

What needs to be done to increase the number of more skilled workers in the hydrogen sector

The transformation we need to undergo in order to become a hydrogen-based society and industry, achieving in parallel our climate targets and defossilisation, will only succeed if we have a wide range of suitable skilled workers. Without enough of these experts, the transformation will not take place at the speed we need it to, and we will not see the economic success we are hoping it will bring.

1 STATUS

The domestic experts in the field of hydrogen technologies, which are currently scarce, are easily absorbed by the market. Nevertheless, many positions remain unfilled. This tense situation is exacerbated by the fact that the economy is in a state of upheaval, and new electrical processes and procedures are being used. For example, there is a competition within areas of the energy industry (such as in energy systems technology), the chemical industry and many other sectors of the economy. In some cases, companies are accepting applicants who only partially meet the criteria required for the role. These employees (as well as those already in the company) only then start to build up the necessary skills and expertise once they have started working. However, various needs already exist that require skilled workers with the relevant knowledge. Skilled workers are in demand along the entire value chain in the major sectors – generation, infrastructure, plants, industry (especially the steel and chemical industry), heat supply, mobility, and logistics – and this will increase significantly in the future with the expected market ramp-up. There is a need for skilled workers along the entire training chain, ranging from skilled workers, technicians, and foremen to engineers and scientists from the academic sector.

2 RESEARCH AND DEVELOPMENT REQUIREMENTS

The upcoming restructuring processes in all sectors are creating a high demand for research and development work along the entire hydrogen value chain. This process requires and involves skilled workers, who must possess the relevant qualifications for these new fields of activity.

Change processes in the world of work, especially in energy-intensive sectors such as the chemical, steel, and cement industry, affect both the construction and the operation of the hydrogen value chain.

Implementing a hydrogen value chain requires the infrastructure to be expanded significantly, which in turn will help create jobs in multiple sectors. Skilled workers are needed first and foremost for hydrogen pipelines and refuelling infrastructure, as well as to expand renewable energies and to broaden research in these areas.

The transformation into a hydrogen economy comes with many changes in technologies throughout all production processes. There is a need for research in the field of electrolysis to make it more efficient in terms of costs and materials. Storage and transport concepts for hydrogen also need to be developed. The use of hydrogen will be introduced on a large scale in industry and mobility and, in the long term, in electricity and heating grids, to be able to utilise the full potential with industrialised technology in a way that is cost efficient and effective.

Commissioning hydrogen value chains also increases the need for further research and development regarding the production of hydrogen, as well as the need to develop new markets – thus creating a demand for suitable skilled workers.

Transferring knowledge and establishing suitable structures across all levels of education therefore play a key role in the implementation of Germany's National Hydrogen Strategy. As a result, this will create a new demand for highly qualified skilled workers who can help guide the transformation process, enabling it to be successful in all its envisaged dimension and technological scope.

3 SECURING THE SUPPLY OF SKILLED WORKERS

Considering the major economic challenges, additional highly qualified skilled workers who can build the bridge between current and new technologies are undoubtedly needed for the transformation. The higher education landscape in Germany offers several pathways for these qualifications to be obtained in the form of the relevant degree programmes, along with vocational and further training courses. However, there is a lack of the necessary visibility and willingness to train in these disciplines – which is equally important as the social task involved. Securing a skilled labour force can therefore only be achieved, if young people can be attracted to these education and training pathways. In addition, the international search for junior staff is also an important instrument for meeting the demand. Measures must be taken to increase the attractiveness of a green industrial landscape to establish new and sustainable job profiles, along with the corresponding regional prospects, across every sector.

4 RECOMMENDATIONS FOR ACTION

Using the research and development needs, the following recommended courses of action and questions to be clarified can be derived for the Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung), the Federal Ministry of Labour and Social Affairs (Bundesministerium für Arbeit und Soziales) and the respective federal states. The recommendations can be used to attract skilled workers in the hydrogen sector and retain them in the long term.

- ◆ **Recommended courses of action for schools:** The process of recruiting young people needs to start at school by further developing and improving STEM (science, technology, engineering, and mathematics) subjects to get students interested in scientific and technical professions at an early age. The trend of declining student numbers in STEM subjects over the past few years must be

countered at an early stage in the educational process. Hydrogen acts as a possible 'figurehead' in the choice of study programme. Modern teaching approaches, including equipment with teaching materials and experimental kits, can also contribute to this, enabling the establishment of a motivational infrastructure and making sample material available, as well as enhancing the profile of schools and thus bringing the subject of hydrogen closer to the learners. This requires corresponding investment programmes for the schools.

