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Willingness and Ability to Pay for Renewable Energy in Jakarta

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ABSTRAK

Pemerintah Indonesia memiliki komitmen yang tinggi untuk mewujudkan Net Zero Emission (NZE) pada tahun 2060, yang diantaranya adalah dengan melakukan transisi energi pada sektor kelistrikan dengan mengganti bahan bakar fosil menjadi EBT secara bertahap. Targetnya adalah agar bauran energi baru terbarukan mencapai setidaknya sebesar 23% di tahun 2025 dan setidaknya sebesar 31% di tahun 2050. Komitmen ini juga menjadi komitmen bagi semua provinsi di Indonesia termasuk Provinsi DKI Jakarta. Sampai dengan tahun 2023, bauran energi baru terbarukan di Indonesia masih mencapai 13,3%. Batubara masih menjadi sumber energi yang paling banyak digunakan tahun 2023 yaitu mencapai 39,7%. Penelitian atas willingness and ability to pay ini dimaksudkan untuk menganalisis kemauan dan kemampuan daya beli masyarakat di Provinsi DKI Jakarta jika terjadi perubahan harga energi jika terdapat transisi energi dengan meningkatkan bauran energi terbarukan. Penelitian ini menggunakan metode kuantitatif untuk mengetahui daya beli masyarakat atas energi listrik dengan menggunakan penyebaran kuesioner kepada pelanggan PT PLN (Persero). Responden dari penelitian ini adalah pelanggan PT PLN (Persero) dengan kategori rumah tangga pada semua tingkatan yaitu R1, R3 dan R3. Hasil penelitian menunjukkan bahwa 97% responden mengetahui bahwa batu bara sebagai sumber energi utama pembangkit listrik, dan 96,3% memahami dampak negatifnya terhadap lingkungan dan kesehatan. Kesadaran masyarakat akan kebijakan transisi energi pemerintah cukup tinggi, yaitu 97,6%, dan 93,3% responden mendukung peralihan ke energi terbarukan. Hasil penelitian juga menunjukkan bahwa kesediaan untuk membayar tarif listrik pada seluruh kategori pelanggan, adalah pelanggan kategori R1 sebesar 54,13%, R2 sebesar 47,83%, dan R3 sebesar 33,33%. Sementara itu kemampuan membayar responden menunjukkan bahwa responden kategori R1 adalah sebesar 5% dari tagihan awal. Kategori R2 dan R3 mampu membayar maksimal 10% dari tagihan awal.

Kata kunci: energi listrik, transisi energi, kemauan membayar, kemampuan membayar, harga pokok penyediaan

ABSTRACT

The Indonesian government is firmly committed to achieving Net Zero Emission (NZE) by 2060. This involves transitioning the electricity sector by progressively replacing fossil fuels with renewable energy sources. The goal is to have a renewable energy mix of at least 23% by 2025 and at least 31% by 2050. This commitment applies to all provinces in Indonesia, including DKI Jakarta Province. This study aims to analyze the willingness and ability to pay DKI Jakarta Province residents for potential changes in energy prices resulting from an energy transition that increases the renewable energy mix. By 2023, the renewable energy mix in Indonesia reaches 13.3%. Coal is still the most widely used energy sources ini Indonesia, reaching 39,7%. This research employs quantitative methodology to ascertain the purchasing ability of the community for electrical energy through questionnaire distribution to PT PLN (Persero) customers. The respondents of this research are PT PLN (Persero) customers with household categories at all levels, which are R1, R2 and R3. The result showed that that a vast majority of respondents (97%) recognize coal as the primary energy source for electricity generation, with 96.3% acknowledging its negative environmental and health effects. Awareness of the government's energy transition policy is high at 97.6%, and 93.3% of respondents support the shift to renewable energy. However, the willingness to pay higher electricity tariffs declines across customer categories, with R1 at 54.13%, R2 at 47.83%, and R3 at 33.33%. The research results on respondents' ability to pay show that R1 category respondents represent 5% of the initial bill. The R2 and R3 categories represent a maximum of 10% of the initial bill.

Keywords**:** Electrical energy**,** Energy transition, Willingness to Pay, Ability to Pay, Cost of Supply

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1. INTRODUCTION

Climate change and global warming will significantly disrupt human life worldwide, impacting health, agriculture, forestry, infrastructure, transportation, tourism, energy, and social structures (Ainurrohmah & Sudarti, 2022). Analysis indicates

that between 2000 and 2016, global energy consumption decreased global warming potential by 18.7% and acidification potential by 33.37%, while increasing eutrophication potential by 28.42% (Zheng et al., 2023).

The global strategy for renewable energy aims to replace fossil fuels in support of green and sustainable development (Abbasi et al., 2022). Renewable energy offers various benefits, including fossil fuel conservation, lower-cost energy resources, and enhanced energy security (Adams, et.al, 2018). However, challenges such as high capital costs, low efficiency, and dependency on weather conditions remain key concerns, along with environmental impacts that must be managed wisely (Bhattacharya et al., 2017)..

Various solutions have been developed to overcome these limitations, including energy storage technology for long-term use and optimizing power plant locations to reduce costs and environmental impact (Trinh & Chung, 2023). Governments and policymakers design diverse energy generation strategies to strengthen energy security (Blum & Legey, 2012). If necessary, energy imports are carried out with varied types to prevent shortages at specific times (Kharrazi et al., 2015).

The Government of Indonesia has committed to a long-term energy transition strategy by setting national targets through the 2020–2024 National Medium-Term Development Plan (Aghahosseini et al., 2020). This includes achieving a 23% share of renewable energy in the national energy mix by 2025 and 31% by 2050 (Bappenas, 2021a). Additionally, Indonesia has pledged to reach Net Zero Emissions (NZE) by 2060, as outlined in a roadmap developed by the Ministry of Energy and Mineral Resources (ESDM) in collaboration with the International Energy Agency (IEA) (International Energy Agency, 2022).

To implement this national strategy effectively, energy transition efforts must also be integrated at the regional level. The DKI Jakarta Provincial Government has implemented a range of policies and strategies to support the transition from fossil fuels to renewable energy. As outlined in the Regional Energy General Plan (RUED), the government aims to gradually increase the share of renewable energy in the province's primary energy mix.

