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ENERGY & ENVIRONMENT DIVISION

HOSPITAL VENTILATION STANDARDS AND ENERGY CONSERVATION:
A REVIEW OF GOVERNMENTAL AND PRIVATE AGENCY ENERGY
CONSERVATION INITIATIVES

Robert S. Banks and David Rainer

March 1980

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AGENCY ENERGY CONSERVATION INITIATIVES

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March 1980

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EXECUTIVE SUMMARY

It is generally agreed that the indoor environmental quality of health care facilities such as hospitals and nursing homes, must be better than that provided the general public in eating and lodging facilities and places of assembly. This is based on the premise that patients are already under stress and that they should not be subject to additional stress from environmental shortcomings. Consequently, there has been a tendency in the United States to set standards of good hospital design and operation that provide a very high quality environment for patients and staff. Today's standards also arise from the "penny cheap" energy era and were therefore developed with little or no regard to the energy consumed to provide such an environment, contributing significantly to the fact that hospitals are considerably more energy intensive than their commercial or public building space counterparts. Even in face of continually escalating energy costs, the health care community is highly reluctant to consider lowering hospital environmental standards because of concern over possible adverse impact on the health, safety, and comfort of patients and staff.

This report presents the results of a recent research project originally concerned with review of governmental initiatives for changes to these standards at both the federal and state levels. However, it quickly became apparent that concern with energy conservation was not impacting hospital environmental standards, especially at the state level, irrespective of the energy implications. Consequently, the study was redirected to consider all energy conservation initiatives directed toward design and operating practices unique to the hospital environment.

The scope was limited to agency programs (i.e., not undertaken at the initiative of individual hospitals), applicable to non-federal public and private hospitals.

At the federal level, hospital construction standards have been mandated since 1946 with passage of the Hill-Burton Act which authorized the federal government to provide grants in aid to the states for the planning and construction of new hospital facilities. Hill-Burton program standards are particularly important in that they are specifically oriented toward hospital and medical facility design and construction. Further, they are widely respected within the United States health care community as specifying the state of the art in acceptable engineering design practice. These standards were last revised in October, 1978, and they now include for the first time, some operational energy conservation measures. However, even in this revision, the federal government has specifically avoided making any changes which might reduce operating costs at the expense of quality care. Thus, the current Hill-Burton standards do not relax any of the basic pressure relationships, ventilation and thermal requirements which characterize and are highly unique to the hospital environment. As a result, they place a strong constraint on energy conservation programs which are highly effective in other types of building space.

While hospital environmental standards are not being altered, there are two pieces of federal legislation which do provide considerable opportunity for other forms of hospital building energy conservation measures. These are:

1. The Energy Policy and Conservation Act of 1975. This legislation, among other provisions, mandates the establishment of federal guidelines for the attainment of specified levels of energy efficiency in new building construction and for development of energy conservation contingency plans. Under this Act, a model energy conservation building code was developed, which includes building envelope and lighting standards applicable to hospitals. In addition, one of the energy conservation contingency plans includes building temperature standards which must be complied with in those portions of hospitals not occupied by patients.
2. The National Energy Conservation Policy Act of 1978. This Act includes a grants program for schools and hospitals, providing \$900 million in matching funds over a three year period to improve the energy efficiency of schools and hospitals. NECPA authorizes grants to states and to public and non-profit schools and hospitals to assist them in identifying and implementing energy conservation, maintenance and operating procedures and in evaluating, acquiring and installing energy conservation measures to reduce the energy use and anticipated energy costs of schools and hospitals. Federal funds are being made available as matching grants through state energy offices to both schools and hospitals, but neither sector may receive more than 70 percent of the total funds allocated to the state. Federal funds are on a 50-50 cost sharing basis, except that in certain cases of "severe hardship," schools and hospitals may receive up to 90 percent of costs. In kind contributions may be used for matching purposes and can

include staff time and building materials. Extensive as it is, nowhere in this program is any provision for energy conservation measures based on relaxation of hospital environmental standards.

At the time of preparation of this report, the Energy Action Staff, Health Resources Administration, U.S. Department of Health, Education, and Welfare was developing its own hospital energy conservation program, including sponsorship of several energy conservation seminars for professionals in the health care community, but did not have a definitive program which could be documented herein. It is recognized that the EAS does, at this time, have an active involvement in hospital energy conservation programs.

At the state level, a letter survey was conducted to determine the extent and kinds of energy conservation programs for health care facilities operative in the various states. Information was requested from each state on such items as:

1. Adoption of mandatory energy conservation standards;
2. Energy audits;
3. Technical assistance;
4. Education programs;
5. Grants; and
6. Participation in the schools and hospitals program of the National Energy Conservation Policy Act.

Survey results indicated that the federal programs described above are clearly dominating governmental hospital energy conservation initiatives at all levels. The states' activities have been largely limited to implementing the NECPA schools and hospitals grants program. There

are two major and inter-related reasons for this situation:

1. The lack of technical and financial resources at the state level to deal with the unique problems of the hospital environment; and
2. The widespread acceptance of the Hill-Burton program standards as specifying minimum acceptable requirements for quality patient care.

Consequently, there are no efforts underway among the responding states to relax hospital environmental standards. In addition, no grant programs involving state monies were evident in the survey results.

While the lack of initiative at the state level might be characterized as a "hands off" attitude toward the patient environment, several states were found to be actively pursuing energy audit, education, and technical assistance programs well in advance of the NECPA grants. The nature of these programs is quite varied, often involving cooperative ventures with state hospital associations and third party reimbursers. Nonetheless, the initiative for the majority of these programs was anticipation of federal funds.

Due to their unique involvement with the payment of hospital operating costs, the hospitalization insurance industry has a strong, influential and continuing interest in hospital cost containment programs, of which energy conservation measures are one. Activities by third party reimbursers are not yet concerned with revision of hospital environmental standards, but are presently directed toward creation of incentives for purchase of capital equipment by and improved operating practices within individual hospitals. Our survey found several Blue Cross Plans actively involved in support of energy conservation measures. These

programs varied significantly in terms of scope, financial and technical resources, and relationships with hospitals and local interest groups. In general, however, Blue Cross Plans appear to be able to take one or both of two roles in support of energy conservation programs:

1. Act as a coordinating agency to develop data, conduct educational programs, and organize community interest; and
2. Organize and financially support hospital energy conservation programs.

Examples of both these two roles are provided in this report. In addition, the national Blue Cross and Blue Shield Associations are involved in a National Cooperative Effort under a grant from the Exxon Corporation, which has an overall goal of creating conditions which will allow hospitals to realize their full potential in voluntary energy conservation measures. Initiated in 1978, the project first emphasized practical, low cost steps. Presently, it is shifting its focus to more complex measures with longer pay-back periods.

In summary, while Hill-Burton program standards strongly limit opportunities for energy conservation measures in hospital building space, a number of effective programs -- directed toward improved operating practices -- have been put in place. These, in themselves, can accomplish substantial energy savings, whether or not hospital environmental standards are changed.

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Chapter 1

INTRODUCTION

Energy used in buildings account for an estimated 35 percent of the nation's energy budget; consequently, many diverse groups and government agencies are focusing considerable attention on the energy performance of buildings and on changes to the codes used to guide construction of new buildings.

It has been estimated that hospitals consume approximately 15 percent of all energy used in commercial buildings (the equivalent of 400,000 barrels of oil a day). Approximately 30 to 50 percent of this energy is used for heating and another 10 to 15 percent for cooling. Therefore, measures that reduce energy consumption of HVAC systems in hospitals could have a significant impact on the nation's overall energy consumption. Unfortunately, while current thrusts in building codes ostensibly include hospitals and other health care facilities, they are exempted in many important aspects. For example, the model code, Code for Energy Conservation in New Building Construction, which is based on ASHRAE Standard 90-75, Energy Conservation in New Building Design, and is being widely adopted around the country, states that "this code is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances."

It is generally agreed that the quality of the environment in health care facilities such as hospitals and nursing homes must be better than that provided for the general public in eating and lodging facilities and places of assembly. This is based on the premise that patients are already

under stress and that they should not be subject to additional stress resulting from environmental shortcomings. An additional consideration is that patients are exposed to the health care environment 24 hours per day, with limited or no opportunity to escape from that setting. It is also thought that the quality of the hospital environment should be and can be actually supportive of the patient rather than stressful.

Consequently, there has been a tendency in the United States to set standards of good hospital design and operation that provide a very high quality environment for patients and staff. This has been done largely with little or no regard for the energy consumed to provide such an environment, contributing significantly to the fact that hospitals are considerably more energy intensive than their commercial or public counterparts.