- ◆ **Recommended courses of action for universities and colleges:** There is no need for new degree programmes specialised in hydrogen. Rather, newly developed individual modules can contribute to deepening the topic in existing bachelor's and master's programmes. Furthermore, the interdisciplinarity at universities, especially between the subject areas of renewable energies and hydrogen, must be strengthened by introducing dual degree programmes, among other things. These measures at universities should be supported by investment programmes to equip student hydrogen laboratories so that they can offer practical training. In addition, stronger cooperation between universities, non-university research institutions and industry should also be promoted. Project funding from both the public sector and from the industry that explicitly includes final theses in bachelor's and master's degree programmes, as well as doctorates, can make a major contribution to promoting this cooperation. In turn, this will enable new skilled workers to be recruited across disciplines and educational programmes to be established in the long term.
- ◆ **Recommended courses of action for vocational training:** As with the higher education sector, there is a need to supplement and deepen the curricula in vocational training to address the topic of hydrogen and its respective facets without creating new professions or programmes. In addition, offerings must also be created at the level of subject and technical knowledge, which may lead in part to restructuring and adjustments in the curriculum. A nationally uniform structure that transcends state borders but does not lose sight of or neglect regional needs is recommended. These measures also need to be supported with appropriate programmes that enable training institutions to provide practical sessions in laboratories.
- ◆ **Recommended courses of action for in-service qualifications:** Establishing quality-assured and market-oriented certificates of advanced studies allows skilled workers to obtain an immediately applicable (basic) qualification (for example, by IHK, TÜV Süd and so on). The offerings that are already available, such as those from the Carl von Ossietzky University of Oldenburg, the Gottfried Wilhelm Leibniz University Hannover, and the Fraunhofer Institute for Wind Energy Systems IWES, are aimed in particular at skilled workers and managers in companies who are involved in the design and implementation of hydrogen business models. Standardised procedures should also be developed to make degrees easy to compare, including those on hydrogen expertise (for example, expert training, certificates of advanced studies for obtaining hydrogen-specific expertise). However, the nationwide framework curricula should also consider the needs of each region. For example, an individual regional concept must be developed for the upcoming transformation of the lignite region in Central Germany into a hydrogen economy. This must be linked to the local economy/companies and specifically tailored to those job profiles.
- ◆ **Recommended course of action for teaching:** There is a great demand for professionally qualified teachers on the subject of hydrogen as well as for corresponding further qualifications across the entire H₂ value chain. The corresponding qualification must take place through a continuous transfer of knowledge, and this must be done nationwide for different target groups (blended learning including practical sessions, should they be necessary). It is vital to build up a specialist community, including a pool of hydrogen instructors, to ensure that there are qualified teachers throughout Germany.

- ◆ **Stakeholder involvement:** Other stakeholders at different levels (such as insurance providers, municipalities, mayors, fire brigades and so on) also need specially tailored training. It is necessary to provide materials (e-learning courses, training videos and the like) at different levels and for different target groups as well. To comply with special laws and regulations (explosion hazard in pressurised systems) when working on hydrogen generation systems, the responsibility for further training lies with the employers, the employers' liability insurance associations and the statutory accident insurance companies, depending on the respective situation.
- ◆ **Recruitment of qualified skilled workers from other European countries:** Establishing a European hydrogen network that ensures the exchange of knowledge, further training and the quality of research and development in the field of hydrogen means new skilled workers could be attracted from other European countries. This would also expand the pool of available teachers. What is needed here above all is a concrete implementation of the federal government's new skilled worker strategy.
- ◆ **Strengthening innovation:** Start-ups in the hydrogen sector need to receive financial support to make innovative processes ready for the market more quickly. Start-ups also offer the opportunity to use motivation and 'inventiveness' as tools to transform a fossil fuel economy into a hydrogen one. At the same time, new skilled workers can be recruited and retained using attractive packages.

In summary, first, current systems in the field of education and training must be strengthened across all educational pathways to retain skilled workers. Second, current qualification, education and training opportunities in the hydrogen economy sector must be advertised more strongly. This could be achieved through a nationwide campaign, highlighting the attractiveness and future viability of the hydrogen economy. The target group here should primarily be young people, who should be shown in which areas they can directly contribute to the realisation of a climate-neutral economy in the future and which diverse job profiles are associated with this.

If you are interested in finding out more or have any questions, please contact:

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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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