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METI Promoting IGFC

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1. Governmental Measures

(1) The Liberal Democratic Party of Japan

On June 9th, the Committees for Achieving Positive Economic Growth Cycle of the Liberal Democratic Party of Japan revealed its draft of suggestions for the growth strategy to be revised by the government. The committee makes a request to raise the domestic market share of fuel cell vehicles (FCVs) to 3% by 2030. The number of automobiles in Japan is currently 80 million. FCVs run on electricity produced by the chemical reaction of hydrogen and oxygen, and Toyota recently started commercial sales of this kind of vehicle. The committee intends to promote technological innovations by using low-carbon technologies. (The Nikkei, June 10, 2015)

(2) METI

The Ministry of Economy, Trade and Industry, (METI) will start research on commercialization of "hydrogen power generation" using thermal power plant of natural gas of a utility firm next year. Their aim is to carry out experiment by 2020 to sort out issues to be solved for commercialization. They will examine turbines of gas thermal power plants nationwide to find out a befitting facility to mix hydrogen in natural gas for experimental power generation. A small-scale facility is also under consideration to be built for the experiment in case that there are no established plants suitable for the experiment. For thermal power generation, hydrogen costs more than other fuels such as coal. Mixing hydrogen in natural gas for power generation reduces the amount of hydrogen and the costs. Japan does not yet have a large-scale hydrogen power plant. In last October, the ministry launched a committee of experts to carry out investigation for commercialization of hydrogen power generation. Their support also goes to technological development of businesses for hydrogen production and transport in order to bring hydrogen purchase costs down. The ministry intends to prepare an environment to distribute electricity generated by hydrogen by 2030 by sorting issues out for commercialization through experiments. (The Nikkei, June 16, 2015)

METI will promote next generation of thermal power generation, especially coal power generation which is expected to be used more, to reduce the amount of fuel. Commercialization is planned for a new facility to achieve 20 to 30 % reduction in greenhouse gas emissions by 2020 compared to the most advanced plants commonly used. On the other hand, the ministry will tighten the regulations on construction to avoid less efficient coal power plants. On June 16th, the plan was revealed at the first meeting of the "Committee for Early Commercialization of Next Generation Thermal Power Plant". A roadmap will be made for the commercialization with actual measures in July. Integrated coal gasification combined cycle (IGCC) is a new technology, and extracts gas from coal to be used in its power generation. METI's estimate shows that this technology can reduce greenhouse gas emissions by 20% compared to common power generations. Additionally, research will be carried out on integrated coal gasification fuel cell combined cycle (IGFC) which has even higher generation efficiency than IGCC in order to be commercialized by 2030. The ministry will investigate systems to bury greenhouse gasses coming from thermal power plants underground or to use captured greenhouse gasses as a material for chemical products. Development of a gas turbine fuel cell combined cycle (GTFC) will start as a part of liquefied natural gas (LNG) power generation. An expert working group will be launched soon to study to control constructions of coal power plants by tightening the Act on the Rational Use of Energy. The aim of tightening this law is to replace less efficient power plants with highly efficient ones by rejecting construction plans of facilities which do not

meet the standards of generation efficiency set by the law. (The Nikkei & The Denki Shimbun, June 17, 2015; The Denki Shimbun, June 23, 2015)

METI will relax the regulations on stationary FCs for industrial purposes. FCs are power generation systems using a chemical reaction of oxygen and hydrogen which is commonly produced from natural gas, and are used as independent power sources for offices or factories. This system advantageously emits less CO_2 during the power generation. The ministry plans to back up the market by significantly simplifying the process for installation and monitoring system. On June 26th, a draft will be revealed at the meeting of the Electric Power Safety Subcommittee of the Industrial Structure Council. Once the experts agree on the draft, the regulations will be eased by amending related ministerial ordinances by the next financial year. One of the keys is to simplify the installation process. Currently an operator has to apply for governmental approval of FC installation with a 500 kW generation capacity or more with the construction plan. This approval process takes two month, which hinders these installations. The ministry is considering cutting down the process for facilities which consists of multiple units of FCs with a total output from 500 to fewer than 2000 kW by omitting submission of plans, which would reduce the pre-installation period to several days. The regulation on monitoring will be revised. Currently a warden must be watching the FCs which are largely pressurized during power generation around the clock. The revision will allow remote monitoring of FCs which are produced with established technologies and output less than 300 kW. This change significantly reduces work of operators by removing obligation of close attendance. METI supports research and development of businesses and research institutes to improve technologies of hydrogen power generation, and market entries of highly efficient FC systems for industrial purpose by FY 2017 (The Nikkei, June 26, 2015)

