American Society for Healthcare Engineering
of the American Hospital Association

Healthcare Energy Guidebook

Results of the
Healthcare Energy Project
November 2001 through December 2003

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American Society for Healthcare Engineering (ASHE) of the
American Hospital Association
Health Research and Education Trust (HRET)
Environmental & Energy Conservation for Healthcare Organization
(EECHO)
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Ordering Information

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FOREWORD

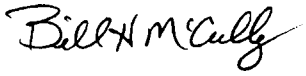
Hospitals are large users of both electrical and thermal energy on a continuous basis. Their operation is year-round and 24 hours per day, and they are highly energy intensive.

This basic assessment, from the National Accounts Sector—Energy Profile, says it all. Hospitals are energy intensive. Daily challenges include providing patients with a safe and comfortable environment, coping with dwindling staffing and financial resources, and compliance with a myriad of codes and standards. Among the daily challenges is the challenge we all face of reducing operating costs—the largest being energy consumption.

With these challenges comes the opportunity to design in energy-efficient equipment, operations, and controls. But energy savings opportunities do not only come with capital dollars. Facility managers and engineers may increase the energy performance of their buildings through improved operations and maintenance. These often overlooked best management practices are based on fundamental principles of equipment preventive maintenance and effective operational control.

In 2003 ASHE was awarded the Environmental Protection Agency (EPA) Energy Star Partner of the Year Award for Excellence in Business Outreach. We are both proud of this honor, and mindful that we as a healthcare community can do more. That "more" starts with sharing best practices, lessons learned, and proven energy savings solutions among our profession. This guidebook is a first step in the sharing of this information, and a call for continued work to identify practices, techniques, and technologies that we can all leverage to conserve our precious energy resources.

Michael Kuechenmeister
2003 Chairman
ASHE Facilities Management Committee



Bill McCully
2003 President
ASHE

ACKNOWLEDGEMENTS

This guidebook could not have been completed without the help of the ASHE members who participated in this project. They took their valuable time to share their knowledge and data by completing both the EPA benchmarking survey and the HEP comprehensive survey. Top performers also provided valuable information through a series of phone interviews. All ASHE members owe the participants their appreciation. In addition, the following organizations made this guidebook possible.

American Society for Healthcare Engineering (ASHE) has initiated programs for the coming years to educate, train, and promote energy conservation and efficiency practices. ASHE spearheaded the HEP project by promoting it to its members, gathering feedback and data from its members, and working with AHA and HRET to distribute the findings of the study.

Health Research and Educational Trust (HRET) is a 501C3 non-profit corporation providing research and educational services for AHA divisions. HRET's mission is "transforming health care through research and education through people, communities, and those who serve them working together to improve health." HRET supports the Healthcare Energy Project (HEP), which has resulted in this guidebook for all AHA and ASHE members across the country.

Environmental & Energy Conservation for Healthcare Organization (EECHO) is involved in energy conservation and efficiency for hospitals nationwide. It explores technologies and practices that will assist hospitals in controlling energy costs. EECHO was instrumental in initiating this project.

ProWrite Inc. is a full-service technical communications company that specializes in communicating technical information to broad audiences. ProWrite developed the comprehensive study, gathered and analyzed the data, and designed, wrote, and produced the guidebook.

United States Environmental Protection Agency (EPA)

This research was made possible through a United States Environmental Protection Agency (EPA) grant.

Disclaimer

Although the research described in this report has been funded wholly or in part by the United States Environmental Protection Agency through EPA Assistance Agreement # X-82934101-0 to the Healthcare Education Research Trust, it has not been subjected to the Agency's required peer and policy review and therefore does not necessarily reflect the views of the Agency and no official endorsement should be inferred.

EXECUTIVE SUMMARY

Healthcare Energy Project

This guidebook profiles the U.S. healthcare market on size and energy-related characteristics and provides energy benchmarking data that can be used to make meaningful comparisons between healthcare facilities. The intent of the guidebook is to provide assessment of practices, methodologies, and technologies being applied for the purpose of improving energy efficiency in hospitals.

This guidebook will enable managers to gain a better understanding of the key characteristics of healthcare facilities that have lower energy usage and those that have higher energy usage. Managers can also look at practices that seem to make little or no difference. When future projects are considered, they may want to promote the projects that are characteristic of top performers and re-evaluate those that are characteristic of low performers or seem to make little difference.

