In the global clean energy agenda, the potential commercialization of the use of hydrogen technologies could play a key role. Russia's interest in hydrogen seems to be primarily driven by changes in the global energy markets. Therefore, the government recently has produced its own short term hydrogen roadmap, covering the years 2021 – 2024. This is the first step for Russian government, businesses, and institutions to get involved in hydrogen opportunities and to encourage the implementation of hydrogen pilot projects. The roadmap entails various steps to promote hydrogen generation and use between 2021 and 2024 by relevant ministries and organizations such as Rosatom, Gazprom and the St-Petersburg Mining University. The document mentions international cooperation as well as scientific and technological developments for high-tech solutions.

However, it should be mentioned that the embassy follows the stance of the Russian government towards foreign technology with great interest. First of all, there is a drive to localize production and industry, this might hinder opportunities mentioned below. Second, the Russian government announced that they will cut back on subsidies destined for renewable energy. The impact on the development of hydrogen is - up to this point - not clear.

**Energy & Transport Sector**

A 2019 report prepared by the infrastructure centre EnergyNet stated that, to create a hydrogen energy sector in Russia in the subsequent years from 2025 to 2035 requires 3.9 billion USD, but have the potential to produce an annual profit of up to 3.1 billion USD. The report emphasized that the export of hydrogen to the global market should be a top priority for the Russian economy, this would entail an ambitious goal to make up to 15% of the global hydrogen export market by 2030. The report also highlighted that hydrogen projects in other sectors like transport are being considered. The Russian government is also negotiating further hydrogen export with Germany.

**Hydrogen Infrastructure**

According to Vitaly Ermakov, energy expert at the Moscow Higher School of Economics, the biggest challenges with regard to the development of various types of hydrogen in Russia are high costs of development, expensive technology for CO2-storage (for blue hydrogen), a lack of infrastructure for transport and storage of hydrogen. The go-
vernment has therefore announced to create a support mechanism in the course of 2021 for the development of infrastructure for the transport and consumption of hydrogen. According to Deputy Energy Minister Pavel Sorokin, it is important to start by making an inventory of the list of projects already existing and their development phase. “This is because the [Russian] hydrogen energy sector, although it exists for quite a long time and is developing over a long period, is still at an early stage of the development cycle.”

Industrial use

Russia does have a history with hydrogen. For example in industry, where “gray” hydrogen is primarily being used in oil refinery, steel and chemical industry. It is often produced directly at the plant where it is used. The country has all the internal resources - such as water and natural gas – and sufficient capabilities to produce grey, blue and green hydrogen for a global market. Its location close to potential importers such as the EU, China and Japan is also an important advantage. Currently, the Island of Sakhalin is being transformed into a hydrogen testing ground, where the Russian train company RZhD launched a hydrogen train and (inter) national giants such as Shell, Rosatom and the Japanese Kawasaki company are looking into new ways of low-carbon hydrogen production.

Green hydrogen

It is already possible to produce green hydrogen at the under-loaded Ust-Srednekanskaya hydro plant in Magadan and in the Leningrad and Kola nuclear power plants. Installing hydrogen generators on the latter will require 55 billion rubles (approx. 612 million euros). From the site in Magadan, it will be possible to ship test batches of hydrogen to Japan, where hydrogen transport is actively developing. Moreover, Gazprom is considering using North Stream one and two for the purpose of exporting hydrogen to Germany and the EU in the future. Finally, the use of existing LNG infrastructure is currently being researched by Gazprom and is being considered by other regions.

An ongoing discussion for potential export is how to produce green hydrogen and the need to cover internal demand of energy. For example, multiple scientists stressed the availability of hydropower for the production of clean (green) hydrogen. However, this hydropower is usually destined for local use. If this is going to be used for export, local energy production should come from another source of energy. Possibly, the cheapest way will be to use natural resources. This could cancel the positive effect on the environment and possibly create a higher CO2 footprint.

Innovative developments

The hydrogen roadmap also touches on different scientific and technological developments in the field of domestic energy-efficient technologies for the generation, transportation, and storing of hydrogen, as well as testing of hydrogen and methane-hydrogen fuel in gas turbines and vehicle power plants (program from 2021 – 2024). Furthermore, the government proposed more research of technologies and greenhouse gas emissions in the production chain of hydrogen generation, transport and use, meaning that they intend to look specifically into the production of green hydrogen.

The Technological Hydrogen Valley Consortium was established in Russia in November 2020. The initiators were Tomsk Polytechnic University, Institute of Catalysis Siberian Branch of RAS, Institute of Problems of Chemical Physics RAS, Institute of Petrochemical Synthesis RAS, Samara Polytechnic University and Sakhalin State University. Together, they will conduct research and develop technologies throughout the “hydrogen chain”. Also, the Federal Center for the Development of hydrogen energy technologies is under consideration.

The largest Russian energy companies, Gazprom and Rosatom, are working on technologies for producing hydrogen with a minimal carbon footprint through adiabatic conversion of methane and high-temperature nuclear reactors. The technologies are in the stage of preliminary scientific development or (for adiabatic methane conversion) – testing at a pilot laboratory facility. There are such technologies at the stage of laboratory testing as:

- production of hydrogen by aluminum oxidation in water (United Institute of High Temperatures of the Russian Academy of Sciences);
- fuel processors for natural gas conversion and diesel fuel to a hydro-enriched fuel cell mixture and separation of pure hydrogen from it (Central Research Institute of Ship Electrical Engineering and Technology and Krylovskiy State Scientific Center).

