sustainable Building Design. Sustainability initiatives require an integrated design approach to the life cycle of buildings and infrastructures. The concepts of sustainable development as applied to DoD installations shall continue to be incorporated into the master planning process of each of the Services. MILCON and facility repair or sustainment projects shall include an energy analysis to show compliance with part 434 of title 10, Code of Federal Regulations (Reference (m)); relevant E.O.s; and other Federal energy conservation requirements, including the requirements in Reference (c). All new facility construction and major renovations shall perform 30 percent better than American Society of Heating, Refrigerating, and Air Conditioning Engineers Standard 90.1-2013 (Reference (n)). All new construction and major renovations shall incorporate all five guiding principles from the 2006 Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding (Reference (o)). Unified Facilities Criteria (UFC) 3-400-01 (Reference (p)) provides for definitions, design criteria, and life cycle cost analysis for sustainable development principles. Renewable energy systems shall be considered when cost effective through a life cycle cost analysis. The DoD Components shall obtain at least U.S. Green Building Council's

Leadership in Energy and Environmental Design (LEED) rating system (Reference (q)) silver level of performance or equivalent (based on the most current rating system aligning to DoD UFCs). The DoD Components shall document sustainable development costs on DD Form 1391, "Military Construction Project Data" (<http://www.dtic.mil/whs/directives/forms/eforms/dd1391.pdf>) and are encouraged to approach land use planning and urban design in a holistic manner and integrate it with energy planning. Additional information on sustainable design is in Reference (l). This intuitive, Internet-based tool serves as a portal to the design principles and other resources needed to construct cost effective, sustainable buildings.

(b) Project Execution. The DoD Components are encouraged to include cogeneration systems, fuel switching, high efficiency lighting, waste heat usage, and thermal storage units in new construction or retrofit projects when cost effective. The DoD Components are encouraged to incorporate energy saving technologies such as efficient thermal storage systems, chillers, boilers, lights, motors, energy management control systems (EMCSs), ground source heat pumps, and water reducing devices.

1. O&M. The DoD Components shall ensure that the energy efficiency measures are incorporated into repair and minor construction projects using available O&M funding. The DoD Components shall also ensure that sufficient O&M funding is available to support other projects using alternative financing vehicles such as UESC and ESPC.

2. ECIP. Congress appropriates funding for the ECIP to execute projects that save energy or reduce energy costs. Funds shall be allocated on a fair share basis based on the DoD Component's previous year reported facility energy use and factoring in their obligation rate for the last 5 years. This approach allows the DoD Components to manage the program with a degree of funding certainty and encourages timely execution. The DoD Components shall strive to obligate 100 percent of the ECIP funds provided by the end of the third quarter in the fiscal year in which the funds were issued. At the end of the third quarter, any unobligated funding at that point may, at the discretion of the ASD(EI&E), be withdrawn and redistributed to another DoD Component poised to obligate against a valid design-complete project, with priority given to renewable energy projects. ECIP funding should only be applied to projects that directly produce energy savings or cost reduction. However, the ASD(EI&E) shall have the discretion to directly apply funding for other uses such as studies and assessments if deemed appropriate. Realized savings should not only be auditable, but the initial submission of proposed projects shall identify the method to be used for savings verification on the DD Form 1391. Project lists shall include project title, installation, savings to investment ratio (SIR), and payback, as well as the estimated project cost and annual energy savings in British thermal units and dollars. At the discretion of the DoD Component, up to 25 percent of its annual ECIP target budget may be programmed against renewable energy applications that do not necessarily meet the SIR and payback period criteria in order to expand use of renewable energy applications and to meet the goals of References (c), (d), and (e). Each DoD Component should strive to attain an overall annual ECIP program SIR of 2:1 and must meet the minimum SIR of 1.25:1. Detailed ECIP program guidance can be found in the Assistant Secretary of Defense for Logistics Memorandum (Reference (r)).