The population of DKI Jakarta exhibits considerable economic heterogeneity, characterized by a pronounced disparity in income distribution between lower- and upper-income groups. As the capital and a major metropolitan center, Jakarta serves as a hub of economic activity and is associated with a relatively elevated cost of living. According to data released by the Central Bureau of Statistics (BPS) of DKI Jakarta, the average monthly income of formal sector workers in the region reached IDR 5,532,624 in 2024. In 2022, the average monthly per capita expenditure in DKI Jakarta was recorded at IDR 2,525,347. This total expenditure is categorized into two primary components: food expenditure, reaching IDR 953,321, and non-food expenditure, totaling IDR 1,572,026.

In 2023, the Province of DKI Jakarta recorded approximately 4.85 million household electricity customers under PLN, with 87.63%—equivalent to around 4.25 million customers—still receiving government electricity subsidies. In terms of connected capacity, the household sector accounted for 9.39 MW out of a total installed capacity of 21.64 MW across all customer categories (PLN, 2023). However, the energy supply is still dominated by fossil fuels, particularly coal-fired power plants, which contribute significantly to carbon emissions. The current energy mix consists of coal (41.9%), petroleum (29.5%), natural gas (25.4%), and renewable energy (3.2%). Under RUED, the province targets a 2050 energy mix of renewables (24.4%), natural gas (42.3%), coal (17.9%), and oil (15.4%) (DKI Jakarta Provincial Government, 2023).

Prior research in Indonesia indicates that electricity subsidy reforms have negatively impacted income distribution, thus widening the economic disparity. Low-income households experienced a more significant income reduction compared to high-income households. Furthermore, the increase in income inequality was more pronounced in urban areas than in rural areas (Mahadevan & Nugroho, 2021). Research indicates a consumer willingness to pay a premium for electricity generated from renewable sources. For instance, studies show a significant willingness to pay for increased hydropower generation, ranging from IDR12,700 to IDR155,400 per month, depending on household electricity consumption (Siyaranamual et al., 2020).

While increasing the supply of renewable energy is crucial for emission reductions (Cui et al., 2019), the transition brings economic implications, especially related to the cost of electricity supply and public affordability. Renewable energy technologies, particularly solar, currently have higher generation costs than fossil fuels (Cheng et al., 2023). For instance, the Cost of Supply for coal-based electricity stands at IDR930.71 per kWh, whereas solar power reaches IDR13,667.21 per kWh (PLN, 2023).

Currently, 64.28% of PT PLN (Persero)'s power plants rely on coal, which helps keep electricity prices relatively affordable for consumers, ranging from IDR1,352.00 to IDR1,699.53 per kWh depending on the customer category (PT PLN (Persero), 2023a). However, as the energy transition progresses and a greater portion of electricity is generated from costlier renewable sources, the average Cost of Supply is expected to increase. If electricity tariffs are not adjusted accordingly, PLN may face higher operational expenses, which could negatively impact its financial stability. Under the Business as Usual (BAU) scenario, PLN recorded a net profit of IDR14.41 trillion in 2022 (PT PLN (Persero), 2023a).

To maintain affordable electricity prices amid rising production costs, the government provided IDR123.14 trillion in subsidies and compensation in

2022 (BPK, 2023). If electricity prices increase due to a higher share of renewables, the burden on public spending will also increase, especially if large portions of the population cannot afford the adjusted tariffs. In such cases, government subsidies become essential to bridge the gap between supply costs and the public's ability to pay.

This condition illustrates the critical interdependence between energy supply and public affordability. A shift in the energy supply, especially toward more costly but cleaner sources, has direct consequences for electricity tariffs. These, in turn, affect the willingness and ability of the community to pay. If the cost burden is transferred fully to consumers, household purchasing power may be compromised. Conversely, if costs are absorbed entirely by the government, fiscal sustainability may be at risk (Daumas, 2023). This balance is central to ensuring a just and sustainable energy transition.

Therefore, to achieve Net Zero Emissions (NZE) while maintaining social and economic stability, energy policies must carefully align the cost of supply with consumer affordability. Infrastructure investments in renewable energy must be economically viable, and public support mechanisms, including subsidies or differentiated tariffs, should be based on realistic assessments of the community's willingness and ability to pay.

This research aims to provide such an assessment in the context of DKI Jakarta. It will analyze how changes in electricity prices resulting from an increased renewable energy mix will impact residential consumers, and how policy can support both emission reduction goals and energy affordability.

2. METHODS

The research methodology employed in this study involves a quantitative approach, utilizing questionnaire distribution to ascertain individuals' purchasing power for electrical energy. Furthermore, the researchers will conduct a literature review to substantiate the findings and gather pertinent data and information from reputable national and international journals, articles, texts, regulations, and news sources from both traditional and online media.

This research utilizes national data, but the research sample is conducted in DKI Jakarta Province during August-September 2024. The consideration for this selection is that DKI Jakarta Province has the highest average energy sold to household customers in Indonesia. The average energy sold in 2022 was recorded at 3,173.87 kWh (PT PLN (Persero), 2023b).

A survey was conducted to gauge the willingness and ability of PT PLN (Persero) customers in the DKI Jakarta Province area to pay for their electricity consumption. The respondents were household customers categorized based on their tariff class: R1 (450 Watt - 2,200 Watt), R2 (2,200 Watt - 6,600 Watt), and R3 (above 6,600 Watt).

Using the Krejcie & Morgan Method, a minimum sample size of 95 customers was determined from a customer population of 4,670,630, with an error rate of 10%. The composition of PT PLN (Persero) customers in DKI Jakarta Province in 2020 was R1 category - 88.64%, R2 category - 8.71%, and R3 category - 2.65% (DKI Jakarta Provincial Statistics Agency, 2020). The survey received 164 responses, with the following composition: R1 category - 66.46%, R2 category - 28.05%, and R3 category - 5.49%.

The results of the data collection will be analyzed using comparative analysis, interpolation and regression to draw conclusions. In addition, interviews with respondents and experts were also conducted to confirm the results of the questionnaire.

3. RESULT AND DISCUSSION

3.1. Energy Transition from Fossil Energy to Renewable Energy

Reducing carbon emissions requires concerted efforts, including transitioning from fossil fuels to renewable energy sources. This global strategy is crucial for replacing fossil fuels used in electrical energy generation, promoting green and sustainable development. Renewable energy offers numerous advantages, such as conserving fossil fuels, providing cost-effective energy resources, and ensuring energy security. However, renewable energy also presents challenges, including high initial investment costs, lower efficiency compared to fossil fuels, dependence on weather conditions, and potential environmental concerns. To address these limitations, innovative solutions have been developed, such as energy storage technologies for long-term use and optimizing energy generation locations to minimize costs and environmental impacts (Trinh & Chung, 2023). To achieve energy security, a diversified energy generation strategy is essential. This includes diversifying imported energy sources to mitigate the risk of energy shortages (Kharrazi et al., 2015). By adopting these measures, we can ensure a reliable and sustainable energy supply for the future.

