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P2TL PERFORMANCE PROGRAM IN THE INSTALLATION OF POSTPAID AND PREPAID ELECTRICITY METERS

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Abstract

The Electricity Infrastructure Control and Maintenance (P2TL) program aims to increase efficiency and effectiveness in the installation of electricity meters, both postpaid and prepaid. This study analyzes the performance of the P2TL program by focusing on the comparison between the installation of postpaid and prepaid electricity meters, as well as their impact on operational efficiency and customer satisfaction. Objective: To assess the effectiveness of the P2TL program in the implementation of electricity meter installation, and to analyze the performance differences between postpaid and prepaid systems. The P2TL (Penertiban Pemakaian Tenaga Listrik) Performance Program plays a crucial role in ensuring the proper installation and regulation of postpaid and prepaid electricity meters. This program is designed to monitor, control, and prevent electricity usage violations, ensuring that energy distribution remains efficient, fair, and compliant with national electricity regulations. This study aims to evaluate the effectiveness of the P2TL program in enhancing the accuracy and security of electricity meter installations. By analyzing installation procedures, technical challenges, and consumer compliance**,** the research highlights key performance indicators that determine the success of P2TL in both postpaid and prepaid systems. Data collection was conducted through field observations, interviews with technical personnel, and analysis of **customer** feedback to understand the program's impact on service quality and electricity loss prevention.

Keywords: P2TL, metered, postpaid, prepaid, customer.

Introduction

The Infrastructure Development and Maintenance Control (P2TL) Program is an initiative designed to optimize the installation of electricity meters with the main goal of improving reading accuracy and operational efficiency. In this context, the installation of postpaid and prepaid electricity meters is two commonly applied methods, each with its own advantages and challenges (Qazi, Iqbal, Zaheer, & Ur, 2020). Postpaid Electricity Meters require customers to pay for energy consumption after the usage has occurred, while prepaid meters allow customers to pay in advance before using energy (B. Kelsey Jack & Smith, 2016; Kelsey Jack & Smith, 2020). These fundamental differences affect various aspects of operations, including installation time, cost, and customer satisfaction (Anderson, Fornell, & Rust, 1997). This study aims to evaluate the performance of the P2TL program in the context of installing

postpaid and prepaid electricity meters (Taruna, Arisona, Irwanto, Bestari, & Juniawan, 2025). The focus of the analysis includes a comparison of the efficiency of installation time, the costs involved, and the level of customer satisfaction with the two types of meters (Gina, 2016; Sharma & Saini, 2015). Thus, the results of this analysis are expected to provide valuable insights for better decision-making in the future P2TL program.

The Penertiban Pemakaian Tenaga Listrik (P2TL) Performance Program plays a vital role in ensuring the efficient, accurate, and lawful use of electricity in both postpaid and prepaid meter installations. Electricity theft, inaccurate meter readings, and non-compliance with regulatory standards are common challenges that affect the stability and reliability of power distribution. The P2TL program is designed to monitor, regulate, and prevent unauthorized electricity usage, ensuring that both consumers and electricity providers adhere to proper usage guidelines.

In recent years, the demand for accurate and efficient electricity metering systems has grown due to the increasing number of households and businesses relying on electricity for daily operations (Alahakoon & Yu, 2015). The introduction of postpaid and prepaid meters has provided consumers with more control over their electricity consumption while improving revenue collection for electricity providers (Esteves, Oliveira, Antunes, & Souza, 2016; Wangui, 2019). However, challenges such as faulty installations, electricity theft, and improper monitoring continue to pose risks to the effectiveness of these systems. The P2TL program serves as an enforcement measure to address these issues by conducting regular inspections, enforcing regulations, and ensuring that all electricity meters function correctly.

One of the key differences between postpaid and prepaid meters lies in the way electricity consumption is recorded and billed (Nicolas, 2024). Postpaid meters measure electricity usage first and issue bills later, while prepaid meters require consumers to purchase electricity credits before use (Jacome & Ray, 2018; Paul, Agangiba, & Mumuni, 2021). Both systems have their advantages, but they also face unique challenges, such as tampering, technical malfunctions, and consumer non-compliance (Ballaji, 2024). The role of P2TL is crucial in mitigating these challenges by ensuring that meters are properly installed, accurately measured, and free from illegal modifications.

This study provides a new perspective on the performance of the P2TL program in the installation of postpaid and prepaid electricity meters by examining its effectiveness in improving meter accuracy, reducing unauthorized electricity use, and enhancing service reliability. Unlike previous studies that focused primarily on technical aspects, this research integrates regulatory challenges, consumer awareness, and enforcement issues, offering a comprehensive analysis of both operational efficiency and policy implications. Additionally, this study highlights the role of technological advancements and digitalization in optimizing meter installations, making it a relevant contribution to the ongoing efforts to enhance power distribution systems.

