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Training for Improving Energy Efficiency Awareness in The Home Industry Sector

Rahmi Andarini*, Fahmy Rinanda Saputri
Engineering Physics Department, Faculty of Informatics & Engineering,
Universitas Multimedia Nusantara, Indonesia.
*Corresponding Author. Email: rahmi.andarini@lecturer.umn.ac.id

Abstract: This community service aims to promote energy efficiency awareness for the home industry sector, so that energy efficiency becomes a culture both in household domestic activities and in the production process. The method of implementing this service uses training with the participants of this activity are the residents around Keranggan Ecotourism Village who run businesses and have household industries. The evaluation instrument uses in this community service is the increase of awareness level of the participants regarding energy efficiency behaviour, such as selecting energy efficient equipment, recording the electricity consumption, and setting the operational hour of energy-using equipments such as lamps, rice cookers, and so on. The results of this service show that participants gained knowledge in recording electricity consumption and knowing the activities that have an impact on increasing electricity consumption and develop plans for energy efficiency programs.

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Introduction

The electricity consumption in Indonesia continues to grow from year to year. Electricity statistics record that electricity consumption increased from 187,541 GWh in 2013 to 234,618 GWh in 2018, increasing by more than 25 percent in just 5 years. (Hidayanto et al., 2021). With the condition that Indonesia's electricity production still relies on fossil fuels (coal, gas, oil, etc.), the increasing electricity consumption also demands an increase in primary energy supply. However, the rate of discovery of energy reserves currently does not match energy consumption, thus putting society in the shadow of an energy crisis in the future.

On the other hand, during the pandemic, one of the efforts to break the chain of Covid-19 virus transmission is the transition of business activities and work routines, as well as education, into the home, known as work from home or distance learning. With this working and learning from home situation, it will lead to a significant increase in energy consumption in the household sector (Kementrian ESDM, 2019). Furthermore, to sustain the economy during the pandemic, many people have begun to relocate and develop home-based industries. This, of course, will trigger an increase in energy costs, which still rarely receive attention from stakeholders in the household sector industry. From the preceding activities (Sequeira & Joanaz de Melo, 2020; Trombley, 2014) obtained information indicates that small and medium enterprises have a significant potential contribution to energy efficiency. However, on the other hand, there are still obstacles faced by these small businesses in implementing energy efficiency programs, one of which is related to policies (Kostka et al., 2013) and supporting funds. (Cagno & Trianni, 2013; Henriques & Catarino, 2016). "In

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addition, small industries, as drivers of the economy, also have the potential to implement energy efficiency programs (Budiman et al., 2023; Prasetyo, 2021). Behavior change programs related to energy efficiency also have a positive impact on the productivity of small industries and household sectors (European Environment Agency, 2013; Perényi et al., 2019).

Keranggan Ecotourism Village is a community-based tourism area managed by the Tourism Awareness Group (Pokdarwis). This ecotourism village offers outdoor attractions such as river tourism, archery, cultural performances, as well as homestays and restaurants. The villagers' main livelihoods mostly revolve around various home industries, producing chips and souvenirs. Additionally, the ecotourism village has several energy conservation programs, including the use of solar cells as one of the alternative energy sources. (Adhistian et al., 2022). However, the installed capacity of these solar cells is not yet sufficient to replace the majority of the electricity needs in the Ecotourism Village. Therefore, activities supporting efficiency in electricity consumption are necessary. Table 1 lists several situational analyses that serve as the basis for implementing this training program.

Table 1. Analysis of Pokdarwis Situation

Situational Analysis	Description
Lack of Knowledge Regarding Energy Efficiency	Some of the villagers involved in small and medium enterprises (UMKM) in the Ecotourism Village are illiterate, which affects their knowledge regarding energy efficiency.
Lack of Awareness Regarding Energy Efficiency	Due to the lack of knowledge regarding energy efficiency, this will affect the level of awareness among residents.
Energy Efficiency Potential	Some businesses in the Ecotourism Village heavily rely on electricity, such as homestays and restaurants. Owners of homestays and restaurants complain about high electricity costs. From observations, there are still opportunities for savings through behavioral changes and the use of energy-efficient household appliances.