3. Alternate Financing Mechanisms. Partnerships with the private sector through alternative financing (UESC and ESPC) are a crucial tool for financing energy efficiency measures and allow installations to improve their infrastructure. These contracts shall include infrastructure upgrades (e.g., new cogeneration, renewable systems, and ancillary structures) and new equipment (e.g., heating, ventilation, and air conditioning; lighting; motors; fixtures; and controls) to help the installations reduce energy and water consumption. Increasingly, projects with higher SIR should be first pursued using UESC and ESPC before consideration for ECIP, since these projects are typically more attractive to the commercial sector. Any funds paid by the DoD Component in the agreement pursuant to such a financed energy project shall be from funds made available through the same project's recurring or nonrecurring energy or water-related cost savings. Payments may be made only when the project is determined to be life cycle cost effective and when actual savings generated from the financed project exceed the payment amount in the same year. Non-recurring savings, or ancillary savings, are those such as utility rebates and avoided costs from repairs, replacements, retrofits, or capital improvements that have been budgeted for but are no longer required because of the financed energy project. Recurring savings are reductions in energy, water, or wastewater consumption; maintenance; or operations costs because of the financed energy project. The basis for all cost savings used to pay for these projects must be fully documented in the contract file.

4. Information Management. DoD Components shall track all estimated and actual costs, estimated and verified savings, interest rates, measurement and verification information, and mark-ups as well as any changes to project scope that may affect costs and savings. The DoD Components shall track and store this information.

5. Expertise. Consistent with applicable law, activities not possessing the prerequisite expertise may use the contracting centers of the Air Force, Navy, Army, and DESC to ensure best value according to inter-Service support agreements or memorandums of understanding. Contracting agencies should ensure that multi-year indefinite delivery and/or indefinite quantity contracts are re-competed at regular intervals. Each DoD Component contracting center that awards or administers ESPC or task orders shall conduct internal audits at intervals not greater than every 5 years to ensure project performance and guaranteed savings. DoD Components may issue more detailed implementing guidance.

(2) EnergyStar® and Other Energy Efficient Products. The DoD Components shall select energy efficient standby power devices, EnergyStar®, Federal Energy Management Program-designated energy efficient products, and other energy efficient products when acquiring energy-consuming products when it is life cycle cost effective to do so. Guidance generated by the DoE, the GSA, and the DLA are continuously being incorporated into the sustainable design and development of new and renovated facilities. Information technology hardware, computers, and copying equipment shall be acquired under the EnergyStar® Program using GSA schedules, Government-wide contracts, or Service contracts. Computer equipment should be turned off at night or when not in use. The DLA distribution centers shall serve as the focal point for the DoD program to procure energy and water efficient products. DLA and GSA product catalogs shall be widely used, as well as the Construction Criteria Base (available on CD-ROM and the Internet). Procuring agents, including users of Government credit cards, shall procure EnergyStar® products and other products in the top 25 percent of energy efficiency.

(3) EnergyStar® Buildings. The DoD Components shall encourage participation in the EnergyStar® building program, developed by the U.S. Environmental Protection Agency, which promotes energy efficiency in buildings and requires measured building data and a comparison with archetypes in various regions of the country. EnergyStar® building criteria are based on a five-stage implementation strategy consisting of lighting upgrades, building tune-up, load reductions, fan system upgrades, and heating and cooling system upgrades.

(4) Solar Water Heating. In accordance with Reference (c) and where life cycle cost effective, a minimum of 30 percent of facility hot water demand in new construction or buildings undergoing major renovation shall be met with solar water heaters.

c. Energy Resilience. The DoD Components shall take necessary steps to ensure energy resilience on military installations. DoD Components shall plan and have the capability to ensure available, reliable, and quality power to continuously accomplish DoD missions from military installations and facilities. UFC 3-500 (Reference (s)) provides guidance to assist in the determination of power availability, reliability, and quality definitions that will impact design criteria for energy resilience. DoD Components shall protect any information or data on energy resilience in accordance with pertinent DoD issuances on operations security.

(1) Energy Resilience Requirements. DoD Components shall clearly define, identify, and update critical energy requirements that align to critical mission operations in collaboration with tenants, mission owners, and operators of critical facilities on military installations. DoD Components shall incorporate defense critical infrastructure (DCI) when developing critical energy requirements on military installations or facilities (Reference (t)).

(2) Critical Energy Requirements. DoD Components shall determine their critical energy requirements and conduct an engineering facility energy load analysis for these requirements when metering data is not available. These critical energy requirements shall be reviewed and updated on an annual basis. UFC 3-540-01 (Reference (u)) provides definitions and design criteria to assist in the determination of critical energy requirements and to conduct facility energy load analysis. The critical energy requirements and facility energy loads identified by DoD Components shall be used to comply with:

(a) Emergency Energy Preparedness. Critical energy requirements and facility energy loads shall be included into emergency preparedness and continuity of operations plans, communicated to utility providers for integration into service restoration plans, and communicated within the installations, as well as with other relevant federal, State, and local authorities. DoD Components shall ensure that:

1. Emergency preparedness and continuity of operations plans include an installation's plans to prioritize and restore power with local utilities; consider both host and tenant critical energy requirements; describe movements to alternate locations in the case of a power disruption; and ensure that existing utility contracts include emergency support contingency clauses in the case of an energy disruption.

