(Attachment 2)

November 5, 2021

Subjects for exploration after COP26

The following is a list of subjects that the ETI-CGC will explore after COP26, identified at the point of its establishment. The list may be modified depending on future discussions in the ETI-CGC. The priority order of the subjects, the research process, as well as the structural and organizational framework for further study will be decided in consultation with the ETI-CGC engagement partners. The ETI-CGC may consider to propose the policy recommendations as outputs of the studies of these subjects.

I. Energy-related items

1. Renewable energy and other costs
   - 1.1. To what extent can the costs of solar PV, on-shore wind, off-shore wind and other renewable energy sources be reduced, taking into account relevant constraints such as the burden on the natural environment and technical risks?
   - 1.2. Given the transmission and distribution network vulnerability and the geographical gap between suitable renewable energy areas and power consumption areas, to what extent can the integration cost for stable energy supply be reduced?
   - 1.3. To what extent can the cost of batteries be reduced?
   - 1.4. To what extent can the cost of hydrogen electrolyzers be reduced?
   - 1.5. How do we analyze the outlook for the costs of domestically produced hydrogen and ammonia and imported hydrogen and ammonia?
   - 1.6. Following the previous point, how do we consider the total energy efficiency of using hydrogen and ammonia for power generation, including both co-firing and mono-firing, and energy use by direct combustion?
   - 1.7. To what extent can the cost of carbon-neutral fuel, such as e-fuel and bio-fuel, be reduced?

2. Technological requirements, including safety conditions, applicability, and timing of introduction for achieving carbon neutrality
   - 2.1. Technologies for renewable energy (relevant to point 1)
   - 2.2. CCS(Carbon Capture and Storage)

2.3. CCU(Carbon Capture and Utilisation)

2.4. CDR(Carbon Dioxide Removal)

3. Changes in the energy mix

3.1. How do we realistically verify and realize the capacity potential of renewables, particularly how are we going to explore and capture the potential of off-shore wind?

3.2. How do we consider the role of nuclear power?

3.3. How do we consider constructing new nuclear power plants, including a new type of reactor? Following this point, how do we consider the operation period of the existing power plants?

3.4. How do we consider the role of hydrogen and ammonia?

3.5. How do we consider using existing facilities (e.g., coal power plants and LNG power plants)?

3.6. How do we consider the optimum roles of short charge-discharge batteries and hydrogen for longer-term power storage, including seasonal load balancing?

3.7. From the perspectives of stable energy supply and the international division of labour, how do we consider the balance between domestic production and imports of hydrogen and ammonia?

3.8. What is our consideration of bioenergy use and its sustainability?

3.9. How do we consider securing mineral resources in increasing global demand for rare mineral resources?

3.10. Based on the discussed views in points 1 and 2, what is/are the optimal energy mix option(s) from the perspectives of stable energy supply, including energy self-sufficiency and geographic dispersion of energy sources?

4. Changes in energy infrastructure

4.1. Based on the discussed views in points 1, 2 and 3, how do we consider the role of transmission and distribution grid?

4.2. How do we consider the role of gas supply system and oil supply system?

5. Electricity prices for residential and industrial use and gas prices

5.1. How much will the impact on residential and industrial electricity and gas prices be? How do we allocate the cost burden to stakeholders in society?

5.2. If there are increases in future power generation costs, electricity prices, and gas prices, how much will these impact intermediate and final product prices?

6. Approaches for carbon neutrality by the industrial and transportation sectors and the Japanese economy as a whole

6.1. Is the outlook of identified key technologies in each sector, technical feasibility and timing of introduction considered reasonable?

6.2. What kinds of business ecosystems, such as recycling, will be required?

6.3. How do we consider uncertainties that affect future energy demand, such as digital infrastructure implementation for information society and penetration of autonomous driving technology?

6.4. What industrial structure transformations will take place, and at what speed?

II. Required economic and social system transitions in association with energy challenges

◆ Transition pathways for Japan's energy, economic and social systems to 2050

1.1. Based on the studies above, how does the optimal energy transition pathway to achieve carbon neutrality in 2050, desirable for Japan's economic and social systems, look like? (the analysis includes the assumptions of multiple scenarios and plans A/B)

1.2. How do we promote electrification, utilization of hydrogen, and other carbon neutral energy for society as a whole as essential actions for achieving carbon neutrality?

1.3. What are the interim milestones or achievements we need to target in 2030 and 2040, taking into account the durability and replacement timing of assets on the supply and demand sides?

1.4. What kinds of economic and social system transitions will be required for the Japanese economy to become a carbon-neutral international role model, and what kind of growth strategy can be drawn up, considering the strategic indispensability that contributes to global industrial competitiveness? How do we attenuate the economic costs and loss in life convenience that the transitions may entail?

1.5. How should we design a resource-efficient society (e.g., urban design, building standards, improvement of circularity, digitalization)?

1.6. How should we develop nature-based solutions (e.g., food system transitions, forest conservation) to achieve carbon neutrality?

1.7. What kinds of changes in consumer mindset and behaviour are required to achieve these transitions? What measures should be taken to induce them, including the use and visualization of Life-Cycle Assessment?

1.8. How should we secure and develop human resources to support the transitions?

1.9. What are the technical, social, and economic constraints in making the transitions happen? What kind of innovation and collaboration between public and private sectors is needed for overcoming these constraints?

1.10. How do we implement the ecosystem to support start-ups to promote innovation?

1.11. How do we prioritize and stimulate investments to support these transitions, considering various investment options, including investments in power generation, transmission and distribution, industrial and transportation sectors, and investments for economic and social system transitions and growth strategies? How do we allocate the incremental costs and risks, as well as the roles between public and private sectors, to stakeholders in society?

1.12. How do we consider the role of carbon pricing in the transition and its implementation, taking into account the inter-relationship between domestic and global energy prices and carbon pricing?

1.13. As a result of the transition, how does Japan's international competitiveness look like?

1.14. What should we consider for international cooperation to promote the transition?

1.15. How should we consider the Greenhouse Gas Emissions in the global supply chains outside of Japan?

1.16. 2050 being a momentary point, how should we envision Japan’s and the world’s economic and social systems on a longer-term view, such as a 100-year span?