

# Pemodelan Strategi Pengembangan Industri Battery Swapping untuk Mendukung Transisi Net Zero Emissions = Modeling Battery Swapping Industry Development Strategy to Support Net Zero Emissions Transition

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## Abstrak

Pemerintah Indonesia menetapkan peta jalan menuju Net zero emissions tahun 2060, termasuk percepatan adopsi motor listrik. Pemerintah menugaskan PT PLN (Persero) sebagai lokomotif percepatan adopsi dengan cara mengoptimalkan potensi pengguna motor konvensional dan ride hailing, Skema battery swapping menjadi pilihan yang menarik bagi perusahaan untuk meningkatkan profit. Namun, pengguna masih mengalami ketidakpastian penukaran baterai di stasiun battery swapping. Oleh karena itu, sangat penting untuk menerapkan strategi reservasi baterai untuk memudahkan pengguna motor listrik battery swapping dalam menukarkan baterai. Meski demikian, menerapkan strategi industri battery swapping merupakan sistem kompleks yang melibatkan banyak elemen yang saling terkait. Pengembangan strategi seperti ini memerlukan pandangan holistik untuk memahami proses dan mendefinisikan hubungan antar elemen. Penelitian ini bertujuan untuk mengembangkan strategi industri battery swapping dengan pendekatan pemodelan sistem dinamis dan langkah awal dalam mengembangkan produk menggunakan kerangka kerja business model canvas yang berfokus pada jumlah pengguna motor listrik battery swapping, pengurangan emisi CO<sub>2</sub>e dan profit. Terdapat tiga intervensi perusahaan tercapainya objektif yaitu tarif listrik, biaya reservasi baterai dan pembangunan stasiun battery swapping. Intervensi perusahaan diuji kedalam tiga skenario berbeda. Hasil menunjukkan pembangunan stasiun battery swapping dan skema reservasi baterai berdampak signifikan pada jumlah pengguna motor listrik battery swapping dan pengurangan emisi CO<sub>2</sub>e. Selain itu, pemberian diskon tarif listrik memiliki dampak langsung pada profit industri battery swapping.

.....The Government of Indonesia has set a roadmap towards Net zero emissions by 2060, including accelerating the adoption of electric motorbikes. The government assigned PT PLN (Persero) as a locomotive to accelerate adoption by optimizing the potential of conventional motorcycle and ride hailing users. The battery swapping scheme is an attractive option for companies to increase profits. However, users still experience uncertainty in exchanging batteries at battery swapping stations. Therefore, it is very important to implement a battery reservation strategy to make it easier for battery swapping electric motorcycle users to exchange batteries. However, implementing a battery swapping industrial strategy is a complex system involving many interrelated elements. Developing a strategy like this requires a holistic view to understand the process and define relationships between elements. This research aims to develop a strategy for the battery swapping industry using a dynamic system modeling approach and initial steps in developing products using a business model canvas framework that focuses on the number of battery swapping electric motorcycle users, reducing CO<sub>2</sub>e emissions and profits. There are three company interventions to achieve objectives, namely electricity tariffs, battery reservation fees, and the construction of battery swapping stations. The company's intervention was tested in three different scenarios. The results show that the construction of battery swapping stations and battery reservation schemes have had a

significant impact on the number of battery swapping electric motorcycle users and reduced CO<sub>2</sub>e emissions. Apart from that, providing discounts on electricity rates has a direct impact on the profits of the battery swapping industry.