Green hydrogen - fuel for the global energy transition

Why Germany's hydrogen strategy needs supplementing with a multilateral agenda

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Germany's Federal Cabinet signed off the National Hydrogen Strategy (Nationale Wasserstoffstrategie, or NWS) in June 2020. Given that it entails a number of ambitious targets as part of the energy transition, the country's next government will continue to develop and later implement it. Hydrogen (H2) can be used as an energy source where an electrical power supply is not technically or economically feasible, such as in heavy haulage or shipping. H2 is also a versatile raw material for industrial processes, particularly in the chemical and steelmaking industries. Even now, 55 terawatt-hours (TWh) of H2 are powering industrial processes across Germany, over four times as much electricity as is consumed annually in the whole of Berlin (12.8 TWh in 2020). There is nothing new about H2, either as an energy source or as an industrial raw material. Up until now, however, it has almost exclusively been 'grey H2' that has been used, which is obtained by converting fossil fuels (mainly natural gas) using a process that releases significant quantities of CO2. To help meet national climate targets, the NWS envisages a future, where only 'green' H2 is used, i.e. hydrogen that is manufactured using electricity from renewable sources (primarily solar and wind power).

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The NWS brings together climate and industrial policy, and declares its purpose to be establishing Germany as a pioneer and global market leader in hydrogen technologies. The vision of a rapid market ramp-up for green H2 in order to decarbonise industry and transport faces challenges in terms of the sheer quantities involved. The Federal Government is expecting demand for green H2 to reach 90-110 TWh as early as 2030. However, between now and then, 5 gigawatts (GW) of renewable generation capacity is to be commissioned in Germany. By way of comparison, one of the world's largest electrolysers for H2 production – according to Shell, the company operating it – went into operation in Wesseling near Cologne in July 2021. It has a capacity of 10 megawatts (MW), meaning that 500 facilities of this kind would theoretically be needed in order to meet the 2030 capacity targets. This presents a technical and economic challenge, not least as electrolysers still lack any form of standardisation and cannot, currently, be mass-produced cost-effectively.

The NWS predicts that the capacity expected to be made available by 2030 will be enough to generate 14 TWh of green H2. However, this will only cover some 13 to 16 per cent of anticipated demand. Even after it has abandoned fossil fuels, therefore, Germany will still be a net energy importer, particularly when it comes to fuels for propulsion and industrial process heat. The NWS remains fairly vague on the question of where exactly the envisaged volumes of green H2 are to be imported from. Collaboration with Northern Europe (offshore wind) and Southern Europe (photovoltaics and wind) is mentioned, as is cooperation with countries in the Global South – albeit without any reference to potential interests, opportunities and risks. Germany has entered into energy partnerships with various developing countries and emerging economies in recent years, including Algeria, Morocco, Chile and, most recently, Namibia. It very much remains to be seen on what terms these countries will be willing to harness the potential of their renewables, in order to facilitate large-scale production of green H2 for the German and European markets.

The NWS thus needs to be complemented by a European and a multilateral agenda that views H2 as an opportunity to overcome global challenges and focus on benefiting all parties. For example, the countries of North Africa are exigently dependent on creating jobs for young people in particular. However, international ventures such as the Ouarzazate solar project in Morocco, which has been supported by Germany, demonstrate that these employment opportunities are often modest once large-scale systems have finished their construction phase and enter regular operation. Germany and Europe should reach out to potential exporter countries in the spirit of partnership and scope out what mutual benefits can be achieved in order to increase the political will and local acceptance for joining an international hydrogen economy. Knowledge sharing and scientific cooperation are essential if developing countries are to be empowered to develop their own H2-based solutions, including switching their fertiliser production from fossil fuels to H2 or decarbonising their (petro-)chemical industries. More technologically advanced countries such as South Africa or Brazil could supply core components for electrolysers. The least-developed countries could use H2 as an energy storage medium in power grids supplied by intermittent renewable energy sources.

There is much to be said for taking a more systematic approach to dovetailing the NWS with the European H2 strategy. This move would amplify Europe's voice in the international arena. After all, there is another enticing international hydrogen partner waiting in the wings for many developing countries, namely China.

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