Background

This guidebook on the healthcare/hospital market is the result of the Healthcare Energy Project (HEP), which is a cooperative effort of the American Society for Healthcare Engineering (ASHE) of the American Hospital Association, Health Research and Educational Trust (HRET), Environmental & Energy Conservation for Healthcare Organization (EECHO), and ProWrite Inc. It was made possible through a United States Environmental Protection Agency (EPA) grant.

Goals and Objectives

The primary goal of the Healthcare Energy Project is to provide healthcare engineers technical guidance to increase the energy performance of their buildings. The scope of this guidance covers technology upgrades and operations and maintenance (O&M) practices (including preventive maintenance plans) of lighting, HVAC load reductions, fan systems, and HVAC plant operations.

To achieve this goal, the following objectives were accomplished:

Determine benchmarking scores for at least 120 hospitals—Benchmarking surveys were completed by hospitals geographically distributed across the country to obtain an even distribution across all major climate regions.

Create comprehensive surveys—The comprehensive survey provided detailed information on technologies and current O&M practices. It focused on obtaining information about what differentiates high-performing and low-performing hospitals.

Compare management practices within and among each quartile—The hypothesis of HEP is that high-performing hospitals will employ more technologies that are energy-efficient and institute more aggressive best management O&M practices than low-performing hospitals.

Compile a best practices guidebook—A best energy management practices guidebook has been compiled that details the differences between respondents whose benchmarking scores are in the top quartile from those in the bottom quartile and the respondents as a whole.

Approach

HEP involved a phased approach to accomplish the goals and objectives of this effort. The first phase involved obtaining benchmarking scores and completed comprehensive surveys from 121 hospitals. Next, the data were analyzed and management practices within and among each quartile were compared. The final phase involved compiling the data and reporting the study findings in this best energy management practices guidebook.

Results

Although there were many areas such as types of fuel used, that showed little difference between top performers and bottom performers, other areas showed significant differences.

The strongest common characteristics of top performers included

- The greater use of a variety of lighting sources, especially halogen bulbs and installing more lighting conservation features
- Working with ESCOs
- Using EMCS/BAS that cover a large number of areas
- Having twice as many O&M energy conservation strategies
- Installing insulation within the last five years
- Using more O&M procedures for laundry equipment

Because operating a healthcare facility and achieving good energy efficiency is a complex operation, any conclusions from this study should be made by examining the study as a whole.

CONTENTS

1 INTRODUCTION

In response to the growth of managed care, advances in medical technology that reduce hospital stays, reductions in reimbursement rates, and the increasing number of uninsured patients, the healthcare industry continues to experience intense financial strain. Continual pressure to cut costs together with the trend for consolidation are driving healthcare providers to thoroughly scrutinize their services and expenditures, including energy usage.

Nationally, hospitals and healthcare facilities generally spend approximately $6 billion annually on energy-related items, including electricity, natural gas, and fuel oil; equipment operations, and infrastructure financing. Energy performance of hospitals can be improved and significant cost savings realized through better operations and maintenance (O&M) of existing systems, by purchasing more energy-efficient technologies, or a combination of the two. Oftentimes, lack of knowledge has barred adoption of best management practices or certain technologies since the gain in energy performance is unsubstantiated or difficult to predict, especially given different building types and climate region. In pursuit of cost reduction and improved operating efficiency, hospitals are seeking to bridge information gaps. The market knowledge presented in this guidebook is designed to fill some of these gaps and shed light on many aspects of the hospital market that could translate into an increase in energy performance and significant energy cost savings.

Energy Costs in the Healthcare Market

According to the Environmental Protection Agency (EPA), healthcare is one of the most energy intensive industries in the U.S. Hospitals use more than twice as much energy per square foot as office buildings; however, cost increases cannot be offset, as they would in other industries, because healthcare facilities have set reimbursement rates. Healthcare organizations face significant revenue gaps created by shrinking budgets, declining tax bases, aging facilities, and growing energy costs. These facilities are constantly challenged to reduce costs, elevate the quality of care, and compete in the market place. By improving energy efficiency, hospitals can generate a new source of capital for investment in facilities, for expansion, or to increase the bottom-line.

Background

This Healthcare Energy Guidebook is the result of a collaborative effort among the American Society for Healthcare Engineering (ASHE) of the American Hospital Association (AHA), the Health Research and Educational Trust (HRET), Environmental & Energy Conservation for Healthcare Organization (EECHO), and ProWrite Inc. It was made possible through a United States Environmental Protection Agency (EPA) grant.

