Rat für NACHHALTIGE Entwicklung

Making hydrogen a sustainable decarbonisation option

Recommendation of the German Council for Sustainable Development (RNE) re the Federal Government's National Hydrogen Strategy

Berlin, 17 June 2020

For the Paris climate targets to be achieved and for global warming to, if possible, be limited to 1.5 degrees, the energy transition needs to be made a success in all sectors. The strategy pursued to date has rightly focused on green electrification, and in particular on electricity generated from wind, the sun, biomass, hydroelectric power and natural heat energy resources.

However, if fossil energy from coal, oil and gas is to be almost entirely replaced by renewable energy sources by 2050 at the latest, hydrogen needs to be made a partner to the renewable energies in order to achieve sector coupling and storage, and thus also both security of supply and sustainable prices. The German Council for Sustainable Development (RNE) does not consider an energy transition based solely on electrification to be realisable. Electrons and molecules are consequently a necessary synthesis for a promising energy transition within industry and society.

The RNE therefore fundamentally welcomes the National Hydrogen Strategy adopted by the Federal Government on 10 June 2020 and explicitly supports the establishment of a hydrogen industry being given a major boost in the stimulus package.

It does, however, recommend that the proposed measures be substantiated in the upcoming implementation process and that they be turned into political action quickly and based on partnership. The RNE believes it is time to think big and act swiftly. At the same time, the RNE is aware that some of the issues such as the establishment of international partnerships, the reduction of carbon emissions and the needs-based availability of hydrogen still need to be discussed and negotiated in detail.

The RNE is advocating that action be taken more systematically, more swiftly and more internationally than has been the case until now. Working closely with environmental organisations, consumer protection associations, industry associations and development assistance organisations, interrelationships need to be communicated and, building on this, acceptance within society needs to be increased. To establish a hydrogen industry, renewable energies need to be massively expanded both nationally and internationally, the necessary infrastructures need to be created and

large volumes of hydrogen need to be imported. Comprehensive efficiency and sufficiency measures aimed at reducing energy consumption must also continue to be pursued.

The RNE sees a course of action agreed upon at the European level for the creation of a green hydrogen market as a major opportunity to establish new value chains and to support the rapid ramping up of new technologies. The RNE is therefore pushing for a European solution and for international partnerships. It is a question of creating win-win solutions in particular with the sun-rich countries in Europe, Africa and elsewhere. As far as partnerships with developing countries are concerned, the focus must be on their national development goals.

The RNE proposes that the strategy be complemented with a hydrogen pact concluded by and between the Federal Government and the industries that are primarily involved and affected, based on the dialogue with associations as outlined above and following consideration within the National Hydrogen Council. The aim of such a cooperative and partnership-based approach is to create a reliable framework for the swift ramping up of the hydrogen industry founded on mutual responsibility and obligation. The Federal Government's target of increasing electrolysis output in Germany to up to five gigawatts by 2030 should be increased to ten gigawatts and should be developed beyond this with no upper limit as required by demand.

Specifically, the RNE makes the following recommendations:

1. Define the terms of transitional periods and avoid "lock-in" effects
2. Accelerate the expansion of renewable energies
3. Make green hydrogen marketable in the medium to long term
4. Make efficient use of the opportunities offered by hydrogen and swiftly secure its industrial ramping up
5. Promote research and development in the area of hydrogen technologies
6. Swiftly define sustainability standards for the roll-out of hydrogen
7. Implement investment-boosting measures extensively and swiftly
8. Build up and strengthen strategic partnerships in Europe and internationally

Hydrogen has to be made part of a successful energy transition

Hydrogen has served as a base material for industrial processes for a long time. Accordingly, hydrogen can play a key part in the transition to carbon-neutral industrial production. There is especially large potential in the use of hydrogen in the steel and chemical industries. But it is not only its use as a material that makes hydrogen a key element in sustainable system transformation – so too does its energy source property. In addition to its direct use in various areas of application, hydrogen is becoming increasingly important for the system integration of renewable energies due to its high storability and transportability. Security of supply is crucial to its use in industrial processes, in particular as a base material. Hydrogen is currently generally generated from fossil resources. This so-called grey hydrogen[1] has largely met the demand to date.

