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Article

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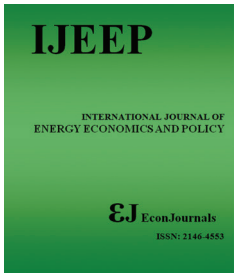

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Renewable Energy Policy in Indonesia: The Qur'anic Scientific Signals in Islamic Economics Perspective

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ABSTRACT

This study confirms that renewable energy sources become the solution for energy development in Indonesia due to the increasingly depleted use of fossil-based energy, due to an increase in the population that increases energy consumption and waste in fuel consumption. The Qur'an has provided simple concepts and illustrations about renewable energy sources that can be utilized by humans, energy conservation, and energy enrichment. With the codification and content analysis approach to energy policy in Indonesia and energy themes in the Qur'an, this paper asserts that the Government of Indonesia's renewable energy policy focuses on providing and developing renewable energy as part of sustainable development. This renewable energy policy can be proven scientifically with the implementation of scientific Qur'anic terms about renewable energy sources such as water, geothermal, ocean, vegetation, and wind. The policy on energy conservation through energy saving becomes a religious obligation for every person, institution, and government because to meet the needs of consumers, maintain the survival of the community, and preserve the environment.

Keywords: Renewable Energy, Energy Conservation, Energy Efficiency, Energy Economy
JEL Classifications: Q28, Q48, Q58

1. INTRODUCTION

Energy consumption in Indonesia is still dominated by the use of fossil-based energy, especially fuel oil and coal. If in the near future not found significant new energy sources in the year 2046 is feared Indonesia will experience energy deficit. The use of new and renewable energy should be the main concern of the Indonesian government not only as an effort to reduce the use of fossil energy but also to realize clean energy or environmentally friendly (Yudha, 2017).

By 2015, the increase in energy supply is seen almost in all energy types except hydro and biomass. Meanwhile, the dominance of fossil energy (coal, gas, petroleum) in the supply of primary energy is still visible, close to 90%. Although in this period the Indonesian economy is experiencing a slowdown, this has no negative effect on national energy consumption. Total national energy utilization in 2015 increased 2% from the previous year. According to Mujiyanto (2016), Indonesia's dependence on fossil fuels has an impact on high imports to meet domestic demand for petroleum (reaching approximately 55% of the total national petroleum supply) by 2015. Transport is still a sector with petroleum use the highest compared to other sectors.

Vera and Langlois (2007) stated that energy is an important factor in the overall effort to achieve sustainable development. Countries seeking to achieve this goal seek to reassess their energy systems with a view to planning energy programs and strategies consistent with the goals and objectives of sustainable development. The most important thing is the existence of guidelines and methodologies for the development of national energy indicators to be used in their efforts to monitor the impact of energy policies on sustainable social, economic and environmental dimensions.

Studies by Ozturk (2010), Payne (2010), and Tugcu et al. (2012) affirms that energy consumption and economic growth are the most popular topics in the literature of energy economics. Bozkurt and Destek (2015) emphasize that rising environmental pollution and environmental issues along with technological developments and improvements, and faster exhaustion of fossil fuels give rise to consideration of renewable energy sources that may create less pollution and degradation.

In developing strategies for sustainable development with a renewable energy perspective covering the wind, solar, wave and biomass will involve three major technological changes, namely demand-side energy savings, increased efficiency in energy production, and replacement of fossil fuels by renewable energy sources. As Lund (2007) points out, this has resulted in large-scale renewable energy implementation plans that should include strategies to integrate renewable sources in coherent energy systems that are affected by energy savings and efficiency measures.

The results of the study from Dincer (2000) conclude that renewable energy sources become the most efficient and effective solution to the current environmental problems faced and require long-term potential action for sustainable development. Thus, potential solutions to environmental problems are identified along with renewable energy technologies. Sadorsky (2011) argues that the great forces that make up the renewable energy sector for future scenarios include energy security issues, climate change, the depletion of fossil fuels, new technologies, and environmentally conscious consumers. The future of renewable energy depends on how much this strength and the combination of forces exist.

Meanwhile, Bompard et al. (2017) argue that the possibility of ensuring the energy required by a country is a fundamental requirement for economic growth and social welfare of the country. Fulfilling this need is particularly challenging for countries characterized by low levels of energy self-sufficiency. Energy security assessments need to consider different dimensions and are very important as benchmarks for understanding and implementing different policies. Security level assessments should rely on science-based models that can track rapidly growing geopolitical scenarios, and provide detailed information and quantitative indices to policy decision-makers.

Indonesia contributed the largest carbon emissions from the land use land and change sector sector by 50%. While the energy sector contributes 30% of carbon emissions, and from the transport sector reaches 12%. Meanwhile, 90% of air pollution is generated from ground transportation and as respiratory tract infections. In view of Yudha (2017), this pollution problem can be suppressed through government policies, especially in the energy sector with the use of new and renewable energy Energi Baru Terbarukan (EBT), which is environmentally friendly, in addition to reducing carbon emissions and realizing energy independence.

Another problem in Indonesia is the provision of energy for fuel for power generation, which is still dominated by fossil energy. According to Mujiyanto's analysis (2016), in addition to coal, the dependence of power plants on fuel oil (BBM) is still high, whereas from the side of the provision of fuel is very limited and used to meet the needs of other sectors. The national electricity industry is also facing crucial problems due to unbalanced supply with its utilization, especially in areas with minimal access.

Specifically, in the field of energy independence in the Indonesian government, energy independence targets in 2017 are conducted in order to meet electrification ratio of 92.75% and electricity consumption per capital 0.58 KWh, increased production of energy resources such as petroleum, natural gas and coal. In terms of energy distribution, especially natural gas, the emphasis is on the construction of transmission pipelines and gas distribution pipelines along 12,597 km, 2 units of SPBG (State budget), and municipal gas networks in 12 locations.

In this case, studies conducted by Omer (2008) suggest to reduce energy consumption and reduce the depletion of world energy reserves and environmental pollution. For example, one way to reduce building energy consumption is to design more economical buildings in energy use for heating, lighting, cooling, ventilation, and hot water supply. Passive action, especially natural or hybrid ventilation rather than air conditioning, can dramatically reduce primary energy consumption. However, the exploitation of renewable energy in agricultural buildings and greenhouses can also contribute to reducing dependence on fossil fuels. Therefore, promoting innovative renewable applications and strengthening renewable energy markets will contribute to the preservation of ecosystems by reducing emissions at local and global levels. It will also contribute to the improvement of environmental conditions by replacing conventional fuels with renewable energy that does not produce air pollution or greenhouse gases.

