Energy Consumption Patterns in Commercial Buildings

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Introduction

Commercial buildings consume 20 % of national electrical energy supply and was 817GWh in 1998. The identification of energy consumption patterns is very important in both national and institutional perspectives. This will help in energy planning & in setting up of energy policies, etc. This paper discusses the energy consumption pattern of commercial buildings in Colombo based on findings of energy audits carried out on a general government office building, a bank building and a private office building.

General Data

The general data regarding the energy consumption of the focused establishments for the study is given in Table 1 below.

Table 1

	Government Office Building	Bank Building	Private Office Building
Energy demand (kVA)	315	615	150
Annual Energy Consumption (MWh)	625	1650	358
Floor Area (m^2)			1560

Energy Balance

Air conditioning, lighting, office equipment & lifts are the major consumers in a commercial building and Table 2 below shows the electrical energy balances of the respective establishments.

Table 2

Energy Balance

Load	Percentage Energy Consumption		
	Government Office Building	Bank Building	Private Office Building
Air conditioning	58.0	53.5	66.6
Lighting	23.0	30.9	24.0
Office equipment	3.2	3.7	9.4
Lifts	3.7	4.4	2.2
Fans	8.4	2.1	10.1
Kettles & water heaters	2.4	3.7	0.02
Other **	1.3	1.9	4.4

Table 3 below shows the maximum demand balance of the respective establishment.

Table 3

Maximum Demand Balance

Load	Percentage Maximum Demand		
	Government Office Building	Bank Building	Private Office Building
Air conditioning	52.4	52.4	50
Lighting	14.5	19.1	33
Office equipment	12.4	2.5	6
Lifts	1.5	16.6	4
Fans	7.8	1.4	10.01
Kettles & heaters	20	7.2	0.02
Other auxiliaries	14	0.8	7

According to the above ,air conditioning is the major contributor to the total consumption, which represents about of 53 – 60 %. The 2nd major load is lighting which represents about 23 – 30 % of the consumption.

On maximum demand, kettles account in the government office buildings for a considerable amount (7 - 20%). This is because in these building, a number of kettles operate at tea time at each section.

Specific Energy Consumption

Specific energy consumption (SEC) is an indicator of the energy utilization efficiency. In commercial buildings, this can be expressed in kWh/(m^2/day) and kW/m^2. SEC is very useful when estimating energy requirement of a building. Table 4 below shows the SEC in kWh/m^2.

Table 4

Specific Energy Consumption (kWh/m^2)

(private office buildings)

Load	Kwh/m2/month	W/m2
Total load	19.16	72
AC Load	10.37	32
Lighting Load	4.67	14

Conclusion

Air conditioning, which accounts nearly 50 - 60% of total energy consumption is the major contribution towards the energy consumption in commercial buildings. Lighting takes the second place, consuming 25 - 30% of the total load. Even though kettles consume little energy compared to the total, they are important when considering maximum demand.

Reference

1 Sri Lanka Energy Balance – 1998, ECF

2 Energy Audit Reports- NERD

Energy Management in Industrial Sector

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Introduction

Rising fuel cost and diminishing supplies forced industrialists to seek energy saving methods and products. The gap between domestic energy supplies and demand, the need to import large amounts of raw energy materials, the cost of environmental mitigation and quality control equipment have driven the cost of energy to an unprecedented heights. All of us are well aware of the fact that the cost of electricity and petroleum fuels have been inching upward for the past several years and many of us have experienced blackouts, service interruptions brought - about by a scarcity of power in the past few years.

It is the responsibility of the Engineering Manager/Chief Engineer to see that his plant has the electrical power necessary to sustain the plant activities. Therefore, identifying and stopping power wastage in the plant rests on the shoulders of the engineering manager.

Energy conservation has evolved from a means of coping with severe energy shortages to a way of improving the profitability of the operation. These facts have led many industries to establish long-range permanent energy conservation programs. We must not lose sight on the fact that energy conservation and reduction of electricity costs should be given prime consideration on an around – the – clock basis. The best specific approach will be different for each industry but there are some general rules that can be applied to all industries.

Principles of Energy Management

The wise management of available energy requires the total involvement of people, because energy management is 80 percent attitude and 20 percent technology.

Therefore, an energy management program will progress as energy facts are explained to employees, role of each individual is defined and targets are set.

The following basic principles of energy management should be engineered for a proper energy management system.

- Initiation of Energy Conservation program
- Establishing of effective Energy Monitoring and Reporting system
- Analyzing the energy conservation measures
- Analyzing the energy management program

1. **A monitoring and reporting program includes**
   - Recording the basis energy data
   - Historical records
   - Tracking year to year improvement
   - Identifying the best conservation projects.

2. **Understanding the energy budget and goal**

   Having establishing energy management practices need to be followed to be followed to achieve the goals.

Energy Management Practices

- Energy Auditing
- Identify conservation opportunities
- Analyzing the saving potential
- Implementation of viable projects.

Industrial sector consumes approximately 20% of the total energy supply in the country. This amount as a percentage of total commercial energy (Petroleum and Electricity) accounts for 26% in the year 1999. Out of this, electricity accounts for only 23% and the balance is petroleum oil.

Cost reduction in electrical systems

More than 80% of the electrical energy supply is consumed in electric motors in the industry. Therefore, energy saving the electrical system solely depends on their efficiencies. Energy efficient opportunities can be found in

- Proper motor sizing
- Motor selection
- Motor control
- Maintenance

Cost reduction in thermal systems

Most industries use boilers for their thermal heat supply. Therefore, efficient use of steam produced by burning petroleum oil guarantee the low fuel bills. Following areas need to be attended to in this respect.

- Efficient operation of boilers
- Efficient operation of steam distribution systems and end users.

The above guidelines will help to develop a proper energy management system for an industry to reduce its energy bill if instituted effectively.