CONSERVING ELECTRICITY IN GOVERNMENT INSTITUTIONS: CASES OF THE UNIVERSITY OF PERADENIYA AND THE INSTITUTE OF FUNDAMENTAL STUDIES

by

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Abstract

Electricity conservation in government institutions in Sri Lanka is discussed using the cases of the University of Peradeniya and the Institute of Fundamental Studies. The consumption patterns and the imperatives for conservation are discussed. The financial imperative is effective in inducing top management to conserve. Realistic electricity rates and budgetary control from the Treasury can promote conservation. However, even in cases, of budgetary pressure and recognition of the need for conservation by the top management, some institutions are unable to conserve effectively. The inability to conserve goes along with hazardous, unhygienic and unreliable facilities and waste. The difficulties in implementing a program of conservation were identified as poor internal financial control, poor internal communication, poor organization of the institution and poor personnel management. The outlook of the top management regarding technical work and workmanship could be another impediment. The relative importance of these factors varies from institute to institute.

1.0 Introduction

Why should a government servant conserve electricity at office when he or she does not pay for it? This appears to be the central dilemma of conservation in government. This question gains urgency because of the recent electricity crisis and the escalation of electricity rates. The electricity bill of the University of Peradeniya (UOP) is three million rupees a month — an amount that was equivalent to the salaries of one half of the academics (Statistical Unit, 1993). The bill of the Institute of Fundamental Studies (IFS) in Kandy is three lakhs of rupees, which is as extravagant as the University when one considers its budget. Both at UOP and IFS, electricity bills keep rising and have become unaffordable. At UOP, the escalating electricity bill prompted the Bursar, the Vice Chancellor and the Registrar to issue circulars asking that all lights and other equipment be turned off when not needed. At IFS, the Accountant wrote to the Director, "please request the Project Leaders to reduce their consumption of electricity". There have also been pleas from the State in times of crisis in electricity supply to reduce consumption.

In this paper, the patterns of electricity consumption, the possible conservation strategies and the obstacles faced are outlined using two case studies: that of the University of Peradeniya and the Institute of Fundamental Studies.

2.0 Case Studies

2.1 Energy Audit at the University of Peradeniya

The University of Peradeniya is the oldest and largest University in Sri Lanka. It was founded in 1942 in a salubrious site of 700 ha of land at Peradeniya by the side of the Mahaweli Ganga with the Hanthana Hills as the backdrop. Its climate is pleasant throughout the year. Apart from the Mahaweli, the Mau Oya stream and few other creeks run through the campus. It has faculties in Arts, Agriculture, Engineering, Medicine, Dentistry, Veterinary Science and Science. Faculties in Law and Management are to be established soon. It has 6600 undergraduate and 1200 postgraduate students. 5100 undergraduates are housed on campus of-

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ficially. More find accommodation illegally. Accommodation for limited numbers from all categories of staff is provided on campus in 230 housing units. The design of the early buildings was inspired by the traditional Sri Lankan architecture, which took advantage of natural lighting and ventilation. The design of important contemporary buildings has ignored the architectural heritage of UOP.

The maintenance unit carries out the upkeep of the University. It functions under a Works Engineer, who has two other engineers on the staff. The Works Engineer reports to a Deputy Registrar.

In 1996, the final year chemical and mechanical engineering students conducted an audit of the energy use in the Faculty of Engineering (Samaraweera, 1996) as part of a course on Energy that I taught. Another group of five third year students audited the energy use in the University (Ratnaweera et al., 1997). Another group of twenty students drawn from all faculties conducted an Environmental Impact Assessment of the University as part of a course on Environment Assessment under my guidance (Dharmasena et al., 1997).

