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ENERGY SECURITY: THE IRENA ROLE IN SUPPORTING NET ZERO EMISIONS PROGRAM OF INDONESIA

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ABSTRACT

This study examines how Indonesia's energy sustainability is affected by the International Renewable Energy Agency's (IRENA) efforts to increase energy security in the nation. In light of the pressing global concerns around climate change and Indonesia's expanding energy requirements, IRENA is essential in helping to ease the country's transition to a more reliable and sustainable energy system. IRENA helps Indonesia reduce its reliance on fossil fuels and increase the use of renewable energy by supporting cutting-edge technology and sustainable energy policies. In order to assess IRENA's contributions to national energy policy making, international cooperation, and the development of renewable energy technologies, this study uses a desk analysis approach. The results showed that Irena's role in assisting Indonesia in achieving Net Zero Emission through renewable energy has an influence on Indonesia's energy security.

Keywords: IRENA, Energy Security, Renewable Energy, Indonesia

INTRODUCTION

With the dense population in Indonesia reaching more than 270 million (UN, 2020), of course, the need for energy continues to increase, currently the use of energy such as coal, petroleum, natural gas is still the main source of energy in Indonesia, which over time will become extinct and run out (Handayani & Priyadi, 2021). In addition, the impact of non-renewable energy use also affects the increase in greenhouses, which causes pollutants, increased sulfur dioxide, air pollution and causes climate change (Faculty of Agriculture, University of Medan Area, 2023).

In contemporary international relations, climate change is a crucial phenomenon, therefore Indonesia has begun to make policies about phenomena related to climate change. With the Conference on Parties (COP) 21 being held in Paris, an agreement was reached regarding limiting global temperature rise below 1.5 degrees Celsius (Surya Husada & Erar Joesoef, 2022). In order to implement it properly, Indonesia has established a collaboration with IRENA or known as the International Renewable Energy Agency.

Several previous studies entitled "Rethinking Energy Security in Indonesia from a Net Zero Perspective" explained Indonesia's strategy to achieve NZE by 2060 by improving energy efficiency, electrifying transportation, and utilizing renewable energy. This article also explains the challenges that Indonesia faces when it comes to achieving NZE, such as regulatory policy issues, population growth, and high dependence on fossil fuels. The findings of this article are that there are still many gaps in efforts to achieve NZE, and Indonesia feels that it is necessary to tighten its legal commitments (Muyasyaroh, 2024). Second, "Analysis of Renewable Energy Potential in The Implementation Of NZE 2060 to Support Defence in Indonesia" this article discusses the potential of renewable energy as the implementation of the NZE 2060 program in Indonesia. It is intended to combat climate change and reduce dependence on fossil fuels. The results of this study confirm that with government support, and maximizing the potential of renewable energy, the country will play an important role in strengthening national resilience and international relations (HS Putri et al., 2023). And the third article entitled "Energy Security: Indonesia's Grand Strategy in Facing Global Energy Market" in this article seeks to discuss Indonesia's energy security and the need for a large and comprehensive strategy to overcome challenges in the global energy market. In addition, this article also identifies shortcomings in Indonesia's energy policy, such as Indonesia's persistent fossil fuel imports that threaten national sovereignty and economic independence. The result of this article is a call to develop policies that prioritize energy independence and security by switching to renewable energy, thereby attracting foreign investment and diversifying energy sources to safeguard national interests from external threats (Anggraini, 2023).

Of the three previous studies, none of them discussed Indonesia's cooperation efforts with international organizations, how the output of the cooperation is on energy security in Indonesia to achieve the net zero emissions program 2060. This study aims to explore how the role of IRENA in assisting Indonesia in achieving the NZE target has an impact on Indonesia's energy security.

Energy Security Concept

Since the oil crisis in 1970, the term "energy security" has been used for the first time. In the past, the concept of energy security was only used to avoid disruptions in oil supply, as shown by the Energy Security Indonesia Case Study 51. However, due to changes in energy availability and demand, the definition of energy security is changing. Not only the availability of petroleum is the focus of energy considerations, but also other types of energy. To illustrate the level of energy security, additional elements are also considered (Hassan et al., 2022).

