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Private Developments & Businesses for Hydrogen Society

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1. Governmental Measures

(1) MLIT

On February 12th, the Ministry of Land, Infrastructure, Transport and Tourism (MILT) announced that fuel cell (FC) and compressed natural gas (CNG) vehicles related public notices would be revised to coordinate with the international standards. With the revision, the Japanese regulation will follow the testing methods of the "Global Technical Regulation on the Safety of Hydrogen and Fuel Cell Vehicles" and "Uniform Provisions Concerning the Approval of Motor Vehicles Using CNG in Their Propulsion System" of the United Nations (UN). The public notices detailing the safety standards on road trucking vehicles will be changed in order to set them in operation for new model cars from February 13th, 2017. The technical regulation on fuel cell vehicles (FCVs) based on the Japanese proposal was adopted by UN last June. In order to fit to the global regulation, MILT will decide requirements such as the hydrogen concentration allowed in the interior compartment after an automobile collision, and how a hydrogen container is fastened to a vehicle. (Nikkan Jidosha Shimbun, February 13, 2014)

(2) Liberal Democratic Party of Japan

On February 13th, the Liberal Democratic Party of Japan launched a "Promotion Sub-committee for Hydrogen Society" in the Policy Research Council for Resource and Energy Strategy" in order to propose a draft of the energy basic plan to be drawn up by the government. The "Study Group to Realize a Hydrogen Society by FCV" consisting of voluntary members has investigated plans since last June. In the first meeting of the sub-committee, they suggested that hydrogen generation including FCVs effectively can reduce the ratio of the thermal generation using liquefied natural gas. Also, the Agency for Natural Resources and Energy of the Ministry of Economy, Trade and Industry (METI) explained activities of the hydrogen and FC field as well as their plan for FY 2013 to make a road map to realize a hydrogen society. (The Denki Shimbun, February 17, 2014)

2. Local Governmental Measures

(1) Tokyo

Tokyo Metropolis will support energy management projects of apartment houses and smaller business in FY 2014. The promotion for smart apartment buildings takes up ¥1 billion in the budget bill for FY 2014, and ¥3 billion is allocated for the heat and electricity energy management support for smaller businesses. The promotion for smart apartment buildings supports installation of energy management systems (EMS). The heat and electricity management support will encourage installation of FCs and cogeneration systems to medical institutions and care homes. (The Denki Shimbun, January 21, 2014)

(2) Fukuoka City

Fukuoka City has held an organization meeting of the "Smart Community Creation Committee of Fukuoka City" with commemorative speeches at Resola Tenjin in Chuo-ku, Fukuoka City. Trying to change the city into a smart city, the committee will investigate and carry out experiments of efficient usage of renewable energy, applications of information and communication service and FC technology. (Dempa Shimbun, February 11, 2014)

(3) Fukushima Prefecture

On February 10th, Fukushima Prefecture signed a partnership agreement for the energy field including developments of energy saving technologies with North Rhine-Westphalia, Germany. The partnership includes a total of 10 subjects such as commercialization of energy saving houses and developments of wind power, hydrogen and FCs. (The Fukushima Minyu Shimbun, February 11, 2014)

3. Developments of FC Element Technology Development

(1) Kyoto University

On January 22nd, the study group of Prof. Hiroshi Kitagawa at the Department of Chemistry, Graduate School of Science of Kyoto University announced that a new nano alloy has been developed by mixing palladium (Pd) and ruthenium (Ru) at an atomic level. The alloy has the same electronic state of rhodium (Rh) which is located in-between Pd and Ru in the periodic table. The cost of the alloy however is a third that of Rh. Being called "synthetic Rh", the alloy is expected to be applied in many ways. Pd is used as a catalyst for organic synthetic reactions and in domestic FCs, and Ru catalyst is utilized to synthesize ammonia. Though these elements are renowned to be immiscible even in liquid state at over 2000°C, using a bottom-up method, the study group made nano particles by reducing the metal precursor in a solution. Then, nano particles of the Pd and Ru mixed alloy were confirmed by elemental mapping using scanning transmission electron microscopy. Additionally, the alloy particles demonstrate higher catalytic performance of oxidizing CO than Rh nano particles, and the particles with the even ratio of Pd and Ru exhibited the highest performance. (The Nikkan Kogyo Shimbun & The Nikkei Business Daily, January 23, 2014; Japan Metal Daily, January 27 & 30, 2014)

