

New ENE·FARM Operates During Power Cuts

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1. Governmental Measures:

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

METI has decided to classify domestic storage batteries as dual generation in the Feed-in Tariff scheme for renewable energy starting from July. Domestic storage batteries are categorized as private power generator which also includes fuel cells, FCs, and gas cogenerations. A household with a photovoltaic generator and storage battery is eligible to 20% lower tariff rate than a household solely with a photovoltaic generator. On the other hand, electric vehicles (EVs) and plug-in hybrid vehicles (PHVs) can provide electricity to home, but are not included in dual generation. This treatment might cause consumers and the industry to complain due to the difference in the rate giving an unfair impression. The tariff rates are 42 yen per kWh for photovoltaic generators only and 34 yen per kWh for a combination of a photovoltaic generator under 10 kW output and a storage battery, following the current scheme which is to buy just excess electricity. (The Nikkan Kogyo Shimbun, June 7, 2012)

METI established "Smart House/Building Standardization and Business Promotion Study Group" in the Japan Smart Community Alliance which aims to promote the concept of Smart Community such as smart grid through government-private sector cooperation, and the first meeting was held on June 22nd. Aiming to formulate a road map by this autumn and to solve all the issues within three years, the study group discussed the agendas to establish standards for smart house related systems and facilities such as selecting and developing the underlying layer of strategic equipment. Photovoltaic generators, storage batteries, FCs and EVs/PHVs were chosen as strategic equipment as well as air conditioners lighting and water heaters. (Daily Construction Newspaper, June 26, 2012; Nikkan Jidosha Shimbun, June 27, 2012)

(2) Ministry of the Environment, MOE

On June 18th, MOE announced that the subsidy rate would be raised to 5% from the current 3% on more, 24 out of 36, electricity saving products subject to "Eco-Lease" which helps smaller businesses to lease energy saving facilities. The higher rate, for the 24 products, will be applied to facilities such as high efficiency air conditioners for business use and kitchen equipment, solar panels and FCs, and available to the applications submitted from 25th. (The Chugoku Shimbun, The Shizuoka Shimbun, June 19, 2012; The Chemical Daily, June 20, 2012; The Mainichi Newspapers, June 25, 2012)

2. Local Governmental Measures

(1) Gifu Prefecture

On June 5th, Gifu prefecture announced an open tender for an operation on the disaster control enhancement experiment by installing next generation energy facilities in a roadside station "Michino Eki", and the proposals will be evaluated comprehensively. With a photovoltaic generator, FC and storage battery combined as a next generation energy providing system, the roadside station "Hoshino Furusato Fujihashi" in Ibigawacho plans to use the electricity for lighting of the car park and building every day and for communication and lighting during power cuts in disasters. The aim of the experimental demonstration is to find out the safety and practicality of the system and an efficient way to operate the facilities together for full scale introduction in the future. (The Nikkan Kensetsu Kogyo Shimbun, June 7, 2012)

(2) Okayama Prefecture

Okayama prefecture has improved its subsidy scheme to promote new energy. New subsidies are set for the fiscal year 2012 for domestic photovoltaic generators, low head hydro generators and EVs to promote and advance these technologies. A subsidy of 100,000 yen applies to a house with domestic solar

panels combined with either a home energy management system (HEMS) or domestic FC when building the house. (The Sanyo Shimbun, June 10, 2012)

(3) Osaka City

On June 13, Osaka city announced its proposal information for the "Leading Urban Eco House Project" to select the contractor. The project is to be an example of houses with advanced facilities such as photovoltaic generators and FCs. The city expects proposals to suggest pioneering housing models for a metropolitan area to fulfill energy saving and low carbon dioxide (CO₂) emission by combining highly efficient facilities and elaborated design as well as energy creation and storage equipment to secure energy with consideration of urban issues. (Architectures, Constructions & Engineerings News (Daily), June 14, 2012; Nikkan Kensetsu Sangyo Shimbun, June 19, 2012)

