Chapter 6

Conclusions and Recommendations

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Becoming carbon neutral towards 2050 or 2060 is a crucial target for the world, including the ASEAN region, and, consequently, hydrogen is highlighted because it can be combusted the same as fossil fuels but does not emit CO_2. There are two types of hydrogen: green hydrogen and blue hydrogen. Green hydrogen is produced by electrolyser technology using clean electricity generated by renewable energy. Blue hydrogen is produced from fossil fuels by applying reforming and gasification technology with CCS. Brunei is a rich blue hydrogen country due to its large oil and gas reserves. On the other hand, Brunei is poor in renewable energy and only solar PV systems are available in limited amounts due to the small land area. Thus, floating solar PV systems are an option for Brunei for applying to reservoirs, rivers, wetlands, and Brunei Bay. This study firstly estimated the potential capacity of solar PV systems, mainly the floating type, in Brunei (2,387 MW) and after that, based on the solar PV power generation, potential hydrogen production was forecasted (73.4 kilotonnes/year). Next, the study forecasted the future hydrogen demand in the ASEAN region, including Brunei (70 million tonnes/year in 2040). Thus, in addition to green hydrogen, Brunei has to produce blue hydrogen to meet its future hydrogen demand and that of other neighbouring countries. Investment in floating solar PV systems and electrolyser facilities will be huge for Brunei (US$2,300 million), comprising around 40% of the country's gross capital formation in 2019. The cost of hydrogen production using PEM as one of the electrolyser technologies is estimated at US$3.5–US$5.2/kg-H_2, which is a little higher than the expected hydrogen supply cost of US$1–US$2/kg-H_2. Considering a cost reduction in the hydrogen production cost due to strong competition with other countries, such as India and Middle Eastern countries, Brunei will be a continuous energy-exporting country after oil and gas because hydrogen is classified as a clean fuel.

Based on the conclusions mentioned above, the following points are recommended:

a. Brunei Bay could have a large potential for a floating solar PV system.

b. However, blue hydrogen production is a crucial policy for Brunei due to its limited renewable energy resources.

c. The power generation cost of floating solar PV is estimated at US$0.07/kWh, and further cost reductions, such as lower than US$0.05/kWh will be targeted.

d. The green hydrogen production cost using solar PV systems is forecasted to be US$3.5–US$5.2 per kg-H_2 and will be slightly more expensive compared to the expected hydrogen supply cost (US$1–US$2 per kg-H_2). Innovative electrolyser technologies are expected to be available commercially, such as solid oxide electrolytic cell (SOEC) and anion exchange membrane (AEM) technologies.

e. Carbon dioxide enhanced gas recovery and carbon dioxide enhanced oil recovery as CCS should start with collaboration with foreign organisations, such as the Japan Oil, Gas and Metals National Corporation.

f. Hydrogen demand will be huge in Asia, but there will be many competitors (the Middle East and India) for hydrogen exports. Brunei's advantage in terms of hydrogen exports is its location at the centre of Asia, so its hydrogen transport costs will be much lower than its competitors.