NATIONALER WASSERSTOFFRAT

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Russia's war of aggression against Ukraine – Possible impact on hydrogen ramp-up

EXECUTIVE SUMMARY

The German National Hydrogen Council (NWR) is deeply dismayed and greatly concerned with Russia's war against Ukraine and condemns it in the strongest possible terms.

Russia's attack on Ukraine has led to a reassessment of energy supplies from Russia on a policy level, both in terms of energy security and energy in general. This has implications for Germany's energy supply as well as its economy, both of which are highly dependent on imported energy from Russia.

In relation to climate goals, increasing the resilience of the German energy supply and that of the German economy with regard to energy imports and becoming less dependent on individual energy suppliers should be the goals going forward. In addition to renewable electricity, circular economy as well as energy conservation and efficiency, renewable gases are a key pillar of the energy transition.

In the medium term, hydrogen can contribute significantly to the security of supply and diversification. The NWR projects that demand for hydrogen and hydrogen derivatives is set to increase. What is therefore needed is an ambitious ramp-up of the domestic hydrogen economy and intensified efforts to quickly meet demand through imports.

In order to achieve the medium-term objective of increasing the security of supply, a decision on the implementation of measures necessary for a ramp-up of hydrogen technologies and the hydrogen market must be made this year.

In addition to the rapid expansion of renewable energy sources, an ambitious expansion of infrastructure both in terms of pace and scale is necessary as well as because of the increased uncertainty.

Efforts must also be made to ensure that pending investments in climate-friendly applications take place now as planned despite the radically changed situation. This step is necessary to create the first anchor customers in the hydrogen ecosystem. To make this happen, changes will need to be made to the funding instruments. In addition, technical upgrades and new technologies must be promoted to enable economies of scale and cost-effective use. Availability issues and competing uses must also be addressed at an early stage with regard to natural gas as a flexible option and in the ramp-up phase of climate-neutral hydrogen. It may be necessary to prioritise, taking into account the impact on other

application areas and sectors. The long-term ramp-up of the hydrogen economy will only succeed, if significant progress is made on the technological front and in reducing costs. This requires contributions from all areas of R&D, which must be strengthened accordingly.

The changed geopolitical situation due to the war in Ukraine makes it necessary to act quickly, decisively and flexibly in creating the general conditions required for the hydrogen ramp-up. An adaptive operational framework that remains flexible on the path towards climate neutrality is necessary in order to respond to changing conditions, also on a technological front. It is essential to create a climate-neutral, resilient economic and energy system in Germany that provides a secure supply of energy.

1 INTRODUCTION

The NWR is deeply dismayed and greatly concerned with Russia's aggression war against Ukraine and strongly condemns its actions. Our thoughts are with the victims of this war, the people in Ukraine and the refugees from the country. The NWR supports full and active assistance to Ukraine. Similarly, we are analysing the overall situation and potential consequences.

As the situation is so dynamic, it is not yet possible to predict the full depth and breadth of the geopolitical, macroeconomic and societal impact of this conflict as well as its effects on energy policy. However, steps will undoubtedly be taken in response to the changing geopolitical landscape because of Russia's attack on Ukraine. This has consequences for the energy sector and the transformation trajectory necessary to achieve climate goals. In particular, guaranteeing a reliable energy supply is emerging as a new priority. It is already clear that hydrogen will play an increasing role. A rapid ramp-up of the hydrogen availability is essential for climate protection and is also a way to diversify our energy supply to help make it more resilient.

The following analyses and recommendations are based on the current developments or predicted trends of the present time. They focus lies primarily on the impact and implications of the hydrogen ramp-up for the German and European economies and will need to be expanded or modified in response to future developments.

2 INITIAL SITUATION

Germany's energy supply and its economy are highly dependent on imported energy. Imported energy is expected to also play a significant role in the future. Despite all efforts to bolster domestic energy production on the basis of renewables and increase energy efficiency. Nonetheless, the goal should be to significantly reduce Europe's reliance on imported energy compared to the situation today and increase Europe's resilience with regard to energy imports. Oil, natural gas and hard coal together account for about 67 per cent[1] of Germany's primary energy demand today. This is almost exclusively reached by imports. Diversification of German energy imports has decreased significantly in the past 15 years, with a handful of countries responsible for a majority of the supplied energy. Russia is the Germany's largest energy supplier: Germany purchases around 55 per cent of its natural gas, 34 per cent of its oil and 46 per cent of its hard coal from Russia. This corresponds to roughly 30 per cent of its current primary energy requirements.