(4) Tokushima Prefecture

On June 12, Tokushima prefecture revealed its supplemental budget bill for the fiscal year 2012 including new projects: for example, disaster control such as earthquake and tsunami, electricity shortage and suicide-prevention program for the younger generation. As a measure against electricity shortage, 100 million yen is allocated to help smaller businesses, hospitals and welfare facilities to install own generators. The subject for the subsidy is high energy efficient cogenerations, FCs and storage batteries either newly installed or replaced, and a third of the expense is to be provided. (The Tokushima Shimbun, June 12, 2012)

(5) Kyoto City

Kyoto city extended its "Eco Renovation Lease" for the fiscal year 2012. Domestic storage batteries were newly added, and the subjects are, for example, better insulation for windows, exterior walls and roofs and installations of photovoltaic generators, solar thermal utilizing systems, FCs and water-saving toilets. (The Kyoto Shimbun, June 14, 2012)

(6) Yamanashi Prefecture

University of Yamanashi and firms in the Yamanashi prefecture are developing a "Smart Village Plan" to produce clean energy such as photovoltaic generators, FCs and geothermal power to provide all the electricity an area needs. Building a geothermal

power station using the heat from the source of Kofu Yumura Onsenkyo, a hot spring, the energy is planned to be sent to a housing estate in northern Kofu. The houses in the estate are intended to be provided with electricity from an existing large scale photovoltaic generator and low head hydro generators as well as their own generators installed at home. As a start, the university will establish a technology to generate electricity more efficiently over five years. The system, to provide clean electricity within the area, will be created with industry, academia and government cooperation after the technology development. (The Yamanashi Nichinichi Shimbun, June 21, 2012)

3. Business Plan with Solid Oxide Fuel Cell, SOFC, for Business Use

The world largest on-line auction website of US, eBay, announced that a data center would be built with FCs producing clean energy as the main power source in Utah. The generation capacity will be 6MW with 30 units of Bloom Energy's "Energy Server" using bio gas as fuel. The data center will be the largest scale example of FCs utilized in a private firm in US. The firm plans the data center to be operated by mid-2013. (Dempa Shimbun, June 25, 2012)

4. Research on Polymer Electrolyte Fuel Cell Related Element and Business Plan:

(1) Toshiba Fuel Cell Power Systems

On June 25th, Toshiba and Toshiba Fuel Cell Power Systems announced the first shipment of new Ene Farm (polymer electrolyte fuel cell, PEFC) which can generate electricity during power cuts as long as gas is provided. The Ene·Farms have been produced and sent to coal and liquefied petroleum gas providers who sell the FCs to consumers. To start with, Osaka Gas will sell the Ene·Farm from July 1st. Three types will be available, a 700W output unit at independent operation with a switch box which eliminates the need to re-plug the lead from the grid to Ene Farm for water heating during power cuts, a 350W output unit with the switch and a 350W output unit without the switch. (The Asahi Shimbun, the Nikkei Business Daily, the Chemical Daily, June 26, 2012; the Nikkan Kogyo Shimbun, June 27, 2012)

(2) Tokyo City University

Honorary Professor Koichi Kobayashi of Tokyo City University has established a method to improve the durability of platinum catalysts for PEFC electrodes without rare metals such as ruthenium. Carbon nanotube (CNT) electrodes coated with titanium oxide become 1.2 times more durable than non-coated carbon electrodes. Approximately 60 nm thick CNTs (cylindrical carbon molecules) are coated with approximately 10 nm thick titanium oxide, and then platinum particles are fixed on the CNTs. A non-coated electrode showed 23% deterioration rate at 2,000-time cyclic voltammetry which measures electrochemical reaction. On the other hand, a coated CNT electrode exhibited only 7% deterioration rate. Current-voltage characteristics of the coated CNT electrode were the same level as a platinum-ruthenium-alloy coated CNT electrode. These results show a possibility to reduce amount of rare metals used in electrodes. Currently the performance as a cell is lower than that of carbon black, the common material, but Dr Kobayashi aims to commercialize by the end of 2012 with further improvement. (The Nikkan Kogyo Shimbun, June 26, 2012)

