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ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

ISSN: 0976-3376

Asian Journal of Science and Technology
Vol. 10, Issue, 01, pp.9192-9201, January, 2019

RESEARCH ARTICLE

INTEGRATING AWARENESS CONSERVATIVE AND ENVIRONMENTAL ELECTRIC ENERGY FOR ENGINEERING'S STUDENTS IN RAJABHAT MAHA SARAKHAM UNIVERSITY

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ARTICLE INFO

Article History:
Received 10th October, 2018
Received in revised form
19th November, 2018
Accepted 14th December, 2018
Published online 30th January, 2019

Key words:
Integration,
Awareness,
Conservation,
Environment,
Electric energy,
Engineering's students.

ABSTRACT

To assess engineering students' perceptions of their behaviors to their usages the energy conservative and environmental awareness were integrated, and the problems, obstructions, and suggestions of their behavioral effects to their usages the energy conservation and environmental awareness were analyzed. The quantitative and qualitative data was collected with the 29-item Fostering Conservative and Environmental Energy (FCEE) Questionnaire on five ranking level in five scales, the Depth Interview and Observation Forms were assessed with a sample group of 648 personnel that composted of 12 educational officers, 53 instructors and 583 engineering students in Faculty of Engineering, Rajanhat Maha Sarakham University as the case study in four months (April, July, October, and December, 2016). Students' responses to a questionnaire on their perceptions indicated that on building lighting and comfortable energy scales as *Sometimes* totalized level, students' performances of their usage electric energy and their conservation and environment effects indicated of *Often* level on their supporting building engineering, and they responses of their perceptions revealed that of Almost always with level on and their building integrated design. Suggestions that, students must emphasize to reduce the integrating awareness conservative and environmental electric energy at their home and the earth's natural resources to protect energy.

Citation: Pongsakorn Pimphanit, Paisan Ekkakul and Chawisorn Pukhapak, 2019. "Integrating awareness conservative and environmental electric energy for engineering's students in Rajabhat Maha Sarakham University ", *Asian Journal of Science and Technology*, 10, (01), 9192-9201.

INTRODUCTION

Generally, all the existing energy sources have environmental, social and economic impacts. The greenhouse effect results global warming, air pollution and energy security have led to increasing interest and more development in energy conservation. Electrical energy conservation is one of them. Electrical energy is used throughout the world to power devices, appliances and methods of transportation utilized in daily life. To make things operate, electrical energy must be emitted from energy sources such as power plants, to enable an object to consume the power it needs to function. Thailand can partly provide itself with self-produced energy. The total production of all electric energy producing facilities is 168 bn kWh. That is 100% of the countries own usage. The rest of the needed energy is imported from foreign countries. Along with pure consumptions the production, imports and exports play an important role. Other energy sources such as natural gas or crude oil are also used. Although Thailand is 99% electrified, the primary source of energy is domestic and imported natural gas, creating the issue of energy security. Thus, energy diversification should be the prime goal to Thailand to ensure sustainable supply of energy in the country. As of 2012, 45% of primary energy comes from natural gas, 36% comes from oil, 16% comes from coal and 3% comes from hydro. Bio-energy is the dominant renewable energy source in Thailand's end use sectors with 15 TWh generated in 2015 (equal to about 75% of all renewable generation in Thailand). In addition, research continues on energy efficiency and conservation in various buildings of an educational institute is integrated. Several researchers have studied the various energy saving methods and techniques and have recommended some policy suggestions on energy conservation and environment to awareness from a vending machine because the electrical energy is available. This introduction section would be described that following sub-section as:

Energy

In physics, energy is the quantitative property that must be transferred to an object in order to perform work on, or to heat, the object. Energy is a conserved quantity; the law of conservation of energy states that energy can be converted in form, but not created or destroyed. The SI unit of energy is the

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joule, which is the energy transferred to an object by the work of moving it a distance of 1 meter against a force of 1 Newton. Common forms of energy include the kinetic energy of a moving object, the potential energy stored by an object's position in a force field (gravitational, electric or magnetic), the elastic energy stored by stretching solid objects, the chemical energy released when a fuel burns, the radiant energy carried by light, and the thermal energy due to an object's temperature. Mass and energy are closely related (Smith, 1998). Due to mass–energy equivalence, any object that has mass when stationary (called rest mass) also has an equivalent amount of energy whose form is called rest energy, and any additional energy (of any form) acquired by the object above that rest energy will increase the object's total mass just as it increases its total energy. For example, after heating an object, its increase in energy could be measured as a small increase in mass, with a sensitive enough scale. Living organisms require available energy to stay alive, such as the energy humans get from food. Human civilization requires energy to function, which it gets from energy resources such as fossil fuels, nuclear fuel, or renewable energy. The processes of Earth's climate and ecosystem are driven by the radiant energy Earth receives from the sun and the geothermal energy contained within the earth (Harper, 2007). This research study was focused on the electrical energy that it has been used in an educational institute in Thailand. Energy in Thailand refers to energy and electricity production, consumption, import and export in Thailand. According to the Ministry of Energy, the country's primary energy consumption was 75.2 Mtoe (million tons of oil equivalents) in 2013, an increase of 2.6 percent over the previous year (Ministry of Energy, 2013). Thailand produces roughly one-third of the oil it consumes. It is the second largest importer of oil in SE Asia. Thailand is a large producer of natural gas, with reserves of at least 10 trillion cubic feet. After Indonesia, it is the largest coal producer in Southeast Asia, but must import additional coal to meet domestic demand. Ninety percent of Thai electrical generating capacity is conventional thermal. Oil-fired plants have been replaced by natural gas, which as of 2016 powers 60 percent of electrical generation. Coal-fired plants produce an additional 20 percent, with the remainder from biomass, hydro, and biogas. As of 31 May 2018 the Electricity Generating Authority of Thailand (EGAT) produces 37 percent of Thailand's electricity; independent power producers, 35 percent; small power producers, 19 percent; and electricity imports, 9 percent.[4] International power sector governance experts from Harvard University, University of Delaware, and the World Resources Institute lauded the successful repeal of EGAT privatization as an important step towards increased accountability and transparency in the Thai energy industry (Rujivanarom, 2018).