[1] Source: AG Energiebilanzen – Energy consumption in Germany. Data for Q1 to Q4 2021.

Now that nuclear power has largely been phased out and the goal of fully phasing out coal-fired power generation if possible by 2030 has been enshrined in the coalition agreement, renewable gases are, together with renewable electricity and increased energy efficiency, key pillars of the energy transition. In addition to electricity, gaseous energy sources – first natural gas and, in the future, hydrogen – will play an important role. In addition to securing the heating supply and ensuring the stability of the electricity system through H_2-ready gas power plants, evening out seasonal fluctuations in energy demand by means of gas-based long-term storage is also of considerable importance. Gas applications will play an important role in other sectors in the future as well.

In certain fields of applications (in the power sector, the steel industry, etc.), there are already plans for the transition to hydrogen-based technologies using natural gas as a flexible option. These would lead to increased demand for natural gas in these areas. In view of newly produced estimates of natural gas use and large increases and fluctuations in prices, discussions and in-depth analyses are needed along with decisions on policy. One of the main goals is to find a solution in the near future on how to reach the intermediate phase involving natural gas over the next few years in order to support the necessary technological switchover. It will also be necessary to evaluate what accompanying measures can be taken on a cost front, and how the production of hydrogen can be prioritised and ramped up quickly. Finally, the relevant application areas must be supported in order to avoid having to use natural gas as a temporary solution or significantly reduce the length of this transitional phase.

Key decisions in this area may necessitate adjustments both to the accompanying policy tools and to the framework of the infrastructure ramp-up, including storage, which have an impact on both the hydrogen and natural gas sectors.

Against this backdrop, all strategies to ensure H2-readiness must be re-evaluated and improved towards using natural gas as a flexible option and include more binding commitments.

The expansion of the hydrogen economy alone will not be sufficient to reduce the use of natural gas more quickly, which is why it is also necessary to develop other options to gain additional flexibility.

3 IMPLICATIONS FOR THE CURRENT ENERGY SUPPLY

Russia's attack on Ukraine has led to a reassessment of energy supplies from Russia on a policy level, both in terms of energy security and energy in general. This may affect energy imports from Russia in general and over the long term, or, at the very least, the amount or volumes for the duration of the conflict.

Reducing vulnerability from an energy and security policy perspective can be reached through diversified energy supplies on the international market. Conversely, it is important that a more rapid ramp-up of renewable energies, an increase in energy efficiency and the adoption of suitable stockpiling strategies all make significant contributions in this area.

There is a consensus on this front. This means that the importance of hydrogen and hydrogen derivatives will increase not only for reasons of climate policy, but also as an option for increasing the security of supply through diversification. The expansion of renewables and the ramp-up of the hydrogen economy must therefore be expedited. At the same time, there is also a challenge of ensuring that hydrogen production in Germany and Europe should not lead, either directly or indirectly, to an increase in the

need to import natural gas (especially from Russia), which is why it is necessary to focus on green hydrogen. Having in mind an expected big role of imported hydrogen and hydrogen derivatives procured on the international market,, it makes sense to have an effective diversification and stockpiling strategy in place from the start.

Overall, the strategies for increasing energy efficiency, energy source substitution, diversifying supplies from the international market and stockpiling both traditional energy sources as well as hydrogen and hydrogen derivatives must be coordinated. This has to be done in such a way that the loss of the major energy supplier will not threaten the security of energy supply or the scope for action in terms of security policy.

The options for replacing or restructuring current energy imports from Russia vary widely, especially in the case of natural gas. These relate to the corresponding periods and to the length of any disruptions or restrictions on imports, that may occur. Significant restrictions that occur at short notice and last longer than a few months, especially with respect to natural gas imports from Russia, will likely lead to severe, far-reaching consequences for the German economy and thus also for the German population. In addition to higher prices, this also puts jobs and value-adding activities at risk. All aspects and uncertainties have to be carefully considered when it comes to political considerations and making policy decisions.

In spite of all efforts, the policy options in the hydrogen sector will only begin to take effect and contribute to the security of energy supply to any significant extent in the medium term, i.e., from 2025 onwards. To increase the security of supply over the medium term, it is essential to take decisions on a number of measures involving the ramp-up of the hydrogen economy this year.