(2) Nagaoka University of Technology

The study group of Prof. Minoru Umeda at Nagaoka University of Technology has developed a method to efficiently collect used platinum from FC electrodes. In this method, hydrogen peroxide and iron ions are added to a dilute sulfuric acid solution containing platinum to dissolve platinum effectively, and then platinum is captured by electro plating. Theoretically 100% of platinum can be collected by this method. The group put a used electrode in a sulfuric acid solution of 0.5 mol/L concentration, and added hydrogen peroxide and iron oxide ions into the solution to make hydroxyl radicals which are a very reactive oxygen species. The hydroxyl radical is chemically bonded to platinum atoms, which is considered to promote to dissolve platinum. Because other electrode materials such as polymer and carbon stay solid, platinum is selectively dissolved into the solution. Platinum in the electrolytic solution is deposited by an electro plating technology. To commercialize the method, the group will study further to seek the factors and conditions of platinum dissolution. (The Nikkan Kogyo Shimbun, February 12, 2014)

(3) Nippon Kodoshi

Nippon Kodoshi will accelerate to widen the application of its "iO-brane", an inorganic/organic nano-hybrid membrane, and has started to distribute its samples for electrolyte membranes of FCs. The membrane uses tungstic acid to gain conductivity. Because the cost can be a tenth that of conventional membranes, the manufacturer aims to sell the product as a next generation FC material. Inorganic oxide nano particles and organic polymer molecules are chemically bonded to make iO-brane. By using originally developed coexistence neutralization, a solution process, the firm succeeded in making hybrid organic polymer and inorganic oxide nano particles. The membrane has improved heat resistance over 200 °C as well as keeping the properties of an inorganic oxide which include oxidation and free radical resistance. The manufacturer says that the membrane can work at high temperatures and can be applied to next generation FCVs. Additionally, hydrogen is used in the production process, which advantageously reduces its impact on the environment. (The Chemical Daily, February 14, 2014)

4. Ene-Farm Business Plans

(1) Sales Figures of Ene-Farm

Annual Ene-Farm sales appeared to go over 30,000 units in FY 2013 for the first time. Tokyo Gas's cheaper product has been available since April, 2013, and shows a positive result in the market. Housing starts is increasing due to the coming tax rise. These activities are supporting sales. According to a report of Ene-Farm sales unit researched by the Advanced Cogeneration and Energy Utilization Center Japan, 17,780 units, 1.3 times that of the previous year, were sold in the first half of FY 2013. Orders of Ene-Farm are still going strong in the second half, and sales are expected to be 30,000 units for the whole FY 2013. Ene-Farm Partners and the government target 5,300,000 accumulated units in FY 2030, which is

long way to go and requires further cost and space saving. (The Nikkei Business Daily, January 23, 2014)

(2) Toray Construction & Shizuoka Gas

Toray Construction, Osaka City, and Shizuoka Gas have developed a "T-Grid System" to share energy within a whole apartment building consisting of Ene-Farm and management service of incoming high voltage electricity, a commercial scale contract. The first installation of this system will be in the apartment building which is a part of a smart town planned by Toray Construction in the eastern part of Shizuoka Prefecture. The primary energy can be annually reduced by about 25% as well as saving about 30% energy cost by the commercial scale electricity contract and the sharing energy from Ene-Farms installed in the apartment units. The FC system controls its power output depending on the consumption of a household, and its maximum power output is 750W. When a household uses more than the system produces, the shortfall is compensated from the grid. When each household with Ene-Farm of an apartment building has its own contract with the utility firm in the current scheme, electricity from the FCs cannot be shared between these households. In contrast, surplus energy production from the FC can go to households which need it because the apartment building, but not each household, has a single contract with the electricity provider. This system allows efficient use of electricity and heat which are produced by fuel gas in the facility. Electricity purchase should consequently go down. (The Shizuoka Shimbun, January 31, 2014; The Nikkan Kensetsu Kogyo Shimbun, February 3, 2014; The Nikkei Business Daily, Nikkan Kensetsu Sangyo Shimbun & Jutaku Shimpo, February 4, 2014; Architectures, Constructions & Engineerings News (Daily), February 5, 2014; The Denki Shimbun, February 10, 2014)