Germany supports the European Commission's target of making the EU greenhouse gas-neutral by 2050 at the latest. Among other things, this target is contingent upon a successful energy transition which is characterised by a switch to a wholly renewable energy supply in the long term. Alongside the extensive electrification of many sectors, green hydrogen[2] must contribute to climate protection as an alternative to fossil energy sources and as a partner to renewable energies in Germany, Europe and around the world. A transition to a green and global hydrogen industry should therefore be a binding target.

For there to be large-scale investment in the ramping up of the hydrogen market, the opportunities, risks and impacts must be promptly evaluated and clarified, and the requirements and parameters for hydrogen usage need to be regulated.

The National Hydrogen Strategy is laying some important foundations

With its National Hydrogen Strategy, the Federal Government is seeking to create a suitable framework for a successful ramping up of the market in order to exploit the energy, climate, innovation and development policy opportunities offered by hydrogen. The purpose of the strategy is to pave the way in Germany for decarbonisation potential to be tapped and to make Germany a global leader in supplying green hydrogen technologies. Hydrogen technology is to be funded with a total of more than two billion euros between now and 2025. The stimulus package includes an additional seven billion euros for the ramping up of the hydrogen technologies market in Germany as well as two billion euros for international partnerships. At least 20 per cent of the hydrogen used in Germany is to come from sustainable sources by 2030 and up to five gigawatts of electrolysis output is to be built up in Germany. Ideally, a further five gigawatts should be installed by 2035, or by 2040 at the latest.

At the same time, the necessary filling station infrastructure is to be funded with 3.4 billion euros. In addition, the funding of the living labs selected last year in which the production and application of hydrogen on an industrial scale is to be tested will be increased. The Federal Government intends to expand the hydrogen transportation and distribution infrastructure and also to make some of the existing gas grid usable for hydrogen.

[1] Grey hydrogen is produced by means of steam reforming using fossil hydrocarbons. CO_2 is produced in the process and is released into the atmosphere.
[2] Green hydrogen is produced by means of water electrolysis, using electricity from renewable energies.

In addition to the introduction of carbon pricing for fossil fuels and the reduction in the Renewable Energy Sources Act (EEG) surcharge as laid out in the Climate Action Programme 2030, the government has announced it will take a look at reforming the state-induced price components. Various instruments for funding the roll-out of green hydrogen are presented. As well as the EU's Renewable Energy Directive (RED II) being transposed into national law, other things being discussed include investment promotion, partial electricity cost reimbursements and quota models. For example, the possibility of waiving the EEG surcharge on the production of green hydrogen and a demand quota for climate-friendly base materials such as green steel are being examined. The Federal Government is also looking at promoting "hydrogen-ready"[3] plants via the Combined Heat and Power Act (KWKG) as well as establishing a European hydrogen organisation for the promotion and tapping of joint international production capacities and infrastructures.

The strategy revolves around hydrogen application in industry and, in the short term, in the areas of mobility where there is no other technical decarbonisation solution. Particularly shipping and aviation and also parts of heavy goods transport cannot function solely on the basis of electricity. In the area of mobility, electricity should be used directly wherever possible. Usage in segments of heat supply, such as in buildings, is also conceivable in the long term. The Federal Government plans to temporarily also use blue[4] or turquoise[5] hydrogen in the areas of application, in addition to green hydrogen.

In addition to developing a "home market" for hydrogen technologies in Germany which is characterised by the establishment of a national hydrogen value chain in which all the German regions benefit from the new value creation potential, the Federal Government wishes to intensify its cooperation with other EU member states, in particular in the North Sea and Baltic Sea areas and also in southern Europe, promote the global hydrogen market, enter into energy partnerships with potential hydrogen supplier countries and other importing countries and use Germany's upcoming Presidency of the Council of the European Union to further advance the transition to a green hydrogen industry globally too.