Electrical Energy

Electrical energy is the energy newly derived from electric potential energy or kinetic energy. When loosely used to describe energy absorbed or maybe delivered by an electrical circuit (for example, one provided by an electric power utility) "electrical energy" talks about energy which has been converted from electric potential energy. This energy is supplied by the combination of electric current and electric potential that is delivered by the circuit. At the point that this electric potential energy has been converted to another type of energy, it ceases to be electric potential energy. Thus, all electrical energy is potential energy before it is delivered to the end-use. Once converted from potential energy, electrical energy can always be called another type of energy (heat, light, motion, etc.). Electricity generation is the process of generating electrical energy from other forms of energy. The fundamental principle of electricity generation was discovered during the 1820s and early 1830s by the British scientist Michael Faraday. His basic method is still used today: electricity is generated by the movement of a loop of wire, or disc of copper between the poles of a magnet (The Institution of Engineering and Technology, 2015). For electric utilities, it is the first step in the delivery of electricity to consumers. The other processes, electricity transmission, distribution, and electrical power storage and recovery using pumped-storage methods are normally carried out by the electric power industry. Electricity is most often generated at a power station by electromechanical generators, primarily driven by heat engines fueled by chemical combustion or nuclear fission but also by other means such as the kinetic energy of flowing water and wind. There are many other technologies that can be and are used to generate electricity such as solar photo voltaic and geothermal power (Molina, 2017). In this research study was described the measuring electricity at the building in the educational institute whereas it's used to supporting students and officers (Ministry of Energy, 2018).

Measuring Electrical Power

Electric power is the rate, per unit time, at which electrical energy is transferred by an electric circuit. The SI unit of power is the watt, one joule per second. Electric power is usually produced by electric generators, but can also be supplied by sources such as electric batteries. It is usually supplied to businesses and homes by the electric power industry through an electric power grid. Electric power is usually sold by the kilowatt hour (3.6 MJ) which is the product of the power in kilowatts multiplied by running time in hours. Electric utilities measure power using an electricity meter, which keeps a running total of the electric energy delivered to a customer. Electrical power provides a low entropy form of energy and can be carried long distances and converted into other forms of energy such as motion, light or heat with high energy efficiency. Electric power is transformed to other forms of energy when electric charges move through an electric potential (voltage) difference, which occurs in electrical components in electric circuits. From the standpoint of electric power, components in an electric circuit (Smith, 2001). Electric power is used to provide air conditioning in hot climates, and in some places electric power is an economically competitive source of energy for building space heating (Ignacio, 2014). The amount of energy we use in our homes mainly depends on the climate where we live and the types and number of energy consuming devices we use. The pie chart on the right shows the major energy uses in homes in 2015, when most energy use was for space heating (42%), followed by electronics, lighting and other appliances (30%), water heating (18%), air conditioning (6%), and refrigeration (5%) (Ministry of Energy, 2015). The primary criticism for the household electricity approach, as well as other electrical consumption approaches, centers around the assumptions made regarding the stability of the consistency of electrical consumption with GDP. Critics suggest that levels of stability can be altered significantly by the omission of such basic factors as shifts in the weather (Hanousek and Palda, 2004). The authors of

electrical consumption approaches have admittedly been aware of the weakness of their assumptions and have made attempts to control for factors that would make electrical consumption inconsistent with GDP; however, critics do not see these attempts as being adequate enough (Hanousek and Palda 2006).

Important Use of Electric Energy

Electric energy is used to power energy efficient vehicles. Although electric vehicles have existed since the early 1920's, newer electric vehicles are plugged into outlets that can charge the battery in the car to permit it to operate. These vehicles often feature an aerodynamic design to prevent air resistance from restraining the vehicle, enabling it to use less energy on the road. Once the electrical energy in the vehicle has diminished, the vehicle must be plugged into a special outlet device to re-charge. When the vehicle has finished re-charging, it can be driven once again. Electrical energy is utilized to provide power to homes across the world. People can plug appliances into outlets to make them operate, and connect electrical wiring within the structure of the home to provide energy for indoor and outdoor lighting. Electrical energy also works to cool or warm a home throughout the year. Air conditioning that is used to cool a home in hot weather connects to the main power source within the home or building, enabling it to operate. Furnaces also use electrical energy to help power the fan that is used to release the heat that is emitted by the unit when in use. The most important possibilities for increasing energy efficiency of electric energy would be considered, regarding energy savings accumulated in itself and increasing the range of performances of the usage with given initial resources. Some of the possibilities that should provide such a progress nowadays are using energy under braking, using waste heat energy, improved mechanical energy transmission system, improved homes or building design, increasing of efficiency of power convertors' special design of electric engines with optimization of energy consumption. Today, the problem of energy becomes so important that an entire industry is turning towards clean, renewable energy (solar energy, wind energy, etc.). Prototypes of hybrid vehicles with the announcement of mass production scheduled for the near future have become everyday occurrence. In addition, many buildings are designed to use only electricity as motive power, which reduces emissions to zero, possibly (Stevic and Radovanovic, 2015). Electricity is one of the most important blessings that science has given to mankind. It has also become a part of modern life and one cannot think of a world without it. Electricity has many uses in our day to day life. It is used for lighting rooms, working fans and domestic appliances like using electric stoves, A/C and more. All these provide comfort to people. In factories, large machines are worked with the help of electricity. Essential items like food, cloth, paper and many other things are the product of electricity. Modern means of transportation and communication have been revolutionized by it. Electric trains and battery cars are quick means of travel. Electricity also provides means of amusement, radio, television and cinema, which are the most popular forms of entertainment, are the result of electricity. Modern equipment like computers and robots has also been developed because of electricity. Electricity plays a pivotal role in the fields of medicines and surgery too — such as X-ray, ECG. The use of electricity is increasing day by day (Harper, 2007).

