12 Organizations from Industry and Academia Starting R&D to Half Installation Costs of Hydrogen Refueling Station

Arranged by T. HOMMA

1. Governmental Measures

(1) METI

The Ministry of Economy, Trade and Industry (METI) will narrow down the preparation target of hydrogen refueling stations to 20 locations for the next financial year. Currently 81 hydrogen refueling stations, including mobile facilities, are either in operation or underway. First of all, the ministry plans to make sure the initial target of 100 filling facilities in four urban areas of Tokyo, Chukyo, Kansai and Kitakyushu to be hit. Secondly the "post-100 filling station preparation plan" will be determined in this financial year, and its expense will be included in the budget request for FY 2017 and later. The budget request for next financial year was decreased from ¥10 billion to ¥6.2 billion, a 40% decrease of that of this year. Construction of a hydrogen refueling station costs ¥400 to 500 million excluding land price. METI has subsidized operational costs as well as construction, and some automakers have also started providing financial assistance for the operation of hydrogen refueling stations. However, "these promotions have persuaded very few businesses to build and operate hydrogen refueling stations, and the number has not met the expectations" according to the Fuel Cell (FC) Promotion Office. At this stage, only Toyota Motor sells fuel cell vehicles (FCVs). Honda and Nissan Motor have shown their intention to enter the market. Though these automakers have not revealed their production and sales plans, and this seems to give a hesitation to refueling station operators in investment for hydrogen refueling stations. The ministry will prioritize the preparation of 100 filling stations in the four urban areas in the "Hydrogen/FC Strategy Map" which was published June, 2014 with industry announcements. At the same time, the roadmap will be revised. The revised roadmap will be published containing a FCV use expansion plan, which is not included in the current roadmap, and a new preparation plan with the intentions of local governments of other urban areas and energy firms, and the state of technological development and deregulation for self-service refueling stations as early as the end of this financial year. A subsidy scheme following the new policy for construction will start in FY 2017, and the subsidy scheme for FCV purchase is to work together. (Nikkan Jidosha Shimbun, September 3, 2015)

On September 3rd, the Kyushu Bureau of Economy, Trade and Industry held a departing ceremony of Toyota Motor's FCV "MIRAI" purchased as an official car. "The government and industry have kept fully in contact for FCV. We will drive the FCV as far as possible for promotion." Mr. Yoshio Kishimoto, the head of the bureau, addressed. (The Nikkan Kogyo Shimbun, September 4, 2015)

(2) MOE

The Ministry of the Environment (MOE) will request a total of ¥381.4 billion, a 44% increase in that of the previous year, for the general account and energy measure special account budgets of FY 2016. Energy saving measures will be swiftly carried out to hit the governmental target of a 26% reduction in greenhouse gas of that of 2013 by 2030. For the automobile area, traffic measures in the transport field will be promoted in liaison with of METI and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and MOE will continue to work on the preparation of refueling stations supplying hydrogen produced by

renewable energy for FCVs. For the transport area, the CO_2 emissions in cargo vehicle and bus use are 30% of the whole CO_2 emissions, and more resources will be used to reduce these emissions. The ministry will request ¥1 billion for "Promotion Project of Advanced Environmentally Friendly Truck and Bus Introduction" for the first time. This scheme will support the purchase of vehicles which exhibit higher fuel efficiency than standard ones with a certain percent of the purchase cost difference. The government will bear half the amount of price difference for hybrid vehicles (HVs) and compressed natural gas (CNG) cars and two thirds for FCVs and electric vehicles (EVs) to support environmentally friendly cars. For hydrogen related operation costs, the ministry will request ¥6.5 billion for FY 2016 which is significant increase from ¥2.65 billion for FY 2015. They will work on making guidelines to evaluate the CO_2 reduction effect of the whole hydrogen supply chain all the way from production to use and the promotion of small refueling stations which supply hydrogen produced from renewable energy and are promising facilities to be used in communities. (Nikkan Jidosha Shimbun, September 4, 2015)