With respect to ventilation, hospitals utilize large quantities of outdoor air, ostensibly for airborne infection control--a problem unique to hospitals and other health care facilities--on the premise that such air is inherently cleaner than recirculated air. The energy implication, however, is that in patient areas, for example, hospitals must heat and cool almost four times as much outdoor air as contemporary office space.

The prevalent view toward the hospital environment is embodied in a 1976 statement by the Health Resources Administration:

There is a limit to how low we can set the thermostat for sick and elderly patients. Air conditioning is not a luxury in patient care and certainly not in the operating room. Ventilation made possible by power driven fans is tightly controlled by federal regulation. Few appreciate the fact that a hospital is divided into positive and negative pressure zones to reduce the possibility of cross-contamination. Humidity levels are controlled for optimum patient care and to avoid fire and shock hazards in critical areas.

As a result of such arguments, there has been considerable reluctance to lower hospital environmental standards because of concern over possible adverse impact on the health, safety and comfort of patients and staff. However, in an era of increasing energy-conservation consciousness, a critical reassessment of the validity of these standards is necessary. They were developed in an era of "penny cheap" energy and without the knowledge base developed in the past decade or so.

This report presents the results of a study of hospital energy conservation initiatives undertaken at the federal and state levels and by private sector agencies. It was originally directed toward governmental activities involved with changes to the aforementioned standards. However, it early became readily apparent that concern with energy conservation was not impacting these standards, especially at the state level, irrespective of the energy implication. Consequently, the study was expanded to include all energy measures directed toward design and operating practices unique to the hospital environment. That is, for example, changes to building envelope codes are not of concern herein, while financial arrangements to create incentives for any energy conservation measures are of interest. The scope is limited to agency programs (i.e., not undertaken at the initiative of individual hospitals), applicable to non-federal public and private hospitals.

Chapter 2

FEDERAL ACTIVITIES

Federal hospital construction standards have been mandated since 1946 with passage of the Hill-Burton Act which authorized the federal government to provide grants in aid to the states for the planning and construction of new hospital facilities. As part of the grant program, the Act provided for federal specification of general standards of construction and equipment for hospitals of different classes and different construction. As with all federal grants, the states must comply with federal regulations governing the conditions of the grant, which under the Hill-Burton Act, include compliance with these construction and equipment standards.

Hill-Burton Program standards are particularly important in that they are specifically oriented toward hospital and medical facility design and construction. Further, they are widely accepted within the United States health care community as specifying the state of the art in acceptable engineering design practice.

Over the years, these standards have been updated from time to time. In their respective hospital licensure programs, most states today utilize one of the versions of the Hill-Burton standard. At present, most recognize the 1974 standard, either formally or informally. Revised editions were published in 1975 and 1976; however, they did not involve substantive changes and as a result, are not widely used. On October 3, 1978, the Public Health Service formally adopted a new standard,⁵ which incorporates for the first time some operational energy conservation

measures. These are summarized in the preamble of the Federal Register notice (43FR45738) promulgating the new standard:

The standards have been clarified to permit use of variable air volume and load shedding systems in many areas of hospital and medical facilities. In addition, there are provisions for the reduction of ventilation rates during periods of nonuse. Additional editorial clarifications have been made to encourage energy conservation and good design while maintaining considerations for life cycle operating costs and acceptable levels of patient care.

Some suggestions for energy conservation measures were rejected because of the potential deleterious effect upon patient care. The Department has attempted to avoid making any changes in the standards which might reduce operating costs at the expense of quality care.

Some comments suggested that the standards be more restrictive concerning insulation required, design temperatures, fenestration and siting, as well as limitations on the use of plastics, water, etc. However, the Secretary has decided to give the maximum flexibility possible in areas where there is no consensus as to the best approach to a design problem. He is concerned that overly restrictive standards in the absence of clear evidence in support of such standards will inhibit innovation and possibly reduce optimal care.
[emphasis added]

In line with the policy of not impacting "quality care," the new standard does not relax any of the basic pressure relationship, ventilation and thermal requirements found in the 1974 standard. In fact, it is somewhat more restrictive in that it now specifies a humidity range of 30-60 percent for all inpatient areas.

For other types of non-residential and public buildings, the federal government has taken a strong initiative in energy conservation measures for both new and existing buildings. These programs generally exempt the

hospital air environment in patient care areas, surgery, etc., by deferring to the Hill-Burton or other health and safety standards, but do not apply to such aspects as the building envelope and lighting.

Two key pieces of federal legislation provide the mandate for much of the federal activity:

1. The Energy Policy and Conservation Act of 1975 (PL 94-163). This legislation, among other provisions, mandates the establishment of federal guidelines for attainment of specified levels of energy efficiency in new building construction and for development of energy conservation contingency plans. The implications of these features with respect to hospitals are discussed in Sections 2.1 and 2.2, respectively.
2. The National Energy Act of 1978. This "act" consists of five bills concerned with energy conservation, coal conversion, utility rate reform, natural gas policy, and energy tax credits, respectively. The conservation portion of the NEA, the National Energy Conservation Policy Act of 1978 (PL 95-619) includes a grant program for schools and hospitals, providing \$900 million in grants over a three year period to improve the energy efficiency of schools and hospitals. This program is discussed in Section 2.3 and bears heavily on the discussion of state-level programs in Chapter 3.

Again, it must be noted that the federal Hill-Burton standards place a strong constraint on these programs, in contrast to energy conservation opportunities possible in other types of building space. None of the three programs described in this chapter attempts to abrogate this standard in any substantive sense.

2.1 MODEL CODE FOR ENERGY CONSERVATION IN NEW BUILDING CONSTRUCTION

With passage of the Energy Policy and Conservation Act of 1975, the United States Congress mandated establishment of federal guidelines requiring that certain levels of energy-efficiency be achieved in new building construction. Virtually all states have responded to these guidelines and are now participating in this program. Under this program, a state may voluntarily enter into a cooperative effort with the federal government to further that state's energy conservation efforts. Each state bears the responsibility for developing and implementing a comprehensive state energy conservation plan. The federal government, in turn, provides both technical assistance and financial support.

To assist these state and local building code officials in the development, adoption and implementation of energy conservation codes for new buildings, the United States Department of Energy (DOE) funded the development of a model building design code establishing minimum energy conservation levels in new building construction. The model, Code for Energy Conservation in New Building Construction, is the result of a contract between the National Conference of States on Building Codes and Standards, Inc. (NCSBCS) and DOE.³

The genesis for this development began with the National Conference of States on Building Codes and Standards (NCSBCS). Concerned with regulation to conserve energy, its Standards and Evaluation Committee in November 1972 voted to request continued National Bureau of Standards (NBS) activity in this area, and solicited recommendations on the possible content and strategy for generation of a building-related energy conservation reference standard. In June 1973 a joint NCSBCS/NBS emergency energy workshop was held to define the magnitude of the problem, and in August 1973 NBS agreed to develop the design and evaluation criteria for energy conservation in new

buildings, which would be offered to a suitable sponsor as the basis for development of a performance standard.

In February 1974 [the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., (ASHRAE)] Board of Directors voted to accept the responsibility to develop this national voluntary consensus standard based on the NBS document. This effort titled, "Design and Evaluation Criteria for Energy Conservation in New Buildings" (NBSIR 74-452) was delivered to NCSBCS in February 1974 and to ASHRAE shortly thereafter.

After two public reviews of Proposed Standard 90P, the ASHRAE Board in August 1975, approved Standard 90-75 for publication with 11 Sections (1-Purpose, 2-Scope, 3-Definitions, 4-Exterior Envelope, 5-HVAC Systems, 6-HVAC Equipment, 7-Service Water Heating, 8-Electrical Distribution Systems, 9-Lighting Power Budget Determination Procedure, 10-Energy Requirements for Building Design Based on Systems Analysis, 11-Requirements for Building Utilizing Solar, Wind or Non-Depleting Energy Sources).

In January 1977, NCSBCS in concert with Building Officials and Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Conference International, Inc. (SBCCI) published a preliminary draft of a "Code for Energy Conservation in New Building Construction." Essentially based on Standard 90, the document was submitted to public review and hearings, and in December the final version was published. To date 45 states have already enacted or are considering legislation based on Standard 90, the Model Code, or one of several regional codes which also use the standard as a technical base.⁴

Extracting from the Code itself, its intent and scope are as follows:

101.2 Intent. *The provisions of this Code shall regulate the design of building envelopes for adequate thermal resistance and low air leakage and the design and selection of mechanical, electrical and illumination systems and equipment which will enable the effective use of energy in new building construction...This Code is not*

intended to abridge any safety or health requirements required under any other applicable codes or ordinances.

