



COMDTINST M4101.2A  
27 APR 1981

COMMANDANT INSTRUCTION M4101.2A

Subj: Shore Facilities Energy Conservation Retrofit Program

Ref: (a) Civil Engineering Manual, COMDTINST M11000.1 (old CG-251)  
(b) Buildings Plan dtd May 1980  
(c) COMDTINST M4100.2B

1. PURPOSE. The purpose of this Instruction is to:
  - a. Summarize mandated energy conservation goals for existing Federal buildings.
  - b. Clarify the intent of various pieces of legislation and distinguish between short and long term goals for reducing energy usage levels in existing and new buildings.
  - c. Consolidate existing mandates and legislation into a program aimed at reducing energy consumption in existing buildings and reducing dependence on non-renewable energy resources.
  - d. Introduce certain reporting requirements necessary to monitor program progress, forecast retrofit funding requirements, and support a centralized buildings data base which will help reflect the operating, maintenance, and repair requirements of buildings.
2. DIRECTIVES AFFECTED. COMMANDANT INSTRUCTION 4101.2 is cancelled.
3. DISCUSSION.
  - a. Program Goals. Chapter 1 discusses Presidential and Congressional mandates that establish energy conservation goals for existing Federal buildings. The goals of the "Shore

COMDTINST M4101.2A  
27 APR 1981

- 3-a (cont'd) Facilities Energy Conservation Retrofit Program" are the same as those contained in this chapter. Change 16 to reference (a) contains design and policy guidance in support of these goals. Reference (b) is a non-directive publication that summarizes some of that guidance and also reflects many of the goals discussed in this Instruction. Ref (c) discusses many of the administrative measures that must be taken to complement the actions of the retrofit program and ensure ultimate compliance with energy goals
- b. Program Definitions. Chapter 2 contains program definitions.
  - c. Program Execution Strategy. Chapter 3 discusses the strategy which should be followed in reaching program goals.
  - d. Program Resources. Chapter 4 discusses the procedures to be followed in order to obtain the funds needed to meet program goals.
  - e. Reporting Requirements. Chapter 5 discusses required progress reports and retrofit project documentation.
4. ACTION. All district commanders and commanding officers of Headquarters units shall ensure that the provisions of this Instruction are followed in the administration of the Shore Facilities Energy Conservation Retrofit Program.
  5. CHANGES. Recommendations for improvements to this Instruction may be submitted to Commandant (G-ECV).

/s/ D.C. THOMPSON  
Chief, Office of Engineering

TABLE OF CONTENTS

CHAPTER 1- Mandated Conservation Goals

- A. Background.....1-1
  - 1. The Energy Policy and Conservation Act (1975).....1-1
  - 2. Executive Order 12003 (1977).....1-1
  - 3. The National Energy Conservation Policy Act (1978)1-2
  - 4. Petroleum Reduction Goal.....1-2
  - 5. Solar Energy Message.....1-2

CHAPTER 2- Program Definitions

- A. Buildings Plan.....2-1
- B. Cost-Effective.....2-1
- C. Energy Conservation Project.....2-1
- D. Energy Conservation Retrofit Handbook.....2-1
- E. Existing Building.....2-1
- F. Individual Building.....2-1
- G. Facility.....2-1
- H. Individual Building Audit.....2-1
- I. New Building.....2-1
- J. On-Site Technical Survey.....2-1
- K. Preliminary Energy Audit.....2-2
- L. Preliminary Energy Audit Form.....2-2
- M. Retrofit Option.....2-2
- N. Savings to Investment Ratio.....2-2
- O. Simple Payback Period.....2-2

CHAPTER 3- Program Execution Strategy

- A. Administrative and Retrofit Actions.....3-1
- B. OG-30 Retrofit Funds.....3-1
- C. OG-43 Retrofit Funds.....3-1
  - 1. Scheduling Retrofits.....3-1
  - 2. Legitimate Retrofit Expenditures.....3-1
  - 3. Unit Executed Retrofits.....3-1
- D. AC&I Retrofit Projects.....3-2
- E. Early Emphasis on Petroleum Reduction.....3-2
- F. FY90 Goals Relative to FY2000 Goals.....3-2
- G. Compliance with Goals.....3-2
  - 1. Measuring Renewable Energy Usage.....3-2
  - 2. Gauging Compliance with Energy Reduction Goals....3-2
  - 3. Isolating Non-Building Energy Use.....3-3
- H. Performance of On-Site Technical Surveys.....3-3
- I. Data Collection for New Buildings.....3-3

TABLE OF CONTENTS (cont'd)

CHAPTER 4- Program Resources

- A. Obtaining Funds.....4-1
  - 1. OG-30.....4-1
  - 2. OG-43.....4-1
  - 3. AC&I.....4-1
- B. Projected Funding.....4-1

CHAPTER 5- Reporting Requirements

- A. Progress Reports.....5-1
  - 1. OG-43 Retrofits Executed.....5-1
  - 2. Compliance with Energy Goals.....5-1

## CHAPTER 1. MANDATED CONSERVATION GOALS

A. Background. In order to conserve energy in buildings and reduce dependence on non-renewable resources (primarily imported oil) the Congress and the President have issued mandates as described below.

