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Technical Guidance Provision in Electricity Energy Saving for Teachers and Educational Staff of SDN 09 Pontianak Timur

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ABSTRACT

The provision of electricity is crucial, so efficiency must be done because electrical energy is a top priority for residential, industrial, and outdoor lights. All tiers of society must support the government's efforts to ensure the stability of the nation's energy supply through initiatives to boost supply and conserve energy. The public, particularly the lower middle class, do not yet understand the existing technology well; the information of its benefits and drawbacks have not been equally spread. Energy researchers and experts assert that the domestic or household sector's contribution to the attempt to cut power usage is very significant due to the comparatively high share of residential consumers. A project must be carried out to provide counseling in the form of instruction on cost savings when utilizing electrical and electronic gadgets in homes and schools. The counseling results revealed that the teachers of SDN 09 Pontianak Timur were genuinely interested in what they were hearing and in the presented curriculum. Through the counseling technique it is observed that the community is becoming more conscious of the need to utilize electrical energy more intelligently and is gaining new insights into how to do so. These insights help the community promoting energy efficiency in daily life.

Keywords: *energy conservation, reduce energy, electricity-saving, schoolteachers*

1. INTRODUCTION

Electrical energy today plays a fundamental role in modern living. Humans will not be separated from the need for electrical energy and are greatly helped by the presence of electrical energy from housing activities, education, industry, and other activities. The longer electrical energy presents, the more essential it is for human survival, making people highly reliant on its availability **(Vassileva & Campillo, 2014)**. Human dependence on electrical energy is increasing along with the needs and the increasing number of the human

population, causing electricity supply companies to continue to increase the capacity of the energy they generate **(Laicane, Blumberga, Blumberga, & Rosa, 2015)**. A large amount of power is needed with a significant source of material as well to increase the capacity of the energy produced.

Renewable energy developments and innovations have been developed to meet electrical energy needs, such as nano power plants and power optimization in power plants **(Vassileva & Campillo, 2014)**. However, the development of renewable energy technology is still in the prototype stage, so it still sticks to fossil energy; this is the main problem. The average power plant still uses fossil fuel engines such as coal, gas, and diesel because the effectiveness and efficiency of machines that use fossil materials are more significant than other materials **(Hasan, Mahlia, & Nur, 2012)**. Meanwhile, the supply of fossil materials is getting thinner, and the demand for electrical energy is increasing. Therefore, it is necessary to save electricity consumption to sustain the electrical energy supply.

Indonesia is a country that has abundant natural wealth and a diversity of energy sources, including water, wind, solar, petroleum, gas, coal, and renewable energy. With the wealth of abundant energy sources and independent and sustainable energy management, inevitably, this country will not lack energy; it will even be able to export energy **(BPPT, 2018; Kementerian Energi dan Sumberdaya Mineral, 2017b, 2017a)**. Based on the 2018 Indonesia Energy Outlook data, it is stated that the projections for Indonesia's electricity consumption and production are relatively thin. Indonesia's electricity demand in 2050 is estimated at 1,611 TWh, while its production capacity is slightly above 1,767 TWh **(BPPT, 2018)**.

According to several energy experts, the condition of Indonesia's energy security is in the unstable category. Efforts to produce electricity are relatively tricky because they are constrained by changes in the Indonesian and world's unstable economy **(Sukarno, Matsumoto, Susanti, & Kimura, 2015)**. In contrast, electricity consumption is sure to increase in line with Indonesia's population growth **(BPS, 2018)**. Based on data from the Ministry of Energy and Mineral Resources, until September 2017, around 2,500 villages, or 7% of the total villages in Indonesia, were still waiting for their turn to receive electricity. Data on the composition of Indonesian electrical energy consumers state that electricity users from the household sector play a high role, around 48.38% **(Kementerian Energi dan Sumberdaya Mineral, 2017b)**. This high number of consumers from the household sector has consequence that government efforts in suppressing or stabilizing electricity use need to pay attention to the behavior of electricity users from the household sector **(Boudet, Flora, & Armel, 2016a; Zhang, Yu, Wang, & Wei, 2018)**.

