

RUSSIA'S POLICY IN VIEW OF COUNTRY'S ENERGY SECURITY, ACHIEVEMENT OF CLIMATE CHANGE TARGETS UNDER THE PARIS AGREEMENT AND ENERGY COOPERATION IN NORTHEAST ASIA

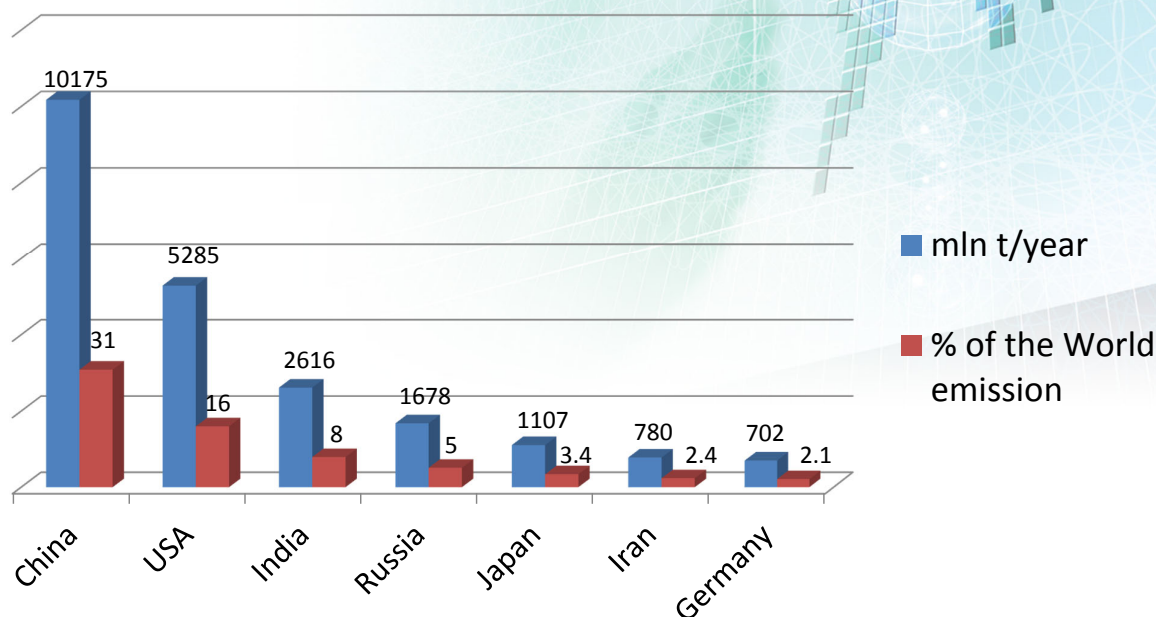
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Carbon dioxide (equivalent) emission by country, 2019



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Carbon dioxide emission in Russia

- In 2017, greenhouse gas emissions in Russia accounted for 67.6 % of the 1990 level excluding the absorbing effect of forests, and 50.7% when it is taken into account
- The specific emissions by the end of 2017 in comparison with 2008 decreased by
 - 15.6 % in the electric power industry
 - 13 % in the oil industry
 - 15.9 % in the gas industry



The latest key policy documents defining the low-carbon development of energy in Russia

- Decree of the Government of the Russian Federation dated September 21, 2019 No. 1228 ratified the Paris Agreement of December 12, 2015 under the United Nations Framework Convention on Climate Change
- Energy strategy of the Russian Federation for the period up to 2035, approved by Decree of the Russian Federation Government # 1523-r on June 9 2020
- Development of hydrogen energy in the Russian Federation until 2024, approved by Decree of the Russian Federation Government # 2634-r on October 20, 2020
- Draft of Strategy for long-term development of the Russian Federation with low greenhouse gas emissions up to 2050



The environmental and low carbon development priorities of the Russian energy policy

