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ENE-FARM Sales Hitting 0.2 Million Units Over 8 Years in Total

Reported by K. Onda

1. Governmental Measures

(1) Parliamentary Group of Liberal Democratic Party of Japan

On April 26th, the "Study Group to Promote Realization of Hydrogen Society Focusing on Fuel Cell Vehicles (FCVs)", a parliamentary group of the Liberal Democratic Party of Japan compiled "2017 draft of H_2 Japan". To promote the use of CO_2 free hydrogen, this draft includes a certification scheme to approve clean hydrogen. In this scheme, hydrogen producers will apply certification to a verifying organization, and certifying organization under the authority will issue proof. The draft also contains plans to power the lighting of Tokyo Tower and to use fuel cell (FC) drones which can achieve high speed and long distance flight for broadcasting sports events. The group suggests the necessity of legislation such as a Basic Act of Hydrogen Society Promotion. (The Nikkan Kogyo Shimbun, April 27, 2017)

(2) Committees of Natural Resource & Energy and Hydrogen Society Promotion of the Liberal Democratic Party of Japan

On April 28th, the Committees of Natural Resource and Energy and Hydrogen Society Promotion of Liberal Democratic Party of Japan compiled policy proposals for the realization of hydrogen society considering its great importance for both environmental and energy security reasons at the joint meeting. They clearly suggest a plan to run the Tokyo Olympics and Paralympic using hydrogen. Hydrogen refueling stations are planned to be prepared at 100 locations by the end of FY2017, and the proposals also state specification standardization and deregulation for hydrogen refueling stations. The proposals recommend the development of a business model of ENE-FARM market growth combined with power sales to the grid. To achieve hydrogen power generation, technology should be gradually developed starting from small-scale hydrogen mixed combustion generation to sole hydrogen combustion to ammonia mixed combustion. In April, the Japanese government decided to compile a basic strategy of which the core is to relax the safety regulations to promote preparation of hydrogen refueling stations and to make full use of hydrogen power generation by the end of the year in the Cabinet meeting. (The Denki Shimbun, May 1, 2017)

(3) Japan Patent Office

Japan Patent Office has published trend research on patent filed technologies focusing on socially interesting areas for FY2016. In the area of highly efficient thermal power generation and power generation gas turbines, out of all 15 areas, Japanese technologies for triple combined cycle, and FC complex power generation take the largest global application share of about 40%. Japan filed 93 patent applications from 2007 and 2014 for technologies related to the triple combined cycle which connects turbine FC combined cycle (GTFC) and integrated coal gasification combined cycle (IGCC), a combination of gas and steam turbines. This makes Japan the global leader in patent applications with a 40% share. On the other hand, Japan is left behind in high-temperature technology. To promote technological development in this area, Japan Patent Office suggests a support system to be built for new heat resistant materials and fundamental research and development in cooling and coating with the cooperation of industry, government, and academia. (The Denki Shimbun, May 10, 2017)

(4) MOE

The Ministry of the Environment (MOE) has compiled guidelines of Life Cycle Assessment (LCA) for the effect of reduction in greenhouse gases in the hydrogen supply chain. Although hydrogen produces no CO_2 in use, hydrogen supply chains currently produce CO_2 at different levels in various production, storage, transport and supply. The CO_2 production level largely changes depending on business models; for example, hydrogen production using fossil fuel or renewable energy, compressed hydrogen for storage and transport or liquid hydrogen through pipelines. From a LCA point of view,

it is important that the effect of reduction in CO_2 is measured by the same index all the way through the hydrogen supply chain. The aim of the guideline is for related businesses and local governments to use it as an evaluation tool to calculate the effect of the total reduction in CO_2 of their planned hydrogen supply chains or hydrogen supply under development. The ministry published a supportive calculation tool following the guidelines at the same time. Being the first edition, the guideline and tool will include the latest information as necessary by revisions. (The Chemical Daily, May 16. 2017)

