

## **METI Initiates the Transition of IGFC from Development Phase to Validation**

**Arranged by T. HOMMA**

### 1. National Policies

#### (1) Ministry of the Environment (MfE)

On September 1st, the MfE announced another 28 qualified companies to be listed in the Eco-Lease subsidy program – a government program that aims to facilitate the use of energy-saving products such as solar panels, wind power equipment, fuel cell systems, etc. by reducing the lease rate of such products for SMBs (small and middle-sized businesses) and families. The Eco-Lease subsidy program was started in June with 67 companies included through the first recruitment. Whereas many organizations suffering from the Great Earthquake claimed that "there was no time for sufficient preparation (for the first recruitment) as the Earthquake was just over", the second round of recruitment was conducted in August in order to accommodate their application. (Yamanashi Nichinichi Shimbun, Shikoku Shimbun, Niigata Nippo, Iwate Nippo, Hukushima Minpo, Fukushima Minyu Shimbun, Okinawa Times, September 2nd, 2011; Miyanichi e-press, September 9th, 2011)

#### (2) Ministry of Economy, Trade and Industry (METI)

The METI has set to develop a Japan-initiated international standard for the performance evaluation of products in 29 different fields in which Japan has a strong presence, including LED, antibacterial fiber and residential fuel cell systems, etc. The standard is supposed to be completed in 2 or 3 years and proposed to the responsible international organization then. This initiative is for the purpose of appealing the high quality of Japanese products against Chinese ones which increased in sales due to low prices. In addition, a proposal for the energy efficiency and safety assessment of residential FC products will be submitted to the International Electrotechnical Commission (IEC) next year. Although the merchandization of residential FC products is only

available among Japanese enterprises at present, it is anticipated that Chinese competitors will emerge soon to grab a share. (Asahi Shimbun, September 5th, 2011)

On September 9th, METI announced the establishment of a new subsidy system named "Energy-Saving Eco-Subsidy" under which the introduction and deployment of energy-saving equipment, e.g. storage batteries, will be subsidized by the government. In the third supplementary budget, this new system will be taken as a key project and requested for an allocation of up to 200 billion Yen. For ordinary families, the deployment of storage batteries, solar power equipment, FC, as well as HEMS (Home Energy Management System) will be eligible for a subsidy of up to 30 percent of the cost. For enterprises and schools, all facility reconstructions for the purpose of energy-saving will be eligible for the subsidy. (Yomiuri Shimbun, Asahi Shimbun, Chunichi Shimbun, September 10th, 2011; Denki Shimbun, September 12th, 2011; Kagaku Kogyo Nippo, September 14th, 2011)

In order to improve the efficiency of thermal power generation, METI is planning to reinforce its support for technology developments in that field. In prospective FY 2012 Budget Request, METI will first incorporate the expenses for the validation of "Integrated Gasification Fuel Cell Combined Cycle (IGFC)" which is expected to be put into application as the next-generation coal-fired power generation technology. In respect of the policy on high-efficiency gas turbine systems, as the continuous fundamental technology development has come to a close by the end of this FY, the focus will move to the validation phase in FY 2012. The Japan government has clarified its policy on gradually reducing the dependence on nuclear power while accelerating the

development of high efficiency thermal power generation technology as an alteration. IGFC is a triple-combined cycle power generation system which can boost the gas turbine with gasified coal fuels, drive the steam turbine with waste heat and activate the fuel cell system with hydrogen generated in the coal gasification process, respectively. Therefore the efficiency of the generating equipment can be as high as 60%. METI has set its goal to facilitate the early application of IGFC and further accomplish an ultimate coal fired thermal power generation that can realize a zero CO<sub>2</sub> emission by integrating with CO<sub>2</sub> separation and recycling equipment in the future. (Denki Shimbun, September 26th, 2011)

## 2. Local Initiatives

### (1) Gifu Prefecture

In Gifu prefecture, the local government provides owners of detached houses and small business offices who have introduced the cutting-edge new-energy equipment incorporating solar power equipment, FC and storage batteries into their buildings with a subsidy of half of their expenses or a maximum of 6 million Yen per case. In the general accounting supplementary budget of Gifu prefecture, the allocation for this program accounts for 30 million Yen. (Chunichi Shimbun, September 2nd, 2011)