The Federal Government emphasises that, regarding European and global hydrogen trading, ambitious and uniform quality and sustainability standards and corresponding verification processes must be established both for hydrogen production and transportation and for the corresponding emissions.

The National Hydrogen Strategy will be professionally supervised by a National Hydrogen Council comprising 25 eminent experts from the fields of science, business and civil society, which in turn will be supported by a hydrogen coordination centre. This coordination centre is to produce monitoring reports at regular intervals that identify the areas in which action is needed and evaluate implementation of the hydrogen strategy action plan. In addition, the governance structure for the implementation and ongoing development of the strategy includes a cross-ministerial State Secretaries' Committee for Hydrogen and a green hydrogen innovation officer within the Federal

[3] This refers to the preparing of infrastructures and plants for use in a hydrogen industry.
[4] Blue hydrogen is produced by means of steam reforming using fossil hydrocarbons but is additionally coupled with a carbon capture and storage (CCS) process during production.
[5] Turquoise hydrogen is generated by using heat to split methane into hydrogen and solid carbon by means of pyrolysis.

Ministry of Education and Research (BMBF). A suitable platform format for close cooperation between the Federal Government and the *Länder* should be promptly established.

Substantiating the Federal Government's hydrogen strategy with additional measures

The RNE welcomes and supports the Federal Government's National Hydrogen Strategy and its fundamental approach. However, for hydrogen to become a marketable decarbonisation option with technological and industry policy opportunities for Germany, Europe and globally, measures must be substantiated, expanded and promptly translated into political action. Climate and environmental protection, security of supply, competitiveness, affordability for the consumers, economic viability for businesses, and European and global partnerships need to be enshrined as the pillars of a sustainable hydrogen strategy.

The RNE would like to closely accompany the Federal Government's implementation of the National Hydrogen Strategy and is offering to work together with the National Hydrogen Council.

The RNE advocates that the Federal Government incorporate the following recommendations into the National Hydrogen Strategy:

<u>Define the terms of transitional periods and avoid "lock-in" effects</u>

Above all, the foundations need to be laid for green hydrogen if the decarbonisation strategy is to be promising.

Various technologies will be needed for the swift ramping up of an industrial-scale hydrogen industry. The use of grey hydrogen, which is harmful to the climate, must be terminated as quickly as possible.

Blue hydrogen will only be used for a transitional period in order to achieve emission reductions quickly.

Turquoise hydrogen, regarding which research is still needed in order for its use to be environmentally and climate-neutral, can constitute part of a new hydrogen industry. The prerequisites here are that the overall balance for the mining and transportation of fossil natural gas and for the production, transportation and storage of turquoise hydrogen is greenhouse gas-neutral and that the solid carbon can be stored or processed sustainably and safely. The RNE is of the opinion that the energy needed to split the methane must come from renewable energy sources.

With the various technologies, there is, however, the risk of a fossil "lock-in" if fossil fuels are used, with the non-sustainable fossil-based processes remaining permanently in place. Furthermore, financial resources could be committed to this for too long, and this would hinder and delay development, promotion, upscaling and implementation processes based on renewable energy sources.

Openness to technology and also transitional periods are needed as the necessary transition to green hydrogen will take time, on the one hand to achieve the large volumes of renewable energies needed and on the other to achieve cost-effective technological development. Vice versa, however, the cost efficiency of climate-neutral processes can only be achieved by realising plants on an

industrial scale and, linked to this, with the scaling of requirements and demand. Only then can the ability to compete internationally be guaranteed.

To avoid a potential trade-off between the ramping up of green hydrogen and of other technologies, achieve the Paris climate targets and establish planning and investment reliability in equal measure for industrial production and the financial sector, what is needed are transparency, clear targets for a lastingly green transformation, a gradual approach involving ambitious sub-goals and appropriate management.

The RNE recommends that strict and transparent sustainability requirements and parameters for the transitional periods be formulated.

