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Toshiba Energy Systems & Solutions Corporation

Tohoku Electric Power Co., Inc.

Tohoku Electric Power Network Co., Inc.

Iwatani Corporation

Asahi Kasei Corporation

**Expansion and reinforcement of technology development project for practical storage  
and use of energy using hydrogen  
—Extension of term and expansion of consigned companies for NEDO renewable energy  
system technology development project in Namie town, Fukushima Prefecture—**

Toshiba Energy Systems & Solutions Corporation (Head Office: Kawasaki, Kanagawa; President and CEO: Mamoru Hatazawa; hereinafter “Toshiba ESS”), Tohoku Electric Power Co., Inc. (Head Office: Sendai, Miyagi; President: Kojiro Higuchi; hereinafter “Tohoku Electric Power”), Tohoku Electric Power Network Co., Inc. (Head Office: Sendai, Miyagi; President: Mitsuhiro Sakamoto; hereinafter “Tohoku Electric Power Network”), Iwatani Corporation (Head Office: Osaka; President: Hiroshi Majima; hereinafter “Iwatani”), and Asahi Kasei Corporation (Head Office: Tokyo; President: Hideki Kobori; hereinafter “Asahi Kasei”), regarding “Hydrogen social construction technical development project/Hydrogen energy system technical development/Technical development concerning business model construction and the large-scale actual proof of a re-energy use hydrogen system”\* (hereinafter “the Project”), a technology development project previously solicited by Japan’s New Energy and Industrial Technology Development Organization (hereinafter “NEDO”), in order to expand and reinforce the Project, the five companies, including the original participants Toshiba ESS, Tohoku Electric Power, and Iwatani, and the newly added Tohoku Electric Power Network and Asahi Kasei, have concluded a consignment agreement with NEDO to extend the term from March 31, 2021, to February 28, 2023.

The five companies will work together to further heighten system control and water electrolysis technology.

\* Project name: Hydrogen social construction technical development project/Hydrogen energy system technical development/Technical development concerning business model construction and the large-scale actual proof of a re-energy use hydrogen system

Period: Fiscal 2016–2022

(Feasibility study [FS Phase] performed from fiscal 2016 to 2017, system technology development [Demonstration Phase] currently in progress from fiscal 2017 to 2020.

System technology development [Demonstration Phase] now extended to fiscal 2022.)

## Project Outline

### 1. Background

With the expanding use of renewable energy such as solar and wind, there is an increase in occasions for output controlled variable in order to maintain the power grid supply-and-demand balance. Power-to-gas technology using hydrogen to enable large-scale long-term energy storage is a way to enable effective use of power from renewable sources with the least output controlled variable. The efficient advancement of such hydrogen energy storage and use will require not only a power grid supply-and-demand balancing function (demand response) but also establishment of the optimal operation function based on a hydrogen demand and supply forecasting system.

The Fukushima Hydrogen Energy Research Field (FH2R) which opened in March 2020 using a 10 MW hydrogen production unit is designed to fully utilize highly fluctuating power output from renewable energy without using storage batteries by performing supply-and-demand adjustment with respect to the power grid while producing clean hydrogen at low cost.

### 2. Activities henceforth

Henceforth, Toshiba ESS, Tohoku Electric Power, Iwatani, and the newly joined Tohoku Electric Power Network and Asahi Kasei, will extend the current Demonstration Phase until February 28, 2023, aiming to establish practical technology for power-to-gas by further heightening each control system (hydrogen energy operation system, power grid control system, and hydrogen demand-and-supply forecasting system) and water electrolysis technology.

Research and development to heighten each control system is directed toward greater functionality of the hydrogen energy system as resource for adjusting supply and demand through the addition of a reverse-power-flow function for the solar generated power based on electric power system reforms and electricity market trends.

Research and development to further heighten water electrolysis technology is directed toward optimization of membrane replacement frequency based on evaluation of degradation of components and apparatus over time as well as reducing the cost of the water electrolysis equipment by reviewing the structure and materials of the electrolysis cell frames.

### 3. Role and stance of involvement for each company

Each company's role and stance of involvement in the Project are as described below.

Through this Project, Toshiba ESS will contribute to Supervision of overall project and the overall hydrogen energy management system. Yoshihisa Sanagi, General Manager of the Hydrogen Energy Business Division at Toshiba ESS, said, "It is our great honor to contribute to the formulation of the hydrogen supply chain in Fukushima and we will continue to support expanding hydrogen energy for a low carbon society through our hydrogen-related technologies and solutions."