101.3 Scope. This Code sets forth minimum requirements for the design of new buildings and structures or portions thereof and additions to existing buildings that provide facilities or shelter for public assembly, education, business, mercantile, institutional, storage and residential occupancies, as well as those portions of factory and industrial occupancies designed primarily for human occupancy by regulating their exterior envelopes and the selection of their HVAC, service water heating, electrical distribution and illuminating systems and equipment for effective use of energy.
[emphasis added]

In effect, implementation of the Code means that, in the interest of energy conservation, new buildings which are used primarily for human occupancy (including residences, office space, portions of factory and industrial occupancies, educational facilities, or shelter for public assembly, business, etc.) must meet minimum design requirements ensuring efficient use of energy.

Functionally, the Code was developed to serve three major purposes:

1. Provide, in language compatible with current building codes, energy conservation standards for new building construction that are based upon technical criteria developed by ASHRAE as embodied in its Standard 90-75, Energy Conservation in New Building Design. Each paragraph of this standard was reviewed for appropriateness as an enforceable provision with applicable sections modified into code language. These sections are considered no less stringent than Standard 90-75. The Code has also been restructured in relation to the ASHRAE standard, and requirements to regulate new additions to existing buildings and acceptable practice provisions have been

added.

2. Take into account codes reflecting a concern for energy conservation that have already been developed by various states and model code groups. This was done to ensure that the Code is compatible and therefore, acceptable to all the concerned state and local code groups. Moreover, the Code takes a comprehensive approach, as opposed to other codes, which do not consider all elements of the ASHRAE standard and all building types.
3. Include administrative provisions to facilitate adoption and implementation of the Code by states and local government units.

The Code is forming the backbone of state-level building energy conservation programs throughout the United States (see Table 2-1). Nonetheless, it must be placed in perspective with respect to hospitals and other health care institutions. The Code specifically states that it is "not intended to abridge any safety or health requirements required under any other applicable codes or ordinances."³ This one statement, in effect, exempts hospitals from many important provisions of the code relative to ventilation, the thermal environment and service water heating, all of which are presently subject to energy intensive federal requirements.⁵

2.2 EMERGENCY TEMPERATURE BUILDING RESTRICTIONS

The Energy Policy and Conservation Act of 1975 (PL 94-163) also required the President to adopt energy conservation contingency plans. On March 1, 1979, the President adopted the first three such plans and sent them to Congress for approval. These plans are:

1. Standby Conservation Plan No. 1, Emergency Weekend Gasoline Sales Restrictions. This plan would authorize "the Secretary of Energy

Table 2-1
STATUS OF STATE NEW BUILDING
ENERGY CONSERVATION CODE ADOPTION
(As of April 1, 1978)

<u>State</u>	<u>Legislative Authority for Types of Building</u>	<u>Technical Basis for Code</u>	<u>Model Code Adopted, Modified or Considered</u>
Alaska	None		
Alabama	P (NR)	ASHRAE 90-75 (ASHRAE (90-75)	ICBO (ICBO)
Arizona	P (NR)	ASHRAE 90-75 (ASHRAE 90-75)	ICBO (ICBO)
Arkansas	None		
California	NR R	ASHRAE 90-75 State Standards	ICBO
Colorado	A11	ASHRAE 90-75	NCSBCS
Connecticut	A11	ASHRAE 90-75	BOCA
Delaware	(A11)	(ASHRAE 90-75	(None)
District of Columbia	(A11) (does not apply to federal buildings)	(ASHRAE 90-75)	(NCSBCS)
Florida	A11	ASHRAE 90-75	SBCCI
Georgia	A11	ASHRAE 90-75	NCSBCS
Hawaii	(NR/P)	(ASHRAE 90-75/ HUD MPS	(ICBO)
Idaho	P	ASHRAE 90-75	ICBO
Illinois	(A11)	(ASHRAE 90-75)	ICBO
Indiana	A11	ASHRAE 90-75	NCSBCS
Iowa	A11	ASHRAE 90-75	NCSBCS/ICBO
Kansas	A11	ASHRAE 90-75	ICBO

Table 2-1(Cont'd)
 STATUS OF STATE NEW BUILDING
 ENERGY CONSERVATION CODE ADOPTION
 (As of April 1, 1978)

<u>State</u>	<u>Legislative Authority for Types of Building</u>	<u>Technical Basis for Code</u>	<u>Model Code Adopted, Modified or Considered</u>
Kentucky	(All)	(ASHRAE 90-75)	(NCSBCS)
Louisiana	None		
Maine	P	ASHRAE 90-75	BOCA
Maryland	(All)	(ASHRAE 90-75)	(BOCA)
Massachusetts	All	ASHRAE 90-75/ HUD MPS	NCSBCS
Michigan	All	AHSRAE 90-75	BOCA
Minnesota	All	ASHRAE 90-75	ICBO
Mississippi	(All)	(ASHRAE 90-75)	(State Code)
Missouri	(All)	(ASHRAE 90-75)	(None)
Montana	All	ASHRAE 90-75	NCSBCS
Nebraska	(All)	(ASHRAE 90-75)	(ICBO)
Nevada	All	ASHRAE 90-75	NCSBCS
New Hampshire	All	ASHRAE 90-75	NCSBCS/BOCA
New Jersey	All	ASHRAE 90-75	BOCA
New Mexico	All	ASHRAE 90-75	ICBO
New York	R (NR/P)	Public System Commission Standards (ASHRAE 90-75)	None (NCSBCS)
North Carolina	All	ASHRAE 90-75	State Code
North Dakota	All	ASHRAE 90-75	ICBO

Table 2-1 (Cont'd)
STATUS OF STATE NEW BUILDING
ENERGY CONSERVATION CODE ADOPTION
(As of April 1, 1978)

<u>State</u>	<u>Legislative Authority for Types of Building</u>	<u>Technical Basis for Code</u>	<u>Model Code Adopted, Modified or Considered</u>
Ohio	All	Ohio Standards	Ohio State-Wide Building Code
Oklahoma	(All)	(ASHRAE 90-75)	(BOCA)
Oregon	All	ASHRAE 90-75	ICBO
Pennsylvania	(All)	(ASHRAE 90-75)	(BOCA)
Rhode Island	All	ASHRAE 90-75	BOCA
South Carolina	(All)	(ASHRAE 90-75)	(NCSBCS/ICBO)
South Dakota	None		
Tennessee	(All)	(ASHRAE 90-75)	(NCSBCS/SBCCI)
Texas	P	ASHRAE 90-75	NCSBCS
Utah	All	ASHRAE 90-75	NCSBCS
Vermont	None		
Virginia	All	ASHRAE 90-75	Virginia Uniform State Building Code-(R) BOCA-(NR)
Washington	R	ASHRAE 90-75	ICBO
West Virginia	(All)	(ASHRAE 90-75)	(ICBO)
Wisconsin	NR/P (R)	ASHRAE 90-75 (ASHRAE 90-75)	State Code (State Code)
Wyoming	NR/P	ASHRAE 90-75	ICBO

Table 2-1 (Cont'd)
STATUS OF STATE NEW BUILDING
ENERGY CONSERVATION CODE ADOPTION
(As of April 1, 1978)

() Legislation Pending

Type of Building:

R - Residential

NR - Non-Residential

P - Public

NCSBCS - National Conference of States on Building Codes and Standards, Inc.

BOCA - Building Officials and Code Administrators International, Inc.

ICBO - International Conference of Building Officials.

SBCCI - Southern Building Code Congress International, Inc.

SOURCE: American Society of Heating, Refrigerating and Air Conditioning
Engineers, Inc.

to restrict retail sales of gasoline and diesel fuel to most motor vehicles during all or any portion of the period from noon Friday to mid-night Sunday" (44FR12906).

2. Standby Conservation Plan No. 2, Emergency Building Temperature Restrictions. This plan would authorize "the Secretary of Energy to establish thermostat restrictions for heating, hot water temperature and air conditioning in public and commercial buildings" (44FR12906).
3. Standby Conservation Plan No. 3, Advertising Lighting Restrictions. This plan would require "businesses to limit advertising lighting to that essential to identify the business, direct customers to it and indicate the goods and services available for sale" (44FR12906).

These plans are intended to be implemented only "in the event of a severe energy supply interruption or in order to fulfill obligations of the United States under the International Energy Program" (44FR12906).

Of particular interest to this study is the Emergency Building Temperature Restrictions plan. It

would require that owners of most nonresidential buildings maintain thermostat settings at no higher than 65°F for space heating, at no lower than 80°F for space cooling, and at no higher than 105°F for hot water intended for personal hygiene and general cleaning purposes. The plan would permit DOE to establish other reasonable heating, cooling and hot water temperature levels which it deems are necessary in the circumstances. The plan would also require that thermostats be maintained within reasonable tolerances of accuracy in order to insure that actual temperature levels would be consistent with the required thermostat settings.

