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Influence Green Energy Awareness and Price Perception Towards Customer Satisfaction with the Decision to use Renewable Energy as an Intervening Variable (A Study on the Environment of PT PLN UP3 North Banten)

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Abstract: The global reliance on fossil fuels has been proven to accelerate the pace of global warming, making the transition to renewable energy and the implementation of energy efficiency measures an urgent necessity. This study aims to analyze the influence of Green Energy Awareness and Price Perception on Customer Satisfaction, with the Decision to Use Renewable Energy as an intervening variable among medium and high-voltage customers within the operational area of PT PLN UP3 Banten Utara. A quantitative approach was employed by collecting primary data through questionnaires distributed to 100 respondents using a non-probability sampling technique. The data were analyzed using multiple linear regression and the Sobel test to examine the mediating effect. The findings indicate that both Green Energy Awareness and Price Perception have a positive influence on the decision to use renewable energy. Furthermore, Green Energy Awareness, Price Perception, and the Decision to Use Renewable Energy all positively influence Customer Satisfaction. The decision to use renewable energy mediates the effect of Green Energy Awareness and Price Perception on Customer Satisfaction. These findings provide valuable insights for the development of renewable energy initiatives in Indonesia.

Keywords: Customer Satisfaction, Decision to Use Renewable Energy, Green Energy Awareness, Price Perception.

INTRODUCTION

The growth in global energy consumption, driven by population growth and economic development, has led to a heavy reliance on fossil fuels, accelerating global warming. To address this, a shift towards renewable energy and energy efficiency is urgently needed. Various countries, including Indonesia, have responded by introducing initiatives such as Renewable Energy Certificate (REC) by PT PLN (Persero) to support the use of clean energy. Despite the significant increase in REC usage, widespread adoption of renewable energy remains limited compared to the total number of national electricity customers.

Customers' decisions to use PLN RECs have increased dramatically in recent years. By 2024, 7,354 customers had utilized PLN RECs, a 117% increase compared to the previous year's 3,378 customers. PLN's President Director, Darmawan Prasodjo, emphasized that RECs are a solution for the industrial and business sectors to obtain a reliable and affordable supply of green electricity. Facing the global trend that increasingly emphasizes sustainability, many companies are starting to consider clean energy aspects in their operations to increase competitiveness in the international market. Since its launch in 2020, PLN RECs have recorded significant growth, with total sales reaching 10.99 Terawatt hours (TWh) by 2024. Of that total, nearly half, or 5.38 TWh, were sold in 2024, a 52% increase compared to the previous year's 3.54 TWh.

Theory of Sustainable Consumption Behavior (TSCB) is a theoretical framework that explains how social norms, environmental awareness, and behavioral intentions influence individual decisions to adopt sustainable consumption, particularly in the context of renewable energy (Witjaksana et al., 2024). This theory emphasizes that energy consumption behavior is influenced not only by economic and technological factors, but also by socio-psychological aspects such as carbon mitigation norms and awareness of the negative impacts of fossil fuels. Individuals with strong intentions to use green energy tend to be driven by internal factors such as awareness and external factors such as financial incentives, government regulations, and awareness campaigns from energy companies.

Consumers' decisions to use renewable energy are the result of complex psychological and behavioral processes, influenced by various internal and external factors (Munirah et al., 2024). Internally, environmental awareness and personal values are the primary drivers that drive individuals to choose green energy as a more morally and socially responsible alternative. Individuals with a strong concern for environmental issues tend to feel a responsibility to contribute to reducing carbon emissions and preserving nature. On the other hand, external factors such as perceived price and technology availability play a significant role in influencing an individual's readiness and ability to switch to renewable energy. Without easy access to adequate technology and perceived reasonable prices, even consumers with high environmental awareness may delay or abandon their plans.

Green energy awareness refers to an individual's understanding of the importance of using environmentally friendly energy sources such as solar, wind, hydro, and biomass. This awareness encompasses the dimensions of knowledge, concern, and the drive to act in an environmentally friendly manner in daily life (Loaiza-Ramírez et al., 2024). Meanwhile, price perception is a consumer's subjective assessment of the fairness, affordability, and value of a product or service. According to Zeithaml (1988) and Xu et al. (2023), this perception depends not only on the nominal price but also on the extent to which consumers perceive the benefits to be commensurate with the costs. Therefore, a price perceived as excessively high without clear added value can be a significant barrier to renewable energy adoption, even if environmental awareness is well established.