Energy conversion requires political support through governmental legislation. This ensures equitable burden sharing for society, including comprehensive compensation for governmental finances (Perry et al., 2013) and social fairness (Hoffman et al., 2021). However, the Indonesian government faces challenges in implementing sustainable energy conversion, such as weak institutional capacity, limited financial resources, and poor coordination between agencies. To address these issues, the central government should implement regional autonomy and decentralize economic and political power to provincial and district governments (Batel, 2020). Additionally, policy coherence is crucial to achieving sustainable green growth (Jupesta et al., 2011). Such coherence safeguards the diverse interests of the government, coal companies and their workforce, and the community (Brauers & Oei, 2020). Indeed, policy coherence is one of the key elements

contributing to the success of the energy transition, alongside policies that are developed with the involvement of various stakeholders (Arora & Schroeder, 2022). Achieving international commitments to reducing greenhouse gas emissions necessitates policy harmonization, coherence, and alignment (Herbert et al., 2022).

It is crucial to strike a balance between the utilization of renewable energy sources and fossil fuels, considering the Capacity Factor (CF). In the implementation phase, it is essential for the government to comprehend the performance and reliability of diverse resources in accomplishing the decarbonization of the power system. This involves estimating the CF for various types of power generation systems, including solar, wind, hydropower, natural gas, and coal. While renewable sources like solar and wind have lower CFs compared to non-renewable sources like natural gas and coal, the lower CF of renewable sources can be compensated by their lower costs and environmental advantages, making solar and wind power generation more viable (Bolson et al., 2022).

Analysis of interviews with Ministry of Energy and Mineral Resources experts indicates that the energy transition policy must proceed with GHG emission reductions. However, this transition requires careful consideration of PLN's financial capacity to manage electricity production costs. Excessively high renewable energy costs will necessitate increases in public electricity tariffs. Consequently, if these tariffs become unaffordable for the public, the government will be required to subsidize electricity costs (Figure 8). Expert interviews conducted by PLN indicate that excessively rapid energy transition could negatively impact PLN's financial stability. As a result, PLN suggests utilizing gas-fired power plants as an interim solution during the shift from coal to renewable energy sources.

3.2. Energy Supply in Indonesia

The Indonesian government, through the Directorate General of Mineral and Coal, Ministry of Energy and Mineral Resources, announced in 2021 that Indonesia's coal reserves have reached 38.84 billion tons (Dermont et al., 2017). With an average annual coal production of 600 million tons, the current coal reserves are projected to last for approximately 65 years, assuming no new coal reserves are discovered. Furthermore, the Ministry of Energy and Mineral Resources has estimated that Indonesia possesses an additional 143.7 billion tons of potential coal resources that could be developed in the future.

As per the Indonesian Energy Outlook report published by the National Energy Council in 2022, data acquired from the Ministry of Energy and Mineral Resources and SKK Migas indicates that Indonesia's primary energy supply reached 207.9 MTOE (million tons of oil equivalent). Fossil fuels dominate the supply, with coal accounting for the majority at 78.2 MTOE (37.6%), followed by petroleum at 69.5 MTOE (33.4%), and natural gas at 35 MTOE (16.8%). Notably, new renewable energy sources contributed only 25.3 MTOE (12.2%) to the overall energy supply, encompassing water, geothermal, solar, wind, and bioenergy (National Energy Council, 2022).

In 2023, there was a commendable increase in energy supply from renewable energy sources, reaching 13.3%, while energy supply from petroleum experienced a reduction to 29.9%. The target and current status of the energy supply are visually in Figure 1.

Coal remains a crucial component in ensuring a stable electricity supply and serves as a significant export commodity, contributing substantially to government revenue. To strike a balance between promoting renewable energy sources and utilizing coal effectively, it is essential to align policies related to coal utilization with the expansion of renewable energy power plants (Erfian et al., 2024). This strategic approach will enable us to meet the nation's energy demands while enhancing the well-being of the citizens (Carter, 2013).

3.3. Energy Supply in DKI Jakarta Province

The majority of DKI Jakarta Province's energy supply originates from external sources, including other provinces and international imports. The province's energy requirements encompass petroleum, natural gas, LPG, and renewable energy. Petroleum usage is anticipated to experience a modest increase from 22.5 MBOE to 26.5 MBOE by 2050, assuming successful energy diversification efforts through the integration of biofuels. Concurrently, the utilization of natural gas will be augmented primarily for electricity generation and household consumption. Projection of fuel supply in the DKI Jakarta Province can be illustrated in Figure 2. In the renewable energy sector, the DKI Provincial Government will develop renewable energy derived from solar, wind, biofuels, waste, and hydrogen energy. For solar energy, they will focus on photovoltaic systems (Agarwal et al., 2023). In 2017, the installed capacity of PLTS in housing and offices was 500 kW. The Provincial Government plans to maximize the utilization of solar energy by actively involving the community. They will promote and require the installation of PLTS systems in residential houses, office buildings, hotels, shopping centers, schools, hospitals, terminals, ports, and other buildings. These PLTS installations can be placed on rooftops, parking areas, and other suitable locations, utilizing available land. Additionally, they will construct centralized solar systems on land and at sea surface.

3.4. Energy Consumption in Indonesia

Indonesia's electricity demand reached 255 TWh in the year of 2021 (Figure 3). This is a significant increase of approximately 46.55% compared to the consumption level in 2012. Of the total energy

consumption, the largest portion is used by the household sector, which is 44.9% or around 114 TWh distributed to approximately 69 million households in 2021. After consumption in the household sector, the industrial sector uses a fairly large percentage of electrical energy, namely 41.4%.

3.5. Energy Consumption in DKI Jakarta Province

The energy consumption in DKI Jakarta Province is divided into several sectors, including the household sector, commercial sector, industrial sector, transportation sector, and other sectors. In 2015, the total energy consumption in DKI Jakarta Province reached 6.86 MBOE, with the following Figure 4.

In Figure 4, it is known that in 2015 the energy composition was dominated by the transportation sector, namely 39.00%, then the household sector by 23.20%, the commercial sector by 20.50% and the industrial sector by 17.30%. In the household sector, electricity dominates energy consumption. In 2015, the household sector of DKI Jakarta Province used 70.1% of electricity from a total of 1.49 MBOE. It is estimated that this percentage will increase to 77.9% in 2025 and 89.8% in 2050, with a total of 2.43 MBOE.

