

# A Study of Renewable Energy Management in Suan Sunandha Rajabhat University <sup>†</sup>

**Chaiwat Waree**

Faculty of Education, Suan Sunandha Rajabhat University, Bangkok 10300, Thailand; chaiwat.wa@ssru.ac.th;  
Tel.: +66-086-077-5746

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**Abstract:** This study aimed to investigate the renewable energy management in Suan Sunandha Rajabhat University; to analyze physical factors, management factors that affected the renewable energy management; and to recommend some appropriate measures for managing renewable energy in faculty in Suan Sunandha Rajabhat University. A questionnaire was used to collect the data from sixty faculty energy officers—one from each faculty. However, only fifty copies of the questionnaire or 83.33% were returned. The descriptive statistics, i.e., frequency, percentage and mean, was used to describe the data. The results showed that different types of renewable energy were used in all faculty in Suan Sunandha Rajabhat University. Biomass was the most used renewable energy for all faculty, following by solar energy in small quantities, while hydro energy, wind energy, garbage energy, biogas, as well as geothermal energy were not used. With regard to physical factors, geographical characteristics were an important factor that influenced renewable energy use. Importance was given to raw materials available in sufficient quantity and quality. Transport also affected renewable energy use. Although there were enough energy officers with a good knowledge and understanding of renewable energy, the budget, materials and equipment were insufficient, so more support was needed from the government and the private sectors and other financial sources. Monitoring, evaluation and follow-up, faculty officer's knowledge and understanding of renewable energy, and training on renewable energy use also had an effect on renewable energy management.

**Keywords:** renewable energy; management; higher education

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## 1. Introduction

At present, Ministry of Energy has the vision of “Sustainable energy management to ensure sufficient energy supply for the country's development and the people's well-being”. The Ministry of Energy and the Appropriate Technology Association (Energy Ashram) as well as experts from Denmark intend to develop and push work processes at the level of local area; therefore, the Community Energy Plan has been in place since 2006. The plan focuses on establishing the participation of population, local government, educational institutions, and private sector in energy management by promoting knowledge and understanding about energy, raising awareness of sustainable energy use, and searching for alternative energy technologies that can be used by the community through the Community Energy Plan.

Energy consumption in Thailand has continuously increased during the past years. Based on data from 2006 to 2011, it is likely to be higher. In 2011, it was 4.1% higher than 2010 or equivalent to 1856 barrels of oil equivalent per day [1]. As a result, there is a renewed interest in finding alternative sources of energy to meet future needs. Currently, people are interested in renewable

sources of energy, which are natural and replaceable indefinitely, such as solar energy, wind energy, water energy, geothermal energy, biomass energy, waste energy, etc. These are all important and beneficial in economic and in environmental protection.

Suan Sunandha Rajabhat University is another state agency or community that has a higher energy consumption. Therefore, the researcher is interested in studying renewable energy management approaches at the level of university and faculty of the university, as well as studying factors that affect renewable energy management. This is to provide a suitable renewable energy management approach for the university to suit the physical and administrative aspects. The researcher hopes that this research will be used to help decide on renewable energy development, and that it will be beneficial for future sustainable energy management.

## 2. Study Objectives

1. To study the situation of community renewable energy management in each faculty of the university.
2. To analyze the physical, social and cultural factors, as well as the management factors that affect the renewable energy management in each faculty of the university.
3. To offer appropriate alternative energy management at the university level.

## 3. Study Procedures

This study is a quantitative research. Data were collected from questionnaires to staff associated with the energy of 60 people from each group. When using Taro Yamane [2] at 95% confidence intervals in the sampling, it was found that the population sampling must be surveyed from a total of 6 faculties. Due to the small sample size and in order to obtain the total number of samples from all over the university, the method of questionnaire distribution was used. In the distribution, the questionnaires were sent via E-Office and Google forms. The questionnaires were responded in total of 50 items, or 83.33%, divided into the following groups: Faculty of Education 10 items, Faculty of Industrial Technology 8 items, Faculty of Humanities and Social Sciences 6 items, Faculty of Management Science 7 items, Faculty of Science and Technology 12 items, and Faculty of Fine Arts 7 items. A restriction of the survey was that some of the questionnaires were not answered because some of the sample groups did not see the importance of the research. The concept of this study applied the Sustainable Development Theory and Good Governance Principle [3] to offer renewable energy management approaches at the university level. The 4 major issues to consider included: (1) Physical (environmental)—considerations of terrain, climate, and raw materials, adequacy, near-source of energy, and reduction of environmental problems, (2) Economy—considerations of revenues, expenditures, as well as energy imports, (3) Society and Culture—considerations of lifestyle, values, belief, and (4) Management—considerations of personnel, budget and materials, control, supervision, as well as participation.

## 4. Results

### 4.1. Physical (Environmental)

Concerning the choice of renewable energy and the factors influencing the choice of renewable energy, every faculty has used renewable energy in their community, representing 100%. The most common type of renewable energy was biomass energy, followed by solar energy. Water energy, wind energy, waste energy, biogas energy and geothermal energy were not applied. Comparing different types of renewable energy use in each province of each region with those in each faculty of the university, it was found that average of suitability of the renewable energy category was consistent and their operations were going in the same direction as shown in Table 1.