In addition to monitoring of the transitional period for the use of blue hydrogen and sustainable technological development for turquoise hydrogen and its derivatives, this includes a dynamic development curve for the ramping up of green hydrogen in general and clearly defined measures to be implemented if the sub-goals – climate and environmental protection, security of supply, competitiveness and affordability – are not achieved. The timeline should be reviewed regularly and amended if necessary.

Criteria additionally need to be established for the upstream natural gas supply processes and for the transportation and storage of the CO_2 generated during blue hydrogen production. Furthermore, environmental standards need to be defined for the handling of solid carbon from the turquoise hydrogen production processes. When blue and turquoise hydrogen are used, the entire greenhouse gas footprint must be presented.

<u>Accelerate the expansion of renewable energies</u>

The Federal Government is working on the assumption that Germany will have to produce considerable volumes of hydrogen internationally on the basis of partnerships and then import it in order to meet its rising energy requirements in the medium to long term. However, this does not alter the fact that endeavours to achieve greater efficiency and sufficiency need to be stepped up and the ramping up of renewable energies in Germany, which is already under way, needs to be tackled more ambitiously and considerably more quickly. A key basis for establishing hydrogen value chains within production, conversion, storage, transportation, distribution and usage in Germany is a significant expansion of renewable energies – at the local, national, European and global levels. Tapping the potential of renewable energy sources through the effective expansion of renewable energies in Germany and around the world is therefore a “no regrets” measure which plays a part in the greenhouse gas reduction targets being achieved within electricity- and gas-based areas of application and processes.

At the national level, therefore, the compromise struck regarding abolition of the PV cap and the *Länder*-specific opt-in to onshore spacing regulations must be implemented without delay in order to tap the potential offered by renewable energies in full once again and strengthen the sector. Because expansion came to a virtual standstill in the area of onshore wind, among other things due to increasing issues of acceptance, the Federal Government should also clarify the framework for approval processes, civic participation and incentivisation in consultation with the *Länder* as quickly as possible. The ramping up of the onshore area coming to a standstill jeopardises not only the climate protection goals, but also some 40,000 jobs in the wind sector. The RNE sees relevant

potential of a green hydrogen strategy both in Germany and around the world in the offshore area. The RNE additionally sees particular opportunities for a significant expansion of renewable energies and entry into a hydrogen industry in those regions that need to establish new value creation following the phasing out of lignite mining. The foundations should be laid for an increased eco-friendly expansion target in order to guarantee that the ramping up process is carried out as quickly as possible. Generally speaking, considerably better use must be made of digital possibilities than has been the case previously in order to significantly accelerate the frequently very protracted approval and civic participation processes, which are also difficult to calculate. It is a question here of working with civil society organisations to guarantee that there is as much acceptance as possible of the accelerated expansion of renewable energies.

Taking into account the sizeable volumes of renewable energy required for green hydrogen production, the approach to be taken at the European and global levels needs to be clarified at the same time as hydrogen technology being rolled out. The RNE assumes that there will be very good opportunities for inner-European and global partnerships here which would benefit both climate protection and the development of business, jobs and income.

Make green hydrogen marketable in the medium to long term

To guarantee the swift development of a green global hydrogen industry, all the innovative methods of hydrogen production should be used in order to rapidly replace grey hydrogen as the form which is currently used the most. When applying the sustainability standards, the principle of openness to technology will likewise apply in the future. The conversion losses during the generation of climate-friendly hydrogen must not result in the energy system's overall environmental footprint becoming worse.

There also needs to be a discussion regarding the extent to which local hydrogen generation solutions and existing hydrogen island networks can be drawn on and expanded by converting the existing gas infrastructure. New hydrogen pipes could also be built based on demand, in particular to assist with the development of decentralised infrastructures in the industry and heat sectors. Scientific studies and demonstration projects should serve as a reliable basis subject to economic and socio-ecological evaluation.

Setting the framework conditions aside, green hydrogen costs are very much defined by whether economies of scale and efficiency effects can be achieved on the basis of technological innovations and increased demand. This should be the goal in the interests both of the climate protection targets and industrial and technological production and export. In view of this, the RNE recommends that the Federal Government increase its targeted expansion of electrolysis output from up to five gigawatts in Germany by 2030 to ten gigawatts, and to then further develop this without any cap based on needs and competition.