Energy security indicators such as reliability, adequacy, consistency, affordability, sustainability, and environmental acceptance of energy supplies are used to define how well energy security is. Energy sustainability is proportional to energy security when the economy and the environment are considered together. The International Energy

Organization describes energy security as "the availability of uninterrupted energy sources at affordable prices" (Asif, 2022).

The concept of energy security is essentially subjective, as it depends on the perspective of each country in assessing the effectiveness of its energy policies. According to Energy Law No. 30/2007, energy security in Indonesia takes into account acceptability, affordability, and accessibility in addition to energy availability (Hassan et al., 2022).

Figure 1. Aspects of Energy Security.

Aspects 4A (accessibility, affordability, accessibility, and acceptability) are used to measure energy security itself, and the weighting method is used using the Analytical Hierarchy Process (AHP). Availability aspects include the availability of domestic and international resources and energy, as well as the affordability of energy investment costs, including exploration, production, and distribution costs, as well as the affordability of energy prices for consumers. Furthermore, accessibility aspects include the ability to gain access to energy sources, energy grid infrastructure, as well as geographical and geopolitical issues. However, acceptable aspects include the use of environmentally friendly energy (land, sea, and air) and community acceptance (MEMR, 2021).

1. Accessibility: centered on people's ability to securely access energy and energy resources to meet future needs. These aspects include the provision of fuel and LPG energy, the provision of electricity, the provision of electricity services, the provision of natural gas, and the provision of natural gas distribution. To support effective and efficient energy accessibility for the community, it is important to

build energy infrastructure that can provide reliable access capabilities and according to needs.

2. Affordability: in the context of energy security, it refers to the ability of customers to obtain energy at an affordable cost. This affordability indicator refers to four main components: energy productivity, electricity prices, fuel oil (BBM)/LPG gas prices, and natural gas.
3. Availability: This aspect is related to the availability of energy and domestic energy resources. Eight indicators are used to assess this aspect. They are petroleum and LPG reserves, energy buffer reserves, petroleum and LPG imports, petroleum imports, gas and coal domestic market bonds, energy mix achievement, oil and gas reserves and resources, and coal reserves and resources.
4. Acceptability: refers to how society receives environmentally friendly energy. Energy efficiency, the role of New and Renewable Energy (NRE), and Greenhouse Gas (GHG) emissions are the three indicators used to assess. A thorough analysis of these three indicators can determine the level of public acceptance of environmentally friendly energy. Indonesia can increase its energy security in the long term, maintain resource sustainability, and reduce negative impacts on the environment by accepting sustainable energy.

METHOD

The data used by the author in this case is secondary data because the author uses documentation studies to collect data in order to answer the formulation of the research problem. According to Sugiyono (2007) a document is a written record of past events, photographs, or artistic works of a person. Therefore, the author uses information collected from various current sources, including books, journals, and internet articles, to be evaluated and interpreted according to the purpose of the research.

This research uses qualitative methods to deepen the important things that underlie Indonesia's interest in improving its partnership with IRENA in order to achieve NZE. The data used in this research is descriptive-qualitative (Robert & Steven, 1992). Qualitative methods can provide more detailed and complex data about the phenomenon under study. Therefore, the data is expected to expand knowledge and insight into Indonesia's interests in enhancing its partnership with IRENA. The data analysis technique model in deductive research is a way in which the process takes place from new theories to facts, which means that research is written by explaining a phenomenon in society based on valid facts (Ulber, 2012 and Sitoyo, 2015). In connection with the analysis procedure, the authors used interactive data analysis. According to Miles & Huberman, this analysis begins with

1. Data collection

The author searches for data on the sister city cooperation between Germany and Berlin that are in accordance with the research topic through documentation

2. Data reduction

selection of data or information in accordance with the focus of the research

3. Data Presentation

Roses presents data that has been collected and analyzed in a form that is easy for the audience to understand. The processed data is presented in a variety of formats, such as tables, graphs, diagrams, or other visual forms

4. conclusion withdrawal

In the last stage, conclusions are made based on the information and concepts produced.