Conservation of Energy

The fact that energy can be neither created nor be destroyed is called the law of conservation of energy. In the form of the first law of thermodynamics, this states that a closed system's energy is constant unless energy is transferred in or out by work or heat, and that no energy is lost in transfer. The total inflow of energy into a system must equal the total outflow of energy from the system, plus the change in the energy contained within the system. Whenever one measures (or calculates) the total energy of a system of particles whose interactions do not depend explicitly on time, it is found that the total energy of the system always remains constant (Kittel, Knight, and Ruderman, 2009). While heat can always be fully converted into work in a reversible isothermal expansion of an ideal gas, for cyclic processes of practical interest in heat engines the second law of thermodynamics states that the system doing work always loses some energy as waste heat. This creates a limit to the amount of heat energy that can do work in a cyclic process, a limit called the available energy. Mechanical and other forms of energy can be transformed in the other direction into thermal energy without such limitations. The total energy of a system can be calculated by adding up all forms of energy in the system (Wayback Machine, 2006). Energy conservation is the effort made to reduce the consumption of energy by using less of an energy service. This can be achieved either by using energy more efficiently (using less energy for a constant service) or by reducing the amount of service used (for example, by driving less). Energy conservation is a part of the concept of eco-sufficiency. Energy conservation reduces the need for energy services and can result in increased environmental quality, national security, personal financial security and higher savings. It is at the top of the sustainable energy hierarchy (Smith, 1998). It also lowers energy costs by preventing future resource depletion. Energy can be conserved by reducing wastage and losses, improving efficiency through technological upgrades and improved operation and maintenance. On a global level energy use can also be reduced by the stabilization of population growth (Lofts and O'Keeffe, 2004). One of the primary ways to improve energy conservation in buildings is to perform an energy audit. An energy audit is an inspection and analysis of energy use and flows for energy conservation in a building, processor system with an eye toward reducing energy input without negatively affecting output. This is normally accomplished by trained professionals and can be part of some of the national programs discussed above. Recent development of Smartphone apps enables homeowners to complete relatively sophisticated energy audits themselves. Building technologies and smart meters can allow energy users, both commercial and residential; to visualize the impact their energy use can have in their workplace or homes. Advanced real-time energy metering can help people save energy by their actions (Schmidt-Rohr, 2015).

Save Energy: Save the Environment

How does save energy help the environment for saving energy and saving the environmental encouragement? Although it may not be obvious, there's a direct connection between the energy use and the environment. When people who consume less power, they reduce the amount of toxic fumes released by power plants, conserve the earth's natural resources and

protect ecosystems from destruction. By taking steps to reduce the energy intake, they'll contribute to a healthier and happier world. Perhaps the most notable way that reducing energy helps the environment is by decreasing power plant emissions. To generate electricity, most power plants burn coal, crude oil or other fossil fuels. Although this method of creating energy is relatively inexpensive, our planet pays the price – carbon dioxide, sulfur dioxide and nitrogen oxides are just a few of the byproducts that come from traditional methods of power generation. Cutting back on energy consumption reduces the amount of electricity that power plants have to make, subsequently reducing the amount of fossil fuels that are burned each day. Even a small change can make a tremendous difference – if every Thai household traded in just one incandescent light bulb for an efficient CFL, the reduction in pollution would be equivalent to taking 1.3 million cars off the road (SaveOnEnergy.com, 2018). Conserve limited natural resources, exactly; when people opt to cut back on energy use, they also help conserve limited natural resources that would otherwise be used to power the power plants. Less demand for energy creates less demand for harvesting fossil fuels. Turning off the lights at night or washing clothes in cold water can save trees, coal, natural gas and more. From an economic standpoint, it's critical to conserve our finite resources. As fossil fuels become increasingly scarce, they will become extremely expensive. Consume less, conserve more reducing electricity use in the buildings of Rajabhat Maha Sarakham University whereas there are more than 30 buildings to be going off the power grid with electric power, such as; electricity in the university's buildings, faculties, offices, to use the lifts and elevators for transportation of students, official, or general personnel.

