Hydrogen battery storage

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As governments focus on dealing with the Covid-19 health emergency, they are increasingly turning their attention to the impact of shutting down their economies and how to revive them quickly through stimulus measures. Economic recovery packages offer a unique opportunity to create jobs while supporting clean energy transitions around the world.

Energy efficiency and renewable energy like wind and solar PV - the cornerstones of any clean energy transition - are good places to start. Those industries employ millions of people across their value chains and offer environmentally sustainable ways to create jobs and help revitalise the global economy.

But more than just renewables and efficiency will be required to put the world on track to meet climate goals and other sustainability objectives. IEA analysis has repeatedly shown that a broad portfolio of clean energy technologies will be needed to decarbonise all parts of the economy. Batteries and hydrogen-producing electrolysers stand out as two important technologies thanks to their ability to convert electricity into chemical energy and vice versa. This is why they also deserve a place in any economic stimulus packages being discussed today.

Batteries and electrolysers apply the same scientific principles of electrochemistry, meaning that they share several components such as electrolyte and membrane materials, as well as key manufacturing processes. The future development of electrolysers therefore stands to benefit from the experience of manufacturing batteries. The knowledge acquired from batteries should spill over into the scaling up of electrolyser production, enabling faster cost reductions.

Specialised suppliers for both technologies such as Toray or BASF tend to capitalise on these similarities and innovate to the benefit of both devices. The human capital and skills that are developed cross-fertilise each other. The lessons learned in the development of individual components also have the potential to ripple through other industries that share them. These include fuel cells, control systems and specialised materials for other engineering applications.

The IEA will publish an Energy Technology Perspectives special report focusing on clean energy technology innovation on 2 July that will discuss these and other attributes of technologies that are particularly suitable for fast clean energy transitions.

Electrolysers, devices that split water into hydrogen and oxygen using electrical energy, are a way to produce clean hydrogen from low-carbon electricity. Clean hydrogen and hydrogen-derived fuels could be vital for decarbonising sectors where emissions are proving particularly hard to reduce, such as shipping, aviation, long-haul trucks, the iron and steel or chemical industries. These are areas where other clean energy technologies cannot be easily deployed.

However, natural gas and coal are currently the primary sources for almost all of the approximately 70 million tons of hydrogen produced each year for making fertilisers and for use in oil refineries. This means that the production and use of hydrogen is associated with more than 800 million tons of carbon dioxide (CO2) emissions today - a staggering amount that is equivalent to the emissions of the United Kingdom and Indonesia combined.

The world"s capacity to make battery cells has expanded rapidly in recent years. Today, manufacturing operations globally can produce around 320 gigawatt-hours (GWh) of batteries per year for use in electric cars. This is well above the approximately 100 GWh of batteries required for the 2.1 million electric cars that were sold in 2019.

Having sufficient capacity available for battery manufacturing is critical for the continued electrification of road transport. Global production capacity is unevenly distributed. China is the world leader, accounting for around 70% of global capacity, followed by the United States (13%), Korea (7%), Europe (4%) and Japan (3%). The outbreak of the Covid-19 epidemic has affected all of China"s battery production hubs, located in the provinces of Hubei, Hunan and Guangdong. Manufacturing has resumed gradually due the time it takes to restore the supply chain and return employees to work.

There is a need for manufacturing capacity to grow further. Assuming that the global auto industry"s announced targets for electric vehicle production are met despite the Covid-19 crisis, around 1,000 GWh of battery manufacturing capacity would be needed in 2025. This output would require equivalent of 50 plants, each on the scale of a Tesla Gigafactory.

Longer-term targets set by governments around the world - as reflected in the Stated Policies Scenario of the IEA"s World Energy Outlook - could require global annual battery production to reach around 1,500 GWh by 2030 for all electric vehicles combined (including cars, buses, etc.). Moreover, about twice as much production would be needed in 2030 to supply the amount of batteries envisaged in the IEA"s Sustainable Development Scenario, which provides a pathway to meeting long-term sustainability goals.