METI will relax technical standards and their guidelines for thermal power generation facilities, and collect useful knowledge worldwide. Thermal power generation has been widened its range with development of biomass, hot spring/geothermal and FCs in progress, and the ministry will commission a review of the technical standards and guidelines during the 3 year period from FY2015. With this research, their aim is to achieve more effective electric safety by using more new knowledge and technology of Japan and oversea. (The Denki Shimbun, July 3, 2015)

(3) NEDO

In June, the New Energy and Industrial Technology Development Organization started a development project of a system to use hydrogen energy which is produced oversea, stored and transported to Japan. In cooperation of major plant engineering and general contraction firms, the project aims to achieve a large-scale power generation using hydrogen. The project members are leaving competition among them behind and trying to establish the world's first hydrogen supply chain together. "Some of the participants are competitors in their market, but they are working on realizing a hydrogen society with all Japanese expertize" said Mr. Munehiko Tsuchiya, an executive director of NEDO at the press conference on June 9. The system development will last six years to FY 2020 with a total project cost of ¥40 billion. The participants are seven firms including Kawasaki Heavy Industries (KHI) and Chiyoda Corporation. (The Nikkei Business Daily, June 23, 2015)

(4) MLIT

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has decided to ease the regulations on usage of sidewalks and roadside stations "Michinoeki". This change aims to vitalize communities and industries by allowing these facilities to be used more by cafés/restaurants and hydrogen refueling stations. The ministry plans to discuss deregulation in a council meeting to implement the change in FY 2016. The usage of the sidewalks and roadside stations controlled by the Japanese or local governments are basically limited to traffic access of pedestrians and vehicles, and the use of these facilities for purposes other than that requires permission based on the Road Act. The ministry is considering relaxing the usage regulations so that cafés/restaurants can offer more outdoor tables, and hydrogen refueling stations for FCVs can be installed at roadside stations. On the other hand, the regulations on roads for vehicles are planned to be tightened. New installations of utility poles are to be

controlled more to reduce the number of roadside poles, and multiple road signs are to be unified on a single pole to reduce obstacles on roads during disasters. (The Yomiuri Shimbun, June 27, 2015)

2. Local Governmental Measures

(1) Kyukeiren

The Kyushu Economic Federation (Kyukeiren) has compiled the "Action Plans to Establish Renewable Energy Industry (Kyushu Model)". The plan shows that the organization aims to establish the region as an industrial center for three fields of geothermal/hot spring, ocean and hydrogen energy with actual mid- to long-term objectives such as a number of projects. Kyukeiren considers hydrogen energy as a technology to adjust power output and to deal with temporary excess power of renewable energy. Hydrogen demand is aimed to expand by steadily increasing the number of FCVs and household FCs. As the core, Kyukeiren also plans to support technological progress of local businesses and to develop a model market with locally produced hydrogen to be consumed within the area. The target number of their projects for hydrogen to be produced and used in the region is set 20 by 2020, and the figure is to be increased to 40 by 2030 in total. Also the organization targets a total of 20 hydrogen refueling stations in Kyushu and Yamaguchi to be prepared by 2020. (The Denki Shimbun, June 9, 2015)

