



HOW POWERING 8 MILLION RICKSHAWS WITH BATTERIES COULD HELP INDIA GO NET-ZERO

HONDA'S SWAPPABLE, RECHARGEABLE BATTERY SERVICE could hasten the transition to electric cars and e-rickshaws and provide power for many other aspects of daily life.

"The automobile industry is at a turning point," says Kazuyuki Iwata, Honda R&D's executive chief engineer — one pivoting us towards a future where cars and other vehicles, such as rickshaws, are connected through the cloud, shared between users and powered by electric batteries.

Furthermore, as part of global initiatives to slash CO₂ emissions and tackle air pollution, many governments will ban sales of vehicles using conventional petrol engines in coming

▲ **Honda is launching a battery-sharing scheme for rickshaws.**

decades. India for example — a nation synonymous with poor air quality records — plans to bring in such a ban in 2030. To prepare, the government is undertaking initiatives to accelerate production and adoption of electric vehicles, including tax incentives for manufacturers and subsidies for drivers.

In mid-2022, Japanese vehicle manufacturer, Honda, plans to launch a novel battery-sharing service in India for rickshaws, the three-wheeled vehicles traditionally powered by foot or with a petrol-driven engine, widely used as low-cost

taxis. There are about 8 million rickshaws in India, mostly fuelled by compressed natural gas. Honda hopes to speed the transition to environmentally-friendly e-rickshaws with its 'Mobile Power Pack e', a swappable, lithium-ion battery pack designed to overcome several challenges associated with electric vehicles.

OVERCOMING LIMITATIONS

The plan expands on a pilot programme that Honda has been running in the outskirts of Mumbai since February 2021 with 30 rickshaws, which have covered 200,000 km during

the trial. The e-rickshaws run on four swappable batteries, each weighing roughly 10 kg. Recent upgrades to the battery pack enable them to collect data on usage, as well as withstand India's hot weather, a major risk factor for batteries.

The first generation of the Mobile Power Pack, unveiled in 2017, was designed to address the three most significant limitations to four-wheeled electric cars: driving range, charging time and cost.

"Cars with fossil-fuel engines are still able cover longer distances than electric vehicles before they need to be refueled,"

explains Iwata. "Because they fear running out of battery, consumers want electric vehicles with similar driving ranges to fossil fuel cars. This means bigger, heavier batteries, which in turn lengthens charging time. In addition, bigger batteries make electric vehicles more expensive, since the cost is mostly made up of the price of the battery."

With this in mind, Iwata's team conceived the idea of carrying a portable set of spare batteries to assist the main battery once it is drained of charge. This later led to the realization that lighter vehicles like motorcycles and rickshaws could run exclusively on swappable batteries.

For rickshaws and drivers using rideshare services such as Uber, the amount of time that vehicles are on the road correlates with profit, and drivers lose money waiting hours for vehicles to fully charge. But with Honda's scheme, India's e-rickshaw drivers will now be able to swap batteries in minutes at solar-powered charging stations installed at local shops.

MORE USES FOR BATTERIES

The battery packs are central to Honda's 'eMaaS' concept — a term coined to describe the integration of 'energy as a service' (EaaS) and 'mobility as a service' (MaaS). The concept helps outline the company's aspirations toward a carbon-neutral society. Under eMaaS, renewable energy for powering electric vehicles is also utilized in other aspects of daily life. For example Honda is hoping to aid the transition to a carbon neutral society by expanding into new areas, such as the construction industry, with clients including Japanese construction firm, Komatsu.

When battery packs are eventually depleted and their driving range is limited, Honda envisions repurposing them for

storing excess energy generated from renewable energy sources in households.

This could help tackle one of the current hurdles with scaling up the use of renewable power, particularly from solar, says Iwata. "Energy demand dips in the middle of the day during the sunniest time, but peaks suddenly around sunset," when there is no more sunlight to power solar cells, but people are returning to their homes, he explains.

High demand with simultaneous low power availability leads to outages, while an excess of generation when demand is low also strains the grid.

However, for vehicle batteries to be successfully repurposed, maintaining their good condition is key. Data collected from the pilot trials using the Mobile Power Pack e in India, Indonesia and the Philippines have revealed that it is possible to incentivize how customers use batteries via mechanisms such as pricing schemes.

"Our experience was that users who were charged a fixed price for every exchange event, often exchanged batteries when the charge was almost completely drained," explains Iwata. This would damage

"WE AIM TO HELP EXPAND THE USE OF RENEWABLE ENERGY."



▲ **Honda's batteries could soon power Komatsu's construction vehicles.**

the battery, making them degrade quickly.

However, "where users had access to a subscription model, allowing them to swap to fully charged batteries at no extra cost, they were returned with a reasonable amount of charge left," which results in batteries that are more durable over the long term, he adds.

Furthermore, "we also found out that since the batteries were shared among both heavy and light users, swappable batteries experience homogenized usage compared to the fixed batteries," Iwata says. "Batteries are likely to be in similar state of degradation when collected from the sharing service," which expands the possibility of them having a second life beyond electric vehicles."

BUILDING RESILIENCE

Swappable, rechargeable battery services may accelerate the transition to a future where many aspects of our lives are powered by renewable energy. Through these services, Honda is contributing towards efforts to limit global temperature rise to 1.5 °C above pre-industrial levels — the more aspirational of the goals outlined in the 2015 Paris Agreement.

"However, we must be prepared to see more extreme weather and natural disasters," says Iwata. Honda is preparing

its batteries to deal with such extreme weather events and has taken part in a number of disaster drills with the government-funded Japan Disaster Medical Assistance Team, providing power for equipment in ad-hoc medical stations.

The drills proved worthwhile when Typhoon Faxail hit Chiba, east of Tokyo, in September 2019, causing an electricity outage across the prefecture, which lasted in some areas for 16 days. Honda provided electricity to high-risk facilities such as nursing homes using battery-run vehicles and external batteries. These powered air conditioners, lighting, fans and refrigerators. Honda is now partnering with fellow Japanese company Toyota to develop a more comprehensive system involving fuel-cell powered buses and portable batteries such as Honda's mobile power pack e.

"Electric vehicles are essentially an energy source with wheels, but they spend most of their time being parked," says Iwata. "By using the batteries beyond simply transport, we aim to help expand the use of renewable energy." ■

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