Customer satisfaction in the context of renewable energy is the result of an evaluation of the experience of using a product or service which is influenced by various factors, such as environmental awareness (green awareness), price perception, service quality, and the decision to use green energy. Research shows that environmentally friendly practices and fair price perceptions significantly increase customer satisfaction (Yu et al., 2017; Kumar & Aggarwal, 2022; Loaiza-Ramírez et al., 2024). Based on various previous studies, the decision to use renewable energy is understood as the result of an interaction between cognitive, affective, and conative factors that influence consumers' intentions and actions in adopting green energy. Research by Irfan et al. (2021), Schulte et al. (2021), and Loaiza-Ramírez et al. (2024) shows that this decision acts as a significant mediating variable in the relationship between renewable energy awareness, perceived price, perceived benefits, and environmental values on customer

satisfaction. Perceived benefits (Scheller et al., 2023), perceived price (Khalid et al., 2021), and convenience and personal values (Loaiza-Ramírez et al., 2024) have been shown to drive customers' adoption intentions and actual decisions to use renewable energy. Other findings also emphasize that this adoption decision is influenced not only by economic factors, but also by social attitudes, sustainability values, and the existence of incentives and education (Malik et al., 2020; Zhang et al., 2021). Therefore, the decision variable to use renewable energy can be used as a strong theoretical basis in explaining the transition of consumer behavior towards more sustainable energy.

Previous studies have shown that the variable green awareness Environmental awareness plays a significant role in influencing purchasing decisions and the adoption of renewable energy technologies. Most studies confirm that the higher a consumer's awareness of the importance of environmental conservation, the more likely they are to purchase environmentally friendly products or use green energy such as solar energy and electricity from renewable sources. This is supported by the results of Giafanny Sionika (2023), Behrang Vand (2019), and Irfan et al. (2021), which concluded that green awareness significantly correlates with customer intentions and satisfaction in the context of energy sustainability.

Furthermore, price perception has emerged as a critical variable in numerous studies examining customer satisfaction, particularly in the context of environmentally friendly products and services. When consumers perceive that the price they pay is fair, affordable, and aligned with the value they receive, their overall satisfaction tends to increase. This perception can influence not only their current evaluation of the product but also their likelihood to become repeat buyers and loyal advocates. Research consistently indicates that consumers are more willing to support green innovations when they feel the pricing reflects a balance between environmental benefits and economic value. In this regard, perceived price fairness plays a pivotal role in shaping customer attitudes toward sustainability-driven products.

Supporting this perspective, several studies such as those conducted by Meida Ramita Sari (2024), David Palelu (2021), and Xu et al. (2023) highlight that perceived price fairness can serve as a strong mediating factor between green product innovation and consumer satisfaction. These findings suggest that when companies effectively communicate the environmental and functional value of their products, and set competitive pricing, they are more likely to build customer trust and satisfaction. However, it is important to note that not all research reaches the same conclusion. Some studies reveal that price perception may not always have a significant impact on satisfaction, especially when examined across different cultural contexts, income levels, or market segments. Thus, the influence of price perception should be considered within the broader socio-economic and psychological landscape of the target consumer group.

Another interesting finding is the role of the decision to use renewable energy as a mediating variable. Many recent studies, such as those by Loaiza-Ramírez et al. (2024), Schulte et al. (2021), and Malik et al. (2020), highlight that the decision to adopt green energy can mediate the influence of green awareness and price perceptions on customer satisfaction. This means that cognitive factors such as price awareness and assessment do not necessarily have a direct impact on satisfaction but must be mediated through the decision-making process involving the choice of clean energy. This mediation approach provides an important theoretical contribution to understanding consumer behavior in the context of sustainability and energy transition.