2.1.1 The findings of these studies were:

- The University does not investigate the use of electricity in any manner.
- Wiring diagrams are not available.
- There is inadequate monitoring of the use of electricity. There is no overall meter even for each Faculty or Hall of Residence. Only recently were the staff quarters outfitted with electricity meters. Within the Engineering Faculty, only three laboratories have electricity meters. The users of these labs were unaware of the consumption patterns. The Halls of Residence have a few electricity meters among them and these are haphazardly located.
- There is no monitoring or financial control over electricity consumption. Indeed, the University administration only maintains overall bills with no understanding of the breakdown within the campus.
- Approximately 45% of the electricity is consumed in the Faculties, 40% in the Halls of residences, 6% each in the staff quarters and 6% in the various service units.
- Of the total usage in the Faculties, Engineering consumes 32%, Medicine 20%, Agriculture 16%; Science 12%, Dental 8%, Veterinary Science 8% and Arts 4 %.
- In the Faculty of Engineering, the consumption is heaviest in the Workshop (25%), Computing Centre (17%), Electrical Engineering Laboratory (10%), Fluids Laboratory (9%) and Chemical Engineering Laboratory (7%).
- In the Faculty of Engineering, machinery accounts for 34%, air conditioning for 30%, illumination for 16% and computers for 7% of the consumption of electricity.
- The consumption in the Halls of Residence varies from 14 kWh per student per month at Wijewardene Hall to 35 kWh at Sanghamitta Hall indicating wastage. Lighting is often left on indiscriminately. Cooking in the rooms with electric hot plates is another reason for high consumption The newly established New Akbar Hall has been outfitted with ceiling fans, which some students leave on during the day to dry clothes.
- The electricity consumption in some staff quarters varies considerably: in one instance, the usage in one unit was ten times as much as another of the same category. The University subsidizes the electricity bill of heavy users.
- There is little consideration for energy efficiency in the design of new buildings. For example, the large Examination Hall for External Students had been constructed 10 years ago without allowance for natural ventilation or lighting. As a result, electricity is consumed for approximately 40 bulbs and 20 fans during the daytime. Examinations have been disrupted unnecessarily during the day because of electricity failures.
- Water costs electricity for treatment and pumping. However, water is rather wastefully used. Indeed, there is no appreciable difference in water usage, when students have vacated the University or when the Faculties are closed because of strikes. The distribution of water is inefficient. Treated water that has been pumped up to the high storage tanks in Uda-Peradeniya is brought back down for purposes such as gardening.
- There is no program of preventive maintenance. Taps leak for months at a time. When malfunctioning equipment is reported, there are inordinate delays in maintenance work.
- There are more power cuts in the Campus than in the Peradeniya town. The Ceylon Electricity Board handles the maintenance in the town.

2.1.2 Recommendations

There are ample opportunities for conservation at the UOP that will also improve safety, efficiency and reliability of the electricity supply. The following steps were recommended:

- An energy conservation unit to monitor energy and water use, educate employees and students, and provide advice on conservation and highlight difficulties should be established.
- Wiring diagrams of the electricity supply must be prepared.
- Every laboratory, office complex and floor in a Hall or Residence should be outfitted with an electricity meter.
- Financial incentives should be provided for each unit to conserve.
- The need for air conditioning should be re-assessed and the consumption for air-conditioning should be reduced.
- Equipment that is to be purchased should be vetted for energy efficiency.
- Energy efficiency should be considered when buildings are to be constructed or restructured.
- The conservation of water is the conservation of energy as well. If water is wasted, it overloads drains and septic tanks and dampens buildings.

2.1.3 Outcome

These results were publicized in two seminars organized by the Centre for Environmental Studies of the University. The relevant officials were invited. The Vice Chancellor came for the meeting and the reports were submitted to him. The report from the study done in the Faculty of Engineering was submitted to the Vice Chancellor, Dean of the Faculty and Heads of Departments. These recommendations were not carried out. In the Computing Centre, alone, the Director took measures to conserve. The temperature setting of the air-conditioners was monitored and the number of air conditioners that were used was reduced when there were fewer users. These steps not only helped conserve electricity but also reduced the demands on the supply and on the Uninterruptible Power Supply.

A proposal to expand the supply capacity of the University was approved and funded rather than any program to reduce wasteful use of electricity.

2.2 Electricity Audit at the Institute of Fundamental Studies

The Institute of Fundamental Studies was established by Act of Parliament in 1978 to conduct research into the physical, chemical, biological and social sciences. Most research projects have a bearing to the resources of Sri Lanka. The majority of the projects is experimental and use electricity for laboratory equipment and air-conditioning. 14 postdoctoral scientists, 5 visiting postdoctoral scientists, 23 postgraduate students, 11 laboratory assistants, 8 pre-University students and several volunteers carry out the work in 16 research projects. The Institute is located on the Hanthana mountainside above Kandy. It occupies the former Hotel Hanthana. Hotel rooms have been converted into laboratories. While the original designs of the buildings were energy efficient, later modifications into laboratories were not. A Building Supervisor who has 6 workers under him handles maintenance.