### (2) Fukushima Prefecture

The third supplementary budget request of Fukushima prefecture puts an emphasis on encouraging energy saving in order to overcome the power shortage. As an energy-saving eco-subsidy, a foundation grant of 100 billion Yen was established to support the adoption of solar power generation equipment as well as storage batteries, and to finance the construction of R&D base for renewable energy in the prefecture. In respect of eco-subsidy for ordinary families, besides of former eligible items, including solar power generation equipment and FC, the introduction of storage battery and energy performance management systems were added into the list. (Fukushima Minpo, September 10th, 2011)

### (3) Osaka City

On September 21st, Osaka government summarized the "Osaka Energy Vision (Provisional)", presenting the city's energy policy. With a vision of realizing a locally produced and consumed electric energy

network, the local government raised a discussion on the site of the prospect mega-solar and high-efficiency Gas Turbine Combined Cycle (GTCC) power plant at Yumeshima District in Osaka Bay Area, as it would be related to the location of future industrial sites. Besides, the government planned to construct a model district on 2900m<sup>2</sup> (about 0.717 acres) of city land in Tsurumi ward in which at least 20 detached houses equipped with solar cells, fuel cells and storage batteries would be built. The construction was expected to be completed by 2014-2015. (Sankei Shimbun, the Nikkan Kogyo Shimbun, September 22nd, 2011)

## 3. Initiatives of Public Utility Organizations

On September 1st, the Center for Promotion of Natural Gas was renamed to "Advanced Cogeneration and Energy Utilization Center Japan (ACEJ)". It was jointly established by cities gas companies, engineering companies and gas appliance manufacturers and has been dedicated to the promotion of overall cogeneration systems to ordinary families. After the rename, it will include a newly-established FC Office and operate under a new structure. Professor Kashiwagi from Tokyo Institute of Technology was appointed the chairman of the board. (Nikkei Sangyo Shimbun, September 2nd, 2011; Denki Shimbun, September 7th, 2011)

## 4. Technology and Business Development of SOFC

### (1) Hokkaido University

A research team led by Associate Professor Motohashi from the Hokkaido University Graduate School of Engineering has developed an oxygen storage material composed of only common elements. Although made from naturally abundant elements including Calcium, Aluminum, Manganese and Oxygen, the new material exhibits excellent Oxygen absorption and desorption characteristics, thus important for the Element Strategy. Even a slight change in temperature and/or atmosphere can cause the material to rapidly absorb and desorb a great volume of oxygen up to 3.0wt% (weight percent) in a reversible way. Hence it is highly expected to be used in the fields of Oxygen concentration as well as SOFC (solid oxide fuel cells). The team now works with Mitsubishi Chemical Corporation in a joint research

project to improve the material's oxygen storage ability by optimizing the composition process and also discuss the application of it. Metal oxides which can absorb and desorb a great amount of oxygen at low temperature in a reversible way, also known as oxygen storage materials, are generally expected to be used in diverse high-temperature processes regarding productivity improvement and environmental protection. For example, new oxidation-reduction catalysts based on oxygen storage materials can benefit environmental protection by means of low-carbon process, and latest high-performance electrode materials can accelerate the R&D of SOFC, etc. At present, many research groups in Japan and other countries are engaging in studies on improving the performance of existing materials such as the ceria-zirconia solid solution. (Kagaku Kogyo Nippo, August 31st, 2011)

#### (2) JX Nippon Oil & Energy Corporation

JX Nippon Oil & Energy Corporation (JX NOE) deployed SOFC in its model house "ENEOS SOENE house" and opened it to the public. Comparing with existing PEFC (Polymer Electrolyte Fuel Cell), the JX NOE's SOFC was 40 percent smaller in size and realized a rated power generation efficiency of 45% (LHV). The stack for power generation as the core of the SOFC was manufactured by Kyocera Corporation. The new SOFC was scheduled to be released to the market in October. (Kagaku Kogyo Nippo, September 8th, 2011; *Denki Shimbun*, September 9th, 2011)

#### (3) Osaka Gas Co., Ltd.

On September 8th, Mr. Ozaki, the president of Osaka Gas Co., Ltd., announced the release of new SOFC ENE-FARM in 2012. It was said that the new product could provide high power generation efficiency and might bring significant energy savings to small families with less hot-water demand. (*Yomiuri Shimbun*, September 9th, 2011)