2. Mutual aid agreements have been negotiated with State and local officials, as well as utility providers to assist in an installation's recovery and to minimize power disruption impacts to the outlying community. DoD Instruction 6055.17 (Reference (v)) provides policy to assist DoD installations to prepare, respond, and recover from emergencies.

(b) Energy Generation Systems, Infrastructure, Equipment, Fuel, and Testing. DoD Components shall identify, design, and install primary power and emergency energy generation systems, infrastructure, and equipment to support their critical energy requirements.

1. Energy resilience solutions are not limited to traditional standby or emergency generators. They can include integrated, distributed, or renewable energy sources; diversified or alternative fuel supplies; and movements to alternative locations, as well as upgrading, replacing, and maintaining current energy generation systems, infrastructure, and equipment on military installations and at facilities. Alternative locations that require a continuous supply of energy in the event of an energy disruption or emergency shall also be subject to energy resilience requirements.

2. When selecting distributed or renewable energy systems and emergency generators for energy resilience, they shall be properly designed to have the ability to prepare for and recover from energy disruptions that impact mission assurance. Their design shall include automatic transfer switching, inverters, and black-start capabilities to minimize energy resilience risks. DoD Components shall also determine fueling or storage requirements for the selected energy generation systems. DoD Components shall follow relevant UFCs for safe and cost effective designs of energy generation systems that minimize risks to mission assurance when complying with energy resilience requirements stated in this instruction.

3. DoD Components shall ensure that primary power and emergency energy generation systems, infrastructure, equipment, and fuel that support their critical energy requirements receive the necessary maintenance. At a minimum, DoD Components shall maintain primary power and emergency generation systems according to their technical specifications and ensure that there is a trained operator assigned to maintain the energy generation system, infrastructure, equipment and fuel. DoD Components shall also develop and update fueling plans and ensure that fueling contracts are in place. The DLA should be considered by DoD Components to service their fueling requirements, as appropriate. Further guidance on energy generation systems, infrastructure, equipment, and fuel can be found in the Deputy Assistant Secretary of Defense for Logistics Memorandum (Reference (w)).

4. DoD Components shall conduct full-scale and routine testing of emergency and standby energy generation systems, infrastructure, equipment, and fuel that support their critical energy requirements. A full-scale test includes operating all associated emergency and standby energy generation systems, infrastructure, equipment, and fuel at full operational loads while completely separated from the primary source of power. DoD Components may also elect to substitute a black-start test for a full-scale test. Routine tests include operating all associated emergency energy generation systems, infrastructure, equipment, and fuel at full operational loads while still coupled with the primary source of power. At minimum, a full-scale test shall be conducted on an annual basis and routine tests shall be conducted semi-annually. Routine

testing shall be conducted on a monthly basis for emergency and standby generation at DCI facilities.

(3) Execution and Implementation of Energy Resilience. DoD Components shall perform periodic vulnerability assessments and audits to assess the risk of energy disruptions on military installations, and implement remedial actions to remove unacceptable energy resilience risks. DoD Components shall also provide energy projects that align to energy resilience requirements during the planning, programming, budgeting, and execution process. These energy projects shall be pursued based on life cycle cost effectiveness or if they remove unacceptable energy resilience risks.

(a) DoD Components are encouraged to use alternative financing or utility privatization arrangements in the pursuit of energy resilience projects, when they are life cycle cost effective. In collaboration with DoD Components, the ASD(EI&E) shall issue supporting technical and budgetary guidance to assist DoD Components in prioritizing energy resilience decisions, and shall update and provide this guidance annually.

(b) In the pursuit of energy resilience projects, DoD Components shall use National Institute of Standards and Technology Handbook 135, Life Cycle Costing Manual (Reference (x)) to determine life cycle cost effectiveness. DoD Components shall pursue opportunities that reduce life cycle costs, to the maximum extent practical, such as participation in peak shaving, demand response programs, ancillary services markets, and other financial incentive programs.