4 PROSPECTS FOR THE RAMP-UP OF THE HYDROGEN ECONOMY

A more rapid expansion of the energy generation capacity based on renewable sources is a basic prerequisite for transforming the energy system in order to achieve climate protection goals and for reducing reliance on individual energy exporters. At the same time, this must be accompanied by an ambitious ramp-up of the international hydrogen economy. The targeted and efficient use of climate-neutral or largely climate-neutral hydrogen contributes to achieving the climate change objectives. It also increases the security of supply through diversification and the addition of new energy suppliers.

A faster growing demand for hydrogen and hydrogen derivatives, even with a more ambitious ramp-up of domestic hydrogen production, can only be met through imports from Europe and beyond. For that reason, a much faster ramp-up of the international hydrogen economy and a liquid hydrogen market cannot be achieved unless the following four goals in particular are met:

- Reduce CO_2 emissions and meet climate protection goals as best as possible.
- Reduce reliance on individual energy exporters by expanding the number of regions from which hydrogen and hydrogen derivatives can be sourced.
- Safeguard industrial production in Germany.
- Secure higher volumes of imported hydrogen and derivatives in order to be able to meet a correspondingly higher demand earlier than expected.

The long-term ramp-up of the hydrogen economy will only succeed, if significant progress is made on both technological front and cost reduction side. This requires contributions from all areas of R&D, which must be strengthened accordingly.

4.1 GENERATION

The focus must now be on the rapid expansion of generation capacities both in Germany and abroad. Sustainability criteria must be applied from the outset to facilitate an efficient ramp-up that benefits climate protection . Domestic production of green hydrogen will play an important role, especially at the beginning of the ramp-up of the hydrogen economy. This makes the ramp-up of electricity generation from renewables in Germany even more urgent. However, when working to achieve the target of 10 GW for domestic electrolysis capacity, measures must be taken to ensure that the chosen locations do not further exacerbate existing bottlenecks in the electricity grid.

Germany's reliance on the Russian natural gas means that large-scale domestic production of blue and turquoise hydrogen is rather unlikely at the moment, or in any case it has become much more difficult. It is necessary to assess the extent to which large-scale decarbonisation projects using climate-neutral and largely climate-neutral hydrogen can nevertheless be rapidly implemented, either through collaboration with the European partners such as Norway or partners from the MENA region.

The expansion of the hydrogen economy must be expedited and conceptualised more in terms of the European context, especially under the new conditions. In particular, the regions in southern Europe and those bordering the North and Baltic Seas can be developed relatively quickly as large-scale suppliers of green hydrogen. In addition, other regions in the Black Sea area and the southern neighbourhood could also play a major role in the medium term. Furthermore, international energy partnerships with new supply regions have the potential to contribute to efforts to substitute fossil energy sources and to the greater diversification of energy supply regions. In the latter case, this will initially take the form of hydrogen derivatives and then later hydrogen. In this context, the focus should also be on regions that offer good local conditions and sufficient energy production capacities without the risk of competing uses (e.g. Australia). This should be done earlier on in the process. For international hydrogen diplomacy, efforts should focus on strengthening existing energy partnerships and establishing new ones in order to promote the ramp-up of the international hydrogen market. The German government should create a framework for the production of green hydrogen, enhance and combine existing tools such as H2Global and H2 diplomacy to enable companies to develop projects and partnerships in Europe and internationally.

In this context, the prospects for Germany and Europe as a production location must be taken into account. This encompasses everything from the primary industries to the expansion of production capacity for hydrogen technologies and the impact of imported hydrogen and hydrogen derivatives on value chains.

4.2 APPLICATIONS

4.2.1 Power sector

A more rapid expansion of electricity generation, from renewables in particular, is also accompanied by a growing need to increase hydrogen-based options in the form of H2-ready gas-fired power plants in order to achieve greater flexibility.

System stability and demand-based power generation in an electricity system based primarily on variable energy sources such as wind and solar power must also be ensured. This should be done by means of electricity-based hydrogen storage and reconversion following the phase-out of nuclear energy and coal-fired power generation. Seasonal storage will be extremely important in a wind- and solar-based electricity system, with hydrogen-based storage, playing here a central role.

In addition to the core applications for hydrogen and hydrogen derivatives discussed so far, the electricity sector will have to play a role in hydrogen applications much earlier on than had often been previously assumed. The role of natural gas as a way to achieve greater flexibility in power generation and district heating is one of the main strategic challenges both for companies and in terms of creating a suitable framework in view of the new conditions and priorities.

4.2.2 Industrial sector

Similar to the electricity sector, industry is making a large-scale shift towards hydrogen-based options in the technologies it uses. The role of intermediate steps involving natural gas must be intensely scrutinised and re-evaluated. It should also be taken into consideration in the planned measures both at the strategic level and in terms of the policy instruments.