### 5. Development of PEFC Component Technology

#### (1) Tohoku University

Muyashita, director of Tohoku University Institute of Multidisciplinary Research for Advanced Materials Polymer-Hybrid Materials Research Center, and Assistant Professor Matusi have led their team to success in developing a new proton conducting membrane material which exhibited an ion

conductivity of 0.1S/cm. It is an organic-inorganic hybrid material made from low-cost silicon and organic materials, possessing high heat resistance and easy to form membrane. Therefore, it can be used as high polymer electrolyte in PEFC. As it features high proton conductivity even under high-temperature without humidification, the use of platinum catalyst may be decreased and thus the cost will be reduced. The new material developed by the team is a phosphate-based proton conducting compound containing double-decker-shaped silsesquioxane (PHOS-DDSQ). Composed by the components of glass and resin, the new material exhibits unprecedented high heat and flame resistances. Moreover, membranes can be easily obtained by applying the solution of the material on substrates and letting it dry out. Under a humidity of 95% and a temperature of 85°C, the material shows a proton conductivity of 0.1S/cm, comparable to that of existing fluoropolymers. In addition, it also possesses high proton conductivity under non-humidification condition, which is up to 10<sup>-4</sup>S/cm at 170°C. (Kagaku Kogyo Nippo, August 31st, 2011)

#### (2) Kyushu University

Professor Ogo at Faculty of Engineering, Kyushu University developed a new fundamental PEFC technology that used nickel and ruthenium as catalysts instead of platinum. The power generation performance of the new technique reached 1/25 of that of the traditional platinum-based method. According to Professor Ogo, "the goal in the future is to improve its power generation performance to the level of platinum-based method". For this purpose, he will focus on seeking for applicable catalysts to replace the platinum which is both expensive and exhaustible. He has started a joint research project with Daihatsu Motor Co., Ltd. The latter is also concentrated in the R&D of FC. (*Nishinippon Shimbun*, September 13th, 2011; *Nikkei Sangyo Shimbun*, *Nikkan Kogyo Shimbun*, September 14th, 2011)

### 6. Updates on ENE-FARM

#### (1) Panasonic

On September 6th, Panasonic announced an expansion of the production of ENE-FARM in FY2011 to a little bit over 6000, 1.2 times as many as indicated in the original plan. Seeing that FC, which was

available for residential power generation, had been receiving more and more attention since the Great East Japan Earthquake, Panasonic rescaled its production to attain a higher productivity. (Sankei Shimbun, September 7th, 2011)

(2) Nihonkai Gas Co., Ltd.

Nihonkai Gas (Toyama City) has launched a new line of ENE-FARM. With the 700W-rated output SOFC manufactured by JX Nippon Oil & Energy Corporation, the new line provides 45% higher power generation efficiency in a smaller footprint. (Kitanippon Shimbun, Toyama Shimbun, September 13th, 2011)

(3) Toho Gas Co., Ltd.

According to an announcement of Toho Gas, the company's accumulated sales volume of ENE-FARM products since the beginning of sales in May 2009 has reached 1000 sets; that is, 202 sets in 2009, 515 sets in 2010 and 283 sets as of September 2nd, 2011. The record keeps updating now. (Denki Shimbun, Nikkankogyo Shimbun, September 15th, 2011)

(4) Osaka Gas Co., Ltd.

Osaka Gas published a summary of the promotion of the Gas Cogeneration System, according to which the sales of ENE-FARM had exceeded half of the annual goal of 1500 sets by the end of July. (Denki Shimbun, September 15th, 2011)

(5) JX Nippon Oil & Energy Corporation

On September 15th, JX Nippon Oil & Energy Corporation (JX NOE) issued a statement that its SOFC-based ENE-FARM would be released to the market at a base price of 2.7 million Yen (installation cost not included) on October 17th. From September, the company will start to recruit 270 participants who prefer to buy the limited-edition product for a trial. Other customers can purchase the new product in the market since January 2012. JX NOE's goal is to achieve a total sales volume of 5000 sets for both existing and new types. In the press conference held on September 15th, JX NOE President Kimura enthusiastically said "with the introduction of SOFC-based type, we will devote to push forward the 'ENEOS SOENE project' to meet the energy demand after the Great East Japan Earthquake." The company scheduled to deliver self-developed storage battery system (6kWh, less than 1 million Yen in cost) for ordinary families by the summer of 2012,