The guidebook is designed to provide decision makers with knowledge about improving energy efficiency. The data presented profiles the U. S. hospital market on size and energy-related characteristics and provides energy benchmarking information that can be used to make meaningful comparisons among healthcare facilities. This guidebook will enable managers to gain a better understanding of the key characteristics of energy-related issues within the healthcare market and to assess how well their facilities are performing relative to hospitals with similar energy equipment.

Uses of Hospital Facility Data

The data presented in this guidebook were gathered through a comprehensive survey and facility benchmarking using the EPA's ENERGY STAR® Portfolio Manager benchmarking tool. Surveys were completed by 121 healthcare facilities representing all types of climate region. Energy management practices were compared between the top and bottom performing quartiles.

Goals and Objectives

The primary goal of the Healthcare Energy Project is to provide healthcare engineers technical guidance to increase the energy performance of their buildings. The scope of this guidance covers technology upgrades and operations and maintenance (O&M) practices (including preventive maintenance plans) of lighting, HVAC load reductions, fan systems, and HVAC plant operations.

To achieve this goal, the following objectives were accomplished:

Determine benchmarking scores for at least 120 hospitals—Benchmarking surveys were completed by hospitals geographically distributed across the country to obtain an even distribution across all major climate regions, as outlined in the Commercial Building Energy Consumption Survey (CBECS), coordinated by the Energy Information Administration of the U.S. Department of Energy. The survey results have been benchmarked using the EPA benchmark algorithm at www.epa.gov.

Create comprehensive surveys—The comprehensive survey provided detailed information on technologies and current O&M practices. It focused on obtaining information about what differentiates high-performing and low-performing hospitals.

Compare management practices within and among each quartile—The hypothesis of HEP is that high-performing hospitals will employ more technologies that are energy-efficient and institute more aggressive best management O&M practices than low-performing hospitals.

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Results

Although there were many areas such as types of fuel used, that showed little difference between top performers and bottom performers, other areas showed significant differences.

Top Performers

The strongest common characteristics of top performers included

- The greater use of a variety of lighting sources, especially halogen bulbs and installing more lighting conservation features
- Working with ESCOs
- Using EMCS/BAS that cover a large number of areas
- Having twice as many O&M energy conservation strategies
- Installing insulation within the last five years
- Using more O&M procedures for laundry equipment

Other characteristics of top performers included

- Using recently-installed EMCS/BASs—or none at all
- Installing HVAC maintenance conservation features in the last five years
- Using single-duct or multi-zoned variable volume or multi-zoned constant volume air handling
- Having air-cooled chillers, district chilled water, or evaporative or desiccant cooling
- Having larger cooling sources
- Using air balancing, filter replacement, and piping insulation in their O&M procedures for their HVAC systems

- Using chemical treatment of closed-loop system and descaling of boilers for their hot water systems
- Using passive solar energy heating
- Using the following lighting types: compact florescent, electronic ballast florescent, high-pressure sodium, parabolic aluminized reflectors, standard incandescent, low-pressure sodium, and, as mentioned above, halogen
- Installing lighting conservation features within the last five years including dimmers, electronic ballasts, occupancy sensors, photocells, relamping, and timers
- Cleaning lighting fixtures and conducting lighting zone maintenance daily checks
- Performing annual roof inspections and caulking inspections
- Installing seals and roofing within the last five years
- Having a preventive maintenance program for cooking equipment
- Replacing cooking or laundry equipment in the last five years
- Checking laundry equipment including checking the ironer temperatures, daily monitoring of kWhs and water usage, recovery of heat from wastewater, and reuse of wastewater—or outsourcing their laundry
- Performing energy audits internally
- Working with ESCOs to finance and install energy-efficient equipment

Bottom Performers

Respondents in the bottom quartile also shared some common characteristics which could result in

- Consuming more energy
- Making less energy improvements than other measures
- Keeping other more-effective measures from being implemented

This study did not attempt to determine which of the above was the cause of low performance.

