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CIRCULAR ECONOMY BUSINESS CASE STUDIES IN SOUTHEAST ASIA

Electrum

Jakarta, Indonesia
Renewable energy
www.electrum.id
Analysis period: 2021-2024

Two wheeler EVs to reduce climate and air emissions

Business Spotlight

Electrum, a brand name for PT Energi Kreasi Bersama, is a joint venture company between PT Gojek Tokopedia Tbk (GoTo), a digital platform company, and PT TBS Energi Utama Tbk (TBS), an integrated energy company, formed at the end of 2021. Electrum was created to develop the electric vehicle (EV) ecosystem in Indonesia.

Electrum initially supports GoTo's effort to switch from conventional internal combustion engines (ICE) to EVs to reduce GoTo's Scope 3 carbon emissions from its on-demand transportation and delivery services, known as Gojek. As GoTo's joint venture partner, TBS entered the electric vehicle sector to develop and diversify its clean energy business. Currently, Electrum is taking strategic actions to build the necessary ecosystem for the two-wheeled Electric Vehicles (2W EV).

Electrum started construction of Indonesia's first EV manufacturing facility in June 2023 with capacity of 250,000 2W EV units per year. The first fully internally developed Electrum H5 was launched in November 2023, and some 500 of these were on the road at end of 2023. Another product Electrum H3 was launched in April 2024. The factory is foreseen to expand at later stage, up to 1 million units per year, making it possible for Electrum to serve wider markets aside of the GoTo fleet. To provide supporting infrastructure, Electrum collaborates with several companies: PT Pertamina (Persero) (a state-owned energy company that operates the majority of petrol stations in Indonesia), mini-marts (AlfaMart Group, IndoMaret), PLN (state electricity company) and Planet Ban (a motorcycle service and tyres retail group) for providing battery swapping stations. By May 2024, nearly 250 swap stations were available in the Greater Jakarta area, with plans to continue to deploying further stations for these to be available at every 3 km to minimize user anxiety.

Keywords

Renewable energy, Electric vehicle, Electric scooters; battery swap

Innovation

Product/service design, Manufacturing, Use and maintenance, Resource efficiency, Resource substitution

Analysis of PT Energi Kreasi Bersama (Electrum)

Context and baseline

In 2019 GoTo started looking at EV utilisation in its operations in Indonesia, its largest operation, and taking into consideration the Indonesian Government's policy to decarbonise the transportation sector. At the same time TBS was diversifying, moving from being a mining company to become an integrated energy company centered on sustainability.

Electrum aims to ensure that its products are the best fit for local users in Indonesia, starting with GoTo driver-delivery partners and their customers' experience. Electrum started by developing and producing two-wheeler electric vehicle (2W EV), named Electrum H5, launched in November 2023. This included development of own small battery making the 2W EV lighter, easy to manoeuvre in urban traffic and competitive in price. Electrum since launched in April 2024 its second product, Electrum H3, as a product fitting the mass market beyond Gojek drivers.

As Electrum co-founder, GoTo acknowledges that its on-demand transportation services platform (with around 2.6 million driver-partners across Indonesia, Singapore and Vietnam) contributes to greenhouse gas (GHG) and other air emissions. The on-demand transportation and delivery services provided by GoTo's delivery partners contributed in 2022 75% (722,191 tCO_{2eq}) of the GoTo Scope 3 GHG emissions.[1] By switching its transportation fleet to EVs, GoTo aims to gradually reduce its Scope 3 carbon emissions by 90% by 2050, considering that driver-partners are GoTo suppliers.

Both Electrum's parent companies are aligned in their ambitious sustainability goals for 2030. GoTo's Three Zeros commitment is to be: Zero Carbon (towards net zero greenhouse gas emissions), Zero Waste (by encouraging reducing, reusing and recycling waste) and Zero Barriers (for the socio-economic development of its merchants and delivery partners). TBS launched the "Towards a Better Society 2030" (TBS 2030) commitment in 2022 focusing on three main pillars: Thriving Environment, Empowered People, and Trusted Partner. TBS states "to achieve significant advancements in 2030, including carbon neutrality (scope 1 and 2 emissions), promoting sustainable development, and fostering community empowerment."[2]

From 2019 to 2021, GoTo and TBS carried out research to understand the drivers' preferences with respect to switching to EVs along with the ecosystem that would be needed for EVs to thrive. To test the market, in late 2021, Electrum procured on a trial basis 2W EVs from third-party producers, Gogoro (Taiwan) and Gesits (Indonesia), and rented these to Gojek drivers in Jakarta. To pilot battery swap station operations, Electrum collaborates with PT Pertamina (Persero), a state-owned energy company which operates the majority of petrol stations in Indonesia.

Innovation

The ordinary internal combustion engine (ICE) vehicles emit greenhouse gases (GHG) and other air emissions (CO, NO_x, soot) from the combustion of the fuel that contributes to climate change and adds to poor air quality. Switching to battery powered EVs avoids these on-road emissions; however, electrical power, depending on its source, would already have caused GHG emissions during power generation (in particular from the Indonesian grid which relies on fossil fuels for about 80% of its production). In addition to the immediate reduction of on-road air emissions, EVs pave the way for net zero mobility once all electricity for battery charging is obtained from renewable sources.

