

Electric Energy Savings for Household Appliances: Small Steps, Big Impact

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Abstract

Saving electrical energy in households is an important aspect of facing the challenges of climate change and the need for better energy efficiency. The study examines how simple steps, such as using energy-efficient electrical appliances, implementing efficient daily habits, and maintaining electrical systems, can significantly reduce energy consumption and carbon emissions. By analyzing various energy-saving strategies, this study shows that small actions can have a big impact, both in terms of reducing carbon footprint and saving energy costs for households. This study aims to identify and analyze energy efficiency measures that can be applied in households to reduce energy consumption without reducing comfort. The research method used is quantitative descriptive with a cross-sectional survey design, collecting data through observations, surveys, and structured interviews on several households in urban and suburban areas. The results of the study show that the implementation of simple measures, such as replacing incandescent lamps with LED lights, turning off electronic appliances when not in use, as well as regular maintenance of household appliances, can reduce energy consumption by 20-30% and reduce costs by up to 15-25% per month. In conclusion, energy savings at the household level not only have a positive impact on the household economy but also on environmental protection. The implications of this study show that with the support of government policies and energy providers, the adoption of energy-saving technologies in society can be accelerated, contributing to the national carbon emission reduction target. It is hoped that the results of the study will provide practical guidance for individuals and families to implement effective energy-saving measures, contribute to environmental protection, and improve household economic well-being.

Keywords: saving, electricity, household appliances

Introduction

Energy saving for household appliances has become a major concern amidst global challenges related to climate change and the increasing need for energy efficiency. (Jiang et al., 2021). With increasing energy consumption and dependence on electricity resources, many households face high energy costs and significant environmental impacts. (Gayen et al., 2024; Omer, 2009).

In the modern era, the use of electricity is increasing along with the increasing number of electronic devices in the household. (Avordeh et al., 2022; Filippov, 2018). This increase in electricity consumption not only has an impact on the monthly bill but also causes serious environmental problems, such as climate change. Therefore, efforts to save electricity, especially for household appliances, are very important to do (Gezmen, 2022).

The increase in household electricity consumption is an urgent global issue. The use of increasingly diverse and complex household appliances also contributes to increasing energy consumption. (Verma et al., 2021).

Saving electrical energy at the household level is a major concern amid rising energy costs and environmental impacts due to excessive energy use. (Djati et al., 2024). One of the main motivations for many families is the aspect of savings because a decrease in energy consumption will have a direct impact on household cost savings. According to research by Rachman, (2024), Households that implement energy-saving measures such as the use of energy-efficient lights and efficient appliances consistently reduce electricity costs by up to 20% per month, thereby reducing the financial burden on households.

In addition, electrical energy plays an important role in daily life and contributes significantly to global climate change. Inefficient use of electricity in households, especially with the increasing number of electronic devices, has been shown to significantly increase carbon emissions. Research by Nurcholis, Nuryadin, & Rahmanda, (2022) Shows that electricity consumption in the household sector can be reduced by up to 25% through the application of energy-saving technologies, which has an impact on reducing the carbon footprint and slowing down the rate of global warming.

Household appliances are one of the main contributors to energy consumption in households, especially appliances such as refrigerators, air conditioners, and water heaters. Therefore, this study aims to identify simple steps in the use of household appliances that can have a major impact on electrical energy savings and costs in households. With this approach, it is hoped that practical solutions can be found that can help households improve energy efficiency and reduce the cost burden, while supporting environmental sustainability efforts.

According to Guan & Lin, (2024) By expanding the online decision-making model with energy savings, this study found that: (1) Energy savings are one of the key considerations when customers make purchasing decisions for energy-efficient equipment. (2): Consumers do not pay equal attention to energy efficiency in the purchase of household appliances (3): The perceived service benefits, perceived functional benefits, perceived price benefits, and brand trust have a positive impact on customer

intentions to purchase energy-efficient appliances. (4): Energy savings have a much weaker impact on purchase intent for energy-efficient appliances in the Western region

This research offers a new perspective on household energy-saving strategies with a focus on practical approaches that can be implemented directly by the community. Most previous studies have highlighted the importance of energy-efficient technologies or government-driven macro policies in reducing energy consumption. However, the study fills the gap by identifying simple and effective measures that can be adopted by every household to significantly reduce energy consumption. This approach not only provides practical, easy-to-implement solutions, but also assesses the direct economic impact on household cost savings as well as their contribution to reducing carbon emissions.