The strongest common characteristics of bottom performers included

- Participating in supply side management
- Replacing air-handling equipment in the last five years

Other characteristics of bottom performers included

- Using contracted lighting replacement
- Using mercury vapor lighting
- Using single- or dual-duct constant volume or dual-duct variable cooling air handling system

- Using an air-handler economizer cycle (although the vast majority of all facilities use an economizer cycle)
- Using the following O&M procedures for their HVAC systems: chemical treatment of closed-loop system, coil cleaning and maintenance, monitor operating conditions, steam trap inspection program for boilers, and water treatment for boilers as well as performing fewer total procedures than top performers
- Using fuel oil #2 for heating
- Replacing their hot water heating system or replacing no main equipment in the last five years in addition to replacing their air handling equipment mentioned previously
- Using the following O&M procedures for their cooling towers: ozonation and organizing the motors as cells as well as performing more total procedures than top performers
- Using a water-cooled chiller as the primary cooling source
- Using a combination of distributed and centralized primary domestic water heating system
- Not cogenerating or not recovering waste heat
- Installing an EMCS or making no HVAC energy conservation improvements in the last five years
- Installing their last EMCS/BAS before 1997
- Having a laundry (using electricity)
- Not working with ESCOs
- Performing their last energy audit before 1997 and using a consultant to perform it
- Participating in rate review and consumption auditing
- Installing multi-paned windows or doors or installing no building shell conservation features in the last five years
- Using vendor contracted O&M on cooking equipment and refrigerators
- Using the following O&M procedures for laundry equipment: flame testing of dryer burners and outsourcing chemical treatment of water

Because operating a healthcare facility and achieving good energy efficiency is a complex operation, any conclusions from this study should be made by examining the study as a whole.

Guidebook Organization

The Healthcare Energy Guidebook is organized in the following chapters:

Overview of the Hospital Market—A summary of general market characteristics, including locations of hospitals in the U.S., ownership, size, and operating expenses.

Energy Use in the Healthcare Industry—An overview of typical energy use for hospitals in the U.S. healthcare industry, including electricity, natural gas, fuel oil, and other types of energy.

Healthcare Energy Project Survey Results—The results obtained through the HEP survey, which was completed by engineering and facilities management professionals at 121 hospitals. Results examined include

- Census Division
- Annual Inpatient Days
- Fuels
- Heating and Cooling Sources and Systems
- Energy Use
- Management
- Equipment and Conservation Features
- Operations and Maintenance
- Energy Audits

This chapter also presents data analysis and conclusions, including the method of data analysis, an overview of the benchmarking scores, and conclusions about best energy management practices.

Best Practices—A summary of the best energy practices including the results of interviews with the top 10 percent of high performers and a preventive maintenance checklist.

Appendix A, Summary Statistics—A compilation of the numerical data collected using the HEP survey, analyzed by top quartile, bottom quartile, and all respondents.

Appendix B, Survey Tool—A printed version of the survey tool completed by HEP participants.

Appendix C, Spreadsheet Benchmarking Tool—A printed version of the spreadsheet benchmarking tool completed by HEP participants for submission of data to the EPA's ENERGY STAR® benchmarking program.

Appendix D, Glossary—Definitions of the terms used in the surveys and this report.

Appendix E, Highlighted Summary Statistics—A version of the Summary Statistics with the most significant findings highlighted as well as comments.

Appendix F, Qualitative Data— A compilation of the qualitative data collected using the HEP survey, analyzed by top quartile, bottom quartile, and all respondents. Included are all the responses to "Other."

Appendix G, Summary Statistics by Region—Similar to Appendix E and F but compared by the different regions.

Appendix H, Statistical Significance—Statistical significance of key findings determined using statistical techniques such as *t*-tests.

Data Sources

The profiling information for the overview of the healthcare market and energy usage was drawn from two EPRI reports, *Energy Market Profiles: Hospital Buildings, Equipment, and Energy Use* and B*ackground, Trends, Issues, and Opportunities in Healthcare*. The Healthcare Cost and Utilization Project (HCUP) is a family of administrative longitudinal databases, web-based products, and software tools developed and maintained by the Agency for Healthcare Research and Quality (AHRQ) as part of a Federal-State-Industry partnership to build a standardized, multi-state health data system. HCUP is the primary source for the hospital market statistics.

2 BACKGROUND: OVERVIEW OF THE HOSPITAL MARKET

This chapter provides an overview of the national hospital market. This overview was developed from the analysis of statistical data obtained from The Healthcare Cost and Utilization Project (HCUP). HCUP is based on weighted national estimates from a HCUP Nationwide Inpatient Sample completed for the year 2000 using data collected and provided to the Agency for Healthcare Research and Quality (AHRQ) by individual States.

Summary of General Market Characteristics

National hospital market characteristics summarized in this chapter include:

- Location of hospitals in the U.S.
- Hospital ownership
- Hospital classification
- Hospital size
- Operating expenses and profit margins

Location of Hospitals in the U.S.