RESULT

A. The Urgency of Cooperation between Indonesia and IRENA

Indonesia uses more energy than other countries in the ASEAN region; Indonesia's share of energy use has almost reached 40%. With a strong bioenergy sector, considerable potential for solar, geothermal, and hydropower resources, as well as low-carbon energy infrastructure, Indonesia is well-positioned to achieve prosperity. Indonesia intends not to build new coal-fired power plants after 2030, unless it is already contracted or under construction, and has set a target of 23% of its energy mix coming from renewable energy sources by 2025 (Ministry of Energy and Mineral Resources, 2021).

On November 4, 2021, the Indonesian Ministry of Energy and Mineral Resources (EMR) began a partnership with the Director General of IRENA. This aims to intensify cooperation between the two parties in identifying the implementation of the decarbonization roadmap. This signing is proof of the implementation and commitment of the Indonesian state to reduce emissions by 29% by 2030 and set a net zero emission (NZE) target by 2060 (Ministry of Energy and Mineral Resources, 2021).

IRENA, also known as the International Renewable Energy Agency, is an intergovernmental organization tasked with assisting countries in making the transition to sustainable energy sources and functioning as a platform. The center acts as a focal point for global collaboration, a center of excellence, and a library of information on renewable energy resources, finance, technology, and policy. In order to achieve sustainable development, energy access, energy security, as well as low-carbon economic growth and prosperity, IRENA promotes the widespread adoption and sustainable use of all renewable energy sources, including bioenergy, hydropower, geothermal, wind energy, solar energy, and marine energy (IRENA).

Not only did Indonesia show its commitment to the Paris Agreement, but IRENA also conducted a high-level policy dialogue with the United Nations Framework Convention on Climate Change (UNFCCC) with the aim of discussing new institutional planning that unites the long-term of the energy path with a net-zero commitment. As a result, the UNFCCC and IRENA will work together to assist countries in harmonizing the process of formulating and communicating long-term development strategies with low greenhouse gas emissions (IRENA, 2020).

Indonesia is taking part in IRENA because the country is making the latest innovations aimed at developing new and renewable energy (NRE). The actions taken by the country are due to a decline in the number of old energy sources such as gas and oil that are difficult to resolve. As a result, Indonesia is looking for other solutions to overcome its energy security by developing new and renewable energy (NRE) (Zulfadli, 2016).

B. IRENA's role in the net zero emission program in Indonesia

IRENA's role in helping Indonesia to achieve the goals of the Paris Agreement is by facilitating access to climate finance as well as risk-free investments, support for project planning, development of project networks, including through coalitions for sustainable energy access and investment platform initiatives (Ministry of Energy and Mineral Resources, 2021).

IRENA has played an active role in assisting countries, one of which is Indonesia in compiling an energy transition *road map*. In addition, they have also mobilized significant funds worth 4 Billion USD to support renewable energy projects, demonstrating a commitment to improving energy efficiency and accelerating economic growth globally (Suara Enerdi, 2024)

IRENA has played an important role in supporting the Net Zero Emission (NZE) program in Indonesia, focusing on several key implementation areas related to energy policy, technology, and renewable energy financing.

1. Energy Transition RoadmapIn 2021, IRENA and Indonesia's Ministry of Energy and Mineral Resources (EMR) collaborated to create a roadmap for the energy transition. The main focus of this collaboration is to determine the policy actions and technological solutions needed to achieve Indonesia's decarbonization goals. The purpose of this roadmap is to meet the global targets set by the Paris Agreement and achieve a maximum global warming of 1.5°C before the end of the century (IRENA, 2021). The purpose of this roadmap is to encourage the development of renewable energy such as solar, geothermal, and bioenergy.
2. Access to Climate Finance and Renewable Energy InvestmentIRENA is also doing a lot to help support renewable energy projects in Indonesia with climate finance. One of IRENA's key initiatives is the Climate Investment Platform, which aims to reduce investment risks and improve access to clean energy