Make efficient use of the opportunities offered by hydrogen and swiftly secure its industrial ramping up

The hydrogen produced in the market ramp-up phase should be put to use in particular where there is the greatest greenhouse gas reduction potential in order to keep efficiency losses as low as possible or where no or only limited alternatives for the achievement of climate neutrality are expected in the long term. The RNE therefore recommends that the use of hydrogen be prioritised in

the industrial and energy sectors. If electricity generation in Germany is to be climate-neutral by 2040, hydrogen must also be available as a fuel for the thermal power plants, which would then continue to serve as a "backup" for renewable energies. Secondly, hydrogen and its derivatives (power-to-X) can be used as alternative energy sources in the mobility and transport sectors, in particular in shipping, aviation and heavy goods transport.

In the medium to long term, green hydrogen technologies can offer solutions in the area of heating too. There is huge potential for decarbonisation in the building stock in particular, primarily by means of energy efficiency upgrading. A particular opportunity also exists for hydrogen to be a partner to renewable energies where the storage of wind and solar power is concerned. Energy-density, existing and expandable storage points and transportation networks make hydrogen an important guarantor of security of supply. Moreover, as key sector-coupling elements, hydrogen and its derivatives can help to reliably manage energy supplies and make them more flexible.

To exploit greenhouse gas reduction potential across all sectors in Germany by means of a sector-coupled hydrogen industry, there need to be developments in the major projects already initiated and in the regulatory parameters. This includes both the prompt expansion of a hydrogen-compatible network infrastructure and the separate development of a hydrogen infrastructure in Germany. This will allow hydrogen's maximum carbon reduction potential to be achieved on the basis of its efficient usage – as a material and for energy. Adding hydrogen to the mix is especially suited to the distribution network level. In the long term, gas network operators should be in a position to add larger volumes of renewable gases (synthetic natural gas) to natural gas. The existing natural gas infrastructure, the conversion of natural gas pipes – with the existing capacities (low-calorific gas network) being drawn on both at the transportation and distribution network levels – and the construction of dedicated hydrogen networks are important components of an integrated infrastructure. This expansion needs to be tackled now and it needs to be planned with a commitment to the long term. Before the gas network infrastructure is expanded, it needs to be determined to what extent this is compatible with electricity expansion and climate protection targets at the European level. Coordination across the whole of Europe is essential.

As a green global hydrogen strategy primarily relates to industry across the board, be it the chemical, energy, transport or heating sector or the base materials industry, the RNE proposes that a hydrogen pact be concluded through dialogue between the Federal Government and the industries which are first and foremost involved and affected, and with the involvement of society's stakeholders and the National Hydrogen Council. The aim of such a cooperative and partnership-based approach is to create a reliable framework for the swift ramping up of the hydrogen industry founded on mutual responsibility and liability.

In the interests of a promising energy transition, the RNE welcomes the entry into a green global hydrogen industry as an important part of a sustainable recovery package in the wake of the coronavirus pandemic. Crisis management and sustainably shaping the future are thus intertwined.

<u>Promote research and development in the area of hydrogen technologies</u>

For hydrogen to be made marketable, research and development in the area of hydrogen technologies must be promoted. This applies both to process technologies, in particular regarding hydrogen efficiency, methods and transportation options, and to production technologies, above all electrolysers, and raises the question as to how demand and needs can be catered to both nationally

and internationally. Also, the opportunities resulting from this in the area of mechanical engineering nationally and as exports must be developed and exploited.

In addition, further research is required regarding the transportation, storage and ultimate disposal of the CO_2 generated during the production of blue hydrogen. Industrial-scale solutions are currently lacking. Equally, the research requirements need to be clarified, in particular regarding the environmentally friendly handling of "coproducts" during the production of turquoise hydrogen.