3. FC Related Element Technology Research, Development & Business Plans

(1) Kyoto University & Ritsumeikan University

A research group of Prof. Kunio Miki at the Kyoto University and Ritsumeikan University determined the mechanism how microbes synthesize hydrogenases for hydrogen production. This finding reveals how hydrogenases take in a very small quantity of metal in the cells, which is likely to lead to improvement of hydrogen production using microbes. Requiring no oxygen, anaerobes produce hydrogen while breaking down organic matter. These microbes have nickel in their hydrogenases, and nickel in these hydrogenases functions as catalysts to convert hydrogen ions into hydrogen molecules. Hydrogen production technologies are under development using this reaction. However, only small amount of nickel ions exist in the cells, and the detailed mechanism how the microbes incorporate nickel ions into their hydrogenases was unclear. The research team focused on "HypA" and "HypB", proteins, which capture and forward nickel ions. These two proteins were mixed and crystalized to be examined by SPring-8. The results indicate that the combination of these proteins bond with nickel ions 600 times stronger than a single type of protein bonding with nickel ions. The microbes seem to efficiently capture a small amount of nickel ions to integrate it into their hydrogenases. (The Nikkan Kogyo Shimbun, June 10, 2015; The Nikkei Business Daily, June 11, 2015)

(2) UEC

The Innovation Research Center for Fuel Cells of the University of Electro-Communications has succeeded high resolution 2-dimentional imaging of platinum catalyst degradation in a polymer electrolyte fuel cell (PEFC) in a simulated operating state. The imaging captured chemical and physical state of the catalyst at the same time. To make catalyst more durable, it is important to find out factors of the degradation and the mechanism through examinations and analyses of catalysts during the reactions. The imaging method is expected to be used for development of highly functional catalysts for PEFCs. The research team captured the image of the chemical and physical state of the catalyst during a FC operation by combining scanning transmission electron microscope (STEM) and 2D scanning X-ray absorption fine structure spectroscopy (XAFS), nano XAFS, system placed in the X-ray absorption fine structure beam line of SPring-8. Nano XAFS allows examining chemical states of platinum nano-particles, such as oxidation state and coordination structure, at a 200 nm spatial resolution. On the other hand, STEM can determine physical states of an individual platinum nano-particle and distribution of the particles. However, samples deform and contract during the measurement, because they are normally placed in a highly vacuumed state. For improvement of catalysts of PEFC, their chemical and physical states need to be analyzed at a same time in the same environment as operating in a cell. STEM measurement is required to be performed in an environment with saturated water vapor, which is the same state in the cell. The team developed a membrane XAFS/STEM measuring cell for the simultaneous measurement of chemical and

physical states. This method allows detailed 2D imaging of nano-hole areas, degraded areas, in a catalyst layer for cathodes with carbon supported platinum nano-particles by nano XAFS and STEM, energy dispersive X-ray spectrometry (EDS) under an environment with saturated water vapor. (The Denki Shimbun & The Chemical Daily, June 12, 2015)

(3) Toray

On July 1st, Toray announced that they acquired German-based FC material developer SolviCore for approximately ¥1 billion. All the shares of SolviCore were bought from two Belgium firms. The German firm develops components for FCs and water electrolysis equipment to produce hydrogen. Toray aims to expand FC related business including hydrogen tanks using carbon fiber. The acquired firm was a joint venture of Umicore, a battery component manufacturer, and Solvay, a resin producer. (The Nikkei, July 2, 2015)

4. Hydrogen Infrastructure Related Technology Development & Business Plans

(1) New Kansai International Airport Company

The previous Kansai Airport operator and the Japanese government were individually carrying out environmental measures, and the New Kansai International Airport Company upgraded these to the "Smart Island Plan" including clean energy use. The key of the plan is the "Hydrogen Grid Project", and currently three actions are in progress. One of them is a commercialization of forklifts using FCs for their power source. Toyota Industries is developing a forklift of Kansai Airport model, and the equipment will be tested in the actual environment from coming autumn or winter. The plan is to introduce a couple of ten of vehicles will be brought into the airport operation each year from 2016, and then the all of 400 forklifts which are currently operating in the airport are to be replaced with FC forklifts by 2025. As another project, Iwatani will start building a commercial hydrogen refueling station this month. The station aims to start its operation in coming January, and would be the largest filling facility in Japan and open to the public as well as supplying the forklifts with hydrogen. Additionally, the airport operator is considering introducing FC busses to connect Kansai and Itami Airports based on results of the experiment of a FC bus carried out from 2012 to 2014. The third action is hydrogen power generation system preparation. A megawatt level system will be installed in the terminal 2 area to provide electricity and heat. (The Nikkei Business Daily, June 9, 2015)