(4) Renewable Energy. The Department of Defense is committed to creating opportunities to install renewable energy technologies and purchase electricity generated from renewable sources when it is life cycle cost effective to enhance energy resilience. Passive solar designs, such as building orientation and window placement and sizing, shall be implemented in a variety of building types and new facility construction.

(a) Purchases. The DoD Components shall purchase renewable energy generated from solar, wind, geothermal, and biomass sources when cost effective and any premium is considered fair and reasonable. The DoD Components are encouraged to aggregate regionally when considering renewable energy purchases to leverage DoD buying power and produce economy of scale savings. The DESC can act as a procurement agent for all renewable energy purchases.

(b) Generation. Exploration in efficiency opportunities in renewable energy technologies such as wind, biomass, geothermal, ground source heat pumps, and photovoltaics shall be pursued when life cycle cost effective. Self-generated power may be coupled with ground source heat pumps, solar water heating systems, and photovoltaic arrays to generate electricity at isolated locations, such as range targets, airfield landing strips, and remote water pumping stations.

(5) Distributed Energy Generation. Distributed energy resources shall be used for on-site generation using micro-turbines, fuel cells, combined heat and power, and renewable technologies when determined to be life cycle cost effective or to provide resilience and security

to mitigate unacceptable risk. In most cases, larger scale, off-grid, electrical generation systems should be non-DoD owned and operated. Off-grid generation systems owned and operated by the DoD Components may make sense for mission criticality and remote sites when it is life cycle cost effective. In these cases, innovative energy generation technologies such as solar lighting, large photovoltaic arrays, wind turbine generators, micro-turbines, and fuel cell demonstration projects shall be utilized.

(6) Procurement Strategy. Reference (d) requires agencies to take advantage of competitive opportunities in the electricity and natural gas markets to reduce costs and enhance services. The DoD Components should partner with DESC, the single manager for acquisition of direct supply natural gas (DSNG) for delivery to DoD installations, to identify and develop risk mitigation strategies appropriate for the risk preference profile of the end user. The DoD Components are encouraged to aggregate demand across facilities or agencies to maximize the economic advantage.

(a) Electricity. The DoD Components should partner with DESC and aggregate regional electricity requirements (including renewable energy) to competitively procure electricity and ancillary and incidental services needed to meet the identified requirements. Award determinations shall be based on best value and, where applicable, compared to the applicable utility tariff available under a utility services contract to ensure economic value.

(b) Direct Supply Natural Gas Program (DSNGP). DoD Components shall competitively acquire DSNG under the DSNGP, managed by DESC, when cost effective and when the DSNG has the same degree of supply reliability as other practical alternative energy sources. All DoD installations that have the ability to compete natural gas requirements shall participate in the DSNGP. The DESC and the applicable DoD Component may mutually agree to exclude an installation from a DSNG contract under any one of these conditions:

1. An award is uneconomical.
2. The local distribution company (LDC) does not provide transportation from the city gate to the end use customer.
3. Ongoing or pending legal or regulatory action adversely impacts participation in the program.
4. The installation is impacted by base realignment and closure actions.
5. Existing contractual arrangements with the LDC or with existing multi-year DSNG suppliers offer better prices or have termination liabilities exceeding DESC direct supply contract cost benefits.
6. Loss of utility-sponsored demand side management program benefits is greater than the potential savings available through the DESC DSNGP. The DoD Components shall enter into and maintain all necessary LDC transportation agreements to support delivery to the burner tip and for ensuring that sufficient funding is available for payment. The DoD

Components shall consult with DESC to ensure that the DSNG and LDC contracts are synchronized.

d. Efficiency Measures

(1) EMCSs. The DoD Components are encouraged to apply EMCSs or other energy management technology on all new and existing system expansion applications subject to funding availability and cost effectiveness. The DoD Components shall ensure that installed systems are provided with the necessary O&M support to maintain efficiency and resultant savings. EMCS implementation using shared energy savings contracts, which provide continuous O&M through the contract term, is an option to assure adequate O&M support. DoD Component energy managers shall ensure compliance with the building benchmarking and reporting requirements for building energy usage required by Reference (c), by using the EPA's EnergyStar® benchmarking or similar tool.

(2) Metering. Application of meters and sub-meters are required for all appropriate facilities by References (c) and (d). Appropriate facilities are those for which the DoD Component has determined metering would be cost effective and practical as a management enhancement tool to identify energy cost savings attributed to conservation projects, energy systems maintenance activities, energy load management, command leadership, or other specific, discrete measures implemented during the year. Usage shall be determined through engineering estimates only when metering proves to be cost prohibitive and shall be reported as required in paragraph 2.a. of this enclosure.