- The transition to environmentally friendly and resource-saving energy
- Rational use of natural resources and energy efficiency
- The Russian Federation, based on its national interests, resource and intellectual potentials, and taking into account the need to achieve the Sustainable Development Goals approved by the UN General Assembly, contributes significantly to ensuring global energy security

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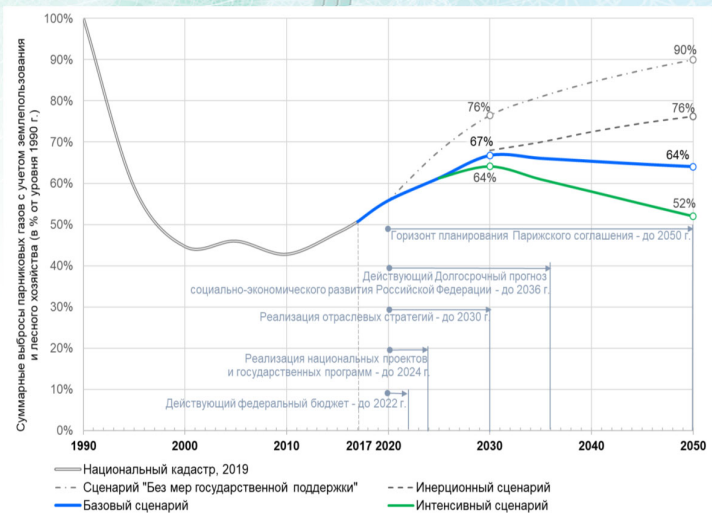
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The strategies for long term energy development of Russia considering carbon emission

Russian energy strategy and low-carbon development aspects

The forecast ratio of greenhouse gas emissions in Russia for the period up to 2035 compared to 1990 should not exceed 70-75%