In 1997, the Accountant of the IFS raised the issue of escalating energy bills and I was asked to evaluate (Zubair, 1997).

2.2.1 Findings

- Employees are unaware of the extent of the energy usage in their units.
- There is no monitoring of electricity usage by projects or units.
- Wiring diagrams are not available.
- Five units of the 20 in the IFS account for 75% of the electricity consumption.
- Up to 75% of the energy consumption at IFS is due to 25 equipment such as 13 air conditioners, 2 ovens and 2 incubators.
- Air conditioners account for 37% of the electricity use, furnaces, ovens, pumps and similar equipment use 25%, illumination for 15% and computers and office equipment for 9%.

2.2.2 Recommendations

- Employees should be made aware of the consumption patterns.
- A person should be recruited to look after the electrical system. This person will maintain records regarding energy consumption and promote conservation.
- A wiring diagram is required not only for conservation but also maintenance. Equipment necessary for monitoring energy use and conservation should be purchased.
- Meters should be installed for all laboratories and service units.
- Incentives should be provided for projects and units to promote conservation.
- Air-conditioning systems in place must be evaluated to minimize waste.
- Power Factor correction should be implemented to reduce the charge for peak KVA usage, which is approximately 15% of the electricity cost.
- Attention must be focused on the top 25 energy consuming devices, which account for 75 % of the total energy consumption.

- Future purchases of equipment must be vetted for energy efficiency.

2.2.3 Outcome

This survey was conducted two years ago. Reports were made available to the officers and the staff. Two seminars were presented on Energy audit and conservation measures. The electricity consumption did reduce marginally due to awareness. However, for the last two years, none of the recommendations of the report was implemented. As the electricity costs have been escalating further, interest in conservation has been renewed.

An energy audit was carried out the National Engineering Research and Development Centre (NERD) in March 1999. The NERD Centre evaluation was received but remains to be implemented. A decision has been taken to install meters in all units and to account for the electricity and water usage by each unit. However, this too has not been implemented.

3.0 Imperatives for Conservation in the State Sector

In general, the possible imperatives for employees to conserve in the state sector are

- Conservation ethic among employees
- Sense of duty and loyalty to the Institute
- Patriotism of employees
- Social, environmental and human costs of new power generation plants
- Safety and health of the workers
- Longevity of the physical plant
- Better electricity supply

In both institutes, the employees were supportive of the energy audit and conservation efforts in general. Employees were not aware as to the details of where energy is being wasted and how it can be conserved. The goodwill of the employees for conservation that exists has not been supported. Thus a proper monitoring and awareness program is essential. To monitor consumption, the first step is to install electricity meters in every identifiable unit within the institution.

In state institutions, there is greater inertia to act on energy conservation. In both institutions, it was only the financial imperative that led to the recognition that conservation is needed. The increase in electricity rates to more realistic levels, the removal of subsidies, good accounting practices and realistic budget does lead to conservation.

Some imperatives for conservation such as patriotism, the urgings of the State to conserve and the social, environmental and human costs of new power generation plants are remote considerations for the employees. More immediate imperatives such as worker safety and health, longevity of the physical plant and better electricity supply overall is not appreciated by employees and not communicated among them.

Apart from education and incentives, the third category of imperatives is disciplinary action. That possibility should be open in case of sabotage or deliberate wastage but it is the last option and one that is the least desirable.

4.0 Impediments to Conservation

On occasion when the top management is keen to conserve, the main difficulties that have been identified in implementing conservation programmes are poor internal financial control, poor communication within the institution, poor organization of the institution and poor personnel and maintenance management.

4.1 Poor Internal Financial Control

Financial control within the institutions is an effective tool to promote conservation. However, electricity use is often anonymous and not accounted for. It is essential if financial discipline is to be used to promote conservation, that electricity consumption ceases to be an "open-access good". Use of electricity must be accounted for. Thus if electricity bills are charged to Laboratory or Department budgets in the UOP and to Project budgets in the IFS it will induce conservation. As it is, Laboratory, Department or even Faculty budgets does not exist for electricity within the UOP. Disincentives, such as charging the occupants of staff quarters with a flat rate rather than for their metered water consumption should be eliminated. The provision of subsidies may lead to inefficient energy use. For example, the provision of free electricity in cafeterias induces the private management to use electricity instead of the more energy efficient liquefied petroleum gas for cooking.