Based on consumer behavior tracing from the household electricity consumption in 2017 was 1,012 per kilowatt-hour (kWh) per capita and is estimated to increase by around 10% or to 1,129 kWh per capita in 2018 **(Kementerian Energi dan Sumberdaya Mineral, 2017a)**. Although the consumption value of electricity needs is still 25% lower than the electricity consumption of developed countries, which reaches 4,000 kWh/capita, it remains a threat due to Indonesia's relatively high population growth of around 1.5% **(BPS, 2018)**. These facts are what cause Indonesia's electrical energy supply is not able to meet all the electricity needs of the people of Indonesia.

Energy observers state that the contribution of the community, especially the household sector, to saving electrical energy is quite enormous **(Dianshu, Sovacool, & Vu, 2010; Georgou, Ioannou, & Christodoulides, 2013; Wijaya & Tezuka, 2013)**. As an

illustration of the effectiveness of these savings activities, for example, the household sector can be achieved up to 10% of household electricity consumption nationally, which means that the value of savings is equivalent to efforts to build a steam power plant with a capacity of 900 Mega Watt (MW). Alternatively, it can be illustrated that if 10 million electricity customers can save 50 W every day for 5 hours of peak load, the electricity consumption that can be saved is 10 million x 50 W X 5 hours = 2,500-million-Watt hours or 2,500 MWh every day. Therefore, efforts to increase public awareness and participation in electricity-saving activities must be facilitated to produce optimal savings output **(Santoso & Salim, 2019)**.

The diversity of social and educational backgrounds of individuals in the household is one of the challenges in the education of national electrical energy-saving efforts **(Boudet, Flora, & Armel, 2016b)**. On the other hand, individuals in the household are also believed to be able to become effective agents in this saving effort **(Karjalainen, 2011; Vassileva & Campillo, 2014).** Because of the growing awareness of each household about the importance of saving electricity, it is believed that it will have a significant impact on the success of the saving program in general. Therefore, efforts to increase community participation in this electrical energy-saving activity must be supported and facilitated to produce optimal savings output.

The school building is an option in this community service because it aligns with the government's recommendation for one of its energy-saving programs. The government recommend saving on electricity consumption and not wasting fuel use. Energy saving, in this case, is devoted to buildings because the building sector absorbs 40% of the world's energy sources. Even in Indonesia, this sector is responsible for 50% of total energy use and more than 70% of electricity consumption **(ESDM, 2011)**. One of the benefits of energy saving is an increase in quality and comfort in people's lives. The target for this community service is for the SDN 09 Pontianak Timur Pontianak City teachers to gain new knowledge and insights about saving energy, which can be implemented at school and at home.

2.METHODS

Based on the previously presented problems, the solution that can be offered as a first step to overcome these problems is to provide a briefing and education on electrical energy saving and training on how to calculate the electrical energy consumption of households and school buildings.

2.1. Community Services Location

The community service was conducted in SDN 09 Pontianak Timur with the address at Jalan H. Rais, Parit Mayor Subdistrict, Pontianak Timur District, Pontianak City, West Kalimantan as shown in figure 1.