Buildings covered by the requirements of the plan include

schools, churches, retail and wholesale establishments, entertainment facilities, government and private office buildings, industrial plants, transportation depots and the like. Specifically excluded from coverage are residential buildings (buildings in which over 50% of the gross square footage is used for residential purposes), hotels and other lodging facilities and hospitals and other health care facilities. The plan also exempts from the heating and cooling restrictions those buildings or areas of buildings where specified temperature levels are required by manufacturers' warranties for the operation of special equipment (such as electronic data processing machinery) or where special environmental conditions are necessary in order to protect animal or plant life or materials. The plan exempts from the hot water restrictions hot water which is the only available source for dishwashing and for which health codes require higher sanitizing water temperatures. (Many dishwashing machines do not have sufficient booster capacity to raise 105°F water to sanitizing levels.)

The thermostat levels specified above were selected following careful analysis of experience with comparable conservation efforts, including the Federal Energy Management Program and similar programs in the private sector. The 65° and 80° temperature levels are consistent with standards set by the Occupational Safety and Health Administration, and existing studies indicate that the establishment of these temperature levels for space heating and cooling would not bring about a significant decline in employee performance or productivity. In the case of hot water, the 105°F temperature level is adequate for personal hygiene and general cleaning purposes (44FR12914). [emphasis added]

The plan was approved by resolutions of the Senate on May 2, 1979 and of the House of Representatives on May 10, 1979. Proposed regulations implementing the plan appeared in the Federal Register on June 1, 1979 (44FR31922). The U.S. Department of Energy subsequently published final regulations on June 5, 1979 (44FR39353).

These regulations apply to all "covered buildings in each state [including the District of Columbia, Puerto Rico or any other territory or possession of the United States] or political subdivision thereof or any Federal order, regulation or directive, to the extent such law, order, regulation or direction is inconsistent..." (44FR39362). They are to become effective on the date specified by the President for implementation of Standby Conservation Plan No. 2.

A covered building includes "every building or portion of a building, but excludes residential buildings, hotels or other lodging facilities, hospitals and health care facilities, elementary schools, nursery schools and day care centers..." (44FR39362) (emphasis added). In turn, a hospital or a health care facility is a "building such as a general hospital, tuberculosis hospital or any other type of hospital, clinic, nursing or convalescent home, hospice or other facility duly authorized to provide hospital or health care services under the laws of the jurisdiction in which the institution or facility is located" (44FR39363). Thus, the promulgated regulations are generally in line with the Plan as excepted above.

One major deviation from the Plan in the final regulations is in lowering the minimum permissible cooling temperature from 80⁰ to 78⁰F. This resulted from numerous comments from restaurant, retail store and other business representatives who were concerned with expected business declines due to unwillingness of many customers to experience thermal discomfort, reduced employee productivity, and possible damage to merchandise (including food) from spoilage and mildew. DOE also argues that "the energy savings potential of the 78⁰F restriction on cooling is equal to or greater than the possible savings which would be achieved under the 80⁰F limitation, due to increased voluntary compliance" (44FR39356).

In summary, the final regulations prescribe 65⁰F maximum for space heating, 78⁰F minimum for space cooling, and 105⁰ maximum for domestic hot water thermostat settings. The regulations, however, additionally include provisions allowing for maintenance of room temperatures at these limits as an alternate to thermostat settings. The regulations also require temperature setbacks during unoccupied periods.

The extent to which the hospital complex is exempted from these requirements is not clear in the final regulations. In a brochure mass-mailed to building owners, operators and managers in August 1979, How to Comply with the Emergency Building Temperature Restrictions, DOE included clarifying language:

Facilities authorized under State law to provide hospital or health care services (e.g., general or specialized hospitals, clinics, and nursing or convalescent homes) are excluded. However, if the administrative or other portions of such buildings where patient care is not provided have separate heating, cooling or water temperature controls, such areas are covered by the regulations. Medical, dental and nursing school buildings, administrative buildings, and other building associated with hospitals and other health care facilities, but where patients are not treated, are covered and must comply with the regulations. The offices of physicians and dentists are not excluded, but an exemption for health-related reasons is available.

The U.S. Department of Health, Education, and Welfare's hospital construction requirements specify temperature requirements for some hospital spaces that are not patient care areas, and some conflict over the two sets of requirements may arise. In general, however, the DOE approach of distinguishing between patient care and other areas is consistent with the DHEW regulations.

On July 10, 1979, the President issued and transmitted to Congress Proclamation 4667, National Energy Supply Shortage. Therein, the President stated:

I hereby find and determine...the existence of a national energy supply shortage constituting a severe energy supply interruption which:

- a) is of significant scope and duration and of an emergency nature;*
- b) may cause major adverse impact on national safety or the national economy; and*
- c) has resulted from an interruption in the supply of imported petroleum products.*

I further find that implementation of the Emergency Building Temperature Restrictions, Energy Conservation Contingency Plan No. 2, is required by the severe energy supply interruption....The provisions of the...[Plan]...shall become effective as of July 16, 1979 (44FR40629).

The regulations indicated that they will become effective on the date specified by the President for implementation of the Plan. They may be "terminated or suspended by the President or will terminate on the same date the Plan terminates" (44FR39355). The plan itself remains in effect for no more than nine months (44FR12911).

2.3 NATIONAL ENERGY CONSERVATION POLICY ACT

Part of the National Energy Act, the National Energy Conservation Policy Act of 1978 (PL 95-619) includes numerous provisions related to its purposes which include reduction in "the growth in demand for energy in the United States, and ... [conservation of] ... nonrenewable resources produced in this Nation and elsewhere, without inhibiting beneficial economic growth." Of particular importance to the hospital community is the Act's Title III, "Energy Conservation Programs for Schools and Hospitals

and Buildings Owned by Units of Local Government and Public Care Institutions," the purpose of which is

to authorize grants to States and to public and nonprofit schools and hospitals to assist them in identifying and implementing energy conservation maintenance and operating procedures and in evaluating, acquiring, and installing energy conservation measures to reduce the energy use and anticipated energy costs of schools and hospitals.

Within the act, a four phase program is delineated, and each participating facility must fulfill the requirements outlined for each phase in the following progression:

1. Preliminary Energy Audit. The purpose of this audit is to determine the energy consumption for at least the preceding 12 months prior to the audit, and to identify the building's major energy-using systems. This information, which is to be used by each state to determine priorities for funding in the other three phases, is gathered by means of a questionnaire that can be completed by in-house personnel. Although some of the data requested by each state energy office will vary, there are specific data that each state is required to collect.
2. Energy Audit. The purposes of this audit are to determine appropriate operating and maintenance procedures for energy conservation, and using general estimates, to determine the need for energy conservation measures that will require major capital outlays. The implementing rules specify that the person conducting this audit must be familiar with the systems and operations of the buildings being audited and must complete an approved state training program or demonstrate the required skills. In addition, a facility

employee should participate in the audit; however, this individual is not to be directly responsible for the day-to-day operations of the facility. All operating and maintenance procedures identified must be implemented before the facility is eligible for additional funding.

3. Technical Assistance. Under this phase of the program, facilities can obtain funds to secure a consultant or a consulting firm to identify energy and cost savings that may be realized as a result of either modifying operating and maintenance procedures or purchasing and installing capital energy-conserving equipment. Funds will also be available for planning or administering specific remodeling, renovation, repair, replacement, or insulation projects that will contribute to energy conservation.

Under the implementing rules the consultant must be, at a minimum, a registered professional engineer (or a registered architect-engineer team) with experience in conducting specialized energy conservation studies.

4. Energy Conservation Projects. Under this final phase of the grants program, financial assistance will be offered for the purchase and installation of capital equipment to effect energy conservation. Under the rules implementing Title III, an Energy Conservation Project (called an "Energy Conservation Measure" therein) is defined as

an installation or modification of an installation in a building which is primarily intended to reduce energy consumption or allow the use of an alternative energy source, including, but not limited to—

- (1) *Insulation of the building structure and systems within the building;*
- (2) *Storm windows and doors, multiglazed windows and doors, heat absorbing or heat reflective glazed and coated windows and door systems, additional glazing, reductions in glass area, and other window and door system modifications;*
- (3) *Automatic energy control systems;*
- (4) *Equipment required to operate variable steam, hydraulic, and ventilating systems adjusted by automatic energy control systems;*
- (5) *Active or passive solar space heating or cooling systems, solar electric generating systems, or any combination thereof;*
- (6) *Active or passive solar water heating systems;*
- (7) *Furnace or utility plant and distribution system modifications including—*
 - (A) *Replacement burners, furnaces, boilers, or any combination thereof, which substantially increase the energy efficiency of the heating system;*
 - (B) *Devices for modifying flue openings which will increase the energy efficiency of the heating system;*
 - (C) *Electrical or mechanical furnace ignition systems which replace standing gas pilot lights; and*
 - (D) *Utility plant system conversion measures including conversion of existing oil-and gas-fired boiler installations to alternative energy sources, including coal;*
- (8) *Caulking and weatherstripping;*
- (9) *Replacement or modification of lighting fixtures to increase the energy efficiency of the lighting system without increasing the overall illumination of a building, unless such increase in illumination is necessary to conform to any applicable State or local building code or, if no such code applies, the increase is considered appropriate by the Secretary.*
- (10) *Energy recovery systems;*
- (11) *Cogeneration systems which produce steam or forms of energy such as heat, as well as electricity for use primarily within*

a building or a complex of buildings owned by a school or hospital and which meet... [specified]...fuel efficiency requirements;

(12) Such other measures as ...[may be specified]...;

(13) Such other measures as a grant application shows will save a substantial amount of energy and as are identified in an energy audit(44FR19351)

Any such project must have a "simple payback period" of not "less than 1 year nor greater than 15 years, and the estimated useful life of the ... [project] ... shall be greater than its simple payback period" (44FR22950).