Hospitals are located throughout the U.S. generally in proportion to the nation's population, with the heaviest concentrations occurring in the East North Central (primarily in Michigan, Ohio, and Illinois), South Atlantic (primarily in Georgia and Florida), West North Central (Kansas, Missouri, Iowa, and Minnesota), and West South Central (Louisiana and Texas) regions.

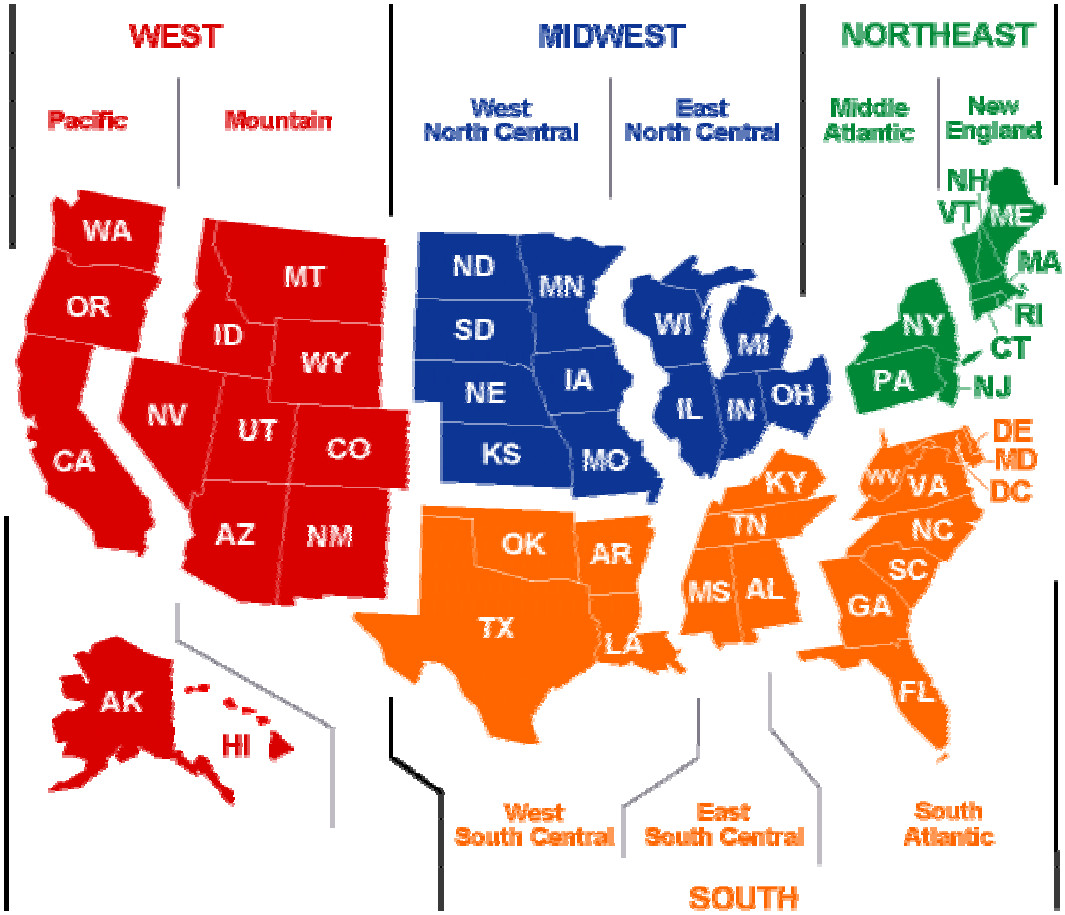
Table 2-1 shows a breakdown of total U.S. hospitals by Census Division. Figure 2-1 shows states in the Census Division and Regions. Figure 2-2 shows the percentage of hospitals by Census Division. Figure 2-3 shows how the surveyed hospitals compare with the national distribution of hospitals.

Table 2-1: Total Hospitals by Census Divisions

Census Division	National Count	Percent of Total
East North Central	761	15
East South Central	432	9
Middle Atlantic	504	10
Mountain	353	7
New England	206	4
Pacific	609	12
South Atlantic	751	15
West North Central	699	14
West South Central	702	14

Source: *Federal Register*, July 31, 1998 edition (Table 4, pp. 41116–17).

