HYDROGEN IN RUSSIA: CURRENT STATE AND NEW OPPORTUNITIES

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Hydrogen 1.0

- 65 million tons are produced per year globally (mostly as a captive product)
- Hydrogen is used for decades (in chemical industry and refineries)
- Hydrocarbons are the main source (gas, oil, coal)
- Steam Methane Reforming is the cheapest way to produce (1-2 USD / kg)

Sources: DECHEMA, DOE, Fair-PR, Linde
Decarbonization: the main global driver for changing the hydrogen’s role

- 186 states are parties to the Paris Agreement
- 45 states and 25 regions either have already launched national CO₂ trading systems or other forms of carbon pricing, or plan to do so soon
- National emissions reduction targets:
  - 2030 - by 25-40% from 1990-2005 level (common target)
  - 2050 – by 80-95% (target discussed in EU)

Source: World Bank Group, State and Trends of Carbon Pricing 2018
Hydrogen 2.0: the role of new global clean energy carrier in sector coupling

Source: IEA
Climate agenda and the drive for decarbonization are not yet essential factors in the Russian energy policy

- Skepticism concerning the anthropogenic nature of climate change is prevalent among stakeholders,
- In the 1990s, Russia has de facto sharply reduced GHG emissions due to economic downturn (1998 – by 40-50%);
- Carbon content of electricity is less than in USA, China, Australia, India, Japan, Germany… - due to big share of nuclear / hydro / gas-fired power generation (and even 4-8 times less in some regions);
- Russia joined the Paris Agreement LAST FRIDAY, but CO₂ pricing could be implemented only in 2020s

Source: I. Staffell, IEA, UNFCCC
So far, hydrogen agenda in Russia will be determined more by export opportunities than by domestic demand...

- The undiscovered green PtX potential in Russia is one of the strongest worldwide.
- Wind is insignificant in current and short-term perspective Russian electricity mix (<1%)
- Wind potential is about 17,101 TWh (16 times more than overall electricity generation in 2018)
- Existing gas transportation infrastructure + proximity to the markets of Europe and Asia are important supporting factors

Source: Frontier Economics
Remote areas power supply:
>150 remote towns & villages with diesel-fueled power plants (Sakha Republic)

Hydrogen fuel-cell train pilot project for the city of Yuzhno-Sakhalinsk with polluted air (MoU was signed in September 2019 by Sakhalin Region, Rosatom, Russian Railways)

... and domestic demand will be limited by demonstration pilots
Historical space and military capabilities that existed in Russia for many years will help Russia to develop its own competencies for a new hydrogen market...

**PRODUCTION**
- Electrolysers: Rosatom, OMZ, OSK
- Methane pyrolysis: Gazprom
- Nuclear SMR: Rosatom

**TRANSPORTATION**
- Pipelines: Gazprom
- Compressed/liquid hydrogen: Cryogenmash (OMZ Group)

**USAGE**
- Fuel cells for mobility and electricity production: Rosatom, Inenergy

**STORAGE**
- Underground gas storages: Gazprom
- Compressed/liquid hydrogen: Cryogenmash (OMZ Group)

Source: Moscow School of Management SKOLKOVO
...but a full-scale government funding hydrogen program is needed to realize the potential

- Integration of hydrogen into low-carbon development strategy (under development);
- Coordination of stakeholders in the national level;
- Enhancing international cooperation;
- Demonstration pilot projects.
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