(3) Japanese Government

On September 15th, the Council for Science, Technology and Innovation (Chairperson: Prime Minister Shinzo Abe) held an investigation committee meeting of a specialized evaluation to sort out discussion points for the intermediate assessment of the demonstrational project for the integrated gasification fuel cell cycle (IGFC). Started in 2012, this project will last until 2021 operated by Osaki CoolGen, the contractor in Hiroshima Prefecture. Some members of the committee expressed their positive evaluation for the progress, and pointed out that the project needed to liaise more closely with projects for CO_2 capturing and storage (CCS). Innovation projects using over ¥30 billion of governmental grant in total are assessed as progressing. This evaluation started as the IGFC demonstration project will move on phase 2 in FY 2016. As phase 1, demonstrational oxygen injection integrated coal gasification combined cycle (IGCC) is being installed, and is planned to start its experimental operation, receiving power in November. The committee suggested that the "Demonstration of Integrated Coal Gasification Combined Cycle with CCS" be worked more closely with the CCS projects in phase 2 and the FC design be progressed for the IGFC demonstration in phase 3. The assessment committee will discuss details for these. (The Denki Shimbun, September 16, 2015)

(4) NEDO

The New Energy and Industrial Technology Development Organization, NEDO, announced that it would start development of clean-up technology of coal gasification for highly efficient coal thermal generation. This development is for IGFC which is to be technologically established by 2025. Contracting out to J-Power, the project will develop a technology to precisely remove poisons in coal gas which reduce FC performance. NEDO has been working on the development of IGFC which produces power with three methods of FCs and gas and steam turbines using gas made from coal in order to reduce carbon emission of coal thermal power generation further. The ultra-supercritical coal thermal power generation, today's most advanced technology, produces at approximately 40% generation efficiency. On the other hand, IGFC can operate at 55% generation efficiency or more, and reduce CO_2 emissions by about 30%. Due to these performances, IGFC is considered the ultimate highly efficient coal thermal power generation. (The Chemical Daily, September 24, 2015)

2. Local Governmental Measures

(1) Osaka Prefecture

Osaka Prefecture will fortify support for smaller firms which want to start businesses related to hydrogen refueling station or FCV. On August 27th, the prefecture and the Osaka Chamber of Commerce and Industry held a "Hydrogen Technology Experience and Exchange" which aims to match technological needs of businesses in FCV and hydrogen refueling station with smaller firms' expertise in Kitaosaka Truck Terminal, Ibaraki City of Osaka Prefecture. The conference introduced technological needs of automakers and hydrogen refueling businesses to the participants. Toyota's FCV "MIRAI" was displayed at Kitaosaka Hydrogen Station next to the venue for the members to feel the most advanced hydrogen related technology while interacting with each other. About 50 organizations of

the prefecture, the majority being smaller business, joined the event. Five firms represented the areas of hydrogen businesses; Toyota Motors for FCV, Osaka Gas for hydrogen production facilities, Iwatani for hydrogen compressors, the Japan Steel Works for accumulators and Hitachi Automotive Systems Measurement for dispensers. They explained the market trend of FCV and hydrogen refueling stations, the state of research and development and prospects. After that, the event moved to Kitaosaka Hydrogen Station next door, which just finished construction in May, to have a look. This is the first on-site hydrogen production refueling station converting natural gas into hydrogen in Japan. Osaka Gas operates the facility, and explained each instrument including hydrogen production equipment "HYDERVE-300". Also Osaka Toyota brought a MIRAI for display. Furthermore, a demonstrational hydrogen supply was performed. The prefecture has provided more support for smaller businesses wanting to enter the FCV related market. The aim of this event was to introduce technological needs of core Japanese firms leading hydrogen related technologies to smaller businesses, so that the smaller business would have opportunities to enter the industry. From this autumn to next January, the "Course of New Energy Industry Promotion" will be held to back up entry to new industry. (Nikkan Jidosha Shimbun, September 2, 2015)