Another study from Demirbas (2009) explains that the major biofuel policy concerns job creation, greater efficiency in the general business environment, and environmental protection. Projection is an important tool for long-term planning and policy setting. Renewable energy sources that use natural resources have the potential to provide energy services with zero or near zero emissions from air pollution and greenhouse gases. Biofuel is expected to reduce dependence on imported petroleum with associated political and economic vulnerabilities, reduce greenhouse gas emissions and other pollutants, and revitalize the economy by increasing demand and prices of agricultural products.

Therefore, the new renewable energy policy in Indonesia is a top priority that will be utilized in the future. The national energy mix has been designed to continuously improve the utilization of new and renewable energy. As is known, the national energy mix 2015 consists of: 39% petroleum, 22% gas, 29% coal, and 10% renewable energy (EBT). In 2025, the national energy mix is planned to be 25% petroleum, 22% gas, 30% coal and 23% renewable energy (EBT), and the national energy mix in 2050 to 20% petroleum, 24% gas, 25% coal and 31 % renewable energy (EBT) (Yudha, 2017).

However, although the total renewable energy potential reaches more than 400 GW, EBT utilization in Indonesia is still very

low, <2% of the total potential of EBT. In addition to the low utilization, renewable energy production in 2015 shows a negative trend, especially water power which experienced a decrease of production up to 7.6%. The most significant production decline occurred in biodiesel close to 60% in 2015 from the previous approach of 4 million KL in 2014 to about 1.6 million KL. The decline in biodiesel production in 2015 is affected by the decrease of crude palm oil production as a result of El Nino (Mujiyanto, 2016).

This article will investigate about Indonesia's renewable energy policy in 2017 from an Islamic economic perspective. This paper will begin with a review of the literature on renewable energy policy from several research or study results, so as to know the scope and focus of the study. To focus the study on renewable energy as a top priority in development in energy, resources and minerals in Indonesia, this paper will investigate and review the Indonesian government's 2017 policy on renewable energy and other energy resource potentials to identify issues, developments and achievements policy at this time. As for focusing on renewable energy in terms of philosophy and thinking about energy from the perspective of Islamic economics, and of course, still little written or reviewed by energy researchers, this paper will focus also on the discussion of scientific signals in the Qur'an about energy sources, renewable energy, and simple implementation in developing renewable energy sources, as well as some examples of the use of renewable energy sources in terms of policies and their application in Indonesia. The study will be concluded with a review of energy conservation in the form of energy savings, implementation of energy conservation programs in Indonesia, and the affirmation of the religious aspect of renewable energy and energy saving.

2. LITERATURE REVIEW

The study of energy economics, renewable energy and energy development ethics in the perspective of Islamic economics can be grouped into three main discussions covering the Qur'anic philosophy of energy economy and renewable energy, the ethics of renewable energy development, and the policy of developing renewable energy in Indonesia year 2017 analyzed from an Islamic economic point of view. Energy problems in every country in the world can not be separated from the need to consume environmentally friendly energy, the need to develop renewable energy, and energy efficiency for future energy reserves for every country, including Indonesia. Here are some studies that focus on the issues mentioned above.

The study by Sadorsky (2011) concludes that the future of clean and safe energy, where renewable energy accounts for between 50% and 80% of total energy demand, is the most favorable scenario for the future of renewable energy but also the scenario that takes the amount the greatest commitment, in terms of time and money from businesses, individuals, governments, and policymakers. Dincer (2000) conducted research on the existence of a close relationship between renewable energy and sustainable development. Future patterns of anticipated energy use and consequent environmental impact (focusing on acid precipitation, stratospheric ozine depletion and greenhouse effect) are discussed comprehensively in this paper.

Meanwhile, Evans and Hunt (2009) assess that energy has a significant impact on the global economy is an important component for economic growth. The need to meet rising energy demand has driven leading innovation in clean technology in the pursuit of environmental and cost goals while ensuring energy supply security.

Dincer (1999) extensively also describes energy and environmental impacts. Energy utilization and environmental impact are mainly discussed from the standpoint of sustainable development, including anticipated future energy usage patterns and subsequent environmental issues. Renewable energy technologies and efficient energy utilization are identified as the most effective potential solutions to current environmental problems, along with some practical examples. This study is very important regarding the aspects of energy utilization, renewable energy, energy efficiency, environment and sustainable development that are analyzed from the current and future perspectives.

Research conducted by Omer (2008) concludes that about the influence of buildings on a global scale responsible for about 40% of the total world's annual energy consumption used for the supply of lighting, heating, cooling, and air conditioning. Raising awareness of the environmental impact of CO_2 and NOx emissions and chlorofluorocarbons sparked renewed interest in environmentally friendly cooling, and heating technology.

Vaghefi et al. (2015) emphasizes that developing countries, like most Muslim countries, need an economy that encourages growth and development, conserves natural capital, creates jobs, improves human welfare, and reduces poverty and inequality. Such an economy is called a green economy.

Omer (2008) conducted a study also on the removal of chemicals used as a refrigerant that potentially destroys stratospheric ozone. He therefore advises to reduce energy consumption and reduce the depletion of world energy reserves and environmental pollution. The study discusses a comprehensive review of energy, environmental and sustainable development sources covering all renewable energy technologies, energy efficiency systems, energy conservation scenarios, energy savings, and other mitigation actions necessary to mitigate climate change.

Elliott (2000) describes the current development of renewable energy technologies that are considered important in the world movement towards a sustainable approach to energy generation. This paper describes some of the institutional and social constraints to the development and dissemination of renewable energy and how it can be reduced, to regulate the development of renewable energy in the context of broader sustainable development.

Hammond (2000) examines the energy sources of different types of heat and human development forces, but also jeopardizes the quality and viability of the long-term biosphere as a result of undesired 'second order' effects. These side effects pose potential

environmental hazards at local, regional and global scales. This paper stresses the importance of balancing economic and social development with environmental protection as the core of the idea of sustainable development. A study conducted by Bompard et al. (2017) by applying a comprehensive methodology emphasizing the evaluation of energy security by considering the external and internal dimensions and integrating the security of energy supply from abroad (external) and the security of national (internal) energy infrastructure.

Phalan (2009) describes broadly about the social and environmental costs and benefits of biofuels in Asia. The main factors that determine the impact of biofuels are their contribution to land use change, raw materials used, and technology issues and scale. So, biofuels offer economic benefits, and in the right circumstances can reduce emissions and make small contributions to energy security.

