Spreading the sets of FC, solar cell and storage battery

Arranged by T. HOMMA

1. National Policies

(1) Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

On August 1 Ministry of Land, Infrastructure, Transport and Tourism published the result of the 55th Fire Prevention Subcommittee of International Maritime Organization (IMO) held in July August. Though the concrete plan of the rule maintenance for the safe transport by sea of hydrogen fuel FCV and natural gas vehicle (NGV) to which development has been advanced in the automobile industry as a vehicle with small environmental burden has been almost taken together, brings a concrete idea together; finalization was let pass due to the difference of the transportation frequency by Pure Car Carrier (PCC) and the ferry. The gas such as hydrogen used for the fuel in hydrogen FCV and NGV is lighter than air, and IMO Marine Safety Council agrees on settling on the standard added to the transportation safety standard of an existing gasoline automobile and the diesel car through the examination result centering on the Japanese Marine Technology Research Society. Though in this meeting the rule maintenances such as ▽making the electrical machinery and apparatus for excluding ignition source an explosion proof type, ▽doubling the CO_2 capacity when installing fire extinguishers which use CO_2, and ▽installing the handheld type gas detector inboard were roughly agreed, they were not concluded by pointing out of the low transportation frequency of the next generation type cars such as FCV compared with PCC and it has been decided that they would be discussed continuously by the next meeting. (The Japan Maritime Daily, August 2,'11)

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

Ministry of Economy, Trade and Industry announced the adoption result of promotion project of domestic location of the innovative low carbon technology intensive industry on August 8. It is to support the domestic location of low carbon product where great CO_2 reduction effect of CO_2 is expected in use of innovative technology. This project aims to evade the de-industrialization, and promote the growth of the low carbon industry. The investment in the first line that introduces the innovative technology for the first time in the green technology field is targeted and 1,500,000,000 yen at maximum is assisted with 1/3 to the big enterprise and 1/2 to the small and medium-sized enterprise. Among 48 numbers of applications for subsidy 22 were adopted. Among 22 numbers of applications 4 are from the small and medium-sized enterprise, and by field there are each 4 numbers of applications in eco-friendly car parts, solar battery-related, lithium-ion battery (LIB)-related, and energy-saving type information equipment-related.

Items of LIB-related materials of Toda Kogyo and Kansai Catalyst Chemistry, materials related to the solar battery of SUMCO, and the capacitor of Nippon Chemi-Con and the Toshiba FC system and Toshiba finance FC field were adopted. (The Chemical Daily, August 9,'11)

(3) Science and Technology Basic Plan

The government decided the fourth stage Science and Technology Basic Plan in the cabinet targeted on 15 fiscal year from 2011 till 2015 on August 19. This plan makes much account of the science and technology innovation policy to achieve the restoration from the East Japan Great Earthquake to accomplish continuous growth, and its theme is divided to 1) achievement of restoration and the rebirth from suffering, 2) green innovation targeted on the environment and energy and 3) the life innovation targeted on the medical treatment, nursing, and health. This plan states improving rapidly the existing technology and acquiring the innovative

technology such as photovoltaic power generation and algal biomass in terms of renewable energy especially in green innovation, promoting research and of development of hydrogen supply system and power transmission by superconductivity, and smart grid in addition to FC and storage battery in decentralized energy, and moreover promoting the research and development of zero emission combined with integrated coal gasification combined cycle (IGCC) and carbon dioxide capture and storage (CCS) for high effectiveness and low carbonization of the key energy source. While the research and development of nuclear power is executed based on the verification of the Tokyo Electric Power Company Fukushima First Nuclear Power Plant, the disaster prevention research of nuclear power, the radiation measurement, and the treatment of contaminated water etc. are strengthened. (The Denki Shimbun, August 22,'11)

2. Measures by local government

(1) Osaka Prefectural Government

"Osaka eco-friendly car cooperation spread support net", public-private council organized by Osaka Prefectural Government etc. strengthens the enlightenment activity and the information delivery for the spread of the eco-friendly car. It aims to carry out the exhibition and the trial-ride fair of the eco-friendly car besides EV in the event etc.