(3) Tokyo Gas & Panasonic

On February 3rd, Tokyo Gas announced that a generating function during power cuts had been developed with Panasonic in order to supply a home with electricity through a dedicated socket. The "Emergency Generation Switching Unit" will be available from April 21st as an option for Ene-Farm. The unit can power equipment up to 700W for a maximum of 4 days during power cuts, and will sell for ¥140,400. Tokyo Gas's Ene-Farm, to be released in April, will take the unit, although the unit does not work with existing Ene-Farms. Additionally unsuitable usages of the unit include products requiring high power such as microwaves, hair dryers and induction cookers and home appliances which temporary need a large current such as a refrigerator, vacuum cleaner and washing machine. (The Yomiuri Shimbun, The Nikkei, The Denki Shimbun, The Nikkei Business Daily, The Nikkan Kogyo Shimbun & Fuji Sankei Business i, February 4, 2014)

5. Cutting Edge Technologies of FCVs & EVs

(1) Nissan

On January 20th, Nissan Motor announced that the accumulated global sales of the electric vehicle (EV) "Leaf" reached 100,000 vehicles. The EV was released in December, 2010 in the US and Japan, and they are now sold worldwide in 35 countries. The manufacturer plans to introduce a business use EV "e-NV200" in 2014 into the European and Japanese markets. (The Nikkei, January 21, 2014; The Yomiuri Shimbun, January 27, 2014)

(2) Toshiba

Toshiba has developed an electric bus, and the commercial operation of the bus will start as a community transport in Minato-ku in central Tokyo from February. The bus will run between Tamachi Station and Shimbashi Station, a 17 km round trip, 6 times a day. Toshiba provides Japanese automakers with batteries for EVs, and has been fully developing the electric bus since 2011. From March, 2013, an experiment has been carried out in cooperation with Minato-ku. The firm established an ultra-quick charging technology which is 3 times faster than conventional chargers. This technological development allows the commercial operation of over 100 km a day. (The Sankei Shimbun, January, January 21, 2014)

(3) Aisan Industry

Aisan Industry plans to enter fully into the market of FCV parts in 2015. For new FCVs, they developed an injector and valve designed to supply a FC stack with compressed hydrogen by regulating the pressure, and received the first order for FCVs. Their head plant in Obu City, Aichi Prefecture will produce these products when the production of FCVs starts. The

manufacturer will research further to develop a next generation system of pressure regulator for affordable version of FCV which is expected to appear in 2020. The regulation system for FCVs uses expertise from fuel injection of liquefied petroleum gas (LPG) and CNG cars, and controls the pressure between the tank and stack, so that the stack produces power efficiently. (Nikkan Jidosha Shimbun, January 22, 2014)

(4) Yachiyo Industry

Yachiyo Industry will work on changing the metal vessel of high pressure hydrogen tanks for FCVs to resin. Aiming to reduce the cost of high pressure hydrogen tanks, the manufacturer is trying to develop a technology to replace aluminum cylinder liners with resin ones. The aluminum liner is made of aluminum tube processed by tube spinning (flow-forming), which pushes the price up. Resin, a cheaper material than aluminum, can be formed into shape using various methods, which expectantly allows reducing production costs. The firm has experience of production technology of resin parts through developments of its key product, resin fuel tank. Because the FCV component market is expected to grow, the manufacturer plans to develop a technology for a resin liner for the coming hydrogen era. (Nikkan Jidosha Shimbun, January 24, 2014)

