*This is the English translation of the Keidanren Times' article on the results of Keidanren's questionnaire survey on energy and low-carbon technologies. The results are available only in Japanese.
(http://www.keidanren.or.jp/policy/2013/069.html)

# Keidanren Announces Results of Questionnaire Survey on Energy and Low-Carbon Technologies

In the Japan Revitalization Strategy, the Japanese government decided that "in order to formulate the Proactive Diplomatic Strategy on Global Warming by which Japan would contribute to the world through technology, the government develop a new Environmental Energy Technology Revolution Plan at the Council for Science and Technology Policy so as to promote research and development." Based on the government decision, the Council for Science and Technology Policy established the Commission for the Environmental Energy Technology Revolution Plan (Chairman: Kazuo Kyuma, full-time member of the Council for Science and Technology Policy), which is scheduled to compile a new Environmental Energy Technology Revolution Plan near the end of August.

Against this backdrop, the Keidanren conducted a questionnaire survey among members of the Subcommittee on Policy of the Committee on Energy and Resources and the Subcommittee on Global Environment of the Committee on Environment and Safety addressing technology fields which require special focus in terms of research and development for practical application in 2050. The results of the survey were announced on July 22.

Thirty-four technology fields were discussed in the responses, as provided below.

Abstract of survey (total of 34 technology fields) in random order

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| 1.Energy supply-side (20 technology fields) | |
| (1) Advanced utilization of fossil fuels（7 technology fields) | ・700°C-class advanced ultra-supercritical (A-USC) coal-fired power generation<br>・High-efficiency natural gas-fired power generation<br>・Next-generation advanced integrated gasification combined cycle (A-IGCC) power generation<br>・High-efficiency thermal power generation technologies (fuel cell / gas turbine / steam turbine combined cycle thermal power generation)<br>・Solid oxide fuel cells（SOFC）<br>・Carbon dioxide capture and storage technologies (CCS)<br>・Methane hydrate mining technologies |
| (2)Advanced utilization of renewable energy (6 technology fields) | ・Innovative solar power generation<br>・Space photovoltaics<br>・Geothermal power generation<br>・Tidal power generation<br>・Production of alternative transport fuels from biomass (cellulosic bioethanol)<br>・Production of alternative transport fuels from biomass (microalgal biofuel) |
| (3)Utilization of hydrogen (3 technology fields) | ・Hydrogen production (including solar thermal hydrogen production)<br>・Hydrogen storage and transport<br>・Utilization technologies for hydrogen energy carriers |
| (4)Advanced power transmission and distribution systems (2 technology fields) | ・Next-generation power transmission and distribution networks<br>・High-performance stationary power storage |
| (5)Advanced nuclear power technologies (2 technology fields) | ・Next-generation light-water reactor with improved safety<br>・Fast breeder reactor cycle |
| 2.Energy demand-side (14 technology fields) | |
| (1)Industrial sector (6 | ・Innovative iron and steel making processes |

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| technology fields) | ・Production of chemical products from non-edible wood-based biomass<br>・Production of chemical raw material using artificial photosynthesis<br>・Chemical loop combustion technologies<br>・Production of glass using atmospheric dissolution technologies (innovative materials, production/processing)<br>・Engine-based cogeneration |
| (2)Residential / commercial sector (1 technology field) | ・HEMS / BEMS / local EMS |
| (3)Transportation sector (3 technology fields) | ・Intelligent transport systems (ITS)<br>・Plug-in hybrid vehicles (PHV) / electric vehicles (EV)<br>・Fuel cell vehicles |
| (4)Cross-cutting technologies (4 technology fields) | ・Utilization technologies for unharnessed energy using cogeneration, etc.<br>・Ultra-high efficiency heat pumps<br>・Next-generation semiconductor technologies<br>・Recovery and refinery of rare earth |

1. Energy supply-side

(1) Among the technologies referred to in terms of the sophisticated utilization of fossil fuels were carbon capture and storage (CCS) technologies which will reduce carbon dioxide emissions and methane hydrate exploitation technologies for resources in Japanese coastal waters which will contribute to improving Japan's energy self-sufficiency rate, in addition to high-efficiency technologies for fossil fuel use, including advanced ultra-supercritical (A-USC) coal-fired generation and combined cycle power generation technologies employing gas turbines and fuel cells.

(2) In relation to the utilization of renewable energy, power generation technologies harnessing solar, geothermal and tidal energy were raised. Some responses included technologies to produce transport fuels from biomass resources.

(3) For the hydrogen utilization technology field, responses included

hydrogen production technologies employing photovoltaic and solar thermal energy, transport and storage technologies using chemical energy and hydrogen storing alloys, and technologies to directly use chemical energy, such as ammonium, in fuel cells.

(4) Technologies for sophisticated power transmission and distribution / storage systems included those to regulate electrical flow through output control or power storage depending on grid conditions. Sophisticated stationary fuel cells technologies such as lithium ion cells and capacitors were also provided in the responses.

(5) In terms of nuclear power technologies, some responses called for the development of fast breeder reactor cycle technologies, with a view to its establishment based on national energy policy, while improving the safety of light water reactors.

2. Energy demand-side

(1) Technologies given for the industry sector included steelmaking processes using hydrogen reduction, chemical product manufacture using biomass or artificial photosynthesis, glass manufacture by means of air dissolution of glass material granules, and gas engine cogeneration.

(2) In relation to the residential / commercial sector, local energy management system technologies, as well as household-based systems were raised.

(3) For the transportation sector, intelligent transport systems (ITS), plug-in hybrid vehicles (PHV), electric vehicles (EV) and fuel cell vehicles were given.

(4) Cross-cutting technologies included semiconductor technologies with

reduced electricity loss, the utilization of unharnessed energy resources, the recovery and refinery of rare earth from Japanese coastal seas, and ultra high-efficiency heat pump technologies.