Scenarios for long term development of Russia with low greenhouse gas emissions

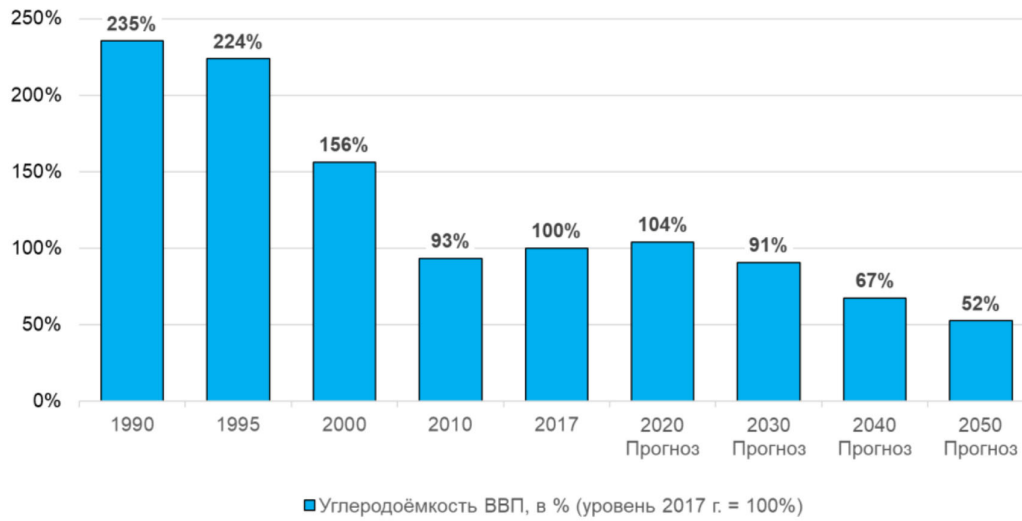


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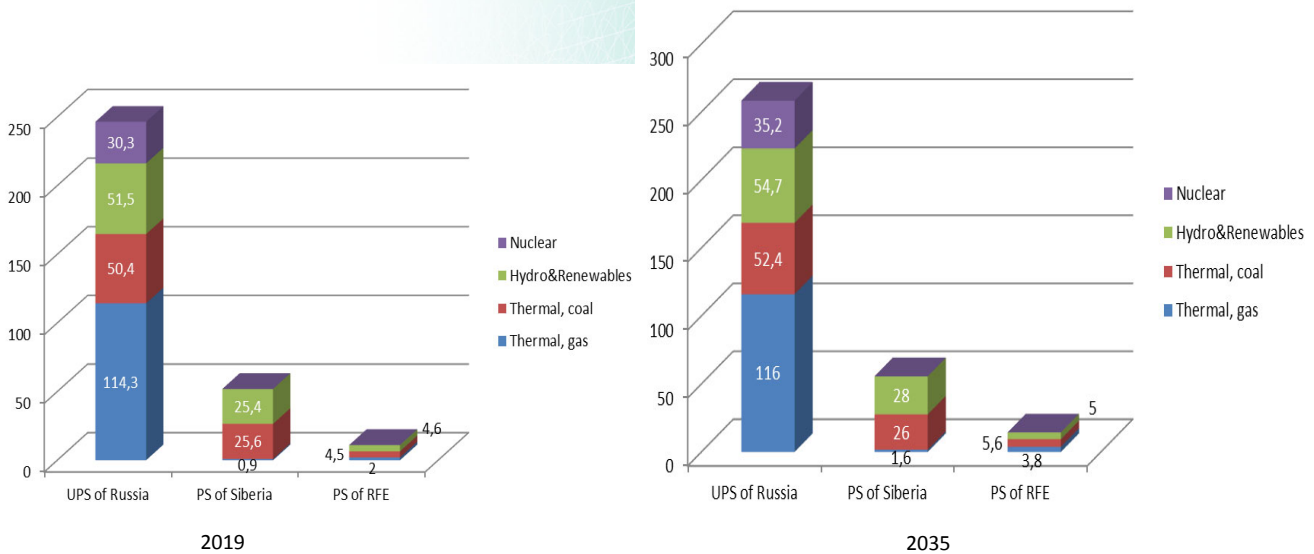
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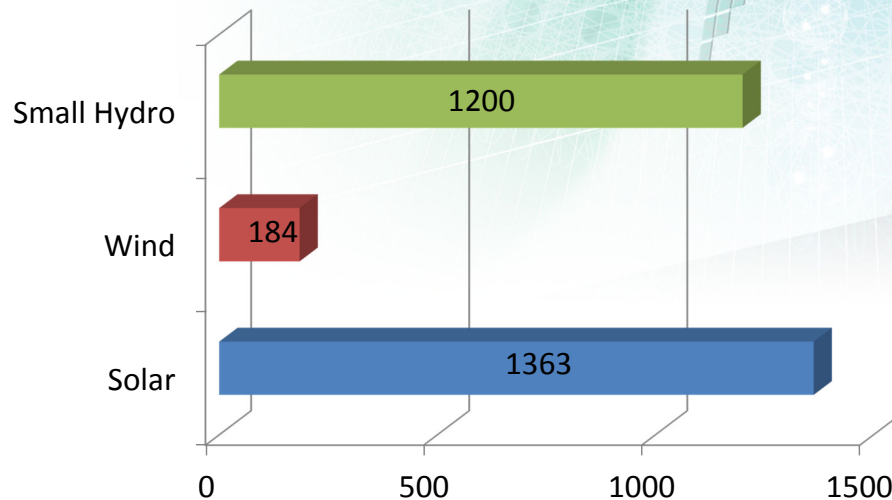
Carbon intensity of RF GDP



Installed Capacity Mix in the Unified Power System of Russia, Base Case, GW



Installed capacity of solar, wind and small hydro in Unified Power System of Russia, MW, 2019



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Mechanisms to facilitate renewables penetration in Russia