The Federal Government should quickly initiate the development of an application-oriented research road map for the German hydrogen industry that focuses on establishing suitable parameters for putting living labs into practice (with opex and capex[6] funding). The living labs must lead to production. To avoid repeating the mistakes made in other climate-friendly production areas, attention needs to be rigorously paid to needs and demand at the national, European and international levels.

Last, but not least, there needs to be scientific involvement in order to develop reliable simulation models for an overall approach that makes decarbonisation, energy requirements, emissions, security of supply and costs flexibly and efficiently manageable in order to achieve the climate protection targets.

Swiftly define sustainability standards for the roll-out of hydrogen

The National Hydrogen Strategy emphasises the importance of sustainability standards. It remains to be seen how such standards might be formulated. The RNE recommends that clearly defined sustainability standards for the production and transportation of hydrogen and its derivatives be established at the European and international levels and that these be incorporated into the monitoring reports that the Federal Government is planning to produce. To increase acceptance and avoid negative impacts, those affected at the local level should also be involved in establishing and monitoring the sustainability standards.

It is important that the standards take into account the environmental impacts of hydrogen production, CO_2 transportation and the storage of blue and turquoise hydrogen in the production and partner countries as well as the social impacts. It must be ensured that the production countries do not experience any negative impacts on electricity supply locally due to their exporting of green hydrogen. The sustainability standards must ensure that the emission reductions achieved in Germany by importing hydrogen do not lead to increased emissions in the countries of origin, with the decarbonisation of their own energy supply thereby being impeded. Additionally, export-oriented hydrogen production must not be allowed to jeopardise people's access to land and to water, in particular in arid regions of the world. Moreover, the production of green hydrogen in the partner and exporting countries should create long-term jobs there.

The RNE recommends that the Federal Government step up its international endeavours to establish sustainability standards and that it contribute its expertise regarding renewable energies. It is offering to assist with the development of a promising system that takes into account the

[6] Opex (operational expenditure) represents current spending on raw materials, supplies, staff, leasing, energy, etc. Capex (capital expenditure) represents investments in longer-term assets such as machinery and buildings.

sustainability goals of hydrogen technology and the hydrogen industry as well as the market ramp-up.

Implement investment-boosting measures extensively and swiftly

The hydrogen market entry and the transformation of the energy system should not be impeded by subsidies or price signals that work in the opposite direction. The RNE therefore recommends as a basic principle that there be a fundamental reform of the taxation, surcharge and levies system which manages and guarantees achievement of the climate protection targets in the energy sector and in other sectors transparently, consistently reliably and efficiently.

The carbon pricing adopted by the Federal Government as part of its Climate Action Programme lays important foundations for a green hydrogen market entry and should be introduced promptly in order to implement the higher price path agreed upon within the Mediation Committee. The RNE believes that systematically focusing on rising carbon pricing, setting an example by internalising environmental costs – both at the European and global levels – and having ambitious certificate trading which is at least Europe-wide and ideally covers all sectors constitutes the most promising and also the most market-based incentive strategy.

To avoid distortion of competition within the domestic industry and the relocation of the value chains to countries outside of Europe, globally comparable carbon pricing should also be the aim. Furthermore, a price signal for carbon emissions should not find itself counteracted by direct or indirect subsidies of fossil fuels. On the contrary – incentives must be put in place for efficient and economical energy usage and provision.

There is investment responsibility in particular regarding electrolysers, and this needs to be reflected in the taxation and surcharge system in the form of incentives. However, it is important that, during the transitional period, openness to technology, security of supply and carbon reduction apply as the principles for all funding and relief arrangements. Climate-neutral production processes having equal access to funding programmes and funds based on their life cycles should therefore be guaranteed for the duration of the transitional period. Periods of the simultaneous funding of and publicly initiated investment in a long-term green hydrogen strategy should therefore be founded on reliable requirement volumes, especially in the industrial arena.

Climate-neutral hydrogen production methods should not be seen only as consumers of renewable energies, but also as energy converters, and should accordingly have the EEG surcharge waived. Additionally, a tender system should be established for electrolysers in Germany which is based among other things on network aspects.