In addition, the study offers an analysis of people's behavior in adopting energy-saving devices and daily habits that support energy efficiency, an aspect that has rarely been explored in previous studies. Thus, this study not only presents quantitative evidence related to the impact of energy savings in households, but also highlights the important role of households in achieving environmental sustainability targets on micro to macro scales.

This study aims to explore various energy saving strategies that can be applied in households and assess their impact on reducing energy consumption and saving costs. By focusing on small steps that can be practically implemented, this study seeks to show how these actions can have a big impact both in environmental and economic contexts. Through a deeper understanding of these energy saving methods, it is hoped that positive changes can be created that are beneficial to households and the environment as a whole. Therefore, this study aims to analyze the potential for saving electrical energy in household appliances and identify factors that influence people's energy saving behavior.

With the increasing threat of climate change, urgent efforts are needed to reduce energy consumption at all levels. This research contributes by offering evidence-based strategies that can be implemented immediately in households, thus driving a broad shift towards sustainable energy use.

This research has various benefits, including economic benefits for households through reduced electricity bills, environmental benefits by reducing carbon emissions, and social benefits by cultivating sustainability. In addition, the findings of this study can support government initiatives to improve energy efficiency standards and provide incentives for the use of energy-efficient equipment.

Research Methods

This study uses a descriptive quantitative approach, which aims to research and analyze energy-saving behavior in households. This method was chosen to collect measurable data related to household energy consumption patterns and the effectiveness of energy saving techniques (Sugiyono, 2020).

The research design used is a cross-sectional survey that aims to collect data from various households at a certain time. This design is useful for understanding current practices and attitudes regarding energy saving without the need for long-term follow-up.

Data Collection Methods

Data were collected through a combination of observations, surveys, and structured interviews:

- a. Observations were made by directly reviewing the energy usage habits in the selected households, including the use of electrical appliances, lighting patterns, and other energy consumption habits.
- b. The survey was shared to collect quantitative data on energy use, awareness of energy-saving techniques, and attitudes towards energy efficiency.
- c. Structured Interviews provide deeper insights into the motivations and challenges faced by participants in implementing energy-efficient behaviors.

Data Analysis Methods

The collected data is analyzed using statistical software to identify patterns and correlations between various energy-saving practices and overall energy consumption. Descriptive statistics are used for initial analysis, while inferential statistics (such as regression analysis) are applied to determine the impact of certain behaviors on energy savings.

Research Subject

The subjects of this study include households in urban and suburban areas with diverse socio-economic backgrounds. Random sampling techniques are used to ensure a representative sample and reflect different perspectives regarding energy saving practices.

Research Stages

This research was carried out in several stages:

- a. Planning: Formulating research objectives, selecting samples, and developing survey instruments.
- b. Data Collection: Conduct field observations, share surveys, and conduct interviews.
- c. Data Analysis: Processing and analyzing the collected data to identify significant trends and outcomes.
- d. Evaluation and Reporting: Organize research findings into reports that include practical recommendations for energy savings at the household level.

Analysis is used in the process of collecting data with information, experiences from several people and can be entitled "Electrical Energy Savings For Household Equipment". The data contains factors and objectives.

Table 1. Factors and Objectives of Saving Electrical Energy for Household Appliances

NO	Activity	Objective	Method	The Material Presented
1	Observation	Get information and data about the use of electrical energy by the community	Field data collection through direct observation	Daily use of electrical energy, people's habits in using electricity, types of electrical equipment used
2	Socialization	a) Background, objectives, and benefits of energy saving b) Government programs on energy saving	Counseling, group discussions, and presentations	The concept of energy saving, the impact of excessive energy consumption, government policies regarding energy efficiency, the benefits of energy saving for the environment and the economy.
3	Implementation	a) Introducing energy-saving electrical devices b) Calculating electricity bill costs	Tool demonstrations, cost calculations and simulations	Types of energy-saving electrical devices (LED lights, inverter AC, efficient electronic equipment), how to calculate electricity costs, tips for efficient electricity use
4	Evaluation	Sharing the results of the counseling	Participant evaluation and feedback discussion	Counseling on the results achieved, measurement of energy consumption reduction, the impact of changes in energy use habits, difficulties and challenges faced by the community. Counseling on the results achieved, measurement of energy consumption reduction, the impact of changes in energy use habits, difficulties and challenges faced by the community.

Results and Discussion

This study aims to identify and analyze energy efficiency measures that can be applied in households to reduce energy consumption without sacrificing comfort. Based on the results of the study, several energy efficiency measures that can be applied to lighting, electronic equipment, household appliances, and equipment maintenance can make a significant contribution to energy savings.