- Contracts for the supply of power from renewable energy facilities to the Russian wholesale electricity market
 - The contracts will contribute to introduction of 5 GW of capacity of NRES by 2024
 - 10 GW more will be added in 2025-2035
- The production of high-tech innovative equipment and the market of engineering services for the creation of solar and wind energy facilities of various capacities and complexity
- A number of Russian universities train specialists in the fields of construction, design and operation of renewable energy facilities

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Renewables and hydropower resources potential of Eastern Russia

Renewables technical potential:
 solar – 32500 TWh/year
 wind – 8300 TWh/year

Hydropower technical potential:
 Conventional hydropower resources:
 – Siberia – 757 TWh/year
 – Russian Far East – 684 TWh/year

Non-conventional hydropower power resources:
 – Russian Far East
 • Tugur tidal power plant – 5 GW, 16 TWh/year



Global activity of Russia in carbon-free nuclear power generation development

- Russia is developing its carbon-free nuclear power sector based on advanced nuclear power generating technologies including VVER and breeders
- Russia is actively involved in the construction of nuclear power plants in India, Belarus, and China
- Agreements have been signed on the construction of nuclear power plants in Bangladesh, Finland, Hungary, Egypt, Uzbekistan and other countries
- Rosatom has 36 orders for the construction of nuclear power plants globally

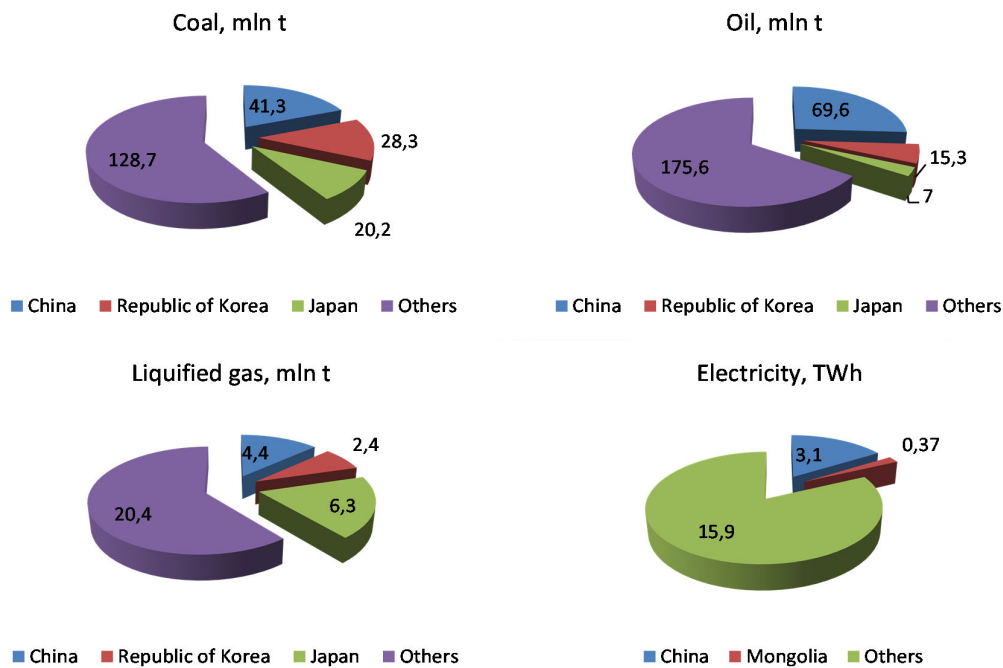
Long term prospective carbon-free technologies

- Hydrogen energy technologies are supposed to have a special role in low-carbon development
 - It is considered that hydrogen, which is used today mainly in the chemical and petrochemical industries, in the future is able to become a new energy carrier, replacing hydrocarbon energy carriers, and shaping a “hydrogen economy”
 - H_2 production in Russia reached 1.95 bln m^3 in 2019
 - Russia has potential for hydrogen production
 - it is considered to export 0.2 mln t/year (2.2 bln m^3) of H_2 in 2024 and 2.0 mln t/year (22.2 bln m^3) in 2035)
- Carbon capture, storage and use technologies can have a significant impact on the use of fossil fuels in the long run

