EU - Japan Business Round Table
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Recommendations of the EU-Japan Business Round Table to Leaders of Japan and the European Union

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Working Party 4
Energy, Environment, and Sustainable Growth

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Introduction

Japan and the EU would like to support the Paris Agreement which came in force in November 2016. An international framework of the Agreement is promised by all major emitters, including developed, emerging and developing economies, for engaging in global warming countermeasures. Currently, parties are negotiating to work out detailed rules by 2018 towards its implementation in 2020.
However, with the announcement made in June 2017 by U.S. President Trump that the U.S. would withdraw from the Paris Agreement, there is increased uncertainty regarding the effectiveness and international fairness of the Agreement.

Despite the US decision, moving backwards on climate protection is not an alternative. The EU and Japan should stay fully committed to implementing the Paris Agreement. Japan and the EU need to continue to comprehensively analyze how U.S. climate change and energy policies will affect international competition on an equal footing and energy security as well as the impact that they will have on international coordination and cooperation on global warming countermeasures, and to address such impacts strategically. Not only is there time before the U.S. can officially withdraw from the Paris Agreement, the U.S. has declared that it will continually participate in international negotiations including the COP23 talks. Therefore, Japan and the EU should join forces with other major economies to persistently convince the U.S. to remain in the Agreement, maintain partnership with the U.S. in areas within the COP framework where they can be collaborative, and identify areas of cooperation which can add momentum to the drive against global warming.
KEIDANREN (Japan Business Federation) also released a set of countermeasures for global warming issues in October, 2017.

Today, developing countries account for approximately 60 percent of global greenhouse gas emissions, and all emitters are required to contribute to reducing emissions on a global scale.
However, at the 23rd session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP23), some developing countries argued that implementation of the Paris Agreement should be differentiated between developed and developing countries and pushed for broadening the scope of the guidelines. Developed countries opposed to these arguments, but the guidelines should promote all countries' efforts on climate change and should not be bifurcated.

The issue of climate change is one that must be addressed through the cooperation of all countries and people. Amidst the recent inability of international conferences to come to conclusions on other important issues requiring international-level discussions, the fact that the Paris Agreement was agreed upon by countries around the world in such a short period of time makes it particularly noteworthy. To ensure that all major emitting countries ratify this agreement, as well as to enhance its fairness and effectiveness, it will be imperative to establish a system with which the promises made by each ratifying country and the fulfilment of these promises can be monitored internationally and gap closing actions can be considered as necessary.

On December 12, 2017, One Planet summit convened by France jointly with the United Nations and the World Bank was held in Paris for discussing three areas (1) to commemorate the second anniversary of the adoption of the Paris Agreement and maintain momentum for expanding support for the Agreement, (2) to confirm the importance of climate finance and pursue the “greening” of public finance and private finance; and (3) to share good practices and lessons so that countries and various actors will pursue low-carbon and resilient economies.

Japan and the EU will not only need to steadily implement the domestic measures that served as the basis for the formulation of their intended nationally determined contributions (INDC) but also undertake the tasks of developing low-carbon technologies and transferring technology to developing countries with significant potential for making reductions, with support from international institution.

The energy scenarios through multiple future pathway of global energy situation in Japan and the EU should be basically outlined by an integrated approach to achieve the energy-related aspects of the UN Sustainable Development Goals: determined action on climate change; universal access to modern energy and a dramatic reduction in air pollution.

Climate migration is already happening. Between 2008 and 2015, an average of 26.4 million people per year were displaced by climate- or weather-related disasters, according to the United Nations. With increasing temperatures, heat waves and extreme weather events are likely to increase in frequency, intensity, duration and cause more harm and death.
These impact human health, livelihoods, and stability of the broader economy and society.

Sea levels of the pacific islands are extremely vulnerable, as are more than 410 cities around the globe, including Amsterdam, Hamburg, Lisbon, Mumbai, etc.
Climate change is already causing mass human migration. The International Organization for Migration fears that the scale of such movement will rise, with unprecedented impact on lives and livelihoods. Parts of western Asia, for example, are likely to become inhospitable for humans by the end of this century, with temperatures projected to exceed the human adaptability threshold.
Temperatures exceeding 45 degrees Celsius will become the norm in most low-lying cities and could go as high as 60 C in Kuwait, Al Ain and Doha during late summer months.

For Japan and the EU, it will be crucial to carry on with efforts to secure safe, stable, economical, and sustainable energy. The governments, enterprises, industries, and citizens of Japan and the EU must not only prepare for natural disasters that could potentially occur in each region as a result of global warming and implement crisis management measures but also address energy system reform, the reduction of energy demand and greenhouse gases, and the resolution of environmental conservation and other problems.