Students' Behaviors of their Using Electric Energy

In recent years, the researchers have given emphasis on efficient energy consumption and energy conservation. Some studies in different countries have evaluated the energy conservation measures of building energy consumption in hot and humid climate for saving energy and improving the building performance . Another study on commercial hotel building in Qatar has found an energy saving ranges between 10% and 24.12% of its energy through the development of envelope design and customer behavior change (Khan and Halder, 2015). A huge amount of electricity is misused everyday all over the world by unconscious behavior of consumer. Numerous studies have shown the effect of human behavior change on energy conservation and environmental sustainability. Although there are various obstacles for upgrading the energy efficiency (Amulya, 1991), some studies have shown different strategies to boost energy saving behaviors (Chatterton, 2011). Energy saving or energy conservation through the change of human behavior only, without any capital cost can be a great option to meet demand instead of increasing generation. However, because of unpredictable nature of human behavior change long term individuals and organizational involvement is essential for energy efficiency achievement. There are no sufficient literature on energy efficiency and conservation in the world context. Only one study has shown the theoretical framework of essential of energy efficiency and conservation (Khan, Rasul, and Khan, 2004). However, it is good news that the government has realized the importance of energy efficiency and conservation and has taken some steps to solve this problem. A huge amount of electricity loss is incurred everyday due to the lack of awareness. This causes load shedding as well as inadequate supply in rural areas. Therefore, the use of energy efficient appliances and energy conservation is the other alternative way to mitigate this severe energy crisis in the third world countries, such as; Thailand. This research represents a novel attempt to save a higher educational institute electric power consumption through student behavior change that would open a pathway towards an energy-efficient future in Rajabha Maha Sarakham University as well as in any developing the property is directly proportional to the presence or absence of the usage elevators or lifts was surveyed. Because of this University's demand for electricity is increasing sharply due to the latest proliferation of new electrical and electronic educational institute appliances.

Measuring Behaviors

Measuring Behavior is the premier interdisciplinary event for scientists and practitioners concerned with the study of human or animal behavior. This unique community and its biannual conference focus on methods, techniques and tools in behavioral research in the widest sense. The purpose of this community is to foster scientific discussions regarding methods and techniques in behavioral research. Measuring Behavior is known for its interdisciplinary character. At the biannual conference you will find yourself among colleagues from various fields of research. While the research questions and applications may be highly diverse, what all delegates share is an interest in methods, techniques and tools for the study of behavior? In this research study, measuring behavior has established itself as a standard text, updated and reorganized, this third edition is, as before, a guide to the principles and methods of quantitative studies of behavior, with an emphasis on techniques of observation, recording and analysis. It provides the basic knowledge needed to measure behavior, doing so in a succinct and easily understood form.

The sections on research design and the interpretation and presentation of data have been greatly expanded. Aimed primarily at undergraduate engineering students who are about to embark upon quantitative studies of their responses to their perceptions' reviews of methodology that would be of great values. The electric lifts are one of the first modern lifts and more widely used in neighboring communities. Recall that Rajabhat Maha Sarakham University is one of a University, with more lifts per capita, because the average is nearly ten hours per four thousand students or personnel at the institute's buildings throughout the University so its use is much more widespread than in this University with much more students. In this article we will explain the many advantages of electric elevators, all subsumed into a group for integrating awareness energy conservation and environment for encouraging engineering's students in Rajabhat Maha Sarakham University and this advantage is shared by any type of lift, note the not inconsiderable advantage of the revaluation of the buildings. The revaluation of the higher floors of the property is directly proportional to the presence or absence of an elevator. In fact, there are cases in which requested the installation of an elevator to sell an old estate at the University must be paid for the cost of using the electricity lifts between 20 and 40% higher than it would have on the University's incomes without this contraption.

MATERIALS AND METHODS

Green environment has become an important topic around the world. This campaign can be realized if everybody understands and shares similar objectives on managing energy in an efficient way. This paper would present and analyze the survey on energy usage for issues related to students' behaviors with real situations to verify the tested data and the results in energy monitoring system to integrate the awareness energy conservation and environment for encouraging engineering's students in Rajabhat Maha Sarakham University was assessed with the qualitative and quantitative methods. Researchers have also developed some quantitative model, design method and multi-criteria approach for energy conservation. This article was focused on the problem effects according to the engineering's students who also used electric energy environmental consumption, to encourage the energy conservation and environment trends, and to provide solutions to problems of electrical energy and environmental wasteful was assessed.

Research Framework

Because of the advancing research made in power generation technologies and their growing economic viability are cultivating a new climate of hope and altering how the Rajabhat Maha Sarakham University balances its environmental responsibilities with its energy needs. Researcher team planned to design this research framework for indicating that this study has being gone on our work, complete of the reliability and high quality that following as:

Research Aims

1. To assess engineering students' perceptions of their behaviors to their usages the energy conservation and environmental awareness.
2. To integrate engineering students of their behavioral effects to their usages the energy conservation and environmental awareness.
3. To analyze the problems, obstructions, and suggestions of their behavioral effects to their usages the energy conservation and environmental awareness.

Sample

Foundational Context: The engineering building is the 17th building of Rajabhat Maha Sarakham University, there are seven floors, 94 study's rooms, 9 largest rooms, 14 common study's room, 21 official and administration's rooms, 2 hall rooms, 11 storage rooms, 35 toilet rooms, and two lifts for transporting students and personnel at 8 hours per working day.