(2) Fukuoka Prefecture

On September 1st, Fukuoka Prefecture announced that a hydrogen refueling station would be installed at the prefectural office. The operation is aimed to start in early December. With the installation cost of ¥72 million, Iwatani will install the equipment on a trailer to be mobile, and operate the station. The prefecture has been working on infrastructure to establish FCV to foot in, and preparation of these facilities is determined for 10 locations. In the plan, nine facilities are to be stationary. This one for the prefectural office is the first mobile one. The mobile station is planned to operate from 10 am to 5 pm on weekdays excluding days when the prefectural office is closed, and is to be opened to the public. "This refueling station installation at the prefectural office symbolizes the commitment for promotion of FCV." said Governor Hiroshi Ogawa. (The Nikkan Kogyo Shimbun, September 2, 2015)

(3) Tokyo

On September 15th, Tokyo announced that Keisei Bus was selected for the operator of bus rapid transit (BRT) which is to connect the center and the coastal area for 2020 Olympics. Their proposal included an introduction of FC buses which emits no harmful gasses, and this persuaded the local government. They will prepare bus stops at 11 locations including Toranomon and Kachidoki, and the operation will start in FY 2019. (The Nikkei, September 16, 2015)

3. FC Element Technology Development & Business Plans

(1) Primix

Primix, a mixing equipment producer in Awaji City of Hyogo Prefecture, has established a laboratory to improve production technology of electrode plates, a core part of cells, at its headquarter. This is a joint project with the National Institute of Advanced Industrial Science and Technology, AIST, and Yamagata University. They aim to make the leading production center of new electrode plates in cooperation of manufacturers of materials and automakers using batteries in their products. The subject of research is coating material of electrode plates which is used for lithium-ion batteries, LIBs, and FCs. Primix has own technology for a variety of materials to be mixed evenly. Their mixing equipment for coating electrode plate production is around 50% the global market. They set a course to develop and commercialize coating materials quickly and smoothly in cooperation with AIST which has rich expertize of small batteries, the Research Center for Organic Electronics of Yamagata University which is specialized in large-scale batteries as well as automakers. (The Nikkei, September 11, 2015)

(2) Biocoke Lab

Biocoke Lab, a venture of environmental technology development in Chiyoda-ku (Tokyo), will triple its production capacity of originally developed fuel for FCs in one year. A small FC system is planned to be produced and sold from November, and the manufacturer is preparing its production system for increase in demand. Their plant in Numazu City, Shizuoka Prefecture, will move to another place, and expand. Magnesium tablet "Mag Hydrogen" was

originally developed with the manufacture's accumulated expertize in hydrogen, and the firm will increase the production. The tablet will produce hydrogen when mixed with acid or hot water, and currently used for bath bombs apart from FCs. (The Nikkei, September 20, 2015)

4. Hydrogen Infrastructure Technology Development & Business Plans

(1) Experiment Project at Keihin Coastal Area

On September 8th, Kanagawa Prefecture, Yokohama City, Kawasaki City, Iwatani, Toshiba, Toyota Motor, and Toyota Turbine and Systems in Toyota City together announced that an experiment project would start to use low-carbon hydrogen at the Keihin Coastal Area in Kanagawa Prefecture. The project aims to achieve a simple integrated system through the development of a hydrogen supply chain including hydrogen produced by renewable energy to be CO_2 emissions free, storage, transport and use. These members will decide details to start the experiment in full operation from April, 2016 or later. Detailed experiment items and feasibility for commercialization will be studied as a part of the "Community Collaboration Project for Technological Evaluation of Hydrogen with Low-carbon Emission" that MOE commissioned from the group. The four main subjects are (1) an electrolysis hydrogen production system from water using wind power, (2) a storage and transport system for optimum hydrogen supply, (3) FC forklift use, (4) feasibility study of hydrogen supply chain businesses. On September 7th, the committee was launched for the project, and Honorary Prof. Ken-ichiro Ota at the Yokohama National University and Honorary Prof. Yoji Uchiyama at the University of Tsukuba join it as expert members. The direction of the experiment and post-experimental targets will be discussed in meetings. The committee will seek cooperation of the community while studying detailed experiment items. The project started in this April, and will last for four years. The experimental hydrogen supply chain is expected to use wind power generation, storage battery, hydrogen production equipment, hydrogen storage/compression equipment, simple mobile hydrogen refueling station and FC forklift. Planned use of FC forklift is for fruit and vegetable markets and refrigerated/distribution warehouses. (The Denki Shimbun & The Nikkei Business Daily, September 9, 2015)