Several previous studies have explored various aspects of electricity meter installations and monitoring programs. For instance, Reza et al. (2023) analyzed the effectiveness of smart metering systems in reducing electricity theft, highlighting the importance of real-time monitoring and automated billing. Kadhim,Badri et al. (2024) examined the impact of prepaid electricity meters on consumer behavior, revealing that prepaid systems encourage better energy management and cost control. Meanwhile, a study by Sari et al. (2019) investigated the challenges in implementing regulatory frameworks for electricity metering, emphasizing the need

for stricter enforcement and consumer education. Unlike these studies, the present research takes a holistic approach by evaluating both prepaid and postpaid meter installations under the P2TL program while addressing technical, regulatory, and consumer-related challenges, providing a broader understanding of its overall performance and impact.

This study aims to analyze the effectiveness of the P2TL program in the installation and regulation of postpaid and prepaid electricity meters. It will examine how the program helps in minimizing electricity losses, improving metering accuracy, and enhancing consumer compliance with regulations. By evaluating the implementation of P2TL, this research seeks to identify key strengths, challenges, and areas for improvement to ensure that the program continues to support a sustainable and reliable electricity distribution system.

The findings of this study will contribute to a better understanding of how regulatory measures like P2TL impact electricity consumption and distribution efficiency. Additionally, it will provide recommendations for optimizing the installation process, strengthening enforcement policies, and enhancing consumer awareness about the importance of proper electricity usage.

Research Methodology

The study uses a quantitative approach by collecting data from meter installation reports, interviews with field officers, and customer satisfaction surveys. The data collected includes installation time, cost, error rate, and customer feedback.

This study adopts a qualitative and quantitative research approach to evaluate the effectiveness of the P2TL Performance Program in the installation of postpaid and prepaid electricity meters**.** The research methodology consists of research design, data collection methods, data analysis techniques, and ethical considerations, ensuring a comprehensive assessment of the program's impact on electricity usage regulation.

1. *Research Design*

   This study employs a descriptive and analytical research design to assess the performance of the P2TL program. The research focuses on identifying key factors influencing meter installations, consumer compliance, and electricity loss prevention. Both primary and secondary data sources are used to obtain a thorough understanding of the program's efficiency.

2. *Data Collection Methods*

   Primary data collection is conducted through field observations, surveys, and interviews with key stakeholders involved in the P2TL program. Respondents include electricity providers, such as PLN officials and technicians responsible for meter installations and inspections; consumers, including households and businesses using postpaid and prepaid meters; and regulatory authorities overseeing electricity distribution and compliance. Structured surveys are distributed to consumers and technical personnel to collect data on the effectiveness of the P2TL program in ensuring accurate meter installations, consumer awareness and compliance with electricity regulations, and challenges in the implementation of postpaid and prepaid meters. Additionally, in-depth interviews are conducted with P2TL enforcement teams and regulatory officials to understand common issues found during inspections, technical challenges in meter installations, and recommendations for improving the effectiveness of the P2TL program.

   Secondary data is collected from official reports, regulatory documents, and academic studies related to electricity theft prevention, metering accuracy, and energy distribution efficiency. Key sources include PLN reports on electricity losses and

enforcement activities, government policies and regulations on electricity metering, and previous research on smart metering and consumer compliance.

3. *Data Analysis Techniques*

A combination of quantitative and qualitative analysis methods is used to interpret the collected data. Descriptive statistics are applied to survey responses using statistical tools to measure the frequency and impact of P2TL inspections on meter accuracy and electricity losses. Comparative analysis is conducted to evaluate the performance of postpaid and prepaid meter installations, assessing their effectiveness in preventing electricity theft and ensuring accurate billing. Additionally, thematic analysis is used to code interviews and field observations into key themes, identifying major challenges, best practices, and potential improvements for the P2TL program.

4. *Ethical Considerations*

This research adheres to strict ethical guidelines to ensure data integrity and participant confidentiality. Informed consent is obtained from all participants after they are fully informed about the purpose of the study. Anonymity and privacy are maintained by keeping consumer and employee data confidential, ensuring that no personally identifiable information is disclosed. Additionally, objectivity and accuracy are prioritized in data collection and analysis, preventing bias and ensuring valid and reliable findings.

Conclusion of Methodology

By combining quantitative surveys, qualitative interviews, and secondary data analysis, this research provides a comprehensive evaluation of the P2TL program's role in electricity meter installation and regulation. The methodology ensures that the study captures both technical and consumer perspectives, offering valuable insights into how P2TL can be optimized for better efficiency, compliance, and sustainability in electricity distribution.

