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A Proposal for Personal Mobility for a Decarbonized Society

Kenji Morita 1)

1) Japan Automobile Research Institute
2530 Karima, Tsukuba, Ibaraki, 305-0822, Japan (E-mail: kmorita@jari.or.jp)

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In order for mankind to live safely and securely into the future, we must hurry to become carbon neutral (CN). Achieving the Japanese government's goal of "CN by 2050" will require bold and "discontinuous change." Although today's standard-sized battery electric vehicles (BEVs) are practical enough for many cases other than long-distance driving, they have problems such as falling prices of used vehicles due to battery degradation and the depletion of scarce resources used for batteries. In personal use, the energy consumption required to move the vehicle itself is excessive for the movement of one person, putting pressure on energy that can be used in a life centered on renewable energy sources that do not use fossil fuels. In addition, demographic trends indicate that not only Japan but also many other countries, especially developed countries, are expected to have an aging population in the future, and securing transportation for the elderly who have returned their driver's licenses will become an issue.

In order to solve these problems, it is thought that an ultra-compact vehicle and a drive system that does not rely solely on battery energy but also on human power would be an effective solution. Furthermore, it is thought that CN mobility, i.e., mobility that does not require external recharging, can be realized by attaching photovoltaic panels (PVs). In this study, an electrically power assisted recumbent trike with PV that fits within bicycle regulations was considered as "holonism mobility.

Two types of vehicles were considered: Type A (Fig. 1), a relatively long-distance, high-speed vehicle for use between cities, and Type B (Fig. 2), a short-distance, low-speed vehicle suitable for sidewalk riding in the city. The energy consumption in WLTC-low (urban) mode and constant-speed driving was predicted for high-speed Type A, assuming vehicle specifications. As a result, in WLTC-low (urban) mode, the energy consumption became almost zero at 50 W of human power and 100 W of PV output (Fig. 3), and in constant-speed driving, the energy consumption became negative at 100 W of PV output at a speed of 28 km/h or less (Fig. 4). These results indicate that CN mobility can be realized without the need for external recharging.

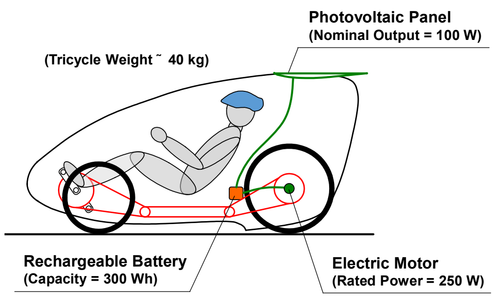

Fig. 1 Holonism Mobility (Type A)

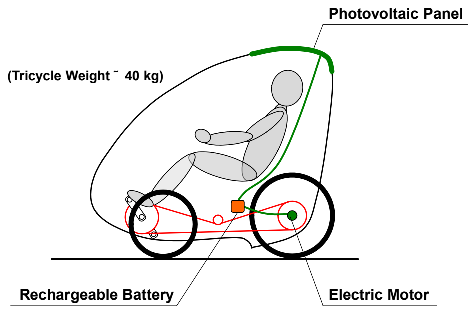

Fig. 2 Holonism Mobility (Type B)

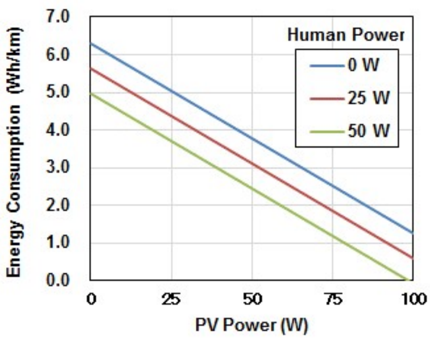

Fig. 3 Energy Consumption of Holonism Mobility (Type A)

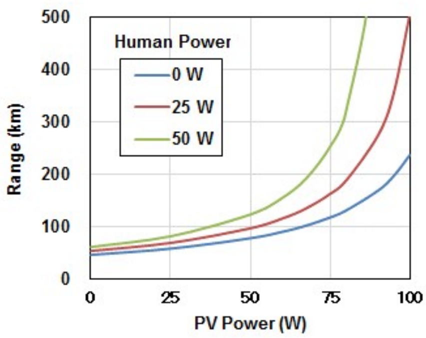

Fig. 4 Range of Holonism Mobility (Type A)