and provide information on the eco-friendly car to the citizens and the enterprises in Osaka prefecture by homepages and mail magazines, etc., which leads to the introduction of 1,800,000 eco-friendly car by 2020 that are half the number of cars in Osaka. In the eco-friendly car, EV, HV, natural gas vehicle, the clean diesel car, and FCV, etc. are targets. (The Nikkan Kogyo Shimbun, July 27,'11)

(2) Tokyo Metropolitan

Tokyo Metropolitan starts the reception of the application for the business that assists purchasing cost of the residential gas electric power generation water heater and FC on July 29. 100,000 yen per 1 kW output is provided. This project tries to secure insufficient electric power after the earthquake by spread of both systems. This project expects 10,000 applications of the gas electric power generation water heater with the equipment of the standard output 1 kW and 2000 applications of FC with the equipment of the standard output 0.75 kW.

Operating expenses are 1,150,000,000 yen for two years from 2011. (The Nikkei July 29,'11, the Nikkan Kensetsu-Kogyo Shimbun, August 5, Dempa Shimbu,n August 19)

(3) Gifu Prefectural Government

Gifu Prefectural Government raises ideas of the exceptional measures of restriction and support measures of the tax and finance concerning the introduction and the promotion of the next generation energy for the next generation energy promotion special district (tentative name).The next generation energy includes new energy such as the sunshine, wind force, and small scale water power, the innovative technology such as FC and storage batteries and next generation cars such as EV and PHV. The prefecture is scheduled to apply for the appointment of next generation energy promotion special district based on General Special Zone Act this autumn, subject to the promulgation of the Act on June 29. (Architectures, Constructions & Engineerings News (Daily), August 2,'11)

Gifu Prefectural Government starts "Next generation vehicle propulsion conference" with three automaker companies, and five cities in the prefecture for the spread of EV and PHV. The prefecture holds up the target to increase the number of the next generation cars which are 168 (end of March) in the prefecture to 1500 in 2013, and 156,000 in 2020. (Gifu Shinmbun ,August 17,'11)

(4) Hokuriku Green Energy Society

Hokuriku Green Energy Society started charging by field service by the abandoned aluminum dynamo in the ward-managed Kasuga bicycle parking lot in Tokyo Bunkyo Ward on August 1. It is for the motor-assisted bicycle that the district rents, and is made from high-purity aluminum 60g, by which 100WFC can be operated for one hour. This service is executed to the full in August. (Kitanippon Shimbun, Fukui Shimbun, The Hokkoku Shimbun, The Toyama Shimbun, August 2 ’ 11, Nikkei Industrial News August 16)

3. Development of FC element technology

(1) Shinshu University

Associate Professor Nakayama of Shinshu University, Department of Engineering Mechanical System

Engineering Section, developed the separator material for FC using mixture powder added Vapor-Grown Carbon Fiber; (VGCF) to the titanium powder. The normal temperature compression shearing method is adopted as a process, and about twice of the hardness than titanium rolling material in the and about 75% lower contact resistance than it are achieved. Associate Professor Nakayama pays attention to a new titanium that molding and thinning of passage of turbine are possible and lightweight property is excellent by the press molding. Conductivity was improved that was assumed to be a weak point of the titanium by having developed the composite material with titanium and by using VGCF excellent in conductivity. He wants to accelerate the research and development in the future, and start a joint research with the enterprise with FC technology. He aims at the practical use after 2-3 years. (Nikkei Industrial News August 18 The Nikkei Business Daily, August 12,'11)

(2) The University of Tokyo

Professor Nakamura and others of the University of Tokyo and the research team of the National Institute of Advanced Industrial Science and Technology succeeded to observe the appearance that the iron atom promoted the chemical reaction with the electron microscope. They clarified that the catalysis advanced with one metal atom. If this technique is applied to the platinum catalyst, it is useful for the reaction of FC etc.(The Nikkan Kogyo Shimbun, August 23,'11)