1. The "Energy Policy and Conservation Act" (EPCA) of 1975. This Act required the President to establish or coordinate Federal agency actions to develop 10 Year Plans for energy conservation in buildings owned or leased by the United States. The President delegated this responsibility to the Department of Energy (DOE). Guidelines for preparing Buildings Plans were developed by DOE and promulgated in 10 CFR Part 436, Subpart C. The Coast Guard followed these guidelines and developed its own Buildings Plan in May of 1980. In the future, DOE will develop required conservation and efficiency standards and each agency will be required to implement them through its Buildings Plan. These standards will apply to existing buildings and will provide an indication of the extent to which buildings should be retrofitted to make them energy efficient.
2. Executive Order 12003 of 1977. This Order required DOE to establish requirements and procedures which will insure that each Federal agency will aim to achieve the following goals.
  - a. "For the total of all Federally owned existing buildings, the goal shall be a reduction of 20% in the average annual energy use per gross square foot (gsf) of floor area in 1985 from the average energy use per gsf of floor area in 1975." DOE has interpreted this to mean that by the end of FY85, the average energy usage rate for all of those buildings existing as of November 9, 1978 must be 80% of the FY75 average energy usage rate. The FY75 average usage rate in the Coast Guard was 270.7 Kbtu's/gsf/yr. Thus, the target average FY85 consumption rate for these "existing" buildings is  $.8 \times 270.7$  or 216 Kbtu's/gsf/yr.
  - b. "For the total of all Federally owned new buildings, the goal shall be a reduction of 45% in the average annual energy requirement per gsf of floor area in 1985 from the average annual energy use per gsf of floor area in 1975." DOE has interpreted this to mean that the group of buildings constructed between November 9, 1978 and September 30, 1985 shall consume 45% less energy than equivalent buildings existing in FY75. In the absence of consumption figures for specific equivalent buildings existing in FY75, the average consumption rate for all buildings will be used. Thus, the target average consumption rate for new buildings as of

1-A-2-b (cont'd) September 30, 1985 will be .55 x 270.7 or 149 Kbtu's/gsf/yr. Note, however, that as of the effective date of Change 16 to COMDTINST M11000.1, the target energy budgets contained therein shall be used in the design of all new buildings.

3. The "National Energy Conservation Policy Act" (NECPA) of 1978. This act stated that the Federal Government must develop demonstrate, and promote energy conservation, solar heating and cooling, and the use of renewable resources in Federal buildings. The act contains specific requirements as follows:
  - a. All new Federal buildings shall be life cycle cost effective as determined by DOE guidelines (See Appendix II-1-A of COMDTINST M11000.1 for information on these guidelines).
  - b. DOE shall establish and publish "performance targets" for existing Federal buildings and promote achievement of these targets. (Preliminary performance targets indicate that the limits to cost-effective retrofitting of existing buildings equates to an average energy usage rate of approximately 150 kbtu's/gsf/yr) These performance targets go hand in hand with the standards discussed in paragraph 1.a. and will be implemented once they are finalized by D.O.E..
  - c. All agencies must conduct Preliminary Energy Audits (PEA's) of buildings greater than 1,000 gsf in floor area.
  - d. All Federal buildings occupied or controlled by any Federal agency shall be completely and cost-effectively retrofitted by 1 January 1990. As discussed in paragraph A.3.b. above, this is assumed to mean retrofitting to the 150 Kbtu's/gsf/yr level.
4. Petroleum Reduction Goal. In issuing guidelines for the development of agency Buildings Plans, DOE called for agencies to plan toward a 30% reduction in the use of petroleum-based fuels by FY85.
5. Solar Energy Message. In a message delivered to the Nation on June 9, 1979 the President called for increased national emphasis on shifting energy dependence from non-renewable to renewable resources. He established a goal to have renewable resources supply at least 20% of our total energy needs by the year 2000. DOE adopted the President's initiative as policy and later asked each agency to establish its own renewables goal as part of its Buildings Plan. The Coast Guard's Buildings Plan adopts a 25% renewables goal by the year 2000. This goal is officially promulgated in COMMANDANT INSTRUCTION M11000.1.