(2) The University of Tokyo & University of Miyazaki

The University of Tokyo and University of Miyazaki have succeeded in storing 24.4% of solar power as hydrogen produced by electrolysis using the power from a highly efficient photovoltaic generator. An existing hydrogen production method using photocatalyst only converts 10% or less of sunlight into energy. This research result allows more efficient hydrogen production using sunlight in limited areas. Currently hydrogen is produced from fossil fuel. Japan wants to develop a technology to efficiently produce hydrogen from sunlight at a low cost in order to increase the ratio of renewable energy. The team of Associate Prof. Masakazu Sugiyama at the University of Tokyo connected a water electrolytic instrument using a polymer membrane to a new concentrating photovoltaic system, CPS, which is installed in the outdoor test station of University of Miyazaki. Stable hydrogen production was achieved. In this experiment, Sumitomo Electric Industries' CPS and THK's tracking rack were installed on the site. The generation efficiency reached 31% under Miyazaki's sunlight. Generation efficiency of photovoltaic generator depends on electrical resistance of instruments connected to the generator. Due to this, the characteristics of the current and voltage of photovoltaic generator and water electrolytic instrument were taken into account, and the number of series connection was optimized. The water electrolytic instrument took power from the highly efficient generator at a nearly zero-loss rate. The generation efficiency of CPS is expected to improve to 35%. Considering energy-transfer efficiency from electricity to hydrogen of water electrolysis, the energy conversion rate from sunlight to hydrogen is expected to reach 28%. This system uses a photovoltaic generator and electrolytic instruments already available in the market. Systems are designed to fit to operational conditions, which enables highly-efficient production of hydrogen from sunlight. Although CPS is more expensive than common photovoltaic generators, power can be efficiently generated in areas with high-light intensity overseas to reduce power generation costs. In the future, cheaper

hydrogen may be produced abroad on a large-scale to be transported to Japan. Hydrogen is expected to be an energy source. (The Denki Shimbun, September 17, 2015)

(3) JBEC

Japan Blue Energy (JBEC), an energy venture in Tokyo, will build a bio-mass power plant in Wajima City, Ishikawa Prefecture. Forest thinnings will be collected, and heated to produce gas in order to generate power. Gas will be partially used to produce hydrogen. With ¥3 billion investment, the power plant aims to start operation in the summer of 2016. Facilities to produce electricity and hydrogen from forest thinnings are uncommon. JBEC invests in Wajima Blue Energy, Wajima City, for the construction. The power plant is planned to output 3,000kW using forest thinnings at the same time as producing hydrogen at 40 m^3/h. Hydrogen is planned to fuel FCVs. (The Nikkei, September 22, 2015)

5. Ene-Farm Business Plans

(1) Tokyu Land Corporation

On September 8th, Tokyo Gas's Ene-Farm for apartment units was shown to the press. The product made its appearance at a press preview of completed Tokyu Corporation's "Branz City Shinagawa Katsushima". This is the world's first apartment house with Ene-Farm for apartment units installed. Additionally, a 30 kW photovoltaic generator and cloud home energy management system (HEMS), and the FCs contributes to promote energy-saving/environmental consciousness of real estate businesses. All the 356 units of the apartment house are installed with Ene-Farm. For safety even on upper floors, the FC system is designed to withstand 30 m of wind speed and 1.0 G of jolt, and is made compact to be installed in pipe shaft spaces on hallways. The Tokyu group has been working on a project to reduce CO_2 emissions, and Branz City Shinagawa Katsushima is the first one to have been chosen for the "Leading Project for Reduction in CO_2 Emissions of Houses/Buildings" of MLIT, for FY 2013. While HEMS supports residents to reduce energy consumption, the developer will use collected data for future energy saving projects. Ene-Farm can reduce annual, 1 ton of CO_2 emissions of an average household use, and will contribute to reduction in CO_2 emissions of the project. Since Tokyo Gas introduced the FCs into the market in May, 2009, the firm has been fully promoting the product. The accumulated sales of the FCs reached 50,000 units in August, 2015. The FC system for apartment units was developed in April, 2014, and 1,000 units are used or planned in nine projects. For this financial year, the gas supplier targets 600 units at apartment completion basis, and the sales are currently 417 units. (The Denki Shimbun, September 9, 2015)