4. PAFC business development

Fuji Electric Co., Ltd. donated PAFC"FP-100i" to Tohoku Welfare University Kunimigaoka Campus (Sendai-city). Output is 100kW. The gas electric power generator and the solar battery are set up inside the campus, the private power generation ability is 850kW combined with FC this time, which can cover 80-90 percent of the electric power used inside the campus. There is attached the welfare facilities for elderly people in the campus, and it was donated as part of the East Japan Great Earthquake disaster area support of Fuji Electric considering the electric power securing is needed in the emergency. (The Nikkan Kogyo Shimbun, August 10,'11)

5. SOFC development and business development

(1) JX Nippon Oil & Energy Corporation

JX Nippon Oil & Energy Corporation announced the restoration plan of Sendai Oil Factory (Sendai-city) that struck by the East Japan Great Earthquake on July 28. The production restart which was assumed next summer is moved up at the end of March next year and also the shipment equipment which received the tsunami damage is transferred to the hill in the oil factory. Additionally is photovoltaic generation facility with the output 30kW, three SOFCs of output 0.7kW and the storage battery of 50 kWh in capacity are introduced, which can secure half of used electric power of personal computer and the illumination, etc. and moreover, serve as securing the power supply in the emergency and demonstrating the new energy system at usual time. The total investment for the restoration is expected to be about 50,000,000,000 yen. Moreover, the introduction of 1MW class mega solar is examined in Nishi district where the vacant land is ensured by the transfer of equipment for the shipment. (The Asahi Shimbun, the Nikkei Business Daily, the Nikkan Kogyo Shimbun, the Denki Shimbun, the Hokkaido Shimbun, the Kahoku Shimpo, Iwate Nippo, July 29, '11)

(2) Sumitomo Precision Products Co., Ltd.

Sumitomo Precision Products Co., Ltd. (Amagasaki-city) starts the commercialization of SOFC system for commercial use of the output of power generation 5kW class that city gas is used as the fuel by the end of fiscal year 2011. Several billion yen is invested in the headquarters factory, mass production begins in fiscal year 2013, at the same time 100kW class developing now also on the mass production line, and moreover by OEM supply business for the home is developed to expand to the sales of ten billion yen in 2015 fiscal year. This company has engaged with the development of FC since 2001, and has worked on the joint development with NTT and Toho Gas Co., Ltd. after 2007. Sumitomo Precision Products took charge of the design manufacturing of the power generating unit which became the center. This is composed of the equipment etc. which piled the flat type cells with tens of steps, and the generating efficiency at the highest level in the world was achieved by this joint development. (The Kobe Shimbun, July 30,'11)

(3) Hitachi Metals Co., Ltd.

Hitachi Metals Co., Ltd. developed the material for SOFC "metal interconnector material" which improved the oxygen resistance and strength. As for interconnector (separator is included) the oxygen resistance for a long time at the operation temperature and an excellent conductivity and the performance of thermal expansion coefficient etc. near the electrolyte (zirconia ceramics) are demanded. There were problems such that general stainless steel was insufficient in oxygen resistance, the thermal expansion coefficient of the nickel-base alloy that had the excellent oxygen resistance was large and aluminum additive alloy that had the excellent oxygen resistance was insufficient in the conductivity of oxidized film.

This company worked on the development of the interconnector material which filled these requirement characteristics, developed ferritic stainless steel "ZMG232L" of the principal ingredients iron and chrome in autumn in 2005, and developed interconnector material "ZMG232J3" "ZMG232G10" which had improved conductivity, the oxygen resistance, and strength in addition this time. (The Denki Shimbun, August 11,'11)

6. ENE-FARM business development

(1) Hokkaido Gas Co., Ltd.

Hokkaido Gas Co., Ltd. sells ENE-FARM of the city gas specifications for the first time as city gas business operators in Hokkaido by the end of August. Using the opportunity that we try to review the life that too much depends on the electricity since the Great Earthquake, the company aims at sales of 150 sets every two years opposing all- electric. (The Hokkaido Shimbun, July 27,'11)

(2) Sekisui House Co., Ltd.