Demirbas (2009) examines current energy policies addressing environmental issues including environmentally friendly technologies to increase energy supply and encourage cleaner, more efficient energy use and overcoming air pollution, greenhouse gases, global warming and climate change. The biofuels policy aims to promote the use of transportation of fuels made from biomass, as well as other renewable fuels. Biofuel provides the prospect of new economic opportunities for people in rural areas in oil importers and developing countries.

The study by Zweifel et al. (2017) asserted the application of general economic theory as well as empirical econometric methods to explain the drivers of the energy market and its development. This study is very comprehensive in the specific nature of the energy market as well as the physical, technological, environmental, and geopolitical properties of energy and product sources. With an argumentative explanation, this study also describes all types of energy markets, ranging from liquid fuels, gas fuel, and solid fuel to electricity, emissions allowances, energy efficiency, and nuclear risk. Important note that this study discusses the technological properties of energy technologies including renewable energy, natural resource economy, and environmental protection, market liberalization, and energy trade, as well as energy transformation experiences, particularly in Germany.

Da Silva (2010) also describes the life cycle analysis of renewable energy sources that focus on the static calculations of the energy balance and greenhouse balance in Brazil. This work introduces conceptual frameworks and mathematical models to simulate the time evolution of energy balance energy conversion technologies that are capable of complementing static energy recovery analyzes. Banks (2015) noted in his research that the energy economy includes oil, natural gas, and nuclear energy, and without excessive amounts of math. This work is quite important to the modern energy economy described in a simple and straightforward manner.

Jones (2009) in the study of the energy economy concludes that the energy economy is an important subject and not a commodity that can be bought and sold on the market, even though individual fuels (primary and secondary electricity, natural gas, oil, coal) can be bought and sold. Thus, primary electricity includes both renewable sources and nuclear power, so the "energy economy" is really a fuel-market economy, and the energy economy is used for convenience that represents all the concepts of economic utility emerging in the study of different fuels.

Research from Lund (2007) by taking the case of Denmark has proved that the problems and perspectives for transforming energy systems are now up to 100% renewable energy systems. Such a development may be possible, since the necessary renewable energy sources exist, and if further improvements in energy technology systems exist, a renewable energy system can be created, especially technology to transform the transport sector and introduction of flexible energy system technology.

A comprehensive description by Dincer (2000) on the relationship between renewable energy and sustainable development described by practical cases, and illustrative examples, further reinforces that renewable energy, environmental and sustainable development issues are part of the problem in today's world.

Ramli et al. (2014) conducted a study of the concept of biodiesel contained in the Qur'an as a scientific fact. This study provides an explanation of the concept of biodiesel in the Qur'an that is viewed from the perspective of modern science. Scientific evidence of the amount of energy generated from the reaction of plants, solvents and catalysts produce biodiesel which is one potential alternative energy source to replace conventional fuels. The formation of chemical structures from biodiesel resulting from the breakdown of triglyceride (green plant oil) structures that react with hydroxide ions and produce three fatty acid methyl esters, biodiesel and one molecule of glycerol. This shows that the green plants found in plants are energy elements.

From several studies of the above literature it can be argued that renewable energy becomes the solution for the sustainability of energy for human life in the future, and the scientific fact can be found in some scientific verses in the Qur'an. Meanwhile, the need for technology in developing renewable energy is a priority for every country, including Indonesia. The development of renewable energy is related to economic aspects such as economic growth and energy security, environmental support, and development ethics, so it needs to be discussed in depth from the perspective of Islamic economics.

3. METHODS

This article is structured in the following steps: First, identifying new renewable energy issues in Indonesia; second, data collection related to new renewable energy in Indonesia derived from the energy policy document 2017 sourced from APBN document 2017, as well as the regulation and policy of renewable energy at the Ministry of Energy and Mineral Resources of the Republic of Indonesia; third, the collection, study, and analysis of the Qur'anic text on the sources of energy, renewable energy, and energy saving; fourth, the analysis of Indonesia's energy policy from an Islamic economic perspective; and fifth, the preparation of conclusions or recommendations for the development of renewable energy.

4. THE RENEWABLE ENERGY POLICY IN INDONESIA

The Government of Indonesia's policy on energy can be found in some predetermined regulations. In the Law of the Republic of Indonesia Number 30 year 2007 on energy, article 3, mentioned energy management includes: Energy independence, ensuring the availability of energy from domestic and non-domestic sources, ensuring optimal, integrated and sustainable energy resources management, utilization energy efficiency, ensuring people's access to energy, improving the capacity of domestic energy industry and services so as to become more independent, creating jobs, and ensuring environmental sustainability.

In the Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia Number 12 of 2017 on utilization of renewable energy sources for the provision of electricity, chapter 1, article 1, paragraph 2, states that renewable energy sources are sources of energy generated from sustainable energy resources if well managed, among others, geothermal, the wind, bioenergy, sunlight, flow and waterfall, as well as the movement and differences in sea lining temperature. Thus, renewable energy sources include: Sunlight, wind, hydropower, biomass, biogas, municipal waste, and geothermal.

Presidential regulation number 27 of 2017 on the National General Energy Plan Rencana Umum Energi Nasional (RUEN), chapter 1, article 1, paragraph 3, stated that the National Energy Policy Kebijakan Energi Nasional is a policy of energy management based on the principles of justice, sustainable and environmentally friendly for the creation of independence energy and national energy security. Therefore, the development of national energy in Indonesia refers to the formulation that has been established in the RUEN policy, including the development of renewable energy (Figure 1).

In connection with the development of renewable energy and energy efficiency development in terms of fiscal policy in Indonesia, a study conducted by Ward et al. (2015) affirms that the Ministry of Finance of the Republic of Indonesia has identified three pillars that can provide a foundation for Indonesia's sustainable development, namely increasing budget resilience, improving macroeconomic stability, and enhancing international competitiveness. Integrated renewable energy development strategies can help to achieve the above.

The integrated approach to renewable energy development depends on three separate, interconnected pillars. First, the economic calculation of the project should be sufficient to provide an adequate rate of return, but not excessive. Second, funding should be available for good investment opportunities with logical requirements. Third, the interdependence of each pillar, the condition of the political economy should be able to provide confidence for investors to invest (BPPT, 2016).

The national energy policy is set up as a guideline for national energy management in realizing energy independence and energy security to support sustainable national development (BPPT, 2016). The latest energy policy in Indonesia, can be illustrated in Figure 2.