5. Business Plans for Ene·Farm & Home Energy Management Systems

(1) Sekisui House

On May 30th, Sekisui House announced that a "Domestic Credit" certification had been acquired based on the CO₂ emission reduction achieved by its house owners, Green First Club members, with photovoltaic generation systems and FCs. 272 tons of CO₂ was saved by the end of November, 2011, and that was certified by the 25th Domestic Credit certification committee. Run by METI, Ministry of the Environment (MOE) and Ministry of Agriculture, Forestry and Fisheries (MAFF), the Domestic Credit scheme is to certify a reduction amount of greenhouse gas which can be exchanged in emissions trading. (Jutaku Shimpo, June 5, 2012; the Nikkan Kensetsu Kogyo Shimbun, June 15, 2012)

On June 14th, Sekisui House announced that a six-story apartment house would be completed to sell by May 2013 in Chuoku, Fukuoka city. The apartment house has nine units inside and each unit has a domestic FC on the balcony to supply each

household with electricity. The domestic FCs are designed to be installed for houses but will be converted for balcony use to withstand earthquake as a joint effort with Seibu Gas. (The Mainichi Newspapers, June 15, 2012; Jutaku Shimpo June 23, 2012; Architectures, Constructions & Engineerings News (Daily), June 27, 2012)

(2) Takushin

Takushin, a developer of Shiga prefecture, will build a smart community "Lake Biwa Smart Commons" with consideration given to low carbon society blending into the local community, environmentally friendly and resistant to disasters. The gross development area is 118,990 m². Currently the first block is being prepared for construction, and the preparation is planned to be finished by the end of this year. The second block will be prepared from July to be completed by February 2013. After an opening ceremony in early May, 2013, houses and facilities will be constructed. The houses will have photovoltaic generators, domestic FCs and charging equipment for EVs. (Architectures, Constructions & Engineerings News (Daily), June 5, 2012)

(3) Soken

Soken, a midsize house seller of Osaka city, will sell 86 housing lots of "Luna Sanda Smart Town Yurinokidai" in Sanda city, Hyogo prefecture. Gas and electricity bills can be reduced by 88% each year with a photovoltaic generator, Ene·Farm and light emitting diodes, LEDs. A house with solar panels, Ene·Farm and HEMS is around 40 million yen. (The Asahi Shimbun, June 7, 2012; the Sankei Shimbun, June 23, 2012)

(4) The Japan Research Institute, JRI

On June 15th, JRI has compiled policy proposals to achieve "Smart Residential Square, SRS" where neighboring houses share electricity generated by independent power sources in the area. The proposals suggest that energy related firms be ready to provide new services for electricity deregulation to boost the energy related market. The concept of SRS is a residential area which has a single contract with an electricity supplier instead of individual households having their own contracts. The houses have independent power sources, and all the generated electricity is controlled together with the power from the grid. Also, the control system provides additional

information such as security and local activities thought the same network. In another word, SRS is a system proposed for a group of houses to share power between them including high voltage electricity from the utility company with a single contract between the group and the supplier and distributing electricity both ways through power cables. With photovoltaic generators, fixed storage batteries, FCs and batteries on EVs, the power from independent source is shared in the community to control variable consumption as well as improving in securing energy during disasters as extra value. JRI also suggest the certification scheme for the system to prevent solo operation of generators be improved for safety. (The Denki Shimbun, June 18, 2012)

(5) JX Nippon Oil & Energy

JX Nippon Oil & Energy will expand its new energy business as twin cores for home and industry. For home, independent energy systems will be promoted by combining three forms of batteries SOFC type Ene·Farm, photovoltaic generator and storage battery. Also, 1,000 energy analysts will be developed in the firm by 2013 to evaluate devices and performance of houses. For industry, the disaster resistant filling station will be promoted by adding 12 stations on the pacific coast by the fiscal year 2013 as energy stations for the area. (The Chemical Daily, June 19, 2012)

