



Gas Turbine Opportunities in Russia

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Energy scenario in Russia

Russia domestic energy mix is essentially based on fossil fuels with some nuclear power, a situation which is unlikely to change in the foreseeable future. Except for large-scale hydroelectricity, renewable energies are still in their infancy. Russia's internal fossil fuel supplies, cover nearly 90% of its domestic energy needs. Natural gas production is the second largest in the world. Unlike in US (first producer) all production comes from conventional reservoirs (the world's largest proven reserves) According to Russia's Energy Strategy until 2035, the share of fossil fuels in the domestic energy mix will remain above 85 %, though with a shift from coal to gas. Russia's CO2 emissions are supposed to grow by 7% between 2014 and 2035, more slowly than energy consumption (+11%).

Energy production/ consumption

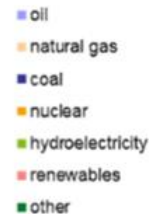
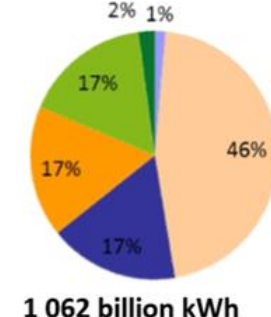
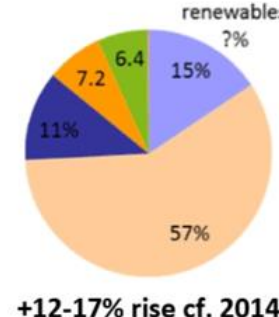
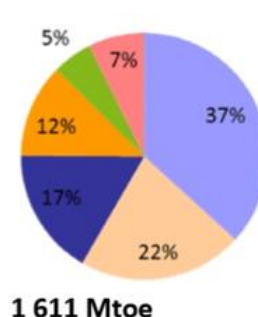
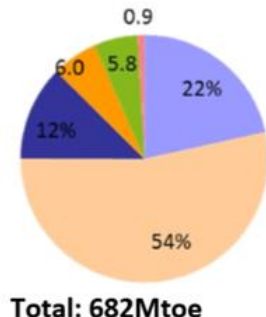
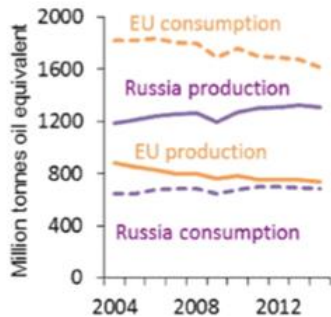
Energy mix: Russia, 2014

EU, 2014

(forecast) Russia, 2035

Electricity mix Russia, 2014

Units: Million tonnes oil equivalent (Mtoe); % total primary consumption; % electricity produced; kilowatt hours (kWh)



Data: [BP Statistical Review of World Energy](#) (2015), draft [Energy Strategy for the Period till 2035](#) (Russian Ministry of Energy).

Power generation in Russia

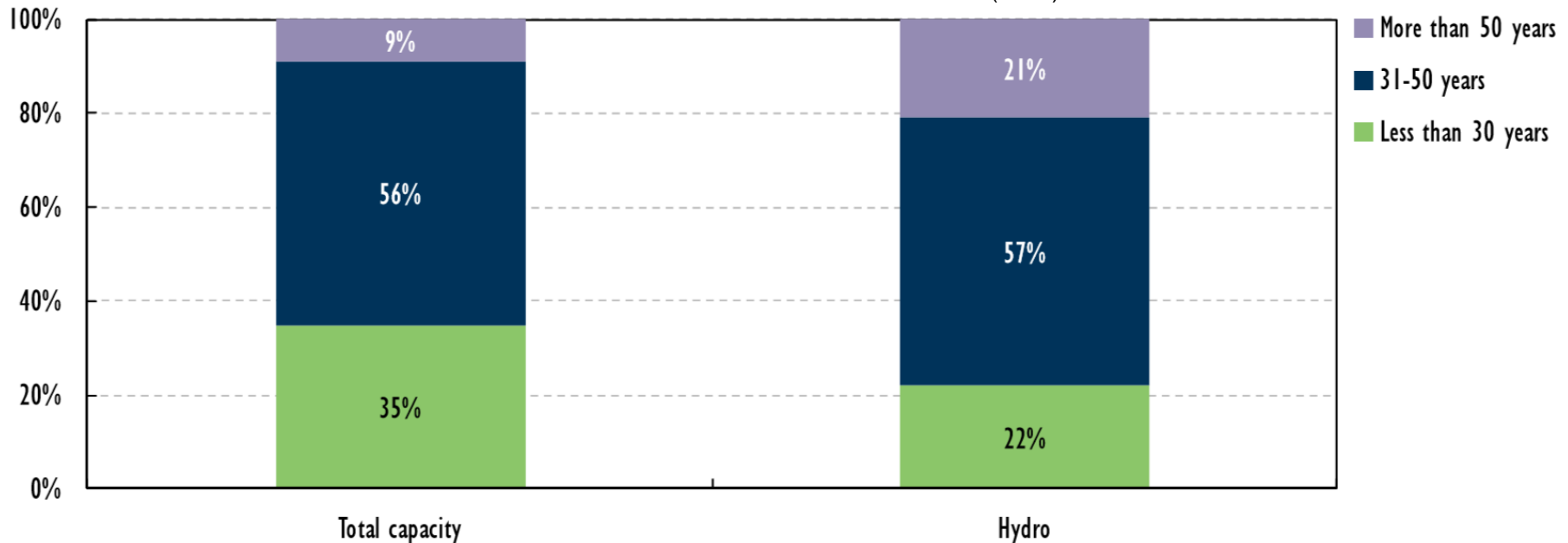
Russia total installed capacity (more than 240 GW) is the fourth-largest in the world.