The common drawbacks of EVs are their weight, range and cost (all largely determined by battery size), along with drivability, performance and charging infrastructure availability. Based on the Gojek drivers' experiences with commercially available 2W EVs, Electrum set out to develop and manufacture 2W EVs customised to the use specifications of Gojek delivery drivers. They require comfort (for the driver and the paying passenger), drivability (to navigate congested traffic and uneven road surfaces), and short-ride distances in populated urban areas. Electrum innovated by using a comparatively small battery (hence lighter and cheaper) and compensated for the downside of a more limited range (up to 60 km) and battery charging time, with an easy-to-operate battery swapping system along with a dense network of battery swapping stations

1 https://content.goinfra.co.id/asts/OurCommitment/GoTo%20Sustainability%20Report%202023.pdf
2 https://www.tbsenergi.com/sustainability/tbs2030

in urban areas. Access to and payment for battery swapping and charging has been developed through a dedicated customiser mobile app for drivers that deducts directly from Gojek drivers' e-wallet. Moreover, the vehicle design has been optimised for comfort, performance and light weight. By the end of May 2024, performance had been demonstrated with over 2,000 2W EV riders who had travelled over 20 million km and performed over 1 million battery swaps at around 250 battery swapping stations in Jakarta.

For collaborating companies like Pertamina, the contribution to the Electrum initiative provides a good opportunity for entry into the EV market, considering the increasingly unavoidable wholesale shift to EV in response to both government policy and the climate change urgency. TBS is set to pivoting from coal and coal-based power plants to renewables (solar, hydro) and EVs. With the Pertamina New and Renewables Energy business unit (PNRE) Electrum is set to develop battery pack production in Indonesia.

In addition to manufacturing EV motorcycles and batteries, Electrum is creating an integrated ecosystem with partners to provide battery swapping. Electrum has also an end-to-end Internet of Things (IoT) platform, including payment system, to ensure smooth and pleasant user experience and journey.

Circular Economy impact

In the context of the circular economy transition, the use of electric scooters contributes to resource efficiency, as over their life-cycle they use energy more efficiently, as evidenced by reduced life cycle GHG emissions. The Life Cycle Assessment for the Indonesian vehicle sector, conducted by the International Council on Clean Transportation[3], confirmed a 26% reduction of life-cycle GHG emissions for battery-operated electric scooters based on the 2023 Indonesian electricity grid, assuming a 12-year use of the EVs, compared to an ICE scooter with average lifecycle GHG emissions of 74 g CO_{2eq}/km. Assuming a reportedly typical Gojek driver scenario[4], covering an average of 150 km per day and a work year of 250 days, around 0.7 metric tonnes of CO_2 emission would in current charging scenario already be mitigated annually per electric scooter. Furthermore, the electric scooters avoid the non-GHG air emissions that would have been emitted with the use of ICE scooters, which supports efforts to combat ambient air pollution.

Furthermore, electric scooters facilitate resource substitution by enabling the use of renewable energy for transportation. The life-cycle GHG emission reduction for electric scooters increases to 89% when powered by renewable electricity.

Business and market impact

For GoTo, it has seen significant EV adoption in its platform since the introduction of GoRide Electric in 2021. In 2023, GoRide Electric drivers drove 18 million kilometers, or 4.5 times longer than in 2022 – a praiseworthy demonstration scale achievement. GoTo expects that EV adoption will continue to grow significantly. Thus, it plans to gradually ramp up Electrum production to finally switch all 2W ICE units used in its platform by 2030. With its production facility that can develop to 1 million units per year, Electrum has the potential to serve a wider market than just the GoTo fleet.

The ecosystem has also provided positive impact to small and medium businesses through the establishment of outlets for battery swapping.

Stakeholders

Driver-partners and customers have contributed significantly in the transition to EV transportation. Drivers are willing to change their habits by switching from gasoline scooters to EVs considering the economic benefits (fuel cost saving, subsidy for 2W EV ownership). Yet, the drivers need to adapt to the new habit of swapping batteries, calculating their route to save the battery, etc. Customers also have the willingness to try new experiences by riding electric scooters.

As for the effect on employment and livelihood, Electrum created new jobs not just in its manufacturing operations, but also in creating and operating battery swap facilities. For GoTo and TBS, by gradually switching all gasoline scooters to 2W EVs it hopes to provide a better and sustainable urban environment that would benefit its driver-partners as well as the urban dwellers in the locations served by its platform services.

3 https://theicct.org/wp-content/uploads/2023/09/ID-17-%E2%80%93-LCA-Indonesia_report_final2.pdf
4 https://www.reccessary.com/en/news/id-market/indonesia-gojek-replace-all-two-wheelers-with-ev-by-2030

Implementation

GoTo decided to transition to EV when the Government of Indonesia (GoI) pledged its commitment to provide a cleaner mobility system as part of Indonesia's Nationally Determined Contributions (NDC) to the Paris Climate Agreement. GoI has issued regulation No. 55/2019 to accelerate EV adoption by giving incentives, both fiscal (e.g. subsidy for EV purchase, tax exemption for EVs and battery production) and non-fiscal (e.g. ease of permit applications). GoTo did its homework on policy and market research, and after two years of experimentation with commercially available electric scooters, decided to partner with TBS through Electrum to develop and manufacture customised electric scooters in Indonesia.

With the government's support, the EV adoption in Indonesia most likely will continue to grow and pick up its pace with more players and parties expected to join. Aside of manufacturing, the availability of supporting infrastructure (battery and charging stations) and market incentives/disincentives to switch to EV, going forward will require continuous collaboration with many parties.

Takeaways

Backed by the future users within and outside of the GoTo delivery driver system Electrum has the potential to create an EV ecosystem in Indonesia. The product innovation involved a customised electric scooter design for the target group of delivery drivers to improve the user experience by facilitating access to and payment for battery swapping and charging especially in dense urban areas.

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