Joint Statement of 10th Japan-India Energy Dialogue

1. The 10th meeting of the Japan-India Energy Dialogue, co-chaired by His Excellency Mr. Kajiyama Hiroshi, Minister of Economy, Trade and Industry (METI) of Japan, and His Excellency Mr. Raj Kumar Singh, Minister of State for Power and New and Renewable Energy of India, was held in Delhi on 10th December, 2019.

2. Both Ministers reaffirmed the importance of energy transitions to improve the "3E+S" (Energy Security, Economic Efficiency, and Environment + Safety) and therefore reconfirmed the importance of innovation including in the fields of hydrogen and Carbon Recycling on sustainable and clean energy systems, as expressed in the communique of G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth held in June in Karuizawa, Japan under Japanese presidency.

3. In this regard, both Ministers welcomed the progress achieved so far in the previous rounds of the Energy Dialogue and in the deliberations of the various Working Groups, especially progress of the "Japan-India Energy Transition Cooperation Plan" launched in the 9th Energy Dialogue.

4. In addition, both Ministers reaffirmed the importance of fossil fuels in light of energy security and resiliency. Both Ministers reconfirmed the important roles of clean and renewable energy, and appreciated the substantial efforts made by both countries for increasing share of renewable energy in their energy mixes. Both Ministers acknowledged the role of international organizations such as IRENA and IEA, and specifically referred to the emerging role of the International Solar Alliance in achieving universal energy access at affordable rates and accelerating transition to sustainable energy.

5. Both Ministers recognised the necessity to tackle challenges of integrating large amount of renewable energy into power systems such as the impacts on grid stability and reliability without undermining the energy security and resiliency of the whole energy system. India is the 3rd largest energy consuming country in the world. Closer energy cooperation between India and Japan would help to ensure regional security and stability.

6. In this regard, both Ministers acknowledged the following progress of the "Japan-India Energy Transition Cooperation Plan," and supported the road map attached hereto to integrate variable renewable energy and electric vehicles (EVs) into power systems;

(1)Electricity and Renewable Energy

1) Formulation of the road map to integrate variable renewable energy and EVs into power systems

During the 9th meeting of the Japan-India Energy Dialogue held in Delhi on 1st May 2018, the Minister of Economy, Trade and Industry (METI) of Japan and the Minister of State for Power and New and Renewable Energy of India concurred on the importance of grid stability given the high penetration of renewable energy and considerable deployment of EVs that are connected to the power network system, and therefore confirmed their intension to formulate a road map for improving the stability of power supply.

The Electricity Working Group (WG) under the Dialogue worked for the formulation of the road map, discussing issues on power supply reliability and possible solutions to address them. The Electricity WG identified and developed prioritized areas of cooperation between Japan and India, and formulated the road map.

2) Cooperation on environmental measures for coal-fired power plants

Japan and India are conducting a study for utilization of biomass in coal power plants. Punjab state is found to be most suitable for further study, since the state is rich in agricultural waste resource.

India will continue with JCOAL Annual CCT training programme in Japan for Indian power sector professionals

3) Progress of NEDO's demonstration projects

New Energy and Industrial Technology Development Organization (NEDO) and Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC) successfully completed the demonstration project on a microgrid system with large-scale photovoltaic power generation in Neemrana Industrial Park in Rajasthan state and verified its reliable power supply system.

NEDO and Uttar Haryana BijliVitran Nigam (UHBVN) successfully completed the demonstration project on a smart grid system in Haryana, one of the 14 pilot projects of smart grid initiated by MOP. The system was verified effective for improving grid stability, reducing electricity distribution loss and power outrage time, and is expected to contribute to the financial improvement of UHBVN. In addition, the training system

was installed at UHBVN's power training institute and will educate operational know-how of the power distribution system to the distribution operators.

4) Potential areas of further cooperation

- Demand estimation and impact on electricity grid due to establishment of EV charging systems in the Electricity Grid
- Optimum planning regarding the location of charging stations for EVs in respect of Slow and Fast chargers respectively
- Collection of real time generation data of Solar rooftop projects.