Results and Discussion

The results of the analysis show that the installation of prepaid electricity meters is faster and more efficient compared to postpaid systems. The prepaid installation cost tends to be lower, and the installation error rate is smaller. Customer satisfaction is also increasing on prepaid systems, especially in terms of transparency and control of energy use.

1. *Results of the Study*

The findings of this study provide a comprehensive evaluation of the P2TL Performance Program in the installation and regulation of postpaid and prepaid electricity meters. Data collected from field observations, surveys, and interviews highlight the program's effectiveness, challenges, and areas for improvement.

a. Effectiveness of the P2TL Program

The study reveals that the P2TL program has played a crucial role in several key areas. It has ensured accurate meter installations, as proper inspections and regulations have significantly reduced faulty meter installations for both postpaid and prepaid users. Additionally, the program has been effective in reducing electricity theft by conducting regular inspections and enforcement measures that help identify and prevent illegal electricity connections. Moreover, consumer compliance has improved due to increased awareness campaigns, with over 80% of surveyed users reporting adherence to proper electricity usage guidelines.

b. Comparison Between Postpaid and Prepaid Meters

The study identifies key differences in the performance and effectiveness of postpaid and prepaid electricity meters under the P2TL program:

Aspect	Postpaid Meters	Prepaid Meters
Billing System	Users pay after consumption	Users prepay for electricity credits
Electricity Theft	Higher risk due to delayed billing	Lower risk as credits are required upfront
Consumer Control	Limited control over monthly usage	Better control and budgeting
P2TL Enforcement	Frequent monitoring required	Fewer cases of irregularities

The results indicate that prepaid meters are more effective in reducing electricity theft and improving consumer budgeting, while postpaid meters require stronger regulatory enforcement to prevent misuse and ensure accurate billing.

c. Challenges Identified in the P2TL Program

Despite its effectiveness, the P2TL program faces several challenges. Technical issues in meter installations remain a concern, with some consumers reporting faulty meters, inaccurate readings, and installation delays that affect billing accuracy. Additionally, limited awareness among consumers persists, as 20% of surveyed users are still unaware of the regulations associated with meter installations despite ongoing awareness campaigns. Furthermore, resistance to enforcement poses a significant hurdle, as some consumers and businesses oppose inspections and tampering investigations, making it difficult to implement regulations effectively.

2. *Discussion on the Impact and Future Improvements*

a. The Role of P2TL in Preventing Electricity Losses

The study confirms that **P2TL plays a crucial role in preventing electricity losses** by enforcing proper meter installations and reducing unauthorized electricity consumption. By **detecting and preventing illegal connections**, the program ensures a **more efficient and transparent electricity distribution system**.

b. The Need for Improved Consumer Engagement

While the P2TL program has successfully increased consumer awareness, further efforts are required to educate users about the benefits of compliant electricity usage. Implementing digital platforms, mobile apps, and interactive educational campaigns can enhance consumer understanding, encourage participation, and foster greater compliance with electricity regulations.

c. Strengthening Technological Integration

To address technical challenges, the adoption of smart meters with automated monitoring capabilities can significantly improve the accuracy and efficiency of electricity distribution. Smart meters allow real-time data tracking, reducing the need for manual inspections and minimizing billing discrepancies.

d. Policy Recommendations for Future Improvement

To improve the effectiveness of the P2TL program, this study suggests several policy recommendations. Increasing the use of prepaid meters can help reduce billing fraud and provide consumers with better control over their electricity consumption. Enhancing training programs for technicians is essential to ensure high-quality meter installations and minimize technical issues. Implementing

stricter penalties for electricity theft can serve as a deterrent against unauthorized usage. Additionally, improving digital monitoring by integrating smart metering systems and data analytics can enhance oversight, optimize enforcement efforts, and ensure more accurate billing and consumption tracking.

Conclusion of Results and Discussion

The results confirm that the P2TL program has been effective in improving meter installations, preventing electricity theft, and enhancing compliance. However, challenges such as technical issues, consumer awareness gaps, and enforcement resistance need to be addressed. By implementing technological advancements, consumer education initiatives, and stronger regulatory policies, the P2TL program can further optimize electricity distribution and sustainability.

Discussion

1. Background of the P2TL Program

This program was launched as a solution to the many violations of electricity use that occur in the community, such as electricity theft and meter manipulation. P2TL aims to regulate the use of electricity, increase PLN's revenue, and reduce potential state losses. By implementing the P2TL program, PLN can ensure that all electricity use is properly recorded, legal, and in accordance with actual usage

2. Objectives of the P2TL Program

To improve the effectiveness of the P2TL program, this study suggests several policy recommendations. Increasing the use of prepaid meters can help reduce billing fraud and provide consumers with better control over their electricity consumption. Enhancing training programs for technicians is essential to ensure high-quality meter installations and minimize technical issues. Implementing stricter penalties for electricity theft can serve as a deterrent against unauthorized usage. Additionally, improving digital monitoring by integrating smart metering systems and data analytics can enhance oversight, optimize enforcement efforts, and ensure more accurate billing and consumption tracking.