This national energy policy has a target that must be met, ie the renewable energy mix in 2025 reaches at least 23%, and by 2050 it can increase at least 31%, so that Indonesia can put nuclear energy as a transitional energy source that can transform the agrarian country into an industrialized country. In particular, the development of renewable energy is driven by the Indonesian government as the national energy future, due to its high economic level. The potential of renewable energy in Indonesia is 400 gigawatt (GW), but its utilization aspect is only about 8.8 GW or 2% of the potential. This renewable energy optimization has been regulated in Government Regulation Number 79 of 2014 on National Energy Policy.

The Indonesian government also provides energy subsidies to meet the needs of the community. Energy subsidies as forms of government action aimed at lowering energy production costs, increasing energy producer revenues or reducing costs paid by energy consumers. Policy makers often justify subsidizing energy on the grounds that it can help economic growth, reduce poverty, and ensure the security of energy supply (Mujiyanto, 2016).

The realization of the energy subsidy budget in Indonesia in the period 2012-2015 decreased by Rp187.4 trillion or an average of 27.0% per year. In 2016, the energy subsidy budget decreased compared to the previous year, mainly due to the reduction in fuel subsidy budget. The development of energy subsidy realization for 2012-2016 is presented in the following Graph 1.

Fuel subsidies are given in order to control the selling price of subsidized fuel, as one of the basic needs of society, so that it can

Figure 1: National energy policy in Indonesia 2017

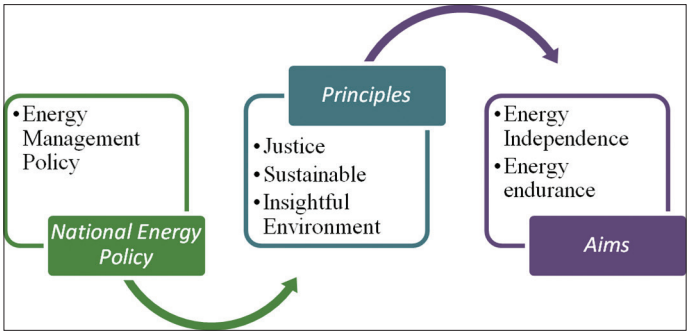
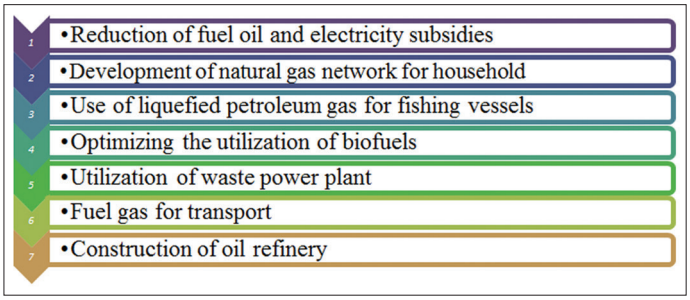


Figure 2: National energy policy for sustainable development in Indonesia



be reached by the purchasing power of the people, especially those with low incomes. Since 2015, fuel subsidies are only given to certain types of fuel (kerosene, fixed subsidies for diesel oil or gas oil), and subsidies for 3 kg LPG tubes.

Then in 2017, the Ministry of Energy and Mineral Resources of the Republic of Indonesia allocates budget of more than Rp 1 trillion for the development of renewable energy, among others for the development of Solar Power Plant, Micro Hydro Power Plant, and provision small-scale energy in the area. Targets in the renewable energy sector in 2017 include the addition of Geothermal Power Plant of 215 MW, bioenergy of 314 MW, Solar Power Plant and Micro Hydro Power Plant, and increased production target of biofuels to 4.6 million KL.

Achieve these targets, the Ministry of Energy and Mineral Resources of the Republic of Indonesia has issued three regulations supporting the increase of renewable energy usage and also supporting the availability of electricity, ie Regulation of Minister of Energy and Mineral Resources of the Republic of Indonesia Number 10 of 2017 on Principles in Power Sale and Purchase Agreement, Number 11 year 2017 on Utilization of Natural Gas for Power Plant, and Number 12 of 2017 on Utilization of Renewable Energy Sources for the Provision of Electric Power.

5. THE QUR'ANIC SCIENTIFIC SIGNALS ON RENEWABLE ENERGY SOURCES

The Qur'an is a complete code covering all aspects of life, whether spiritual, intellectual, political, social, economic or scientific. This is a code that has no time limit, place or space. According to Ahsan (2012), these messages are scattered throughout the Qur'an in various ways, such as direct determination, the reminder of God's favor in his creation, the stories of past societies followed by lessons to be learned from him, and challenges to science that have been proven as facts through modern scientific methods. It is also a review of the conceptual concept of energy or renewable energy sources that are conceptually and simply illustrated in several verses of the Qur'an .

Renewable energy is a source of energy that is quickly restored naturally, and the process is sustainable. Choi et al. (2017) state that renewable energy is a competitor of fossil fuels, but recently used to extract and produce fossil fuel resources, which makes it more difficult to see it as a clear competitor. As according to Sasana and Ghozali (2017), renewable energy is the source of energy from unlimited resources, such as water, wind, solar, and others.

Renewable energy is produced from energy resources that are naturally endless, even sustainable if managed properly. Renewable energy is also called sustainable energy. Renewable energy can be restored, cleaner or environmentally friendly, safe, and affordable to the public. The use of renewable energy is environmentally friendly because it is able to reduce pollution and environmental damage.

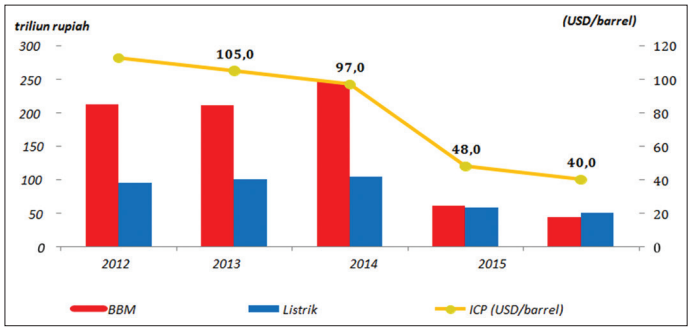
Sources of energy and renewable energy are mentioned in the Qur'an. Here are some verses of the Qur'an that describe various sources of energy and renewable energy in accordance with the themes that are collected into a single unit. Hasanuz (1999) compiled the classification of Islamic economic themes, then the authors modified based on the themes of energy sources, renewable energy, and the environment, namely soil, water and vegetation; land and marine transport, trade and game/catch; minerals and their manufacture; fuel; animal transport and produce; housing and rehabilitation; and environmental support (Figure 3).