Sample Size: To administer of a sample size which consisted of 648 personnel, such as; 12 educational officers, 53 instructors and 583 engineering students

Research Instruments

In terms of the research tools were invented by researcher team that we have been designed with the context of the researching academic principles for the guideline to the questionnaire, depth interview, and observation forms were going on assessment, perfectly, namely:

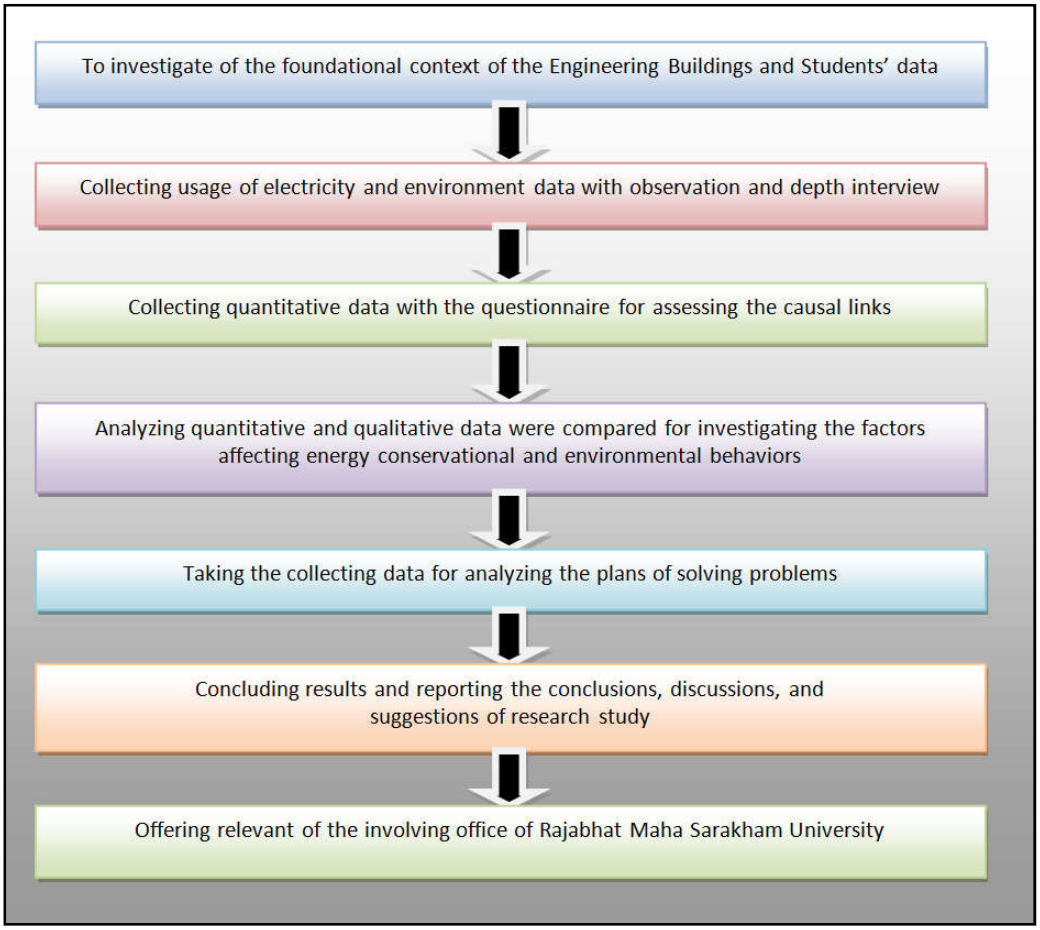

Figure 1. Steps of Research Framework

The Fostering Conservative and Environmental Energy (FCEE) Questionnaire: The *Fostering Conservative and Environmental Energy* (FCEE) Questionnaire was designed into two sections; the general background of sample size was reported on sex, age, and educational property. The sample size's responses was assessed with the 29-item *Fostering Conservative and Environmental Energy* (FCEE) questionnaire in five scales, namely; 6-item *Building Lighting*, 5-item Comfortable Energy, 9-item *Usage Electric Energy*, 5-item *Conservation and Environment Effects*, and 4-item *Building Integrated Design* scales. A psychometric scale commonly involved in this research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term accurately the Likert-type scale is often used interchangeably with rating scale level on a symmetric always to seldom scale for a series of statements, the format of a typical five-level Likert item, for example, could be: Strongly Seldom(1), Seldom(2), Sometimes(3), Often(4), and Almost always (5) levels, respectively (Wuensch, 2005). However, a Likert Scale can be used in just about any situation where we are looking to use a rating scale to get insights into our sample behaviors and feelings however the most common Likert Scale examples include the following use provides:

Mean average scores ranged from 5.00 to 4.51, it's provided with *Almost always level*
Mean average scores ranged from 4.50 to 3.51, it's provided with *Often level*
Mean average scores ranged from 3.50 to 2.51, it's provided with *Sometimes (or Neutral) level*
Mean average scores ranged from 2.50 to 1.51, it's provided with *Seldom level*
Mean average scores ranged from 1.50 to 1.00, it's provided with *Strongly Seldom level*

The Depth Interview Form: The *Depth Interview Form* was interviewed on five topics that followed as the FCEE questionnaire, namely; *Building Lighting, Comfortable Energy, Usage Electric Energy, Conservation and Environment Effects*, and *Building Design* scales. The interviewers would interview on 5% of a sample size that it's totalized of 33 personnel.

The Observation Form: The *Observation Form* was observed by the volunteer observers in 8 hours in three times in each day, which they observed at 08.00-12.00 am at the first time, from 12.01 to 13.00 pm and from 13.01 to 16.00 pm, respectively. The observers would check list into the Observation Form, reliability.