Then even though the majority of research states that green awareness While price perception and price perception have a positive influence on purchasing decisions and customer satisfaction, several findings show conflicting results. For example, research by Giafanny Sionika et al. (2023) and Riny Andriyani Saputry (2020) found that green awareness significantly influences purchasing decisions, while research by Richardus Bowo Harcahyo et

al. (2021) showed that green product did not significantly influence customer satisfaction, indicating that environmental awareness or attributes do not necessarily translate directly into satisfaction experiences. Contradictions also arise in the price perception variable, where most studies, such as those conducted by Meida Ramita Sari & Rahayu Lestari (2024) and Sumiyati & Euis Soliha (2020), state that price perception has a significant effect on customer satisfaction. However, studies by Muhammad Syafi'i (2023) and Ghanim Permana Putra (2024) actually show that price perception has no significant effect on satisfaction, with a p value > 0.05 . These findings confirm that the influence of the price perception variable is not significant. Price perceptions are highly contextual and can be influenced by product type, respondent characteristics, and value perceptions shaped by different consumer experiences. Therefore, a more holistic and segmented approach is needed to formulate green energy-based marketing strategies or policies.

METHOD

This research is a quantitative study with a causal relationship approach which aims to analyze the influence of green energy awareness and price perception on customer satisfaction, with the decision to use renewable energy as a mediating variable. The study was conducted in the working area of PT PLN UP3 North Banten on Medium and High Voltage customers during March–June 2025. Data were collected through questionnaires and analyzed statistically using SPSS. Primary data were obtained directly from respondents, while secondary data came from PLN reports, regulations, and previous literature. The study population was 650 customers, and the sample size was determined at 87 respondents based on the Slovin formula, but rounded up to 100 respondents to ensure representativeness. The sampling technique used was random sampling, with the criteria for active respondents as TM/TT customers who have used or are interested in green energy and have experience as PLN customers for at least one year. This study uses a positivistic approach to objectively test the direct and indirect relationships between variables. Data collection was conducted through a questionnaire with a Likert scale of 1–7. Data analysis used the latest version of SPSS. Analysis techniques included descriptive statistics, validity tests with $KMO > 0.5$, and reliability tests with Cronbach's Alpha ≥ 0.7 . Multiple linear regression analysis was used to examine the relationship between variables, with a t -test for partial effects ($sig < 0.05$), an F -test for simultaneous effects, and Adjusted R^2 to assess the strength of the model. Mediation tests were conducted with the Sobel test ($sig < 0.05$) to assess the indirect effect through the consumer satisfaction variable.

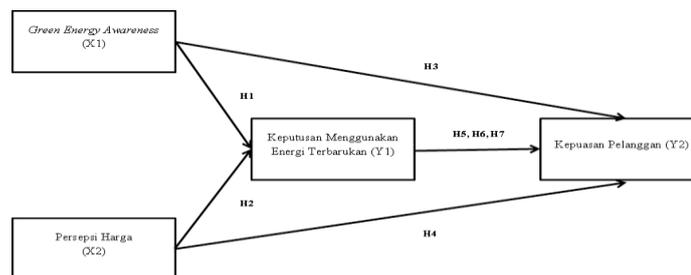


Figure 1. Research Model

In this study, seven hypotheses were formulated that describe the relationship between green energy awareness (Green Energy Awareness), price perception, decision to use renewable energy, and customer satisfaction. The first hypothesis (H1) states that awareness of green energy has a positive effect on consumer decisions to use renewable energy, while the second hypothesis (H2) states that price perception also has a positive effect on this decision. Furthermore, in the third (H3) and fourth (H4) hypotheses, it is assumed that both green energy

awareness and price perception have a direct positive impact on customer satisfaction. The fifth hypothesis (H5) confirms that the decision to use renewable energy contributes positively to increasing customer satisfaction. In addition to the direct effect, this study also tests the mediation relationship through the sixth (H6) and seventh (H7) hypotheses, which state that the decision to use renewable energy is an intermediary variable in the relationship between green energy awareness and price perception on customer satisfaction. Overall, these hypotheses aim to understand the important role of consumer decisions as a bridge between external factors and final satisfaction in the context of renewable energy utilization.