(2) KHI & Others

On June 9th, KHI and Chiyoda Corporation announced that an experiment would start to transport a cheaper hydrogen produced from low grade energy source unused oversea to Japan. Hydrogen energy does not emit CO_2 during power generation, and this project will enable a large-scale production and long-distance transport of hydrogen, which would help hydrogen market growth. The project is subsidized by NEDO governed by METI, and will last for six years to FY 2020. KHI, J-Power and Iwatani will work on development and experiment of hydrogen production from lignite, low-grade coal, in Australia and a special tanker ship to transport liquid hydrogen. Hydrogen is also produced from gas as a by-product at oil refineries, and Chiyoda Corporation will test a technology to process this type of hydrogen to be transported to consuming areas at a normal temperature. Additionally, Mitsubishi Heavy Industries (MHI) and other firms will work on a design of power generator using mixed fuel of natural gas and hydrogen. (The Nikkei Business Daily, June 10, 2015)

(3) Hrein Energy

Hrein Energy, a developer of hydrogen production/storage equipment in Sapporo City, will launch a joint venture to sell hydrogen produced from renewable energy. The new firm plans to sell hydrogen for FCVs to the area outside Hokkaido such as the greater Tokyo area this year. They will promote development of wind turbines by expanding distribution of renewable energy in a form of hydrogen. Hrein Energy, a wind power generation related firm, and a fuel trade house are cooperating to launch the joint venture this summer. Wind turbines will produce electricity to electrolyze water to make hydrogen. Because hydrogen gas is difficult to transport, it will be converted to methylcyclohexane, a liquid, by reacting with toluene for storage and transport. The process level of hydrogen will be 30m^3/h to begin with. (The Nikkei Business Daily, June 12, 2015)

(4) Shimizu Corporation

Shimizu Corporation has developed a simulation system to estimate effects of hydrogen gas explosion. The system calculates how blast pressure affects walls and ceilings and how flames expand. This can be used for facility and structural design to reduce damage and to improve safety. For coming hydrogen society, Shimizu will use the system to design hydrogen related facilities such as a hydrogen refueling station integrated into a building. The system is a numerical fluid dynamics analysis program to estimate air flow and gas dispersion combined with an analysis model to approximate burning process of hydrogen gas. By estimating diffusion of leaking hydrogen, the results give predictions of effect on walls and ceiling moment by moment from catching a fire. The simulation takes one to two weeks for a single pattern. Currently hydrogen storage facilities are installed outdoor. However, these facilities are expected to be installed underground and indoor once hydrogen society is established and an environment is prepared for this. Indoor hydrogen storage system is likely to be used for business use FCs and a hydrogen town of the 2020 Tokyo Olympic and Paralympic village. (The Nikkan Kogyo Shimbun, June 22, 2015)

(5) Osaka University

A research group of Prof. Hikaru Kobayashi at the Osaka University has developed a technology to produce hydrogen using silicon particles which is a waste product made during silicon wafer production. In this special technology, silicon particles were washed and pulverized to less than 10 nm. By mixing the particles in water at a normal temperature, 1 g of silicon particles produced maximum 1600 mL of hydrogen. The group aims to sell the technology for portable FCs and emergency power source using hydrogen. An equivalent of approximately 40% of silicon material is wasted during silicon wafer production for photovoltaic generators. The group made the silicon particles smaller to have suitable physical properties for hydrogen production. Silicon particle surface oxidized as the reaction progresses, which forms a layer on the surface. Once the thickness of the layer reaches 4.2 nm, hydrogen production stops. By using an alkaline solution, more hydrogen is produced before silicon particles form oxidation layers. Nisshin Kasei, Osaka City, has been taking a part in the research, and will cooperate in commercialization of the technology. (The Nikkan Kogyo Shimbun, June 23, 2015)

(6) Toagosei, Tokuyama Corporation & Others

Electrolytic soda manufacturers have joined to projects of local governments to establish models system to use locally produced hydrogen energy. Toagosei joined the "Hydrogen Grid Liaison Committee" set by Tokushima Prefecture to research on establishing a hydrogen supply grid. Tokuyama participates in a project to demonstrate a low-carbon hydrogen supply chain organized by the Ministry of the Environment (MOE), and will cooperate with Shunan and Shimonoseki Cities of Yamaguchi Prefecture for this project. High purity hydrogen is produced as a by-product during the sodium hydroxide production. Because electrolysis plants are spread in Japan, they are potentially good hydrogen supply sources for hydrogen refueling stations. (The Chemical Daily, June 26, 2015)