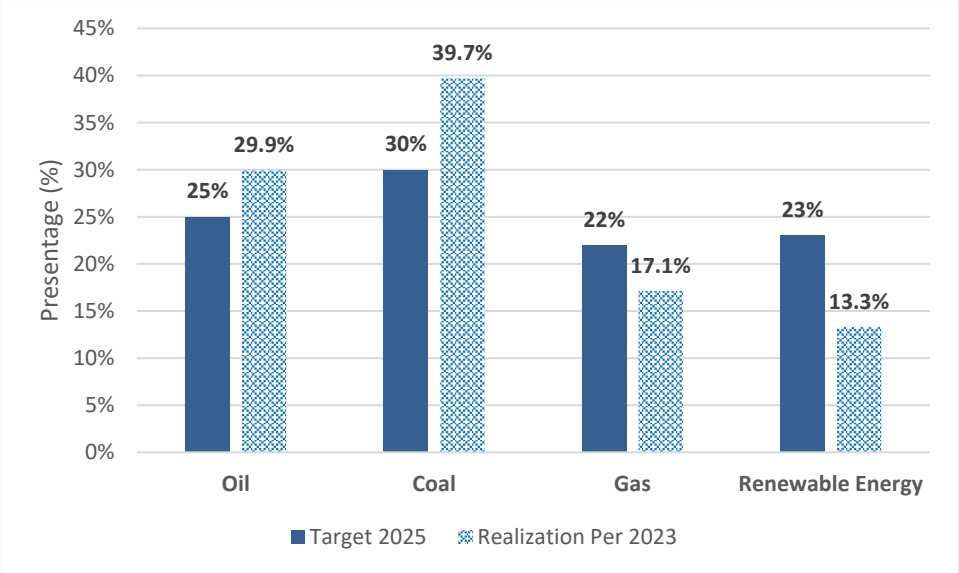

Figure 1. Target and Status of The Energy Supply in Indonesia 2023
(Source: Ministry of Energy and Mineral Resources, 2023)

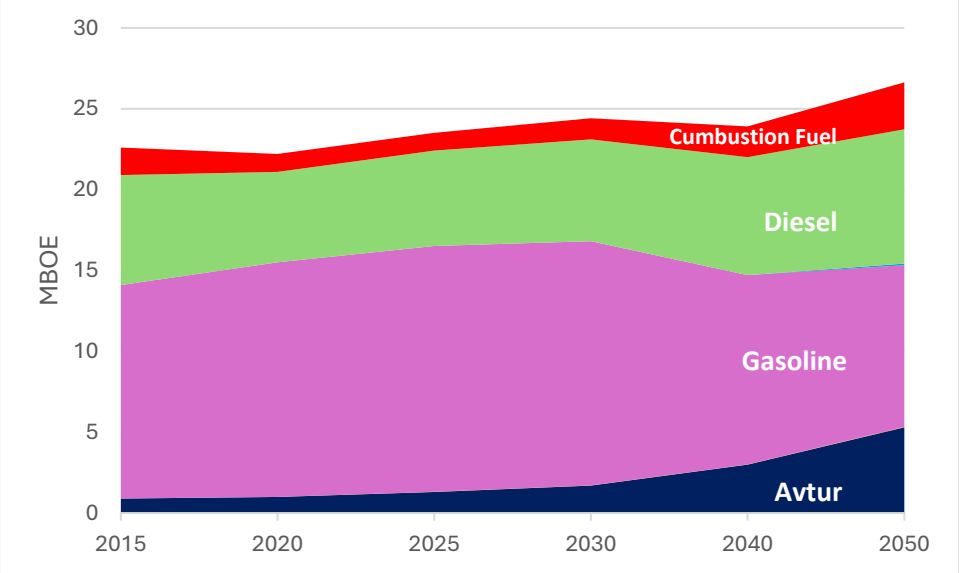

Figure 2. Projection of Fuel Supply in the DKI Jakarta Province
(Source: DKI Jakarta Provincial Government, 2023)

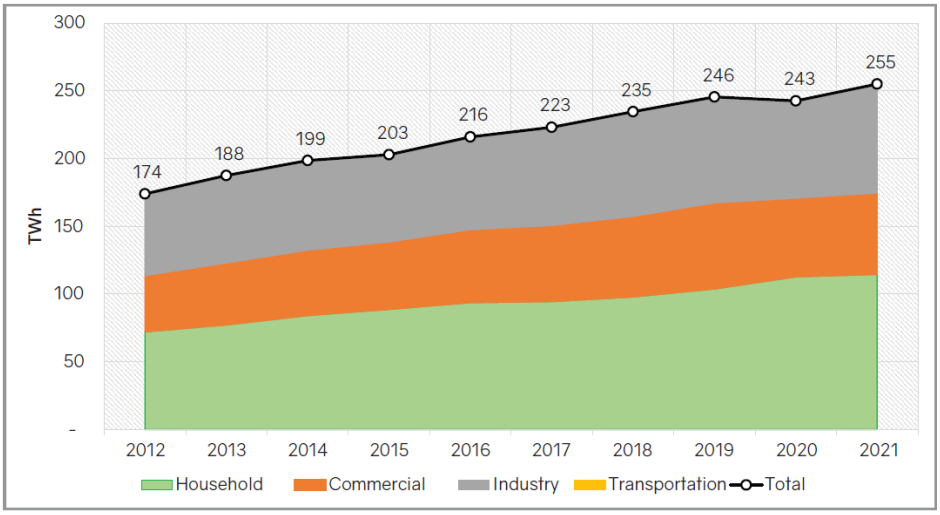

Figure 3. Electricity Energy Consumption per Sector 2012-2021
Source: (National Energy Council, 2022)