Recommendations from both European and Japanese industries

WP-4/#01/EJ to EJ Change and harmony in the areas of energy and the environment

Diversification and destabilization of resource- and energy-supplying regions:

Today, the global energy market remains vulnerable to a wide range of risk factors, including natural disasters, major technical accidents, and geo-political tensions. The shale revolution in the United States and new demand and investment trends in the Middle East and Asia are recasting traditional patterns of global oil trade, with global implications for energy security. The Middle East is set to remain, by far, the largest global crude-exporting region, but the availability of additional crude from this region for international trade is being squeezed by rising domestic consumption and new local refinery capacity. The largest increase in crude export comes from North America, propelling the region above Russia, Africa and South America in the global rankings. On the importers side, Asia's crude oil import requirement grows by a massive 9 mb/d, drawing in available supply from around the world. Taken together, these trends imply the need for a fresh look at oil security and how best to achieve it.

Asia accounts for the lion's share of oil demand growth over the coming 25 years and, unsurprisingly, the same is true for crude oil imports. According to WEO-2017 report, Asia's combined crude oil import needs rise by 9 mb/d to around 30 mb/d by 2040, with strong growth in China, India and Southeast Asia more than offsetting declines in Japan and Korea. Asia's share of global crude oil imports therefore will rises from 50% today to more than two-thirds by 2040.

We still have seen signs of sectarian violence and terrorism even in Middle Eastern regions that have been comparatively stable up until now. The governments of Japan and EU countries will continue their efforts to strengthen cooperation among members of the international community to improve regional peace and energy security.

The significant impact of the destabilization of energy prices on Japan and EU countries that import energy:

Growing dependence on oil from the Middle East, the world's low-cost resource superpower, means that the risk of a sharp rebound in price in the event of shrinking oil investment would offset the economic benefits. And if the price drops to such a level that it does not bring investment to the supply sector, there will also be growing concern over the stable supply of natural gas. Furthermore, the effective use of bio fuels remains a question mark, and there has been a major impact on investment in energy efficient technologies and energy conservation measures. Also, in the unlikely event that a resource-rich country was to fall into a national financial crisis, it could lead to growing geopolitical risks and the potential reinforcement of terrorist organizations.

Although declining resource prices have contributed to the short-term improvement of trade deficits in Japan and EU countries, it is important for these countries to fully understand the impact that the stabilization of resource prices can have on energy security, energy conservation, and energy efficiency, and to act accordingly.

The impact of rising energy demand in newly developing countries on national energy policy changes and resource prices:

At COP21, expectations were high for efforts toward the introduction of energy systems that are not only less carbon intensive but also more efficient.

According to WEO-2017, global energy needs rise more slowly than in the past but still will expand by 30% between today and 2040, the equivalent of adding another China and India to today's global demand. The largest contribution to demand growth – almost 30% – comes from India, whose share of global energy use rises to 11% by 2040 (still well below its 18% share in the anticipated global population). Southeast Asia is another rising heavyweight in global energy, with demand growing at twice the pace of China. Overall, developing countries in Asia account for two-thirds of global energy growth, with the rest coming mainly from the Middle East, Africa and Latin America.

Japan and the EU are committed to working together to stabilize resource prices and implement energy mix policies suitable for regional needs that will enable companies to continue their business activities in a stable manner while contributing to worldwide efforts against global warming.

WP-4/#02*/EJ to EJ Basic energy policies

Harmonization of supply stability, economic efficiency, the environment, and safety standards:

Energy forms the foundation of economic activities. Efforts to reduce energy demand while at the same time ensuring the stable supply of energy and proper electricity rates are not only critical to business operations but also have a profound impact on the creation of new business opportunities. It is also important to give due consideration to environmental load. Based on this perspective, the governments of Japan and EU countries should carefully consider the future role of nuclear power generation to achieve CO2 reduction of Paris Agreement.

Cooperation with other countries from a global point of view:

In regard to the energy demand and supply structure of the world, changes in demand are occurring primarily in Asia, and the diversification of energy sources such as natural gas, renewable energy, and nuclear power is becoming more pronounced. Meanwhile, the impact on the global environment is being exacerbated, and energy issues are becoming even more complex.

Amid these circumstances, Japan and the EU must promote a framework for a more comprehensive collaborative alliance from the viewpoints of energy and the environment.

As such, it will be imperative to not only deepen our relationship with the IEA and IAEA but also strengthen cooperation by exchanging information with our European counterparts in various international committees.