2. Local Governmental Measures

(1) Mitsubishi Kakoki

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has chosen a project by Mitsubishi Kakoki, Kyushu University, Japan Sewage Works Agency and Karatsu City of Saga Prefecture for FY2017 Breakthrough by Dynamic Approach in Sewage High Technology Project (B-DASH Project). This group will produce digestion gas from sewage sludge at sewage treatment plants, and the gas will be used as fuel of solid oxide fuel cells (SOFCs) to improve energy self-sufficiency of the sewage treatment. The experiment will be carried out at Karatsu Water Treatment Center, and last until March 2018. The sewage treatment uses a stirring system without mechanical power for the digesting chamber of sludge, which reduces stirring power by 90% of that of conventional ones. (The Nikkan Kogyo Shimbun, April 19, 2017)

(2) Yamanashi Prefecture & Local Governments

Fuji Subaru Line, a toll road, connects the bottom and the half-way point of Mt. Fuji on the Yamanashi Prefecture side, and has driving restriction for privately owned cars in summers. Because electric vehicles (EVs) and FCVs give far less impact to the environment by producing no exhaust gas, the prefecture will remove the restrictions on EVs and FCVs. Then, the Public Safety Commission will officially give approval of access to these vehicles in summer. The number of the cars on the road is small, and they will potentially cause no traffic congestion. (The Yomiuri Shimbun, April 25, 2017)

(3) Tokyo

On April 26th, Tokyo and the Japanese government held a liaison meeting with higher officials for Tokyo Olympics and Paralympics. Tokyo added requests of financial support for hydrogen energy use including FC buses to expand to the Japanese government as a promotion of Olympics education and an advertisement of Japanese technology. (The Sankei Shimbun, April 27, 2017)

(4) Fukushima Prefecture

On May 10th, the Fukushima Prefecture held a meeting of the "Fukushima Revitalization Promotion Committee" in the prefectural office, and decided to propose Namie-machi for the location of the hydrogen production system, the world's largest, to operate from 2020 in the prefecture to the Japanese government. The preparation of the hydrogen production system is a part of the "Fukushima Concept for a New Energy Society" that the Japanese government is carrying out to make Fukushima an area of advanced new energy. The concept will use a total of 1,690,000 m^2 area of Tanashio and Ukedo both located in the coastal area of Namie-machi including the land which is used to be the Namie-Odaka Nuclear Power Station of Tohoku-Electric Power, and is to be lent out to Namie-machi for free. In the stated area, 400,000 m^2 will be used for the hydrogen production system, and the construction will start in the summer of 2018. The New Energy and Industrial Technology Development Organization (NEDO) is in charge of this preparation project, and will make an official decision on the location this summer. The preparation of the system will be carried out in cooperation with Toshiba, Tohoku-Electric Power and Iwatani which are appointed for the project by NEDO. A solar power plant of 20 MW output will be built on a piece of land of about 360,000 m^2, and generated power will produce 900 t of hydrogen, an equivalent of fuel for 10,000 FCVs, each year. Hydrogen will be supplied to areas inside and outside of the Tohoku region, and will be also used for the Tokyo Olympics and Paralympics to be held in 2020. The prefecture will report its proposal at a meeting of an advisory council to be held by the Agency for Natural Resources and Energy of the Ministry of Economy, Trade and Industry (METI) (The Denki Shimbun, May 12, 2017)

3. FC Element Technology Development & Business Plans

(1) NIMS

The National Institute for Materials Science (NIMS) has discovered that single-layer nano-sheets of layered double hydroxides (LDHs) have hydroxy ion conductivity at a practical level. As an anion conductor, these nano-sheet have the world's highest ion conductivity with single to double digit improvement from the conventional product, and the performance approaches the level of current electrolytes for FCs. Alkaline electrolytes can use transition metals, cheaper materials, which eliminates the need of catalysts using precious metals like cation electrolytes. This allows a reduction in costs including water electrolysis equipment. LDH is a type of clay minerals

and layered microcrystal aggregate with a laminate structure where negative ions fit between positively charged hydroxide layers. NIMS focused on nano-sheets of LDHs which are made into a single layer and deposited them on inter-digital transducers to find out the in-plane conductivity. They exhibited a high conductivity of 10^{-1}S/cm under 80% relative humidity and 60 ºC. A lot of moisture was captured on the surface of the nano-sheets of single layer LDH creating an environment for hydroxyl ions to move freely. (The Chemical Daily, April 17, 2017)