Figure 2-1: Census Divisions and Regions



Source: Energy Information Administration, U.S. Department of Energy, June 14, 2000
http://www.eia.doe.gov/emeu/reps/maps/us_census.html

Figure 2-2: Percentage of Hospitals by Census Division

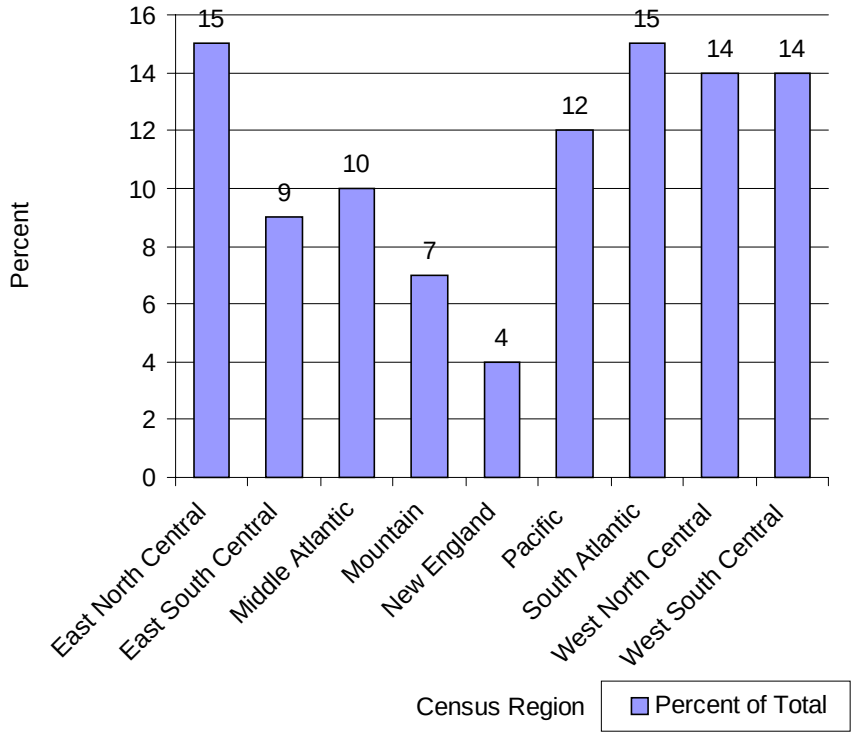
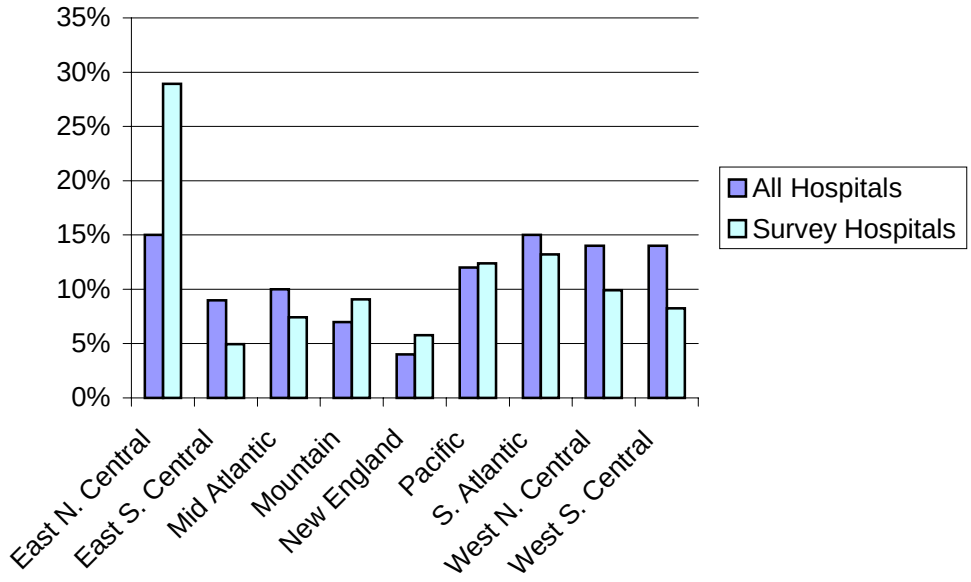


Figure 2-3: All Versus Surveyed Hospitals by Census Division



In general survey respondents reflected the national distribution except for a greater representation in the East North Central region.

Hospital Ownership

Hospital ownership and control generally falls into three categories as defined by the AHA Annual Survey of Hospitals and as used by the EPA for ENERGY STAR benchmarking. These types of hospitals tend to have different missions and different responses to government regulations and policies. Hospital ownership categories are as follow:

- **Non-Profit**—Hospitals that are operated by a church or other non-profit organization
- **For-Profit**—Hospitals that are operated for profit by individuals, partnerships, or organizations
- **Governmental**—Hospitals that are operated by the federal government

Classification of Hospitals

Hospitals are generally classified by type of service, ownership, size in terms of number of beds, and length of stay.