**Table 1.** Renewable Energy Used to Produce Energy.

| Faculty    | Renewable Energy Category (Percentage) |       |       |            |         |       |        |
|------------|----------------------------------------|-------|-------|------------|---------|-------|--------|
|            | Solar                                  | Water | Wind  | Geothermal | Biomass | Waste | Biogas |
| Education  | 20.00                                  | 10.00 | 10.00 | 0.00       | 50.00   | 10.00 | 0.00   |
| Technology | 20.00                                  | 10.00 | 5.00  | 0.00       | 60.00   | 5.00  | 0.00   |
| Humanities | 25.00                                  | 15.00 | 15.00 | 0.00       | 30.00   | 15.00 | 0.00   |
| Management | 25.00                                  | 10.00 | 10.00 | 0.00       | 45.00   | 10.00 | 0.00   |
| Science    | 15.00                                  | 10.00 | 5.00  | 0.00       | 65.00   | 5.00  | 0.00   |
| Fine Arts  | 20.00                                  | 15.00 | 15.00 | 0.00       | 35.00   | 15.00 | 0.00   |

#### 4.2. Economy

Currently, the energy consumption of all faculties still relied on electrical energy imported from outside the university. Imports of energy and costs of each faculty are shown in Table 2. Faculty of Education imported 75% of energy. Faculty of Industrial Technology imported 85% of energy. Faculty of Humanities and Social Sciences imported 80% of energy. Faculty of Management Science imported 65% of energy. Faculty of Science and Technology imported 55% of energy. Faculty of Fine Arts imported 70% of energy. The types of imported energy included electricity, oil and LPG. At present, although each faculty has to import energy inevitably, because renewable energy produced in each faculty is still not sufficient to meet the demand, the use of renewable energy can reduce energy costs.

**Table 2.** Imports of Oil, Electricity, LPG and Costs.

| Faculty    | Imports of Energy–Costs (Percentage) |           |         |
|------------|--------------------------------------|-----------|---------|
|            | Imports of Energy                    | Costs     |         |
|            |                                      | Unchanged | Reduced |
| Education  | 75.00                                | 55.00     | 25.00   |
| Technology | 85.00                                | 65.00     | 15.00   |
| Humanities | 80.00                                | 70.00     | 20.00   |
| Management | 65.00                                | 60.00     | 35.00   |
| Science    | 55.00                                | 50.00     | 45.00   |
| Fine Arts  | 70.00                                | 60.00     | 30.00   |

#### 4.3. Society and Culture

The results of the study on lifestyle, values and beliefs as a driving force for renewable energy production and a guideline for operation. It can be seen that every group has adopted lifestyle, values, and beliefs to motivate the production, more or less, depending on the suitability of each faculty. The use of renewable energy in the area leads to a change of lifestyle in order to suit the current situation. However, a change of beliefs and values is little. After encouraging the use of renewable energy in the area, there are new activities in the faculty, such as creating a biogas digester, molding furnace, solar drying products, and applying technology to suit the situation.

#### 4.4. Management

##### 4.4.1. Personnel Readiness

The results of the study on the readiness of personnel and the availability of resources/raw materials showed that most of the personnel in each community had a moderate understanding of renewable energy.

#### 4.4.2. Budget, Supporting Material

The results of the study on budgets and supporting materials showed that when dividing the budget allocated by the university to support each faculty, it appeared that it was inadequate to more than half the needs of each faculty. All faculties agreed that the allocated budget was insufficient to support the material needed today.

### 5. Discussion of Results

The study on the current renewable energy management approaches at faculty level of Suan Sunandha Rajabhat University considered physical factors, social and cultural factors, as well as management factors. In terms of physical factors, there must be consideration in the terrain, potential of energy, near-source raw materials, output sufficiency, quality/quantity and environmental problem reduction. Some of them correspond to the study of Kokkrut, Phoochinda, & Pooboon, 2012, Phoochinda & Keawdoungek, 2012, Khumpech, 1992, and Jaritngam, 2008 that studied renewable energy in the local area with appropriateness of technology selection in accordance with community context [4–7]. Social and cultural factors affected the thought and acceptance after successful implementation of renewable energy sources. In addition, social and cultural factors also affected combining energy technology with local wisdom in each locality to make the technology suitable for the community as much as possible. This was consistent with the study of Rogers, Simmons, Convery and Weatherall (2008) noted that successful renewable energy projects came from public participation; and people were more likely to accept the bottom-up development rather than the top-down development, and the smaller size than the larger one [8]. The results showed that community-based renewable energy management required raw materials with potential supply for sufficient energy generation to meet the demand of the area. It also required the availability of personnel and budget management, as well as compliance with the values, beliefs, lifestyles of the communities in each region in order to develop sustainable energy management approaches and proper use of renewable energy for the community. The research results should be published using technology. This was consistent with the study of Chaiwat Waree 2018 noted that Application Development on Tablet to Promote a Classroom Research Skills for SSRU' Students [9]. The obtained results were able to be used as guidelines for further development of learning activities management of other information.

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