Medium-, and long-term energy strategies:

The sustainable development scenario should be an integrated way to achieve a range of energy-related goals crucial for sustainable economic development: climate stabilisation, cleaner air and universal access to modern energy, while also reducing energy security risks. Core scenario should be the achievement of an early peak in

CO2 emissions and a subsequent rapid decline, consistent with the Paris Agreement. In a faster transition scenario, how policies could push an even more rapid and steeper decline in CO2 emissions and limit climate risks further.

The key to this will be to balance economic growth with the reduction of CO_2 emissions. And while the decision to engage in global efforts to cut CO_2 emissions was made at COP21, it will be essential to ensure that these efforts are paired with economic growth to make it possible to move forward with them in an attractive and sustainable manner.

Achieving a stable supply of energy through a multi-layered energy supply structure:
An overarching theme is that in the real world there is no single energy transition policy package that fits all countries – national policy objectives and constraints will shape each jurisdiction's policy mix.

There are invariably advantages and disadvantages to the adoption of every energy source, and there is no form of energy that provides complete satisfaction from the view point of stability, environment and economic efficiency. In view of this, a multi-layered energy supply structure capable of functioning not only during times of peace but also in emergencies should be established.

WP-4/#03/EJ to EJ Fossil fuels

Advantages and disadvantages of oil, natural gas, and coal:

Although fossil fuels are known to emit greenhouse gases, they do excel today in terms of economic efficiency and supporting grid stability against a backdrop of increasing portion of renewable energy sources. Progress is currently being made toward the development and commercialization of highly efficient lower-carbon alternatives, and governments should be providing support for these development and commercialization efforts, as well promoting the use of these alternatives in developing countries.

Natural gas supplies 22% of the energy used worldwide, and makes up nearly a quarter of electricity generation, as well as playing a crucial role as a feedstock for industry. Natural gas is a versatile fuel and its growth is linked in part to its environmental benefits relative to other fossil fuels, particularly for air quality as well as greenhouse gas emissions.
In the United States, plentiful supplies maintain a strong share of gas-fired power in electricity generation through to 2040, even without national policies limiting the use of coal. But 80% of the projected growth in gas demand takes place in developing economies, led by China, India and other countries in Asia, where much of the gas needs to be imported and infrastructure is often not yet in place. Efficiency policies also play a part in constraining gas use: while the electricity generated from gas grows by more than half to 2040, related gas use rises by only one-third, due to more reliance on highly efficient plants.

A new gas order is emerging, with US LNG helping to accelerate a shift towards a more flexible, liquid, global market. Ensuring that gas remains affordable and secure, beyond the current period of ample supply and lower prices, is critical for its long-term prospects.
Coal supplies a third of all energy used worldwide and makes up 40% of electricity generation, as well as playing a crucial role in industries such as iron and steel. Coal use will continue to be significant in the future.

Coal is under pressure in many regions of the world for concerns about air pollution and significant greenhouse gas emissions. It is being squeezed out in power generation by cheap (except LNG) and abundant natural gas and fast-growing renewables, whose costs are also plummeting on a world scale.

In light of the Paris Agreement, we can anticipate greater diversification in power sources that will gradually lower dependence on coal in power generation, a long-term transition that must be anticipated. However, the scale and speed of change across the globe must reflect national circumstances, notably in terms of affordability and securing access to energy. Where new investments in coal-fired power are still planned, it is essential that they use the best available and most efficient technologies.

Japan and the EU should collectively contribute to countermeasures against global warming by supporting when necessary the introduction of thermal power technology characterized by high efficiency and lower CO_2 emissions, such as ultra-supercritical coal-fired thermal power, gas-fired combined cycle thermal power, etc.

It should also be noted that fossil fuels remain low in price as a form of thermal energy in developing countries. Among other technologies, gas-fired power plants can provide for security of supply and bring strong benefits on flexibility to the energy landscape, in particular with a growing share of intermittent renewable energy sources.

Carbon capture and storage (CCS) technologies are expected to play a significant part in the global climate response. Following the ratification of the Paris Agreement, the ability of CCS to reduce emissions from fossil fuel use in power generation and industrial processes – including from existing facilities – will be crucial to limiting future temperature increases to "well below 2°C," as laid out in the Agreement. CCS technology will also be needed to deliver "negative emissions" in the second half of the century if these ambitious goals are to be achieved. Japan and the EU should contribute to the development of CCS technologies and support their advancement.