(2) Toyota

On April 27th, Toyota Motor announced that a hybrid power generation system was installed as an independent power generation facility at Motomachi Plant and started the trial operation. This test is carried out as a part of the "Technological Demonstration for Mass-production of Pressurized Hybrid Power Generation System Consisting of Cylindrical SOFC and a Micro Gas Turbine" organized by NEDO. Both SOFCs and turbines generate power using H_2 and CO which are produced by reforming natural gas. The rated output is 250 kW. The automaker will examine and evaluate energy efficiency, performance and durability in order to lead to a reduction in CO_2 emissions. (The Nikkan Kogyo Shimbun, April 27, 2017)

(3) JFCC

Japan Fine Ceramics Center (JFCC) has successfully developed an excellent ion conductor for FCs and oxygen sensors by using an experimental method of artificial intelligence (AI) in cooperation with Kyoto University and NIMS. They explored many elements to be the additive which stabilizes bismuth oxide, an ion conductor, for long periods at 500ºC by investigating the effects on the phase transition temperature and oxygen ion migration using first-principles calculations. The calculation results suggested that a combination of niobium, tungsten and erbium was effective. Following the results, the team synthesized a new material and measured the conductivity in an environment at 500ºC. The material did not exhibit deterioration for 100 hours. (The Nikkan Kogyo Shimbun, April 28, 2017)

(4) Toshiba

On April 27th, a pure hydrogen FC system of Toshiba outputting 100kW started an experimental operation in the wholesale market in Shunan City of Yamaguchi Prefecture. This is carried out as a demonstrational project of MOE to use by-product hydrogen coming out at a sodium hydroxide plant in the city. Because pure hydrogen is used as fuel, the system can generate power from five minutes after start. Power is supplied to refrigerators for flower storage, and waste heat is used for air conditioning and hot water in the market. The system has the largest output of Toshiba Group's pure hydrogen FC systems. (The Denki Shimbun, April 28, 2017)

(5) Toyo Corporation

Toyo Corporation is trying to expand its business of various evaluation instruments and related materials for FCs including imports from the US. They have built a fully automatic evaluation system by centrally managing testing conditions and measuring. This is achieved by the gas supply unit which controls testing condition of FCs in coordination with instruments to measure impedance and cyclic voltammetry for the evaluation of power generation performance. They also sell a membrane test system of US-based Scribner Associates which can measure through-plane and through-thickness membrane resistances of polymer electrolyte fuel cells (PEFCs). FC material range offers single PEFCs and direct methanol fuel cells (DMFCs) of ElectroChem that users can change composing parts and components. The firm has related products of SOFCs by US-based Nexceris. (The Chemical Daily, May 2, 2017)

(6) Japan FC Planning

Japan FC Planning, Aichi Prefecture, will accelerate development of FC systems for small transport means such as drones and scooters. They are aiming to reduce hydrogen leakage from hydrogen tanks to a tenth or less by working on key component development of FC's such as reducers and hydrogen tanks by forming a consortium with multiple firms in order to extend flight distance of drones to five to ten times of that currently. Their prospective product is to allow reducing hydrogen leakage to a tenth or less of that of hydrogen tanks using materials such as anisotropic engineering plastic and a combination of polyamide 6 and carbon fiber. A valve is under joint development to reduce hydrogen at 300 times air pressure to atmospheric pressure. Japan FC Planning is developing a material to be highly resistant to wear and tear, and high sliding performance and hardness using aluminum as the base. Their target is 100 to 150 g for a valve to allow reducing pressure in single process to be developed in two years. They plan to start an experiment of a combination of FC, reducer and hydrogen tank. The targets are markets of scooters, EVs, drones, and alternative power source for traffic signals. (The Chemical Daily, May 11, 2017)

