

Environmental Performance



Powering vehicles and machinery with energy sources that do not derive from fossil fuels is an extremely effective means of addressing global warming. Solar and wind power are often cited as alternative energy-generating technologies, but hydrogen has attracted a great deal of attention in recent years.

The Basic Energy Plan (formulated by the Japanese government in April 2014) specifies the basic direction of Japan's national energy policy. The plan states, "... in the beginning stages of popularizing fuel cell vehicles, it is important to focus on the practical application of fuel cells in buses and forklifts, for which hydrogen demand is expected to quickly become relatively stable ... With this in mind, steady preparations for using hydrogen in these vehicles should begin immediately." The Japan Revitalization Strategy 2015 (formulated by the Japanese government in June 2015) also calls for "the development and popularization of fuel cell buses and other vehicles" as one of the strategies it lays out for national growth.

Hino Motors has been focused on developing hybrid systems, cleaner exhaust gas, and other environmental technologies, equipping its own products with these technologies to help make environmentally friendly vehicles more commercially popular.

In collaboration with Toyota Motor Corporation, Hino Motors has conducted repeated test runs of fuel cell vehicles to propel the development of fuel cell buses (FC buses). Specifically, the Company is working on the development of fuel cells for large-scale route buses, an area for which there is significant public interest and need. Hino Motors receives partial subsidies from the Ministry of the Environment for those aspects categorized as issues to be addressed in fiscal 2015 in the development of carbon emission reduction technologies for transportation under the ministry's Low Carbon Technology Research and Development Program.

The Japanese government has high expectations for FC buses. The special feature below describes the features of the FC bus and the aspects that make this mode of transportation a prime focus of the Ministry of the Environment project.



Test FC bus exterior

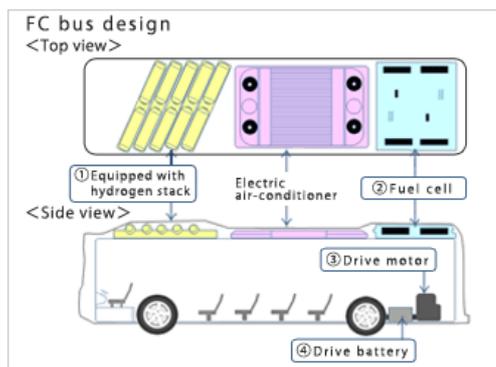
FC Bus Features and Design

The feature of the FC bus most often cited is its superior environmental performance. Specifically, the FC bus emits zero CO₂ (only water) while running; does not consume fossil fuel, instead generating electricity through a chemical reaction between hydrogen and oxygen; delivers high energy efficiency; and generates little noise.

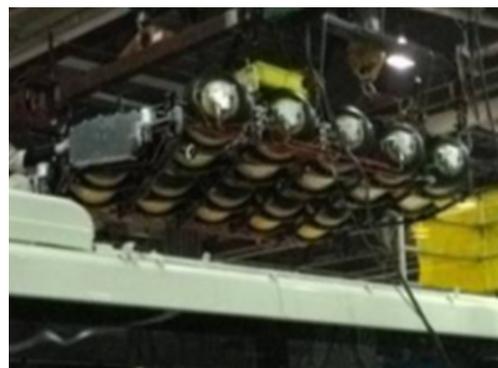
In developing the FC bus, TOYOTA MOTOR CORPORATION is responsible for the fuel cell system, while Hino Motors is in charge of the chassis, suspensions and body of the bus, utilizing the respective technology and expertise developed by each company. For the Ministry of Environment Low Carbon Technology Research and Development Program, the Company has conducted a variety of tests of a vehicle based on the Hino hybrid non-step route bus and equipped with the Toyota Fuel Cell System (TFCS below), which TOYOTA MOTOR CORPORATION developed for the Mirai fuel cell car.

The basic TFCS design comprises (1) a high-pressure hydrogen tank for storing hydrogen fuel; (2) an FC stack, which is the power generator (fuel cell); (3) a drive motor that converts electrical output into an energy source powering the bus; (4) a drive battery to store energy recovered from the drive motor when decelerating while driving; and a computer to control the whole system.

To optimize the design for a large-scale route bus, a number of modifications were made, including equipping the bus with twice the number of FC stacks and motors as a Mirai car in order to boost output.



FC bus design



Equipped with hydrogen stack

Research, Development, and Testing

Buses operate for longer distances and for longer hours than general passenger cars. For practical application in a large-scale route bus, the fuel cell system is required to be more reliable and durable than the system for a passenger car.

For this reason, the first priority was testing and verifying the cruising distances and durability required for typical large-scale route buses.

The second focus was using a prototype with a body designed for both optimal fuel cell system control and commercial appeal to test and verify basic performance and functions in such areas as driving, stopping, and turning.

Durability is another crucial performance index. Test runs clarified durability issues that arise when applying passenger car fuel cell systems to buses. Repeated trial production and testing of system improvements has indicated that, although durability did not reach conventional route bus levels, the system does not pose a problem for actual operation.

Verification testing conducted by Hino Motors under this program will be integrated into future commercial development, and at the same time, it will also help in developing solutions for a variety of issues.

Hino Motors will continue to collaborate with the government, Toyota Motor Corporation and other parties on FC bus development to help achieve a hydrogen society.



Measuring the most stable incline angle