WP-4/#04/EJ to EJ <u>Nuclear power</u>

Nuclear power has been one of the largest contributors of carbon-free electricity globally. There is keen interest in nuclear power generation from the viewpoints of promoting measures against global warming and stably securing energy that is less susceptible to fluctuations in fossil fuel prices.
However, if we attempt to achieve this without nuclear power, the cost of doing so will increase dramatically. At the same time, it would lower the feasibility of achieving this aim, and we therefore believe it will be impossible to reach the COP21 objective without the inclusion of nuclear power generation. WEO-2017 report expects about $1.1 trillion of investment in nuclear power by 2040 leading to an increase of nuclear power production of around 46%. While significant, nuclear's share of power generation declines to 10 percent, and the increased output is currently less than half of what is assumed in the sustainable development scenario. Furthermore, growth is quite concentrated, with about 93% of the net production increase accounted for by two countries: China and India.

A critical and competitive base-loaded power supply in regions without energy resources:

Safe nuclear power generation plays an important role in the energy mix for Japan and the EU. Moreover, it contributes to giving Japan and the EU a competitive edge, securing a low-cost base-load power source, ensuring grid stability, achieving economic growth, and creating jobs.

Rising expectations for nuclear energy and the importance of education and training on ensuring safety and future R&Ds:

Japan and the EU must cooperate to universalize lessons learned from the Fukushima nuclear accident in an efficient and transparent way, as well as provide technology development, education and training in order to ensure the complete safety of nuclear power generation.

Replacement of current nuclear reactors with safer ones:

The latest nuclear reactors provide a technologically high level of safety, are being explored as a possibility for inclusion in the energy mix of the future, and should be considered for use in replacing aging nuclear reactors in Japan and the EU. The construction of nuclear reactors in Japan and the EU utilizing the latest models should be used as a reference for the export of nuclear power technology by Japan and European countries to third countries.

Developing decommissioning technologies and methodologies:

Japan and the EU hold a large part of the worldwide inventory of the aged nuclear reactors which will be subject to decommissioning. Establishing decommissioning technologies and methodologies for safety and minimum environmental impact is an obligation of Japan and EU and precondition to enhance credibility of nuclear schemes in the general public, and promote nuclear power technology to third countries. Japan and EU should therefore promote an R&D program for collaboration on the development of methods for nuclear power plant decommissioning.

Finance & Support:

To achieve the highest possible safety standards, we would like to request that Japan and the EU not only promote investment in nuclear energy but also request that the World Bank, European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), Asian Development Bank (ADB) and JBIC provide financing to support programs dedicated to ensuring the full safety of nuclear power.

Security measures:

Japan and the EU should cooperate in facilitating the effective implementation of international nuclear safety standards and security measures at bilateral meetings and multilateral meetings on nuclear power. These standards should capitalize on lessons learned through the operational experience of the parties.

WP-4/#05*/EJ to EJ Renewable Energy

Renewable energy is expected to play major role in the transition to a less carbon-intensive and more sustainable energy system. Renewables have grown rapidly in recent years, accompanied by sharp cost reductions for solar photovoltaics and wind power in particular on a world scale. The IEA expects renewable electricity generation to increase by a more than one-third by 2022. However, renewable heat and transport are lagging behind, despite good potential.

As the rapid deployment and falling cost of clean energy technologies are mentioned in WEO-2017 report, growth in solar PV capacity was larger than for any other form of generation in 2016 and costs of new solar PV have come down by 70%, wind by 25% and battery costs by 40% since 2010.

Renewable sources of energy meet 40% of the increase in primary demand through their explosive growth.

Renewables capture two-thirds of global investment in power plants as they become, for many countries, the least-cost source of new generation. In the European Union, renewables account for 80% of new capacity and wind power will becomes the leading source of electricity soon after 2030, due to strong growth both onshore and offshore.

Policies continue to support renewable electricity worldwide, increasingly through competitive auctions rather than feed-in tariffs, and the transformation of the power sector is amplified by millions of households, communities and businesses investing directly in distributed solar PV. Growth in renewables is not confined to the power sector; the direct use of renewables to provide heat and mobility worldwide also doubles, albeit from a low base.

Advantage and disadvantage of renewable energy:

Although the role of renewable energy in the reduction of CO_2 emissions and achievement of energy security cannot be denied, integration into the grid and stability of supply remain major issues to address. Despite its potential to complement traditional energy, it will require a smart and integrated power distribution network and the development of energy storage solutions.

