

Hydrogen Utilization in Maintaining Reliable and Cost-Effective Electricity Generation

Mohamad Hakim ZAINUDDIN

Manager (Generation), Technical Advisory & Industry Development, Single Buyer, Tenaga Nasional Berhad, Kuala Lumpur Malaysia

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Abstract

In managing the energy trilemma, Malaysian government has introduced several policies and planning criteria for the generation development of Peninsular Malaysia. One of the criteria is diversity in energy mix, which is managed through the variety of energy sources and technologies. The formulation to manage energy diversity in generation planning is using Herfindahl-Hirschman Index (HHI), where it measures market concentration of an industry. The energy security is targeted to maintain below 0.5 by year 2025, providing enough reserve margin and spinning reserve for the day-today generation and system balancing. In view to accomplished renewable energy (RE) capacity mix target for Malaysia by 2025, it is vital to ensure that intermittencies produce by generation from solar PV will not expose the overall electricity supply system in providing undisrupted and reliable supply. There is also a need to fully understand the underlying costs and technical requirements of having higher shares of variable RE in the grid system. Curtailment of solar energy is a missed opportunity, not just for solar power producers, but also to the grid system. It represents a loss in terms of utilizing natural energy source while reduce reliance on fossil fuel.

Hydrogen can play an important role in utilization of the surplus solar energy, such as for grid balancing or to power a wide range of applications, from vehicles to industrial processes. Hydrogen capable to offer ancillary services through the use of hydrogen fuel cells. Fuel cells is used to provide backup power during times of high demand or when there is a disturbance. They can also be used to help regulate the frequency of the electricity grid, which is important for maintaining a stable and reliable supply of power. However, adopting hydrogen fuel cells could add complexity to the overall grid system operations in which could increase the risk of operational failures. Hydrogen also limited with regards to scalability: its scalability to the level of a large grid system may be limited by the availability and cost of hydrogen production and distribution infrastructure.