(6) Osaka Gas

On June 25th, Osaka Gas announced that Ene·Farm which generates energy during power cuts would be sold from July 17th. Jointly developed with Toshiba FC system (Yokohama city) and Chofu Seisakusho (Shimonoseki city), the product has a small switch which automatically changes its power source from the grid to the Ene·Farm itself once the grid stops providing electricity. A liquid crystal display TV, a laptop and a fan can be powered at same time by the product outputting 350 W at a power cut. The suggested retail price is approximately 2.8 million yen which is approximately 200,000 yen more than the existing model. (The Yomiuri Shimbun, the Asahi Shimbun, the Mainichi Newspapers, the Sankei Shimbun, the Denki Shimbun, the Kobe Shimbun, the Kyoto Shimbun, the Chugoku Shimbun, the Yamaguchi Shimbun, June 26, 2012)

(7) Toho Gas

Toho Gas will start a house renovation business by

the beginning of 2013. A kitchen and bathroom can be renovated by them as well as living and bed rooms. Toho Gas promotes Ene·Farm and gas hydronic underfloor heating satisfying both comfort and energy efficiency to home owners for renovation. (The Nikkan Kogyo Shimbun, the Chunichi Shimbun, June 27, 2012)

(8) Yamaman

Yamaman, Tokyo, plans build some 2,000 smart house within 10 years in the large housing area "Yukarigaoka" under development in Sakura city, Chiba prefecture. Photovoltaic generators, FCs and HEMSs are the standard features and domestic storage batteries are to be added. Additionally, Yamaman will promote smart houses in other areas. (The Nikkan Kogyo Shimbun, June 28, 2012)

6. Cutting Edge Technology of FCV & EV:

(1) EVs in Hillclimbing Race

Japanese automobile related firms are entering the hillclimbing race with EVs held in Colorado in July. The teams are not only trying to win, but also taking part in the competition as a part of technology development. Motorsport may improve EV performance dramatically. Mitsubishi Motors decided to send two types, a consumer car "i-MiEV (or Mitsubishi i in North America)" and "i-MiEV Evolution", which is i-MiEV converted for racing, to the Pikes Peak International Hill Climb. Team Yokohama EV Challenge of Yokohama Rubber will attempt to improve fuel efficiency with its eco tires. Mitsubishi Heavy Industry supports Nobuhiro Tajima, a 7 time winner of the race, with its high output battery, with impressively improved output characteristics, to provide a large amount of current instantaneously. The data from the battery at the race will also be used for development at Mitsubishi Heavy Industry. (The Tokyo Shimbun, June 5, 2012)

(2) Mazda Motor

Takashi Yamanouchi, the president of Mazda Motor, announced the technology of its rotary (Wankel) engine, RE, would be applied to the auxiliary generator of EV to be leased next year although the production of its RE would be end in June. Taking advantage of its RE using hydrogen to extend the driving range, Mazda aims to double or more the cruising distance of the existing EVs. (The Nikkei,

June 6, 2012; Nikkan Jidosha Shimbun, June 8, 2012)
(3) Nissan Motor

Nissan Motor will start a system to create CO₂ emission credit with its EV "Leaf" within June. Using the "Domestic Credit Scheme" administered since the fiscal year 2008 by METI, a credit of about 10,000 tons each year is planned to be sold with the cooperation of Leaf owners and used to install more quick charge facilities. The independent committee operating the credit scheme authorized Nissan Motor's proposal to reduce CO₂ by promoting EVs and cutting down petrol-fueled vehicles as the credit. In the calculation, an EV saves 0.9 tons of CO₂ that a petrol-fueled vehicle emits each year, which will become Nissan Motor's quota. Approximately 12,000 units of Leaf were cumulatively sold in Japan by March 2012. (The Nikkei, June 9, 2012)

(4) Sales and Demonstrational Experiment of Micro EVs

On June 18th, Ministry of Land, Infrastructure, Transport and Tourism, MLIT, held a demonstrational test driving of microcars which take one or two people. The ministry will compile performance guidelines for microcars by mid-June and establish an authorization system for microcars to be able to run on public roads in a limited area by this summer. Toyota Auto Body, a manufacturer of micro EVs, plans to sell a new single-seater EV "Coms" for less than 700,000 yen in June and to develop it further to a two-seater EV. Nissan Motor has carried out a demonstrational experiment with a two seater EV that Renault, a partner of Nissan, sells in Europe. (The Nikkei, June 19, 2012)