Currently there are various options for renewable energy, including wind, solar, hydro, geothermal, tidal, and biomass. However, other than hydroelectric power, which can provide a certain level of base power, these power sources are affected by regional appropriations. Thus, there are remaining economic, efficiency, environmental, safety and stability issues that need to be addressed, pointing to the need for further discussions while their uptake is being realized.

Despite slower capacity growth, hydropower will remain the largest source of renewable electricity generation in our forecast, followed by wind, solar PV and bioenergy.

To overcome these challenges, it is imperative to:

- Comprehensively develop the adoption of highly distributed renewable energy sources.
- Drive down the total costs for renewable energy in comparison with other traditional energy sources, including all indirect costs of CO_2 emission.
- Keep the appropriate level of subsidies or incentive schemes for renewable energy technologies while phasing out subsidies for fossil fuels.
- Promote research on immature renewable energy technologies towards their commercialization.

Feed-in tariff system in Japan

There have been many cases wherein permits have been secured under the renewable energy feed-in tariff system (FIT) in Japan but the project did not actually become operational for some application programs, leading to concerns regarding the high burden on citizens and the prevention of entry of latecomer energy producers that offer lower costs and higher performance. In particular, in regard to the FIT for solar power systems, which are being introduced at a rapidly increasing rate, there is a need to formulate schemes to encourage producers to find ways to lower costs from the perspective of lowering the burden on citizens.

FIT cost in 2017 for renewable energy in Japan reached around $25Bil./year and the FIT cost in 2030 will expect around $34.6Bil./year - $37.4Bil./year, according to government's preliminary calculation

Also, hydro, geothermal, and wind power, which are cheaper to generate but have longer lead times for commercialization should be more encouraged to be adopted.

Furthermore, governments should evaluate a balance between feed-in tariff systems and mitigation of national burden in Japan and EU states to stimulate renewable energy.

WP-4/#06*/EJ to EJ <u>Smart Grid and convergence of Electric distribution networks with ICT</u>

The growth of Renewable Energy Systems on the grids in the future will to a substantial degree occur in dispersed energy production. This will in turn favour local balancing of energy flows on the grid as opposed to centralized transmission system operators (TSOs) controlled balancing. The trends to achieve this are through automatic trading of energy flexibility by prosumers, dynamic pricing of energy based on local conditions, and maximisation of adaptability potential by harnessing virtual energy reservoirs in processes. Local sustainability and uninterrupted energy supply to remote areas in case of natural disasters drives grid planning towards possibilities for island operation of electric micro grids. The growing role of prosumers, smart grids, micro grids, energy storage and e-mobility requires a different distribution of roles and responsibilities in the value chain of electricity production, transmission, distribution and retail. All these trends will have to ultimately result in a multitude of load balanced smart micro grids, which are in turn connected to the main grid, supported by state-of-the-art ICT such as internet of things, big data, etc.

<u>Energy storage batteries:</u>

Along with the spread and expansion of renewable energy, grid stability, peak shift of power consumption, stable power supply need to be dealt with.

Since it is expected that the demand for storage batteries will be greatly expanded in the future, harmonization of safety standards for storage batteries, standardization and unification of test protocols, and/or introduction of mutual certification system should be promoted between Japan and EU.

Storage batteries contribute to the stabilization of the energy supply-and-demand structure through the storage of convenient power and the ability to use it anytime, anywhere. As a technology for long-term and large-scale storage of power, the hydrogen energy storage system should be more widely utilized for the efficient utilization of power.

Due to the development of the smart grid, storage battery applications are expected to expand further to include vehicles, residences, buildings, and commercial establishments. Japan and the EU must continue to work together toward lowering costs and increasing efficiency through technological development and standardization, while also monitoring the “cradle to grave” environmental impact of batteries.

On the other hand, the uptake of renewable energy has led to instability of the power grid due to the increase in distributed power sources. Systems for maintaining stability, however, are prohibitively expensive. Recently, the use of cloud and ICT has made it possible to intensively gather data and carry out control at lower costs. Also, in regard to storage batteries, technologies to prevent imbalances that prevent further charging due to having one battery depleted and another fully charged are being developed. It is imperative to proactively make use of the micro-grid and ICT that enable handling efficient power sources, such as solar power generation.

Measures to be taken are:

1) Strengthening the positive role of highly distributed residential and small commercial photovoltaic (PV) installations for self-consumption to reduce costly investments in power distribution network and new big power generators. This will also reduce the need in harmful environmental interventions.
2) Promote smart functionality of PV inverters through regulatory requirements
3) Improvement of power quality and stability through smart grids and micro grids with battery storages.
4) Unify EU/JAPAN technical standards for highly distributed residential and small commercial PV installations and make them comparable to the high standards set by the newest USA rule 21/2017 regarding power quality and fire safety (such as rapid-shutdown regulation).
5) Prepare concrete action plan for financial stimulation and promotion of high distributed on-site smart grid green power generation in connection with e-mobility penetration.