The U.S. Department of Energy is mandated by Title III to allocate \$900 million over a three year period to state (and territory) energy offices on the basis of such considerations as population, climate, fuel cost, and fuel availability for implementation of the schools and hospitals program.

The federal funds are being made available as matching grants through the state offices to both schools and hospitals, but neither sector may receive more than 70 percent of the total funds allocated to the state.

Eligible buildings include the following structures, provided construction was completed on or before April 20, 1977, and the building includes a heating or cooling system, or both:

1. Accredited public and private nonprofit elementary, secondary and post-secondary schools;
2. Public and private nonprofit hospitals;
3. City, county, township and American Indian government buildings;
4. Public and private nonprofit nursing homes; and
5. Certain rehabilitation facilities and supervised living facilities.

These institutions are all eligible for matching grants for the Preliminary Energy Audits, Energy Audits and Technical Assistance Program phases as described above. However, only schools and hospitals may apply for Energy Conservation Project grants.

The federal grants are on a 50-50 cost sharing basis, except that in certain cases of "severe hardship," schools and hospitals may receive up to 90 percent of costs. In-kind contributions may be used for matching purposes and can include staff time and on-hand building materials.

Technical Assistance and Energy Conservation Project grants are competitive, with cost-effectiveness as the principal criterion for selection.

Chapter 3

STATE PROGRAMS

The federal programs described in Chapter 2 are clearly dominating governmental hospital energy conservation initiatives. The states' activity has been largely limited to implementing Title III of the National Energy Conservation Policy Act of 1978 (see Section 2.3).

There are two major and interrelated reasons for this situation:

1. Lack of technical and financial resources at the state level to deal with the unique problems of the hospital environment; and
2. The widespread acceptance of Hill-Burton Program standards as specifying minimum acceptable requirements for quality patient care, precluding many energy conservation options applicable to other types of building space.

While lack of initiative at the state level might therefore be characterized as a "hands-off" attitude toward the patient environment, many states have been aggressively pursuing adoption of ASHRAE Standard 90-75 (see Section 2.1), much of which is applicable to new hospital construction and operation in such areas as building envelope thermal performance and illumination. In fact, many states are applying ASHRAE illumination standards to existing buildings, including hospitals.

Although this appears to be the general situation, the University of Minnesota School of Public Health conducted a survey to determine what, if any, hospital-specific energy conservation programs may be undertaken at the state level. Chapter 3 documents the methodology and results of this effort.

3.1 STATE SURVEY

Due to the anticipated variation in scope, depth and method of implementation, a structured survey was deemed not practical. Instead, form letters were sent to the following agencies in each of the 50 states and the District of Columbia:

1. State energy office.
2. State health facility licensure agency.
3. State hospital association.
4. Blue Cross Plan operating within the state.

While the wording of the information request was tailored somewhat to the type of agency, the following is representative:

We would appreciate information from your agency regarding health care facility energy conservation programs you have implemented.

Examples of such programs include:

- 1. Adoption of mandatory energy conservation standards,*
- 2. Energy audits,*
- 3. Technical assistance,*
- 4. Education programs,*
- 5. Grants, and*
- 6. Participation under Title III of the National Energy Conservation Policy Act (PL 95-619).*

In addition to a description of each program, we would like to know the statutory authority under which it is conducted, the funding level, duration and any other information you deem appropriate.

If no programs are operative at present, we would appreciate being so advised, with forwarding of this request to any other appropriate agency such as your energy office.

Two cycles of followup letters were sent as necessary. Table 3-1 summarizes the source of the responses that were received. It should be noted that no information whatsoever was received from six states and that no state agency response was received from an additional eight states.

Table 3-1
STATE RESPONSES

State	Response from:				State Program Description
	State Agency	State Hospital Association	Blue Cross Plan	No Response	
Alabama	x				
Alaska	x	x			
Arizona	x	x			
Arkansas	x		x		
California	x				
Colorado	x	x			
Connecticut				x	
Delaware			x		
District of Columbia		x			
Florida	x	x			
Georgia	x				
Hawaii	x				
Idaho	x				
Illinois				x	
Indiana	x	x	x		Section 3.2.1
Iowa	x				
Kansas	x		x		
Kentucky				x	
Louisiana	x				
Maine	x	x	x		
Maryland		x			
Massachusetts	x	x			

Table 3-1 (Cont'd)

STATE RESPONSES

State	Response from:				State Program Description
	State Agency	State Hospital Association	Blue Cross Plan	No Response	
Michigan	x	x			Section 4.2.1
Minnesota	x		x		
Mississippi				x	
Missouri	x		x		
Montana	x				
Nebraska	x				
Nevada	x				
New Hampshire			x		Section 4.2.2
New Jersey	x		x		
New Mexico				x	
New York	x		x		Section 3.2.2
North Carolina			x		
North Dakota	x				
Ohio			x		
Oklahoma			x		
Oregon	x				
Pennsylvania	x		x		Section 4.2.4*
Rhode Island				x	
South Carolina	x				
South Dakota	x	x			
Tennessee	x	x	x		Section 3.2.3

*Sections 4.2.3 and 4.2.5 describe Blue Cross Plan energy conservation operating within Pennsylvania without apparent state involvement.

Table 3-1 (Cont'd)

STATE RESPONSES

State	Response from:				State Program Description
	State Agency	State Hospital Association	Blue Cross Plan	No Response	
Texas			x		
Utah	x				
Vermont	x		x		Section 4.2.2
Virginia	x	x			
Washington	x		x		
West Virginia	x	x			Section 3.2.4
Wisconsin	x		x		
Wyoming	x				

The nature of the response varied considerably. Single page letters were the most frequent form, although many agencies provided copies of technical reports, NECPA Title III management plans, audit workbooks, etc. with their transmittal letter.

3.2 STATE PROGRAM SUMMARY

Analysis of the survey results confirmed that no efforts were underway among responding states to relax hospital environmental standards, presumably for reasons noted previously. In addition, no grant programs involving state monies were evident in survey results.

However, several states were found to be actively pursuing energy audit, education and technical assistance programs in advance of availability of NECPA Title III grants. The nature of these programs is quite varied, often involving cooperative ventures with state hospital associations and third-party reimbursers. Nonetheless, the initiative for the majority of these programs was anticipation of Title III funds.

The thrust of this survey was identification and description of those programs involving a state-level initiative. Consequently, the programs described in this chapter are limited to four examples. Chapter 4, which discusses third-party reimbursers programs, contains descriptions of an additional five programs. The location of information whether Chapter 3 or 4, is indicated in Table 2-1.

The lack of descriptive information on state-level programs herein should not be construed to mean that such programs do not exist. The difficulty lies in obtaining adequate information to describe them.

3.2.1 Indiana

Since March 1978, the Technical Division of the Indiana Department

of Commerce Energy Group has offered an energy management information service to schools and hospitals. The primary purpose of this program is to inform public building operators about various energy conservation procedures, including the energy audit concept, potential operation or maintenance changes and setting up energy management programs.

3.2.2 New York

In November, 1977 the New York State Energy Research and Development Authority and the New York State Energy Office awarded a research contract for a detailed study of the Peekskill Community Hospital, a 116-bed hospital in Westchester, for the purpose of reducing energy use in the hospital and of examining how this information could be of value to other hospitals in the State, particularly to the 67 which have between 75 and 200 beds, to enable them to reduce their energy use. Alternatives were to be analyzed for the amount of energy reduction that could be accomplished and for the relation between the cost of making the change and savings resulting from the change.

