A University's Energy Operation: Basis for Energy Management Policy

Asia Pacific Journal of Multidisciplinary Research
Vol. 3 No.5, 157-162
December 2015 Part I
P-ISSN 2350-7756
E-ISSN 2350-8442
www.apjmr.com

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Date Received: October 8, 2015; Date Revised: December 19, 2015

Abstract - *University's energy management policy is more important as schools espouse new practices, technology and equipment that can affect energy needs. One of the programs is the Government Energy Management Program (GEMP) which aims to integrate efficiency concepts into the operation of government agencies to realize the reduction target of ten percent in electricity and fuel consumption in compliance with the presidential; directive under AO 126. From this perspective, this research looked into the energy operation in Cebu Normal University in order to come up with an energy management policy. Triangulation method with quantitative approaches was made in order to analyze the data gathered from primary as well as secondary information. The university's consumption on electricity in the past 3 years, 2009 - 2011, shows a consistent increase in the monthly consumption of electricity from January to February and March due to various activities conducted for every last two months of the second semester. The university officials and the non teaching staff asserted that "the soaring prices of fuel and commodities are the barometer of the electricity crisis" while the teaching personnel mentioned that "energy crisis is manifested in the oil price increase". Likewise, the students agreed and felt that "in the fast pace of modernization, the demand of energy is getting higher". The current status of the university Energy Management Policy is belonged to Level 1 which means that the university had created small steps towards energy management. Consequently, the university's energy saving practices and the energy management level of sophistication were influenced by the electricity consumption of stakeholders'. Thus, the university's ability to devise energy conservation strategies and to raise its level of energy management level of sophistication can effect lesser energy consumption, thus efficient energy management system is attained.*

Keywords: *Energy Operation, Energy management Policy*

INTRODUCTION

Smart energy management is more important as schools adopt new practices, technology and equipment that can affect energy needs. Recently, more and more schools are expanding their hours, reducing class size, employing high technology, putting up infrastructure and adopting other measures to improve student performance. These changes generally increase schools electrical consumption and cost.

The government has passed several laws for efficient energy management and has created programs which focused on energy efficiency and conservation. Its objective is to make energy conservation a way of life for every Filipino through the theme "EC way of life"[1] . One of the programs is the Government Energy Management Program (GEMP) which aims to integrate efficiency concepts into the operation of government agencies to realize the reduction target of ten percent in electricity and fuel consumption in compliance with the presidential; directive under AO 126[6] . Accordingly, the major activities under the this program will include the conduct of monitoring and energy audit spot check in all government buildings and the conduct of seminars on energy efficiency and energy conservation for government employees.

However, a study was conducted on Electricity by Lund[4] revealed that like any other educational institutions, electrical energy runs the campus like computers, printers and lightings. Furthermore, students watch movies and slides in classes, generally, the campus would not run without electricity. However, in Consumption of Energy in our School,

the proponents found that respondents never wanted to reduce their level of welfare, they only needed to change people's habits for a greater energetic efficiency and a more sensible use of energy.

Hence, energy assessment can be seen as part of management activities that enhances good policy making. Information from energy assessment helps to eradicate energy wastage, minimize losses and maximize profit. Therefore, it has been encouraged in all levels of national development. Electricity could not be seen as right, but as a demanded commodity with a price tag. All who need it pay for it; therefore economies of energy have to be upheld by all. The University community being a research institution should be supported by all stakeholders in the quest for a steady power supply. This will create a conducive environment for learning and research that will affect positively the development of the university in particular and the nation at large[1].

On Sundan's study entitled Energy Conservation within Anmesley College, he urged everyone in the college to raise awareness regarding the use within the campus and formulate a successful plan for energy conservation whose impact could be seen on the College's financial situation. He further mentioned that energy conservation is an applied exercise, rather than a theoretical one and stressed the importance of promoting energy conservation within the school such as newsletter, flyers, announcements and others.

Thus, this research intends to provide an overview on the electricity operation of the University in order to come up with an energy management system to demonstrate the role that it may play in the policy direction. The research will also provide a unique situation for the analysis of electricity consumption of the University. Its isolation from the utility grid provides an ideal situation for implementing an energy audit to determine the profile of its electricity usage and to institute the correct electricity efficiency program.

Theoretical/Conceptual Background

The Stone Age is just around the corner .When the electricity goes out, you are back in the Dark Ages [2].

It is a fact that people have become very dependent on energy for almost everything such as for transportation, production of goods and practically, in doing things. The energy sources people have been using would include the fossil fuel, hydroelectric energy, nuclear energy, wind power, biomass, hydrogen fuel, vegetable oil, tidal power, solar energy or geothermal energy. However, with the increase in population, increase in the demand for energy is expected. A time will come when energy production could no longer supply the demand. According to the Oldivai's theory, as stated in Duncan[3], industrial civilization as defined by per capita energy consumption will have a lifetime of less than or equal to 100 years (1930-2030) only.