With the conditions as listed in Table 1, awareness of energy efficiency among household industry players becomes crucial, considering that the majority of industry owners do not meticulously consider the energy usage required to produce a product. The objectives of this activity include: 1) Cultivating awareness and capacity regarding energy efficiency and conservation for the household industry sector, 2) Encouraging behavioral changes among household industry owners from being less concerned to being more mindful of energy savings, 3) Providing practical knowledge to household industry sector players regarding the implementation of energy efficiency, 4) Providing knowledge regarding energy consumption calculation and planning efficiency programs for household industries.

Through this training, an increase in awareness of the importance of implementing energy-saving principles is expected, which will lead to a decrease in production costs and enhance the competitiveness of the industry. Additionally, this program will provide a solution to the issue of energy costs incurred in the production process. After the training program, household industry players will apply their knowledge to their respective industries.

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Method

The method in conducting the project is shown by the following steps

Table 1. Method

Stage	Activity	Output
PREPARATION	▪ Development of Training Modules ▪ Kick Off meeting with Leader of Keranggan Ecotourism Village ▪ Planning on Training Schedule	✓ Training Modules ✓ List of potential participants and types of home industries ✓ Training Schedule
COMMUNITY SERVICE	▪ Training Sessions 1. Introduction to Energy Efficiency and Its Importance. 2. Simple Strategies for Implementing Energy Efficiency. 3. Developing Energy Efficiency Action Plan. 4. How to Calculate Energy Savings ▪ Mentoring and Measurement Electricity Consumption ▪ Analysis on the trend of electricity consumption	✓ Action plan to implement energy efficiency measures ✓ Data on electricity consumption
REPORTING		✓ Report on Community Service

The program begins with the development of training modules. There are four main modules that will be delivered in the training:

1) Introduction to Energy Efficiency and Its Importance.
2) Simple Strategies for Implementing Energy Efficiency.
3) Developing Energy Efficiency Action Plan.
4) How to Calculate Energy Savings.

In the module about understanding energy efficiency and its importance, participants are introduced to the concept of energy efficiency. The current situation is highlighted, emphasizing that fossil fuel reserves are limited, yet the demand for electricity is increasing. Therefore, energy efficiency is crucial. Aside from resource conservation, energy efficiency can reduce energy costs, consequently lowering production costs and enhancing competitiveness for household industry players.

The second module focuses on simple strategies for implementing energy efficiency. Various simple activities related to energy efficiency are explained, such as using energy-efficient appliances and changing behaviors. Examples of simple calculations illustrating the benefits of using energy-efficient appliances, like light bulbs, and behavioral changes reflecting energy efficiency, such as unplugging unused plugs, are provided. With the knowledge already imparted, in the third session, participants are provided with practical guidance to create an action plan that will be implemented after the training session. The results of implementing the action plan will be measured by comparing the electricity consumption before the participants have knowledge on energy efficiency practice and after participants received the training. The increase of awareness can also be associated with the behavior change that lead to the energy saving.

The data analysis was done through the reading of the trend of the electricity consumption showed in kWh meters. The selected participants, in this case restaurants and homestay management were asked to monitor the daily electricity consumption by recording the reading of kWh meter. For the postpaid kWh meter, the electricity consumption can be calculated by subtracting the number of selected days with the previous day, while for the

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prepaid kWh meter, the consumption can be found by the reduction of available credit. This method is discussed in the fourth module, with the aim of enabling participants to evaluate the success rate of implementing energy efficiency.

Figure 1. Online Training for Pokdarwis Residents

The training method is conducted twice, both online and offline. Online training is conducted considering the ongoing COVID-19 pandemic such as in Figure 1. In practice, online training was found to be less effective due to some illiterate participants finding it difficult to understand the explanations given, compounded by signal and webinar equipment (laptop, projector) constraints. Therefore, it is necessary to consider conducting offline training, with the hope that participants, who are also household industry players, will receive comprehensive information.