(2) Hokkaido Gas

In October, Hokkaido Gas will start to sell home FC systems in Kitami and Chitose Cities. The new home product to be introduced into the market can operate in a very cold outdoor environment of -20°C. The existing model can work only in an environment of down to -15°C. The system can expand its sales area for FCs. The FCs are produced by Panasonic, and specifically designed for the exclusive sales in Hokkaido. The FC system which is sold in the Honshu area has improved its insulation for operation in cold climates. The price is set at ¥2.1 million, excluding tax and installation costs, and is reduced by ¥0.1 million of that of the existing model by cutting down the number of parts. The product is eligible for the governmental subsidy of ¥0.30 million for a new house and ¥0.35 million for renovation of an established house. Some local governments, such as Sapporo City, have their own subsidy schemes to add support for purchase. (The Nikkei Business Daily, September 11, 2015)

(3) Saibu Gas

On September 14th, Saibu Gas announced that its accumulated sales of Ene-Farm had reached 5,000 units. The sales started in June, 2009, and the figure was achieved in six years. The gas supplier plans to sell 2,400 units for FY 2015. Although the sales reached 656 units on September 11th, the sales for new house constructions have slightly gone slower than expected. Increasing steadily every year, the sales of Ene-Farm was 1,283 units for FY 2013 and 1,387 units for FY 2014. The figure only consists of the FC sales for houses, but the result of Ene-Farm for apartment units is not included. Currently, an apartment house development is in progress in Fukuoka City to install Ene-Farm in each unit. According to Saibu Gas, the Fukuoka area is the

leader in the number of FC sales units followed by Kikakyushu then Kumamoto. (The Denki Shimbun, September 15, 2015)

6. Cutting Edge Technologies of FCV &EV

(1) Nissan Motor

On August 2nd, Nissan Motor announced that its EVs would be available for local governments to use for three years with no charge. Local governments which want to take this offer can send applications including their intended use. The automaker will collect data of various EV use including as a storage batteries during disasters for further EV sales growth. From November, two EVs will be sent to each 47 prefecture. Also cities, towns and villages can apply for this offer. (The Nikkei, September 3, 2015)

(2) Showa Denko

Showa Denko will raise its production capacity of a packaging material for lithium-ion battery, LIB, by 30% by 2016. With over ¥1 billion investment, a new production line will be added to their plant in Hikone City, Shiga Prefecture. The regulations of automobile exhaust fume have been tightening up worldwide. The manufacturer tries to catch demand in batteries for EVs and electric buses in the Asian market, mainly China. The packaging material to be produced is a composite of resin and aluminum film "Aluminum Laminate Film". Many small batteries for cell phones and tablet computers use the film, and currently it has been more in demand for EVs due to the advantage of easy shape forming. The firm also produces additives for electrodes and materials for anode for LIBs. Their plant in Kawasaki City has partially stopped the production of additives for adjustment in the output, and the facility will operate fully as the demand comes back. Their production capacity of anode materials is planned to be double by starting contract production in China. (The Nikkei, September 4, 2015)

(3) Mitsubishi Motors

Mitsubishi Motors will develop a new sports utility vehicle, SUV, by 2017. This is to be the fifth SUV for the automaker. The SUV to be developed will offer a plug-in hybrid vehicle, PHV, which can be charged through a domestic wall socket, and it will be also introduced into the global market including Europe. (The Nikkei, September 7, 2015)