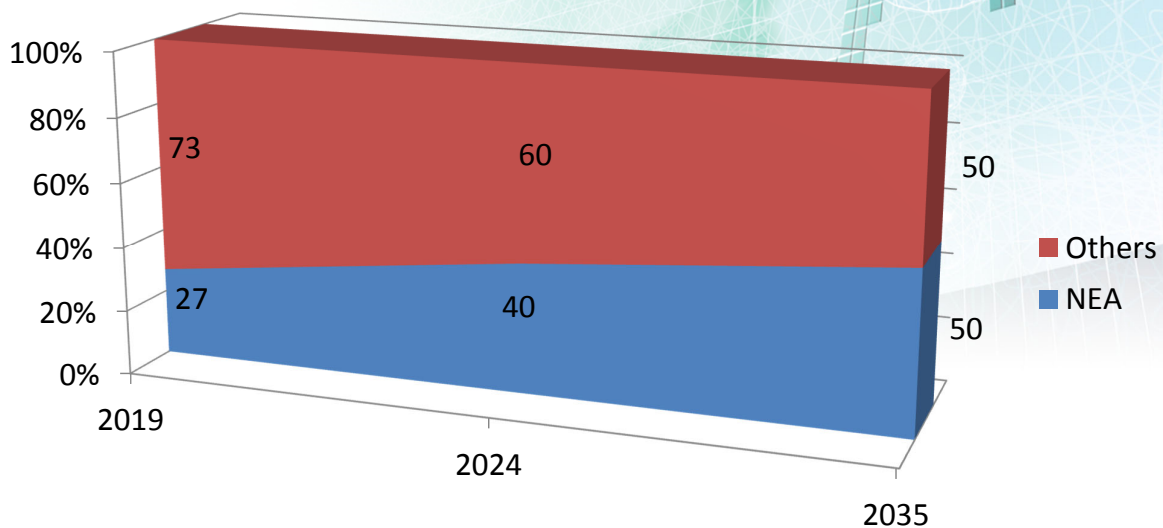
Activities of Russian companies in hydrogen energy

- “Rosatom”
 - together with “RZhd” and “Transmash-holding” develops trains on hydrogen fuel cells
 - signed a contract with “Afrikantov OKBM” to develop project of energy-efficient and environmentally friendly industrial production of hydrogen at nuclear power plants
 - concluded agreement with Japan Agency of natural resources and energy to study export of hydrogen from Russia to Japan
- “Gazprom”
 - carries out methane-hydrogen fuel production project
 - an international scientific and technical project is being carried out jointly with German and Austrian companies to test the possibility of safe storage of methane-hydrogen mixtures in underground gas storage
 - develops carbon-free technologies for the production of hydrogen from natural gas

Export of energy resources from Russia abroad including the countries of NEA, 2019

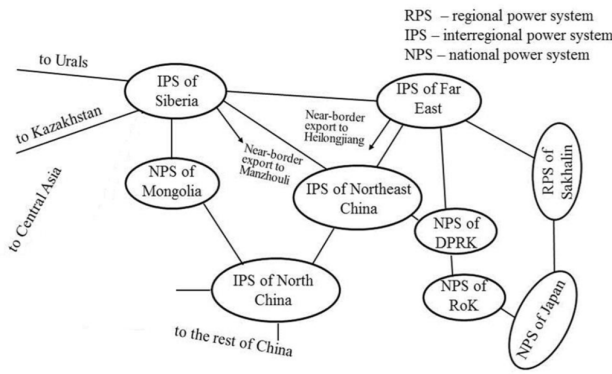


Shares of the countries of the Asia-Pacific region in the total volume of export of energy resources from Russian (Energy strategy of RF)