Figure 2. Offline Training for Pokdarwis Residents

From the implementation of offline training like in Figure 2, the response from participants was very positive because in this session, it was possible to conduct electricity consumption measurement practices, and participants could directly learn how to read electricity consumption. Examples given in practice include comparing electricity consumption in the use of incandescent bulbs, CFL bulbs, and LED bulbs. Additionally, a demonstration of water heater usage was shown to provide knowledge to participants about the high energy consumption of such appliances, as participants often neglect their usage, such as boiling large volumes of water when only a small amount is needed.

Over a period of approximately two months after the training, an analysis of energy consumption and increased awareness of energy efficiency will be conducted, demonstrated

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by behavioral changes. The expected outputs from the implementation of this program include: 1) Monthly energy consumption recording data, 2) Production and occupancy rate recording data for homestays, 3) Data on significant electricity-consuming appliances, and 4) Action plans for energy efficiency programs.

Result and Discussion

After the training session, mentoring is provided to residents involved in Pokdarwis's businesses and household industries. In this program, examples of energy efficiency application results are chosen from a restaurant and a homestay. Figure 3 shows the results of electricity consumption readings at the restaurant over a one-week period. From the obtained data, it can be seen that electricity consumption is high during the weekends (Friday - Sunday) and relatively low on other days (Monday - Thursday).

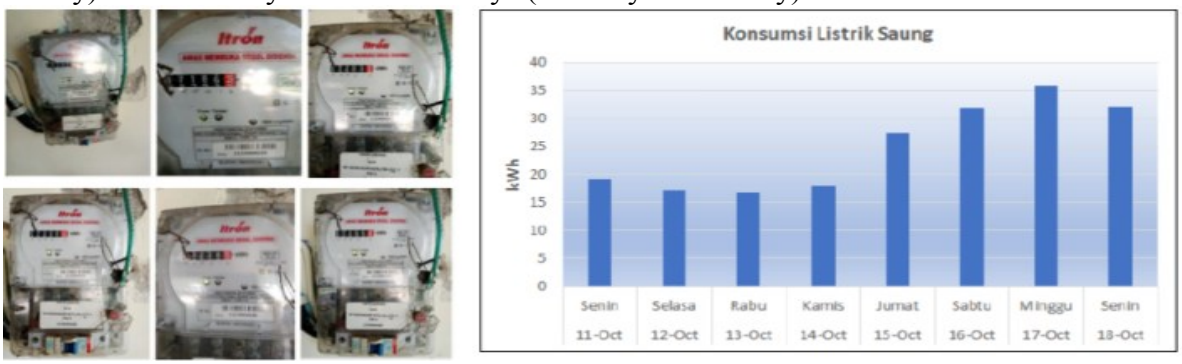
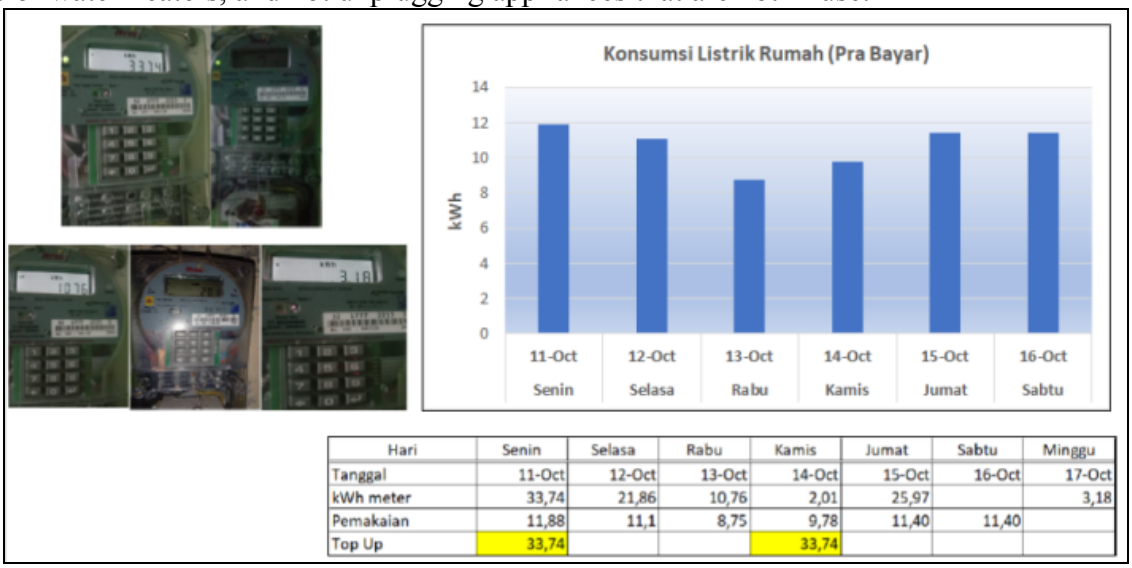