In addition, the German government must ensure that the transformation trajectory is maintained despite current distortions on the wholesale markets and uncertainties regarding the security of supply. Clear commitments to fund programmes are needed soon in view of changing energy prices. Corresponding notification processes must be streamlined and accelerated. Issues in terms of availability must also be addressed to eliminate the risk of stranded assets. In this respect, it is essential that natural gas remains an option to achieve greater flexibility during the transition. Likewise, competing uses that emerge across sectors should be addressed at an early stage and policy decisions made to prioritise the allocation of hydrogen. Lastly, it is important to remember that the energy transition cannot be expedited and that the hydrogen economy cannot be ramped up unless industrial value chains, which are now under increased pressure due to sharp rises in energy prices, function well.

4.2.3 Mobility sector

While natural gas plays only a minor role in the mobility sector, crude oil is the main energy source for maintaining mobility in Germany, apart from rail transport. In addition, Germany imports about 15 per cent of its diesel fuel from Russia. These dependencies demonstrate once more why the transition towards battery-electric and hydrogen-based drive systems, a process that has already begun, needs to be expedited.

By mid-decade, the accelerated expansion of e-fuel production, especially for aviation and shipping, could reduce further dependencies. In addition, if the ramp-up is expedited, hydrogen could be used in significant quantities in commercial vehicles. This would also help secure the supply of energy to the armed forces.

What all of these activities have in common, however, is the need to massively expand the accompanying infrastructure. If not, they will not have the desired impact.

4.2.4 Heating sector

In the heating sector, the top priorities are to ensure security of supply, promote further diversification of the sources of supply and more rapidly expand green local and district heating. This concerns the entire heating market, including SMEs along with centralised and decentralised heat generation. The use of H2-ready technologies in the heating sector should also continue to be viable since electricity-based technologies are not technically and economically feasible everywhere.

Whether and to what extent new strategic approaches or instruments are needed under the new framework must be discussed in depth.

4.3 INFRASTRUCTURE

More ambitious goals for the expansion of the hydrogen infrastructure both in terms of its pace and scale are being set. This must be done with far greater care and attention to detail in view of increased uncertainty. A renewed focus on hydrogen storage and the use of transport infrastructures (ports, rail, road transport, pipelines) is necessary.

The creation of a national hydrogen grid in Germany, that is closely integrated into the European grid, is a key prerequisite for making European generation and import capacities available to Germany more quickly and for connecting these sources with all consumption centres in Germany. To this end, a corresponding funding framework must be created this year, which will enable initial investment decisions.

In addition, it is necessary to assess whether and how the currently standing under discussion LNG terminals can be used in future for importing hydrogen or hydrogen derivatives. The repurposing of existing natural gas storage facilities and depots, which could be adapted for use with hydrogen in the future, should also be part of the discussion.

When setting up the infrastructure and building ship terminals (if this is done), it is important to consider where the future hydrogen consumption centres across Germany will be (i.e., also in eastern and southern Germany).

In addition to creating a suitable funding and regulatory framework, this process must be expedited in order to quickly set up an integrated European infrastructure. Legal uncertainties, such as the risk of a change in the ownership of hydrogen grids due to the potential ban on the ITO (independent transmission operator) model, have an inhibiting effect and should therefore be avoided.

4.4 CREATING THE NECESSARY CONDITIONS

The new geopolitical situation brought about by the war in Ukraine makes it imperative to act quickly, decisively and flexibly in creating the general conditions necessary for the hydrogen ramp-up. It is necessary to review existing or planned policies and create new tools in order to allow companies to make investment decisions on this basis quickly.

THE GERMAN NATIONAL HYDROGEN COUNCIL

On 10 June 2020, the German Federal Government adopted the National Hydrogen Strategy and appointed the German National Hydrogen Council. The Council consists of 26 high-ranking experts in the fields of economy, science and civil society. These experts are not part of public administration. The members of the National Hydrogen Council are experts in the fields of production, research and innovation, industrial decarbonisation, transportation and buildings/heating, infrastructure, international partnerships as well as climate and sustainability. The National Hydrogen Council is chaired by former Parliamentary State Secretary Katherina Reiche.

The task of the National Hydrogen Council is to advise and support the State Secretary's Committee for Hydrogen with proposals and recommendations for action in the implementation and further development of Germany's National Hydrogen Strategy.

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