Research Limitation of Time

Research team was planned to start of our research procedure in four months (120 work days) in April, July, October, and December in 2016.

RESULTS

In Table 1, the general background of a size was reported on sex, age, and educational property was assessed with a sample size consisted of 648 personnel (12 educational officers, 53 instructors and 583 engineering students). In Table 1 reports the percentages of the general background of the 648-sample size, most of them is female, their ages are between 17-26 years old, and undergrad degree is the educational qualifications.

Table 1. Percentage of the General Background of a Sample Size

General background	Sample size's responses	Accounting Number	Percentage
Sex	Male	236	36.42
	Female	412	63.58
Age	Less than 17 years old	11	1.70
	Between 17-26 years old	556	85.80
	More than 26 years old	81	12.50
Educational qualifications	Undergrad degree	583	89.97
	Bachelor degree	10	1.55
	Master degree	47	7.25
	Doctoral degree	8	1.23

N = 648

The Perceptions of the Electric Energy Conservation and Environmental Awareness

The sample size's responses were assessed with the 29-item Fostering Conservative and Environmental Energy (FCEE) questionnaire in five scales. Table 2, 3, 4, 5 and 6 report on Building Lighting, Comfortable Energy, Usage Electric Energy, Conservation and Environment Effects, and Building Integrated Design scales of means, standard deviations, and the series of questions or items in five scales that ask engineering's' personnel to select a rating on a scale that ranges from one extreme to another, such as "Almost always" to "Strongly Seldom" for the *Fostering Conservative and Environmental Energy* (FCEE) Questionnaire, respectively. Table 2 shows the item means ranged from 2.75 to 4.71 and standard deviations ranged from 0.46 to 0.84 on the Building Lighting Scale for the FCEE questionnaire. In most case, the sample size group's perceptions of their engineering building on building lighting scale as *Sometimes* totalized level. In Table 3 shows the item means ranged from 2.34 to 3.58 and standard deviations ranged from 0.34 to 0.62 on the *Comfortable Electric Energy* Scale for the FCEE questionnaire. The sample size group's perceptions of their engineering building on their comfortable electric energy as *Sometimes* totalized level. In Table 4 reports that the item means ranged from 2.30 to 4.92 and standard deviations ranged from 0.39 to 0.88 on the *Usage Electric Energy* Scale for the FCEE questionnaire. In most case; the sample size group's perceptions of their usage electric energy as *Often* totalized level. Table 5 reveals that the item means ranged from 2.30 to 4.92 and standard deviations ranged from 0.39 to 0.88 on the *Conservation and Environment Effect* Scale for the FCEE questionnaire. In most case; the sample size group's perceptions of their awareness to their conservation and environment effects as *Often* totalized level. In Table 6 reveals that the item means ranged from 4.23 to 4.78 and standard deviations ranged from 0.48 to 0.68 on the *Building Integrated Design* Scale for the FCEE questionnaire. In most case; the sample size group's perceptions of their awareness to their engineering building design as *Almost always* totalized level.

Engineering Students' Interviews

In terms of engineering students' interviews were interviewed with the *Depth Interview Form* on five topics that followed as the FCEE questionnaire, namely; Building Lighting, Comfortable Energy, Usage Electric Energy, Conservation and Environment Effects, and Building Integrated Design scales.

Table 1. Percentage of the General Background of a Sample Size

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Educational qualifications	Undergrad degree	583	89.97
	Bachelor degree	10	1.55
	Master degree	47	7.25
	Doctoral degree	8	1.23

N = 648

Table 2. Mean Average Scores, Standard Deviations, and Selected Rating on the Building Lighting Scale for the FCEE

Item	Item questions regarding the perceptions	Means	Standard deviations	Selected rating level
1.	You turn on the lights to make the necessary lighting and use them only.	4.27	0.84	Often
2.	You turn on the classroom light when teaching and turn off the lights whenever there is no teaching.	3.18	0.49	Sometimes
3.	You turn on the classroom light when it is in use and turn off the power whenever it is not in use.	2.75	0.78	Sometimes
4.	You turn off the classroom lights or office hours from 12.01 to 13.00 pm	3.18	0.46	Sometimes
5.	You open the curtains or shades to provide natural light when working or teaching.	4.07	0.65	Often
6.	You open the window while working or teaching.	4.71	0.69	Almost always
	Total	3.39	1.68	Sometimes

N = 648

Table 3. Mean Average Scores, Standard Deviations, and Selected Rating on Comfortable Electric Energy Scale for the FCEE

Item	Item questions regarding the perceptions	Mean	Standard deviation	Selected rating level
1.	You turn on the air conditioner at 25 degrees Celsius.	2.46	0.72	Seldom
2.	You turn on the air conditioner after 30 minutes and shut off the air conditioner 30 minutes before closing work.	3.02	0.34	Sometimes
3.	You turn off the air conditioner from 12.00 - 13.00 hrs.	2.34	0.62	Seldom
4.	You open the air conditioner all day while working or learning.	2.60	0.78	Sometimes
5.	You use light curtains to keep the air conditioning too heavy.	3.58	0.69	Often
	Total	2.80	1.21	Sometimes

N = 648

Table 4. Mean Average Scores, Standard Deviations, and Selected Rating on Usage Electric Energy Scale for the FCEE

