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## **MHPS and NGK SPARK PLUG Sign Basic Agreement on Business Tie-up In Cylindrical Cell Stacks Used in SOFCs**

### **-- Aim is to Form Cost-competitive Mass Production Structure --**

Mitsubishi Hitachi Power Systems, Ltd. (MHPS) and NGK SPARK PLUG CO., LTD. (NTK) have concluded a basic agreement on a business tie-up targeting mass production of cylindrical cell stacks: power-generating elements used in solid oxide fuel cells (SOFC). Through the integration of the two companies' respective technological strengths, expertise and management resources, the tie-up is aimed at forming a mass production structure of cost-competitive cylindrical cell stacks.

Specifically, by combining their technologies and expertise MHPS and NTK aim initially to complete a small-lot production system for cylindrical cell stacks; then based on that system, the two partners will jointly establish the technology to enable full-scale mass production. The companies will target the completion of a mass production line capable of manufacturing upwards of several hundreds of thousands units per year by April 2018. Plans call for the realization of this scheme through the merger of MHPS's development, engineering and manufacturing technologies for cylindrical cell stacks cultivated through many years of R&D, and NTK's technologies in mass production of ceramics.

The SOFCs targeted in this business tie-up are ceramic-based fuel cells that operate at a high temperature above 900 degrees Celsius (1,650 degrees Fahrenheit). They can generate electricity very efficiently by chemical reaction between oxygen in the air and hydrogen and carbon monoxide from reformed city gas. The unreacted portion of the gas and hot air discharged from the SOFC module are then used to drive an MGT. This two-stage system achieves significantly higher power generation efficiency and, as a result, saves substantial energy. In addition, as the high-temperature exhaust gas from the MGT can be used to generate hot water and steam, the hybrid system is capable of performing combined heat and power (CHP) supply functions.

MHPS's cylindrical cell stacks are horizontal-stripe cell stacks structured in such a way that multiple elements (fuel electrodes, electrolytes, air electrodes) that undergo a power-generating reaction are formed on the outer surface of the ceramic-based substrate tube and the elements are

linearly connected by interconnector. Achieving mass production combined with low cost is a major issue being addressed today in order to promote expanded adoption of fuel cells, and the business tie-up between MHPS and NTK aims to overcome this challenge.

MHPS's strength is its ability to provide total solutions in all aspects of thermal power generation systems following its taking over the comprehensive capabilities and product lineups formerly held by Mitsubishi Heavy Industries, Ltd. (MHI) and Hitachi, Ltd. Today MHPS does business in the global market relating to geothermal power generation, environmental equipment, fuel cells, etc., with a focus on thermal power generation system operations involving gas turbines, steam turbines, boilers, integrated coal gasification combined cycle (IGCC) system equipment, etc. Research into the cylindrical cell stacks used in SOFCs was launched by MHPS (MHI at the time) in 1985. Since 2004 development and engineering have been carried forward jointly with the New Energy and Industrial Technology Development Organization (NEDO) at MHPS's Nagasaki Works (Nagasaki Shipyard & Machinery Works).

NTK is a general manufacturer primarily of ceramic products, with a broad lineup including spark plugs and other products related to internal combustion engines, IC packages, cutting tools, bio ceramics and industrial ceramics. Among its many offerings, the company enjoys the top global market shares in spark plugs and automotive sensors. In a quest to forge new areas of business, today NTK is vigorously undertaking research and development in environmental and energy areas: particularly into planar SOFCs, hydrogen sensors and other components for co-generation systems, which are expected to play a major role in future home power generation applications. (Planar SOFCs are not included within the newly concluded business tie-up agreement.)

Leveraging their new business tie-up going forward, MHPS and NTK look to maintain and further develop their favorable ties and to jointly make a positive contribution to the expanding adoption of fuel cells as one significant solution to the world's energy and environmental problems.



Structure of a cylindrical cell stack