Hence, the government has instituted many programs on energy conservation in which the different branches of the government, local government units, schools and the private sectors are strongly urged to adopt measures as provided. Section 2 of Republic Act No. 7638[8], otherwise known as the Department of Energy Act of 1992 declares the policy of the State to ensure a continuous judicious conservation, renewal and efficient utilization of energy, to keep pace with the country's growth and economic development. With this, all government agencies are directed the institutionalization of a government energy management program (GEMP) under Administrative Order 110[7].

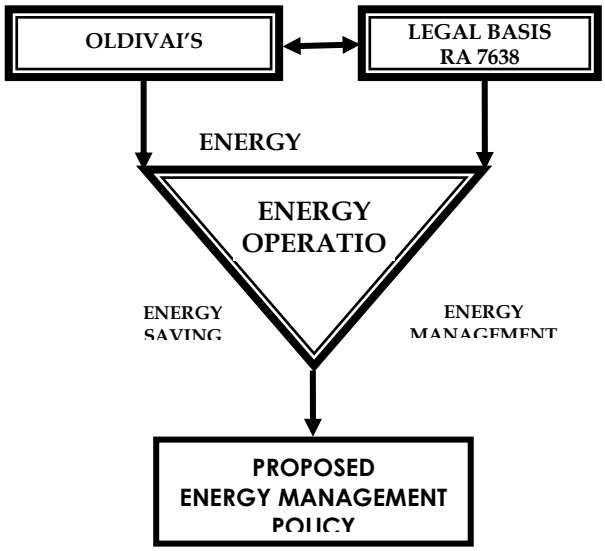

Fig. 1 Schematic Diagram of the Theoretical/Conceptual Background

However, as one of the energy consuming sectors, Cebu Normal University, is responsible to implement guidelines, rules and regulations to ensure compliance with the provisions on energy conservation. Agencies like CNU are expected to have a continuous, adequate, reliable and economic supply of energy

through the judicious conservation, renewal and efficient utilization of energy to keep pace with the country's growth and economic development as stated in Republic Act 7638[8].

As shown in Figure 1, this study focused on the university's energy operation as indicated in its energy saving practices and level of sophistication in the various aspects of energy management as well as their significant roles in the electricity consumption of Cebu Normal University in order to come up with an energy management policy to reach the target of reducing its monthly consumption of electricity by at least ten percent as stated in the Administrative Order No. 110 which has directed the institutionalization of a government energy management program[7].

OBJECTIVES OF THE STUDY

This study looked into the energy operation in Cebu Normal University in order to come up with an energy management policy. It aimed to determine the university's electricity consumption for the past three (3) years; to identify energy saving practices are conducted by the stakeholders; to evaluate the university's level of sophistication in the different aspects of energy management; and to propose a management policy can be designed to reduce energy consumption.

METHODS

This research made use of triangulation method with quantitative and qualitative approaches in order to analyze the data gathered from primary as well as secondary sources.

Participants

The respondents, taken at random, were the people involved in the utilization of electricity.

Table 1. Distribution of Respondents

Respondents		f
a.	University Officials	5
b.	Academic Council	20
c.	Administrative Council	10
d.	Energy Conservation Officer (if there is)	none
e.	Teaching Staff (representative of all colleges)	30
f.	Non-Teaching Staff (representative of all offices)	30
g.	Students (representative of all colleges)	200

Instrument

Data on energy consumption were gathered from secondary sources or documents. Survey questionnaire, interview/FGD and ocular inspection/observation guides were used to determine the energy saving measures or energy conservation the university had been disseminating and implementing in the eyes of the faculty, non teaching staff and students.

Furthermore, the Energy Management Matrix of Energy and Greenhouse Management Toolkit was utilized which provided the level of sophistication of the different aspects of energy management such as the energy management policy; organizing; staff motivation; tracking, monitoring and reporting systems; staff awareness/ training and promotion; and investment. The matrix would identify those aspects where some further attention is required to ensure energy management is developed in an effective way which could be used in organizing an energy management system. The ascending rows, from 0 to 4, represent the increasingly sophisticated nature of these issues:

Level 0 – Energy management is not on the organization's agenda. There is no energy management policy, no formal energy management structure, no means of reporting and no specific person in charge of energy use.

Level 1 – Small steps towards energy management. While there is no official energy management policy, an energy manager has been appointed. The energy manager promotes an awareness of energy matters via a loose network of informal contacts with those directly responsible for energy consumption. This person also responds to requests for advice on an ad-hoc basis.

Level 2 - Energy management is acknowledged as important by senior management but in practice there is little active commitment ro support for energy management activities.