Sekisui House Co., Ltd. sold the environmentally friendly type housing "Green First HYBRID" combined with FC, the solar cell and the storage battery on August 8 in the increasing anxiety of power capacity shortage. A large-scale lead storage battery of the power capacity 8.96 kWh is installed, and it is possible to take a bath even when blacking out and it is possible to use the refrigerator of the output 200W and the liquid crystal television of 150W with the illumination of 100W, and the air conditioner of 600W at the same time continuously for eight hours. It is said that the utility bill during year will be decreased about 260,000 yen compared with general housing. As for prices of three batteries except the main body of the housing, the storage battery is 2,000,000 yen, FC is 2,400,000 yen, and the photovoltaic generation 448,000 yen/kW. Using the photovoltaic generation subsidy system of the country, and municipality, using the solar battery of the output 3.5kW, the cost becomes 4,700,000 yen in total. The company aims at sales of 150 housing every three months. (The Yomiuri Shimbun,the Asahi Shimbun, the Mainichi Newspapers, the Sankei Shimbun, the Nikkei, The Nikkei Business Daily, the Nikkan Kogyo Shimbun, Osaka Nichinichi, the Nikkan Kogyo Shimbun, August 9,'11, the Chugoku Shimbun, August 11, the Hokkaido Shimbun, Jutaku-Shinpo, August 16, the Kahoku Shinpo, August 19)

(3) FCA

The accepted quantity (total in 2011 fiscal year) until the limit (July 7) of "ENE-FARM " introduction support subsidy application in 2011 fiscal year which FC Association brought together became 8133 (6959 in city gas specifications and 1174 in LP gas specifications). Newly building accounted for 65%, complete building 35%, and detached house 98.3%. As for more than 500 sets Tokyo:1540, Kanagawa Prefecture:1256, Aichi Prefecture:773, Osaka Prefecture:711 and Hyogo Prefecture:581. This subsidy system had been executed since 2009 fiscal year, and the subsidy to introduce in 2011 fiscal year was 8.67 billion which was 28% more than in 2010 fiscal year and the maximum per one item was 1,050,000 yen. (The Denki Shimbun, August 10,'11)

(4) The Japan Gas Association

"Total installation capacity of the city gas cogeneration system in fiscal year 2010" which the Japan Gas Association had announced on August 9 became 4,532,000kW of 1% Increase compared with the previous year. Increase of 46,000kW in the single fiscal year of 2010 fiscal year. New demand developed in medical facilities and household use and the domestic use such as ENE-FARM was steady. The gas society thinks that there seems large demand in 2011 fiscal year. (Denki Shimbun August 10,'11 Nikkei Sangyo Shimbun August 11)

(6) Tokyo Gas Co., Ltd. and Osaka Gas Co., Ltd.

Tokyo Gas Co., Ltd. and Osaka Gas Co., Ltd. clarified the policy to improve so that ENE-FARM which stopped automatically when blacking out might be used even when blacking out on August 23. Improving the weak point when blacking out leads to the spread. As a concrete point of improvement, Tokyo Gas is reviewing adopting an external storage battery. Whereas the price possibly becomes 1,000,000 yen or more presently, so the cost reduction is the issue. Tokyo Gas plans to market it by the end of current year. While Osaka Gas is reviewing the adoption of the storage battery method, they are researching the mechanism that power generation is stably continued even if the external power source stops after operating with raising the regulation technique. It will be improved by the next summer. (The Mainichi Newspapers, August 24,'11)

(6) Daisho Co., Ltd.

Daisho Co., Ltd. (Osaka-city) starts sales of the detached house and lot "Links garden" installing HEMS with social network service (SNS) function. The system is standard installed the that makes the quantity consumed of photovoltaic generation, EV-correspondent charger for home use, ENE-FARM and electricity, gas, and water visible (The Nikkan Kogyo Shimbun, August 24,'11)

7. FCV&EV front

(1) LG Chemistry Co., Ltd.