In Table 1, Allah created the source of energy for man by subordinating nature and its contents. Scientifically, soul, water and vegetation through a process preceded by an energy source derived from rainwater (Al-Zarkasyi, 1984. p. 3: 457). This water can fertilize the soil and cultivate crops (such as dates and grapes) partially through the winds so that certain plants undergo pollination (Ramli et al., 2014). Other sources of energy in the form of springs used by humans in life.

Scientific cues in some verses above, among others, vegetable energy sources derived from plants can be used for renewable energy sources as a substitute for fuel. Therefore, renewable energy sources are environmentally friendly sources of energy that do not pollute the environment and do not contribute to climate change and global warming, as the energy derived comes from sustainable natural processes such as sunlight, the wind, water, biofuel, and geothermal. This confirms that energy sources are already available in Indonesia, not detrimental to the environment, and the main reason this renewable energy is closely related to environmental and ecological issues (Suprayogi, 2016. p. 9).

Utilization of plants for fuel in Indonesia to be part of the Ministry of Energy and Mineral Resources of the Republic of Indonesia which has set the policy direction in the energy sector that

Graph 1: Energy subsidy development in Indonesia 2012-2016



Source: Ministry of Finance RI

Table 1: Soil, water and vegetation

Letters and verses of the Qur'an	Energy issues
Al-An'am. 6: 95	Grain of herbs and seeds of fruits
Al-Hijr. 15: 22	The wind, plant marriage, rain, and water to drink
Al-Nahl. 16: 11-13	Rain water, plants that grow, night and day, sun and the moon, stars, earth for human managed
Yasin. 36: 34	Dates and vineyards, and springs

Source: Hasanuz (1999. p. 74-79)

prioritizes the development and utilization of renewable energy, one of them through the utilization of biofuels. To support the program has been issued Presidential Instruction of the Republic of Indonesia Number 1 of 2006 on the Provision and Utilization of Biofuel as Other Fuel. The commitment is continued through a mandatory policy on the utilization of biofuel with the stipulation of Regulation of Minister of Energy and Mineral Resources Number 32 of 2008 in which the transportation, industrial and power generation sectors are obliged to substitute fossil fuels with biofuels at a certain percentage and gradually. In terms of utilization of biofuels energy sources, the government of Indonesia issued a National Economic Policy Package in which the role of biofuel, especially biodiesel, is increased from 7.5% (B-7.5) to 10% - order to reduce state expenditure of rising diesel imports.

Land and marine transport, trade and game/catch is a mean that can be utilized by humans to meet the needs of life on earth. The existence of land and sea transportation by utilizing ships, planes, and animals as a manifestation of God's gifts to humans through the utilization of energy, such as the wind, sea water, and energy sources from livestock. Humans can also utilize the economic resources of the sea for consumption of fresh meat (e.g. fish), and also jewelry. The balance of heaven and earth controlled by God and natural resources can make people to research and create technology to produce renewable energy.

The scientific cues from the Qur'an in Table 2 can be found in the phrase "the wind as a bearer of glad tidings and move the ship" and "the sea that drives a sailing ship", meaning that wind and sea have energy that can be utilized as a renewable energy source. While renewable energy sources in Indonesia are sources of energy generated from sustainable energy resources if managed properly, such as geothermal, wind, bioenergy, sunlight, flow and waterfall, as well as movement and sea surface temperature differences (Suprayogi, 2016. p. 16).

The development of wind power in Indonesia until 2013 has a capacity of 1.3 MW, which includes 1.2 MW interconnected with on-grid (on-grid) and 0.1 MW off-grid networks. The utilization of small-scale water energy, solar energy and wind energy are generally prioritized for the acceleration of electrification of rural areas, underdeveloped areas and border areas/outer islands, such as in Papua and West Papua.

Meanwhile, Indonesia is a country that has the largest sea area, which is about two-thirds of Indonesia is the sea. Sea energy generated from the movement and the difference in temperature of the ocean layer (ocean) is a source of energy in marine waters in the form of tidal energy, wave energy, ocean currents energy, and energy differences in sea lining temperature. Tidal energy in the region of Indonesia is found on many islands. Quite a lot of narrow straits that restrict it and the bay owned by each island. This makes it possible to harness the tidal energy. When the tide and when the sea receded the flow of water can move the turbine to generate electricity. Areas that have tidal energy potential are Siapi-api Chart (7 meters), Palu Bay, Bima Bay in Sumbawa (West Nusa Tenggara), West Kalimantan, Papua, and south coast of Java Island (above 5 meters) (Suprayogi, 2016).

To complement human needs in industry, God creates minerals and the wind. These minerals can be utilized by humans for various industrial purposes, including steel, iron, coal and other types of minerals that can be developed to build aircraft, vehicles and other means of transportation. Winds can be used to generate energy, for example by moving windmills to production machines. The scientific signals in the Qur'an about renewable energy sources can be found in the potential of wind and mineral materials such as iron (Table 3). The study by Kilic (2011) found that wind energy is the most important and fastest growing source of renewable energy in the world.

Naturally the potential of wind energy in Indonesia is relatively small because it is located on the equator. However, there are areas that are geographically a wind region because it is a nozzle effect region or a narrowing between two islands or a mountainside area between two adjacent mountains. Wind energy source comes from the movement of air due to changes in air temperature due to warming of solar radiation. The wind power plant is a fast growing renewable energy power plant in many developed countries. In Indonesia, modern wind turbine technology is not yet fully mastered, so intensive research is still needed to develop a wind turbine that is suitable for the wind energy potential condition in Indonesia. The government needs efforts to commercialize new wind power plant technologies, in addition to encouraging local manufacturers to expand their production capacity.

Renewable energy sources until now are being developed by energy-producing countries, such as fuel. This fuel comes from trees or in the language of the Qur'an called green wood. This green wood is a source of fire that produces heat energy (Al-Qurtubiy, 2006. p. 17: 491). In addition to renewable energy sources in the form of plant and water seeds, this green wooden spark since ancient times has been used by wanderers in the desert as a warning or a hint. Uniquely, this wood content can produce fire even in wet conditions.