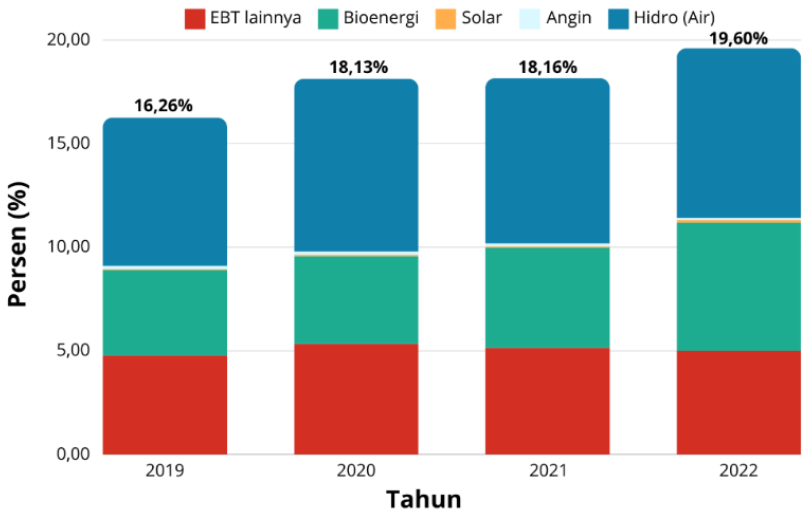
financing in developing countries (IRENA, 2021). With this platform, Indonesia can support renewable energy projects. This can achieve the energy mix target of 23% renewable energy by 2025 and the NZE target by 2060.

3. Increasing Investment and Building Project PipelineIn addition to providing financing, IRENA also assists Indonesia in building a sustainable network of renewable energy projects. This includes assisting in project preparation as well as mobilizing significant investments to accelerate the energy transition in several important sectors (IRENA, 2021). For example, IRENA has provided support for $4 billion in funding to support renewable energy projects in Indonesia; this is an important step towards long-term energy security (IRENA, 2022).
4. Policy Dialogue and Technical Support IRENA and Indonesia have participated in various high-level policy dialogues with international institutions such as the UNFCCC. These dialogues aim to strengthen institutional policy frameworks and strategies to align national energy pathways with net-zero emission targets **(**IRENA, 2021). In addition, IRENA ensures that Indonesia can take advantage of the latest technologies in the transition to low-carbon energy through training and technology transfer.

Through the implementation of these programs, IRENA helps Indonesia create an environment conducive to the energy transition, ensuring that decarbonization and net zero emission targets can be achieved through coordinated actions and continuous support from around the world.

C. Changes Before and After Indonesia's Cooperation with IRENA

Figure 2. Indonesia's Electricity Comes from Renewable Energy



Source : https://renewableenergy.id/data-energi-terbarukan/#

According to Our World in Data, Indonesia's share of renewable energy in electricity production increased from 18.16% in 2021 to 19.6% in 2022. The amount of electricity produced here is roughly 65 Terawatt hours (TWh). To give you an idea, one Terawatt hour (TWh) can light up to 114 thousand 1,000-watt households for a whole year. Accordingly, 65 Terawatt hours (TWh) is the same as illuminating 7.4 million 1,000-watt homes for a whole year, In 2023, Indonesia has 91.2 Gigawatts of energy, with 14.58% of the NRE mix, according to data from the Ministry of Energy and Mineral Resources (REI, 2024).

Prior to the collaboration with IRENA, Indonesia's energy policy was still dominated by the use of fossil fuels, especially coal, which is around 60% of the national energy mix. Although the country has great potential for renewable energy, the development of this sector is still minimal. Renewable energy infrastructure is limited, and investment in this sector is also not developing optimally. In addition, regulatory arrangements have not been well coordinated to support a fast and effective energy transition. After starting cooperation with IRENA, there has been a significant change in Indonesia's energy policy. Indonesia has begun to increase investment in the development of renewable energy, including the development of solar and geothermal power. The renewable energy roadmap prepared with the help of IRENA has become an important guide in directing Indonesia's energy transition (IRENA, 2021). Indonesia also strengthens its commitment to the *Paris Agreement* by setting a Net Zero Emission (NZE) target by 2060 and accelerating the use of renewable energy in the national energy mix, with a target of 23% by 2025.

DISCUSSION

A.Roles of renewable and energy efficiency technologies for enhancing energy security

Cooperation between Indonesia and IRENA plays an important role in strengthening **Indonesia's energy security** . IRENA assists Indonesia in accelerating the transition to cleaner and more sustainable renewable energy. Prior to this cooperation, Indonesia relied heavily on fossil fuels such as coal, oil, and gas to meet its energy needs. This leads to a dependence on energy imports as well as increasing vulnerability to global market price volatility.