Level 3 – Senior managers acknowledge the value of an energy reduction program. Energy consumption issues are integrated into the organization's structure. There is also an agreed system for energy management and investing in energy efficiency.

Level 4 – Energy consumption is a major priority throughout the organization. Actual performance is monitored against targets and the benefits of energy efficiency measures calculated. Achievements in energy management are well reported and energy consumption is related to its impact on wider environmental issues. Senior management is committed to energy efficiency.

RESULTS AND DISCUSSION

This section presents the gathered data, discusses the results and provides implications for the analysis of the research. The data are exhibited in the order of the problem statement.

Energy Consumption

This section presents the data of the university's consumption on electricity in the past 3 years, 2009 - 2011. Figure 2 shows an increase in the monthly consumption of electricity of the university over those years. At a glance, it could be noted that there had been consistent increases in electricity consumption from January to February and March within the three years: in 2009, 56% and 78% increase, respectively; in 2010, 73% and 107% increase; in 2011, 51% and 62% increase.

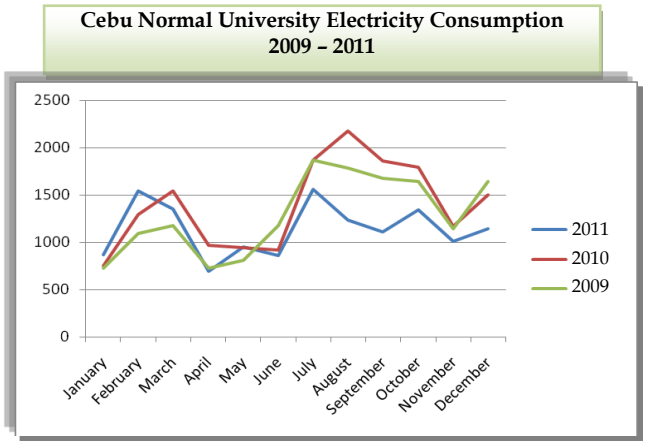

Figure 2. Energy Consumption

The increases could be attributed to the many activities conducted in these last two months of the second semester which would include final examination, culminating activities, commencement exercises after a series of rehearsals, entrance examinations in all the colleges, aside from building repairs and construction.

Then, electricity utilization went down in the months of April, May and June such as an average decrease of 38 percent in 2009, 39 percent in 2010 and 23 percent in 2011. The reasons for the decrease could be the long summer vacation with limited classes and activities conducted in these months.

However, the months of July and August had the highest peak of electricity consumption through the years with an average increase of 63 percent in 2009, 121 percent in 2010 and 126 percent in 2011. Even if the utilization of electricity went down in the succeeding months of September and October but the consumption was still high compared to the previous months. The increase could be ascribed to the classes and many activities in these months such as intramurals, major examinations and other sessions conducted in the first semester utilizing lights, aircon, LCD, laptops and other electricity-powered equipment and devices, aside from repairs or construction of buildings or facilities. It could be notably seen from the graph that there was a decrease in the utilization of electricity in the month of November through the years which could be due to the semestral break where less activities would be done. However, the consumption gradually increased in the month of December as the second semester commenced.

Table 2. University Yearly Electricity Consumption (KWHr)

Month/ Year	2009	Percent	2010	Percent	2011	Percent
January	869	6%	748	4%	729	5%
February	1,549	11%	1,296	8%	1,098	7%
March	1,354	10%	1,547	9%	1,182	8%
April	694	5%	967	6%	733	5%
May	951	7%	938	6%	810	5%
June	860	6%	917	5%	1,175	8%
July	1,563	11%	1,870	11%	1,870	12%
August	1,240	9%	2,179	13%	1,784	12%
September	1,115	8%	1,859	11%	1,680	11%
October	1,345	10%	1,795	11%	1,647	11%
November	1,015	7%	1,165	7%	1,149	7%
December	1,148	8%	1,505	9%	1,642	11%
	13,703	100%	16,786	100%	15,499	100%

In totality, there had been an increase in electricity consumption from 2009 to 2010 by 22.5 % and a decrease from 2010 to 2011 by 7.7%. The erratic trend in the consumption of electricity could be due to the implementation of grants or projects such as installation of electricity-driven equipment and devices, construction or rehabilitation of facilities, laboratories and buildings. Consciousness in the efficient management of energy as reflected in the level of sophistication in the different aspects of energy management and as depicted in the energy conservation practices could be some important factors affecting the consumption of energy in any organization.

Energy Saving Practices

All the respondents such as the university officials, non teaching and teaching personnel as well

as the students believed that "the world is facing energy crisis now". The *university officials* and the *non teaching staff* asserted that "the soaring prices of fuel and commodities are the barometer of the electricity crisis" while the *teaching personnel* mentioned that "energy crisis is manifested in the oil price increase". Likewise, the *students* agreed and felt that "in the fast pace of modernization, the demand of energy is getting higher".