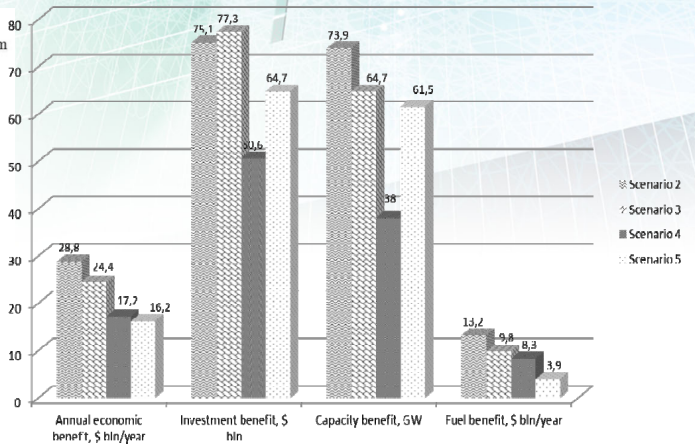


Prospective power system interconnection in North East Asia

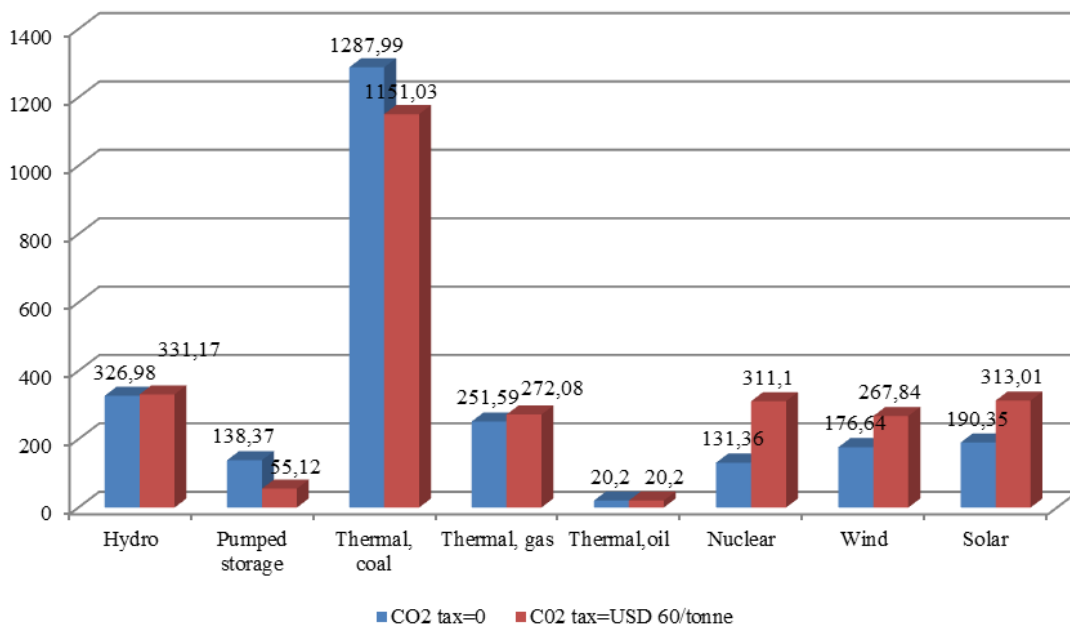
Diagram of the interconnection



System Benefits of the Interconnection



Installed capacity of NEA power grid, GW



Conclusions

- The energy sector of Russia makes a significant contribution to ensuring national energy and environmental security and socio-economic development of the country
- Russia, taking into account the need to achieve the sustainable development goals approved by the UN General Assembly, also makes a significant contribution to ensuring global energy and environmental security participating in energy interstate cooperation particularly in Northeast Asia

THANK YOU VERY MUCH!