WP-4/#07/EJ to EJ <u>Effective use of biomass resources</u>

In order to make the shift from fossil to biomass resources as raw materials for a wide range of uses and therefore achieve significant reduction in greenhouse gas emissions, technologies and processes to competitively convert biomass into fuel, such as cellulosic ethanol, bio-gasoline and biogas, or useful chemicals must be developed and become more widely adopted. It is a positive example of a circular economy.

Fast-tracking the practical and economical utilization of technologies that convert waste products, wood-based biomass, and other non-edible plant resources into fuel or useful chemicals requires strengthening of government support for collaborative R&D and technical trials between private-sector companies and academic institutions in Japan and the EU. Further, promoting the uptake of products manufactured using the above technologies requires the implementation of a sustainable, effective, and transparent framework for providing subsidies and tax incentives for biomass-derived fuels and chemicals until they can become self-justified.

International standardization of evaluation methods, classification schemes, and labelling procedures are also necessary to enable a stable and profitable uptake of biomass-derived products at the global level. In labelling for example, although there are internationally defined environmental labels (Type I, II, and III), compliance standards vary among different countries.

Standardization of the certification criteria for labels will make it possible to have universal labels that can be used worldwide. This will lead to the establishment of market reliability of biomass-derived products and pave the way for their stable and profitable uptake. Also, linking environmental labels with requirements/conditions for tax incentives and public procurement can serve as an impetus for the further spread of the use of biomass-derived products. To enable Japan and the EU to agree on and lead the way in establishing international standards for evaluation and labelling systems, both governments must pursue the harmonization and mutual recognition of their respective regulations.

WP-4/#08*/EJ to EJ Energy conservation & energy efficiency

Energy conservation is an initiative aimed at fulfilling the need for economic efficiency, environmental compatibility, and energy security, and industries in Japan and the EU should make every possible effort to develop and promote the use of energy conservation technologies.

At the same time, it is also important to ensure that excessive investment burden is not placed on companies nor that production suppression is imposed on them for the sake of achieving unequal energy conservation effects.

The promotion of energy conservation will require the strengthening of research and development and improvement of public awareness of energy conservation.

Strengthening of energy conservation in each field:

One area in which energy conservation effects are foreseen in the residential and business fields is the use of insulation materials and high-performance windows as energy conservation measures in houses and buildings.

Energy conservation technology for electric appliances and equipment, such as refrigerators, air conditioners, servers, and LED lighting, is also evolving. In the transportation field, advancements are being made in the energy efficiency and reduced environment footprint of automobiles through the development of EV, PHEV, clean diesel, and hydrogen fuel cell vehicles (FCV). Japan and the EU should collaborate on standards to take the lead in promoting market introduction of these technologies, and their supporting infrastructures. Alignment and simplification of related standards and regulations must also be promoted, as for instance the cost of a hydrogen refilling station for FCVs is today significantly higher in Japan than in Europe or the US.

Industrial energy efficiency has improved, with use of energy management systems increasing Energy use per unit of economic output in the industrial sector fell by nearly 20% between 2000 and 2016. The magnitude of the declines is similar both in IEA member countries and major emerging economies. In some energy-intensive industries, such as aluminum smelting and cement manufacturing, average efficiency has improved sharply as a result of rapid expansion in production capacity, especially in emerging economies, since new facilities tend to be much more efficient than old ones. In these industries, efficiency gains help reduce the impact of volatile energy prices on competitiveness.

Buildings' energy efficiency has improved, but far more is possible as energy efficiency in buildings continues to improve. Efficiency improvements of 10% to 20% are possible in most countries from appliances, equipment and lighting products that are already commercially available. There is strong global momentum towards more efficient lighting; by 2022, 90% of indoor lighting worldwide is expected to be provided by light-emitting diodes (LEDs).

One commonality among all fields is that the introduction of energy management is also an effective means to increase energy efficiency.

To increase the efficiency of energy, Japan and the EU must develop advanced technologies that boost energy efficiency through best practices, and implement stimulus measures such as investment in methodologies. At the same time, these actions should be complemented by aggressive measures that will also have an impact on technologies for soundproofing of buildings and stabilization of room temperature.

Prompt implementation of regulations for building standards and insulation of houses will make it possible for the resulting highly energy efficient buildings and homes to contribute to the lowering of energy consumption and expenditures, the reduction of CO_2 emissions, and the maintenance of good health at both a household and national level.