Item	Item questions regarding the perceptions	Mean	Standard deviation	Selected rating level
1.	You turn off the computer when it is finished and when it is no longer used for more than 30 minutes.	3.94	0.48	Often
2.	You turn off the computer screen when it is no longer used for more than 30 minutes.	4.05	0.56	Often
3.	You unplug the computer every time after use.	4.92	0.39	Almost always
4.	You open the printer all the time.	4.82	0.66	Almost always
5.	You turn off the printer and unplug the power cord after use.	4.75	0.88	Almost always
6.	You charge the electrical equipment in the building.	2.30	0.71	Seldom
7.	You Unplug all electrical appliances when finished.	4.24	0.82	Often
8.	You use the stairs instead of the lift when you go up - down a floor or 2 floors.	4.74	0.47	Almost always
9.	When using the elevator, press the up or down button once.	4.83	0.51	Almost always
	Total	4.29	1.86	Often

N = 648

Table 5. Mean Average Scores, Standard Deviations, and Selected Rating on the Conservation and Environment Effects Scale for the FCEE

Item	Item questions regarding the perceptions	Mean	Standard deviation	Selected rating level
1.	You bring food into the classroom.	2.46	0.81	Seldom
2.	You have to eat the waste every time	4.46	0.76	Often
3.	You always separate waste before disposing.	4.62	0.58	Almost always
4.	You use reuse paper for use.	4.87	0.36	Almost always
5.	You always keep the water.	4.90	0.48	Almost always
	Total	4.26	1.74	Often

N = 648

Table 6. Mean Average Scores, Standard Deviations, and Selected Rating on the Building Integrated Design Scale for the FCEE

Item	Item questions regarding the perceptions	Mean	Standard deviation	Selected rating level
1.	The lighting in the classroom is bright enough.	4.23	0.60	Often
2.	The light in the corridor is bright enough	4.66	0.68	Almost always
3.	The sound of the building is loud.	4.78	0.48	Almost always
4.	Temperature in the corridor in the building	4.63	0.63	Almost always
	Total	4.58	1.99	Almost always

N = 648

Table 7. Percentage of Students' Behaviors to their Using Electrical Conservative and Environmental Energy

Observations on electrical usage inventions	% of students' behaviors of their using electrical conservative and environmental energy in four months (80 working days from 120 Days in April, July, September, and December)								
	08.00 – 12.00 am			12.01 – 13.00 pm			13.01 – 16.00 pm		
	Always	Sometime	Seldom	Always	Sometime	Seldom	Always	Sometime	Seldom
Light lamps	42%	45%	13%	32%	28%	40%	56%	42%	2%
Air conditions	75%	21%	4%	11%	20%	69%	84%	15%	1%
Lifts	84%	12%	4%	91%	8%	1%	78%	20%	2%
Official electrical tools	100%	0%	0%	50%	40%	10%	100%	0%	0%
Eating in the classrooms/offices	32%	48%	20%	12%	22%	66%	16%	28%	56%
Dumping waste	24%	29%	47%	9%	16%	75%	30%	25%	45%
Waste separation	2%	18%	80%	0%	6%	94%	14%	12%	74%
Usage computers and printers	96%	2%	2%	54%	25%	21%	97%	2%	1%
Opening curtains	81%	18%	1%	0%	0%	100%	68%	30%	2%

N = 648

The interviewers would interview on 5% of a sample size that it's totalized of 33 personnel. Most of students' response of their thinking to their engineering building for fostering the awareness energy conservation and environment in Rajabhat Maha Sarakham University, students' turned on the lights to make the necessary lighting and use them in their classroom light when teaching and turned off the lights whenever there is no teaching and open the curtains or shades to provide natural light when working or teaching. They turned on the air conditioner at 25 degrees Celsius, turned off the air conditioner from 12.00 - 13.00 hrs or after 30 minutes and shut off the air conditioner 30 minutes before closing work. However, they opened the air conditioner all day while working or learning and used light curtains to keep the air conditioning too heavy, and turned off the computer when it was finished and when it was no longer used for more than 30 minutes, unplug the computer every time after use. They charged the electrical equipment in the building, using the stairs instead of the lift when they went up - down a floor or 2 floors, if they used the elevator, press the up or down button once with the lighting in the classroom is bright enough, the sound of the building is loud and temperature in the corridor in the engineering building. Focused on the volunteer observers observed students in 8 hours in three times per each day, which they observed at 08.00-12.00 am, 12.01 to 13.00 pm, and 13.01 to 16.00 pm, respectively. The observers would check list into the Observation Form, namely; The Conservative and Environmental Energy Behaviors for Using Electrical Instruments and Air Conditions in the Engineering Building. Table 7 reports on students' behaviors of their using electrical conservative and environmental energy.

DISCUSSION

There are many different ways to reduce the household's or building' energy use, ranging from simple behavioral adjustments to extensive home or office improvements. The two major motives for conserving energy are to save on utility bills and protect the environment. Here are the ten most common ways to conserve energy in a home or building, listed from the simplest to the most intensive methods. Especially, the building in the educational institutes, Thailand is a developing Nation and the most important role in the development process is played by electricity. The demand for energy is growing manifold and the energy sources are becoming scarce and costlier. In particular, growth in electricity consumption is very much related to economic growth. The demands have risen but the corresponding supply hasn't risen with the same pace.