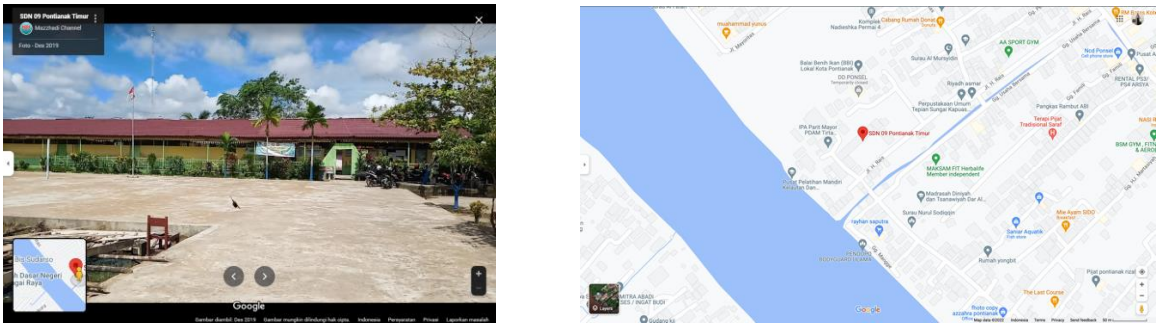


Figure 1. Community Services Location at SDN 09 Pontianak Timur

2.2. Electric Energy Saving Campaign

The campaigns promoting the electricity-saving lifestyle in Indonesia have not deeply touched the community's understanding. Energy saving is solely aimed at reducing electricity bills. Electricity savings are made because the current electricity supply has not been able to meet the needs of all Indonesians consistently and reliably. Many of us still experience pets several times a day or cannot enjoy electricity for 24 hours. Indonesia still needs to increase the availability of electricity because consumer demand continues to increase every year, both for household, office, and industrial activities. If it is not fulfilled, then Indonesia will experience an electricity crisis! For Indonesia to be energy sovereign, the government must prioritize adequate and equitable energy production, especially renewable energy, and implement good governance. At the same time, consumers also need to adopt an energy-saving lifestyle and become intelligent consumers **(Candra, Setyaningsih, Jap, & Beng, 2018)**.

2.3 Community Services Flow Chart

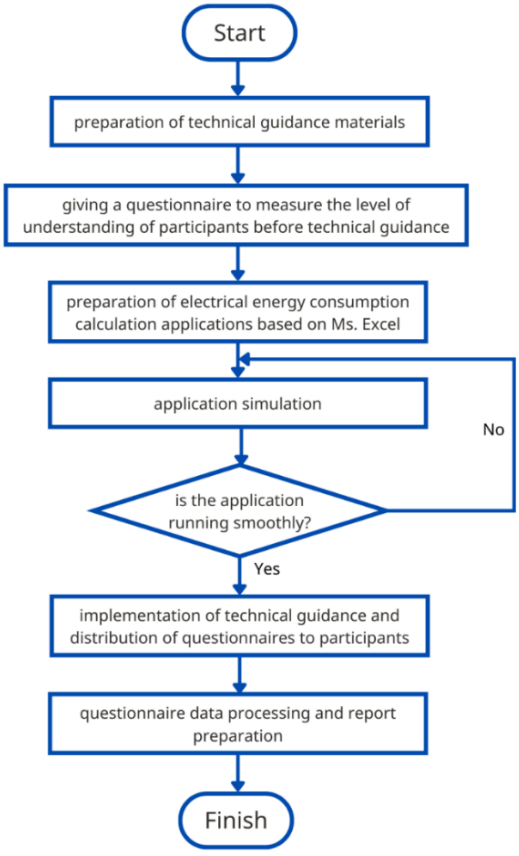


Figure 2. Community Services Flow Chart

The activity implementation flow chart aims at simplifying and drawing the stages of a series of procedures to be carried out in this community service so that it can be understood easily. Figure 2 shows flow chart of the community services implementation stages.

2.4. Excel-Based Electric Energy Consumption Calculation Simulation

One form of savings that can be done is to control the use of electrical energy. Before controlling, each customer must calculate electrical energy consumption daily and monthly. Electrical energy consumption can be calculated using an application based on Ms. Excel, which is prevalent in schools.

2.5. Community Service Implementation Method

Lecture Method: educating teachers on how to use energy-efficient electricity and calculate monthly electricity bills on a KWH Meter so that teachers can have an economic impact on saving electrical energy.

Discussion and Question and Answer Method: exploring questions and discussions from residents about the problems they face related to electricity experienced in their daily lives.

Demonstration Method: providing examples of energy-efficient electrical devices and how people should use or use electricity to save energy.

Simulation Method: simulating the calculation of monthly electricity bills from a sample of several residents on the use of electricity in their homes daily using Microsoft excel-based calculation simulation software.