Through the energy transition roadmap prepared with IRENA, Indonesia has begun to integrate renewable energy sources such as solar, geothermal, and bioenergy into its energy system. This increases the diversification of energy sources, which is an important component in improving energy security. In addition, IRENA supports Indonesia in securing funding for renewable energy projects, which allows the country to develop a more stable and self-sufficient energy infrastructure (IRENA, 2021)(IRENA, 2022).

With IRENA's support, Indonesia has also taken steps to reduce dependence on imported energy, increase energy independence, and reduce the impact of international price fluctuations. These initiatives contribute significantly to improving **energy security**, which in turn ensures stable and affordable energy availability for the long term.

The National Energy Council (DEN) reported that Indonesia's energy security index is currently in the resistant category, with a score between 6 and 7.99. The Indonesian energy security index currently has a score of 6.64 and efforts will continue to be made to achieve the ideal score, which is 7 or 10 (MEMR, 2024)

Linking the data on energy sector achievements in 2023 submitted by Minister of Energy and Mineral Resources Arifin Tasrif with the 4A aspects of Energy Security **Availability** in 2023, Indonesia recorded a significant increase in energy availability, especially through the use of domestic gas which reached 68.2%. The use of domestic gas supports the needs of domestic industries and power plants. The discovery of new gas reserves, such as in the South Andaman Block and the North Ganal Block, also strengthens long-term energy reserves. *Domestic coal production* will reach 775 million tons in 2023, with 213 million tons being used for domestic purposes (Domestic Market Obligation / DMO). This increasing trend provides a guarantee of energy availability for the electricity sector that still depends on coal-fired power plants. The construction of the Cirata Floating Solar Power Plant with a capacity of 145 MW and the development of a 539.52 MW NRE power plant strengthen the availability of renewable energy, although the portion is still small compared to fossil energy. **Accessibility** is One Price Fuel, this program guarantees more equal access to fuel in the 3T (Disadvantaged, Outermost, Frontier) areas. In 2023, there are 512 affordable locations with uniform fuel prices. The 2024 target will expand the program to 100 new locations. *The national electrification ratio* reached 99.78%, with an increase in electricity consumption per capita to 1,285 kWh. However, there are still 185,662 households and 140 villages that have not yet been electrified, so the target of 100% electrification in 2024 is a priority. *The development of gas networks* is also an important effort to improve access to natural gas, although its distribution is still concentrated in urban areas. **Affordability,** *Electrical Energy SupplyThe government continues to strive to reduce the Cost of Supply* through the optimization of domestic electricity transmission. This step aims to provide more affordable electrical energy for the community. *The B35 Biodiesel Program,* The utilization of 12.2 million KL of biodiesel in 2023 resulted in foreign exchange savings of IDR 120.54 trillion. This shows an effort to improve energy affordability by partially replacing the use of fossil fuels. *Emission Reduction and Energy Savings Improving* energy efficiency and decreasing final energy intensity by 0.89 SBM/billion rupiah also had an impact on reducing energy costs. **Acceptability**, *Energy Transition,* Renewable Energy Development such as Cirata Floating Solar Power Plant and the Rooftop Solar Power Plant program are further increasing renewable energy acceptance. The portion of the renewable energy mix in power plants reached 13.1%, exceeding the target. This program encourages the use of greener energy and reduces dependence on fossil energy. *CO2 Emission Reduction*:

Emission reductions of 127.67 million tons of CO2 in 2023, exceeding the target, are important achievements in the transition to cleaner energy. The implementation of carbon trading in coal-fired power plants and the development of solar power plants also supports aspects of environmental sustainability (MEMR, 2023).