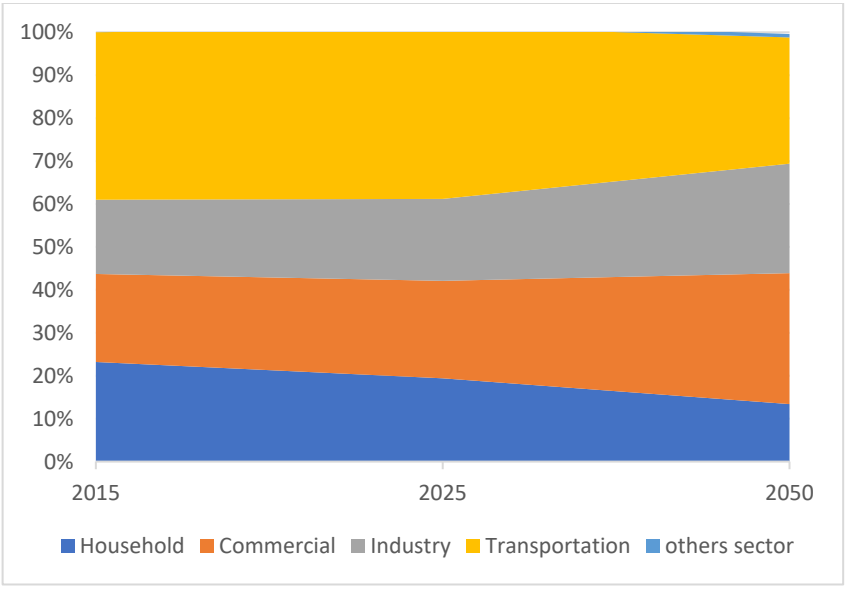

Figure 4. Projection of Energy Consumption in DKI Jakarta Province
(Source: DKI Jakarta Provincial Government, 2023)

3.6. Electricity Supply

The cost of generating electricity using renewable energy sources is generally higher compared to the cost of using fossil fuels. Studies conducted in Romania indicate that efforts should be focused on reducing the production costs of renewable energy, as this represents a cost-effective approach to achieving energy independence and mitigating pollution (Murărașu, 2023). These cost savings will also positively influence public acceptance of renewable energy usage, particularly in relation to the associated costs (Dermont et al., 2017).

In Indonesia, PT PLN (Persero) is the primary provider of electrical energy to the population. Currently, PT PLN (Persero) heavily relies on fossil fuel-based power plants for electricity generation. Based on the electricity production volume reported by PT PLN (Persero), approximately 64.28% of the power plants utilize coal, while oil and gas-based power plants account for at least 7.67%, and renewable energy-based power plants contribute 9.72% (Figure 5).

The majority of PT PLN (Persero)'s coal-fired power plants are situated in Java, while power plants outside Java are strategically designed to utilize nearby energy sources, such as offshore natural gas reserves. As of 2022, PT PLN Persero operates an impressive portfolio of 6,928 power plants, with 6,314 owned by PT PLN Persero itself, 380 owned by independent power producers, and 234 leased.

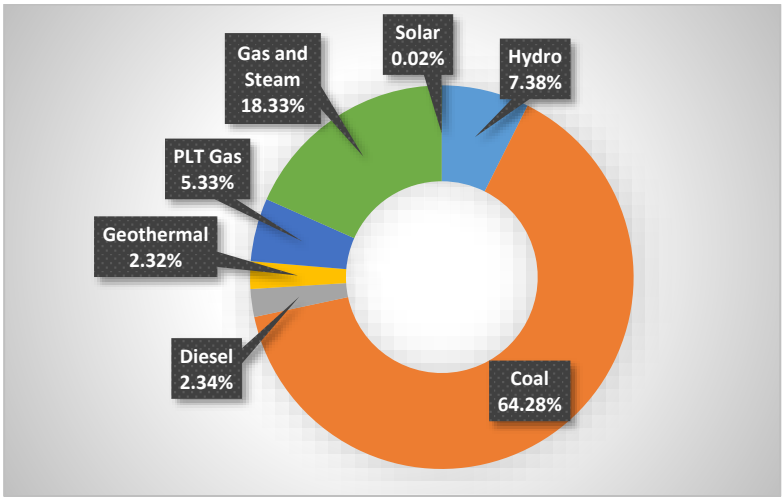

Figure 5. Power Generation Energy Sources Used by PT PLN (Persero)
(Source: Processed from Financial Statements of PT PLN (Persero), 2023)

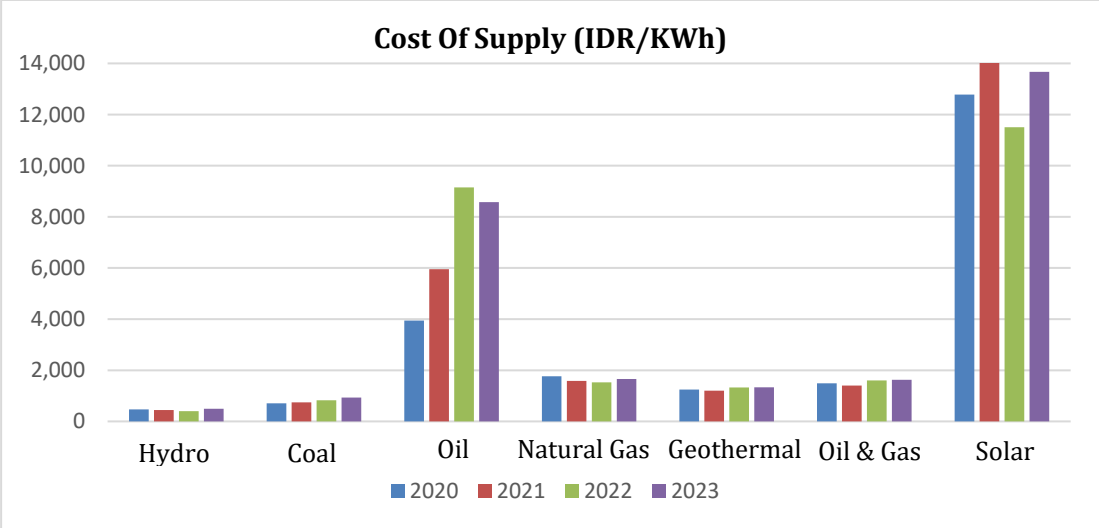

Figure 6. Cost of Supply Per kWh for Each Power Plant
Sources: (PLN Financial Report, 2024)

Although coal power plants are classified as non-renewable energy sources, PT PLN (Persero) continues to rely on coal as its primary source for power generation. This decision is primarily driven by cost considerations, as coal offers a more economic option compared to other energy sources. According to PT PLN (Persero)'s 2023 Financial Report, the Cost of supply (BPP) of electricity generated using coal stands at IDR930,71 per kWh. In contrast, renewable energy sources such as geothermal and solar power have significantly higher BPPs, at IDR 1.658,13 per kWh and IDR13.667,21 per kWh, respectively. The only renewable energy source that surpasses coal in terms of cost-effectiveness is hydropower, with a BPP of IDR 401.22 per kWh (PT PLN (Persero), 2023a). Considering the high BPP associated with renewable energy sources, the Government and PT PLN (Persero) still utilize coal as the primary energy source to guarantee affordable electricity prices for Indonesian citizens. More detailed BPP values for each type of power plant are presented in Figure 6.