The explanation of each stage in the community services flow chart is as follows:

a) Preparation of technical guidance materials and preparation of questionnaires

Modules were prepared to be presented at technical guidance and questionnaires related to technical guidance given were compiled. The questionnaire contained questions and statements related to the material and administration of technical guidance.

b) Administering questionnaire to measure the understanding level of participants before technical guidance

The questionnaire was administered to determine the participants' initial understanding of electricity energy saving, and used as a benchmark for the success of technical guidance provision on electrical energy saving.

c) Preparation of Ms. Excel-Based Applications

A simple electrical energy consumption calculation application that could be applied in schools and homes was created. The application was built using Ms. Office Excel.

d) Application Simulation

Internal testing had been conducted before the application was piloted and distributed in the community services locations to anticipate deficiencies or even failures in the application. The simulation results showed that the application could work well without any problems.

e) Implementation of Technical Guidance and Distribution of Questionnaires

The implementation of technical guidance began with the delivery of materials related to Electrical Energy, Electrical Energy Saving, and Calculating Electrical Energy Consumption using an application. Then, questionnaires were distributed to participants.

f) Questionnaire Data Processing and Report Preparation

Questionnaire data were then processed, the results of which were used as evaluation material (feedback) on the activities carried out and as an analytical basis for writing community services articles.

3. RESULTS AND DISCUSSIONS

This community services activity was carried out at SDN 09 Pontianak Timur, which is located on Jalan H. Rais, Parit Mayor Village, East Pontianak District, Pontianak City, West Kalimantan. The activity took place on 11 April 2022 with SDN 09 Pontianak Timur teachers as technical guidance participants. This activity aimed at teaching teachers the proper, careful, and efficient use of electrical equipment. The next goal was to provide a short course for teachers on how to save electrical energy by regulating the use of electrical equipment through energy audits by calculating electrical energy consumption over a certain period. Figure 3 shows opening and welcoming speech from SDN 09 Pontianak Timur.

Figure 3. Opening and welcoming speech from SDN 09 Pontianak Timur

This activity was carried out by a lecturer's team of the Faculty of Engineering Universitas Tanjungpura as shown in figure 4 and 5. The target of this activity was the teachers at SDN 09 Pontianak Timur. Technical guidance activities were carried out using the lecture method, delivering material about electrical energy and how to save electrical energy. Materials were delivered in the form of *PowerPoint* slides and presented adjusted to the needs of the teachers about the use of electrical energy in schools and homes. The lecturer delivered the material while the students served as operators. The material presented was distributed to the participants before the presentation began, so there was no information gap between the presenters and the participants.

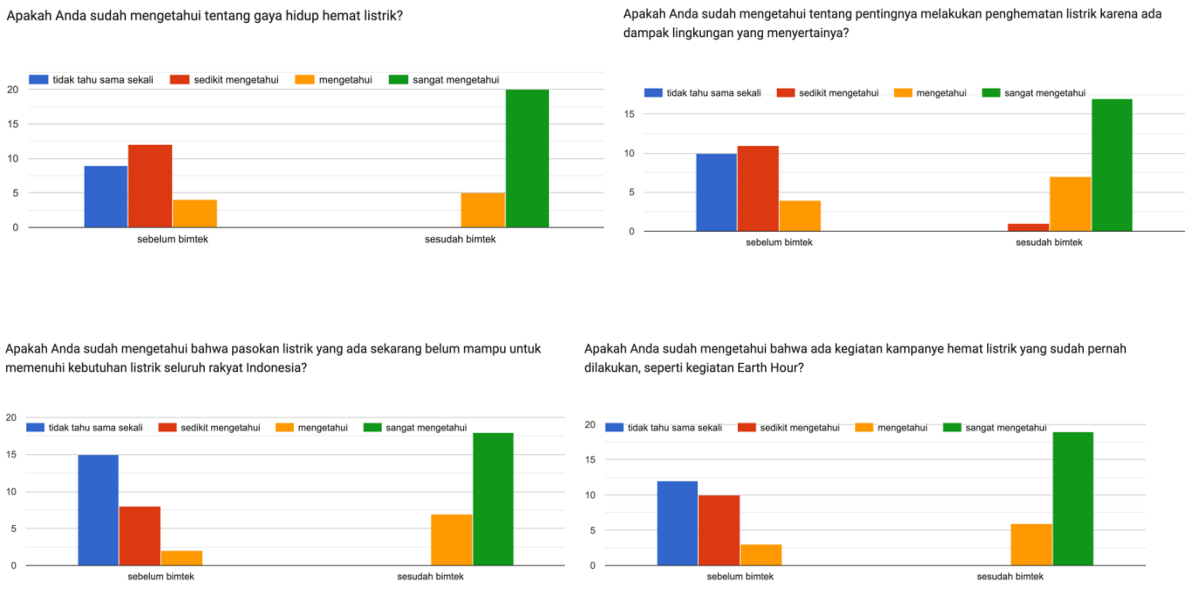
Figure 4. Delivery of technical guidance for saving the use of electrical energy