RESULTS AND DISCUSSION

Respondent Description

Descriptive method is used to describe the characteristics of respondents in this study, which consists of 100 individuals in the PT PLN UP3 North Banten environment which includes Medium and High Voltage customers who meet the research criteria. Based on the amount of company revenue per year, the majority of respondents are companies with revenues of IDR 50 Billion - 500 Billion per year, as many as 87 companies (87%), while the rest are companies with annual revenues of IDR 500 Billion - IDR 2 Trillion, as many as 6 companies (6%), and revenues of more than IDR 2 Trillion, as many as 7 companies (7%). In terms of interest in the use of renewable energy for their company operations, respondents are dominated by groups who are not interested as many as 86 respondents (86%), and followed by groups who are interested as many as 14 respondents (14%), this indicates that most respondents may not have the need or recognition related to renewable energy in their business operations either in terms of technical or market needs.

Variable Description

This study also includes descriptive analysis of the main variables, namely Green Energy Awareness, Price Perception, Decision to Use Renewable Energy, and Customer Satisfaction. This process is carried out by reviewing the data distribution of each variable using the average (mean), standard deviation, frequency, and percentage of respondents' answers to the questionnaire given. The results of descriptive statistical tests show that all variables in this study were measured based on the responses of 100 respondents. The average value (mean) the highest is in the Price Perception variable at 3.4450, followed by the Decision to Use Renewable Energy (3.4333), Customer Satisfaction (3.4200), and Green Energy Awareness (3.3720). All variables have average scores that tend to be moderate on a scale of 1–7, indicating that respondents' perceptions of each construct tend to be quite positive. Median and mode values that are close to or equal to the maximum value for most variables also indicate that most respondents gave moderate scores. Standard deviation values for all variables are in the range of 1.13–1.21, indicating that the data distribution is relatively homogeneous and does not deviate too much from the average. Thus, in general, the data indicate that respondents have a good perception of all variables studied in the context of renewable energy use in the PT PLN UP3 North Banten environment.

Validity Test Results

The validity test in this study aims to ensure that the instrument used is able to measure the variables accurately and appropriately. The test was conducted using factor analysis (factor analysis) through SPSS by considering the Kaiser-Meyer-Olkin (KMO) value and Bartlett's Test of Sphericity. All variables showed a KMO value above 0.5 and Bartlett's significance <0.05, which indicates that the construct used is valid, including Green Energy Awareness (KMO 0.888), Price Perception (0.821), Decision to Use Renewable Energy

(0.725), and Customer Satisfaction (0.815). This indicates that all instrument items have a significant correlation with the total score and are suitable for use in further analysis.

Reliability Test Results

The test results using the Cronbach's Alpha coefficient show that all variables have a high reliability value, namely above 0.80, with Green Energy Awareness(X1) of 0.902, Price Perception (X2) 0.878, Decision to Use Renewable Energy (Y1) 0.841, and Customer Satisfaction (Y2) 0.883. Based on the interpretation criteria, these values indicate that each construct in the questionnaire has very good internal consistency, so that all research instruments are declared reliable and can be used for empirical measurement in this study.

Results of Multiple Linear Regression Analysis

The results of the multiple linear regression analysis are shown in the following table:

Table 1. Results of multiple linear regression analysis

Influence green energy awareness and price perceptions towards the decision to use renewable energy
 $Y1 = 0.558(X1) + 0.347(X2) + e$

Independent Variables	Adj R ²	Anova		Standardized Coefficients		Information
		F	Sig.	Beta	Sig.	
Green Energy Awareness	0.762	159.147	<0.001	0.558	<0.001	H1 accepted
Price Perception				0.347	<0.001	H2 accepted

Influence green energy awareness and price perception on customer satisfaction
 $Y2 = 0.402(X1) + 0.318(X2) + 0.237(Y1) + e$

Independent Variables	Adj R ²	Anova		Standardized Coefficients		Information
		F	Sig.	Beta	Sig.	
Green Energy Awareness	0.823	154.513	<0.001	0.402	<0.001	H3 is accepted
Price Perception				0.318	<0.001	H4 accepted
Decision to Use Renewable Energy				0.237	0.008	H5 is accepted

Source: Data processed by SPSS, 2025

Uji Model I

The results of the analysis show that the model built has quite high predictive power, as indicated by the coefficient of determination (R²) value of 0.762. This means that the variable Green Energy Awareness And Price Perceptions simultaneously able to explain 76.2% of the variation in the decision to use renewable energy, while the remaining 23.8% is influenced by other factors outside the model. The F test provides significant results with a calculated F value of 159.147 and a significance level of <0.001, which indicates that the overall model is suitable for use and that the independent variables have a significant influence on the dependent variable. In addition, the t test results show that Green Energy Awareness(β = 0.558; sig <0.001) and Price Perception(β = 0.347; sig <0.001) each have a positive and significant influence on the decision to use renewable energy, so that the first (H1) and second (H2) hypotheses can be accepted with high confidence.