(7) Kyoto University & AIST

Kyoto University and the National Institute of Advanced Industrial Science and Technology (AIST) have launched

"AIST-Kyoto University Chemical Energy Materials Open Innovation Laboratory (ChEM-OIL)", a research center. Their goal is to develop a next generation storage battery and FC using technology in advanced materials and analysis of Kyoto University and technology to make devices of AIST. They will work together with material producers from the research phase to develop the prospect for the device development in five years. The lab will be launched on April 1st, and the based is located in the Yoshida Campus of the university. They will aim to commercialize an innovative large-scale lithium-ion battery (LIB) and a cheaper cost FC which uses no precious metals such as platinum. The research structure will be established with about 30 researchers from both organizations. Furthermore, the lab will offer good master students paid jobs as part of human resource development. (The Nikkei Business Daily, May15, 2017)

4. Hydrogen Infrastructure Element Technology Development & Business Plans

(1) Toshiba

Toshiba's independent hydrogen energy supply system "H_2One" was installed at Musashi-Mizonokuchi Station of the JR-East Nambu Line, and was revealed to the public on April 15th. The system supplies a temporary sheltering facility with power by generating electricity at the FC unit during disasters. The system is the first for railway facilities to have this kind of measure for business continuity planning (BCP). The station building has 30kW output solar panels installed on its roof. In the system, a Super Charge ion Battery (SCiB) which is LIB, hydrogen storage tank and pure hydrogen FCs operate to supply power for lighting and pump of the toilet in the concourse for two days in emergencies. Power is used for lighting of the platforms and the toilets and improvement in the waiting room's comfort every day. Toshiba aims for the system to replace diesel power generators on remote islands or to be a power source where no power grid installed abroad. (The Denki Shimbun, April 18, 2017)

(2) IEE Japan

The Institute of Energy Economics, Japan (IEE Japan) has compiled suggestions for governmental policies to expand the demand of hydrogen energy, e.g. expanding use of hydrogen refueling stations, which is currently used at a limited level. Their suggestion for the transport area is hydrogen refueling stations to supply distributed energy systems in communities with energy as well as FCVs. For hydrogen energy produced by converting oil or natural gas, a new business model can be established by importing hydrogen energy combined with CO_2 capture and storage (CCS). This business model needs technological development to reduce costs, and international standards and a certification scheme are required to be established for CCS. (The Denki Shimbun, April 21, 2017)

(3) Alhytec

Alhytec, Takaoka City of Toyama Prefecture, will start sales of a mobile system to extract hydrogen from waste aluminum in April. The hydrogen production capacity is 50-55g/hr, equivalent of 800W/hr in a FC, and a single day's operation can produce an amount of hydrogen to drive a FCV for 170 km. The manufacturer also sells a machine to separate high purity aluminum from tin foil and composite waste which has aluminum deposited. Because the hydrogen extractor eliminates the needs of transport and storage, the supply cost can be reduced to a hundredth of that of the conventional method. The product is 58 cm wide, 60 cm deep and 80 cm high. It weighs 80 kg, and sells for ¥3 to 5 million suitable for 800W/hr of FCs. The firm has been selected for the NEDO Strategic Energy Saving Technology Innovation Program for FY2014 (The Nikkei Business Daily, April 21, 2017)

(4) Oriental Energy Company

Oriental Energy Company has started propylene production by propane dehydrogenation in Lianyungang, Jiangsu, and also aims to establish a hydrogen energy supply center there to use hydrogen from the production process. (The Chemical Daily, April 27, 2017)

(5) Nikkei Special

Hydrogen energy has been in competition for development to be used in a wide range of products without emitting CO_2 for automobiles, home and office. Various firms are developing their business to advertise Japanese technologies at the Tokyo Olympics. Iwatani, Toshiba and Tohoku-Electric Power have started construction of a hydrogen production facility using a photovoltaic generator in Fukushima. Their plan is to liquefy and transport 900 t of hydrogen produced by the facility each year in order to supply 10,000 FCVs by 2020. The Japanese government aims at 40,000 FCVs to be used by 2020. ENE-FARM, domestic FCs, using natural gas as its fuel has reduced its price to one third, and its market is becoming independent from subsidies. Panasonic has been trying to expand its ENE-FARM sales in Germany, Switzerland and Austria by connecting with local manufacturers. Kawasaki Heavy Industries (KHI) are aiming to reduce the hydrogen price to half of the current one by mid-2020's by liquefying hydrogen produced at a low cost in Australia, and are working on the development of a maritime transportation system to carry a large amount of hydrogen. (The Nikkei Business Daily,