Moreover, scientific developments in the field of electrolysis, hydrogen storage based on metal hydrides, research projects in the field of fuel cell technologies are conducted in different institutions.

It is clear that the Russian government and companies understand that hydrogen might play an important role in both European and Asian energy systems. For now, it is not clear yet what specific path the Russian government will take. However, the hydrogen roadmap mentioned above seems to show the government does not want to put all its eggs in one
Where do the Dutch and the Russian vision on hydrogen intersect?

Both in the field of international business and scientific research there is a lot to gain from cooperation between Dutch and Russian players in the field of hydrogen. On a government-to-government level, there are several working groups where the topic hydrogen and science is being discussed. Moreover, on a cooperative level, there are several (online and offline) events where players from both countries can take part.

Blue hydrogen

Russia has the natural resources, and potentially the infrastructure to supply blue hydrogen in high quantities to the Netherlands and the European Union in general. The two countries have a long history of cooperation in energy, both on a governmental and a business level. They could exploit this relation to scale up the production in Russia of blue hydrogen and export to the Netherlands. On a governmental level, the embassy is in contact with the Russian ministry of energy on this topic.

Events on this topic are:
- Eastern Economic Forum “The Far East – Development Horizons”, 2–4 September 2021, Vladivostok (although not an energy forum, in recent years new energy projects in the Far East were announced at this forum)
- Sakhalin Oil & Gas, 28–30 September 2021, Yuzhno-Sakhalinsk
- Russian Energy Week (REW), 13–16 October 2021, Moscow
- 25th World Energy Congress, 24-27 October 2022, St. Petersburg

Green hydrogen

The scale up of blue hydrogen supply will eventually reduce the costs of hydrogen in general and prepare the infrastructure for more green hydrogen in the Netherlands.

Regarding Russia, there are multiple pilots with Rosatom, in the field of nuclear energy and hydrogen. Moreover, the country has a lot of hydropower capacity that could possibly be turned into hydrogen. There are also pilots and ideas about more wind energy – examples are to be found in e.g. the Murmansk region. On a governmental level, the embassy is in contact with the Russian ministry of energy and the Russian ministry of economic development on this topic.

Events on this topic are:
- Saint Petersburg International Economic Forum (SPIEF), 2-5 June 2021, St. Petersburg
- Eastern Economic Forum “The Far East – Development Horizons”, 2–4 September 2021, Vladivostok (although not an energy forum, in recent years new energy projects in the Far East were announced at this forum)
- Russian Energy Week (REW), 13–16 October 2021, Moscow
- 25th World Energy Congress, 24-27 October 2022, St. Petersburg

Science & hydrogen

Science received priority from the Russian government. More research projects are to be expected in the period 2021-2024. Cooperation with Dutch universities and NWO is mutual beneficial.

There is a will to do more with blue and green hydrogen due to European and Asian plans regarding energy and reduction of CO2 emissions. However, there is a knowledge gap with regard to CO2 storage and CO2 storage is currently considered expensive in Russia. Dutch knowledge and innovation could help to turn the tide.

More places in Russia could be a test ground for hydrogen projects, such as currently being done on the Island of Sakhalin. On a governmental level, the embassy is in contact with the Russian ministry of economic development on this topic.

Events on this topic are:
- Energy Delta Event, June 2021
- Eastern Economic Forum “The Far East – Development Horizons”, 2–4 September 2021, Vladivostok (although not an energy forum, in recent years new energy projects in the Far East were announced at this forum)
- Russian Energy Week (REW), 13–16 October 2021, Moscow
- 25th World Energy Congress, 24-27 October 2022, St. Petersburg

Transport & hydrogen

About 50 years ago, hydrogen fuel was already successfully mastered in rocket and space technology, and later in avia-
What can the Embassy do for you?

The Netherlands Embassy in the Russian Federation can facilitate your company in a number of ways:

- Provide more detailed market information based on your specific questions and needs, including a company check on a prospective partner on the Russian market;
- Answer first-line questions regarding doing business in Russia;
- Facilitate contacts with regional or federal authorities.

Sanctions

There are sanctions from the EU and other countries imposed on the Russian Federation. These sanctions can particularly affect companies seeking to do business in the energy sphere and/or to cooperate with certain state enterprises. EU measures include restrictions on:

- Doing business with specific Russian entities like energy companies (often financial restrictions);
- Export of goods, technologies or services for deep sea, Arctic and shale oil exploration and production;
- The export on dual-use goods.

Please note that such restrictions are applied on certain goods, technologies and services regardless of their end use. Goods, technologies and services that are intended for use in non-restricted oil and gas projects may also require an export license. Companies are advised to contact the Dutch Central Import and Export Office (CDIU) if they have any questions regarding the potential need for an export license.

Companies are responsible to ensure that their activities comply with the sanction regulations. For more information about sanctions, you can contact the Netherlands Enterprise Agency’s sanctions desk (in Dutch) and consult the handbook on dealing with sanctions on their website.

More Information

For further information, you can contact the Economic department of the Netherlands Embassy in Moscow via mos-ea@minbuza.nl. You can find general information about doing business in Russia, available subsidies and financing for entrepreneurs on the Embassy’s website and on the website of the Netherlands Enterprise Agency (in Dutch). You can follow us via our LinkedIn and Facebook pages.