Second, the discussion method was used as a means of interaction between presenters and participants to create a fluid, warm, and insightful technical guidance atmosphere. In this discussion session, several participants were very enthusiastic about interacting, especially participants who had home laundry businesses and were familiar with non-house electrical energy consumption.

Third, the demonstration method was carried out in an excel-based application simulation to calculate electrical energy consumption at SDN 09 Pontianak Timur and a random sample of residential electrical energy usage from one of the participants.

Figure 5. Teachers and education staff listen carefully to the presenter

After implementing the technical guidance activities on saving electrical energy, questionnaires were distributed to evaluate the participants' understanding and satisfaction with the activity. The questionnaire results can be seen in figure 6 and table 1.



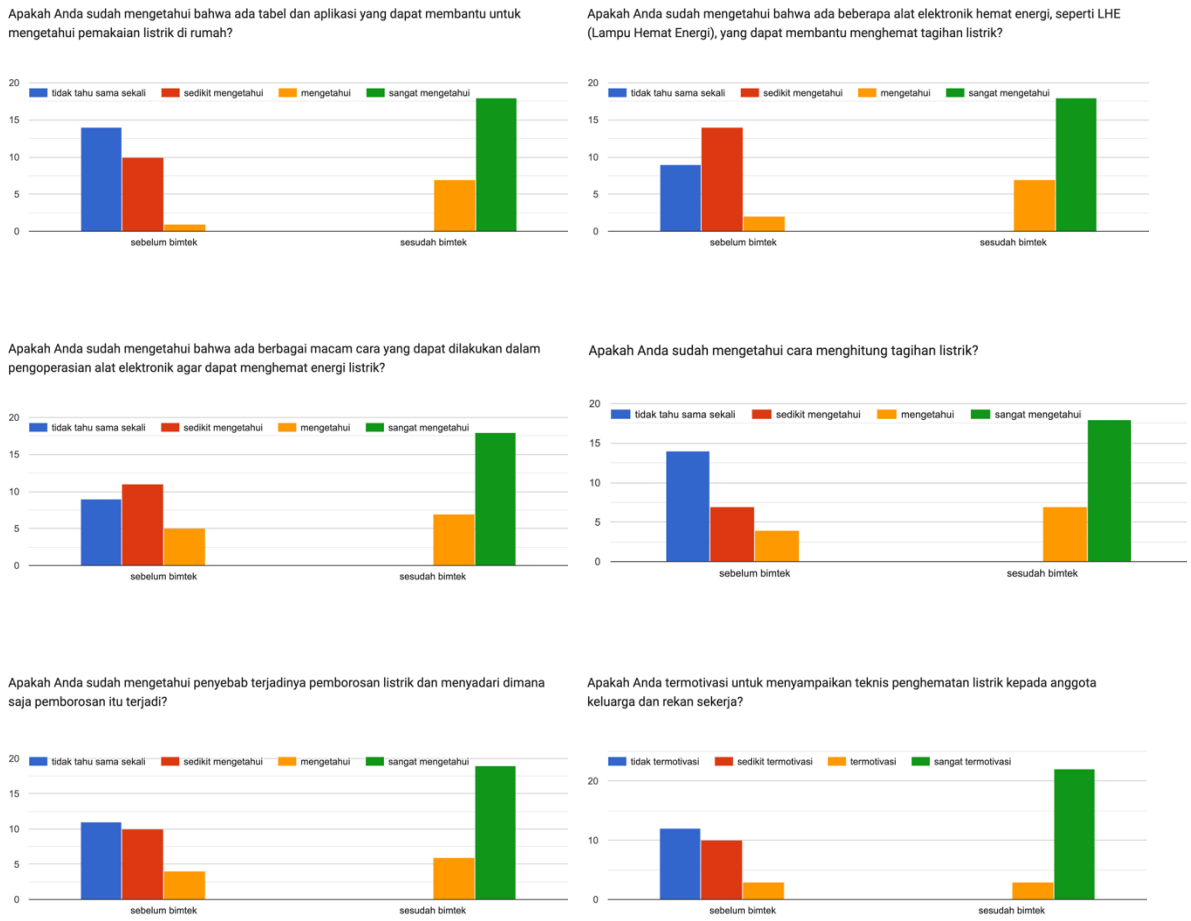


Figure 6. The results of the questionnaire on participants' understanding before and after technical guidance

Table 1. Satisfaction Index of Technical Guidance Participants in Electrical Energy Saving at SDN 09 Pontianak Timur.

No	Questions	Satisfaction Index*	Percentage **	Description
1	Do you already know about the energy-saving lifestyle?	3.80	95%	Very good
2	Do you already know about the importance of saving electricity because environmental impacts come with it?	3.64	91%	Very good
3	Do you know that the current electricity supply has not been able to meet the electricity needs of all Indonesian people?	3.72	93%	Very good
4	Do you know that electricity-saving campaign activities, such as Earth Hour activities, have been carried out?	3.76	94%	Very good
5	Do you know that some tables and applications can help determine electricity consumption at home?	3.72	93%	Very good
6	Doyou know that energy-efficient electronic devices, such as ESL (Energy Saving Lamps), can help save on electricity bills?	3.72	93%	Very good