The Electricity Crises is a grave problem that needs an immediate attention. The responsibility lies with the industrial sector, Government and Educational bodies. Since, the major concerning body being the Educational sector, this paper is dedicated to study the areas where energy can be conserved effectively. This paper includes a case study of a building at Faculty of Engineering, Rajabhat Maha Sarakham University (RMU), Thailand, following which are few suggestions that should be implemented to save electricity. The Government of the Kingdom of Thailand invests a large budget on building the education sector. The Government provides infrastructure, land, building and electricity as an obvious amenity. The latter facility is a recurring expenditure. The educational institutes have a responsibility to become a role model for the nation to save energy and promote optimization. They should also develop and promote indigenous technology. They support a large number of faculties and training facilities which can be a good platform to raise the awareness and promote energy saving. Rajabhat Maha Sarakham University, Mahasarakham, is a Northeastern Rajabhat University Group run by Government of Thailand. RMU has 7 Faculties under which are several departments. The RMU has a total installed capacity of Offices, departments and Street Lighting consumes more than 60% of the total electricity consumption. 10 - 15% consumption is used by Engineering Building. The results of this research study indicates that the energy conservation and environmental awareness are cultivating a new climate of hope and altering how the RMU balances its environmental responsibilities with its energy needs. To reduce energy consumption in the building, don't necessarily need to go out and purchase energy efficient products. Energy conservation can be as simple as turning off lights or appliances when someone doesn't need them. Students can also use energy-intensive appliances less by performing the building tasks manually (Rajabhat Maha Sarakham, 2015). Because of traditional incandescent light bulbs consume an excessive amount of electricity and must be replaced more often than their energy efficient alternatives. Halogen incandescent bulbs, compact fluorescent lights (CFLs), and light-emitting diode bulbs (LEDs) use anywhere from 25-80% less electricity and last three to 25 times longer than traditional bulbs. On average, appliances are responsible for 13% of the total building energy use. When purchasing an appliance, students of officers should pay attention to two numbers: the initial purchase price and the annual operating cost. Although energy efficient appliances usually have higher purchase prices, their operating costs are 9-25% lower than conventional models. Water heating is a major contributor to the total energy consumption. Other than purchasing an energy efficient water heater, there are three methods of reducing the water heating expenses. Windows are

significant source of energy waste, which can amount to 10-25% of the total heating bill. To prevent heat loss through the building windows, the building integrated design can replace single-pane windows with double-pane ones. Although it may not be obvious, there's a direct connection between energy use and the environment.

Conclusion

Generally, a Building Engineer is recognized as being expert in the use of technology in the design, construction, assessment and maintenance of the built environment that it is concerned with the planning, design, construction, operation, renovation, and maintenance of buildings, as well as with their impacts on the surrounding environment. In the 17th building engineer of Rajabhat Maha Sarakham University, Thailand, also known as architectural engineers may work on new building projects, or renovations of existing structures. Areas of study include: design of building, air conditioning, lighting and electrical power distribution, water supply and distribution, fire and life safety systems, sustainable building systems design, building structures and building construction technology construction planning. Building Engineers have to follow an interdisciplinary program that integrates pertinent knowledge from different disciplines. The building engineer explores all phases of the life cycle of a building and develops an appreciation of the building as an advanced technological system. Problems are identified and appropriate solutions found to improve the performance of the building. Using the quantitative and qualitative research methods to foster engineering students in Rajabhat Maha Sarakham University, Thailand of their perceptions to their Building Engineer to a questionnaire, namely; The *Fostering Conservative and Environmental Energy* (FCEE) Questionnaire in two sections; the general background of 648-sample size group was reported on sex, age, and educational property. The sample size's responses were assessed with the 29-item FCEE in five scales, such as; *Building Lighting*, *Comfortable Energy*, *Usage Electric Energy*, *Conservation and Environment Effects*, and 4-item *Building Integrated Design* scales. Accurately the Likert-type scale is often used interchangeably with rating scale level for a series of statements, the format of a typical five-level Likert item with means average scores on each item and scale, Strongly Seldom ($\overline{X}$ = 1.00-1.50), Seldom ($\overline{X}$ = 1.51-2.50), Sometimes ($\overline{X}$ = 2.51 – 3.50), Often ($\overline{X}$ = 3.51 -4.50), and Almost always ($\overline{X}$ = 4.51 – 5.00) levels, respectively. Students' responses to a questionnaire on their perceptions indicated that on building lighting and comfortable energy scales as *Sometimes* totalized level, students' performances of their usage electric energy and their conservation and environment effects indicated of *Often* level on their supporting building engineering, and they responses of their perceptions revealed that of *Almost always* level on and their building integrated design. Students' responses of their interviewing thinking to their engineering building toward their Building Lighting, Comfortable Energy, Usage Electric Energy, Conservation and Environment Effects, and Building Integrated Design scales Building Lighting, Comfortable Energy, Usage Electric Energy, Conservation and Environment Effects, and Building Integrated Design scales also were positive thinking. Students' performances of their observing behaviors to their using electrical conservative and environmental energy were observed in three times per day in four months, such as; April, July, September, and December indicated that of positive behaviors.

Acknowledgement

Firstly, we would like to the raising awareness among staff, engineering personnel, and students on energy use in buildings for the target case study. We would like to thanks Mahasarakham Rajabhat University, whereas the research was supported by the research funding and the administrators and staff of Mahasarakham Rajabhat University, and the consultants and information for use in the establishment of database. Finally, we would like to thank you to Prof. Dr. Toansakul Santiboon, Prof. Dr. Gregg Alexander, Dr. Prosong P. Saihong who reviewed our manuscript.

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