meanwhile facilitating the promotion of ENE-FARM as well as solar power generation systems and providing energy management services. (Yomiuri Shimbun, Mainichi Shimbun, Nihon Keizai Shimbun, Denki Shimbun, Nikkei Sangyo Shimbun, Nikkan Kougyo Shimbun, Kensetsu Tsushin Shimbun, Chunichi Shimbun, Nishinippon Shimbun, Chugoku Shimbun, Shizuoka Shimbun, Fuji Sankei Business, Kagaku Kogyo Nippo, September 16th, 2011; Asahi Shimbun, September 19th, 2011; Jutaku Shimpō, September 20th, 2011; Sankei Shimbun, September 23rd, 2011)

## 7. FCV & EV Frontier

(1) Honda

On September 5th, Honda announced to deliver its "FCX Clarity" fuel-cell vehicles (FCV) to the Tokyo Narita International Airport for a trial to chauffeur International passengers to the downtown. The test will be held by the "Research Association of Hydrogen Supply/Utilization Technology (HySUT)". Since the introduction of FCX Clarity to American and Japanese markets in 2009, altogether 36 FCX Clarity vehicles have been delivered through lease sales. This time, two taxi operators respectively based at Haneda and Narita will participate in the test. FCVs for shuttling business passengers are sponsored by Nissan Motor at Haneda and Toyota and Honda at Narita, one from each company. (Asahi Shimbun, Nikkei Sangyo Shimbun, Nikkan Kogyo Shimbun, Nikkan Jidosha Shimbun, Fuji Sankei Business, September 6th, 2011; Nihon Keizai Shimbun, September 13th, 2011)

(2) Siemens, Volvo, Daimler

Siemens Germany and Volvo Sweden have reached an agreement on partnership for EV (Electric Vehicles) development. The cooperation covers a wide range of areas such as electric drives, battery management and battery chargers which constitute key components of the integrated system of the "C30 Electric" cars being developed by Volvo. Both on-board and off-board rapid battery chargers will be included. Also, the cooperation is expected to benefit the development of FCV that utilizes Hydrogen fuel converted from renewable energy sources. Besides, on September 12th, Daimler Chairman Zetsche made a speech at an event before the Frankfurt International

Motor Show, stressing a desire to devote more resources towards the development of FCV as it precedes EV in both travel distance and charging time. (Denki Shimbun, September 14th, 2011)

On September 13th, Christian Mohrdieck, Director of Fuel Cell and Battery Drive Development at Daimler, declared at the Frankfurt International Motor Show that his staff were going to start the development of FC-based large vehicles including, e.g. trucks. He said, "fuel-cell vehicles, as generally have a longer fuel distance, are suitable for large vehicles. The use of fuel-cell vehicles and electric vehicles should be distinguished according to the type of vehicles and customer requirements." In addition, as a part of the partnership with Nissan-Renault regarding the development of electric vehicles, Daimler expressed an intention to "supply Daimler-sourced batteries" for Renault's new EV-model Twingo mini-car to be released in 2013. Daimler also exhibited its "F125" fuel-cell vehicle. By using Hydrogen fuel cells, the new model can travel approx. 1000 km with one fuel supply, which only needs about 3 minutes. (Nikkan Jidosha Shimbun, September 15th, 2011; Nikkei Sangyo Shimbun, September 16th, 2011)

#### 8. R&D of Biological Fuel Cells

Assistant Professor Akiyama and Associate Professor Morishima at Tokyo University of Agriculture and Technology have created a new type of biological fuel cell that can generate electrical power from insect's body fluids. Electricity was generated by the decomposition of trehalose contained in body fluids. This invention is intended to be applied to mobile robots for such as nuclear disaster sites by means of implanting such fuel cells into the body of insect to power the mini camera or sensor. The new fuel cell is 2.5 cm (H) x 2 cm (W) x 1 mm (D) in size. It generates electrical power by using enzymes to oxidize the glucose decomposed from trehalose contained in insect's body fluids by enzymes. In case of cockroaches, the new fuel cell can generate 10.5 $\mu$ W power. Considering that insects are able to pass through small cracks and in this case, cockroaches are said to have a radiation resistance several dozen times higher than that of human, they may collect information of the site where operators cannot access. Moreover, by implanting small parts that can control the movement

of insects by electrical stimulation of their nerves, the insects will be directed to any sites where information gathering is required. The inventors are now working with private companies with the aim of bringing the new fuel cell into application within one year. (Nihon Keizai Shimbun, September 19th, 2011)

