

Policy brief – February 2024

Hydrogen production in Kazakhstan and Trans-Caspian Hydrogen Transportation

Main Findings

- The energy transition is continuing at an unprecedented pace and scale, requiring new low carbon technologies.
- Green hydrogen is seen as part of the solution to reach the decarbonization of the industry which will require coordinated action from industry and government for Kazakhstan to capture the benefits.
- Green hydrogen is not only an energy carrier for renewable energy sources but can be used in many economic sectors as their input material.
- Early demand markets for hydrogen include balancing supply and demand in the power sector and replacing fossil fuels in industry.
- Hydrogen can be divided into 'grey' (produced from fossil fuels), 'blue' (produced from fossil fuels with carbon capture and storage) or 'green' (produced from renewable electricity).

Introduction

Green hydrogen has become an increasingly relevant topic in the Republic of Kazakhstan within the last years, as it has been addressed during the annual address to the Nation of President Kassym-Jomart Tokayev and other events. At the same time, the Republic of Kazakhstan has gained increasing attention on an international level regarding green hydrogen, as it has among other occasions been discussed during the visits of the Federal President of Germany Frank-Walter Steinmeier in June 2023 and State Secretary and Special Representative for International Climate Policy of the Federal Foreign Office Jennifer Morgan in January 2024. While the importance of the topic is increasing, there is still a lack of vision and mutual understanding which role Kazakhstan will play in global green hydrogen trade and which role green hydrogen will play in the country. In the global development of green hydrogen, there are typically those countries with higher ambitions towards

exporting green hydrogen, and those countries with higher ambitions to import or be self-sufficient. There are several sectors within Kazakhstan, in which the use of green hydrogen currently seems as the most feasible option for decarbonization. In line with the plans and commitments to decarbonize the Kazakh economy (Low Emission Development Strategy, commitment to Paris agreement, NDC Update), the integration of green hydrogen into the value chains of these hard-to-abate sectors and a self-sufficient use should be further developed. On the other hand, Kazakhstan does currently play an important role in the international energy market and could be able to extend or even strengthen this role with the export of green hydrogen, in order to stabilize the income source of energy exports in the long-term. Due to its strong potential for renewable energy and available land, Kazakhstan has the potential to become a large-scale producer, which could enable exports and self-sufficient use of green hydrogen at the same time. For both aspects, a

clear set of visions and policies are necessary for the development of capacities, international partnerships, infrastructure and industry. Furthermore, the topic of transportation needs to be addressed in more detail. The Hydrogen Diplomacy Office Astana has published a study on the techno-economic aspects of different transportation routes from Kazakhstan towards Europe. While the understanding of the associated costs is an important first step, there are more aspects to be covered.

The Ministry of Energy of the Republic of Kazakhstan is responsible for country's energy policy and is a focal point for development of hydrogen energy industry.

Policy Issue

What are we talking about?

The development of green hydrogen in the Republic of Kazakhstan is currently at an early stage, while the range of topics to be addressed are increasing across several stakeholders in the public and private sector. A stronger alignment between the stakeholders within the country and those from (potential) partner countries, clear responsibilities and a roadmap to develop the economy is necessary to understand and determine, in which economic activities of Kazakhstan green hydrogen will eventually play a role and what has to be done to achieve this development. It is important to emphasize that green hydrogen is not only an energy carrier for renewable energy sources, but there are many economic sectors which can use green hydrogen and derivative products as their input material. These value chains on the basis of green hydrogen could be established not only domestically, but also within the region of Central Asia. The regional development could benefit the establishment of infrastructure and green value chains for a green diversification of the economy. At the same time, it would give an opportunity for a just transition for work forces in the country and region, offering a just

transition. Considering the option of exporting green hydrogen to Europe, the transportation route has to be examined in more detail.

Which developments have caused this issue to be of particular relevance right now?

The Republic of Kazakhstan is relying on fossil fuels, for domestic demand and for exports of energy. A large share of the national income is based on the export of fossil fuels, which does not strongly contribute to the depth of added value within the country. While green hydrogen can similarly be produced and directly exported, there are more possibilities in the country to increase the value added within various sectors. The potential of using green hydrogen in the national economy is currently untapped, and there is a low level of involvement. With recent commitments to climate neutrality, the transition away from fossil fuels and plans to build one of the largest green hydrogen production plants in the world, the topic of green hydrogen has been introduced not only as a potential climate-neutral substitute for energy exports, but also as an opportunity to diversify the resource-oriented economy of Kazakhstan. Due to the conflict between Russia and Ukraine, the region of Central Asia has gained a higher geopolitical visibility worldwide, as well as the trans-Caspian route. The trans-Caspian route is of particular relevance for trade between Asia and Europe and it will probably play an important role for the transportation of green hydrogen or its derivatives.