April 28, 2017)

(6) Oita University & JST

Oita University and Japan Science and Technology Agency (JST) have successfully developed a method to produce hydrogen and nitrogen with a shorter starting-up time. This method uses a catalyst of ruthenium oxide supported on aluminum oxide and heat produced by a bonding reaction of oxygen and captured ammonia on the catalytic bed. This heat instantaneously increases the temperature of the catalytic bed from inside, which allows a shortened starting up time to the production of hydrogen and nitrogen. Before hydrogen production, the team treated the catalyst surface under an inert gas at 300 ℃ to create Lewis acid sites which strongly absorb ammonia. By supplying gas containing ammonia with a small amount of oxygen at room temperature, the catalytic bed reached 522 ℃ within 20 seconds, and the heating stage was kept afterwards. By supplying ammonia at room temperature, 1 g of catalyst produced 14 ℓ of hydrogen in 15 seconds and 33 ℓ in 25 seconds. The results are available on Science Advances online. (The Chemical Daily, May 2, 2017; The Denki Shimbun, May 9, 2017)

(7) Mizuho Information & Research Institute

We have interviewed Mizuho Information & Research Institute on the current state and prospect of hydrogen energy. Their explanations are as follows. Reduction in costs should progress using competition for promoting FCVs and hydrogen refueling stations. FCV producers should use global joint development. Manufacturers of FCV components and parts are expected to cut down the costs of new technologies at a higher level than that requested by automakers. It is important to develop standards among operators and manufactures early on and to reduce costs by standardized specifications. Because development of parts and materials is a long- to mid-term operation, the governmental support is required until smaller businesses are able to compete. The support for ENE-FARM development is a good example of improving performance and costs of parts by smaller businesses. The increasing use of FC forklifts and buses raises hydrogen consumption, which is a factor to bring down the price of hydrogen. Another point is durability improvement of FC buses and trucks. In the marine transport area of hydrogen, it is important to have a long-term development for new materials. Experiments of thermal power generations using hydrogen gas have started, and scaling up is another important task. (The Nikkei Business Daily, May 10, 2017)

(8) Iwatani

On May 10th, Iwatani announced that Hydro Edge, a joint venture in Osaka Prefecture with Kansai Electric Power Company (KEPCO) and Sakai LNG would increase production capacity to 1.5 times by adding another line. The new line will start supply in July 2019 to accommodate an expecting demand increase for FCVs and FC buses. Including the additional capacity, the new capacity of liquid hydrogen production will be 9,000ℓ/h. Iwatani group takes almost 100% share of liquid hydrogen in Japan. They have two lines at Yamaguchi Liquid Hydrogen and one line at Chiba Plant in Iwatani. The capacity of the new line and the existing facilities will expand to 18,000 ℓ/h in total. (The Chemical Daily, May 11, 2017)

(9) Zhejiang Unifull Industrial Fiber

On April 28th, Zhejiang Unifull Industrial Fiber which operates a synthetic fiber business decided to invest in Wuhan Troowin Power System Technology which carries out technological development for hydrogen energy. Zhejiang Unifull Industrial Fiber will prepare 111.25 million CNY (¥1,822 million), and its contribution ratio will reach 25 %. This will make Zhejiang Unifull Industrial Fiber the second largest shareholder. Wuhan Troowin Power System was launched to develop technologies for clean energy in June 2011, and has started a joint project of hydrogen energy focusing on FCs with Dongfeng Motor Corporation group which is local to Hubei. Wuhan Troowin Power System also operates commercial production of FC buses in the Jingzhou Economic and Technological Development Zone. Zhejiang Unifull Industrial Fiber has already acquired Jiangsu Zhihang New Energy to enter the market of LIB. The new investment will expand the new energy business of Zhejiang Unifull Industrial Fiber (The Chemical Daily, May 11, 2017)