Energy use at the hospital was analyzed in three different ways, Gross energy use, as recorded in fuel purchases and electric bills and boiler logs, was analyzed to establish how and for what purposes it was used by different mechanical systems. Electricity use was prorated for lighting, motors, elevators, fans for air movement, pumps, electric chillers, cooling towers, special medical equipment, food service and miscellany. Fuel oil use was prorated to heating for building losses, heating of outside air, reheating, hot water, and humidification. Fuel oil use for a self-contained incinerator plant was recorded separately.

As can be expected in a building with the complex requirements

of a hospital, there is no single dominant energy use. An energy reduction program requires the simultaneous implementation of a number of modifications. The study recommended a combination of 27 alternatives plus a modified incinerator use pattern. Their combined capital cost is estimated at \$230,000. Together, they will produce a reduction of 32 percent in annual energy usage and a reduction in operating cost of \$64,200 at 1977 costs.

The New York State Energy Office and the Energy Research and Development Authority also contracted for a study of 234 hospitals and 182 nursing homes which was designed to serve as a predictive tool in estimating the energy savings potential of conservation efforts in health care facilities. This report was not available at the time of this writing.

3.2.3 Tennessee

The Tennessee Hospital Association (THA) has long been recognized as a leader in providing innovative new programs for its member institutions. Realizing that abundant, inexpensive energy is a thing of the past, the THA has taken decisive action to assist its members in containing costs and conserving energy.

After much research into the needs of the member institutions as well as investigating other programs of a national scope, the THA took the initiative to establish a health care energy management program. By May, 1978 the program had been developed, twenty pilot institutions had committed to the program, and experienced, qualified staff was employed.

The initial objectives of the program were:

1. Conduct regional workshops in Tennessee to acquaint health care personnel with the energy management concept and techniques.

2. Provide in-house audits for the purpose of determining ways to conserve energy.
3. Establish an energy management committee in each institution to assist with implementing energy conservation recommendations.
4. Provide in-house promotional and educational materials that would make each employee conscious of the need to conserve energy.
5. Serve as a resource of information on the most current techniques and innovations in energy management.

Several energy workshops have been held across the state. One of the nationally prominent and well attended workshops was conducted in June, 1978 in cooperation with the Energy Action Staff of the U.S. Department of Health, Education, and Welfare and the Tennessee Valley Authority. Several outstanding national authorities in energy management were featured speakers.

The in-house energy audits in the twenty subscribing hospitals are being conducted in two phases. The first phase includes the following:

1. An initial audit to examine lighting, water temperatures and pressures, door and window seals, coolers, heat loss in electrical circuits, insulation, etc.
2. If required, external specialists are asked to check for poor water treatment, etc. THA purchased expensive evaluation equipment to minimize this need.
3. A formal report recommending low cost/no cost improvements.
4. A meeting with administrative and engineering personnel to discuss the recommendations.
5. Organizing an energy committee to assist with the implementation of suggestions.

6. Supplying posters throughout the hospital as well as individual pamphlets for each employee.
7. Implementing employee participation programs.

The second phase of the audit program includes the following:

1. Review HVAC systems, electrical systems, instrumentation and control systems, building design, operating schedules, etc.
2. Conduct feasibility, cost and payback analysis for modifying or adding to equipment which would require a capital expenditure.
3. A formal report of the findings and recommendations for improvements.
4. Continued visits to the institutions to assist with implementation.

As of June, 1979 twenty hospitals have received the phase one audit and several have established energy committees and are actively implementing improvements. Energy saving idea pamphlets have been made available for distribution to each individual employee.

The THA energy engineer has been recognized nationally by being asked to speak at various meetings and to serve on the American Hospital Association energy advisory committee.

The THA staff is in the process of evaluating a centralized building automation system for conserving energy in participating hospitals. The most expensive component, the central processing unit (the computer) would be placed at the THA headquarters and participating institutions would be linked to it by leased telephone lines. The sharing of the cost of the central processing unit will allow institutions of all sizes to realize energy savings through automated building controls.

THA has also been actively involved with the Tennessee Energy Authority in helping develop the state's NECPA Title III program. In

addition, it is assisting individual hospitals by:

1. Developing standard submittal forms for grant fund application.
2. Assisting the hospitals in the completion and routing of the applications.
3. Assisting in the evaluation and followup of energy conservation projects.

3.2.4 West Virginia

West Virginia Energy Management in Health Care Institutions is sponsored by the state's Fuel and Energy Office and Department of Health. It is designed to familiarize health care institutions' administrators, financial officers, and plant engineers with energy and money saving techniques for hospitals, nursing homes, and other health care facilities. Its objectives are:

1. Reduce energy consumption by 30 percent in all health care institutions in West Virginia.
2. Develop an energy management plan for each health care institution to better utilize energy in three phases: 1) energy management plan; 2) quick-fix; and 3) retrofit.
3. Assist each health care institution in developing an energy management program.
4. Assure the efficient operation and implementation of NECPA in West Virginia.
5. Provide technical assistance to health care institutions when needed.
6. Monitor the management programs to assure the projected energy savings.
7. Evaluation

The program addresses only existing structures. The state estimates that implementation of an effective energy management program could lead to a 30 percent reduction in energy consumption by individual health care institutions. With the implementation of the NECPA this estimate is considered very realistic.

Although the program is now involved with Title III implementation, it was initiated a year before NECPA's passage with a November 1977 statewide workshop. The workshop was attended by 88 individuals representing 53 health care institutions in West Virginia. Private and state hospitals, nursing homes, and a personal care facility were represented. The workshop served to educate the participants on the energy situation and energy management measures. Also, data collection and data interpretation were discussed.

As presently structured, the program consists of three phases:

1. Phase I - Survey of Energy Use and Maintenance of Existing Equipment.
Phase I was initiated at the workshop. Participants were asked to bring data concerning energy use at their institutions so that they would have the necessary information when reviewing the format used to design an energy management plan. This required data included: BTU consumption per fuel and fuel use; square footage of the building; dollar cost of fuel per square foot; and dollar amount of steam or purchased steam, and its use. Other ancillary data was also requested.
2. Phase II - Quick-Fix Measures. Phase II involves conservation measures that can achieve energy savings with little or no cost involved. A report was distributed to all health care institutions in West Virginia entitled Operational and Managerial Incentives. This

analysis was developed in cooperation with the National Association of College and University Business Officers and discusses operational considerations ranging from turning off lights when not needed to combining office duties to as few floors as possible. Managerial considerations range from replacing lights and meeting recommended lighting standards to modifying HVAC systems and reducing the amount of outdoor air. The implementation of operational and maintenance options for energy conservation will be greater on those buildings participating in the NECPA program. A questionnaire was developed by the Fuel and Energy Office and distributed to all hospitals in West Virginia to determine their progress in plan implementation and technical assistance needs. The questionnaire was returned by over 50 percent of the hospitals (88) in West Virginia. Although the degree of program implementation varied, and will vary throughout the program period, all hospitals were committed to implementing an energy management program.

By the end of 1978, thirteen of West Virginia's 88 hospitals had implemented quick-fix or retrofit modifications. Only two nursing homes are involved, currently, in quick-fix or retrofit modifications. The quick-fix modifications range from involving the staff in energy conservation programs and posting signs to insulating steam pipes and installing flue analyzers. The retrofit modifications range from insulation of the ceilings to installing heat recovery systems. As a result of these conservation measures West Virginia has saved $.044 \times 10^{12}$ BTU's from this program.

3. Phase III - Retrofit. Phase III will be accomplished either from NECPA Title III funds or through internal financing. The state is

also sponsoring periodic workshops throughout the duration of the program. For example, on November 9, 1978, a walk-through audit workshop was held to familiarize the plant engineers or maintenance personnel with proper techniques in identifying energy saving opportunities. A team of four consultants was brought into Charleston to conduct a hands-on boiler test, discuss energy conservation opportunities relating to various heating, ventilation, and air conditioning systems, discussion on water usage and treatment, and a discussion among participants relating to specific situations in their hospitals. There were 32 hospital engineers in attendance from 27 hospitals throughout the state. The participants gave a very high evaluation of the presentation.

Additional workshops will be held to meet the needs of the health care facilities with their energy management plan and with NECPA Title III implementation.

Chapter 4

THIRD-PARTY REIMBURSER INITIATIVES

Due to their unique involvement with the payment of hospital operating costs, the hospitalization insurance industry has a strong, influential and continuing interest in hospital cost containment programs, of which energy conservation measures are one. Activities by third-party reimbursers are not yet concerned with revision of hospital environmental standards, but are presently directed toward creation of incentives for purchase of capital equipment by and improved operating practices within individual hospitals.

This chapter reviews selected third-party reimbursers activities in the area of energy conservation measures to provide an overview of the potential for private sector opportunity, Section 4.1 discusses the National Cooperative Effort in some detail, and Section 4.2 looks at several individual Blue Cross Plans' programs of varying scope and financial arrangement.