In view of the higher costs involved when using hydrogen in, for example, the steel and chemical industries and also in the areas of electricity and heat generation, at least during the roll-out, the state funding proposed in the hydrogen strategy should be further developed. There needs to be consideration of a hydrogen quota which takes the climate protection targets into account in order to trigger demand that boosts the ramping up of the market, to establish a functioning hydrogen industry. The RNE also recommends that a two per cent power-to-liquids (PtL) quota in the aviation sector be worked towards.

Funding should generate incentives early on not only for hydrogen production, but also for "hydrogen readiness" in all areas of application and infrastructures. Consideration needs to be given here to the fact that the infrastructures in particular need legal and regulatory parameters for the use of hydrogen-compatible components which are reliable over the long term. Endeavours in the direction of efficiency and sufficiency measures should be stepped up parallel to the hydrogen strategy.

Build up and strengthen strategic partnerships in Europe and internationally

While hydrogen technology is still at the experimental stage in Germany, a number of European countries are leading the way. The trailblazers that have concrete plans for large hydrogen production facilities with electrolysis capacities in the three-figure megawatt range include the Netherlands and Belgium. Germany cannot afford to be left by the wayside in terms of technology development and production.

The hydrogen strategy should therefore not only be developed nationally, but should also be closely correlated with the approach of the European Commission regarding a European hydrogen industry as part of the European Green Deal as well as with the European Green Deal recovery package.

Ramping up the economy again once the coronavirus pandemic has levelled off must be tackled in solidarity with and strategically with the other EU member states and it must be used to build up a green global hydrogen industry. For example, existing pipe networks should be used and connected to one another. Also, the economic relations between the southern European production countries such as Italy, Spain, Greece and Portugal on the one hand and the hydrogen user countries on the other should be strengthened. The EU should play a leading part in shaping the international framework conditions by introducing early on standards and frameworks in the interests of sustainable development.

840 million people around the world do not have stable access to electricity.[7] In addition to this serious supply shortage, countries which actually boast excellent climatic conditions are suffering under the outdated structures of conventional energy generation or import dependencies as well as the consequences of this such as highly volatile prices and a lack of development opportunities. In particular in light of the global Sustainable Development Goals, which call among other things for access to modern and affordable energy for all by 2030 and which likewise address climate protection globally, attention should be paid when entering into international energy partnerships to the production and export of hydrogen and its derivatives not occurring to the detriment of the export countries' own energy supplies, which are currently frequently still inadequate, as well as to their resulting in mutual benefit. The energy poverty of African partners should also be overcome with the aid of hydrogen cooperations. This would entail incentives being put in place at the local level for promoting economic development and for creating jobs in order to build up and expand capacities for affordable renewable energies, thereby strengthening the export countries' local markets. The promotion of a green global hydrogen industry is a huge opportunity to make sustainable development, new value chains and therefore also societal prosperity possible in the partner countries. These benefits for the partner countries must be considered from the outset.

[7] United Nations (2019): "The Sustainable Development Goals Report"; https://unstats.un.org/sdgs/report/2019/The-Sustainable-Development-Goals-Report-2019.pdf (17.06.2020).

To guarantee achievement of the sustainability goals in other countries too on the basis of green hydrogen imports, a safeguards system[8] which is derived from the SDGs needs to be developed, drawing on the details of the safeguards for emissions trading and the REDD+ concept.[9]

Hydrogen must also be incorporated into the negotiations regarding and the conclusion of international trade agreements and should be made a key issue in development assistance agreements.

The RNE recommends that the Federal Government enter into strategic alliances with the partner and exporting countries at both the European and the international level. The value added from renewable electricity and green hydrogen should be increased in these countries and the infrastructures for the production and utilisation of green hydrogen should be built up there too. In this way, Germany could make a significant contribution to implementation of the SDGs in the partner countries.

[8] A mechanism which ensures that the policies for achieving the SDGs are not impeded by the expansion of green hydrogen.
[9] A mechanism to reduce emissions from deforestation and forest degradation, for example on the basis of reforestation measures.