(a) By 2012 and thereafter, electricity, natural gas, and water shall be metered on appropriate facilities; steam will be metered at steam plants. Annually, installations should strive to install meters in at least 15 percent of facilities that are not in compliance with this guidance. Meters shall be installed in all MILCON, major renovation, and ESPC projects. DoD Components must document findings that support a determination that a given facility is not an appropriate facility to meter and, accordingly, is exempt from this guidance. Each DoD Component should establish policy and specific criteria for installations to establish a metering program. Each policy should address the process to be used for the Component's approval of exemptions. Final approval should reside at the DoD Component headquarters level. The Department of Defense Energy Manager's Handbook (Reference (y)) is available to assist in the determination of cost effectiveness and practicality. For existing facilities, cost effectiveness can generally be achieved where the cost of the meter, installation, and ongoing maintenance, data collection, and data management does not exceed 20 percent of the yearly cost of the utility being metered. Digital meters with interval and remote reading capabilities are required when utility costs exceed the guidelines in Reference (y).

(b) Meters with interval and remote reading capabilities are required on all new construction and utilities system renovation projects exceeding 200,000 dollars. The remote reading capability of meters can be considered as a part of a more progressive approach known as advanced metering infrastructure (AMI), where two-way communication is established with meters. By transmitting data to the meters, their functionality will be controlled through the configuration programs. In addition, communication should be established with selected

building controls in order to effect energy consumption and take action such as load shedding, when necessary. Also in AMI process, the metering data and service information is retrieved from the meters to a meter data management (MDM) system where the information can be processed for various purposes such as billing, demand response, alarming service issues, estimation, validation, uniform energy management, and outage response.

(c) On a case-by-case basis, DoD Components may install simpler, locally read meters if it is determined that advanced meters are not practical. Safety switches will be required on all new electrical metering systems to facilitate meter replacement and maintenance. Besides utilizing the metering data in MDM systems through the implementation of AMI program, metering data will be incorporated into existing energy tracking systems and made available to facility and installation energy managers. While meters themselves do not constitute a direct energy conservation measure, it is expected that the management of data collected through metering will lead to energy and cost savings. Meter data should be collected, assimilated, interpreted, and made available to facility and energy program managers. This information should serve as the foundation to establishing facility energy efficiency relative to other facilities in the building inventory. It should also serve to identify and confirm opportunities for energy reduction or increased energy efficiency through improved operational procedures, best practices, or energy conservation and retrofit projects.

(3) Water Conservation. Reference (e) requires a reduction in water consumption intensity and water efficiency improvement for Federal agencies, suggesting specific strategies that include development of a water management plan and adoption of Federal Energy Management Program water efficiency improvement best management practices (BMPs). The BMPs range from system-related (boiler, steam, cooling tower, faucets, showerheads, etc.) to public information and education programs. Installations shall incorporate water management plans in their existing O&M plans and shall focus on dissemination of information to all levels to educate personnel on water conservation practices. Audits shall be conducted to identify the best opportunities and, where economical, installations shall initiate water conservation projects using O&M, ECIP, UESC, or ESPC. The DoD Components shall continue to concentrate on water conservation methods such as public awareness programs, early leak detection and repair, and installation of low-flow water efficient fixtures in housing and administration buildings, consisting of electronic flush sensors, electronic sensor control valves for hand wash lavatories, and waterless urinals.

(4) Electrical Load Reduction Measures. As a result of the Presidential Memorandum (Reference (z)), DoD installations' emergency load reduction plans were updated. The DoD Components shall continue to identify load shedding techniques to cut electricity consumption in buildings and facilities during power emergencies. Examples of these techniques include: EMCSs, sub-metering, cogeneration, thermal storage systems, duty cycling of air conditioning in military family housing by EMCSs, alternative energy sources for air conditioning, and turning off unneeded lights with motion sensors and separate lighting circuits. In addition, the Department of Defense continues to focus its energy conservation program on measures that reduce electric consumption.