4.1 NATIONAL COOPERATIVE EFFORT

In July 1978, the Blue Cross and Blue Shield Associations (Program Development Department (External Contracts), Marketing Support Services Division), Chicago, Illinois, in conjunction with the Hospital Research and Education Trust (an affiliate of the American Hospital Association), and the Hospital Association of New York State, formed a coalition to provide direct support to hospitals for implementation of effective energy conservation measures. The coalition, called the National Cooperative Effort (NCE), has developed a three-year research and education program,

with the first project year (through June 30, 1979) funding provided by a \$481,000 grant from the Exxon Corporation.

The NCE goal is to create the conditions that will allow hospitals to realize their full potential in volunteer energy conservation measures. Initially the project is emphasizing practical, low cost steps. Later it will focus on more complex measures with longer payback periods.

4.1.1 Responsibilities

Each of the three agencies have specific responsibilities under the NCE plan:

1. Blue Cross and Blue Shield Associations. The Blue Cross and Blue Shield Associations are developing a prototype financial incentives program to support hospital energy conservation efforts. The prototype program may involve special grants, changes to reimbursement methods, and/or other financial arrangements that encourage energy conservation measures. The prototype program will not only consider incentives for energy conservation measures requiring no capital investment, but also will seek to provide hospitals with access to capital needed to take more complex steps. For example, grants or revolving funds might support special hospital energy conservation staff as well as capital intense projects such as retrofit, modernization, or conversion of the physical plant. Changes to reimbursement methods to allow hospitals to keep all or part of savings due to hospital energy conservation efforts provide a further incentive to continue these efforts. The prototype financial program will include criteria to evaluate proposed hospital conservation projects and monitoring and reporting systems to assess results.

During the first project year, the Associations also developed educational materials on hospital energy conservation for use by individual Blue Cross Plans. These materials explain the hospital energy problem and the need for action on energy conservation. The materials also describe current conservation efforts and highlight the achievements of Blue Cross Plans and hospitals.

During the second and third project years, the Associations plan to convene a national meeting of Blue Cross Plans to explain the prototype financial program, describe the latest developments in hospital energy conservation and permit an exchange of ideas among Plan personnel and experts on hospital energy conservation. In addition, the Associations will assist interested Plans, on a field test basis, to adapt the prototype financial program to their communities, implement the program, and evaluate the results.

Finally, once the Associations and Plans have gained two to three years experience with the prototype program, the Associations will provide case studies that describe problems encountered and applied solutions and that identify approaches with the most potential to support greater hospital energy efficiency.

2. Hospital Research and Educational Trust. The Hospital Research and Educational Trust is responsible for energy conservation education programs aimed at trustees, administrators, middle managers and engineers. The Trust is developing a hospital trustee program to keep trustees abreast of the energy problems facing the health care industry. This is being accomplished through a series of magazine articles and special mailings providing information essential to

the hospital's energy decision-making. A workshop series on managing energy is oriented toward the professional development of the hospital engineer in specific energy management functions such as energy analysis, goal setting, and determining and implementing appropriate energy reduction measures. Audiovisual educational materials on energy conservation are also being developed that will aid in securing the support and cooperation of the entire hospital staff, promote the management team approach to conservation, and provide inservice education for maintenance personnel on specific conservation measures. Finally, a hospital energy conservation clearinghouse is providing administrators and engineers with information on federal energy policies and programs, energy availability problems, and case studies, through a periodic energy strategies bulletin and through responses to individual requests.

3. Hospital Association of New York State. The Hospital Association of New York State (HANYS) is designing and testing a system to provide needed data on hospital energy consumption to analyze energy management of performance. The Association intends to organize that data by institutions with common characteristics (for example, size, mechanical systems, and heating and cooling degree days) to allow valid comparisons of energy management and generalizations about common problems and solutions.

4.1.2 Status

For its first project year, the NCE had four overall goals:

1. Establish awareness in the hospital community about energy conservation and related issues;

2. Develop materials to educate and motivate hospitals and Blue Cross Plans to act on hospital energy conservation;
3. Develop technical materials to support hospital energy conservation efforts; and
4. Establish strong inter-organization linkages at the national level to serve as a basis for local hospital/Blue Cross Plan coordination.

Specific accomplishments in terms of these goal include:

1. Establishment of a strong inter-organization project management team, coordinating use of both inhouse and consultative expertise;
2. Development of a direct hospital energy information service and a WATS communication system to provide hospitals, Blue Cross Plans, and other agencies and organizations with information on virtually every aspect of hospital energy conservation, including legislative, financial and technical issues;
3. Conduct of an energy awareness campaign aimed at key decision makers on policy, finance and planning within individual hospitals and Blue Cross Plans, initiated through bulletins, articles, news items and special mailings;
4. Development of an energy conservation package consisting of audio-visuals and printed materials for use in launching hospital-wide programs to effectively motivate general staff to apply energy conservation practices;
5. Development of an information package to help Blue Cross Plans assume financial and non-financial roles to support hospital energy conservation; and
6. Establishment of a technical support program for hospital engineers and operating staff which explains sound hospital energy management

techniques through a structured educational workshop format. With these accomplishments, the coalition feels that it has met its first year objective.

In addition, NCE has secured the direct involvement of representatives of the Medicare and Medicaid programs that account for 50 percent of hospital revenues, as well as the Department of Energy and the state energy offices that are administering the schools and hospitals grant program under the National Energy Conservation Policy Act. Involvement of these agencies is expected to expedite implementation of the NCE program.

4.1.3 Plans

For the second and third project years (July 1, 1979 to June 30, 1981), NCE goals are:

1. Educate and motivate hospitals and Blue Cross Plans to implement hospital energy conservation measures;
2. Implement, by direct consultation and by distribution of technical materials, energy conservation programs in at least 50 percent of all hospitals; and
3. Provide leadership in organizing local community efforts to support hospital energy conservation measures.

Attainment of these goals is expected to reduce energy consumption at targeted hospitals by 14 percent with annual savings at current fuel prices of \$250 million. Planned tasks in support of these goals are:

1. Increase top management and employee commitment to sound energy stewardship among hospitals, Blue Cross Plans and other membership organizations;
2. Assist hospital engineers in developing energy management expertise through a series of "hands-on" workshop packages;

3. Develop the technical skills for operations and maintenance staff in specific key elements of hospitals' energy systems through a series of technical training packages;
4. Provide technical support and on-site consultative services to Blue Cross Plans for implementing both financial and non-financial methods to support energy conservation in hospitals.
5. Expand the direct information services and clearinghouse to include consulting services to facilitate NCE effectiveness;
6. Integrate research on hospital energy use with the development of management and technical materials;
7. Expand the NCE leadership role with external organizations such as health planning and energy regulatory agencies; and
8. Develop and implement an evaluation method to assess the effectiveness of NCE activities.

4.2 INDIVIDUAL PLANS

In addition to the National Cooperative Effort, individual Blue Cross Plans have initiated hospital energy conservation programs. In February, 1979, the Blue Cross and Blue Shield Associations surveyed Blue Cross Plans to learn the present levels of activity and interest in hospital energy conservation.

Thus far, of the 69 Plans surveyed, 38 have responded. Of these, 11 (29 percent) reported active support for hospital energy conservation. Four were supporting hospital energy conservation programs through special financial arrangements. The other seven were providing information and technical support to hospitals.

An additional nine Blue Cross Plans reported that they were

considering activity in support of hospital energy conservation. Six were considering financial support and three were considering educational or technical support.

Thus, over half of the responding Plans were either currently involved in or were contemplating activity in support of hospital energy conservation. Further, an additional 18 Plans expressed interest in receiving assistance from the Blue Cross and Blue Shield Associations in this area. Specific types of support suggested included technical materials, information on other Plan activity, educational materials, and public recognition for Plan efforts.

These programs vary significantly in terms of scope, financial and technical resources, and relationships with hospitals and local interest groups. In general, however, Blue Cross Plans can take two roles in support of hospital energy conservation programs:

1. Act as a coordinating agency to develop data, conduct educational programs, and organize community interest; and
2. Organize and financially support hospital energy conservation programs.

Information obtained both by the Blue Cross and Blue Shield Associations and by the University of Minnesota School of Public Health Survey (see Chapter 3) have been consolidated and are included in the following summaries of current energy conservation programs of five Blue Cross Plans:

4.2.1 Blue Cross and Blue Shield of Michigan.

Within Blue Cross and Blue Shield of Michigan, the Cost Containment Committee (CCC) Program of Provider Affairs is actively involved in promoting hospital energy management on both a state and national level. The

charge for these activities is based on its Participating Hospital Agreement which states that the Plan is to provide assistance and advice to hospitals in support of their cost management activities.