The transition from fossil fuels to renewable energy sources will affect PT PLN's (Persero) BPP. This BPP only represents the production cost of the power plant. Additional costs such as transmission, distribution, depreciation, and PT PLN's profit margin must also be factored into the selling price of electricity from power plants to customers. In 2023, the average electricity tariff reached IDR 1,556.87 per kWh. Electricity tariffs are differentiated by customer type, namely industry, household, business, social services, government offices and public street lighting (PJU). In the household customer group, it is divided into 3, type R1, type R2 and type R3 customers with the following tariff details in Figure 7.

Considering the current electricity price per kWh and in comparison, to the average Cost of Supply, the government will be required to provide PT PLN with an electricity subsidy amounting to IDR 54.15 trillion in 2022. Given these circumstances, if the transition to alternative energy sources for PT PLN's power plants is pursued, it will lead to an increase in both the Cost of Supply and the overall electricity cost. As the Cost

of Supply rises, the electricity tariff will also increase unless subsidized by the government. However, if the government does provide subsidies, it becomes crucial to assess the impact on the state budget, as it will bear the burden of the subsidized electricity price. The graph in Figure 8 illustrates the value of electricity subsidies granted by the government over the past four years.

3.7. Public Willingness to Pay for Renewable Energy

The results of research using a questionnaire approach to PT PLN (Persero) customers in DKI Jakarta Province aim to determine the public's willingness to pay more for the use of Renewable Energy in electricity production. To demonstrate public confidence in the willingness to pay more for energy derived from Renewable Energy, the researcher attempts to ascertain the level of public understanding regarding the utilization of Renewable Energy in electricity generation.

The questionnaire results about Affordability of current electrical energy prices reveal that a substantial majority of respondents, approximately 84.15%, expressed that the current electricity tariff remains within their means. Conversely, a minority of respondents, accounting for 15.85%, indicated that the current electricity tariff poses financial challenges. Notably, among the various customer categories, those belonging to the R3 category exhibited the highest level of affordability, with an impressive 88.89% of respondents finding the current electricity tariff manageable. The detailed findings are presented in Figure 9.

Researchers also inquired about the degree to which participants comprehended the significance of the energy transition from fossil fuels to Renewable Energy. The findings revealed that 97% of respondents were aware that coal was the primary source of energy for electricity generation. Additionally, 96.3% of respondents acknowledged the detrimental effects of coal usage in power plants on both the environment and human health (Figure 10).

Other results also show that 97.6% of governments implement energy transition policies from fossil energy to renewable energy, and 93.3% of respondents would support such policies (Figure 11).

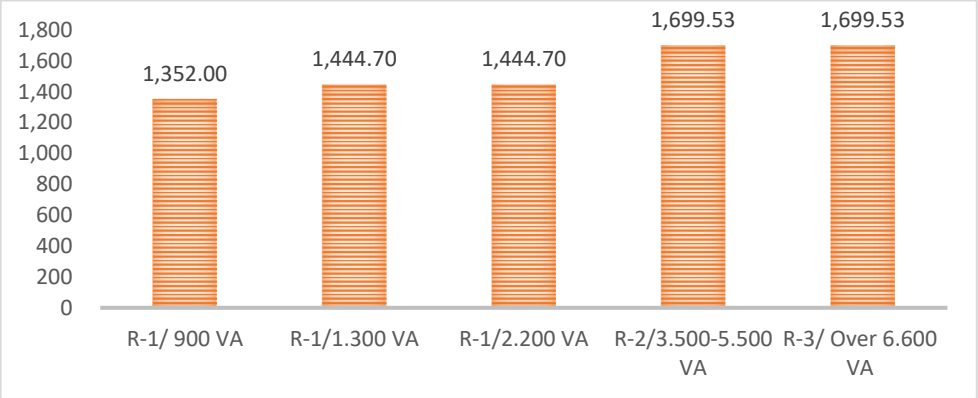

Figure 7. Tariff per kWh for PLN Customers from Housfromd Types
Source: (PLN, 2023)

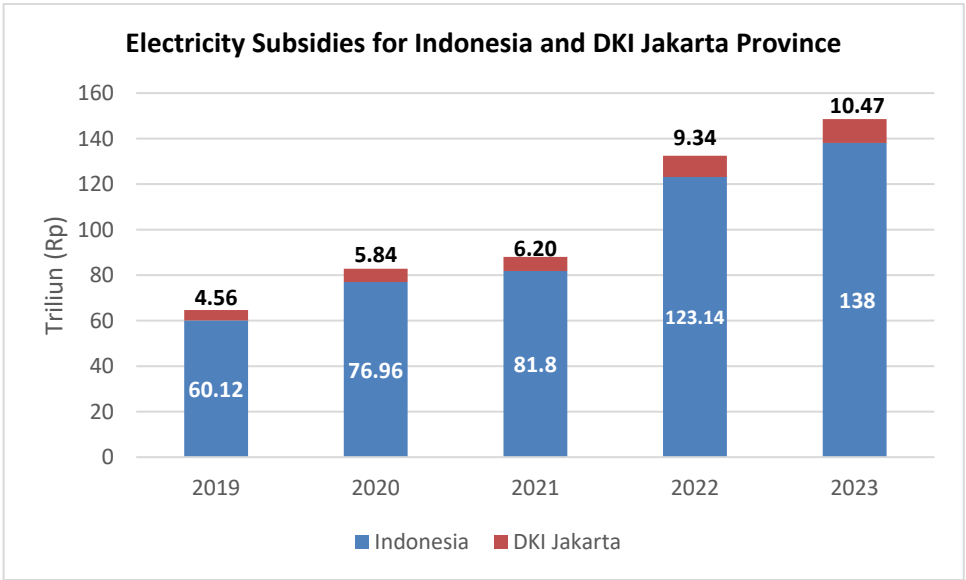

Figure 8. Electricity Subsidies for National and Province of DKI Jakarta 2018-2023