5. ENE-FARM Business Plans

(1) Tokyo Gas

Tokyo Gas announced that as of May 2nd the accumulated sales of its ENE-FARM had reached 80,000 units from the start of the world's first sales in May 2009. They achieved a retail price of under ¥1.5 million for the latest domestic product in April 2017. Their accumulated sales target for 2020 is 300,000 units. As well as countering global warming, the product contributes to improvements of comfortable life, energy security and moderation of power usage peak. (The Denki Shimbun, May 9, 2017)

(2) Tokai Corporation

Tokai Corporation has announced that it would start a test of "On the Spot (OTS) House" to be self-sufficient of electricity and domestic water. They will build a model house combining

their own ENE-FARM using liquefied petroleum gas (LPG), a photovoltaic generator, a system to store and circulate rainwater, and will look into the possibility to commercialize it as good performance for disasters. They are aiming to reveal it in October. This two-story house has 228m^2 of ground floor area, a large roof to use sunlight and rainwater and a tiled garden. The power source will be a combination of an ENE-FARM, photovoltaic generator and storage battery, and it will be able to charge an EV. Rainwater will be stored in an underground tank, and treated for domestic use. Waste water will be treated, and put back in the circulation to secure 800 ℓ day which is the required amount for a household of four members. (The Nikkei Business Daily, May 10, 2017)

(3) ENEFARM Partners

On May 10th, ENEFARM Partners of which the office is in Collabo which is composed of the Japan Gas Association, the Conference of LP Gas Associated Organizations and Japan Community Gas Association announced that the accumulated sales of ENE-FARM reached 200,000 units. The sales have steadily gone up as the product range has expanded since the product launch in 2009. The sales are currently progressing at a pace of 40,000 units each year. The product started with PEFC type in the first year of 2009, and SOFC type was added in 2011. Products to be installed in apartment units, to have function to operate during power cuts, and to be able to use existing boiler were added, which promoted the sales. (The Denki Shimbun, May 11, 2017)

6. FCV

(1) New York International Auto Show

In the New York International Auto Show to be open to public on April 14th, eco cars are standing out as well as sports utility vehicles (SUV). This shows strategies that automakers expect eco cars to become more in demand in the future, although the Trump regime is working on relaxing environmental policy. CLARITY only had a FCV range, but Honda revealed EV and plug-in hybrid vehicle (PHV) models for the first time. South Korean-based Hyundai Motor brought out a concept car of new FCV. (The Denki Shimbun, May 17, 2017)

(2) Honda, Toyota & Nissan

On April 19th, one of the world's largest international auto shows opened in Shanghai, China. Since the Chinese government is tightening its environmental regulations, European and Chinese automakers are aggressively working on EVs. Losing the eco car competition in China which is the world's largest market has a substantial impact on automakers. Also, Japanese automakers are making haste to work on this area. From 2018, the Chinese government is likely to implement a new energy vehicle (NEV) regulation to force automakers to sell over a certain amount of cars such as EVs, PHVs and FCVs. Because the Chinese government does not include hybrid vehicles (HVs) in NEV, Toyota is considering introducing EV into the market within a few years. Honda has revealed market introduction of EV in 2018, and is developing an exclusive model to introduce into the Chinese in haste. Also, they are examining the introduction of PHV and FCV there. Nissan had sold EVs since September 2014, but the product has been removed from the list for subsidy. In the auto show, FCVs and FC busses are displayed. Beijing Automobile Works and Beijing Hyundai brought out their concept cars of FCV, and Beiqi Foton Motor is displaying a FC bus as Chinese manufacturer. Beiqi Foton Motor delivered 60 FC buses to Beijing City; the FC bus is 8.5 m long, 2.5 m wide and 3.8 m high, and the maximum speed is 100 km/h. It drives over 300 km on a full tank. This is an equivalent of a medium size bus in Japan. The manufacturer will conduct a driving test of the bus from May. The FC unit is produced by CITIC GUOAN MGL Power Science & Technology, and powers at 45 kW/h. FCVs' issues are the storage method of hydrogen and preparation of hydrogen refueling stations, which is the same in Japan. (The Asahi Shimbun, April 20, 2017; The Nikkei, April 20, 2017; The Chemical Daily, April 27, 2017)