4.2 Poor Communication and Lack of Awareness

One reason why conservation fails is because the employees are unaware. In many institutions, most officials are not aware of the cost of electricity. Even if they did, they may not have a notion of what practices lead to high consumption.

One difficulty at both UOP and IFS is the lack of an employee forum to highlight these matters. No newspapers, newsletters or bulletin boards that provide such information are available. All that is available are

directives from the top. Indeed, energy conservation needs better access to information among employees and communication at all levels.

Some officers with the imperative to conserve, act, but only have a vague notion as to how effective their actions are. Thus in a conservation programme the education of the employees must follow an assessment of the consumption patterns and monitoring. Monitoring encourages conservation and identifies where efforts should be directed. Employees will like to know the effectiveness of their efforts to conserve.

4.3 Poor Organization and Management

At Peradeniya, there is no program of preventive maintenance. The provision of materials for maintenance is slow. There is no systematic recording of breakdowns. Perhaps its symptomatic of the importance given to the maintenance unit that it is housed in one of the most run-down buildings on campus - a dilapidated tea factory.

In the University, the highest officials are unable to take effective remedial action. Decisions regarding the University's infrastructure and maintenance are left to the Lands Buildings and Maintenance Committee (LBMC). This committee comprises of the Deputy Registrar, Works Engineer and academic representatives from the different Faculties. The members of committees save few have no exposure to maintenance or engineering. The LBMC meets once a month and decisions are often delayed as they request for more information. Even after a decision is taken another month elapses before implementation, as the minutes of the meeting have to be confirmed. The members are not personally aware of the problems that the maintenance department faces. Academic members of the LBMC will point to the fact that theirs is a voluntary appointment. Such Committees are inefficient at handling maintenance or labour force.

Members of the LBMC point to numerous restrictions they have in effective action on account of the administrative procedures within the University. Such administrative gridlock seems to prevail in larger established institutions.

4.4 Poor Personnel Management

Employees who feel ill treated by management do not cooperate with conservation efforts. Indeed, they are reluctant to provide energy conservation statistics, as they fear some conspiracy on the part of the management directed against them. If employees are disgruntled they lose their goodwill to the institution.

4.5 Poor Maintenance Management

The relationship between the management and the technical staff is important. Often the highest officials have a background in the humanities. They sometimes do not appreciate the difficulties in maintenance. Even when scientists hold the top management, they can be dismissive of the difficulties that the maintenance staff has. Adequate cadre positions and personnel are not provided for technical divisions. Essential tools are not provided. Orders are given for improperly planned work. Adherence to design codes is ignored. Proper administrative procedures are not instituted. The need for employee training is not appreciated. The need for rapid purchasing during the job is not appreciated. Solutions to bottlenecks are not provided expeditiously. Most of all the hard work of the technical staff is not appreciated.

5.0 Conclusion

The two institutions that are discussed are not entirely typical of government institutions. Other institutions may be focussed on office complexes and industries rather than laboratories. All the same they provide important lessons regarding conservation at all institutes. The University of Peradeniya is a special institute that houses future government leaders. The example it provides and the values it sets will affect the attitudes of future leaders of various government institutes.

The effective imperative that moves management in government institutions to conserve is the financial imperative. Realistic electricity rates and good budgetary control from the Treasury can promote conservation within state institutions. However, even in cases, of budgetary pressure, some state institutions are unable to effectively conserve. The inability to conserve is only one aspect of poor management and it seems to go along with hazardous, unhygienic, unreliable and wasteful supply of utilities.

The impediments in implementing a program to conserve were identified as poor financial control, poor communication within the institution, poor organization of the institution and poor personnel management. The outlook of the top management regarding technical work and workmanship could be another impediment. The relative importance of these factors may vary from institute to institute.

Thus when we ask the question as to what will make the government servant conserve - the answer is in awareness, sense of duty and incentives. Most government servants are not perversely driven to waste. It is really that the framework necessary for conservation

is not in place. The question, more appropriately, is not why the government servant, who does not pay for electricity, does not conserve, but why government institutions that pay for electricity, cannot conserve.

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