(7) Toyota Industries

Toyota Industries plans to commercialize a forklift using the same components as Toyota's FCV "MIRAI" by FY 2016. The forklift can be refueled in three minutes, and can continuously operate. These make the forklift more efficient than common electric forklifts. Toyota Industries aims to sell the vehicle to logistics airports and operators. The forklift and MIRAI will share the FCs which are under development, and the commercial version will use components of MIRAI sold as a consumer product to reduce the costs. Because all the components including a hydrogen tank are required to be stored under driver's seat, the control system will be originally developed. Since February, a forklift with previous generation FCs has been tested in the Kansai Airport. In early 2016, a new forklift using the same FCs as MIRAI will be brought to examine durability and performance before commercialization. Kansai Airport plans to introduce 200 FC forklifts by 2020. Toyota Industries aims to deliver 500 vehicles including these 200 for the airport by 2020. The forklift is expected to sell for triple the price of rechargeable one, just under ¥4 million. (The Nikkei, June 27, 2015)

(8) Panasonic

Panasonic will develop a technology to produce

hydrogen easily at home. The system will be connected to panels on a roof to produce hydrogen by using sunlight to split water. Hydrogen will be used for FCs for power generation, heating water and FCV fuel. The firm aims to commercialize the system to supply all the power needed for a household as "post-photovoltaic generator" by 2030. On July 3rd, they held a press conference on hydrogen related technological development in Tokyo. "We will work on the development to facilitate domestic hydrogen infrastructure", Mr. Yoshiyuki Miyabe, the Senior Managing Director of the development, emphasized. Water breaks down into hydrogen and oxygen. However, the common electrolysis method requires electricity, which adds costs to utility bills. Although hydrogen is considered as clean energy, hydrogen production with electricity by fossil fuels "cannot avoid environmental impacts". The key for hydrogen is how to be more affordable and environmentally friendly-to appeal to consumers. Panasonic considers photocatalytic technology as the core. By applying sunlight, the catalysts start to promote the reaction to break down water into hydrogen and oxygen. However, the common catalyst only works under ultraviolet rays which take a very small share of sunlight. They have developed an original "niobium nitride catalyst" which works with visible rays which have the most energy in sunlight, and it exhibited the ability to produce hydrogen. Research on increasing the hydrogen production rate has been carried out in cooperation of NEDO and the Kyoto University since this financial year. Niobium is plenty on the Earth, and has fewer risks of unstable supply and price variation than silicone which is a material of photovoltaic generator. It makes a hydrogen production system simple, which contributes to reducing costs. "We aim to develop a system to supply a household with all the electricity needed except for cars.", Mr. Kazuhito Hato, the General Manager in charge of the hydrogen production/storage technological development said enthusiastically. Common FCs have reformers to extract hydrogen from natural gas. The firm will work on development of a FC system using hydrogen directly at the same time. This will reduce gas bills. Panasonic is leading the technologies to use renewable energy and save energy by investing more in photovoltaic generators, and looks ahead to realizing the hydrogen society promoted by the Japanese government. (The Nikkei, July 4, 2015)

Many firms work on "upstream business" research and development of hydrogen production from oil and natural gas and a large-scale power generation with imported hydrogen. Nevertheless, Panasonic is tackling a "downstream" business with home use products. Each product does not make large profit, but the consumer base for this area is huge. Housing and home appliances can create a synergetic effect. "We aim to create ¥1 trillion businesses with the three areas of water, hydrogen and air by 2030." Mr. Kazuhiro Tsuga, the President in the research and development area, raised the morale of the employees. (The Nikkei, July 4, 205)