Uji Model II

The results of the regression analysis show that the research model has excellent predictive ability on customer satisfaction, with a coefficient of determination (R²) value of 0.823. This figure indicates that the variable Green Energy Awareness, Price Perception, And The Decision to Use Renewable Energysimultaneously contributed 82.3% to customer satisfaction, while the remaining 17.7% was influenced by other factors outside the model. The F test produced a calculated F value of 154,513 with a significance of <0.001, which indicates

that the three independent variables together have a significant influence and the model used meets the eligibility requirements (goodness of fit). Furthermore, the results of the t-test show that Green Energy Awareness ($\beta = 0.402$; sig < 0.001), Price Perception ($\beta = 0.318$; sig < 0.001), and The Decision to Use Renewable Energy ($\beta = 0.237$; sig = 0.008) each have a positive and significant effect on customer satisfaction. Thus, the third (H3), fourth (H4), and fifth (H5) hypotheses are declared accepted.

Mediation Test Results

Table 2. Mediation Test

Relationship between variables	Indirect Effects	Sig.	Information
Green Energy Awareness on customer satisfaction through the decision to use renewable energy	0.2965	0.0001	Significant
Price perception on customer satisfaction through the decision to use renewable energy	0.3558	0.0000	Significant

Source: Data processed by SPSS, 2025

Based on the results of the analysis of indirect effects with the mediation of the decision to use renewable energy, it was found that the relationship between green energy awareness on customer satisfaction through the decision to use renewable energy shows an effect value of 0.2965 with a significance of 0.0001 (< 0.05), which means it is significant. This means that the decision to use renewable energy mediates the relationship between green energy awareness and customer satisfaction. Furthermore, the relationship between price perception and customer satisfaction through the decision to use renewable energy shows an indirect effect of 0.3558 with a significance level of 0.0000 (< 0.05), thus significant. This indicates that the decision to use renewable energy significantly mediates the relationship between price perception and customer satisfaction.

Discussion

Influence Green Energy Awareness on the Decision to Use Renewable Energy

The results of the study show that green energy awareness has a positive and significant effect on the decision to use renewable energy, in line with research by Irfan et al. (2021) and Khalid et al. (2021), which shows that awareness of green energy increases intentions and actual decisions to use renewable energy, even when faced with challenges such as price or technical risks. This awareness also strengthens personal values such as social responsibility and ecological concern (Loaiza-Ramírez et al., 2024), which contribute to more psychologically and socially meaningful decision-making. Therefore, increased green energy awareness through environmental education and campaigns, it is an important strategy in encouraging people's decisions to switch from conventional energy to renewable energy.

The Influence of Price Perception on the Decision to Use Renewable Energy

The results of this study indicate that price perception has a positive and significant influence on the decision to use renewable energy, which aligns with research by Xu et al. (2023) and Irfan et al. (2021), which showed that perceptions of price fairness and initial investment costs strongly correlate with customer decisions, particularly regarding the use of renewable energy technologies such as solar panels. Positive price perceptions minimize psychological barriers and strengthen perceived value, ultimately driving the decision to switch to renewable energy. Therefore, energy provider strategies that emphasize price transparency, financial incentives, and education on long-term economic value can be key to strengthening green energy adoption in the community.

Influence Green Energy Awareness to Customer Satisfaction

The results of the study show that Green Energy Awareness has a positive and significant effect on customer satisfaction. This finding aligns with research by Irfan et al. (2021) and Khalid et al. (2021), which states that consumers with high environmental awareness feel more satisfied after adopting renewable energy because they feel they are contributing to environmental conservation and have personal values that align with this behavior. Therefore, Green Energy Awareness not only is it a trigger for adoption intention, but it is also an important factor in shaping positive experiences and customer satisfaction with green energy services.