(5) Fukuoka Motorshow

From January 24th, Fukuoka Motor Show 2014 will start at three venues in Hakata-ku, Fukuoka City. Being the fourth to be held, the motor show will display a total of about 220 vehicles which consist of 26 car and 9 motorbike brands worldwide. Honda will reveal for the first time in the Kyushu area its small EV "UNI-CUB β" currently under development. A driver controls the EV by facing forward or leaning their body in the driver's seat. The EV goes up to 6km/h. Toyota will bring a single-person vehicle "FV2" that a driver commands it by shifting their weight. This futuristic concept vehicle reads driver's mood by sensing voice and facial expression, and suggests ideal destinations from driving histories. Test rides will be provided. (The Nishinippon Shimbun, January 24 & 25, 2014; Miyazaki Nichinichi Shimbun, The Nagasaki Shimbun, Kumamoto Nichinichi Shimbun, Minami-Nippon Shimbun, Oita Godo Shimbun & The Yamaguchi Shimbun, January 25, 2014; The Nikkei Business Daily, January 28, 2014)

(6) VW, Mercedes-Benz & BMW

German-based VW will sell its plug-in hybrid vehicle (PHV) and diesel car in Japan. The PHV was developed using a small car for its base, and aims to be introduced into the market in 2015. The "VG Group Japan" will start selling the PHV which is developed based on their key small car "Golf". Electric versions of "Golf" and "up!" will also be introduced into the market in 2014. The firm considers electric powered vehicles to be key products for its growth. German-based Mercedes-Benz and BWM also plan to introduce PHVs there. Automakers are preparing product line-ups for expansion of the tax cuts for eco cars. (The Nikkei, January 25, 2014)

(7) Toyota

Toyota plans a larger scale production of FCVs, and to start with one FCV will be produced each day. The automaker aims to start manufacturing prototypes this summer while checking production efficiency. The production scale is expected to increase to an annual 1,000 vehicles in December. (The Yomiuri Shimbun, January 27, 2014)

2014 All Toyota Motor Show will be held on February 8th and 9th at the Okinawa Convention Center in Ginowan City. The exhibition will display 60 used hybrid cars and 40 new vehicles including "FCV Concept" to be available from next year and "FV2" which is controlled by a driver shifting their weight. (Okinawa Times, February 8, 2014)

On February 13th, Toyota Motor announced that an experiment of a wireless charging system to charge PHV and EV using a domestic wall socket would start in February. The system will be improved by results of the one year test, and aims to go into the market in a few years. This makes charging easier, and the automaker expects the system to support sales of rechargeable electric powered vehicles. Using electromagnetic resonance induction, the system can charge a car when the car is not in the exact charging position or when it is a distance from the charger. It requires no cable to the car, the transmitter is placed in a parking lot, and a car is parked over the transmitter to charge. Plug in chargers of other makes are just over ¥300,000, and Toyota targets the same level for its system. (The Nikkei, February 14, 2014)

(8) Mitsubishi Paper Mills

Mitsubishi Paper Mills has developed a non-woven

fabric for a core material of lithium-ion batteries (LIBs). The developed material is non-woven fabric separator. Generally separators are made of polyethylene. Once the temperature inside a battery reaches 130°C, the melting point of polyethylene, the material shrinks which may result in overheating by a direct contact of the anode and cathode. The manufacturer succeeded to thinly apply ceramic on both sides of polyethylene non-woven fabric in order to increase its heat resistance to 200°C. The durability also improved to 1.5 to 2 times longer than conventional separators, and the product price is 20 to 30% cheaper. As a material to solve a fire issue, the LIB problem, the new product is aimed at for industrial machinery and EVs. Their Takasago Plant has a capacity to produce 100,000 to 200,000 m^2 of separator each month. The shipment of the new separator will start in FY 2014, and the firm plans to invest a couple of hundred million yen to increase production capacity depending on the demand. (The Nikkei, January 27, 2014)