(9) Toshiba

On July 3rd, Toshiba announced that an experiment of a supply chain from hydrogen production to power generation with FCs would start in the Kushiro area, Hokkaido. A small-scale hydroelectric power generation will be used to electrolyze water to produce hydrogen which then will be transported to supply FCVs by lorries. This experiment will be carried out in cooperation of Hokkaido and Kushiro City governments for approximately five years until FY 2019. A hydroelectric power plant of 220 kW output will be constructed at the dam in Shiranuka Town, Hokkaido. The planned hydrogen production capacity is 1,000 m^3/day (at 0°C, 1 atm). Iwatani will transport hydrogen. (The Nikkei, July 4, 2015; The Denki Shimbun, July 6, 2015)

5. Ene-Farm Business Plans

(1) Advanced Cogeneration and Energy Utilization Center Japan

The sales of Ene-Farm for FY 2014 ended approximately 38,000 units, a 13.4% increase of that of the previous year. Ene-Farm sales started in FY 2009, and approximately 121,000 units have been sold since. The sales increase was achieved in cooperation of major gas suppliers such as Tokyo Gas and homebuilders. The figures were reported by the Advanced Cogeneration and Energy Utilization Center Japan which is an organization of gas suppliers. Ene-Farm using natural gas achieved 33,278 units, about a 20% rise, but liquefied

petroleum gas (LPG) ones went down to 4740 units, about a 17% decrease. The Japanese government aims at accumulated sales units of 1.40 million by 2020, and more sales promotions are required to hit this target. (The Nikkei Business Daily, June 11, 2015)

(2) Saibu Gas

Saibu Gas is trying to expand Ene-Farm sales. As well as to major homebuilders, their experienced sales representatives will be sent to local homebuilders to increase the sales. Apartment houses are also targeted. Their objective for FY 2015 is set 2,400 units, a 70% increase of that of the previous year to expand the market for the coming electricity deregulation. (The Nikkei Business Daily, June 18, 2015)

6. Cutting Edge Technology of FCVs & EVs

(1) BYD

BYD, a major Chinese automaker, has released a new plug-in hybrid vehicle (PHV) "Tang". This is the third passenger PHV for the manufacturer after "Qin". The firm aim to catch up on automobile sales which currently remains stagnant. (The Nikkei, June 10, 2015)

(2) VW

German-based Volkswagen (VW) and Chinese-based Shanghai Automotive Industry Corporation (SAIC) have signed a partnership for a stronger tie for production, research and development of EVs in China. Shanghai VW, their joint venture in China, will expand the plant to start local production of eco cars such as EVs and PHVs. VW will prepare research and development of eco cars in China. As well as EVs and PHVs, FCV will be included in the research and development range. (The Chemical Daily, June 10, 2015)

(3) Sumitomo Chemical

Sumitomo Chemical will build a new plant for separator which is a key part for insulation of lithium-ion batteries (LIBs) in South Korea. A separator insulates the cathode and anode of a cell. The manufacturer's product has an advantage of higher heat resistance and safety function by a resin film formed on its surface. The new plant will be invested with ¥8 to 9 billion, and its operation is planned to start by 2017. Prior to this, the production capacity will be increased by 30% at the Ohe Works, Niihama City of Ehime Prefecture, by the spring of 2016. The total investment of the both plant is ¥10 billion. Although Won is getting higher, they will use the free trade agreement between the United States of America and the Republic of Korea (KORUS FTA) which aims to eliminate the tariff on automobile parts in order to boost the presence in the market of EV battery parts. The firm plans to deliver the product to the automobile battery plant which is under construction in the US in cooperation of Panasonic and US-based Tesla Motors. The plant will be the first separator production for Sumitomo in South Korea. The production capacity will be 70 million m^2, which is 10% of the world demand. They decided the production in South Korea since material supply and production facilities are ready, and their plants have capacity to increase production of electronic part materials. They take over 30% in the separator market for automobiles, although their share is 5 to 10 % in the whole separator market. (The Nikkei, June 10, 2015)