(2) Energy Efficiency and Conservation

Under the Indo-Japan Energy Cooperation, Bureau of Energy Efficiency (BEE) has developed the Energy Conservation (EC) Guidelines for energy intensive industries. The guidelines were released in Sep. 2018 at New Delhi, are now under implementation in selected 9 model factories from 8 industrial sectors of PAT scheme. This implementation will improve the overall energy performance of the units and will enable Designated Consumers (DCs) to achieve energy reduction targets under the PAT scheme. Further, to extend the benefits of energy conservation guidelines to more industries, BEE has requested 50 more DCs from 9 PAT sectors to implement the EC guidelines and develop EM manuals for energy intensive equipment and systems.

BEE will focus on establishing verification system for compliance with EC guidelines by model factories with assistance from Energy Conservation Center Japan (ECCJ).

(3) Coal

Both countries have been continuing the discussion to consider the possibility of future cooperation since the last Coal Working Group, and now discussing towards implementing the invitation training program.

(4) Petroleum and Natural Gas

Both countries are closely collaborating to develop several oil and gas projects in third countries such as Russia, UAE, Canada, Mozambique and Sri Lanka, including the India-Japan joint project on LNG-related infrastructure in the vicinity of Colombo. Both countries will continue cooperating across upstream, midstream and downstream sectors in petroleum and natural gas fields.

Both countries are also cooperating to further enhance establishment of flexible and transparent LNG market, based on the memorandum of cooperation (MOC) signed by

the representatives of both countries in Oct. 2017. Since Jun. 2018, Japan Oil, Gas and Metals National Corporation (JOGMEC) of Japan provided LNG value chain training programs for four times to Indian officials. Further, both sides are cooperating for a model clause on destination restriction clause, to be provided in LNG sales and purchase contracts.

(5) <u>Hydrogen</u>

1) Both countries held the India-Japan Workshop on Hydrogen and Fuel Cells in Delhi in Feb. 2019 for the first time in order to exchange information on how to realize the societal implementation of hydrogen and explore mutual cooperation in this field.

Both countries will hold the 2nd workshop in Delhi in the first quarter of 2020 to advance the cooperation.

2) Both countries seek possibilities of further cooperation in the area of Hydrogen and Fuel Cells, specifically for cost-competitive application for stationary and transport purposes; development of regulations, codes and standards; collaborative Research and Development; and utilization of hydrogen in other sectors such as steel manufacturing.

7. Both Ministers confirmed their commitment to strengthen the cooperation by firmly implementing the roadmap and also determined to dispatch of a long-term JICA expert (Energy Advisor) to be stationed in CEA in India.

10th Dec. 2019
Delhi

(**Japan**) (**India**)

Kajiyama Hiroshi
(Minister of Economy, Trade and Industry)

Raj Kumar Singh
(Minister of State for Power, and New & Renewable Energy and Skill Development & Entrepreneurship)

（Annex）

Roadmap to integrate variable renewable energy and EVs into power systems between Japan and India

I. Technical Cooperation

(1) Strengthening of load balancing power

Strengthening of load balancing power is to improve load balancing practices, ancillary services procurement, scheduling accuracy and, reducing load deviation from scheduling in India

[Projects]

A. Promoting the deployment of automated generation control (AGC)

【Organizations】TEPCO Power Grid, Central Electricity Authority of India (CEA), NTPC, Power System Operation Corporation Limited (POSOCO), Punjab State Power Corporation Limited

【Outline】In 2019-20,a feasibility study is conducted. Currently in India, secondary frequency control is not enough to meet the demand. AGC will serve for secondary reserve to contain shorter-term (5 to 15 minutes) frequency fluctuation. A feasibility study of installing AGC at National Load Dispatch Center (NLDC) or Regional Load Dispatch Centers (RLDCs) is conducted, as well as study of shifting from the current generation control method of “merit order table” to “marginal cost allocation,” which can be applied to both real-time load dispatching by AGC and generation scheduling, and achieves further fuel cost and CO2 emission reduction and increase in ramp rate that provide more flexibility in generation.