Russia has the world largest district heating system, closely interlinked with the electricity sector due to the huge number of CHP plants.

A key issue is related to obsolescence of the fleet: almost two-thirds of Russian thermal power plants are more than 30 years old.

Age of installed generation capacity in Russia

Source: Sberbank Investment Research (2012)



Power generation in Russia

- **Electrical market privatization and the introduction of capacity mechanisms has attracted considerable private investment and new gas-fired power generation and combined heat and power (CHP) plants came into operation during the past 15 years.**
- **Today more than 150 large gas turbines operate for a total capacity of nearly 20 GW.**
- **Decrease in energy consumption and sharp reduction in investments from 2014, due to economic and financial crisis and dramatic drop in the gross domestic product (GDP).**
- **Even under a low energy demand outlook, the renovation and modernization of the Russian power generation fleet remains the priority in the medium term.**
- **Also maintenance and repair cost is becoming a pressing concern.**

Power generation market trends

- **High efficient CCGT instead of Steam Plants**
- **GT-based equipment :**
 - > 80% of market in 2007-2013
- **Cogeneration and district heating**
 - Share of population connected: 70%
 - Share of co-generation in total heat production: 30%
- **Shift to distributed generation, small sized engines & modular approach**



Gas turbine “plus”:

- **Efficiency**
- **Suitable size for district heating**
- **Maximize availability & reliability**
- **Low initial investment & phased modular construction (OC vs CC)**
- **Lower emissions**

Natural gas transmission system

Russia owns the world's largest gas transmission system, the greater part of which belong to the Unified Gas Supply System (UGSS).

The UGSS represents a unique engineering complex encompassing gas production, processing, transmission, storage and distribution facilities in European Russia and Western Siberia and assures continuous gas supply from the wellhead to the ultimate consumer.

600 billion cubic meters are flowing yearly in the pipelines, roughly 2/3 for internal use and 1/3 for export.

The total length of gas transmission lines in Russia is more than 170000 kilometers with 250 compressor stations.

Total rated capacity of gas compression units is around 46000 MW, with a total fleet of more than 3000 gas turbines (including small sizes). Obsolescence is a key issue.



Program for modernization of gas compression fleet

A huge investment program has been launched by Gazprom, Rosneft and private operators to modernize and expand gas pumping fleet, as well as to develop large LNG and LPG plants.

As part of this program, Gazprom is deploying new Gas-pumping units designed and manufactured by CJSC “REPH” for operating conditions of any complexity and based on 32 MW MS5002E gas turbine (manufactured under License Agreement with GE Oil&Gas).

- high efficiency (36%);
- low emissions (NO_x < 18 ppm), compliance with the modern environmental requirements
- prolonged service life;
- high reliability and operational availability.

More than 50 units have already been put into operation since 2011

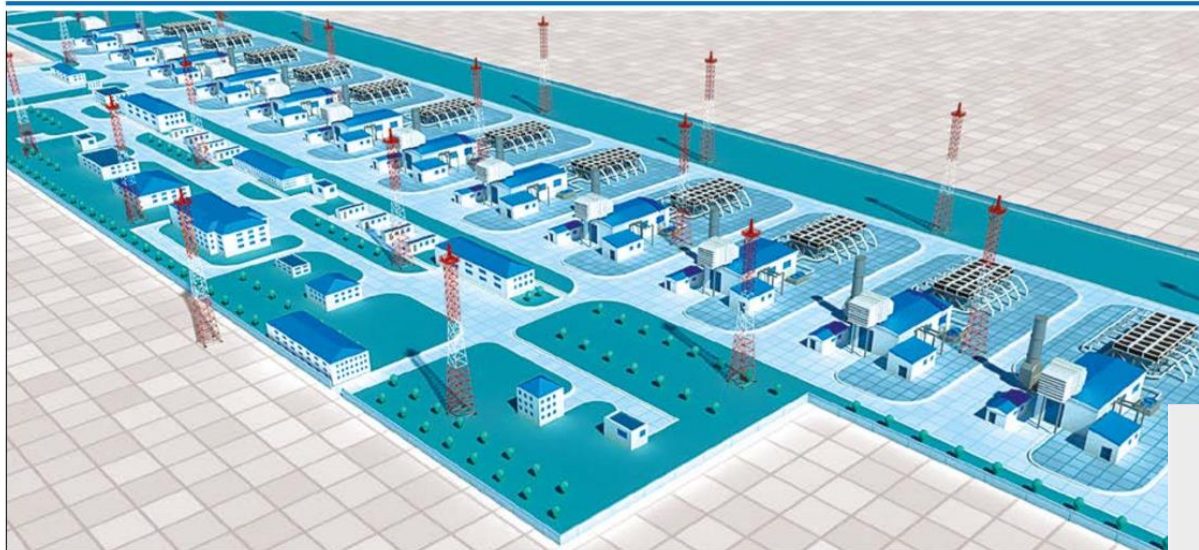


Russkaya Compressor Station

Russkaya compressor station

Russkaya is the most powerful compressor station in the world. It is the ending point of Southern Corridor and at the same time the starting point of South Stream.

The CS capacity will enable to create the gas pressure sufficient for conveying the blue fuel over a distance of 900 km with no extra technical means involved.



The Russkaya station will be equipped, with 14 identical compressor units, supplied by REP Holding and powered by Ladoga T32 gas turbine

28,45 MPa

Gas discharge pressure

63 bln m³/year

Compressor station capacity

448 MW

Total capacity of Russkaya CS (Eastern and Western routes)

Source: Gazprom