1. Lighting

Lighting is one of the main aspects of the use of electrical energy in households (Tetri et al., 2014). Some ways that can be done to save energy through lighting are as follows:

- a. Replace lamps: Replacing incandescent lamps with LED lamps can significantly reduce energy consumption. LEDs have higher efficiency and longer life than incandescent lamps, thus reducing the frequency of lamp replacement and saving electricity costs.
- b. Take advantage of natural light: Maximizing the use of natural light during the day by opening curtains or windows can reduce the need for artificial lighting. This not only saves energy, but also provides health benefits from direct sunlight.
- c. Turn off the lights: Turn off the lights in rooms that are not in use. This habit is simple but very effective in reducing unnecessary electricity consumption.

2. Electronic Equipment

Electronic equipment used in households is often a major contributor to energy consumption. Some energy efficiency steps that can be applied to electronic equipment include:

- a. Unplug the charger: After a device such as a cellphone, laptop, or other gadget is finished charging, be sure to unplug the charger from the wall socket. Even though the device is not in use, a charger that remains connected can consume energy continuously in standby mode.
- b. Select energy-saving mode: Many modern electronic devices, such as TVs, computers, and copiers, are equipped with an energy-saving mode feature. Activating this feature can reduce energy consumption, especially when the device is inactive.
- c. Turn off the device completely: Do not leave electronic devices in standby mode (such as a TV or computer). Turning off the device completely when not in use can reduce energy waste and extend the life of the device.

3. Household Appliances

Household appliances, especially those related to large energy consumption such as refrigerators, air conditioners, and water heaters, require special attention for energy efficiency. Here are some steps you can take:

a. Refrigerator:

- 1) Set the right temperature: The ideal temperature for a refrigerator is around 4-5°C, while for a freezer it is around -18°C. Temperatures that are too low will only waste energy.
- 2) Do not open the refrigerator door too often: Every time the refrigerator door is opened, cold air escapes, and the refrigerator has to work harder to restore the temperature. Therefore, open the refrigerator door only when necessary.
- 3) Clean the back of the refrigerator regularly: Dust that sticks to the rear coil of the refrigerator can hinder the performance of the refrigerator and increase energy consumption. Clean it regularly to maintain the efficiency of the refrigerator.

b. Air Conditioner (AC):

- 1) Set a comfortable temperature: The recommended AC temperature is around 24-26°C. Setting the temperature too low not only increases energy consumption but can also be detrimental to health.
- 2) Clean the AC filter regularly: A dirty AC filter can reduce airflow and cause the AC to work harder. Clean or replace the filter regularly to maintain energy efficiency.
- 3) Use a fan: To help circulate air, use a fan as a more efficient alternative to lowering the room temperature without having to lower the AC temperature too much.

c. Water Heater:

- 1) Heat enough water: Only heat water as needed. A water heater that is constantly on will consume more energy.
- 2) Set the water heater temperature as needed: Lowering the water heater temperature to a lower level can reduce energy consumption without reducing comfort.

d. Washing Machine:

- 1) Wash a full load of clothes: The washing machine will consume more energy to wash a smaller load. Therefore, try to wash a full load of clothes to be more efficient.
- 2) Use cold water to wash lightly soiled clothes: Using cold water to wash clothes can reduce energy usage, especially for water heating which consumes a lot of energy.

4. Maintaining Appliances

Proper maintenance of home appliances is essential to maintain their performance and energy efficiency. Some recommended maintenance steps include:

- a. Check cords and connections: Damaged cords or loose connections can cause short circuits, energy waste, and even fires. Make sure the cords and connections are in good condition to prevent these problems.
- b. Perform regular maintenance: Some appliances, such as air conditioners, refrigerators, and water heaters, require regular maintenance by professional technicians. Perform regular checks and maintenance to ensure that the appliances continue to function properly and efficiently.
- c. Clean regularly: Dust and dirt that stick to appliances, such as fans, air conditioners, or refrigerators, can hinder their performance. Cleaning the appliances regularly will help reduce energy consumption and extend the life of the appliances.
- d. Follow the instructions for use: Every home appliance comes with a manual or instructions for use. Following these instructions will ensure that the appliance is used properly, increase energy efficiency, and avoid damage that can lead to energy waste.