(9) Mitsubishi Motors

On February 3rd, Mitsubishi Motors announced that an EV charging station for farmers was now operating in Miyagi Prefecture in collaboration with Nichicon. To charge EVs, the power of the station is generated by solar panels. EVs are lent to local farmers for transporting agricultural products. The electricity in EVs is also used to power farming equipment and for green houses. The automaker lends 5 EVs including "Minicab-MiEV", and they are recharged at the station operated by Nichicon. This project is a part of support for disaster damaged area of the Great East Japan Earthquake. (The Nikkei, February 4, 2014)

(10) Sumitomo Corporation

Sumitomo Corporation has developed a large scale power storage system made from used EV batteries. The system was sold to electricity suppliers to temporary store power generated by renewable energy at a substation. LIBs were collected from 16 EVs, "Leaf", to build the system which has the capacity of approximately 400 kWh. The firm plans to increase the capacity up to 100,000 kWh depending on the number of scrapped "Leaf". Sumitomo and Nissan Motor launched a joint venture "4R Energy Corporation", Yokohama City to source used batteries of "Leaf", check the performance and design the management system. The venture has a technology to properly charge and discharge multiple batteries. An experiment of the system started on an artificial island in Osaka City. The firm plans to fully commercialize the business in 2017 when scrapped EVs start to appear. (The Nikkei, February 7, 2014)

(11) Tesla

A US-based EV venture Tesla Motors has set the price for its luxury sedan "Model S" at ¥8.23 to ¥10.818 million for Japan. The price range is the same level for the US. The delivery of the car is expected to begin this spring. Having explored in Europe, the automaker has started to break into the Asian market. (The Nikkei, February 12, 2014)

(12) GS Yuasa, Bosch & Mitsubishi Corporation

On February 12th, a German-based car part manufacturer Bosch, GS Yuasa and Mitsubishi Corporation announced that their joint venture for next generation LIB for EVs was established and already started its business. With capital of approximately ¥5 billion, the venture is named "Lithium Energy and Power" and located in Stuttgart, Germany. About 70 employees work there. By using technologies of the three firms, the venture aims to develop a battery which has double the current driving range of EVs on a single charge. (The Nikkei, February 13, 2014)

(13) Saitama Institute of Technology

Saitama Institute of Technology has launched the "Manufacturing Research Center", with a total capital of ¥840 million, to develop EV and FCV over five years. An inter-departmental "Next Generation EV Development Project" will start from April, and the 18 main project members are from the Department of Engineering and Informational Society Studies. (The Nikkan Kogyo Shimbun, February 13, 2014)

(14) Sapporo Motor Show

On February 14th, Sapporo Motor Show 2014 started at Sapporo Dome, Toyohira-ku. The exhibition displays concept cars of 39 global brands and 211 of the latest commercially produced vehicles including next generation cars such as FCVs and EVs. (The Hokkaido Shimbun, February 14, 2014)

(15) Honda

Honda Motor announced that a new emergency power supply experiment using FCVs had started in

Kitakyushu City. Honda's "FCX Clarity" provides electricity, with a storage system installed in a public facility, as an emergency power source during disasters. The experiment is carried out at Kitakyushu Museum of Natural History & Human History in Yahatahigashi-ku, Kitakyushu City. The aim of the experiment is to confirm the feasibility of FCVs as an emergency power source. (The Nikkan Kogyo Shimbun, The Nikkei Business Daily & Nikkan Jidosha Shimbun, February 17, 2014)