Challenges of the development of green hydrogen

Water

The production, storage and transport of green hydrogen will require desalinated water, especially ramping up a hydrogen market in Kazakhstan will increase the water consumption. Water scarcity is a major concern in Kazakhstan as other industry like industry and agriculture rely on water usage. The transition to a green hydrogen economy will

increase pressure on water resources, emphasizing the importance of prioritizing water management in Kazakhstan.

Missing domestic demand for green hydrogen

Currently, unabated hydrogen is primarily utilized in Kazakhstan's refineries as well as in the production of ammonia for the fertilizer industry. Kazakhstan has significant potential for producing green hydrogen due to its abundant renewable energy resources and vast land availability. However, there is currently no domestic demand for renewable or low-carbon hydrogen in Kazakhstan, and there are no policy measures in place to encourage its production and use.

Lack of transportation infrastructure to export countries

The lack of transportation infrastructure for exporting hydrogen to other countries presents a significant challenge. Despite increasing attention to green hydrogen on both domestic and international levels, there remains uncertainty regarding Kazakhstan's role in global green hydrogen trade and its domestic utilization. While Kazakhstan has the potential to become a major producer of green hydrogen, there is a need for clear visions, policies, and infrastructure development to support this transition. The country's reliance on fossil fuels for exports underscores the urgency of diversifying its economy through the development of green hydrogen.

Why is the issue important?

In the Kazakhstani context, creating a new department dedicated specifically to hydrogen within the Ministry of Energy is crucial for several reasons:

1. **Focused Expertise:** Hydrogen is a complex and multifaceted energy carrier, requiring specialized knowledge and expertise for its successful implementation. By establishing a dedicated department, Kazakhstan can pool together experts in hydrogen technology, policy, and regulation, ensuring that decisions related to hydrogen development are informed

by the latest research and best practices. This focused expertise enables more effective planning, implementation, and oversight of hydrogen initiatives, minimizing risks and maximizing benefits.

2. **Strategic Coordination:** The establishment of a dedicated department provides a centralized platform for coordinating the diverse stakeholders involved in hydrogen development, including government agencies, research institutions, industry players, and international partners. Effective coordination is essential for aligning priorities, streamlining processes, and avoiding duplication of efforts. By serving as a focal point for collaboration and information exchange, the new department enhances synergy among stakeholders, leading to more coherent and impactful hydrogen policies and projects.

3. **Resource Allocation:** Hydrogen development requires substantial financial and human resources, including funding for research and development, infrastructure investment, and capacity building. A dedicated department within the Ministry of Energy facilitates targeted resource allocation, ensuring that adequate funding and manpower are allocated to priority areas within the hydrogen sector. This targeted investment maximizes the efficiency and effectiveness of resource utilization, accelerating the pace of hydrogen deployment and adoption in Kazakhstan.

4. **International Engagement:** Kazakhstan's participation in the global hydrogen economy requires active engagement with international partners, including other countries, intergovernmental organizations, and multilateral initiatives. A dedicated department enhances Kazakhstan's capacity to engage effectively in international fora, negotiate partnerships, and leverage opportunities for collaboration and knowledge exchange. By strengthening its international presence in the hydrogen arena, Kazakhstan can attract investment, access technology, and enhance its reputation as a progressive player in the global energy landscape.

A clear strategy and the according policies have to be in order, so that all the other actors within the country are incentivized to take part and can prepare accordingly. As the current local demand for green hydrogen and the capacities in the economy are very low, the efforts of implementing green hydrogen into various economic sectors and the awareness about the possibilities are still low. At the same time, there is a lack of alternatives for decarbonizing the hard-to-abate sectors and an uncertainty about the potential of green hydrogen. The overall regulatory framework within the country has to be established and implemented while also increasing the capacities for a better understanding of the topic. Dedicated policies shall furthermore ensure social and ecological sustainability – Water consumption and pollution are closely linked when it comes to the provision of desalinated water for green hydrogen production, and they have to be closely monitored as one of the important sustainability topics.