(3) Toyota

Toyota will carry out a demonstrational test using two FCVs of MIRAI in various places in China from October. A hydrogen refueling station will be built in the Toyota Motor Engineering & Manufacturing in Jiangsu, China. They have joined the Accelerating the Development and Commercialization of Fuel Cell Vehicles in China project, and will conduct a driving test and hydrogen quality research for three years between 2017 and 2020. There are hydrogen refueling stations at five locations in Beijing and Shanghai, and the new facility will be the first one for Jiangsu. (The Nikkan Kogyo Shimbun, April 20, 2017)

(4) Toyota

Toyota Motor will start experimental operation of a large commercial FC truck at the port of Los Angeles, California, this summer. The truck has two units of FC stacks of MIRAI and a driving battery of 12 kWh, and outputs about 500 kW. The total weight of the vehicle including freight load is 36 t, and the estimated driving range on a fully charged battery is about 320 km. (The Nikkan Kogyo Shimbun, April 21, 2017)

(5) Nichicon

Nichicon will sell V2L system to supply power from FCV, EV and PHV to appliances from August. The target usage is as a power source for emergencies and outdoor events, and the sales target is an annual 120 units. The product's maximum output is 4.5 kW. An EV of which the battery is 30 kWh can supply power through the system for about six hours. The weight is 36 kg. The equipment has three output sockets of AC100V, and will sell for ¥0.65 million excluding tax. (The Nikkan Kogyo Shimbun, April 28, 2017; The Denki Shimbun, May 2, 2017)

7. FCV Component Development & Business Plan

(1) Toyota Industries Corporation

On April 19th, Toyota Industries Corporation announced its development of an air compressor which received the Prizes in the Development Category of the Science and Technology of the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (MEXT) for FY2017. The awarded product uses technology gained from compressors for air conditioning as its base, and is used in FCV MIRAI. It uses the world's first six-lobe helical roots type rotor. This enables optimal compression of air over the range from low airflow during idling to high airflow, which contributes to improvement of acceleration and driving range. These are the winning factors. (Nikkan Jidosha Shimbun, May 2, 2017)

8. Hydrogen Refueling Station Technology Development & Business Plans

(1) Takamatsu Teisan

Takamatsu Teisan, Takamatsu City, has prepared a mobile hydrogen refueling station for FCVs and started the operation on the premises of its headquarters. The station is the first one for Kagawa Prefecture and a third one for Shikoku after two facilities in Tokushima City. The firm used a subsidy of the prefecture and city. Iwatani Group produces hydrogen to be sent in Okayama. Hydrogen is compressed and stored in the station which can refuel two FCVs in an hour. It takes about three minutes to fill FCV. The price is ¥1,500/kg. In the prefecture, about 15 FCVs are in use. (The Nikkei Business Daily, April 19, 2017)

(2) Choshu Industry

Choshu Industry, Sanyoonoda City, will develop a small solar hydrogen refueling station for regional cities where commercial hydrogen refueling stations have not been prepared, to supply FCVs as well to be a disaster prevention base for emergencies. They aim to start selling five to ten units each year in the major cities of Chugoku, Shikoku, Kyushu and Tohoku areas in three years. Solar Hydrogen i Power Station (SHiPS) produces hydrogen by water electrolysis using electricity from photovoltaic generator. Hydrogen is compressed to be supplied to FCVs or stored. The photovoltaic generator of 10 kW output can produce 35 kWh each day. The current price is set about ¥200 million, and the firm aims at ¥100 million for the final price. (The Nikkan Kogyo Shimbun, May 4, 2017)

―Reported from Apr. 17 to May 16, 2017―