#### 9. Technology and Business Developments of Hydrogen Production and Purification

##### (1) Kawasaki Heavy Industries, Ltd.

Kawasaki Heavy Industries plans to start the construction of a zero-carbon-footprint liquid Hydrogen production, transportation and utilization system in 2015 and put it into trial operation in 2017. Specifically, Hydrogen will be refined from untapped low-grade coal (brown coal), and then transported to Japan after being liquefied to energize fuel-cell vehicles. The system is supposed to achieve a daily output of 10 tons liquid Hydrogen at the beginning, equivalent to the consumption of about 100 fuel-cell vehicles, and be increased to 700 tons in 2030 to satisfy the requirements of commercialization. At the same time, the company will facilitate the introduction of Hydrogen-powered sealift ships and gas turbines to accomplish zero CO<sub>2</sub> emission in energy supply and utilization processes. The brown coal, projected to be sourced from Victoria, Australia, will be gasified to Hydrogen gas and carbon dioxide. The latter will be separated with adsorbents and then piped to some natural gas field where it is compressed and buried underground, while the purified Hydrogen gas will be transit to seaports via other pipelines. A power plant, which is also in Victoria and has established measures to collect and store CO<sub>2</sub> produced in power generation, is contracted to supply electric energy for above processes e.g., the gasification of brown coal. Besides, Kawasaki Heavy Industries commits to participate in NEDO (New Energy and Industrial Technology Development Organization) projects and invest over 10 billion Yen in order to develop the technique to refine Hydrogen from the brown coal, safe and secure Hydrogen transport ships, as well as Hydrogen loading and unloading equipment. To achieve such goal, the company will on the one hand request government support and, on the other hand, call on the involvement of city gas companies, automobile

manufacturers, shipping companies, and other enterprises. (Nikkan Kogyo Shimbun, September 1st, 2011)

#### (2) Toshiba

Toshiba developed a new fundamental element which could extract Hydrogen from water vapor using high temperature gas-cooled reactor without the combustion of fossil fuel. The reaction is based on "high temperature water vapor electrolysis" process, a water-splitting Hydrogen production method with a productivity as high as approximately 80% - about twice as that of other existing techniques. This new ceramic element has a SOFC-like three-layer structure, i.e. a zirconia solid electrolyte membrane sandwiched between two electrode plates; while it follows an electrolytic reaction reversed to that of electric power generation. This time, by applying special designs to materials such as creating tiny pores on the electrode plates, an unprecedented Hydrogen productivity was obtained which is 7 percent higher than the best steam electrolysis performance record of the National Institute of Standards and Technology. In addition, the new element was verified to be able to endure over 6000 hours of continuous operation. It is assumed to be used to build a zero-carbon-footprint "green" Hydrogen generation system in 2020. (Nikkan Kogyo Shimbun, September 13th, 2011)

#### (3) Iwatani International Corporation

On September 13th, Iwatani International Corporation (Osaka) published its plan to commence the construction of a liquid Hydrogen plant within the Tokuyama Factory of Tokuyama Corporation in Shunan City in Yamaguchi Prefecture. As a joint venture, the new plant will be put into operation in autumn 2012 with a productive capacity of 3000 L/h to serve not only semiconductor and electronic component industries but fuel-cell vehicles. (Nikkei Sangyo Shimbun, Chugoku Shimbun, Yamaguchi Shimbun, September 14th, 2011)

#### (4) Yokohama City University

Professor Takamisawa at Yokohama City University newly developed a kind of single-crystal metal carboxylate complexes. It is a structure of binuclear copper acetate units linked by pyrazine bridges. Although it needs to be synthesized in solution in order to be crystallized, its single-crystal structure

makes it possible to fabricate transparent materials. Besides, because it features one-dimensional molecular crystal structure, which means its molecules are held together by weak intermolecular forces in solid-state, its crystal structure contains regularly distributed intermolecular spaces ranging from a minimum of 0.2nm to a maximum of 0.4nm, enabling it to physically adsorb various gases. When adsorbed with gas molecules, it will change its solid structure to form gas inclusion co-crystal. In view of the fact that it has superior Hydrogen separation ability, the new single-crystal is anticipated to be active in the production of high-purity Hydrogen for FC and even other applications related to gas separation. (Kagaku Kogyo Nippo, September 20th, 2011)