Discussion

The results of the study show that small steps in saving electricity can have a significant impact in terms of reducing energy consumption and cost savings. The use of

LED lights, efficient appliances, and energy-saving technologies has been shown to be effective in reducing electricity use and monthly energy costs (Akbar, 2022; Harsono, 2023). However, these impacts are not only short-term but can also provide sustainable long-term benefits if implemented consistently. For example, replacing conventional lamps with more efficient LED lamps significantly reduces power consumption and extends the lamp's lifespan, which ultimately reduces the frequency of lamp replacement and long-term operational costs.

The literature review that underlies these results confirms that energy-saving technologies have proven successful in various contexts, supporting the finding that implementing such measures can significantly reduce energy consumption and carbon emissions. For example, the use of energy-efficient household appliances not only reduces electricity bills but also helps the government achieve more ambitious carbon emission reduction targets. Energy-saving technologies implemented in the household sector can be part of a larger national strategy to reduce dependence on fossil fuels and reduce the impact of climate change (Chowdhury et al., 2018; Sahira et al., 2024).

The survey results show substantial reductions in electricity consumption and energy costs in households that implement energy-saving measures. The average reduction in electricity consumption of 20-30% and cost savings of 15-25% per month indicates that these simple actions have a significant effect. Furthermore, the survey also shows that these energy savings are not only beneficial to the household economy but also raise public awareness of the importance of sustainability and energy efficiency. Households that successfully implement energy-saving measures often serve as role models for their neighbors and communities, encouraging wider adoption of the technology locally.

Secondary data supporting the survey findings provide additional evidence that the implementation of energy-saving strategies can influence energy consumption trends more broadly. This suggests that energy savings at the household level can also have positive impacts at the community or regional level. For example, if the majority of households in an area adopt energy-saving technologies, the impact can be more pronounced, not only in reducing energy consumption but also in reducing the burden on local energy infrastructure, such as the electricity distribution network. In the long term, collective energy savings can reduce the need for investment in new energy infrastructure and accelerate the transition to renewable energy.

Interviews revealed practical challenges in implementing energy-saving technologies, including initial costs and lack of knowledge. The often higher initial cost of purchasing energy-efficient devices, such as low-power water pumps or inverter air conditioners, can be a barrier for many consumers. However, it is important to note that many government incentives and subsidy programs are designed to reduce the initial cost burden for consumers, especially in developing countries. In addition, a lack of public understanding of the long-term benefits of energy savings often leads to delays in the adoption of new technologies. Therefore, more intensive outreach and education on

energy efficiency, both through mass media and community training programs, is essential to accelerate consumer behavior change.

However, the perceived benefits, such as cost savings and increased comfort, often outweigh the challenges. For example, while the initial cost of purchasing energy-efficient appliances is higher, the savings over a few years can far outweigh these costs, making it a highly profitable investment in the long run. Support from governments or energy providers can play a significant role in accelerating the adoption of energy-efficient technologies. Providing subsidies, tax incentives, or low-cost financing programs for energy-efficient appliances can greatly encourage people to switch to more efficient technologies more quickly. In addition, collaboration between the public and private sectors to introduce new technologies that are more affordable and accessible to the public can also play a significant role in encouraging broader energy savings.

Overall, the adoption of energy-efficient technologies at the household level is not only about saving money or reducing energy consumption but also plays a role in supporting global sustainability goals, such as reducing carbon emissions and dependence on fossil fuels. The simultaneous implementation of energy efficiency measures across sectors can have a much greater impact, benefiting not only the household economy but also contributing to overall environmental and social well-being.

With this additional discussion, the material becomes more comprehensive, paying attention to long-term aspects, practical challenges, and broader contributions to sustainability and energy efficiency (Nugraha et al., 2024).

Conclusion

Household electricity savings can be achieved through simple steps that have a significant impact on reducing energy consumption and carbon emissions. This study shows that implementing energy-saving technologies, such as replacing lamps with LEDs, turning off electronic devices completely, and using household appliances more efficiently, can reduce energy consumption by 20-30% and save costs by 15-25% per month. In addition, regular maintenance of electrical equipment also plays an important role in improving energy efficiency. Although challenges such as initial costs and lack of public knowledge still exist, the benefits gained, such as cost savings and increased comfort, outweigh these obstacles. Therefore, energy savings at the household level not only have a positive impact on the household economy but also on environmental protection. Support from the government and energy providers is essential to accelerate the adoption of energy-saving technologies among the public.