LG Chemistry Co., Ltd of South Korea announced that they received the order of next generation battery technology for EV use development project from advanced battery consortium (USABC) of the United States. The contract amount is 0.962 billion, the part of which is provided by DOE besides USABC. USABC is the industry group under United States Council for Automotive Research (USCAR) which promotes the battery development for HV, EV, and FCV. (The Denki Shimbun, August 3,'11)

GM and LG group agreed on jointly carrying out the design and the development of EV. CEO Ankerson of GM is holding up the development of EV to top priority. (Fuji Sankei Business i, August 27,'11)

(2) Suzuki Co., Ltd.

Suzuki Co., Ltd. brought together the outline of the exhibition of "Frankfurt motor show" held in Germany on September 13. 24 kinds of vehicles in total such as FC scooters which have been experimented on the public road in Europe are exhibited. (The Nikkei Business Daily, August 16,'11)

8. Hydrogen production purification technique development and business development

(1) BMW Co., Ltd.

German BMW Co., Ltd. announced that they would begin the research program to convert the reclaimed ground gas into hydrogen recently in the South Carolina State, the United States. They aim at efficient production of the hydrogen supplied for FC etc. The research that hydrogen is efficiently taken out of the gas composed of Methane and CO2, etc. is progressed in cooperation with the state government and the research organization on the site. The production base in the North America region is placed in this state, and BMW constructed the hydrogen storage and the distribution system in the factory last year, and has used them for the power supply by FC. This company states, if we succeed this project, we are switched to the locally produced and consumed energy system of the world-biggest scale. This company is advancing the technology development project to store hydrogen efficiently aiming at the FCV practical use in cooperation with United States DOE. (Denki Shimbun August 8,'11)

(2) Miyazaki University and Niigata University

The industry, government and academia of Miyazaki Prefectural government, the Miyazaki university, Niigata university and Mitaka Kohki.Co., Ltd. (Tokyo) start the system research that refines hydrogen from water using the solar heat in their cooperation. The technology which manufactures hydrogen is established in ten years in the future, which aims at use to FCV and FC, etc. According to Miyazaki Prefectural government they defray 50,000,000 yen and optical instrument maker's Mitaka Kohki.Co., Ltd., and. The prefecture bears the cost of, and it installs the beam down condenser which Mitaka Kohki developed in the Miyazaki University campus in Miyazaki-city by the end of fiscal year 2011. It is the mechanism that the sunshine collected with a lot of plane mirrors displayed to the ground irradiated to the dome-type mirror in the upper part of the tower of ten and several meters in height, and its reflected light is collected with the device in the right under,

and using the solar heat which reaches about 1500℃ hydrogen is refined by the technology which decomposes the water which Niigata University developed. Moreover, about 500 times as much sunshine as usual is collected in the condenser and the solar battery with high generating efficiency is researched and developed. Miyazaki Prefecture of nationwide high rank at number of clear days and hours of sunlight in a year settled on "solar frontier plan" in 2009, and has worked on attracting the mega solar and the promotion of the photovoltaic generation-related industries, etc. (The Nikkei Business Daily and the Niigata Nippo, August 22, '11)

9. Development of FC& hydrogen-related measurement and observation technology

Palmeso Co., Ltd. (Nagaoka-city) jointly developed with Prof. Iwai of Fukui University "MSE (micro slurry jet erosion) testing set" which evaluated the strength on the surface of hard thin-film material such as diamond-like carbon (DLC). The set, throwing the ceramics corpuscle at the material, measuring its wear-out degree, evaluates it by the standard of wearing rate. President Matsubara assumes that it can be used for development and the quality evaluation of the new material. Water and ceramics of 1μm in the diameter are mixed like the slurry, the slurry which contains several hundred million ceramics particles is projected to the material surface by using the compressed air at the speed of 100m/a second, and the surface intensity of each material is shown by the wearing rate. The lower the wearing rate is, the larger the surface intensity is, and it is 0.0002 in the diamond sintering material and about 6.3 in the silicon material in. The phenomenon that the wearing-out degree changes was used in proportion to the size of the particle friction of the material surface. The company considers that the strength of the thin film used for polarized light film of both single-layer and multi layers, lithium-ion battery and FC is evaluated in output by the numerical value. (The Nikkan Kogyo Shimbun, August 26,'11)