### 10. Development of Hydrogen Transportation and Storage technologies

The Institute of Physical and Chemical Research has succeeded in synthesizing and analyzing the structure of a new type of Hydrogen storage alloy named "Multi-metal Hydride Cluster", which was compounded with diverse metals including different rare earth metals and d-block transition metals. Also, the research made it possible to observe the reaction between the new alloy and Hydrogen via X-ray structural analysis. Thanks to the achievement of this research, the structure of Multi-metal Hydride Cluster and its characteristics of hydrogen absorption and desorption were clarified, and the application of Hydrogen absorption and storage materials in fuel cell technology was put forward and thus attracted more attention. (Kagaku Kogyo Nippo, September 20th, 2011)

### 11. Technology and Business Development of FC Components

#### (1) Nakaza Co., Ltd.

Nakaza (Tokyo) has successfully machined 0.2 mm thick aluminum plate to an L-like shape by using deep drawing process. Comparing to the ordinary one-step drawing process, the new technique is divided into 3 steps and involves 3 different dies. Therefore, even aluminum plates up to 12mm thick can be processed without any crack at corners or edges. The flatness of processed surface is also secured

and no deformation will occur. Seeing that this improvement is consequent upon orders from a major aluminum rolling company, it is expected to be directed to the manufacture of fuel cell components, as the new technique can achieve a radius of curvature as small as 1.0 at corners as well as an L-like shape processing without causing cracking. (Nikkan Kogyo Shimbun, August 30th, 2011)

(2) Nakayama Seimitsu Co., Ltd.

On September 12th, metal processing company Nakayama Seimitsu (Osaka) announced the upcoming construction of a metal processing factory equipped with a precision level of 10nm at Kikuyo town in Kumamoto Prefecture. The one-billion-Yen construction project is slated to start in January 2012 and be completed in September of the same year. The new factory is expected to be put into the processing and production of dies for fuel cell separators and aspheric lenses, etc. (Nikkan Kogyo Shimbun, September 13th, 2011; Nikkei Sangyo Shimbun, Kumamoto Nichinichi Shimbun, September 14th, 2011)

## 12. Technology and Business Development of FC and Hydrogen-related Measurement and Observation Techniques

(1) SII NanoTechnology Inc.

On August 30th, measurement and analysis instrument manufacturer SII NanoTechnology Inc. (SIINT, Chiba), a subsidiary of Seiko Instruments Inc., announces the completion of its new automated inspection system for lithium-ion battery and fuel cell manufacturers, which enables rapid detection and elemental identification of metal contaminants approximately 20um in diameter. It is said that the new system can significantly improve the operator's working efficiency by integrating the X-ray inspection apparatus, the elemental analyzer and the optical microscope in one system. The system is targeted at manufacturers of lithium-ion battery and relevant components. Elemental, quantitative and qualitative (i.e. sizes) identification of metal contaminants is performed automatically by the fluorescence X-ray method when electrode plates and/or insulators are loaded into the system, requiring no preprocessing, so it can provide simplified troubleshooting and sample inspection. The price of standard version is expected

to be around 50 million Yen. (Nikkei Sangyo Shimbun, Kagaku Kogyo Nippo, August 31st, 2011)

(2) IHI Inspection & Instrumentation Co., Ltd.

IHI Inspection & Instrumentation Co., Ltd. under IHI Group has introduced its fuel cell evaluation equipment into the market, which is designed to optimize the pressure, volume, temperature, humidity and other parameters of Hydrogen and Oxygen supplied to fuel cells and supposed to operate under various conditions, from cold area to warm area. In light of the fact that the performance of fuel cells may be dramatically influenced by many factors, e.g. dew-point temperature, temperature and back pressure of the reaction gas, such equipment is required to bear high responsibility. The newly released equipment is integrated with the company's long-term expertise in control technology and other technologies, such as humidifier technology. Up to now, more than 110 sets of such equipment have been delivered, mainly to major manufacturers. The company plans to facilitate the promotion and achieve a sales volume of 150 sets by 2015 by leveraging its advantage in product customization based on customer requirements. (Kagaku Kogyo Nippo, September 21st, 2011)