Based on CCC reports from 221 hospitals, energy management was identified as one of ten major areas of cost management activities. Therefore, in 1978 a seminar presentation was jointly developed by the CCC Program and a Detroit-based architectural and engineering firm. The seminar program offered organizational, procedural and technical information useful to hospitals in the establishment and maintenance of energy management activities. Since the seminar focused on the administrative and technical aspects of energy management programs in hospitals, the attendance of both hospital administrators and hospital engineers was encouraged.

As the seminar series progressed, other agencies including the Michigan Energy Administration, utility companies and the state hospital association, were invited to discuss their current energy management programs. In total, seven seminars were presented throughout 1978, and all 224 hospitals in Michigan received energy management materials either through seminar attendance or mailings.

On a state level, the CCC Program utilized the energy management seminar experience to provide direct input into two state agencies, the Department of Commerce, Energy Extension Service; and the Michigan Energy Administration. The activities with the Energy Extension Service included membership on the Small Business Energy Project Advisory Committee. The latter project was designed to promote energy conservation and management in small businesses through educational seminars and technical assistance. As a result of this involvement, on January 29, 1979, the CCC Program sponsored two educational seminars to hospitals in southeastern Michigan.

These seminars provided specific and detailed information on hospital energy utilization and potential areas for energy savings.

For the Michigan Energy Administration, the CCC Program has provided feedback and commentary on implementation of the hospitals and schools grant program of the National Energy Conservation and Policy Act. During the past nine months, activities in this area have included:

1. Feedback and commentary on the preliminary hospital energy audit survey and the associated workbook;
2. Hospital contact arrangements for environmental management workshops sponsored by the Michigan Energy Administration;
3. Contact with other federal and state agencies; i.e., the Michigan Department of Public Health, and the Health Resources Administration of the Department of Health, Education, and Welfare; and
4. Testimony on issues related to the state energy plan.

Also, coordination with the Michigan Hospital Association and the Michigan Association of Hospital Engineers was established and is being actively continued to assure that hospital interests are fully represented.

Another recent activity has been support of individual hospital energy management projects in the Certificate of Need project review process. In April 1978, the CCC Program provided verbal endorsement to the Project Review Committee of the Southwest Michigan Health Systems Agency for a major hospital energy project. This project involves significant modifications in the heating, ventilating and air conditioning systems of the hospital with a calculated pay back period of approximately six years. The CCC Program's endorsement was based on the cost containment merits and energy conservation potential of the project.

In the course of coordinating the Plan's input to the health systems

agencies, the CCC Program identified the need to discuss and explore issues related to hospital energy projects with each of the eight health systems agencies in Michigan and other appropriate federal/state agencies. Accordingly, during the first half of 1979, CCC Program staff met with representatives of each health systems agency; the Michigan Department of Public Health; and the Health Resources Administration, Division of Energy Policy and Programs. In general, these discussions focused on the relevant provisions of the National Energy Conservation Policy Act, the amendments to the Health Planning Act which added an eleventh project review criteria to include energy considerations, and issues regarding health systems agency reviews of energy projects.

These discussions resulted in a June 27, 1979 meeting of all health systems agencies, and other involved federal and state agencies. At this meeting, the CCC Program gave a presentation on energy management, the National Energy Conservation Policy Act, and other issues of concern to health systems agencies. Results included:

1. Each issue was discussed and initial steps necessary to resolve them were undertaken and a subcommittee was formed to further investigate several specified issues;
2. A communications network between the health systems agencies, the Michigan Energy Administration, and the Michigan Department of Public Health was established; and
3. The Health Resources Administration, Division of Energy Policy and Programs was provided valuable insights for development of educational programs on hospital energy management for the Department of Health, Education, and Welfare regional centers for health planning; state health planning departments; and state health coordinating councils.

4.2.2 New Hampshire-Vermont Health Service.

In 1978 the New Hampshire-Vermont Health Service (now Blue Cross and Blue Shield of New Hampshire-Vermont) initiated a program of financial support for hospital energy conservation activity. The Plan has committed \$15,000 to the Preliminary Energy Audits and Energy Audits mandated by the National Energy Conservation Policy Act.

The program, which is being conducted in cooperation with the state hospital associations and energy offices in New Hampshire and Vermont, is designed to achieve low-cost energy savings and to prepare hospitals for assistance from the Department of Energy's grants program. Thus far, the Plan has completed the Preliminary Energy Audits and Energy Audit in each of 13 Vermont hospitals and has identified approximately \$160,000 of savings with low or no cost improvements to these facilities. The Energy Audits in New Hampshire are currently being conducted and no reports have been generated as yet.

The project is funded on an equal cost sharing basis of \$300 per building from the hospital and \$300 per building from the Plan. The audits have been conducted by the Technical Service Program Engineers from the University of Vermont and Northern New England Clinical Engineering Center at University of New Hampshire.

4.2.3 Blue Cross of Greater Philadelphia.

In 1975, Blue Cross of Greater Philadelphia sponsored a project to identify and implement energy conservation measures in six Philadelphia area hospitals. The one-year project was organized and directed by University City Science Center and resulted in a ten percent energy reduction in the the annual energy costs of the six participating hospitals. From this

experience, the Center drafted a manual, Practical Energy Management in Health Care Institutions, which was reviewed by the six institutions prior to publication in 1977. In addition to Plan financial support, the manual's development was also funded by the Federal Energy Administration.

The manual has a "principal goal" of encouraging energy management and indicated [ing] how it is to be accomplished." Quoting from its introduction,

the Manual is intended to be used by health care professionals. It is designed to help top management build a professional team to establish and operate on-going energy management. Special attention is given to:

- Executive Overview of Energy Management*
- Detailed "Steps" of Energy Management*
- Data Collection and Analysis*
- Building and Equipment Surveys*
- Energy Saving Ideas*
- Implementation of Energy Saving Programs*

All tasks are described in simple terms. Data formats are included. Energy Savings Ideas (ESIs) are presented and discussed. A "Working Check List" keyed to the ESIs is included to survey buildings and equipment. In addition, case histories in energy management are presented as an integral part of the overall text.

In the two years since it was published, the manual has become a major technical resource nationwide in developing effective hospital energy conservation programs.

In 1978, Blue Cross of Greater Philadelphia began a cooperative program with the Delaware Valley Hospital Council, 59 area hospitals, and local business and labor interests to perform in-depth energy audits in each participating hospital. This program focused on the identification and implementation of no-cost and low-cost energy conservation measures. The Plan

helped organize and manage the program and provided financial assistance through \$500 thousand in incentive payments and an additional \$500 thousand in reimbursements for the cost of audits. One half of the incentive payment was awarded to each participating hospital upon entering the program and the other half was awarded when the hospital implemented the identified measures. The program cost a total of \$1.6 million and resulted in an annual energy savings of \$5 million or 15 percent of projected annual energy costs.

The Philadelphia hospital energy conservation program is significant in three regards. First, it was the first organized community-wide hospital energy conservation effort. Second, it demonstrated a potential nationwide savings of one-half billion dollars in hospital energy costs. Finally, it demonstrated that the investment of subscriber funds in hospital energy conservation can pay back immediately. Blue Cross of Greater Philadelphia is now working to develop a community energy monitoring system, identify and prioritize energy conservation capital investment opportunities, and identify sources of financing of these opportunities.

4.2.4 Blue Cross of Western Pennsylvania.

In 1978, the Hospital Council of Western Pennsylvania requested funding to establish an energy conservation program for area hospitals. In conjunction with the state, Blue Cross of Western Pennsylvania established a \$1 million cost containment fund to be used for this and other purposes. The Plan provided interest-free loans to finance the audits. The loans will be repaid from the energy cost savings resulting from the program.

The audits were carried out by the Oak Ridge Associated Universities, a nonprofit association of 45 colleges and universities with headquarters in

Oak Ridge, Tennessee. Oak Ridge obtains about half its funds (\$7.5 million) through Department of Energy contracts, and the group has had previous experience with energy audit work.

In all, 33 hospitals were audited. Since those audits were begun last winter and recently finished, it is too early to compare actual savings with anticipated results. But expected savings range from 19 to 44 percent, based on payback periods varying from one to six years.

4.2.5 Blue Cross of Northeastern Pennsylvania.

In September 1978, Blue Cross of Northeastern Pennsylvania conducted a survey of local hospital energy consumption and energy conservation activity. In December, the Plan set aside \$80,000 to provide matching grants for comprehensive energy audits. Hospitals can receive 50 percent of the cost of an approved audit, up to \$5,000. In April 1979, the Plan conducted an energy conservation conference for its member hospitals. Speakers included representatives from the Plan, a local utility, hospitals, Blue Cross of Greater Philadelphia, the state energy office, Pennsylvania State University, and a consulting firm.

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