(4) Mitsubishi Motors

On June 18th, Mitsubishi Motors revealed "Outlander PHEV" which is a PHV and can be recharged through domestic wall sockets. The sales will start on July 9th. This car is sports utility vehicle (SUV), a Mitsubishi's specialty, and drives while generates electricity using front and back motors. Mitsubishi renewed this SUV, which is improved the fuel efficiency by 9% and plated inside and outside for classy feel for the first time in 30 months. "We are introducing this vehicle as the first step to restore Mitsubishi brand." said Mr. Tetsuo Aikawa, a President, at the press conference for the product announcement on the same day. The vehicle will be sold in the Netherlands, the UK and Sweden where consumers are more aware of environmental issues among developed countries. Then the sales are planned to start in the US in the spring of 2016. Motor control was revised to improve the mileage to 20.2 km per liter, a 9% increase of that of the previous model. The vehicle drives 60.8 km solely on the fully charged battery. The price range is ¥3.5964 to 4.59 million. The firm targets at 1,000 vehicle sales each month. (The Nikkei, June 19, 2015)

(5) China Harmony Auto Holding

On June 18th, China Harmony Auto Holding, a major

European luxury car dealer in China, has signed an agreement in establishing a new joint venture for EV development with Tencen, a major internet company in China, and Taiwanese-based Hon Hai Precision Industry. (The Nikkei, June 20, 2015)

(6) Honda

Honda is developing a FCV which would drive 750 km at most. This will overtake the performance of Toyota's "MIRAI" by 100 km. Honda plans to sell the FCV for the same price range of MIRAI's approximately ¥7.2 million from March 2016. Honda's entry will stimulate the consumer FCV market. Honda revealed a FCV prototype in November, 2014 and its target of over 700 km driving range. The development now reached the point Honda is confident of hitting the target by improving cell performance and reducing the weight. Honda's commercial FCV will be a five-seater. (The Yomiuri Shimbun, June 23, 2015)

(7) Tesla

US-based EV manufacturer Tesla Motors will prepare new maintenance centers to repair EVs at eight locations in Japan. Currently they have only one maintenance center in Yokohama City, but their maintenance service will expand to other major cities including Aichi and Osaka Prefectures. Their luxury range "Model S" was released in the summer of 2014 in Japan, and users are increasing nationwide. They will build a service network for better customer satisfaction. New maintenance centers will work on simple repairs such as dents on body work comparing to the one in Yokohama City which provides the automobile inspection. However, new centers will take EVs need complicated services to send them to the center in Yokohama for users' convenience. At the moment, users have to bring their EVs to Yokohama center. Tesla released "Model S" in the US in 2012. It sells for a high price of ¥9.37 million, but the firm sold over 70,000 vehicles worldwide. Advantages are quick acceleration of the electric motor and operation using a large touch screen. The model has four- and front wheel drive range. The driving range is approximately 440 to 500 km, which is larger among the EVs. The production is carried out in the plant in California, the USA. The delivery period is approximately four to five months once an order placed. Tesla's own store in Japan is located in Minato-ku, Tokyo, but occasionally offers test-rides of Model S in Nagoya and Fukuoka Cities. Their sales are going up specifically in the rich. Their SUV "Model X" will be introduced into the Japanese market in 2016 or later. They have "Superchargers", a quick charger, free for their EV users, and plan to increase the number of the charger to 30 locations for increasing users. (The Nikkei, June 26, 2015)

(8) Toyota

On June 29th, Toyota Motor released "Prius PHV" which is an improved rechargeable PHV through domestic wall sockets. It sells for ¥2.945314 to 3.210429 million, which is approximately ¥80,000 to 140,000 cheaper than the same grade of the previous model. Since the Japanese government lowered the maximum subsidy for the vehicle, the firm decided to reduce the price for consumer affordability. Annual 10,000 vehicles are set as the target for the sales in Japan. (The Nikkei, June 30, 2015)

7. FC Boat Development

(1) Toda Corporation & Yamaha

Toda Corporation and Yamaha Motor will develop a boat which is powered by FC using hydrogen. A fishing boat and small 10 ton-class cruiser will be built this summer to start test operation in Nagasaki Prefecture. FC buses and forklifts have been also developed in Japan. Hydrogen does not produce greenhouse gasses while being used as fuel, and is expected to be more common energy. The development of the boats will be carried out in cooperation of Toda Corporation, Yamaha Motor and "Flat Field", a venture of clean energy cars in Kanagawa Prefecture. Toda will manage the whole development using MOE's support while Iwatani will provide technical assistance such as a hydrogen handling method, and Yamaha will provide the ship. These boats will store a double the amount of hydrogen than FCVs to cruise approximately 80 km. The current production cost is over ¥100 million, which is over a triple of that of the same class boat running on fuel oil, heavy oil. Although there is an experiment on FC boats in Germany, development of these boats are slower than vehicle development for surface transport universally. Commercialization of these boats is under consideration, and 2020 Tokyo Olympics is a potential timing. The Olympic village is planned to be run on