(5) Toyota Motor

Toyota Motor and BMW of Germany will expand their cooperation in the environmental conscious technology. Toyota Motor will contribute a wide range of its advanced zero-emissions vehicle technologies such as hybrid vehicle system and FCV, which would be the first time for Toyota Motor to give its FCV technology to another firm. Having achieved an outstanding ultra-lightweight body with carbon fiber, BMW will provide its lightweight solution to improve fuel efficiency. Having agreed on supplying diesel engines and joint research for lithium ion batteries, both firms decided to go further with sharing core technologies in environmental conscious technology to build a

stronger partnership. On June 27th, BMW revealed that the talk on a partnership between GM of US had been dropped. Akio Toyoda, the president of Toyota Motor, announced its joint press conference would be held in Germany with Norbert Reithofer the Chairman of the Board of Management of BMW, on 29th. (The Asahi Shimbun, the Nikkei, the Tokyo Shimbun, the Kyoto Shimbun, the Chugoku Shimbun, the Nishinippon Shimbun, the Hokkaido Shimbun, June 25, 2012; the Yomiuri Shimbun, the Mainichi Newspapers, the Sankei Shimbun, the Nikkan Kogyo Shimbun, Nikkan Jidosha Shimbun, Kanagawa Shimbun, the Shinano Mainichi Shimbun, Fuji Sankei Business i, the Niigata Nippo, the Kahoku Shimpou, June 26, 2012; the Mainichi Newspapers, the Nikkei, the Nikkei Business Daily, the Shizuoka Shimbun, June 28, 2012; the Sankei Shimbun, Nikkan Jidosha Shimbun, June 29, 2012)

7. Demonstrational Experiment on Hydrogen Filling Station:

On June 20th, the Research Association of Hydrogen Supply/Utilization Technology, HySUT, announced a demonstrational experiment of hydrogen filling facilities would start in existing petrol filling stations from February 2013. Automakers and oil and gas companies form HySUT. Collecting data from the new facilities as a marketing demonstration for larger scale operation, HySUT plans to install 100 hydrogen filling stations in four urban areas by 2015 prior to the promotion for FCVs starting in the same year. The experiment will be performed in spare space in two petrol filling stations of JX Nippon Oil & Energy until March 2016. A hydrogen filling station in Ebina city, Kanagawa prefecture, will receive hydrogen from a production plant in Yokohama city. The other station in Nagoya city will use liquefied petroleum gas from a petroleum refinery to produce and compress hydrogen on site. With a filling pressure of 70 MPa, a FVC is filled in approximately three minutes, which is roughly the same as filling a car with petrol. (The Nikkei Business Daily, June 21, 2012; the Denki Shimbun, the Chemical Daily, June 22, 2012; the Nikkan Kogyo Shimbun, June 26, 2012)

8. R & D on Technology of Transporting & Storing Hydrogen:

Kyushu University has succeeded to transfer liquidized hydrogen by a superconductive pump system. The research was funded by New Energy and Industrial Technology Development Organization, NEDO, as Grant for Industrial Technology Research which supports young researchers and is now known as "Leading Industrial Technology Creation Project". Using magnesium diboride (MgB_2) wires becoming superconductive, no resistance, in liquidized hydrogen, the pump operates at maximum 1,800 rpm with inverter drive. Liquidized hydrogen was transferred by the impeller attached motor at 900 rpm at the experiment as well as 6.5 L/min at 1,800 rpm. With further development, the technology should advance an easy transfer of liquidized hydrogen to FCV fuel vessel by a pump put inside a hydrogen storage tank. (Nikkan Jidosha Shimbun, June 30, 2012)

9. Development and Business Plan of Direct Methanol Fuel Cell, DMFC

Fujikura will establish a laboratory for FC development on July 1st. The laboratory will also research the market for early commercialization as well as development. Having been supported by NEDO, the firm created DMFC taking liquid fuel. (The Nikkei Business Daily, June 28, 2012)

