



UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

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MARCH 8, 1979

ENERGY AND MINERALS  
DIVISION

B-178205



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The Honorable James R. Schlesinger  
The Secretary of Energy

Dear Mr. Secretary:

As part of our continuing review of Government energy conservation programs, we evaluated the Department of Energy's (DOE's) activities to develop mandatory lighting and thermal efficiency standards for Federal buildings. Such standards are to be developed by DOE as part of the 10-year plan for energy conservation in Federal buildings called for in section 381 of the Energy Policy and Conservation Act (EPCA) (Public Law 94-163).

We found that mandatory lighting and thermal efficiency standards have not been established. We have concluded that DOE needs to promptly address certain issues concerning the establishment of such standards before an aggressive energy conservation program for Federal buildings can be pursued. These matters are discussed below.

LIGHTING AND THERMAL EFFICIENCY  
STANDARDS NOT PROMULGATED

EPCA required the President to develop and implement a 10-year plan for energy conservation with respect to buildings owned or leased by the Federal Government. The 10-year plan was to include mandatory lighting efficiency standards and mandatory thermal efficiency standards and insulation requirements. 1/ As of January 31, 1979, these requirements had not been fulfilled; and given the situation discussed below, it is unclear when, or if these requirements will be met.

1/Energy efficiency refers to the ratio of the useful output of a product or system to the energy consumed by such product or system.

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*Report*

Lighting efficiency standards

According to studies performed for DOE, a number of factors in a total lighting system will have to be considered in the development of a lighting efficiency standard. These factors include

- nonuniform lighting levels, or the amount of light considered necessary to illuminate the various areas within a building,
- lamp efficiency or the efficiency of the light bulbs and fixtures which are used to produce the desired lighting levels,
- lighting controls, and
- natural light (the extent that sunlight through windows can contribute to meeting the necessary lighting levels).

We found, however, that technical problems are hampering development of a lighting efficiency standard which would take into account the above factors.

Lighting efficiency is the desired level of light at the working area divided by the electrical power required to attain that level of light. DOE and its consultants have not been able to determine how lighting level requirements, illuminary efficiencies of light bulbs and fixtures, and various lighting control systems can all be adequately considered and reduced to a lighting efficiency standard. Compounding this problem is how to give adequate consideration to the availability of natural light to meet necessary lighting levels. Thus, DOE has not developed lighting efficiency standards for Federal buildings; and it is unclear when, or if, such standards will be developed.

DOE staff currently believe that a more realistic approach for determining the most efficient way to provide a building's lighting energy needs is to consider building lighting requirements in conjunction with all aspects of building design. In this way, lighting aspects, such as the use of natural light and the heat generated from artificial

lights, can be assessed in terms of their impact on the heating and cooling requirements of a building. Methods for making such assessments are being developed by DOE and are discussed below.

#### Thermal efficiency standards

DOE is proceeding with its assessment of the thermal efficiency of buildings along two paths: one focusing on new buildings and the other focusing on existing buildings. In the area of new buildings, DOE is developing a process standard to assist architects and engineers in achieving energy efficiency in new building design. The process standard is essentially a format which can be used to systematically evaluate the various factors, primarily lighting and thermal aspects, which need to be considered in designing an energy efficient building.

With respect to existing Federal buildings, DOE is developing requirements for selected aspects of a building, for example, permissible infiltration rates and insulation "R" values (a measure of a material's ability to prevent heat transfer), which will be used in building retrofit projects. Beyond these requirements DOE is developing a set of analytical tools and operating requirements for use in evaluating individual buildings for their maximum cost effective energy conservation potential.

While the above activities are directed at improving the energy efficiency of Federal buildings, in our opinion, these actions do not fulfill the legislative requirement to establish thermal efficiency standards, since they will not result in a standard to govern the thermal integrity of buildings. DOE officials do not disagree with this opinion, but believe their approach is more realistic and will be more effective in achieving the overall purpose of the legislation--to conserve energy in Federal buildings.

#### NEED TO RESOLVE A KEY ISSUE CONCERNING STANDARDS' DEVELOPMENT

A major issue which is apparently hampering the independent development of lighting and thermal efficiency standards for Federal buildings is the need for such standards in view of DOE's legislative requirement, contained in section 304 of the Energy Conservation and Production Act (Public Law 94-385), to establish energy conservation performance standards for all new buildings. Section 306 of that Act states that any

Federal building constructed following the establishment of the standards must meet or exceed the energy conservation performance standard.