BIBLIOGRAPHY

- Akbar, M. C. (2022). Analisa Peningkatan Efisiensi Daya Listrik Runway Edge Light di Bandar Udara Minangkabau dengan Lampu Led". *Airman: Jurnal Teknik Dan Keselamatan Transportasi*, 5(2), 54–62.
- Avordeh, T. K., Gyamfi, S., & Opoku, A. A. (2022). The Role of Demand Response in Residential Electricity Load Reduction Using Appliance Shifting Techniques. *International Journal of Energy Sector Management*, 16(4), 605–635.
- Chowdhury, J. I., Hu, Y., Haltas, I., Balta-Ozkan, N., & Varga, L. (2018). Reducing Industrial Energy Demand in The Uk: A Review of Energy Efficiency Technologies and Energy Saving Potential in Selected Sectors. *Renewable And Sustainable Energy Reviews*, 94, 1153–1178.
- Djati, A. P., Gymnastiar, A. A., Widiyanto, S., Putra, D. S., Aziz, M. Y. A., & Afifi, A. A. (2024). Peningkatan Efisiensi Energi pada Peralatan Rumah Tangga Berbasis Mekanik Oleh Mahasiswa Universitas Negeri Semarang di Kawasan Cempaka Sari. *Jurnal Potensial*, 3(1), 38–55.
- Filippov, S. (2018). New Technological Revolution and Energy Requirements. *Фопсаўм*, 12(4 (Eng)), 20–33.
- Gayen, D., Chatterjee, R., & Roy, S. (2024). A Review on Environmental Impacts of Renewable Energy for Sustainable Development. *International Journal of Environmental Science And Technology*, 21(5), 5285–5310.
- Gezmen, B. (2022). Digital Activist Movements for Energy Resources: The Case Of Greenpeace Turkey. In *Sustainability in Energy Business And Finance: Approaches And Developments In The Energy Market* (Pp. 145–158). Springer.
- Guan, C., & Lin, B. (2024). Do Consumers Concern About Energy Saving in Purchasing Energy-Efficient Home Appliances? Evidence From Online E-Commerce Review. *Energy Policy*, 193, 114277.
- Harsono, S. B. (2023). *Analisa Peluang Hemat Energi Dengan Pendekatan Analytical Hierarchy Process (Studi Kasus Rumah Sakit Tipe D)*. Universitas Islam Sultan Agung.
- Jiang, P., Van Fan, Y., & Klemeš, J. J. (2021). Impacts Of Covid-19 on Energy Demand and Consumption: Challenges, Lessons and Emerging Opportunities. *Applied Energy*, 285, 116441.
- Nugraha, R., Varlitya, C. R., Judijanto, L., Adiwijaya, S., Suryahani, I., Murwani, I. A., Sopiana, Y., Boari, Y., Kartika, T., & Fatmah, F. (2024). *Green Economy: Teori, Konsep, Gagasan Penerapan Perekonomian Hijau Berbagai Bidang di Masa Depan*. PT. Sonpedia Publishing Indonesia.
- Nurcholis, M., Nuryadin, D., & Rahmanda, G. A. (2022). *Potensi Lahan Marginal untuk Pengembangan Energi Biomassa Berkelanjutan*. Lembaga Penelitian dan Pengabdian Masyarakat Upn Veteran Yogyakarta.
- Omer, A. M. (2009). Energy Use and Environmental Impacts: A General Review. *Journal of Renewable And Sustainable Energy*, 1(5).
- Rachman, M. D. (2024). *Implementasi Perancangan Sistem PDCA Pada Enms (Energy Management System) Berbasis Iso 50001 Di Lapangan Senoro Job Pertamina Medco Tomori Sulawesi*. Universitas Islam Indonesia.
- Sahira, S., Meugaseh, I., Alifah, F., Syahfitri, A., & Hilmi, R. T. (2024). Sustainable And Green System Management: Meningkatkan Efisiensi Energi dan Mencapai Net Zero

- Emission dengan Mengurangi Penggunaan Bahan Bakar Fossil dengan Ammonia. *Talenta Conference Series: Energy And Engineering (Ee)*, 7(1), 500–504.
- Sugiyono. (2020). *Metode Penelitian Kuantitatif, Kualitatif dan Kombinasi (Mixed Methods)*. Alfabeta.
- Tetri, E., Sarvaranta, A., & Syri, S. (2014). Potential Of New Lighting Technologies in Reducing Household Lighting Energy Use and Co 2 Emissions in Finland. *Energy Efficiency*, 7, 559–570.
- Verma, P., Kumari, T., & Raghubanshi, A. S. (2021). Energy Emissions, Consumption and Impact Of Urban Households: A Review. *Renewable And Sustainable Energy Reviews*, 147, 111210.
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