Table 2: Land and marine transport, trade and game/ catch

Letters and verses of the Qur'an	Energy issues
Al-Hajj. 22: 65	Earth and the ark that sailed in the ocean; holding the celestial body falling to earth
Al-Mu'minun. 23: 21-22	Livestock animals, milk, consumption, animals, and boats for transportation
Al-Rum. 30: 46	The wind as the bearer of good news, the ship sailed to make a living
Al-Fathir. 35: 12	Fresh and salty seas that produce fresh meat and jewelry, and sailing boats

Source: Hasanuz (1999. p. 79-80)

Table 3: Minerals and their manufacture

Letters and verses of the Qur'an	Energy issues
Saba'. 34: 10	Iron, armor
Saba'. 34: 12	Wind and transportation
Al-Hadid. 57: 25	Iron and its utilization

Source: Hasanuz (1999. p. 80)

The scientific gesture in Table 4 is that green wood can produce fire as energy (Ibn Asyur, 1984. p. 23: 77; Ibn Manzur, 1996. p. 14: 366). In other words, this tree or plant can be utilized as a renewable energy source. In the letters of Yasin and Al-Waqi'ah it can be found that the source of energy is from the tree, as exemplified in both verses about people who burn fire directly from wood, although still green, such as al-Markh (Leptadenia pyrotechnica) and al-'Afar that grew on the land of Hijaz Saudi Arabia, North Africa, Central Asia, and in the Mediterranean (Ramli et al., 2014). The swiped material is a cellulose-containing biomass with the chemical formula C6H10O5 (n). While fossil fuels derived from trees in the form of hydrocarbons, such as gasoline, diesel and the like with the formula CnH2n+2. Other innovations from energy sources derived from bioethanol trees with chemical formula C2H6O and biodiesel with chemical formula C19H36O2.

However, this opinion is opposed by Saleh (1984. p. 6) which asserts that the interpretation of "green wood" referring to al-Markh and al-'Afar trees is inaccurate. The interpretation of this verse is general. Based on the results of his research, these two trees can not produce fire when rubbed simultaneously as claimed before. Thus, the interpretation of this sentence must be done in more detail in order to give the reader an accurate Qur'anic explanation.

Indonesia as an agricultural country located in the equator is a country rich in bioenergy potential that can be utilized as fuel in the form of liquid (biodiesel, bioethanol), gas (biogas), solid, as well as fuel power plant. Through the utilization of bioenergy technology, Indonesia can not only increase its energy security, but also have a great opportunity in contributing to the provision of clean energy to the world community (Suprayogi, 2016).

One form of clean energy supply to the world community is through the provision of biodiesel (Hoekman et al., 2012). As the largest palm oil producer in the world, Indonesia should have the potential to become one of the largest producers of biodiesel today, the installed capacity of biodiesel from palm oil has reached 6.3 million kL/year. In addition to palm oil, waste from the palm oil industry also has great potential to be processed into a source of energy. Other industries that have potential in bioenergy development are the sugar industry for bioethanol processing and the provision of national electricity.

Since the past, livestock has been used for means of transportation, consumption of foods and beverages containing high nutrients such as milk, body armor out of the heat and during combat. In the Qur'an, Allah gives a simple but comprehensive illustration of the sources of energy that human beings can utilize (Table 5). God made this balance of nature through the order of the earth and the heavens, including the sea, the land, and the good environment (Ibn Atiyyat, 2007. p. 7: 267).

Table 4: Fuel

Letters and verses of the Qur'an	Energy issues
Yasin. 36: 80	Source of fire from green wood
Al-Waqi'ah. 56: 71-73	Seeds of plants, water, sparks for warning and wanderers in the desert

Source: Hasanuz (1999. p. 80)

Renewable energy sources can be obtained from plants and animals, such as biofuels and biodiesel. Yusuf et al. (2011) stated that the term biofuel refers to liquid, gas and solid fuels that are largely produced from biomass. Biofuel includes bioethanol, biomethanol, biodiesel and biohydrogen. Biodiesel, which is defined as a monoalkyl ester of vegetable oil or animal fat, is an attractive alternative fuel because it is environmentally friendly and can be synthesized from vegetable oils and can not be eaten.

In addition, the sea can produce fossil-derived energy sources and also produce minerals and pearls, the soil has water utilized for electric power, produces gold for jewelry, and the soil becomes fertile with water content growing trees as a source of renewable energy. The whole is God's gift to humans so that the existing energy sources require the right efficiency and utilization for human well-being, and also create technology for the development of renewable energy sources.

In the Qur'an described in the above verses, Allah created man as a prosperous earth that has a home as a refuge, then completes the sources of energy that humans need, such as water, springs, waterfalls, green tree (Ibn Kathir, 1999. p. 3: 172). To improve the quality of life, human beings can utilize livestock, plants and other sources of consumption in the form of business or work, especially finding sources of renewable energy. Therefore, the earth damage caused by humans requires handling or care to restore it. Likewise with non-renewable energy sources, such as petroleum originating from fossils will be exhausted, so the need for the discovery of renewable energy sources, because the energy consumption of society is increasing every year (Table 6).

The environmental support that God created for humans is complete, such as the turning of night and day, the earth and the sky, the sun, the wind that moves clouds toward a place and causes rotating rain, seas to sail and economic resources, biodiversity, and botany, fertilize the soil, generate energy, and other economic resources (Table 7). In addition, the earth, the sun, water, the wind, and vegetation can be utilized by humans as a source of renewable energy for sustainable living in the future. God grants that gift as proof of his unity and power, so that man's task is nothing but to prosper the earth by utilizing energy sources efficiently, not destroying the environment (Q.S. al-Qashash. 22: 76-77), and creating technology for developing renewable energy sources, as God ends each of the above verses with the phrase "does man not think?," "Is a man not contemplating?," and "is a man not thankful?" for all that Allah bestows (Ibn Kathir, 1999).

For example, Indonesia is a tropical country that has enormous solar energy potential as its territory extends across the equator, with a large radiation of 4.80 kWh/m2/day. Solar energy is converted directly and the application forms are divided into two types, namely solar thermal for heating applications, and solar photovoltaic for electricity generation. Solar power plants are

power generation technologies that can be applied in all areas. The installation, operation, and maintenance of solar power plants are so easy that it is easily adopted by the community. The main obstacle of solar power plants market is the investment cost per Watt of generated power is still relatively expensive and some raw materials of solar power plants components especially solar cells still have to be imported. Therefore, the growth of the local solar cell industry becomes very strategic in the development of solar power plants in the future. In addition, the feed-in tariff policy that appeals to investors is also crucial to the growth of private investment in the development of solar power plants (Suprayogi, 2016).