10. Research Findings of Microbial Fuel Cell, MFC

(1) The University of Tokyo

The research group, including Professor Kazuhito Hashimoto of the School of Engineering at the University of Tokyo, has revealed that energy was released by electrons transferring between different species of microbes through conductive minerals. Magnetite, an iron oxides, particles added to two types of microbes *Geobacter furreducens* and *Thiobacillus denitrificans* living in soil together, which exhibited 10 times or faster metabolic speed than without any additives. Using magnetite as wire to conduct electrons, the two microbes helps each other to metabolize. The study may help to improve efficiency of biogas and MFCs using metabolites of microbes as fuel. (The Nikkan Kogyo Shimbun, June 5, 2012)

(2) Maezawa Kasei Industries

Maezawa Kasei Industries has developed a MFC generating electricity and treating sewage at same time. MFC is a technology to produce electricity by a

cyclical process of microbes taking electrons from organic compounds and consuming the organic compound in the reproduction process, which is anaerobic microbe's decomposition of organic compounds in activated sludge. This technology may stop sludge increasing by extracting electrical energy from the microbe's reproduction energy. Focusing on hydrogen ion supply to air-cathode, Maezawa Kasei Industries improved current value and processing and generating efficiency by controlling the pH of air-cathode, while others concentrate on efficient oxygen supply and platinum catalyst usage. The MFC is planned to be commercialized as an appealing next generation water treatment system within two to three years with further development for reducing costs and increasing the scaling. (The Chemical Daily, June 8, 2012)

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A POSTER COLUMN

Heading Towards Environmentally Conscious "Smart Community"

Environmentally conscious communities are spreading in the Kinki (Kansai) area, to using energy, such as electricity and heat, more efficiently in a community. Following on the heel of Kansai Science City, a demonstrational experiment will start in Sakishima, Osaka prefecture from December to share EVs with a management system. The providers will be determined through a public tender in July, and they will develop an energy management system. Quick chargers and photovoltaic generators to be temporally installed at places, such as a school, as EV stations, the system will be tested by around 10 people with around five EVs.

To find out the best time period to charge the EVs and more effective ways to use electricity from the grid and photovoltaic generators, data will be collected on driving speed, power consumption and charging history of EVs to be analyzed as well as a generation chart of solar panels by weather and time.

Smartphones will be provided to the testers to access to the information on charging facilities to book and

confirming status. Additionally, electricity will be sent from EVs to the grid through the chargers as a test for electricity shortage during disasters. All the results of the experiments will be compiled into a report by the end of the fiscal year 2012.

Osaka city and prefecture decided to promote the smart community as a part of Special Zones for Kansai Innovation International Strategy which was designated by the state in 2011. (The Nikkei, June 26, 2012)

"Green Growth Strategy" to be the Key for Economic Recovery of Japan

Japanese Government has revealed an outline of its key plan for economic recovery "Green Growth Strategy" to be compiled by the end of July. The strategy aims to reduce the costs of large storage batteries by half by 2020 and to support storage battery installation combined with photovoltaic generators to promote the technology on next generation energy to expand in the market. Storage battery, zero-emissions vehicle and offshore wind power are to be supported as three main targets.

To promote large storage batteries which are some 100 million yen, the cost is planned to be lowered from current 40,000 yen to 23,000 yen per kWh. Also, safety guidelines will be provided for wind power development in the ocean by the fiscal year 2013 as a preparation of the promotion.

With an infrastructure improvement, EVs and zero-emissions vehicles are planned to increase their ratio from the current 20% to 50% in the new vehicle sales by the fiscal year 2020. By assisting technology development of private firms, the strategy aims to install two million new units of normal charger and 5,000 units of quick charger through the country as well as doubling the EV driving range of currently 200 km by improving storage batteries on cars. The share of EV and PHV, the next generation zero-emissions vehicles, is planned to be increased from currently less than 1% to 20% in the new vehicle sales. A scheme will be prepared for promoting microcars taking one to two people. (The Nikkei Business Daily, July 4, 2012)