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Investments in Hydrogen in Asia and the Pacific

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ABSTRACT

This paper provides the brief review of cost, investments and national hydrogen strategies in Asia and the Pacific.

Keywords: Hydrogen, Investment, National Hydrogen Strategy, Cost, Green hydrogen, Asia

1. INTRODUCTION AND MOTIVATION

A number of countries in Asia and the Pacific have announced their net zero-carbon targets by mid-century. This cannot be achieved by de-carbonizing only one sector, e.g. energy sector, or only using one technology, e.g. renewable energy. Other sectors, such as transport and industries, also need to be decarbonized. Unfortunately, renewable energy is not always a suitable substitute for fossil fuel. Also, renewable energy, particularly from solar and wind, is highly intermittent.

'Green', produced using renewable energy, hydrogen can help to de-carbonize sectors, particularly those where renewable energy is not a suitable substitute for fossil fuel. And hydrogen can be used as a storage of variable renewable energy. That is why hydrogen is considered as an 'important piece of the net zero emissions by 2050 puzzle' [1].

2. HYDROGEN COST

Hydrogen is not necessarily a zero-carbon fuel. Unfortunately, currently, hydrogen is produced mainly from fossil fuels ('brown' hydrogen), due to high cost of 'green' hydrogen. The cost of hydrogen greatly depends on the energy source used. Depending on the energy source used in the production process, hydrogen is divided into several categories: including 'brown', 'grey', 'blue' and 'green'. There are also other 'colors' of hydrogen, but we will limit to these 'colors' in this paper.

It can be produced using renewable energy or fossil fuels (Fig.1). 'Green' hydrogen is produced using

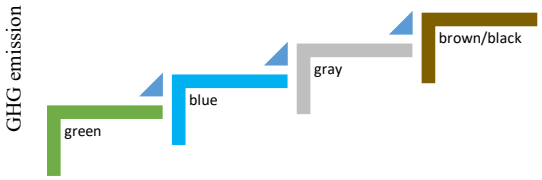

Fig. 1. Hydrogen types by fuel

renewable energy. 'Blue' hydrogen is produced using fossil fuels with carbon capture and storage (CCS). 'Grey' hydrogen is produced using natural gas without CCS. 'Brown' hydrogen is produced using coal without CCS.

The levelized cost of hydrogen is calculated by BloombergNEF with the latest report, at the time of writing this paper, from November 2021 [2]. 'Green' hydrogen is more expensive than 'blue' and 'gray' due to electrolyzers and renewables. The cost of 'Green' hydrogen is expected to fall fast by 2030 due to falling costs of renewable energy and electrolyzer system [2]. Low-cost renewable energy is the most important factor in driving 'green' hydrogen costs down [3]. 'Green' hydrogen is expected to outcompete 'blue' hydrogen in mid-2020s and 'gray' by 2050 [2]. 'Green' hydrogen will outcompete 'gray' hydrogen faster in countries with low renewable energy cost and/or high cost of natural gas.

3. HYDROGEN INVESTMENTS

Data on annual global investments in hydrogen across countries is provided in BloombergNEF Energy transition investment database [4]. Investments in hydrogen increased significantly in 2018. Investments in hydrogen are still small, relative to investments in renewable energy, mainly due to its high cost.

2020 was a remarkable year for investments in low-carbon energy transition technologies, which reached a

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record high of $0.5 trillion despite the onset of the coronavirus disease (COVID-19) crisis. However Investment in hydrogen was only $1.5 billion which is still less than 0.5% of renewable energy investments. Investments in hydrogen grew sharply from 2018 due to investments in the Asia-Pacific region.

Since 2018 the Asia-Pacific region is the major investor in hydrogen. Nearly 3/4 (73%) of hydrogen investments over the period 2018-2020 are in Asia-Pacific (APAC) region (Fig. 2). The People's Republic of China (PRC) and the Republic of Korea are major investors in hydrogen. These two countries accounts for 80% of hydrogen investments in the Asia-Pacific region and 60% of global hydrogen investments (Fig. 2).

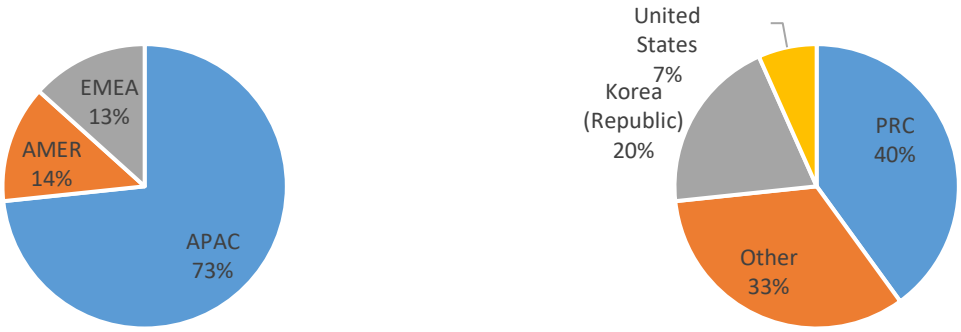

Fig. 2. Investments in hydrogen 2018-2020

4. HYDROGEN POLICY

Policies promoting hydrogen are developing and spreading across countries. Datasets with hydrogen-specific policies are currently lacking. Hydrogen policies can be found in IEA Policies and Measures database [5] with filter 'Technology: Hydrogen electrolysis technologies' (only from 2020) and BloombergNEF Global Hydrogen Strategy Tracker [6] (from 2019).

Hydrogen policy support is needed to establish targets and/or long-term policy signals; support demand creation; mitigate investment risks; promote R&D, innovation, strategic demonstration projects; knowledge-sharing; and harmonize standards and removing barriers [7].

4.1 National hydrogen strategy

The number of countries with adopted national hydrogen strategies is growing: 3 countries in 2019, 13 (accumulated) countries in 2020, 26 (accumulated) countries in 2021 and estimated 48 (accumulated) countries in 2022. 22 countries are currently preparing their national hydrogen strategy to be adopted in 2022 [8]. National hydrogen strategies adopted in the Asia-Pacific include: Australia's National Hydrogen Strategy [9], Japan's Basic Hydrogen Strategy [10] and the Republic of Korea's Hydrogen Economy Roadmap 2040 [11]. These strategies then followed up with other supporting instruments, such as public investments in research and development of hydrogen.

5. CONCLUSIONS

Investments in hydrogen started to grow significantly from 2018, mainly in the Asia-Pacific region. Currently, hydrogen is produced mainly from fossil fuels. However, it is expected that cost of 'green', produced using renewable energy, hydrogen will fall significantly by 2030 due to falling costs of renewable energy and electrolyzer system. The number of countries which adopted national hydrogen strategies is growing fast after 2019.

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