## CHAPTER 2. PROGRAM DEFINITIONS

- A. Buildings Plan. A non-directive publication, prepared pursuant to DOE requirements outlined in 10 CFR Part 436, Subpart C, which contains a 10 year plan for achieving the goals of the Shore Facilities Retrofit Program.
- B. Cost-Effective. With respect to retrofit options, "cost-effective" means that the life cycle cost (determined in accordance with 10 CFR Part 436 and further explained in the Life-Cycle Cost Manual for the Federal Energy Management Program - NBS Handbook 135; referenced in Appendix II-1-A of COMDTINST M11000.1) of an option is less than the life cycle savings associated with that option. The Savings to Investment Ratio of a cost-effective option is greater than 1.
- C. Energy Conservation Project. A project for which at least 50% of the total initial cost is attributed to energy conserving "retrofit options".
- D. Energy Conservation Retrofit Handbook. COMDTINST M11000.5. This Instruction contains information which can be used in the performance of On-Site Technical Surveys to identify energy conserving retrofit options for buildings and building systems. It contains step-by step procedures for obtaining data in the field and using the data with rule of thumb cost figures to determine the payback periods of typical quick payback retrofit options.
- E. Existing Building. A Federal building existing as of November 9, 1978.
- F. Individual Building. An individual building is any one building greater than 1,000 gsf in floor area.
- G. Facility. A group of buildings which share a common site and common energy sources, and which are generally master metered for at least one energy source. The buildings within a facility can be CG owned or leased (excluding GSA).
- H. Individual Building Audit. A PEA on an individual building which is separately metered for all sources of energy.
- I. New Building. A Federal building the construction of which was completed after November 9, 1978.
- J. On-Site Technical Survey. An inspection of a building and its energy using systems in order to identify and evaluate specific building and systems retrofit options, as well as potential energy conserving changes to systems operation and maintenance procedures.

- K. Preliminary Energy Audit (PEA). A PEA is an assessment of the energy use characteristics of a building. Such an assessment identifies energy usage (by types and quantities), energy using systems, building structure, climatic conditions, etc. A field inspection of the building is not normally required to perform a PEA.
- L. Preliminary Energy Audit Form (RCS G-ECV-25-79 (OT)). A form used to collect the information obtained from the performance of PEA's on individual buildings.
- M. Retrofit Option. A change in a building component or energy using system that reduces the building's energy consumption while maintaining its functional adequacy.
- N. Savings to Investment Ratio. The life-cycle savings or cost reduction associated with a project divided by the life cycle investment costs associated with a project. This ratio is better defined in 10 CFR Part 436 and Appendix II-1-A of COMDTINST M11000.1.
- O. Simple Payback Period (SPB). The period of time that it takes for the accrued \$ savings associated with a retrofit project to just equal the initial investment cost. The time value of money is not considered when computing the SPB.

## CHAPTER 3. PROGRAM EXECUTION STRATEGY

- A. Administrative and Retrofit Actions. In pursuit of the FY85 milestone goals, we will attempt to achieve 25% of required energy reductions through administrative conservation measures and 75% through engineering retrofit actions. We will assume that beyond FY85, administratively produced savings will level off and engineering retrofit measures alone will be utilized to meet the FY90 and FY2000 goals.
- B. OG-30 Retrofit Funds. OG-30 funds will be available for administrative conservation efforts and some retrofit measures identified by District/Headquarters unit OG-30 managers and executed directly by field units. Each year Commandant will generate Planning Factors which will establish the criteria governing use of these funds.
- C. OG-43 Retrofit Projects. Approximately 85% of retrofit savings will be from OG-43 projects. On-Site Technical Surveys, periodic inspections, and unit generated SSMR's should generate these projects. Execution strategy should be as follows:
1. Scheduling Retrofits. Retrofit funds have been programmed to support orderly execution of all identified cost-effective retrofit options. These options can be accomplished individually or as part of larger more encompassing projects. When cost-effective retrofit options make up at least 50% of a project, that project is identified as an "energy conservation project". Once identified, OG-43 energy conservation projects should be entered into the backlog and prioritized. Projects that consist solely of cost-effective retrofit options should be ranked according to descending "Savings to Investment Ratios" and accomplished in order of ranking. Projects containing both energy and non-energy conservation related work should be prioritized by considering the benefits of both the energy and non-energy portions of work.
  2. Legitimate Retrofit Expenditures. Retrofit funds will not normally be expended on energy conserving retrofits that are not cost-effective. However, use of retrofit funds for high energy saving retrofit options is authorized when cost-effective alternatives have been exhausted and execution of the retrofits will significantly reduce dependence on petroleum based fuels.
- D. Unit Executed Retrofits. It is estimated that as much as 25% of required energy savings could be achieved through execution, by unit personnel, of quick payback retrofit options or other actions requiring little or no engineering expertise. Voluntary execution of these projects with unit controlled operating funds can not be assured for many reasons. In those instances where District controlled OG-30 funds exist and some portion can be earmarked for unit accomplishable retrofits, OG-43 managers are encouraged to assist OG-30 managers by developing a list of OG-30 retrofit measures that can be