7	Do you know that various ways can be used	3.72	93%	Very good

No	Questions	Satisfaction Index*	Percentage **	Description
	to operate electronic devices to save electrical energy?			
8	Do you already know how to calculate electricity bills?	3.72	93%	Very good
9	Do you know the causes of electricity wastage and are aware of where it occurs?	3.76	94%	Very good
10	Are you motivated to pass on electricity-saving techniques to family members and co-workers?	3.88	97%	Very good
Average		3.744	93.6%	**Very good**

*satisfaction's index =
0.00 – 1.00 : poor
1.01 – 2.00 : fair
2.01 – 3.00 : good
3.00 – 4.00 : very good

**Percentage
0 – 25% : poor
26 – 50% : fair
51 – 75% : good
76 – 100% : very good

Based on the questionnaire results and recapitulation of the results above, it was found that the level of understanding and satisfaction index of the technical guidance participants reached 93.6% and was in the very good category. Thus, it can be said that the educational activities for saving electrical energy are well implemented, and the benefits can be directly obtained. The activity closed with a photo of the community services team with the teachers as participants in this activity as shown in figure 7.

Figure 7. Photo with the community services team, students, and participants (teachers and education staff) of SDN 09 Pontianak Timur

4. CONCLUSIONS

Based on the results of the community service, it is necessary to carry out further research, such as the development of energy literacy-based teaching materials to improve the energy-saving behavior of teachers and education personnel at SDN 09 Pontianak Timur. The hope is that teachers can implement the attitude of saving electrical energy in everyday life and can teach these attitudes to students so that this energy-saving attitude can have a broader impact. In addition, it is also necessary to conduct confirmation studies of theoretical models of energy-saving behavior in teachers, education personnel, and elementary school students.