The Influence of Price Perception to Customer Satisfaction

The results of this study indicate that price perception has a positive and significant influence on customer satisfaction. This finding supports research by Irfan et al. (2021) and Xu et al. (2023), which states that when prices are perceived as fair and rational, consumers are more likely to adopt green energy and are satisfied with its long-term use. Furthermore, a study by Schulte et al. (2021) also highlighted that perceived price benefits influence customer satisfaction after solar energy adoption. Thus, positive price perception is key in shaping customer expectations and evaluations of service quality, ultimately increasing overall satisfaction levels.

The Impact of the Decision to Use Renewable Energy to Customer Satisfaction

The results of the study indicate that the decision to use renewable energy has a positive and significant impact on customer satisfaction. This finding aligns with consumer behavior theory, which states that purchasing decisions based on personal values and preferences tend to result in higher satisfaction, both emotionally and functionally. In the context of green energy, customers who consciously decide to switch to renewable energy perceive the decision as a positive contribution to the environment and support sustainability principles. This is supported by research by Khalid et al. (2021) and Irfan et al. (2021), which shows that renewable energy adoption mediates the influence of environmental factors on customer satisfaction, especially when the benefits are tangible. Furthermore, studies by Zhang et al. (2021) and Loaiza-Ramírez et al. (2024) confirm that the decision to use green energy strengthens the relationship between personal values and satisfaction, even impacting trust and loyalty to the energy provider. Thus, the decision to use renewable energy not only generates functional benefits but also strengthens customers' positive perceptions of themselves and the service provider, ultimately increasing overall satisfaction.

Influence Green Energy Awareness on Customer Satisfaction with the Decision to Use Renewable Energy as an Intervening Variable

The results of this study show that green energy awareness significantly influences customer satisfaction through the decision to use renewable energy as an intervening variable. This finding supports research by Khalid et al. (2021), Irfan et al. (2021), and Loaiza-Ramírez et al. (2024) that the influence of awareness on satisfaction does not occur directly, but is mediated by the actual decision to use renewable energy. This decision acts as a channel for channeling ecological values and perceived benefits towards higher user satisfaction. Thus, in the context of green energy adoption, customer decision is a crucial element bridging environmental awareness and positive perceptions of the services used.

The Influence of Price Perception on Customer Satisfaction with the Decision to Use Renewable Energy as an Intervening Variable

The results of this study indicate that price perception significantly influences customer satisfaction with the decision to use renewable energy as an intervening variable, meaning that consumers' perceptions of fairness, affordability, and price value will encourage them to make decisions to adopt green energy, ultimately increasing their satisfaction. This finding aligns with research by Xu et al. (2023), Irfan et al. (2021), and Schulte et al. (2021) that price perception drives adoption decisions, and this decision becomes an effective link in shaping customer satisfaction. This means that customers are not only satisfied because of affordable prices, but also because they have made environmentally and economically valuable decisions. Thus, in the context of renewable energy, the decision to use green energy becomes an important mediator that transforms price perception into higher satisfaction.

CONCLUSION

Based on the results of the regression analysis and mediation test, it can be concluded that all independent variables studied have a positive and significant influence on the decision to use renewable energy. This indicates that companies within PT PLN UP3 North Banten assess that awareness regarding renewable energy is important. Green energy and price perception plays a major role in shaping their decisions in using renewable energy. Furthermore, in influencing customer satisfaction, the variables green energy awareness, Price perceptions and the decision to use renewable energy were shown to have a positive and significant influence. In addition, the results of the mediation test showed that the decision to use renewable energy was able to mediate the influence green energy awareness, and price perception on customer satisfaction.

This finding underscores the importance of strategic approaches to increasing awareness of the use of green energy and the price perception approach as the main levers of decision and satisfaction in using renewable energy. PT PLN UP3 North Banten is advised to improve the socialization and price perception approach for renewable energy implementation because both have been proven to influence customer decisions and satisfaction. Future research is recommended to add variables such as trust, innovation, or emotional value and consider a qualitative approach for more comprehensive results.

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