6. ENERGY SAVINGS IN ISLAMIC ECONOMY

In Islamic economics, the philosophical approach of energy from the perspective of the Qur'an can be traced from three interrelated aspects of the energy economy, namely the task of human being as the khalifah of Allah in prospering the earth, the environment as a place of human life, and the human need for energy. These three aspects can be illustrated Figure 4.

In the Qur'an, human beings are the most potential creatures so that God delegates the main task as Caliph to man (Q.S. Al-Baqarah. 2: 29-32) to manage and prosper the earth (Q.S. Hud. 11: 61-62). Man is given the potential of reason that is capable of creating technology to manage the earth and natural resources, as Allah has created the heavens, earth, mountains, water and plants (Q.S. Al-Anbiya'. 21: 30-31), so that humans can enjoy all the gifts is to meet the needs of life and live his life, including energy needs (Yusuf Ali, 2016).

Thus, everything created by God is a part of the necessities of human life, but humans are given responsibility as a religious duty to manage well, do no damage on earth by exploiting harm to people and the environment (Q.S. Al-Qashash. 22: 77), and acts efficiently in the utilization of the source of energy (Q.S. Al-An'am. 6: 141) (Ibn Hayyan, 1993). In other words, the task of man in prospering the earth is a religious duty, including the utilization of energy for human welfare and developing renewable energy.

Vaghefi et al. (2015) state that the Islamic view of natural resources derives from the Qur'an. The Qur'an mentions several important principles concerning the conservation of the environment, as well as assessing the environmental damage and errors in the management of natural resources as an evil act (Q.S. Al-A'raf. 7:31, Al-An'am. 6: 141). Thus, energy conservation from abuse and exploitation through energy savings includes religious obligations.

Similarly, the development of renewable energy resources needed by the community, maqashid shariah or Islamic law objectives in the aspects of the maintenance of human life, the development of renewable energy that aims for human survival, the need for energy consumption, the welfare of society, energy crisis, then the development of renewable energy is religious obligatory (Figure 5).

Renewable energy is a replacement energy source from energy sources that are generally used to meet energy needs. Timmons et al. (2014. p. 5) state that, in a way, renewable energy is not limited, because supplies are constantly replenished through natural processes. The daily solar energy supply is theoretically sufficient to meet all human energy needs for a full year. But, solar energy and other renewable energy sources are limited, in the sense that their availability varies between space and time. Currently the increase in energy demand is dominated by non-renewable and unfriendly fossil energy. Fossil energy is closely related to the ecological destruction that results in global warming, the shifting of the earth's layers, the uncertain climate, air pollution and environmental pollution.

In Islamic economics, energy sector development emphasizes sustainable development on the basis of value addition of resources. This is also reflected in the development of biofuel as a government policy through Presidential Instruction of the

Figure 3: Renewable energy sources in the Qur'an

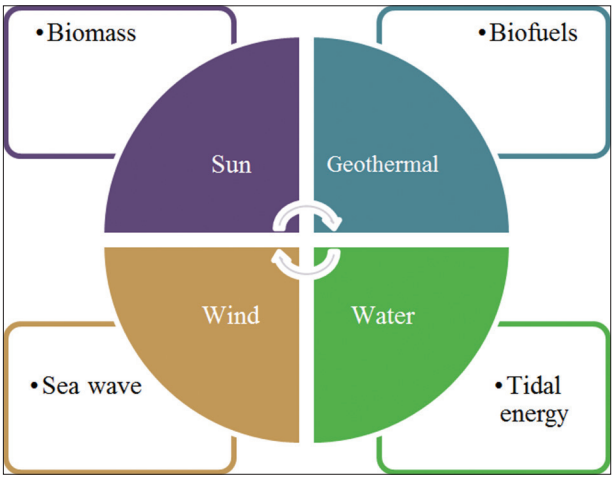


Figure 4: Qur'anic philosophy on human, environment and energy

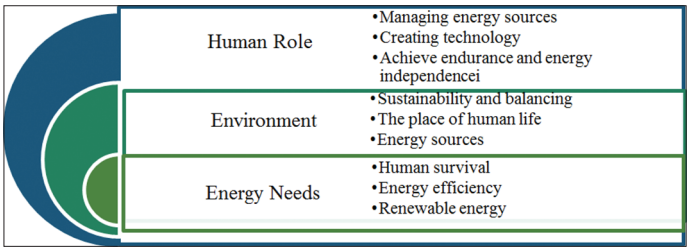


Figure 5: Maqashid Shariah (islamic law objectives) on renewable energy

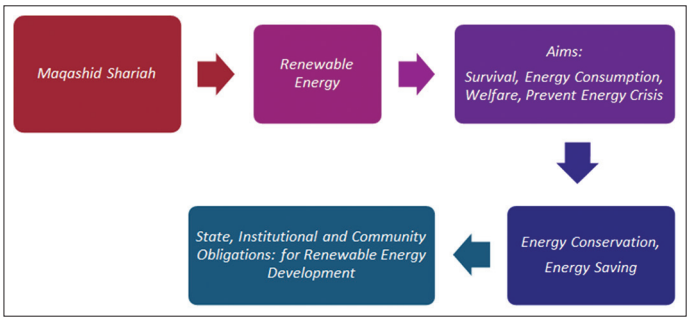


Table 5: Animal transport and produce

Letters and verses of the Qur'an	Energy issues
Al-Nahl. 16: 81	Sanctuary and mountain dwellings, clothes that protect the body from heat and during combat
Al-Hajj. 22: 65	Rivers, jewelry (gold and pearls), and silk clothing
Al-Mu'minun. p. 23: 17-22	Water, date orchards and grapes, fruits, timber trees that produce oil and groceries, and farm animals that produce milk and transportation equipment such as boats
Yasin. 36: 71-73	Farm animals for vehicles, food, and beverages
Al-Zukhruf. 43: 12	Spacious earth, transportation routes, rain-feeding water, and ships and farm animals for transportation
Al-Jatsiyah. 45: 12	The seas and sailing ships, the earth, and the heavens are regular to man

Source: Hasanuz (1999. p. 80-81)

Table 6: Housing and rehabilitation

Letters and verses of the Qur'an	Energy issues
Hud. 11: 61	Humans as prosperous earth, residence, female camel
Al-Nahl. 16: 80	Houses as shelter, cattle-leathered tents, and wooly clothing, camel and goat hair to explore and settle, as well as tools for the necessities and comfort of life
Al-Furqan. 25: 48-49	The wind as a bearer of glad tidings, clear water for drinking and human life, livestock, and rainwater rotation
Yasin. 36: 33-35	Rainwater, grain to eat, date and wine vineyards, sources of springs, and fruits for food, and various human endeavors