3-D (cont'd) accomplished by field units. In this way maximum effort can be dedicated to reducing OG-30 energy costs while optimizing execution of projects from each Operating Guide.

- E. AC&I Retrofit Projects. Approximately 15% of retrofit savings are anticipated from AC&I projects. It is expected that complete and partial (conventional system retained for backup) renewable resource conversion projects will make up the bulk of AC&I projects. A concerted effort must be made to identify these projects as early as possible due to the long lead time in obtaining funds. Due to timing problems, funds for partially documented minor and major AC&I retrofit projects have been requested through FY83. To be eligible for these funds, minor AC&I projects should be sufficiently documented by 1 June 1981. Major AC&I retrofit projects not sufficiently documented (with an AC&I PPR) as of 15 March 1981 will not be eligible for these funds. In FY84 and beyond, AC&I funds will not be requested without prior receipt of fully documented projects to support such a request.
- F. Priority on Petroleum Reduction. To meet all FY85 energy reduction goals without exceeding programmed funds, 75% of all retrofit savings through FY85 must be obtained by reducing petroleum consumption.
- G. Meeting FY2000 Goal. The FY90 retrofit goal and the FY2000 renewables goal are not mutually exclusive. Thus, cost effective renewable conversion projects accomplished before 1990 will serve to also meet the retrofit goal. The remainder of the renewable projects should be accomplished between 1990 and the year 2000, as they become more cost effective (See Appendix II-1-A and II-30-E of COMDTINST M11000.1 for rules on determining cost-effectiveness of renewables projects). Because the level of execution of retrofit funds would not provide a direct indication of progress toward attainment of the FY2000 renewables goal, Districts and Headquarters units will be asked to report on such progress.
- H. Measuring Compliance. Planned program funding levels are based on the complete retrofitting of all existing buildings to achieve an average energy consumption rate of 150 kbtu's/gsf/yr. It is assumed that attainment of this goal will result in automatic attainment of the FY2000 renewables goal. In determining ultimate compliance with all goals, the following ground rules will apply:
  - 1. Measuring Renewable Energy Usage. The percentage of renewable resources used will be calculated by dividing total renewable energy usage by the sum of conventional and renewable energy usage. To this end, verification of renewable energy usage can only be obtained if that energy is metered.
  - 2. Gauging Compliance With FY85 and FY90 Energy Reduction Goals. In calculating the average energy consumption of buildings in FY85 and FY90, renewable energy will not be counted. Thus, if increased renewable energy usage reduces conventional energy usage to 216 Kbtu's/gsf/yr in FY85 or 150 Kbtu's/gsf/yr in FY90 for a given

3-H-2 (cont'd) existing building, that building will meet the respective targets.

3. Isolating Non-Building Energy Use. Non-building energy use can be deleted from average energy usage figures for a "Facility" provided that it can be accurately estimated or is metered. Thus, the metering of vessel shore ties (steam and electricity), industrial process energy, transmitter energy, street lights etc., can effectively reduce the quantity of energy that has to be saved in individual buildings. It is noted, however, that adjustments of this kind must be accompanied by an appropriate adjustment to the FY75 base as well.
- G. Performance of On-Site Technical Surveys. On-Site Technical Surveys for all buildings over 1000 gsf in floor area must be performed by 1 September 1982. The Retrofit Handbook and numerous other references contained in Chapters II-1 and II-30 of COMDTINST M11000.1 can be used to assist in the identification of energy conservation retrofit projects.
- H. Data Collection for New Buildings. Preliminary Energy Audits (PEA's) serve to document the energy use characteristics of buildings. All new buildings shall be audited after 6 months to 1 year of beneficial occupancy in order to determine if energy use is excessive or is significantly different from that which was predicted during the design stage. Where energy use is determined to be excessive, a follow up on-site Technical Survey shall be performed to identify areas where energy can be saved.