During the data collection phase of the HEP study, the EPA ENERGY STAR benchmarking tool required that at least 50 percent of a hospital's floor area consist of the primary space uses associated with acute care or children's hospitals only. Since only acute care and children's hospitals could be benchmarked, these types of facilities only were eligible to participate in the HEP study. These are facilities that typically provide a variety of services within the same building or among multiple buildings on a campus, including:

- Emergency medical care
- Physician's office services
- Diagnostic care
- Ambulatory care
- Surgical care

Hospital Size

Hospital size can be defined by the number of licensed care beds and the total floor area as follows:

Number of licensed beds—The number of licensed care beds, which are defined as beds that are set up and staffed for use by inpatients and licensed by a state or local government agency. The AHA licensed bed count is the average number of beds, cribs, and pediatric bassinets for use by inpatients during a reporting period.

Total floor area—The total floor space from all buildings within a campus.

For multiple-building hospitals (campuses), the sum of the square footage and energy usage of all buildings were included in the ENERGY STAR benchmarking tool.

Operating Expenses and Profit Margins

Hospital profit margins have steadily declined since 1998 due to increased operating expenses that cannot be offset by the industry because of constraints related to set reimbursement rates. Table 2-2 summarizes projected average hospital profit margins by census division through the year 2003.

Table 2-2: Projected Average Hospital Profit Margins

Census Division	1998	2000	2003
Nationwide	6.5%	5.5%	5.2%
New England	4.2%	2.7%	2.4%
Mid-Atlantic	4.2%	4.0%	2.3%
South-Atlantic	7.5%	6.0%	5.1%
East North Central	6.4%	5.4%	5.0%
East South Central	7.2%	6.6%	6.3%
West North Central	6.0%	5.3%	6.1%
West South Central	8.2%	7.0%	6.7%
Mountain	7.0%	5.5%	5.9%
Pacific	5.8%	5.0%	4.3%

Source: *U.S. Hospitals and the Future of Health Care*, seventh edition, Deloitte & Touche, 1998.

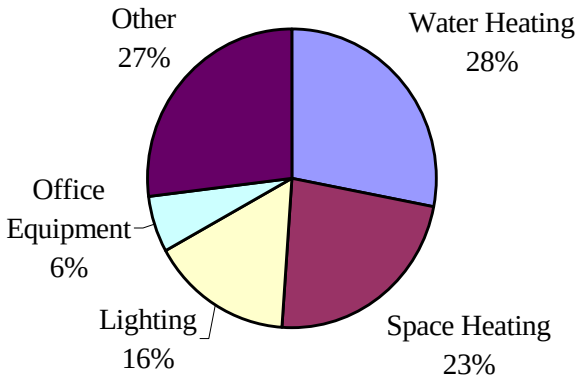
3 ENERGY USE IN THE HEALTHCARE INDUSTRY

Energy is a critical element essential to the delivery of quality healthcare services. According to the EPA, healthcare organizations spend over $6 billion on energy each year to meet patient needs. The upsurge in the use of technology in healthcare has increased energy demand within hospitals. At the same time, energy costs have been on the rise, due to increased demand, aging energy infrastructure, and deregulation of energy markets.

Typical Energy Use for Hospitals

In a typical hospital, water heating, space heating, and lighting account for 61–79 percent of total energy use, depending on the climate relative to the number of cooling- and heating-degree days. Figure 3-1 shows the estimated annual energy consumption of all U.S. healthcare buildings, including inpatient and outpatient facilities and nursing homes.

Figure 3-1: Estimated Annual Energy Use in Healthcare Buildings



Source: Energy Information Administration, U.S. Department of Energy, July 1998.

Table 3-1 lists average energy usage data for healthcare buildings as established by the Commercial Buildings Energy Consumption Survey released in 1998 by the U.S. Department of Energy, Energy Information Administration.

Table 3-1: Average Annual Energy Usage of Healthcare Buildings

End Energy Use	Consumption (Total Btu)
Space Heating	153.98
Space Cooling	29.98
Ventilation	18.18
Water Heating	189.64
Lighting	107.42
Cooking	34.56
Office Equipment	39.06
Refrigeration	13.09
Miscellaneous	86.98
Total	**672.89**

Source: Energy Information Administration, U.S. Department of Energy, July 1998.

