PRESS INFORMATION

Fuji Heavy Industries Announces Its Development of the *Turbo Parallel Hybrid* and *Lithium-Ion Capacitor* Technologies

Tokyo, August 18, 2005 – Fuji Heavy Industries, Ltd. (FHI), a global manufacturer of transportation and aerospace-related products and the maker of Subaru automobiles, today released information on its two new technological projects for future environmentally friendly vehicles: one is the *Turbo Parallel Hybrid* (TPH), a revolutionary powertrain system to be applied to a hybrid electric vehicle (HEV) that the company plans to experimentally launch in the market in 2007; the other is the *Lithium-ion capacitor* (*Li-ion*), which is anticipated to broaden the possibilities for batteries in future automobiles. FHI has been striving to create practical applications for these environmental technologies in its future vehicles.

The TPH is a strategically important technology for the power source of clean-energy vehicles and will be incorporated with Subaru's core technologies: the Horizontally-Opposed Engine and Symmetrical AWD system. FHI has been developing the TPH in view of its future mass production.

The TPH system places a thin, 10-kW motor generator between a vehicle's engine and its automatic transmission. The combination of the motor generator and the boxer turbo engine, which adopts the *Miller cycle*, creates a system that not only provides powerful and pleasurable driving in the mid-speed ranges when turbocharger is active, as with conventional turbo models, but it also delivers excellent acceleration and fuel economy in practical use. This superb, all-range performance has been enabled by *motor assist*, a feature that is designed to boost engine torque at low revolutions.

Compared to the SSHEV (Sequential Series Hybrid) system that FHI had previously developed, the TPH excels in cost performance since it uses a relatively more compact motor and a smaller battery.

In order to bring out even better driving performance from the TPH, FHI is planning to equip the system with high-performance manganese lithium-ion batteries, which are currently under development at NEC Lamillion Energy, Ltd. That company was jointly established by NEC and FHI in 2002 for development of secondary batteries.

As for the Li-ion capacitor, its energy density has been drastically enhanced, while it retains the inherently superior capability of instantaneous charge/discharge and the high durability of regular capacitors. The Li-ion capacitor's negative electrode uses newly developed Li-ion occlusive carbon material, while its electrolyte is also made of Li-ion. The technique called *pre-doping* enables occlusion of large amount of Li-ion on the negative electrode in this new capacitor, helps boost the capacity of the negative electrode, and increases the electrical potential difference, thereby making achievement of high voltage possible without deterioration in positive electrode performance.

Furthermore, the principle of the Li-ion capacitor holds the potential for greater versatility and increased performance of capacitor occlusion. Many new materials to be used for high-energy accumulation in capacitors have been tested, and some progress has been made in that area of research. The application of certain new materials to the positive electrode, combined with the pre-doping technique of the Li-ion capacitor, will theoretically double the estimated accumulation capacity of capacitors available in today's market.

FHI is currently conducting performance tests on prototype cells of the new Li-ion capacitor. The eventual successful commercialization of Li-ion capacitors for compact cars would open up many other business opportunities, including helping to meet the increased demand for new hybrid buses, trucks, and passenger vehicles. This new capacitor also has the potential to be an alternative to conventional lead batteries in the future, and the widespread use of this environmentally sustainable technology will certainly contribute to the well-being of society.

To further address environmental issues and meet the social consensus on the transition from the current burning of fossil fuels to cleaner, renewable, electricity-based secondary energy, FHI is committed to the development of power storage technologies as the key to further promote the use of hybrid vehicles, fuel cell vehicles, and electric vehicles.

Consequently, FHI has been concentrating specifically on the development of power storage systems and the application of NEC Lamillion Energy –made high-capacity manganese Li-ion batteries to prototype hybrid vehicles, including the Subaru R1e, for further testing and evaluation. This approach has allowed the company to efficiently acquire added technical value with minimum investment and to solve issues concerning the practical application and mass production of high-capacity manganese Li-ion batteries.

The TPH and Li-ion capacitor development projects are the latest in FHI's power storage technologies, and the practical advances they represent illustrate FHI's dedication to environmental technology development.

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