6. Hydrogen Filling Station Related Technology Developments and Business Plans

(1) Kobe Steel

Kobe Steel has fully started a machine business for hydrogen filling stations. On January 28th, they announced that Tokyo Gas ordered their compressor unit and heat exchangers for "Nerima Hydrogen Station" to be operated from 2015. The filling station is a project selected by the Next Generation Vehicle Promotion Center for the first year through a public tender. Kobe Steel joins the project from the first commercial station. Their Compressor Division in the Machinery Business produces "HyAC", a high pressure compressor, and a diffusion-bonded compact heat exchanger "DCHE" is made in the Energy & Nuclear Equipment Division. The development of the compressor was finished in FY 2012, and the product is already in use in experimental filling stations of Tokyo Gas in Senju and JX Nippon Oil & Energy in Ebina. A maximum 82 MPa level compressor will be used for the commercial station in Nerima. With Kobe Steel's own technology, the heat exchanger is made smaller to one thirtieth to one hundredth that of conventional products while keeping its performance in chilling hydrogen at ultra-high pressure. These products make a compact unit and the heat exchanger has already proven itself in use. These features became the key factor for the order decision. (The Nikkei Business Daily, Japan Metal Daily & The Chemical Daily, January 29, 2014; The Kobe Shimbun, February 1, 2014)

(2) Alumi-Surface Technologies

Alumi-Surface Technologies, a group member of the Japan Aluminium Products Association, has developed a reactor for hydrogen filling stations. The reactor is a plate with holes such including fine mesh like structure and porous materials to extract hydrogen. A compound gas of hydrogen and toluene goes through the reactor to separate the hydrogen. Anodic oxide coating, a common process for aluminum building material is used for the product which is an aluminum plate anodized to make very small holes on the surface. This process increases the surface area up to 30,000 times. The reactor therefore gains more contact with the gas, which allows an effective reaction and extraction of hydrogen. Hydrogen and toluene make methylcyclohexane, and this compound allows hydrogen transport in a liquid form and hydrogen is separated by the reaction. Furthermore the benzene comes out after the reaction, and can be reused, which also attracts attention. The firm uses a surface process, and coats aluminum plates with platinum catalyst to make the reactor. A small scale reactor has already proved its effect, and the firm is carrying on the research for a larger one. (Japan Metal Daily, February 3, 2014)

(3) The Japan Steel Works, Muroran Plant

The Muroran Plant of the Japan Steel Works has started to produce storage tanks, hydrogen accumulators, of hydrogen filling station for FCVs. Their production line was partially converted to manufacture the tanks, and a few units were already delivered to firms outside Hokkaido. The hydrogen accumulator is a cylinder made of a special steel alloy in order to slow down the speed at which the container becomes brittle through contact with liquid hydrogen, as well as keeping its strength and durability. The plant produces two types, 300L and 450 L. The production started last autumn by converting a line dedicated to pressure vessels for petroleum refining. A very strong and light weight accumulator made of fiber reinforced plastic (FRP) is also under development in the plant. Researching hydrogen storing alloys, the plant is working on the development and production of hydrogen related products as a part of Japan Steel Works' project. (The Hokkaido Shimbun, February 7, 2014)

7. Hydrogen Production & Refining Technology Development

Takahashi Seisakusho, an incinerator manufacturer in Shiraoka City, Saitama Prefecture, has commercialized a technology to produce hydrogen at a

low cost from forest thinnings and food waste. The key of the technology is combining two types of incinerators. Firstly forest thinnings are made into charcoal in an incinerator at a high temperature of 1,000°C. Secondly the charcoal is reacted with water vapor in the other incinerator to make gas containing hydrogen. In ironworks, hydrogen is produced by burning coke, and the mechanism is similar to the new technology which can generate electricity efficiently due to less heat being required. A 1000 kW generation level plant costs approximately ¥500 million. Approximately 2 t/h of biomass makes about 900 m^3 of hydrogen. The hydrogen production technology will open a way to create hydrogen locally in regional towns and cities. (The Nikkei Business Daily, January 30, 2014)