e. Utilities Privatization. Historically, military installations have been unable to maintain

reliable utility systems due to inadequate funding and competing installation management priorities. Utilities privatization is the preferred method for modernizing and recapitalizing DoD utility systems. By allowing military installations to focus on core defense missions and functions instead of the responsibilities of utility ownership, this program will transform how installations obtain utility services. Activities will benefit from innovative industry practices, the reliability of systems kept at current industry standards, and private sector financing and efficiencies. Following Deputy Secretary of Defense Memorandum (Reference (aa)) and supplemental guidance issued by USD(AT&L) Memorandums (References (ab) and (ac)), the DoD Components shall complete privatization decisions on all electric, water, wastewater, and natural gas systems. Except where the Secretary of the Military Department has certified that the systems are exempt due to security reasons, or where privatization is uneconomical, the Military Services shall attempt to privatize those types of utility systems at every Active and Reserve Component installation within and outside the United States that is not designated for closure under a base closure law. Services must program sufficient funds to support privatization contracts.

(1) Margin of Error (MoE) Analysis. Due to a concern that the cost of continued Government ownership has been overestimated and the cost of privatization has been underestimated, DoD Components will incorporate MoE analysis in future utilities privatization efforts. All feasible alternatives shall be evaluated in a manner that sustains the highest level of confidence using prudent business analysis and judgment. The analysis must consider quantifiable and non-quantifiable elements. The approach and assumptions used to conduct the analysis should be documented in a business case to include process, rationales, and conclusions that represent the most probable cost for the project. At a minimum, the DoD Components shall value the following elements when conducting MoE analysis:

(a) For the Government Estimate. O&M cost, recapitalization cost (if the privatization agreement requires recapitalization by the contractor), discount rate, and inflation rate (available from OMB Circular A-94 (Reference (ad))).

(b) For the Contractor Cost Estimate. Taxes paid to the Federal Government and inflation rate.

(c) For Cost Realism. Consistency of proposal to request for proposals specifications and predicted changes in future costs.

(d) For Risk Assessment. Technical capability, quality management plan, and overall impact on future funding.

(2) Post-Conveyance Reviews. Recognizing the value of comparing actual cost to projected results, DoD Components shall conduct a post-conveyance review of each privatized system. To ensure its value, a review shall be conducted 2 to 3 years after award or 1 year after the first price re-determination, whichever is later. This timeframe allows for proper contractor transition and steady state operation. A post-conveyance review shall include, at a minimum, joint detailed inventory, updated list of requirements reflecting changes, updated list of transition requirements, updated list of deficiencies, contract cost changes due to updated inventory,

contract cost changes due to new connections or disconnects, and description of inventory changes due to connections and disconnects. Costs shall be summed over the period from award to analysis and compared to projections. Record of the original Government estimate and contract cost shall be maintained until the analysis is performed. Contract cost shall be normalized to the inflation factors in the Government estimate and any changes in mission or regulatory environment. All analysis results shall be maintained until analysis of all conveyances is complete.

(3) Cost Growth Control. Post conveyance reviews will provide data to verify whether there is a problem with cost growth on utilities' privatization contracts. Once a utility system has been privatized, the Government must enter into sole source negotiation for changes in inventory and future price. Cost growth not associated with increases in inventory or normal consumer prices will be readily identifiable through the post conveyance reviews. This information will place the Government in a better position to negotiate the future contract price.

GLOSSARY

PART I. ACRONYMS AND ABBREVIATIONS

AEMR	Annual Energy Management Report
AMI	advanced metering infrastructure
ASD(EI&E)	Assistant Secretary of Defense for Energy, Installations, and Environment
BMP	best management practices
DCI	defense critical infrastructure
DESC	Defense Energy Support Center
DLA	Defense Logistics Agency
DOE	Department of Energy
DSNG	direct supply natural gas
DSNGP	Direct Supply Natural Gas Program
ECIP	Energy Conservation Investment Program
EMCS	Energy Management Control System
E.O.	executive order
ESPC	energy savings performance contract
GSA	General Services Administration
IEM	Installation Emergency Management
LDC	local distribution company
LEED	Leadership in Energy and Environmental Design
MDM	meter data management
MILCON	military construction
MoE	margin of error
O&M	operation and maintenance
OMB	Office of Management and Budget
SIR	savings to investment ratio
SSC	Senior Sustainability Council
UESC	utility energy services contract
UFC	Unified Facilities Criteria
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics

PART II. DEFINITIONS

These terms and their definitions are for the purpose of this instruction.

critical energy requirements. Critical mission operations on military installations or facilities that require a continuous supply of energy in the event of an energy disruption or emergency.

energy resilience. The ability to prepare for and recover from energy disruptions that impact mission assurance on military installations.