hydrogen. Wind and solar power generation can produce hydrogen at coastal areas, which can form an energy supply system for ships. This is also expected to lead to stimulating economy of the coastal areas. (The Nikkei, June 16, 2015)

8. Hydrogen Refueling Station Business Plans

(1) Chubu Gas

Chubu Gas will install a hydrogen refueling station for FCVs in Hamamatsu City in February, 2016, which will be the first one in Shizuoka Prefecture. Hydrogen will be stored in a large truck, and the truck will be parked on premises of the firm to supply fuel. The facility can fill a FCV with hydrogen in three minutes. The preparation costs approximately ¥300 million. The firm will use METI's subsidy of ¥180 million. Although the hydrogen storage capacity is smaller than stationary refueling stations, the preparation cost is about 60% of that of stationary one because the mobile station does not require land cost. (The Nikkei Business Daily, June 17, 2015)

(2) Next Generation Vehicle Promotion Center

Many of firms are quietly considering operation of hydrogen refueling stations. This month, the Next Generation Vehicle Promotion Center announced the firms which were selected to be subsidized by the "Subsidy Scheme for Installation of Hydrogen Supply Facilities" for FCVs from the supplemental budget for FY 2014. The announcement shows firms from wide range of industries such as of Idemitsu Kosan, Sumitomo Wiring Systems, a manufacturer of automobile cable harness, and Saibu Gas, a utility firm. The project will subsidize 36 cases including local energy firms. Preparation of hydrogen refueling stations has not been progressed much, and the point is whether the number of these stations will be increased by getting more firms to enter the business. (Nikkan Jidosha Shimbun, June 26, 2015)

(3) Sumitomo Wiring Systems

On June 30th, Sumitomo Wiring Systems announced that "Mie Hydrogen Station Limited Liability Company", Yokkaichi City, would be launched in cooperation of Japan Transcity in mid-July. Mobile hydrogen refueling stations will be prepared for FCVs in Tsu and Yokkaichi Cities, Mie Prefecture, to start the operation in April 2016. The venture is capitalized at ¥10 million. The breakdown is 35% each from Sumitomo Wiring Systems and Japan Transcity and 15% each from Mie Toyota, Tsu City, and Taniguchi Oil Corporation, Yokkaichi City. This will be the first hydrogen refueling station for FCVs in Mie Prefecture. Hydrogen will be supplied by the Yokkaichi Plant of Tosoh Daisui which is capitalized by Iwatani Industrial Gases and Tosoh. (The Nikkan Kogyo Shimbun, July 1, 2015)

(4) Toyota, Nissan & Honda

On July 1st, Toyota, Nissan and Honda announced that they would support preparation of hydrogen refueling stations for FCVs. Through the Research Association of Hydrogen Supply/Utilization Technology (HySUT), they will subsidize station operation, and operation data will be shared for usability improvement. With the governmental subsidy, the support plan to make preparation of hydrogen filling facilities faster by this financial assistance. "We aim to grow refueling and FCV businesses together" Mr. Kiyotaka Ise, a Senior Managing Officer, emphasized at the press conference. Those who want the support must be a member of HySUT, or join it, and selected for METI's subsidy scheme. The governmental subsidy supports two thirds of personnel and maintenance expenses, and the rest will be funded by these three firms to make infrastructure firms free from operation costs. The total maximum amount of support is ¥33 million each year. The project will run until 2020. The total support is estimated ¥5 to 6 billion. The expense will be shared among the three firms depending on their FCV sales and release. Although the Japanese government target at 100 hydrogen refueling stations by FY 2015, currently only refueling stations operate at 23 locations. Also constructions plans are still for 81 locations. (The Asahi Shimbun, The Nikkei, & The Nikkan Kogyo Shimbun, July 2, 2015)

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