

Energy efficiency and management in a hospital setting

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Executive Summary:

The practice of medicine and the running of hospitals have come a long way today. Medicine has made rapid advances in all disciplines and branches ranging from cardiology to neurology and pediatrics to geriatrics. Hospital managements progressively rely on advanced information systems for administrations, operations and health care delivery. However we find that hospitals do not pay as much attention to promoting energy efficiency and improving energy management to achieve energy conservation and savings as is expected of them especially when the power sector is in a crisis and power prices are so volatile. The author looks at opportunities for energy saving and energy management in hospitals and discusses typical issues that need to be addressed to achieve better energy management in hospitals.

Introduction :

Hospitals are energy guzzlers that operate on a 24x7x52 basis. Health care facilities and larger hospitals almost always have in house/inpatient facilities, which require energy to be on tap at all times with patients always staying on campus.

Energy consumption and usage is required for lighting and electrical fittings, air conditioning and ventilation, operation theatres and ICUs, ICCUs, laboratories, testing centers and testing equipments and machines, kitchen, laundry, pantry and housekeeping facilities, wards, residents and duty rooms and also for staff quarters and other support amenities and facilities. Teaching hospitals also need power for class rooms, teaching facilities, seminar and presentation halls and rooms, auditorium etc. Larger hospitals even have their own repairs and maintenance facilities, workshops, telephone exchanges etc. that need power. They are infact like mini townships and hence are really fit candidates for implementing energy conservation, efficiency and management programs. Hospitals have to provide for the energy needs of the different stakeholders ranging from patients and their relatives, doctors, Specialists, hospital administration, medical students, interns and residents, hospital staff, technicians, nurses, ward boys to the general public the list is endless.

The complex relationship and issues and the solutions in a hospital setting are brought out in the diagram (see figure 1)

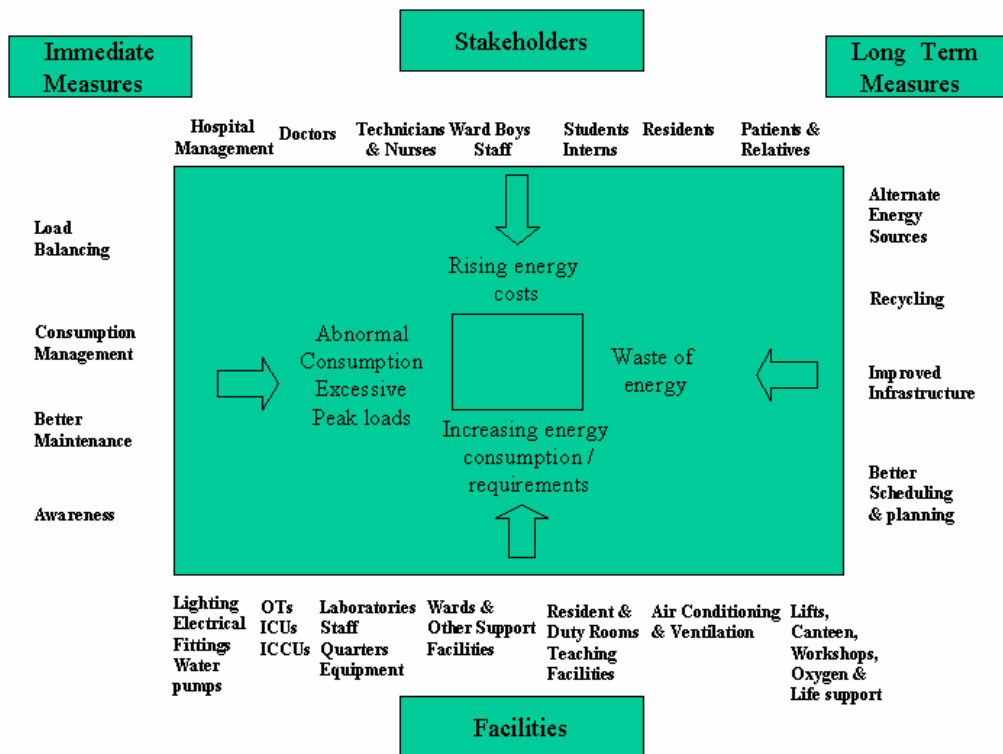


Figure 1: Energy Management in a Hospital Setting

Need for energy conservation:

Apart from the problem of energy shortage that is being faced worldwide today, another important reason for energy conservation in hospitals is the rising cost of health care. The increasing energy requirements/needs of modern hospitals that function on heavy equipment be it X-ray Machines, central air conditioning, pumps, life support systems, pumps for oxygen, lifts etc. make hospitals energy guzzlers. Today with majority of Indians still below poverty line it is imperative that healthcare is affordable and energy conservation and management will positively contribute to lowering health costs and improve quality of patient care.

Energy management program:

A typical energy management program for hospitals will involve :

- (i) evaluation of facilities, systems and operations
- (ii) identify energy type, applications and typical usage consumption patterns.
- (iii) Identification of facilities requiring 24x7x52 operations and those where selective shutdown/scheduling and shedding is possible.
- (iv) Evaluation of supply sources, contracts and alternate energy sources

- (v) energy saving opportunities
- (vi) a continuous process of energy accounting, energy audit and appropriate follow-up action using a Plan, Do, Check Act (PDCA) cycle to implement the energy conservation and management plan outlined above.