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A POSTER COLUMN

Current state of new energy budget of 2011 fiscal year

The Liberal-Democratic Party listened to the current state of the new energy budget of 2011 fiscal year from ministries concerned at the Special Committee for Preventing Global Warming and at the meeting of " the House Steering Committee which advances creating and saving energy for the bright future of Japan".

According to this, the budgetary provision: 51.4 billion yen in the introduction spread promotion, 29.2 billion yen in the technology development and 0.9 billion yen in demonstration, being 81.5 billion yen in total is taken. It was clarified that the budget for the technology concerning only the sunshine occupies the majority, ie. 43 billion of 81.5 billion yen in total budget. (refer to the table)

Ministry of the Environment prepares 6.2 billion yen for businesses of controlling global warming technology development etc. (competitive fund), which targets on the low carbonization technology development of the traffic, the house and the office.

Additionally 0.6 billion yen is appropriated to wind power generation on the sea, 2.4 billion yen to the bio-fuel introduction acceleration business, 0.5 billion yen to the hot spring energy use acceleration business and 0.5 billion yen to the small-scale ground local public body measures technology initiative introduction assistance project such as underground heat utilization and FC using the small hydroelectric or the sunshine not for power, but for the interior lighting.

(Kinyu Keizai Press, August 22,'11)

IGCC and CCS hybrid system which aims at efficiency 60% and CO_2 0

Wakamatsu Laboratory of J Power in Kitakyushu-city is the state-of-the-art technology development base of IGCC: Integrated Coal Gasification Combined Cycle and CCS: Carbon Dioxide Capture and Storage. The project name is EAGLE(Coal Energy Application for Gas,Liquid and Electricity) and around the coal gasification furnace pressure container of 20m in height and 3m in diameter the gas purifier and the gas turbine generator etc. of the output 8,000kW are arranged.

The coal-fired power plant occupies about 1/4 of domestic electric power generation. Assistant head of this laboratory Osono states that hereafter we can do

nothing but to rely on coal in a part to steady supply the electric power. We must advance efficiency as much as possible.
As for the generating efficiency of coal-fired power we aim about 40% on a domestic average, 50% or more by OGCC in addition and 60% or more by using SOFC together in addition. The efficiency of the entire power plant drops a little because the electric power of about several % is used to collect CO2.
(The Sankei Shimbun, August 23,'11)

Table 1 Perspective of new energy measures budget of 2011 fiscal year

Technology development	29.2 billion yen
Sunshine Maintenance of renovation type solar battery international research base	2.1 billion yen
Development of solar photovoltaic system next generation efficient technology	6 billion yen
Biomass Highly effective conversion technology development of bioenergy etc.	2.6 billion yen
Cellulose ethanol renovatitive production system development	2.4 billion yen
Strategic, next generation bioenergy application use technology development	1.6 billion yen
Wind force Next generation wind power generation technology study development	0.8 billion yen
Wind power generation on the sea etc. technology development	3.7 billion yen
Oceanic Ocean energy technology research development	1 billion yen
Storage battery Next generation storage of electricity system practical use strategic technology development	2.5 billion yen
Renovative type storage battery up-to-date science basic research project	3 billion yen
New energy etc. measures storage of electricity system technology development	2 billion yen
Introduction spread promotion	51.4 billion yen
Photovoltaic generation introduction support measures for house	34.9 billion yen
New energy etc. introduction acceleration support measures expenses subsidy	13 billion yen
Renewable energy heat utilization acceleration support measures subsidy	3.5 billion yen