*What are the consequences if we do not act?
What are the benefits of action?*

If no clear roadmap and policies are established, the further realization of projects, use and export of green hydrogen become difficult within the Republic of Kazakhstan, but also within the sphere of international cooperation and trade. The awareness about green hydrogen and the incentives to implement it into the local economy within the country are low, if there is no vision. At the same time, the security to invest into infrastructure and projects is lower.

The impacts on social and ecological sustainability could be severe without a proper framework and standards.

Policy Option

The capacities and awareness on green hydrogen in the Republic of Kazakhstan are currently at a low level, as the topic has just

recently gained relevance in the context of the country. The work on the development of green hydrogen is distributed over various committees and institutions, while there is currently a lack of the country's vision and alignment across the country.

A designated hydrogen department within the public sector, which coordinates the development of a vision, a roadmap and further steps with all public and private sector stakeholders, would help to address the topic effectively and align it with all affected sectors and stakeholders. The integration of green hydrogen in the respective sectoral and national strategies is an important matter to consider synergies, benefits and potential conflicts with other activities. This would be important for the domestic use of green hydrogen as well as for the potential export. Regarding the potential export and transportation across the Trans-Caspian route, a strong alignment with the transit countries along the route and the European Union are necessary. Similarly, the infrastructure for the transportation towards other potential importing countries should be planned, if required. A dedicated hydrogen export strategy or chapter within a roadmap could provide more clarity on this topic.

The roadmap for green hydrogen development in Kazakhstan involves establishing a dedicated hydrogen department tasked with coordinating efforts across various sectors and stakeholders. This department will integrate green hydrogen into sectoral and national strategies, ensuring alignment with broader goals. Additionally, infrastructure for transportation will be developed to support the export of hydrogen, with a focus on leveraging existing routes and fostering collaboration with transit countries and potential importing nations. A hydrogen export strategy will be formulated to guide these efforts and attract investments, although careful consideration of implementation costs, environmental impacts, and social factors will be essential throughout the process.

Recommendations

Recommendations for establishing a new department within the Ministry of Energy:

1. Establish Clear Mandates and Objectives:

Define the specific responsibilities and objectives of the new department within the Ministry of Energy, focusing on the development and implementation of hydrogen-related policies, strategies, and initiatives. This includes setting clear targets for hydrogen production, infrastructure deployment, and market development, aligned with national energy and sustainability goals.

2. Allocate Sufficient Resources:

Ensure adequate funding, staffing, and technical expertise for the new department to effectively carry out its mandates. This may involve reallocating existing resources within the Ministry of Energy or securing additional budgetary allocations to support hydrogen development activities.

3. Develop a Comprehensive Hydrogen Strategy:

Work with stakeholders to develop a comprehensive national hydrogen strategy (concept), outlining the roles, responsibilities, and action plans for various government agencies, industry partners, and research institutions. This document should provide a roadmap for coordinating efforts, leveraging resources, and achieving strategic objectives in the hydrogen sector.

4. Enhance Coordination and Collaboration:

Foster collaboration and coordination between the new department and other relevant government agencies, including ministries of finance, industry, transportation, and environment. This includes establishing interagency working groups, joint task forces, and stakeholder forums to facilitate

information sharing, policy alignment, and collective decision-making.

5. Establish Regulatory Frameworks and Incentives:

Develop clear regulatory frameworks, standards, and incentives to support hydrogen development and investment. This includes streamlining permitting processes, providing financial incentives for hydrogen projects, and establishing regulatory certainty to attract private sector investment and innovation.

6. Monitor and Evaluate Progress:

Implement monitoring and evaluation mechanisms to track progress, assess performance, and measure the impact of policies and initiatives implemented by the new department. This includes establishing key performance indicators, conducting regular reviews, and soliciting feedback from stakeholders to ensure that objectives are being met and adjustments can be made as needed.

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Authors

Manuel Andresh, Head of the H2-Diplo Office Astana;
Nurbek Yessetov, Energy advisor, H2-Diplo Office Astana;
Alexey Kobzev, Head of Green Energy and Climate Lab at Kazakh-German University;
Abylaikhan Soltanayev, Scientific Coordinator at Kazakh-German University.