Source: Hasanuz (1999. p. 81-82)

Table 7: Environmental support

Letters and verses of the Qur'an	Energy issues
Al-Baqarah. 2: 164	The heavens and the earth, the turn of the night and the day, the ark that sailed in the sea, the rain, the earth, the diversity of living beings, the wind that blows, and the clouds controlled between heaven and earth
Al-A'raf. 7: 57	Rain water, plants, green plants, plant grains, dates, wind, clouds, rain, fruits, soil and fertile plants
Yunus. 10: 67	Night for rest and day for activities
Al-Hijr. 15: 22	The wind to cast seeds and water from the sky to drink
Al-Isra'. 17: 11-12	Darkness as a sign of the night, brightness as a sign of the day that humans make a living, know the number of years, as well as the calculation of time
Al-Naml. 27: 86	Night to rest and daylight that illuminate
Al-Rum. 30: 48-49	The wind that moves clouds, clouds stretched and clumps, and rainwater that goes down through the cracks
Fathir. 35: 9	The wind that moves the clouds, and the clouds that cause the rain to bring the dead to life
Al-Mu'min. 40: 61-63	Night to rest, and day to make a living, the earth as a place of residence, and the sky as the roof

Source: Hasanuz (1999. p. 143-145)

Table 8: The Qur'anic scientific signals on energy conservation

Ethics	Letters and verses of the Qur'an	Energy issues
Objective of economic activities	Al-Baqarah. 2: 168	Good and efficient energy consumption
	Al-Baqarah. 2: 172	Energy management and energy saving
	Al-Mu'minun. 23:51	Utilization of renewable energy and energy independence
The moral values		
'Adl/Justice	Al-Nisa'. 4: 135	Fair energy management
	Al-An'am. 6: 152	Fair energy policy
Ihsan	Al-Baqarah. 2: 195	Utilization of energy for the welfare of society as worship; keeping the environment from pollution, and saving energy
	Al-Qashash. 22: 76-77	Prohibition of damage to the earth, such as the exploitation of energy sources, environmental pollution, energy wastage
Self sacrifice	Al-Hasyr. 59: 9	Promote energy saving, energy subsidies.
	Hud. 11: 61	The role of every person in prospering the earth, the utilization of geothermal energy, and the development of renewable energy sources
Generosity	Al-Mu'minun. 23: 18-22	The thrust of research and technology creation to find renewable energy sources (rainwater, crops, and fruits, oil-producing timber, livestock, marine)
Gratefulness	Ibrahim. 14: 7	Be thankful for God's blessings through the maintenance of the environment and energy utilization
	Al-Isra'. 17: 29-30	Prohibition of exploitation and energy wastage
Consideration for others	Al-Hadid. 57: 23-24	Prevent the energy crisis by making energy savings in everyday life
Life-saving	Al-An'am. 6: 141	Energy efficiency, utilization of crops and fruits as energy, mutual support and meet energy needs, and prohibition of energy wastage. Not excessive or not extravagant

Republic of Indonesia Number 1 of 2006 accompanied by Minister of Energy and Mineral Resources Regulation Number 25 of 2013 on Utilization of Biofuels. The regulation states that obligations on the use of biofuel as a substitute for fuel oil are distributed to meet domestic energy needs, such as biodiesel and bioetanol (Suprayogi, 2016. p. 37-38). To meet the supply of biofuel, the government needs to provide energy plantations and infrastructure facilities to support the sustainable availability of biofuels. Renewable energy that can be developed includes hydro power, geothermal, micro-hydro, biomass, solar power, wind power, biofuels, biogass, and municipal waste.

The addition of population and industrial revolution that trigger industrial growth in all sectors, making the use of energy is also increasing. Meanwhile, fossil-based energy is limited and can not be created in accordance with the law of energy. Therefore, the policy on energy conservation aims to make energy savings that will impact on human life in the future.

In economic law applies when demand a lot while the goods needed are few, then the price will be expensive. The facts show that the availability of energy has a small amount, while the demand for more and more, so that will affect the price of energy sources. So does the basic electricity tariff increase, because the increase of fuel oil (BBM) will affect the economy.

Energy conservation has the goal of starting an energy saving movement, to prevent an energy crisis that will have an impact on all sectors. Energy conservation, minimizing natural gas emissions, preventing pollution and pollution, and safeguarding and conserving ecosystems are everyone's responsibility (Mansour et al., 2017). With this energy savings, for example, it will indirectly begin to save energy costs, and can reduce the dependence on natural resources that have a limited amount (Table 8).

To make energy savings, the Ministry of Energy and Mineral Resources of the Republic of Indonesia (Suprayogi, 2016) launched an energy conservation program, namely energy saving and energy efficiency programs, especially electricity for all communities, both industries and households. Energy-saving measures of electrical energy efficiency using minimal electricity to generate electrical energy are the primary energy required for electrical equipment or energy stored in electric currents to drive motors, lighting, heating, cooling or re-moving a mechanical device to produce a form of energy The other, the energy that comes from water, oil, coal, wind, geothermal, nuclear, solar, and others.

Suprayogi (2016) added that energy-efficient electricity in technology, for example, uses energy-labeled machine tools, such as the Swabalast Lamp that has many stars on its label. As for the use of air conditioner is characterized by EER label. EER is the ratio between air cooling capacity (BTU/hour) and the power consumed (watt). Thus, the room temperature can be adjusted according to the capacity of the air conditioner. The minimum permissible efficiency limit as a requirement for the SEK is EER 8.53, while the ideal room temperature is 25°C ± 1. Any decrease of 1°C of AC setting, can increase electricity consumption up to 6%. Through the energy conservation program, several programs are implemented, including standardizing and splitting label (s/L) energy efficiency, and minimum energy performance standard labels for CFL lamps, air conditioners, refrigerators, fans, rice cookers, electric motors, and electronic ballasts, and compile building code.

7. CONCLUSION

Indonesia's energy policy focuses on developing renewable energy sources that can replace fossil-based energy sources whose inventories are already depleting. Renewable energy sources sourced from sunlight, water, the wind, geothermal, biodiesel, biofuels, seawater, and tides. The potential of this energy source is also affirmed in several verses of the Qur'an that provide examples of energy sources and simple concepts in the form of illustrations on the use of renewable energy. Increasing public demand for energy consumption, industrial development, and others indicate that the energy economy needs in Indonesia are shifting to the development of renewable energy sources as a substitute for electric fuel, in addition to energy conservation through energy savings.

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