8. Hydrogen Transport & Storage Technology Development & Business Plan

On February 6, Kawasaki Heavy Industries (KHI) announced that an approval in principle was obtained for its cargo containment system (CCS) by Nippon Kaiji Kyokai. The CCS was developed, by KHI as the hydrogen storage part of an ultra-low temperature of liquid hydrogen carrier ship with a capacity of 1250 m^3. This system uses a horizontally arranged cylindrical pressure vessel which is stored in the cargo compartment, and can contract independently of the hull in order to load liquid hydrogen at an ultra-low temperature. The cargo tanks are also designed to keep the boil-off gas (BOG) produced by external heat in the structure, but does not vent. Therefore liquid hydrogen can be discharged and also sent pressurized by a pump installed in the CCS. To minimize BOG, the cargo vessel has a dual shell structure using a newly developed vacuum insulation system. Glass fiber reinforced plastic (GFRP) is used for the supporting structure of the cargo vessel to improve the insulation. A dome is added to the dual shell structure of the cargo vessel in order to install an inspection manhole, which allows overhaul inspection in a dock. The manufacturer is developing a hydrogen carrier tanker of a 2500m^3 total cargo measurement with 2 CCSs. Using a dual shell structure for its underside for safety, the ship is to have hold covers for external protection and air tightness. The manufacturer plans to use a diesel engine for the ship. An on board laboratory is to be installed to test FC and hydrogen gas turbine as a usage of BOG in future. (The Nikkan Kogyo Shimbun, The Japan Maritime Dairy & The Chemical Daily, February 7, 2014)

9. FC & Hydrogen Related Private Business Plans

(1) Dai-ichi Kogyo Seiyaku

On January 23rd, a chemical manufacturer Dai-ichi Kogyo Seiyaku of Kyoto City, which produces surfactants for soaps and detergents, announced that a new plant would be constructed in Yokkaichi City, Mie Prefecture to produce functional materials for seal materials for domestic FCs. Development of new materials for next generation batteries will also be researched. The plant aims to start operating from September, 2015. (The Asahi Shimbun, The Kyoto Shimbun, The Kabushiki Shimbun & The Chemical Daily, January 24, 2014; Architectures, Constructions & Engineerings News (Daily), January 27, 2014)

(2) Iwatani

On February 10th, Iwatani revealed the construction plan of its fourth liquid hydrogen production plant in Kawasaki City. A 3,000 L/h level production facility is planned to be built in 2015 as the earliest with capital of about ¥3 billion. Mr. Masao Nomura, the president, announced the plan in "Iwatani Hydrogen Energy Forum Osaka" held in Osaka City. The manufacturer has three hydrogen production plants in Nishi-ku, Sakai City, Ichihara City, Chiba Prefecture and Shunan City, Yamaguchi Prefecture. The total production ability is 12,000 L/h. (The Nikkan Kogyo Shimbun, February 11, 2014)

(3) KHI

KHI plans to produce a commercial scale thermal generation facility using hydrogen as its fuel from 2017. Hydrogen does not emit CO_2, and hydrogen generation cost is also expected to go down to the natural gas generation level over years. The firm will sell it in Japan as an off-grid power system, and in Europe which is trying to reduce greenhouse gases rapidly. Mitsubishi Heavy Industries and GE are also accelerating developments of hydrogen generation. A 7,000 kW class smaller generator which can supply 2,000 average households will be manufactured at the Akashi Plant. The price is expected to be 10 to 20% higher than conventional gas turbines. Because hydrogen has a higher energy density than natural

gas, combustion temperature becomes very high. This causes failures. The manufacturer installed a dedicated chiller and improved the design of internal turbine to increase durability. (The Nikkei, February 16, 2014)

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A POSTER COLUMN

Roland Berger's Market Focus for 2025

A consulting firm Roland Berger has released a report saying that the key to reduce production cost is how much platinum can be saved from catalysts.

According to the firm, a unit of FC system costs approximately €45,000 (approximately ¥6.3 million). A half of it goes to membrane and electrode assembly (MEA) which uses platinum as FC catalyst. Being a precious metal, platinum has a high price. Although many automakers work on FC technologies which will eliminate the need for platinum, they still need time to realize this. Roland Berger's analysis indicates that a maximum 80% reduction in cost is expected by 2025; however, the FCVs do not gain enough market share. EVs and hybrid vehicles are the most promising products to achieve zero-emission in near future. (The Nikkei Business Daily &Nikkan Jidosha Shimbun, January 30, 2014)