LIST OF REFERENCES

Boudet, H. S., Flora, J. A., & Armel, K. C. (2016a). Clustering household energy-saving behaviors by behavioral attribute. *Energy Policy*, 92, 444–454. Retrieved from https://doi.org/10.1016/j.enpol.2016.02.033

Boudet, H. S., Flora, J. A., & Armel, K. C. (2016b). Clustering household energy-saving behaviors by behavioral attribute. *Energy Policy*, 92, 444–454. Retrieved from https://doi.org/10.1016/j.enpol.2016.02.033

BPPT. (2018). *Indonesia Energy Outlook 2018. Pusat Teknologi Sumber Daya Energi*. Jakarta.

BPS. (2018). *Laporan Bulanan-Data Sosial Ekonomi*. Retrieved from Jakarta:

Candra, H., Setyaningsih, E., Jap, D., & Beng, T. (2018). *Analisis Efisiensi Konsumsi Daya Listrik dan Biaya Analisis Efisiensi Konsumsi Daya Listrik dan Biaya Operasional Lampu TL-LED terhadap Lampu TL-18*.

Dianshu, F., Sovacool, B. K., & Vu, K. (2010). The barriers to energy efficiency in China: Assessing household electricity savings and consumer behavior in Liaoning Province. *Energy Policy*, 38(2), 1202–1209. Retrieved from https://doi.org/10.1016/j.enpol.2009.11.012

ESDM. (2011). *Efficiency and Conservation Clearing House Indonesia (EECCHI) Kantor Hemat Energi*. Retrieved from Jakarta:

Georgou, A., Ioannou, P., & Christodoulides, P. (2013). *Domestic Electricity consumption and the public awareness factor*. Retrieved from https://www.researchgate.net/publication/259738312

Hasan, M. H., Mahlia, T. M. I., & Nur, H. (2012). A review of energy scenario and sustainable energy in Indonesia. *Renewable and Sustainable Energy Reviews*, 16(4), 2316–2328. Retrieved from https://doi.org/10.1016/j.rser.2011.12.007

Karjalainen, S. (2011). Consumer preferences for feedback on household electricity consumption. *Energy and Buildings*, 43(2–3), 458–467. Retrieved from https://doi.org/10.1016/j.enbuild.2010.10.010

Kementerian Energi dan Sumberdaya Mineral. (2017a). *Capaian 2017 dan Outlook 2018 Subsektor Ketenagalistrikan dan EBTKE*. Retrieved from Jakarta:

Kementerian Energi dan Sumberdaya Mineral. (2017b). *Statistik Ketenagalistrikan 2017*. Retrieved from Jakarta:

Laicane, I., Blumberga, D., Blumberga, A., & Rosa, M. (2015). Evaluation of Household Electricity Savings. Analysis of Household Electricity Demand Profile and User Activities. *Energy Procedia*, 72, 285–292. Retrieved from https://doi.org/10.1016/j.egypro.2015.06.041

Santoso, A. D., & Salim, M. A. (2019). Penghematan Listrik Rumah Tangga dalam Menunjang Kestabilan Energi Nasional. *Jurnal Teknologi Lingkungan*, 20(2), 263–270.

Sukarno, I., Matsumoto, H., Susanti, L., & Kimura, R. (2015). Urban Energy Consumption in a City of Indonesia: General Overview. *International Journal of Energy Economics and Policy*, 5(1), 360–373. Retrieved from www.econjournals.com

Vassileva, I., & Campillo, J. (2014). Increasing energy efficiency in low-income households through targeting awareness and behavioral change. *Renewable Energy*, 67, 59–63. Retrieved from https://doi.org/10.1016/j.renene.2013.11.046

Wijaya, M. E., & Tezuka, T. (2013). A comparative study of households' electricity consumption characteristics in Indonesia: A techno-socioeconomic analysis. *Energy for Sustainable Development*, 17(6), 596–604. Retrieved from https://doi.org/10.1016/j.esd.2013.09.004

Zhang, C.-Y., Yu, B., Wang, J.-W., & Wei, Y.-M. (2018). Impact factors of household energy-saving behavior: An empirical study of Shandong Province in China. *Journal of Cleaner Production*, 185, 285–298. Retrieved from https://doi.org/10.1016/j.jclepro.2018.02.303