The entire hospital facilities will be listed and energy sources, uses and patterns identified. Data of consumption in terms of units of energy consumed and associated cost will be collected over a period of time and comparisons developed with past data.

Analysis will be made to identify critical devices that need to be 'on' at all times, devices that consume large amount of power, areas of energy losses and abnormal consumption patterns will also be looked at closely.

After evaluation and analysis of this data the hospital can identify the opportunities that exist/present themselves for conserving and saving energy consumption.

Energy efficiency and conservation program:

Employee/Staff awareness and usage :

In most organizations, and hospitals are no exception, one comes across fans whirring and lights glowing when the rooms are lying vacant. Empty corridors are brightly lit wasting energy without any cause/justification.

Sensitizing staff and creating awareness is a step in the right direction to save wastage of energy in this fashion.

Air Conditioning & Ventilation :

Maintenance and upkeep of an conditioning systems for energy efficiency and setting the temperature levels to minimize consumption without causing discomfort to patients and users and without compromising their safety is a key area.

Lighting and Utilities:

Lighting and utilities like lifts need to be well maintained. Wiring, switches and equipments should be such as will consume minimum power. Selective use and switching off during day time, off peak hours is important.

Lifts : A hospital, generally has a number of lifts, for staff and doctors, for patients' relatives and for patients and trolleys, stretchers and equipments. These are not always full and use a lot of energy through not fully occupied especially on Sundays and Holidays. Staggering lift timings and keeping lifts shut during off peak hours and on holidays is important.

Load Balancing and Consumption management :

Excessively high loads at certain times followed by very low consumption do not auger well for energy conservation. Identifying such peak loads helps reschedule operations to enable and implement staggering, enabling load balancing and consumption management.

Alternate energy sources and recycling :

Use of bio gas, solar energy and other alternate fuels for using energy for purposes like heating water for use of doctors, staff quarters and patients as well as for cleaning and washing, as well as for street and lobby lighting etc. can help in conserving energy and reducing power costs.

In the words of Charles Johnson, Vice President, St. Johns Medical Center –“Every dollar we save through efficient use of energy is a dollar we can spend towards improved patient care and comfort”. Energy conservation makes good economic sense and improved energy efficiency enables expansion of services and improved infrastructure at lower costs.

In fact the energy conservation programs having identified and focused on critical processes like ICUs and ICCUs ensure that these and other critical areas like operation theatres always have the required power supply and never suffer a black out.

Typical Issues faced in hospitals:

Having seen the benefits and efficiency of implementing energy conservation, efficiency and management programs let us see a few significant issues that are faced in hospitals:

- 1) Hospitals operate on a 24x7 basis and patient care, comfort and life care/saving are very critical and important.
- 2) Critical infrastructure cannot be dysfunctional and should be available at all times with a built in redundancy of at least one is to one.
- 3) Water supply, oxygen and other critical support lines have to be available at all times.
- 4) Monitors, hospital information systems have to function on 24x7x52 basis.
- 5) Deferred maintenance leading to faulty equipment and resultant wastage of energy due to excess consumption causes a drain on resources due to abnormally high energy consumption.
- 6) Shortage of trained manpower resulting in improper use/mishandling of equipment also inflates energy bills.
- 7) Fluctuating and erratic supply leading to voltage fluctuations causes damage to equipment and leads to increased power consumption.

The way forward:

In the given circumstances a typical approach to overcome the common issues to create an all round awareness and to implement effective energy conservation, efficiency and management program in hospitals is to set up multidisciplinary teams on the lines of quality circles. These can be called energy cells, energy groups or energy circles.

Their job will be to create awareness at all levels of the need and importance of energy program, facilitate capturing energy consumption, usage and cost information. They will help identify energy losses, abnormal consumption patterns, wastage of energy and energy saving opportunities.

The energy circles will also help in implementing low cost conservation measures which create more awareness and opinion building leading to staggering, switching off equipment when not in use, promoting use of natural ventilation and lighting during day time, use of solar energy and bio gas fuels, improving building infrastructure to save power losses due to leakages and so on.

The energy conservation efforts can be further improved by using 7 QC tools like cause and effect - herring bone diagrams, which will help in conducting root cause analysis to identify and plug energy losses.

To summarize these efforts can be concentrated in four areas –

Awareness – through campaigns, posters, training, opinion building and demonstration effect by setting down examples of energy conservation by top management. These include messages for switching off lights and equipment when not in use and other energy conservation messages.

Better Maintenance – Equipments and electrical fittings and points should be well maintained, worn out parts regularly replaced to minimize power losses and excessive consumption.

Improved infrastructure – Improvements to building infrastructure including wards, OTs, labs and doctors' quarters to minimize energy losses.

Better Scheduling and planning – Better scheduling of tasks to even out power loads and minimize peak drawals ensure more even power consumption which will lead to energy savings.

Use of alternate sources – Innovative use of alternate sources like solar energy and bio gas where possible should be explored.

Energy saving, conservation and management in hospitals is not a one time exercise and definitely not a quick fix solution. It is a journey where continual improvement and efforts of all members of the team – doctors, staff, maintenance engineers, equipment suppliers and power supply companies all is equally important.

What is needed in a more proactive approach to energy conservation and management that works at all levels and results in improved efficiency, cost savings, better infrastructure and eventually better patient care at lower energy consumption and costs.

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