(4) BMW & VW

On September 8th, the Japanese arms of both German-based BMW and VW announced the release of their PHV rechargeable at home would be released. BMW will bring out the new car as a part of SUV "X5" series, and hold down the actual price at same level of the clean diesel in the same series. VW sets the price of the hatchback "Golf" at under ¥5 million. The choice for environmentally conscious consumers has been expanding. The PHV version of "X5" will be sold for ¥9.27 to 9.93 million, and be delivered from December. The car drives approximately 31 km solely on its battery, and its 2.0 L engine supports the motor during the mode. The new vehicle uses the technology of PHV "i8" was released earlier, and has a four-wheel driving system. On September 8th, VW introduced its first PHV Golf. The price is set at ¥4.99 million. The 1.4 L engine supports the electric motor. The vehicle drives 53.1 km solely on the battery, and its engine and motor fully operate in the "GTE Mode" which enables reaching the speed of 100 km per hour from a still state in 7.6 seconds. The auto maker designed the vehicle using MQB strategy share modular construction, and the PHV exterior is made as same as the gasoline engine one. The both PHVs of BMW and VW are rechargeable only by normal chargers which take more time, and fully charged in three to four hours. The tax reduction scheme for eco cars is applicable for these vehicles, and subsidy can also be applied. (The Nikkei, September 9, 2015)

(5) International Motor Show Germany

European major automakers show their enthusiasm for electric motor drive such as EVs. In the International Motor Show Germany, the number of EVs went up mainly in the luxury range. German-based Audi and Porsche unveiled their concept cars which can drive 500 km on a single charge. Nissan Motor extended the driving range of the EV "LEAF", and Japanese automakers show their commitment to grow the market fully. Audi revealed its concept EV "e-Tron Quattro" which drives over 500 km on a fully charged battery. "What I said two years ago in this show is now becoming real. SUV is a strong seller, and we made this electric SUV. This means a lot." Prof. Rupert Stadler, the CEO, emphasized. The automaker plans to improve the battery performance in cooperation with South

Korean Samsung SDI, and introduce the EV in 2018. Porsche also introduced its concept EV "Mission E" which drives up to 500 km. It only takes 15 minutes to fully charge the car. The firm tries to dissolve consumers' anxiety of the driving range of an EV which is an issue. VW brought out PHV concept which can drive 900 km as a passenger car, the key product. Dr. Martin Winterkorn, the CEO, made an announcement that 20 EVs and PHVs would be added in their range by 2020. Daimler also plans to introduce 10 PHVs by 2017. Japanese automakers are working on improvement. Nissan will extend the driving range of its commercial EV "LEAF" by 26% to 250 km in the European standards on a fully charged battery. The EV is planned to be sold from 2016. Toyota Motor tries to expand HV sales, which is steady in Japan, in Europe. Their current sales are 200,000 vehicles, and the firm aims at double by 2020. The reason for these manufacturers developing more EVs and hybrids is that the environmental regulations are becoming tighter in the EU. The regulations require automakers to reduce significant amount of CO_2 emissions in their new cars in average by 2021. This gives a large impact on automakers which produce a high ratio of large cars. The producers need to sell more EVs and hybrids to lower their average of the emissions and are working on this as quickly as possible. (The Nikkei, September 17, 2015)

(6) ALSOK

Sohgo Security Services, (ALSOK) security service provider, will start sales and installation of quick chargers for EVs to commercial facilities this month. They will also apply governmental subsidy for installation for their clients. Security systems such as CCTVs will be offered at the same time. This will back up quick charger installation which is slow in progress. This operation will be carried out in cooperation with ALSOK Soei, a group member which offers maintenance of buildings in Yokohama City. The service will be offered in the greater Tokyo, Chubu, and Kansai areas. The service includes checking capacity of electricity access required for installation to maintenance of facilities in operation. The cost of a charger and installation is expected to be between ¥3.7 to 5.4 million. (The Nikkei, September 21, 2015)

7. FC forklift Development and Business Plan

Toyota Industries will join an experiment of FC forklift which is to be carried out in Shunan City Wholesale Market, Yamaguchi Prefecture. The experiment period is from October to the end of March 2017. This will be the third experiment location using Toyota Industries' FC forklift. Hydrogen is produced as by-product at the Shunan industrial complex, and will be used to run a FC forklift in the fruit and vegetable market. The manufacturer will investigate the effect of reduction in CO_2 from hydrogen production and improvement of operation. (The Nikkei, September 24, 2015)