As described in the act, an energy conservation performance standard is an energy consumption goal. As applied to buildings, the performance standard will reflect the maximum amount of energy which the building is designed to consume in its total operation. For example, a building energy conservation performance standard is expected to be stated in terms of British thermal units consumed per square foot per year. The energy performance standard is different from an energy efficiency standard in that the performance standard focuses solely on the energy consumed by a building whereas an energy efficiency standard focuses on the relationship of energy consumed to the useful output of that consumption.

DOE officials have expressed the opinion that the establishment of national energy conservation performance standards for new buildings will negate the need to establish lighting and thermal efficiency standards for new Federal buildings, since the energy conservation performance standards will necessarily encompass the energy consumed by a building's a building's lighting and thermal components. In DOE's view, the energy conservation performance standard approach is a more practical means for controlling a building's energy consumption. As a result, DOE is focusing its efforts on assuring that new Federal buildings will be designed in accordance with energy conservation performance standards to be established rather than on developing lighting and thermal efficiency standards for Federal buildings as required by law.

Concerning existing Federal buildings, the recently enacted National Energy Conservation Policy Act (Public Law 95-619) places additional requirements on DOE with respect to conserving energy. These requirements include

- the use of life cycle cost methods for estimating and comparing costs for Federal buildings,
- the establishment of energy performance targets for Federal buildings, and

--the use of energy audits before retrofiting  
of existing Federal buildings.

Fulfilling these requirements in conjunction with the previously legislated requirements for conserving energy in Federal buildings may pose additional problems for DOE.

CONCLUSIONS AND  
RECOMMENDATIONS

We are concerned with DOE's failure to establish, as required in the EPCA, lighting and thermal efficiency standards for Federal buildings as part of its 10-year plan for energy conservation in Federal buildings. It is apparent that the central issues which need to be resolved include the technical problems surrounding the establishment of a lighting efficiency standard as well as the need for lighting and thermal efficiency standards for Federal buildings in view of DOE's requirement to also establish energy conservation performance standards for all new buildings. In addition, the recent requirements for conserving energy in Federal buildings placed on DOE by the National Energy Conservation Policy Act, may compound this situation.]

We previously reported to you <sup>1/</sup> our concern that the development of the 10-year plan for energy conservation in Federal buildings was not being aggressively pursued. At that time we also pointed out that there appeared to be a lack of DOE leadership and support of the Federal Energy Management Program. The matters discussed in this report provide further evidence that the energy conservation program for Federal buildings needs the attention of top-level DOE officials.

Therefore, we <sup>SAO</sup> recommend that you <sup>DOE should</sup> promptly evaluate and resolve the issues raised in this report with respect to establishing lighting and thermal efficiency standards for Federal buildings and move forward with an aggressive and effective 10-year plan to conserve energy in both existing and new Federal buildings. If you determine that meeting the legislative requirements for energy efficiency standards and energy conservation performance standards, as well as the new requirements for conserving energy in Federal buildings contained in the National Energy Conservation Policy

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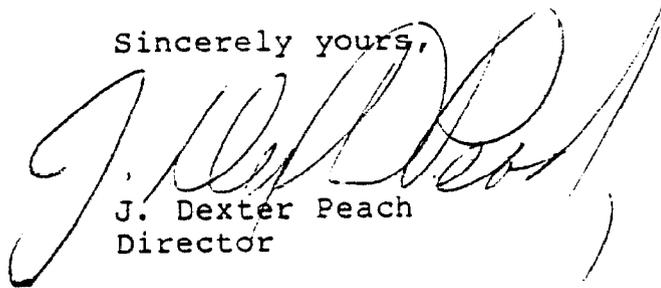
<sup>1/</sup>Letter to the Secretary, Department of Energy (EMD-78-89, July 20, 1978).

Act, is not possible or would be counter-productive to carrying out an effective energy conservation program for Federal buildings, you should report such findings, along with any necessary new legislation for carrying out an effective program for energy conservation in Federal buildings, to the appropriate congressional committees.

*Transmittal Report*  
As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the four committees mentioned above and to the Chairmen of energy-related congressional committees. We are also sending copies to the Director, Office of Management and Budget.

Sincerely yours,



J. Dexter Peach  
Director