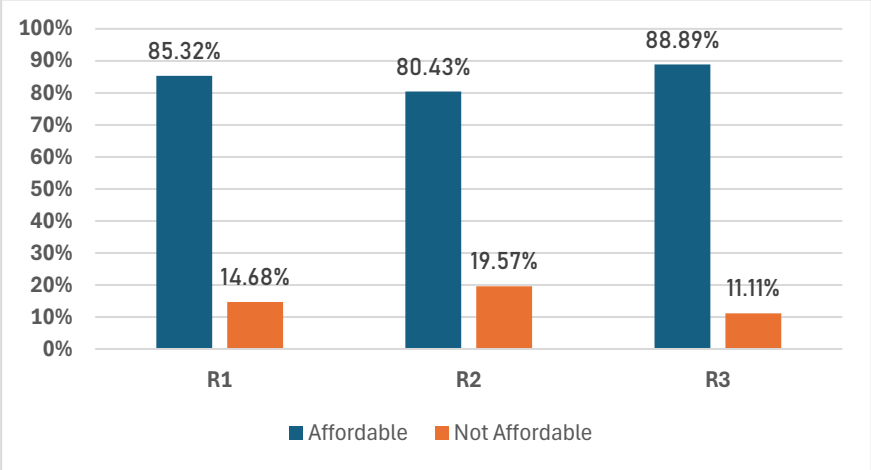

Figure 91. Electricity Tariff Affordability by Household Customer Category

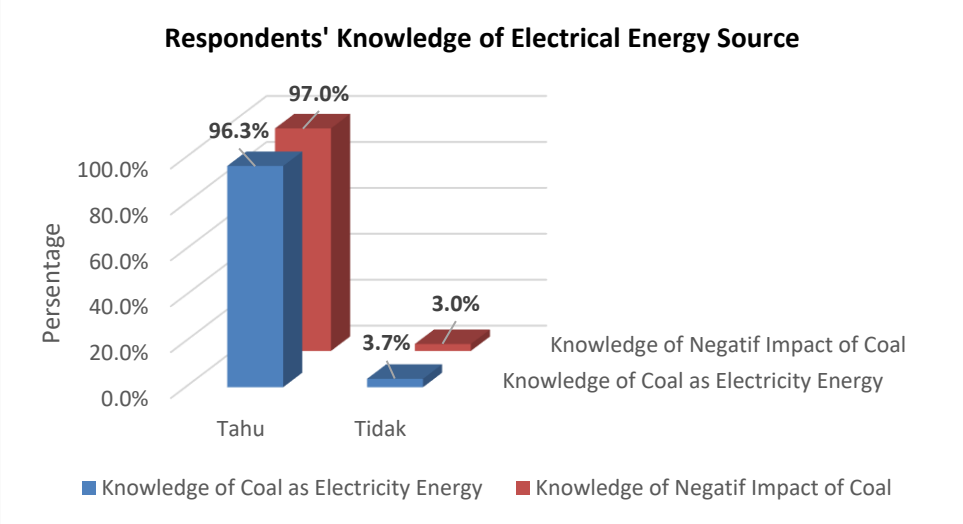

Figure 10. Public Knowledge of Electrical Energy Source

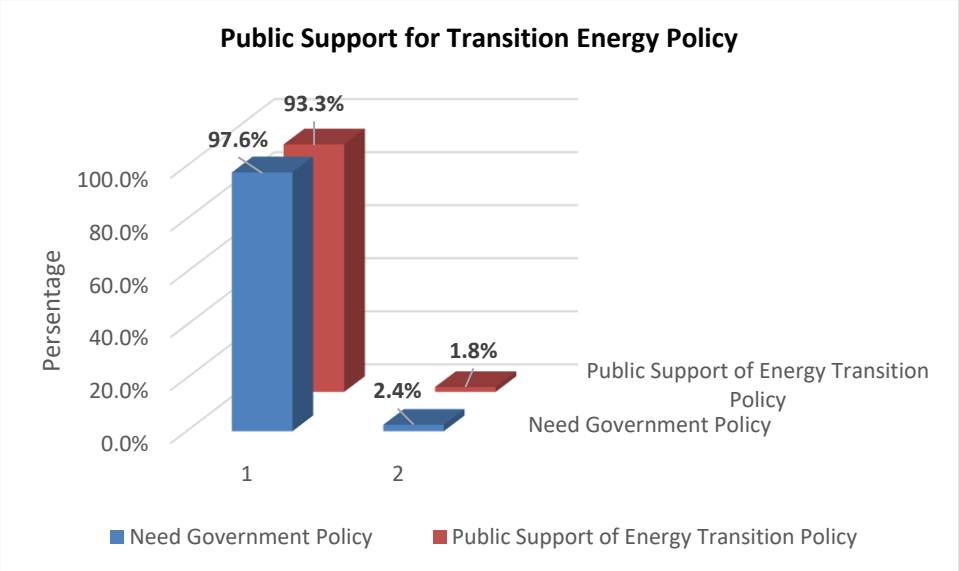

Figure 2. Government and Community Support to Energy Transition

The research also indicates that while most respondents (84.15%) find the current price of electrical energy affordable, there is a notable trend among higher customer categories exhibiting a lower willingness to pay more for the energy transition policy. Despite respondents' knowledge of the environmental hazards associated with coal-derived electricity and the significance of transitioning from

fossil fuels to renewable energy sources, this reluctance persists. The graph in Figure 12 illustrates a correlation between customer categories and their willingness to pay more for Renewable Energy. In the R1 category, 54.13% of respondents are inclined to pay more for RENEWABLE ENERGY, while in R2 and R3 categories, the percentages are 47.83% and 33.33%, respectively. This indicates an inverse relationship between customer category and willingness to pay more for Renewable Energy.

Furthermore, the willingness to pay is significantly influenced by monthly electricity costs. R3 category customers incur the highest average electricity cost of IDR3,118,750, nearly double that of R2 category customers (IDR 1,716,250). R1 category customers, with a power consumption of 2,200 Watts, spend approximately IDR 876,923.00 on electricity, which is almost half of what R2 category customers spend in Figure 13. Given the rising cost of electricity usage each month, any increase in electricity tariffs, even by a small percentage, will significantly impact customers' ability to pay.