Harmonization of standards and mutual accreditation of testing protocols to verify the energy saving effect of components and materials should be implemented.

Energy efficiency is key to ensuring a safe, reliable, affordable and sustainable energy system for the future. It is the one energy resource that every country possesses in abundance and is the quickest and least costly way of addressing energy security, environmental and economic challenges.

WP-4/#09/EJ to EJ Energy research and international cooperation

The reduction of greenhouse gas emissions and energy technology development focused on the mid and long-term

Greenhouse gas emissions are impacting climate change and the environment, thereby making this an issue facing all of mankind that requires international insight. As such, the development of technologies capable of reducing greenhouse gas emissions with the use of electricity produced using fossil fuels, non-fossil-fuel renewable energy, and nuclear power deemed safe is becoming necessary on a global scale, and it is imperative that the development framework be reinforced through cooperation among industry, government, and academia.

Energy and the Sustainable Development Goals

Energy access is the "golden thread" that weaves together economic growth, human development and environmental sustainability. The adoption of the Sustainable Development Goals in 2015, and the adoption of SDG 7.1 specifically – the goal to ensure access to affordable, reliable, and modern energy for all by 2030 – established a new level of political recognition for energy's central role in development.

Improvements in technologies are offering new opportunities for making significant progress on the SDG goal on electricity access. The combination of declining costs

for solar and decentralised solutions, cheaper and more efficient lighting and appliances, and new business models making use of digital, mobile-enabled platforms has increased the number of available solutions to cater to those currently without electricity access. But many challenges remain, particularly for clean cooking.

Of the 1.2 billion people who have gained access since 2000, nearly all have gained access via connection to the main grid, with 70% of people getting access with power generated from fossil fuels (45% coal, 19% natural gas and 7% oil). However, the declining costs of renewables and efficient end-user appliances, along with innovative business models financing electricity access, are all having an impact, and have been transforming the energy access landscape, especially in rural areas. Over the last five years, renewables have started to gain ground, as have off-grid and mini-grid systems, and this shift is expected to accelerate. Over the past five years, renewables (mainly hydro and geothermal) have been the source of over one-third of new connections, and decentralised renewables are the source of 6% of new electricity access.

Human resource development

To promote sustainable efforts aimed at achieving the goal set by all ratifying nations of the Paris Agreement to reduce CO_2, both Japan and the EU—as leaders in the fields of energy and environmental technology—must forge ahead with ground-breaking innovation.

In addition to contributing to the international society, sustainable innovation activities like these are also conducive to economic growth. This is why a system for continuously training technical experts in energy-related fields through personnel exchanges should be considered.

Innovative energy technology development cooperation

Japan and the EU should continue to support ITER (International Thermonuclear Experimental Reactor and Latin for "the way") project, which is one of the most ambitious energy projects in the world today and 35 nations are collaborating to build the world's largest tokamak in southern France, a magnetic fusion device that has been designed to prove the feasibility of fusion as a large-scale and carbon-free source of energy based on the same principle that powers our Sun and stars.

WP-4/#10/EJ to EJ Efforts toward the prevention of global warming following the Paris Agreement reached at COP21

The prevention of global warming is an issue facing all of mankind.

Since much of the world’s greenhouse gas emissions have already shifted from developed countries to newly developing countries, it will be impossible to prevent global warming if only developed countries set targets for reduction.

We welcome the Paris Agreement as a framework through which all major emitting countries, including the U.S. and China, are able to participate, and view it as an extremely important and historical first step that enabled all countries participating in COP21 to set their own targets.

Going forward, it will be necessary to not only ensure that all major emitting countries ratify this agreement and demonstrate their commitment to the full implementation of the Paris agreement, as was established during COP 22 in Marrakech, but also

establish a system with which the fulfilment of the promises made by each country can be reviewed internationally from the perspective of enhancing fairness and effectiveness. As was said in the introduction, we regret the US announcement to want to withdraw from the Paris Agreement. It is important that the EU, Japan and all other signatories (especially other major economies) stay committed, discuss the implications of the US decision with their business communities as soon as possible, and devise ways of bringing back alignment among all parties.

Japan and the EU will need to undertake the tasks of developing low-carbon technologies and transferring technology to developing countries with significant potential for making reductions.

Visualization of emission reduction effects

A life cycle assessment (LCA) is a technology that can be used to evaluate the environmental impact made by a product at every stage of the product life cycle from the cradle to the grave. For evaluating low-carbon technologies and products by LCA, the avoided emission of CO_2 approach should be promoted through public-private collaboration.

