Renewable pro-environmental and energy design of environmentally friendly behavior in Central Java

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Abstract. Energy in Indonesia is increasing rapidly every year in line with economic involvement, and human growth that is getting more and more energy is not fulfilled every year. Indonesia is among the most energy users because of its population; this is what drives the government to accelerate the use of renewable energy such as solar. This is related to its use, which can help many people who live in cities and remote areas such as; Electricity in households, public facilities, offices, electricity is said to be the most environmentally friendly. This research was conducted in Central Java by using descriptive qualitative methods and using research and development (R&D) methods. The technique used in this study is a qualitative expressive analysis technique. The resultant solution is to be able to meet the increasing electricity needs of the community, the use of renewable energy in the city that does not hurt the environment. This research produces renewable energy that can be used as a solution to solving the electrical energy crisis at an affordable cost and can increase the independence of the community so that it does not depend on government electricity supply and improve environmentally-friendly behavior.

1. Introduction
Electric energy has a vital role in achieving social, economic, and environmental goals to support equitable and sustainable development. The use of electricity in Indonesia has increased rapidly in line with economic growth and growing population. Energy is the primary need to increase the needs of human life.

The primary source of electricity in the community today is very dependent on government supplies, which mostly still rely on non-renewable natural resources. The exploration of non-renewable resources continues to be carried out continuously to meet the needs of electrical energy. The use of these resources has diminished, and the number of users is increasing especially households.

Households in Indonesia in remote areas are still many who have not been electrified, where from year to year electricity payments have increased significantly, environmental damage and the national energy crisis demanded the use of renewable and environmentally friendly energy sources is one of the efforts considered essential and needs to be done.
The purpose of this research is as follows: (1) to realize that the potential of renewable energy resources in the form of solar energy can be used as a solution to the national energy crisis, (2) Formulate ways of utilizing renewable energy in the form of solar to be used as alternative energy for electricity generation.

The benefits of this research are (1) the Government, helps meet the needs of electrical energy and provides references to other energy sources besides PLN, (2) The community helps provide alternatives that can help many people living in cities and remote areas such as; Electricity in households, public facilities, offices, electric power is said to be the most environmentally friendly.

Based on existing researchers, one of which was reported by Yusak and Sumartini, including found the Manufacture of Environmentally Friendly Fish Dryers Using Solar Panels; namely the utilization of solar energy both directly and indirectly with solar cell storage, the use of which is maximized and superior to improve the welfare of coastal fishers with products designed in such a way as to produce quality and hygienic dried fish for consumption, reduce dependence on the weather, suppress losses suffered by fishermen during the main harvest, minimize the possibility of damage caused by decay, and speed up the process and do not require large tracts of land.

The results of research from Sarmidi Amin concluded that Microalgae as biomass is a potential source of renewable energy and can also be thus converted into energy such as oil and gas biofuels.

2. Methods
This research was conducted in Central Java using descriptive qualitative methods and using research and development (R&D) methods. The technique used in this study is a qualitative descriptive analysis technique. The explanation is done in an argumentation—material in the form of a real situation review with solving using related theory support tools.

Environmentally friendly behavior is a behavior related to someone's actions that are shown repeatedly and tend to be continued due to the situation and conditions encountered [1]. Mainieri, Barnet, Valdero, Unipan, and Oskamp [2] stating environmental consumerism (environmentally friendly purchases) is the activity of buying and consuming products that are friendly to the environment. Ecologically familiar consumers are those whose purchasing behavior is influenced by environmental concerns, according to saleki-raheki and Rahimi [2]. Robert and Bacon [3] Define an environmentally-conscious consumer as someone who buys (or avoids) products and services that are considered to have a positive or negative impact on the environment. Furthermore, Soonthonsmai quoted the opinion of Anderson and Cunningham to define environmentally friendly consumers as someone whose consumption behavior is consciously endeavored to have a positive or neutral effect on the earth, the environment, and society on the environment.