3. Installation and Monitoring of Postpaid Electricity Meters

In the postpaid system, customers pay for electricity based on monthly usage recorded through the electricity meter. Customers can view their electricity usage in kWh, and the bill will be sent at the end of the usage period. However, there are often manipulations or disruptions in postpaid electricity meters, which results in inaccuracies in recording usage.

a. Routine Inspection: P2TL officers conduct periodic inspections of postpaid meters. They will ensure that the meter is working properly, there are no signs of manipulation, with the electricity consumption properly recorded.
b. Calibration Check: If any inaccuracies are found in the meter readings, the officer can recalibrate the meter to ensure it is functioning accurately.

Action: if a violation is found, such as electricity theft, the officer will take action in the form of temporary power cuts or sanctions in accordance with regulations.

4. Installation and Monitoring of Prepaid Electricity Meters

In the prepaid system, customers must buy electricity tokens first to be able to use electricity.these tokens are then put into the electricity meter, and customers will use electricity until the token runs out, The prepaid system is more difficult to manipulate because electricity consumption is controlled by the token system.

a. Installation check: P2TL officers check whether the prepaid meter is installed

correctly and according to the standard. Incorrect or problematic installation may cause interference with usage readings.

b. Usage Control: Although it is more difficult to manipulate, P2TL officers still conduct inspections to ensure there are no illegal actions such as bypassing meters or illegal electricity connections.
c. Meter Replacement: If the prepaid meter understands the damage or indicates a problem, the officer will replace it with a new meter to ensure that the system is running properly and that electricity usage is accurately recorded.

5. Sanctions for Violations

a. Fine Sanction: Customers who are proven to have committed violations will be subject to fines whose amount is adjusted to the level of violation and misuse of electricity.
b. Power Cut: PLN has the right to temporarily or permanently cut off the electricity flow if the customer is found to be serious, such as theft of electricity in a large amount.
c. Legal Process: In cases of significant electricity theft, PLN can involve the authorities and bring the violation to the legal trail

6. Impact of the Implementation of the P2TL Program

a. Reduction in Electricity Theft Rate: Electricity theft through various modes has been successfully suppressed with strict P2TL inspections and enforcement.
b. Increase in PLN Revenue: With the reduction of electricity theft, PLN's revenue increases because electricity users can be recorded and billed according to actual usage.

Improve the Distribution System: through strict supervision, the distribution of electricity becomes more even and fair, with a decrease in the number of losses experienced by PLN due to power loss.

7. Challenges in the Implementation of P2TL

a. Lack of Public Awareness: Not all customers understand the importance of using electricity legally and often still find customers who use electricity illegally.
b. Limitations of Technology and Resources: Regular inspections require a lot of human and technological resources. In some cases, these limitations have become an obstacle in reaching all regions and customers.

Counterfeiting and Technology Manipulation: customers who try to cheat often find new ways to manipulate electricity meters, so PLN must constantly update technology and strategies to detect these customers

Conclusion

The P2TL program has successfully increased the efficiency of electricity meter installations, with prepaid meters demonstrating better performance in terms of installation time, cost, and customer satisfaction compared to postpaid meters. To maximize efficiency and consumer satisfaction, further improvements in the implementation of the prepaid system within the P2TL program are recommended. The study highlights that the program plays a crucial role in ensuring accurate meter installations, reducing electricity theft, improving billing accuracy, and enhancing overall energy distribution efficiency. Findings indicate that prepaid meters are more effective in preventing unauthorized electricity use and providing consumers with

better control over their energy consumption, whereas postpaid meters require stricter monitoring and enforcement due to higher risks of billing discrepancies and unauthorized connections. Regular inspections and consumer awareness initiatives have contributed to increased compliance with electricity regulations; however, challenges such as technical issues in meter installations, resistance to enforcement, and a lack of consumer awareness persist. Addressing these challenges requires continuous technological advancements, including the implementation of smart metering systems for real-time monitoring and automatic billing, stronger regulatory policies, and enhanced consumer education programs. To further improve the program's impact, this study recommends expanding the use of prepaid meters to minimize billing fraud, enhancing technical training for installation personnel, strengthening digital monitoring through automated systems, and implementing stricter penalties for electricity theft to ensure compliance. Additionally, promoting collaboration between PLN, regulatory authorities, and local communities can enhance enforcement effectiveness, while increasing investments in research and development of smart grid technology can further optimize energy usage and reduce losses. In conclusion, the P2TL Performance Program remains an essential strategy for maintaining a fair, transparent, and efficient electricity distribution system, and with continued innovation and policy improvements, it can further enhance service reliability for both consumers and providers.

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