## CHAPTER 4. PROGRAM RESOURCES

- A. Obtaining Funds. Planned program funding is as shown in Table 1 of this chapter. In order to obtain a share of retrofit funds, the procedures described below should be followed.
1. OG-30. Upon review of annual OG-30 Planning factors, District/ Headquarters unit OG-30 managers should solicit funds on the Summary of Budget Estimates (Form CG-4144).
  2. OG-43. Funds are to be requested on the Summary of Budget Estimates Form. Administrative target units must state the total identified energy conservation related OG-43 funds planned for execution each year. This figure should be the total of all energy funds to be expended on cost-effective "retrofit options". The cost of architect/engineer fees should be included. The funds requested should be included in the figures for both "Minimum Level of Funds Required to Achieve Backlog Objectives" (Item #5 on the form) and "Maximum Operating Guide Civil Engineering Can Effectively Administer, Design, and Execute" (Item #6 on the form). The approved budget request will state the amount of funds approved for, and which must be spent on, energy conservation retrofit options. Energy funds which cannot be obligated during the fiscal year, as originally planned, must be returned to Headquarters no later than the end of the 3rd quarter for each fiscal year.
  3. AC&I. For minor AC&I retrofit projects, documentation involves the submission of an AC&I data sheet followed by a "one-way" planning proposal. For major AC&I retrofit projects, documentation involves submission of an AC&I data sheet, a Planning Proposal, and an AC&I Project Proposal. The procedures in COMDTINST M16010.1 (old CG-411) should be followed in order to insure timely submission of required documentation.
- B. Projected Funding. Table 1 shows projected funding levels needed to meet FY90 energy goals.

PROJECTED FUNDING LEVELS FOR ENERGY CONSERVATION \*

|        | <u>FY81</u> | <u>FY82</u> | <u>FY83</u> | <u>FY84</u>   | <u>FY85</u>   | <u>FY86</u>   | <u>FY87</u>   | <u>FY88</u>   | <u>FY89</u>   | <u>FY90</u>   |
|--------|-------------|-------------|-------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| OG-30: | .457M       | .457M       | .457M       | .457M         | .457M         | .457M         | .457M         | .457M         | .457M         | .457M         |
| OG-43: | 3.3M        | 5.3M        | 11.6M       | 11.6M         | 11.6M         | 11.6M         | 11.6M         | 11.6M         | 11.6M         | 11.6M         |
| AC&I : | <u>1.5M</u> | <u>.4M</u>  | <u>2.9M</u> | <u>2.9M**</u> |
|        | 5.26M       | 6.16M       | 14.9M       | 14.9M         | 14.9M         | 14.9M         | 14.9M         | 14.9M         | 14.9M         | 14.9M         |

\* These projected funding levels are based on a reduction of the Coast Guard wide average energy usage level for buildings to 150Kbtu's/gsf/yr by the end of FY90.

\*\* These figures represent the estimated level funding requirement necessary to achieve 15% of the overall required energy reduction through FY90. These funds have not been requested or programmed to date. Actual AC&I funding will be based on field generated planning documents received in a timely manner for each budget year.

TABLE 1

## CHAPTER 5. REPORTING REQUIREMENTS

A. Progress Report. Include the following information in the annual submission of the Civil Engineering Data Summary (RSC G-ECV-3085).

1. OG-43 Retrofit Projects Executed. A list of the energy conservation projects on which OG-43 energy funds were expended during the fiscal year. This listing should include for each project:

- a. Brief project description.
- b. Project location.
- c. Cost of the retrofit options incorporated into the project.
- d. Estimated energy savings per year (btu's/yr).
- e. Estimated total annual \$ savings from net changes in operating, maintenance, and energy expenditures. (Use constant \$ in FY of project execution). Use these figures to compute a "Simple Payback Period (SPB)" for the energy conserving portion of each project.

2. Compliance with energy goals.

a. Progress in shifting dependence to renewable energy sources: Provide a list of completed retrofit projects incorporating passive or active solar and/or any other features which will result in an increase in use of renewable resources. Include project costs and an estimate of the amount of conventional energy usage (by type) displaced by renewable energy.

b. Progress in surveying buildings; displayed in tabular form as follows:

|                              |  |   |
|------------------------------|--|---|
| # buildings surveyed to date | gross square footage of buildings surveyed to date | building square footage remaining to be surveyed. |
|------------------------------|--|---|

c. Progress in retrofitting buildings; displayed in tabular form as follows:

|  |  |  |  |
|--|--|--|--|
| \$ value of retrofit options identified to date. | \$ value of retrofit options accomplished this FY. | \$ value of retrofit options accomplished to date. | Estimated OG-43 and AC&I funds required to complete all retrofit options by the end of FY90. |
|--|--|--|--|