B. Challenges and Obstacles Experienced by Indonesia during Implementation

Despite significant progress, Indonesia still faces various challenges in implementing the Net Zero Emission program. The main challenges faced are:

1. **Inadequate Renewable Energy Infrastructure**: Although Indonesia's renewable energy potential is large, infrastructure development that supports the development of renewable energy is still relatively slow. Indonesia's widespread geographical location also makes the distribution of renewable energy a major challenge (IRENA, 2022).
2. **Funding and Investment**: Although IRENA provides access to global financing platforms, funding for renewable energy projects is still limited. These projects require large investments, but investors often face high risks, especially when it comes to regulation and policy stability. This obstacle slows down the implementation of clean energy projects (IRENA, 2021)(IRENA, 2022).
3. **Limited Human Resources and Technology**: The development of the renewable energy sector in Indonesia is also hit by a lack of workforce that has specialized skills in the field of renewable energy technology. In addition, the adoption of new energy technology is still slow, resulting in limited capacity in utilizing the potential of renewable energy optimally.
4. **Regulation and Bureaucracy**: The complexity of regulations and bureaucracy at the national and local levels often slows down the process of developing renewable energy projects. The difference in rules between the central and regional governments is one of the factors hindering the implementation of new energy projects. Despite the challenges, Indonesia's commitment to cooperation with IRENA and the ambitious targets that have been set show that the country is determined to move forward in its efforts to achieve energy security and net-zero emissions by 2060.

CONCLUSION

The transition to NZE is not only a target to reduce greenhouse gas emissions and combat climate change, but also has a significant impact on Indonesia's energy security. Cooperation with the International Renewable Energy Agency (IRENA) has played an important role in accelerating the energy transition towards more sustainable use of renewable energy. Through projects facilitated by IRENA, such as the development of solar power and bioenergy, Indonesia is further strengthening its capacity to provide

reliable energy supply, reduce dependence on fossil fuel imports, and maintain domestic energy price stability.

The application of the 4A concept (Availability, Accessibility, Affordability, Acceptability) in the framework of energy security is also increasingly important in efforts to achieve NZE. IRENA helps Indonesia improve the availability of renewable energy, expand access to clean energy, and reduce the cost of developing renewable energy (affordability). Despite challenges in terms of infrastructure and regulations, this cooperation accelerates a more inclusive and sustainable energy transition, as well as strengthens public acceptance of green energy (acceptability).

Thus, achieving the NZE by 2060 will not only help Indonesia achieve its Paris Agreement commitments, but also significantly improve its energy security amid increasingly complex global energy market dynamics. To ensure the sustainability of these efforts, there is a need for continued investment in renewable energy infrastructure, technological capacity building, and more effective regulations so that Indonesia can achieve comprehensive and maintained energy security in the long term.

REFERENCES

Anggraini, M. (2023). Energy Security: Indonesia's Grand Strategy in Facing Global Energy Market. *Budi Luhur Journal of Strategic & Global Studies*, *1*(1), 26–48. https://doi.org/10.36080/jsgs.v1i1.4

Asif, M. (2022). *Handbook of Energy and Environmental Security*.

Data Energi Terbarukan | Renewable Energy. (n.d.). Renewable Energy Indonesia. Retrieved September 29, 2024, from https://renewableenergy.id/data-energi-terbarukan/#

Direktorat Jenderal EBTKE - Kementerian ESDM. (2021, November 4). Direktorat Jenderal EBTKE - Kementerian ESDM. Retrieved September 29, 2024, from https://ebtke.esdm.go.id/post/2021/11/04/3000/kementerian.esdm.irena.tingkatkan.kerja.sama.dekarbonisasi.menuju.target.net.zero.emission

EBT Topang Ketahanan Energi Nasional dan Tekan Laju Emisi. (2021, 11 7). KEMENTERIAN ENERGI DAN SUMBER DAYA MINERAL. Retrieved 9 29, 2024, from https://www.esdm.go.id/id/media-center/arsip-berita/ebt-topang-ketahanan-energi-nasional-dan-tekan-laju-emisi

Handayani, Y. S., & Priyadi, I. (2021). Analisis Pengaruh Variasi Tegangan Terhadap Oxyhydrogen (Hho) Generator. *Jurnal Listrik, Instrumentasi Dan Elektronika Terapan (JuLIET)*, *2*(2), 2–7. https://doi.org/10.22146/juliet.v2i2.69013

Hassan, M., Khan, M. I., Hayat, M., & Ahmad, I. (2022). Environmental security in developing countries. In *Handbook of Energy and Environmental Security*. https://doi.org/10.1016/b978-0-12-824084-7.00012-6