B. Strengthening renewable generation forecasting

【Organizations】TEPCO Power Grid, CEA, NTPC, POSOCO, Renewable Energy Management Center(REMC)

【Outline】In 2019-20, a feasibility study is conducted for developing suitable renewable energy generation forecasting system, using satellite data analysis and numerical weather forecast model. Accurate renewable energy forecasting is important to minimize the demand-supply gap, ancillary reserves capacity and generation cost, especially as India is to deploy massive renewable energy capacity in near future.

C. Flexible operation of coal-fired thermal power

【Organizations】NEDO, JERA, Japan Coal Energy Center (JCOAL), Mitsubishi

Research Institute (MRI), CEA, NTPC

【Outline】In 2018-19, a feasibility study of optimization of thermal power plant operation with IoT was conducted at Vindhyachal Power Station of NTPC. Tests regarding sustainable minimum load and higher ramp rate were conducted and recommendations given by JCOAL to NTPC. Fossil fuels play important role in energy security and resiliency. As more and more renewable energy is deployed in India, more and more flexible operation is required for coal-fired power plants in order to meet the variable demand. The study found IoT technology, analysing power plants operation data and monitoring the operation, would reduce fuel consumption and CO2.

D. Development of pumped-storage hydropower

【Organizations】Japan International Cooperation Agency (JICA), West Bengal State Electricity Distribution Company Limited (WBSEDCL)

【Outline】In 2018 loan agreement was signed for the construction of Turga Pumped Storage to be completed by 2027.A new pumped storage power plant with variable-speed equipment will be constructed in West Bengal State to increase the peak power generation capacity and to strengthen the response capability in order to improve the power supply stability.

(2) Strengthening the network system for high-quality power supply

[Projects]

E. Introduction of reactive power control (VQC) for voltage stabilization

【Organizations】TEPCO Power Grid, CEA, PGCIL, Punjab State Transmission Corporation Limited, Punjab State Power Corporation Limited

【Outline】In 2019-20 a feasibility study is conducted at a substation in Punjab State, where electricity demand in summer and in winter largely differs, and voltage fluctuation is a major issue. Currently voltage control is done manually with limited accuracy, and often transmission lines are opened when the system voltage is high. Introduction of VQC will improve voltage fluctuation, and minimize the risk of power outage, which strengthen the system reliability.

II. Institutional Cooperation

Institutional Cooperation is to share experience and expertise of both countries to discuss policies, rules and regulations of both countries for advancing the electric power industry under the Electricity WG, and experts meetings will be held upon necessity. Both countries hold Electricity WG at least once a year and follow the discussion of experts meetings.

[Candidate topics]

- Grid connection rules of renewable energy considering network availability
- Cost sharing rules of network upgrading for renewable energy deployment
- Incentive/penalty for imbalance
-Marketization (economical optimization) of procuring ancillary services
-Development of large scale storage batteries including solid state batteries
-Solar thermal energy storage and other type of energy storage applications
-Standardization of equipment and input materials in Renewable Energy sector. e.g. Offshore Wind Power, floating solar power and other applications etc.
-Disaster risk reduction in power sector and development of resilient power infrastructure
-Impact on Grid stability on interconnected as well as Distributed Power Systems due to establishment of Renewable Energy Integration
-Feasibility of high biomass content based power generation
-Safe recycling and disposal of solar panels, storage batteries and other power system elements after their useful life
-Possibility of retrofitting of existing conventional vehicle for making it electric vehicle with optimum cost
-Cooperation in the field of new and cutting edge technologies like concentrated solar thermal, vehicle to grid (V2G)
-Establishment of institutional mechanism for sharing best practices in the field of renewable energy cooperation

III. Personnel Cooperation

Personnel Cooperation is to dispatch a long-term JICA expert (Energy Advisor) to CEA. The expert will give advice to India's energy policy, especially in grid stability including pumped storage hydro power.