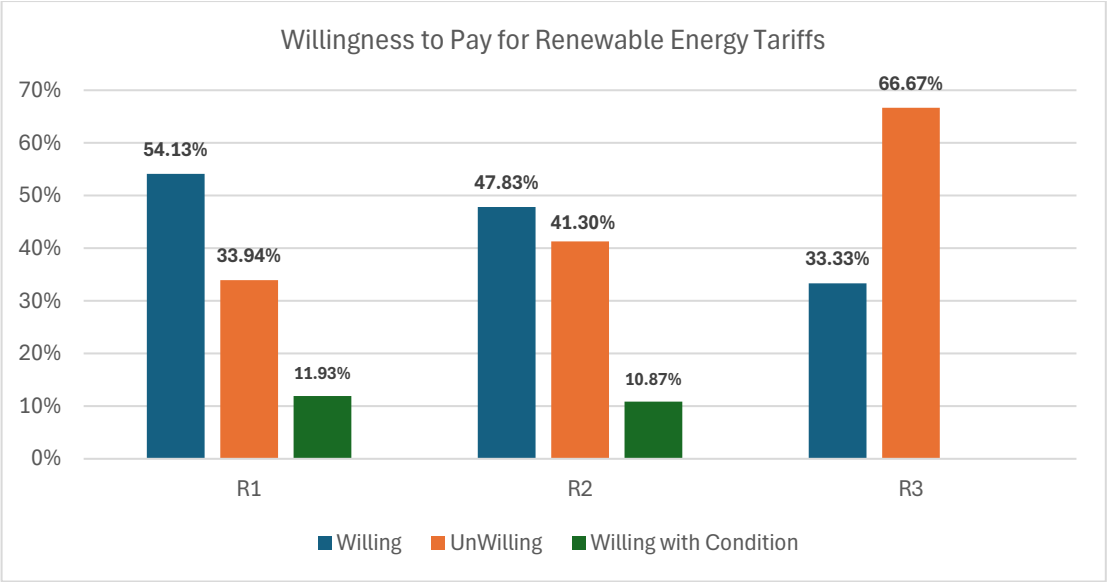

Figure 12. Willingness to Pay for Renewable Energy Tariffs

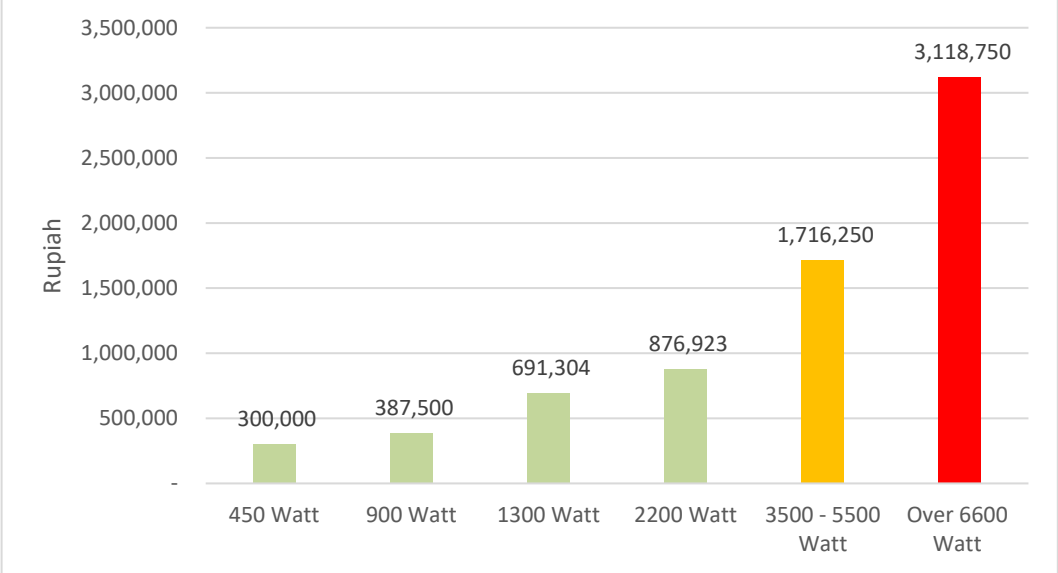

Figure 13. Respondents' Average Electricity Cost Per Month

Table 1. Ability to Pay Rate of Increased Monthly Electricity Costs

Customer Category	Average Electricity Expenditure Per Month (IDR)	Percentage of ability to pay increased monthly of electricity costs (IDR)	Rate of Increase per Month (IDR)
450 Watt	300.000	5%	15.000
900 Watt	387.500	5%	19.375
1300 Watt	691.304	5%	34.565
2200 Watt	876.923	5%	43.846
3500 – 5500 Watt	1.716.250	10%	171.625
Up to 6600 Watt	3.118.750	10%	311.875

3.8. Public Ability to Pay for Renewable Energy

After analyzing the respondents' willingness to pay for electrical energy at a higher price, the questionnaire was directed to find out what percentage of PT PLN (Persero) customers in the DKI Jakarta Province area can pay if there is an increase in electricity tariffs due to an energy transition from fossil energy to renewable energy. Based on the results of the questionnaire, it is known that for customers with lower power consumption (450-Watt, 900-Watt, 1300 Watt, and 2200 Watt), the affordable increase in electricity costs during an energy transition is approximately 5% of their average electricity bill. For instance, a 450-Watt customer with an average bill of Rp300,000 could afford an increase of IDR15,000 per month (5% × Rp300,000). Likewise, a 2200-Watt customer could afford an increase of IDR43,846 per month, which is 5% off their average bill of IDR876,923. R1 category customers are amenable to a 5% price increase, although they continue to receive government electricity subsidies due to their economic vulnerability and ongoing need for assistance.

High-power consumption customers (3500–5500 Watts and 6600-watt and above) demonstrate a capacity to absorb electricity price increases of up to 10% of their monthly electricity bill. Specifically, the 3500–5500-watt customer segment, with an average monthly expenditure of Rp1,716,250, can accommodate a Rp171,625 increase (10%). Similarly, the 6600-watt and above segment, averaging Rp3,118,750 monthly, can absorb a Rp311,875 increase (10%). This higher absorption capacity suggests a positive correlation between electricity consumption and financial resilience to tariff adjustments (Table 1).

4. CONCLUSION

This research on willingness and ability to pay aims to analyze the willingness and ability of people's purchasing power in DKI Jakarta Province if there is a change in energy prices due to an energy transition by increasing the renewable energy mix. This research employs a quantitative method to determine the purchasing power of the community for electrical energy by distributing questionnaires to PT PLN (Persero) customers in the DKI Jakarta Province area.

The study reveals that a vast majority of respondents (97%) recognize coal as the primary energy source for electricity generation, with 96.3% acknowledging its negative environmental and health effects. Awareness of the government's energy transition policy is high at 97.6%, and 93.3% of respondents support the shift to renewable energy. However, the willingness to pay higher electricity tariffs declines across customer categories, with R1 at 54.13%, R2 at 47.83%, and R3 at 33.33%. The research results on respondents' ability to pay show that R1 category respondents represent 5% of the initial bill. The R2 and R3 categories represent a maximum of 10% of the initial bill.

Further research could explore the use of an electricity tariff feasibility model for each power plant type, encompassing both fossil fuels and renewable energy. This model would determine if advancements in technology could make electricity tariffs from renewable energy more economical than those from fossil fuels.

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