HS Putri, R., Suwarno, P., Yudho Prakoso, L., Koerniawati, I., Yulianto, T., & Khotimah, N. (2023). Analysis of Renewable Energy Potential In The Implementation of NZE 2060

To Support Defence In Indonesia. *Return : Study of Management, Economic and Bussines*, *2*(3), 269–273. https://doi.org/10.57096/return.v2i03.78

Indonesia and IRENA Agree Partnership to Decarbonise Southeast Asia's Largest Economy. (2021, 11 5). IRENA. Retrieved 9 29, 2021, from https://www.irena.org/News/pressreleases/2021/Nov/Indonesia-and-IRENA-Agree-Partnership-to-Decarbonise-Southeast-Asia-Largest-Economy

IRENA: Menggali Lebih Dalam Peran dan Tantangan Percepatan Energi Terbarukan. (2024, 5 4). Suara Energi. Retrieved 9 29, 2024, from https://suaraenergi.com/irena-menggali-lebih-dalam-peran-dan-tantangan-percepatan-energi-terbarukan/

Kementerian ESDM RI - Media Center - News Archives - Indeks Ketahanan Energi Indonesia Masuk Kategori 'Tahan'. (2024, January 19). Kementerian ESDM. Retrieved September 29, 2024, from https://www.esdm.go.id/en/media-center/news-archives/indeks-ketahanan-energi-indonesia-masuk-kategori-tahan

Kinerja Sektor ESDM 2023: Perluas Akses Energi, Prioritaskan Kebutuhan Domestik, dan Jaga Daya Saing Lewat Transisi Energi. (2024, January 15). Kementerian ESDM. Retrieved September 30, 2024, from https://www.esdm.go.id/id/media-center/arsip-berita/kinerja-sektor-esdm-2023-perluas-akses-energi-prioritaskan-kebutuhan-domestik-dan-jaga-daya-saing-lewat-transisi-energi

Launch of the Indonesia Energy Transition Outlook. (2022, October 21). IRENA. Retrieved September 29, 2024, from https://www.irena.org/events/2022/Oct/Launch-of-the-Indonesia-Energy-Transition-Outlook

Muyasyaroh, A. P. (2024). Rethinking Energy Security in Indonesia from a Net Zero Perspective. *Indonesian Journal of Energy*, *7*(1), 16–26. https://doi.org/10.33116/ije.v7i1.197

Net-zero emission scenarios for climate policy. (2020, December 17). IRENA. Retrieved September 29, 2024, from https://www.irena.org/Events/2020/Dec/Net-zero-emission-scenarios-for-climate-policy

Peran Energi Terbarukan dalam Mengatasi Krisis Perubahan Iklim. (2023, 9 19). Fakultas Pertanian Universitas Medan Area. Retrieved 9 29, 2024, from https://pertanian.uma.ac.id/peran-energi-terbarukan-dalam-mengatasi-krisis-perubahan-iklim/

Robert Bogdan & Steven J. Taylor, Pengantar Metode Penelitian Kualitatif : Suatu Pendekatan Fenomenologis Terhadap Ilmu-ilmu Sosial (Surabaya; Usana Nasional, 1992) hal 21-22

Sitoyo, S, *Dasar Metodologi Penelitian* (Yogyakarta. Literasi Media Publishing, 2015)

Surya Husada, V., & Erar Joesoef, I. (2022). Legal Policy of the Indonesian Government to Achieve Net Zero Emissions. *Journal Research of Social Science, Economics, and Management*, *2*(1), 128–133. https://doi.org/10.59141/jrssem.v2i1.248

The United Nations in Indonesia | Perserikatan Bangsa - Bangsa di Indonesia. (n.d.). United Nations in Indonesia. Retrieved September 29, 2024, from https://indonesia.un.org/id/about/about-the-un

Ulber Silalahi, *Metode Penelitian Sosial* (Bandung.PT.Refika Aditama,2012) hal. 27-28

Vision and mission. (n.d.). IRENA. Retrieved September 29, 2024, from https://www.irena.org/About/Vision-and-mission

Zulfadli. (2016). Kepentingan Indonesia Bergabung Dengan Irena (International Renewable Energy Agency) Tahun 2014. *Jom FISIP*, *3*(1), 1–15.