- This edition is made up as of September 26, 2011 -

## A POSTER COLUMN

### Development of Fuel Cells That Can Work During Power Outage

JX Nippon Oil & Energy Corporation (JX NOE) has developed a residential fuel cell system which is integrated with storage battery system and thus can work during power outage. At the same time, Tokyo Gas Co., Ltd. is also pursuing the development of fuel cell-combined external batteries. During the implementation of planned outage after the Great East Japan Earthquake, fuel cells all stopped working due to the activity of the build-in function to prevent the power of fuel cells from flowing into power transmission lines. In view that residential fuel cells are extensively anticipated to be effective dispersed power sources, the interested companies are focusing on improving the revealed weak points.

JX NOE has set a goal to release lithium-ion battery-integrated fuel cell systems in next summer.

The new system will eliminate the disadvantage of existing fuel cell systems that causes them stop working during power outage and can operate continuously as long as fuel gas is supplied.

For this purpose, the company developed a set of 6kWh storage battery, consisting of 90 China-made lithium-ion batteries normally used in personal computers. The storage battery was tested by combining with a fuel cell system under simulated outage condition and the integrated system was proved to be able to automatically switch to supply power stored in the storage battery without disruption. The performance degradation of individual lithium-ion battery in the storage battery set can be remotely monitored while the maintenance of the whole set will be supported by retail stores. The storage battery set will also include a ten-year manufacturer guarantee like the full cell systems.

The cost of such storage battery set will be controlled within 1 million Yen. For the anticipated storage battery-integrated fuel cell system, the buyer will need to pay about 2.6-2.7 million Yen depending on the 2012 subsidy policy. JX NOE has planned to sell 4000 fuel cell systems in 2012, half of which is expected to be storage battery-integrated type.

Tokyo Gas is also engaging in developing backup external batteries for the fuel cell system with an objective of offering such products as an option. Besides, Osaka Gas Co., Ltd. also shows concerns and prospects in this field.

(The Nikkei, September 8th, 2011)

#### Forecast of New Energy Industry Research Institute of Ministry of Economy, Trade and Industry: Global New Energy Market Will Reach 86 Trillion Yen

On September 16th, the New Energy Industry Research Institute (NEIRI) of Ministry of Economy, Trade and Industry has agreed to a readjustment plan regarding the future of new energy industry. The scale of global new energy market, such as solar and wind energies and storage batteries, is estimated to increase to 86 trillion Yen (about 1.12 trillion USD) in 2020 - 2.8 times increase within a decade. The percentage of exports of new energies will reach 30.5%, higher than that of auto-related industries (27.9%\*).

Japan will enforce the Compulsory Surplus Renewable Energy Self-Purchase Policy in July next

year. Meanwhile, the pouring in of cheap foreign products, e.g. China-made solar panels, has resulted in the decrease of equipment costs. Under these situations, NEIRI has presented several essential policy issues to reinforce the policies towards 6 sectors in the new energy industry: 1) solar energy, 2) wind energy, 3) solar heat, 4) storage batteries, 5) fuel cells, 6) energy-saving houses and buildings.

As environmental regulations are increasingly stringent, U.S. and U.K. are accelerating the construction of offshore wind power plants. Although the utilization of offshore wind energy is challenged by high cost, corrosion of materials and other difficulties, NEIRI pointed out that "such difficulties could be easily overcome with our technical advantages" and showed an aggressive attitude towards offshore wind energy. NEIRI also raised the necessity of development and verification of "energy storage system" which could help to reduce the load of solar and wind power generation systems in terms of storage batteries.

With the implementation of the Compulsory Surplus Renewable Energy Self-Purchase Policy, it is estimated that, merely in the solar power generation sector, 448,000 employment opportunities will be created as of 2020. "In order to be competitive in overseas markets, companies are required to strategically enhance their abilities to analyze and understand the market and improve their cost competitiveness," indicated NEIRI.

\*Note: The percentage of exports of passenger cars only will be 52.9%.

(The Nikkei, September 17th, 2011; the Asahi Shimbun, September 19th, 2011; the Nikkan Kogyo Shimbun, Kensetsu Tsushin Shimbun, The Chemical Daily, September 20th, 2011; Nikkan Jidosha Shimbun, September 22nd, 2011)