8. Hydrogen Refueling Station Development & Business Plans

(1) 12 Organizations from Industry and Academia

12 businesses and academia organizations including Iwatani and JFE Steel have started research and development to reduce the installation costs of hydrogen refueling station to half. NEDO announced that seven projects were selected for this on September 9th. These projects will work on a technology to make compressed hydrogen directly from liquid and the development of accumulators using reduced amount of expensive materials until FY 2017. Other members of the project are Chiyoda Corporation, the University of Tokyo and Kyushu University. Since the Cabinet decided deregulation for installation standards of liquid hydrogen equipment, research and development has been kicked off. Hydrogen is gasified to be used as FCV fuel in the current technology. This time, the project will study a method which compresses liquid by a pump for an evaporator to gasify it. This method allows a reduction in equipment installation area and operational costs. Also, accumulator development will be carried out to reduce the amount of expensive carbon fiber reinforced plastic, CFRP. Construction of hydrogen refueling stations currently costs ¥500 million, five times of that of gasoline refueling stations, which slows the spread of the facilities. (The Nikkei Business Daily, September 10, 2015)

(2) Saibu Gas

On September 15th, Saibu Gas announced that the construction of a hydrogen refueling station for FCV would start on 16th in Higashi-ku, Fukuoka City. This

will be the first commercial refueling station to produce hydrogen from natural gas on-site in the Kyushu area, and start its operation in March, 2016. For this business, the gas supplier will purchase two of Toyota's FCV "MIRAI". The facility is named "Higashihama Hydrogen Station", and the construction plan was revealed in January, 2015. The filling facility will be built on a 1300m^2 piece of land which was previously used as the Fukuhoku Works of the firm. The function of the facility will be hydrogen supply to vehicles as well as to other refueling stations which have no production capacity of the fuel on their premises. The construction costs are approximately ¥700 million. The facility can supply 6 kg of hydrogen, which is the amount to fully fill MIRAI allowing completing the driving range of approximately 600 km, in three minutes. The hydrogen price is expected to be ¥1,000 to ¥1,200 per kilogram. The operation including staff is still under consideration. (The Denki Shimbun, September 16, 2015)

— This edition is made up as of September 24, 2015 —

A POSTER COLUMN

Various developments from next-generation SOFC to hydrogen detecting sensors

Currently NGK Spark Plug keeps bold attempts to explore new areas of business as a part of its sixth mid-term business plan "NGK Evolution 3 Year Shinkas".

While expectations raised high for hydrogen energy, the firm has made breakthroughs the in development of hydrogen production equipment, SOFC to use hydrogen and hydrogen detecting sensors to ensure safety with the expertise in automotive exhaust gas sensors and semiconductor parts as its base. Home SOFC development has been in progress closely with Kyushu University which focuses on research of next generation FCs. Also the firm is working on commercialization of SOFC cell stacks for large scale systems for business and industrial purpose in cooperation of Mitsubishi Hitachi Power Systems based on a business alliance agreement.

FCVs draw attention for hydrogen society to be realized, and require ensuring safety for hydrogen fuel leak. This pushes demand on hydrogen detectors. Focusing on this coming demand, NGK is developing thermal conductive hydrogen detecting sensors using the micro electro mechanical systems, MEMS. Hydrogen characteristically conducts heat, and the product uses this property to measure the amount of heat taken by hydrogen to detect hydrogen concentration. This system can detect low concentrations of hydrogen.

This sensor consists of a MEMS micro heater, temperature sensor and electronic circuit with a 16 bit microcomputer which runs a precise sensing algorithm to process signals. A solid sensor casing holds these parts, which allows the hydrogen detection under any expected conditions for FCVs. The firm will work on the product to be used in FCVs including FC forklift which are anticipated to grow their market rapidly. (The Nikkei, September 11, 2015)