Figure 3. Restaurant Electricity Consumption Data

With this trend, restaurant managers can evaluate the increase in electricity usage by about 35% during the weekends. Subsequently, managers can encourage employees to be mindful of potentially wasteful electricity usage, such as leaving lights on when not in use, continuous use of water heaters, and not unplugging appliances that are not in use.



Hari	Senin	Selasa	Rabu	Kamis	Jumat	Sabtu	Minggu
Tanggal	11-Oct	12-Oct	13-Oct	14-Oct	15-Oct	16-Oct	17-Oct
kWh meter	33,74	21,86	10,76	2,01	25,97		3,18
Pemakaian	11,88	11,1	8,75	9,78	11,40	11,40	
Top Up	33,74			33,74			

Figure 4. Prepaid Residential Electricity Consumption Data

Energy consumption readings are also conducted at a residential home used as a homestay, using a prepaid electricity meter. With this example, training participants can learn how to record energy consumption for prepaid customer types. Electricity consumption recording at the residential home is carried out for 6 days, and daily electricity consumption trends are

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obtained. From Figure 4, it can be seen that the pulse loading pattern occurs every 3 days. In the second loading period on Thursday, it can be seen that the remaining pulse amount is 2.01 kWh, but during the next loading schedule on Sunday, the remaining pulse amount is 3.18 kWh. This indicates that consumption from Monday to Wednesday is greater than consumption from Thursday to Saturday. This simple method can be applied and understood by residents and can estimate electricity usage over longer periods.

These recording activities are the first steps for training participants to understand the electricity consumption over a 1-week period, enabling them to estimate monthly electricity consumption and its associated costs. With this knowledge and the implementation of action plans in the form of behavioral changes, it is expected to reduce production costs for household industry players, thereby increasing competitiveness. In addition, by implementing energy-saving behaviors, such as reducing unnecessary energy use, maintaining energy-consuming appliances, and exploring environmentally friendly alternative energy options (Khulaemi, 2025; Saputri et al., 2024) participants can make more informed decisions about their energy use. This proactive approach not only improves their ability to control their monthly electricity expenses, but also contributes to long-term sustainability. Through consistent monitoring and gradual application of efficient practices, home industry players can achieve lower operating costs, ultimately strengthening their competitiveness in the market (Pradana & Haryudo, 2023).

Conclusion

Based on the energy efficiency awareness training activities carried out in Keranggan Ecotourism Village, it can be concluded that residents are able to record their electricity consumption using a kWh meter and analyze whether their electricity use is efficient or wasteful. In addition, training participants also began to realize the habits that cause energy waste, making it increasingly clear the need for energy-saving behavior changes. Regarding electricity costs, participants are now able to estimate the amount of electricity costs they have to pay and understand the importance of energy conservation, which has the potential to save costs and increase their productivity.

Recommendation

It is recommended to implement a follow-up program that allows residents to monitor energy consumption on a regular basis, such as through a simple app or monthly monitoring. Continuous education activities also need to be enhanced to shape daily energy-saving behaviors, such as turning off lights when not needed or choosing more energy-efficient appliances. In addition, practical guidance modules and simple measurement tools need to be provided so that citizens can more quickly identify areas that need savings. The implementation of these recommendations is expected to support sustainable energy savings, reduce electricity costs, and improve the welfare of Keranggan Ecotourism Village residents.

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