Strategies for Energy Cost Controls

Energy is a significant factor in the growing percentage of healthcare operating costs, which are increasing at a rate that cannot be offset by increases in reimbursement rates. In order to survive, healthcare facilities must aggressively control costs. Strategies for energy cost controls have led to a trend of dealing with energy supply costs, reliability, and quality as managed risks.

Approaches to handling ever-increasing energy requirements can include:

Demand-side management—A management approach that involves ways to reduce the need for energy.

Supply-side management—A management approach that seeks the most cost-effective ways to procure and distribute the needed energy supply.

Other considerations for energy use in the healthcare industry include:

- Power Sources
- Deregulation
- Outsourcing Energy Management

Demand-Side Management

The key in demand-side management is conservation through system-wide energy conservation programs. These types of programs identify cost-effective procedures that reduce energy consumption and develop systematic programs of energy system efficiency improvements.

Healthcare facilities examine and analyze energy use to determine where it could be possible to cut back. When planning new construction, the most energy-efficient systems are considered. Older buildings are targeted for energy use reductions including:

- Modification of light fixtures
- Alteration of heating and cooling systems from constant volume to variable drive applications
- Addition or upgrade of process instrumentation
- Changeover of equipment
- Controls improvements

Supply-Side Management

Supply-side management focuses on cost-effectiveness in the procurement and distribution of energy. Supply-side management typically includes:

- Load profiling or understanding existing loads
- Load aggregation, which combines the loads of multiple buildings, campuses, or companies
- On-site generation alternatives such as cogeneration
- New procurement strategies such as purchasing energy from suppliers other than the local utility company
- Electrical system upgrades to remove old, inefficient equipment
- Peak shaving opportunities where alternate energy sources are used to reduce the maximum amount of energy used and the demand charges on invoices

Power Sources

Healthcare facilities must be designed to ensure that secure sources of power are available at all times. Regulations mandate emergency power supplies to ensure that critical functions will remain operational during power interruptions. Hospitals typically employ several approaches to meeting this requirement including:

- Diesel-fueled emergency generators
- Electricity distribution systems
- Diversified power sources

Diesel-Fueled Emergency Generators

Diesel-fueled emergency generators are frequently installed on site to maintain the power supply during an outage. Drawbacks include air quality issues related to burning diesel fuel, and the time constraints defined by the amount of fuel available to keep these generators operating.

Distribution Systems

Distribution systems employ two separate utility feeds into the facility so that one automatically takes over the power feed if the other one goes out of service. Local utility companies determine the availability of a second service. Each utility feed should be isolated to a separate sub-station for improved reliability.

Diversified Power Sources

An example of diversified power sources is using natural gas to generate electricity on site. Cogeneration, or using the waste energy from the generation process to supplement or take over load requirements also falls under this category. Diversified power sources often make good sense economically since the facility does not have to pay for the energy that would have been required to address load requirements, which significantly reduces operating costs.

On-site generation and cogeneration enable hospital facilities to maintain greater control of energy supplies and can provide revenue opportunities if excess power is generated that can be sold back to the grid.

Deregulation

Deregulation has split energy companies into generation, transmission and distribution, and services. Transmission and distribution is still regulated, while generation and services are deregulated in many states. Service providers might be independents or spin-offs of an existing energy utility. Energy Service Companies (ESCOs) from other territories can now enter an existing utility's area and offer services. The deregulated electricity market enables healthcare facilities to select services from a wide range of energy suppliers. Facilities can hold competitive bidding for energy supply contracts, which can cut costs by as much as five percent.

Another alternative is to establish long-term supply contracts with energy service providers (ESPs), which function as energy brokers by operating power plants on their own and/or accessing groups of other generators. As brokers for a large number of customers, ESPs have leverage to negotiate for better prices. ESP power supply contracts secure certain amounts of energy at fixed rates over specific periods of time, which guarantees savings.

Outsourcing Energy Management

An increasing number of hospitals today outsource energy management and procurement. Outsourcing means that energy issues are handled by organizations that specialize in energy management. While outsourcing operations, a facility can sell any normal power generating capability, boiler capacity, chilled water capacity, emergency power generating capacity, and other generated power sources to a facilities management company that takes over operations and sells the power back to the facility.

Another outsourcing alternative is to contract with a firm that funds conservation measures and new generating capacity needed for expansion. The hospital can have a power plant designed, built, and operated by a third-party company and then can directly purchase the power generated.