Tohoku Electric Power will verify how to apply the large-scale power-to-gas system, which is based on the premise of a stable power supply, aim to expand the development of renewable energy, and contribute to the reconstruction of Fukushima Prefecture as a local power company continuously.

Tohoku Electric Power Network will verify the improvement of the supply-and-demand balance through demand response using the power grid control system, and work to expand the introduction of renewable energy as well as ensure the stable operation of the power system simultaneously.

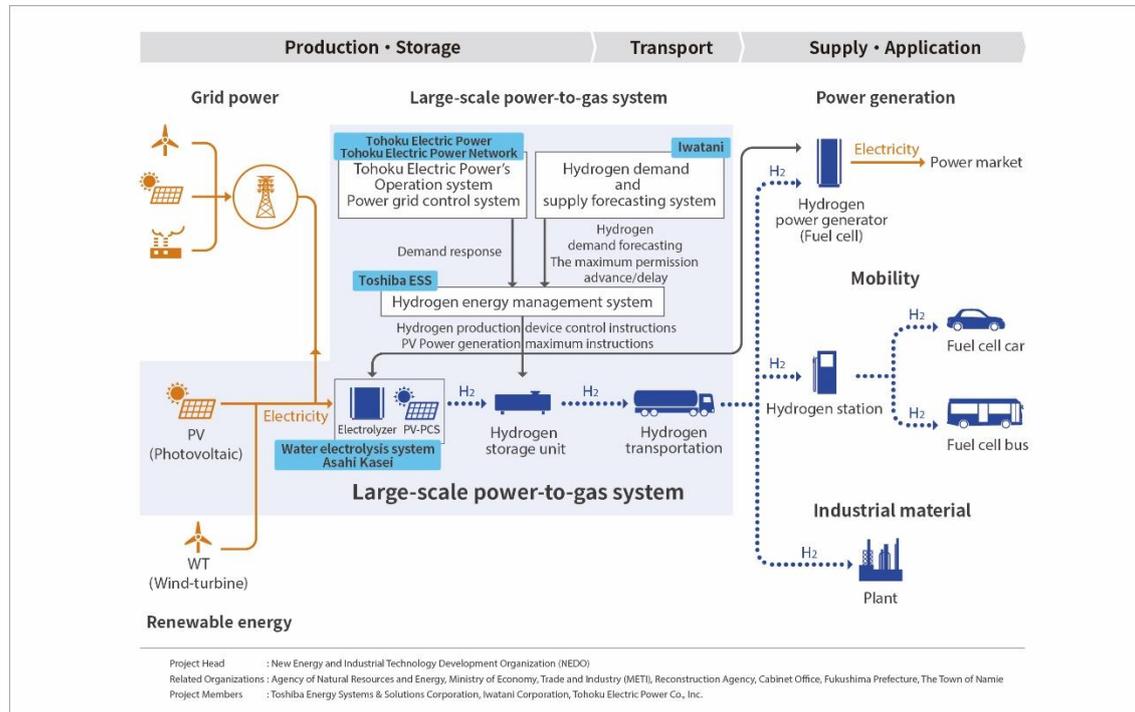
Iwatani believes that this project will contribute to the realization of the hydrogen energy society. We will positively play a role in expanding the utilization of hydrogen energy, based on our knowledge of hydrogen transportation, storage and supply system and construction and operation of hydrogen stations.

Asahi Kasei joined this Project from the position of a supplier that delivered a newly designed world-leading scale 10 MW-class alkaline water electrolysis plant based on original technology. Now we become one of the consignees of the Project, mainly focused on technology development related to water electrolysis equipment. We look forward to leveraging the results of this Project to commercialize large-scale water electrolysis equipment that will contribute to life and living for people around the world.

(Reference) The roles of each company

Toshiba ESS	Supervision of overall project and the overall hydrogen energy management system
Tohoku Electric Power	Verification of the use of large-scale power-to-gas system on the premise of stable power supply
Tohoku Electric Power Network	Adjustment of supply and demand in the power grid by using power grid control system
Iwatani	Hydrogen demand prediction system and storage and transportation of hydrogen
Asahi Kasei	Technology development for reduced maintenance cost of water electrolysis equipment

## Overview of FH2R system



Through this Project, the five companies will advance technology development for expanded use of hydrogen derived from renewable energy and perform optimum utilization of the hydrogen energy operation system for expanded use of renewable energy targeting commercialization of a sustainable power-to-gas business model in 2030 and beyond.

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