Contributions to global warming measures in Japan and the EU

The creation of a framework through which both developed and developing countries can work together to achieve low-carbon growth will play a critical role in addressing climate change issues. The outstanding technologies, products, and know-how possessed by Japan and the EU will not only lead to the strengthening of innovation and sustainable development in both countries but also contribute to global warming countermeasures on a global scale.

In particular, contributions utilizing ICT should also be considered. These include continuous observation of the global environment using artificial satellites, radars, sensors, and other equipment to monitor climate change, the use of supercomputers and other means for climate change prediction and research on the mechanisms behind climate change, and the construction of a global earth observation system.

It will also be imperative to conduct research and development of technologies for calculation and verification of greenhouse gas emissions and carbon dioxide capture and storage (CCS) in order to alleviate climate change.

Moreover, a bilateral offset mechanism will be an effective means for achieving greenhouse gas reductions in newly emerging and developing countries where a sharp rise in energy demand is becoming apparent. Japan and the EU must not only work together with industry to design such a system but also clarify support measures.

In conjunction with measures like these to alleviate climate change, the governments of Japan and EU countries must open their doors to industry, provide easy-to-understand explanations of adaptive planning, technology needs, and financial assistance, and create an environment in which industry can easily participate.

Establishment of IPR protection

To promote commercial technology transfer, Japan and the EU must take measures to ensure the creation of appropriate regulatory frameworks in countries to which technology transfers are to be made and the protection of intellectual property rights. It will be necessary to create appropriate regulatory frameworks to establish IPR protection in newly emerging and developing countries, and governments in Japan and the EU should introduce monitoring systems for the protection of IPR, provide patenting assistance, and establish technology partnerships.

WP-4/#11*/EJ to EJ **Promotion of resource efficiency and the circular economy**

Although resource prices are declining in the short term, resource constraints are likely to inhibit economic growth over the medium to long term. This is why it is imperative to improve the efficiency of resource use. In this light, Japan and the EU welcome the progress being made through international-level discussions on resource efficiency and the circular economy, including the establishment of the G7 Alliance on Resource Efficiency at the G7 Summit at Schloss Elmau held in 2015. The announcement of the EU's adoption of a Circular Economy Package and the promotion of efforts to improve resource efficiency are also welcomed.

Discussions on resource efficiency and the circular economy go beyond recycling and other aspects of the venous industry to cover a wide range of concepts impacting manufacturers, service providers, and other companies to be recognized as arterial industry, including the extension of product life, the sharing of services, and the goods and services through operational billing. The discussion holds the potential to create business opportunities that will lead to additional economic growth and job creation in the future. The truth of the matter is that business is already doing a lot in both Europe and Japan.

On the other hand, the pursuit of resource efficiency through exceedingly regulatory approaches could inhibit economic growth. Therefore, it is desirable to choose an approach that will lead to economic growth, such as promotion through voluntary efforts by stakeholders with associated incentives and reasonable regulation. It will also be imperative to pursue resource efficiency from the viewpoint of international circulation system based on the fact that movement of secondary raw materials across borders is now the norm.

In view of the above, Japan and the EU should not only move forward with efforts aimed at improving resource efficiency but also work together to formulate consistent rules. In addition, Japan and the EU are expected to take advantage of the advanced innovation and competitive edge in international market, which they possess in regard to the institutional and technical aspects of resource efficiency and the circular economy, deepen their cooperation and collaboration, and take the lead in international discussions on the future direction of the circular economy and resource recycling, as well as on the creation of institutions and systems. In this regard, we are looking forward to active discussions on resource efficiency and the circular economy during coming G7 Summits.

WP-4/#12/EJ to EJ **Promotion of global investments and nurturing of long-term relationships**

Amidst sharp fluctuations in the price of oil and other resources, continued investment and strong economic collaboration in a wide range of fields will be necessary to secure stable and inexpensive resources in response to global risks.

When it comes to long-term sustainable energy policy, it is important to make the necessary investments and ensure strong cross-border collaboration in order to achieve ambitious targets. Japan and Europe should therefore encourage direct

investment from a transparent, open, and long-term perspective living up to the commitments all parties made in the Energy Charter Treaty.

To promote the spread of energy conservation technologies and the like, it will be important to promote high-efficiency, low-cost renewable energies and conduct research and development of hydrogen, energy storage, geothermal, and other new energies. In addition, research that will contribute to the highly efficient utilization of fossil fuels and both the safety and security of nuclear power should also be considered.