Bhatia and Jain [4] explained that environmentally friendly behavior is also influenced by several factors, such as consumer demographic characteristics (age, education, gender, income level), knowledge, and consumers' perceptions about environmentally-friendly lifestyles. Rezai [5] said that the demographic characteristics of consumers, such as age and level of education influence perceptions and behaviors that are environmentally friendly, besides that the social environment also shows an essential role in influencing consumer awareness to behave in an environmentally friendly manner. Krajhanzl [6] stated that ecologically friendly behavior is green behavior, which in the context of the community is considered as a way of protecting environmental action that will have an impact on the health environment.

2.1. Environmentally friendly behavior
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2.2. Pro-environmental
Pro-environment is behavior that consciously tries to minimize the adverse effects of one's actions, for example, decreasing the consumption of resources and energy, the use of non-toxic materials, and reducing waste production [7]. Pro-environment attitudes include several aspects, including recycling behavior, conservation behavior, Consumer behavior, and transportation behavior, Markowitz, Goldberg, Ashton, M.C., & Lee [8]. According to Angela [9], the terms that correspond to Pro-environmental: 1) Behavior protecting the environment, 2) Behavior preserving the environment, 3) Responsible environmental behavior, 4) Ecological behavior, 5) Sustainable behavior. Conversely, contrary to counter-environmental behaviors such as destructive behavior and environmentally unfriendly action.

Pro-environmental behavior is a conscious effort to minimize negative impacts on the environment and development, including reducing energy use and water consumption, waste management, and recycling.

2.3. Renewable energy
Renewable energy sources are environmentally friendly energy sources that do not pollute the environment and do not contribute to climate change and global warming because the energy obtained comes from sustainable natural processes such as sunlight, wind, water, biofuels, and geothermal. Solar Panel is a device used to convert sunlight into electricity. Katsuaki, Nwabueze, Ugwuoke [10] stated that renewable energy is wind energy, solar energy, water energy, and biomass energy. The advantage of renewable energy is that it is abundant, free, and environmentally friendly. Meanwhile, when compared with other examples of renewable energy, solar energy has many advantages such as clean, quiet, and safe. Solar energy cannot be used right away, so it must first be converted into electrical energy. Solar irradiation is around 1000 W / m2.

3. Results and discussion

3.1. Overview of current conditions
Almost all the needs of human life require electrical energy. The electricity user community only thinks that electricity consumption will only be directly proportional to the costs incurred. Awareness of the importance of saving electricity usage will reduce the use of non-renewable natural resources is still minimal. The emergence of new electronic devices that require lower electrical power than previous similar devices is the current solution to reduce the amount of electricity used. However, the use of these new tools is increasingly intensive and even more users so that the use of electrical energy is higher. If it only relies on government supply, it is deemed insufficient to fulfill this need or even makes the costs to meet electricity needs swell.
3.2. **Solution that has been implemented**
To meet the increasing electricity needs of the community, the government has made efforts to increase the number of electricity generators that use non-renewable resources. This government solution using diesel fuel for diesel or coal for steam engines has the consequence of running out of resources as well as its adverse impact on the environment. Another weakness is the lack of back-up or backup power plants. The government also purchases electricity from neighboring countries to meet electricity needs.

Various alternative energies have been developed before, such as the use of water currents, wave energy, and solar cells. Still, these energies require high-cost infrastructure so that not all people can create and use them.

3.3. **Level of success of ideas**
The idea of the concept of alternative energy sources for electricity generation can meet the increasing electricity needs of the community. This idea can also reduce the use of non-renewable energy sources for electricity generation and mitigate the consequences arising from the use of fossil fuels. Solar Panel is a tool that can be made by the community and low-cost. Solar Panel does not require complicated infrastructure like other alternative power plants so that people can make these tools independently. This electricity generator uses a battery as its energy source, thereby minimizing the risk of danger.

![Figure 1. Image of solar panel technology scheme.](image)

4. **Conclusion**
The conclusions that can be drawn from this paper are (1) Renewable energy in the form of solar panels can be used as a solution to solving the low-cost electricity crisis, (2) Renewable energy in the form of solar panels can spur increased community independence so as not to depend on government electricity supply.

Renewable energy in the form of solar panels can be used as a primary means of meeting electricity needs because it still needs to be accompanied by existing electricity sources. Because this is expected the government to make on a large scale for households and industry. It is necessary to be aware of the potential of solar panel resources to the community. It is needed to disseminate this concept so that it can be applied to the broader community.

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