To face the alarming situation, the *university officials* and *non teaching personnel* shared that they "turn off the lights, the air conditioning units and computers when not necessary just like during lunch break, others." The *teaching staff* mentioned about "the university's greening with plants which can be one way to use energy wisely and reduce heat due CO_2 emissions." The *students* agreed that "using lights and ceiling fans in the classrooms only when necessary, not charging their cell phones and laptops in school and observing reminders such as *Last to Go, Has to Do* in switching off the lights can be useful practices". Most respondents believed that the 4 days work week could help conserve energy. However, they had a common observation that there had been neither policy nor information disseminated to arouse everyone's consciousness on energy saving practices.

Level of Sophistication in Different Aspects of Energy Management

The Energy Management Matrix was used to identify and describe the current level of sophistication of the different aspects of energy management in the university (BRECSU 1993) such as energy management policy; organizing; staff motivation; tracking; monitoring and reporting systems; staff awareness and training promotion and investment.

Table 3. Energy Management Level of Sophistication

Levels	Energy Management Policy	Organizing	Staff Motivation	Tracking, Monitoring and Reporting Systems	Staff awareness and Training Promotion	Investment
4						
3						
2						x
1	x	x	x		x	
0				x		

Based on the current status of the university, Energy Management Policy belonged to Level 1 which means that the university had created small steps towards energy management. While there was no official energy management policy, the Vice President for Administration had been assigned to respond to energy matters. The institution lacked policies to be observed by stakeholders in reducing the institution's energy bills wherein these policies and procedures had to be reviewed regularly.

The university fell under Level 1 in terms of the Organizing aspect, where the Vice President for Administration managed the facilities including power transformer and power meters; however, line management and authority was unclear since an energy committee had not been created. There was an absence of an implementation team that would assist the energy manager to define and document roles, responsibilities and interrelating functions that would affect the energy performance as well as the allocation of financial and staffing resources. Nevertheless, there was an informal contact between the assigned manager and few users.

On Staff Motivation, the university was categorized as Level 1 inasmuch as there was no define information system about energy utilization, consumption and conservation except in terms of cost/expenditures from Accounting Office. The importance of encouraging staff in using energy wisely and other related concerns cannot be underestimated.

The aspect of Tracking, Monitoring and Reporting Systems was categorized under Level 0. There was no existing system nor accounting for energy consumption in this regard. It is indeed important to know the baseline or energy profile such as what it costs, how much energy is used and where it is used, to be used for future action. Tracking and monitoring systems for energy utilization and then analyzing the data would provide ways to use energy resources to their maximum advantage.

The aspect of Staff Awareness, Training and Promotion belonged to Level 1 where informal contacts were used to promote energy efficiency. There was lack of programs for staff training, awareness and regular publicity campaigns which would aim to raise awareness among the staff the importance of energy efficiency. Energy management system as a process of continuous improvement has to be regularly evaluated, consistent with ISO 14001 principles.

For several years now, the university had increased its demand for electricity due to additional

buildings and installation of high tech devices and equipment; however its electrical set up was still the one designed and installed many years ago when buildings were so few and computers and other high technology devices were not yet invented. On Investment, the university belonged to Level 1 where only minimal measures in terms of finances were taken. A system had to be installed in investing in energy efficiency.

Generally, the energy management aspects as expressed in the different levels of sophistication could be identified as to which required further attention to ensure that energy management had been developed in an effective way.

CONCLUSION

Based on the findings of the study, the university's electricity consumption seemed to be influenced by the stakeholders' energy saving practices and the energy management level of sophistication. In facing the challenges, the university's ability to devise energy conservation strategies and to raise its level of energy management level of sophistication can effect lesser energy consumption, thus efficient energy management system is attained.

RECOMMENDATIONS

To address the university's goal of efficient energy management, the following recommendations are hereby enumerated:

1. Putting up a power patrol in every department/unit to monitor on the efficient use of electrical equipment/device.
2. Mounting meters in every department in order to pinpoint responsibilities and monitor costs associated to department's utilization of electricity.
3. Rewiring the school's electrical structure in a way that distribution loss will be minimized
4. Changing fluorescent bulbs into energy efficient bulbs.
5. Equipment acquisition should be carefully planned as much as possible.
6. Conducting intensive campaign, information dissemination, and training on energy conservation.
7. Imposing policy guidelines on the use of gadgets in the premises of the University.
8. Implementing regular maintenance of the equipments in the University
9. Monitoring energy utilization, consumption and efficiency improvement.
10. Designing new buildings that suffice proper luminescence and open for ventilation and placement of potted plants to produce relaxing environment conducive to learning.
11. Designating an energy manager to implement the Energy Management Policy of the University.

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