



Repowering Kirishi

When two new gas turbines were launched this March at the power plant of Kirishi, some 100 kilometers away from Saint Petersburg, the event was of sufficient importance to merit a visit from then prime minister and current president Vladimir Putin: The development is a lighthouse project for a country that appreciates the need for a great modernization step.

Text: Moritz Gathmann Photos: Alexandra Ivanova, Maria Dyagileva



Grigory Otpetov, who has been working at Kirishi power plant since its construction, in front of the new unit PGU-800.



Open distribution facilities in Kirishi: The power plant supplies cities such as Saint Petersburg and Murmansk with electricity.

Grigory Otpetov is not someone who is easily impressed: The 73-year-old engineer is one of the fathers of the Kirishi power plant. He arrived at Kirishi in 1965 with his wife and two children. “When I came here, this place was all swamps and bomb craters,” says Otpetov with a self-confident smile while walking over the territory of the station. But even the warm sun of this summer day doesn’t make him take off his helmet: In 1972, it saved his life when a pipe fell on his head. Since then, he’s been

a stickler for safety standards – and Otpetov takes all other aspects of his work equally seriously: “You should do your work properly, otherwise it’s not work,” he says. The tough, wiry Russian is one of the technical inspectors of the plant. He is rarely to be found in his office, since he is always on-site monitoring processes and solving problems. Otpetov built this station with his own hands: He knows pretty much every screw in its six units, every gas-heated boiler where the water is turned into steam, the

turbines and the chimneys that rise up into the sky to a height of 320 meters. “Actually, everything has been working quite well for the past 40 years: The technology is quite simple, and we’ve always managed to repair faults,” says Otpetov. But he too has come to understand that time was ripe for a modernization: “Just compare: The efficiency of the old units was 38 percent – the new one operates at 55 percent. This means that for the production of the same amount of energy, we use one-third less gas.”

Increasing the efficiency of its energy sector is on top of Russia’s industrial and economic agenda: In 2010, Russia was the fourth-largest power generator worldwide, but the government expects Russian consumers’ demand for energy to increase by 50 percent by 2030. It is certain that newly built power plants alone will not suffice to cover this increase: Russia is determined to increase the efficiency of its energy sector assets by 20 percent within the same time frame. Given the fact that the country of 143 million produces

two-thirds of its energy in thermal power plants, 70 percent of which are fired with gas, it faces a huge challenge. Siemens is ready to become a reliable partner in this effort. Last December, together with its Russian partner, Power Machines, it launched a new joint venture named Siemens Gas Turbine Technologies that will produce high-efficiency gas turbines near Saint Petersburg from 2014 onwards.

Ambitious Target

The project is to become a model for the repowering of Russia’s power plants in the future: In this case, the plant’s existing steam turbine was upgraded, a new control system was installed, as were two generators, and two 279-megawatt gas turbines. The result is a combined cycle power plant (CCPP) that nearly tripled the installed capacity of the unit from 300 to 800 megawatts. The higher efficiency of the unit makes sense not only economically, but also ecologically. CCPPs use the exhaust gases from the gas turbines to drive the already existing steam turbine, which enhances the fuel utilization factor. Siemens expects gas turbine power plants to play a major role in the coming years: In 2010, power plants operated with gas turbines in the Commonwealth of Independent States (CIS) contributed 30 gigawatts to the combined installed capacity of 370 gigawatts. By 2020, Siemens estimates, this share will rise to 100 gigawatts.

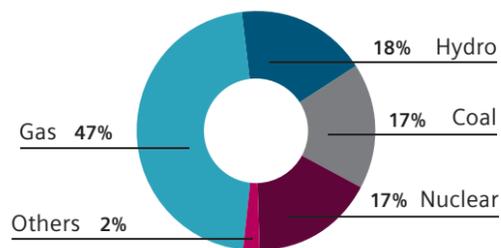
“Our main resource is not gas, it’s the people,” says Yuri Andreyev, Director of the Kirishi power plant, referring to long-serving workers like Grigory Otpetov. Andreyev, a heat and power engineer himself, has managed the Kirishi plant since 2008. “Our workers are proud of their work, but modernization efforts like the launch of the combined cycle plant give us a boost in motivation.” That is true especially for himself: “Engineers like myself, who started their career in the 1980s, belonged to something of a ‘lost generation’: The big power plants of the country had already been built – our

Russia's Energy Policy

The energy strategy of the Russian government envisages to raise the efficiency of its power production facilities and to reduce the use of gas in electricity production until 2030. Today most of its energy is produced by burning gas in thermal power stations.

Gross electricity generation

Total: 990.0 TWh



Population (2009)
141.9
million

Electricity total final consumption (2009)
6,133
kWh per capita

CO₂ emissions/population (2009)
10.8
tonnes CO₂ per capita

Source: IEA Key World Energy Statistics, 2008–2011. Fractions researched by the editors; sum of percentages may diverge from 100 due to rounding differences.

job was to keep them going.” But times have changed: The CCPP in Kirishi is one of the biggest thermal generation projects realized in the last 30 years.

An Ideal Match

As Andreyev looks out of his window, he can see the broad Volkhov River that supplies the plant with water – and the high-voltage lines that leave the plant in various directions. “We



Sergey, the grandson of Grigory Otpetov, is optimistic about his future in Kirishi.

supply power to millions of people and factories in cities such as Saint Petersburg and Murmansk,” says Andreyev. After modernization, the plant has a capacity of more than 2,600 megawatts. “We chose the turbines by Siemens because their capacity of 2,600 megawatts ideally fit with our plans to raise the capacity of the station,” explains Sergey Sizev, Vice Director of the OGK-2 joint stock company, which owns the Kirishi plant. The power provider has a nationwide production capacity of 18.1 gigawatts and produces 8 percent of Russia’s electric energy. “Apart from that, we took into account the good references: Siemens has built more than 100 similar turbines over the last years – and they were well recommended.” Sizev is in charge of the investment strategy of OGK-2, which envisages an ambitious modernization plan. OGK-2 plans to invest 165 billion roubles (more than €4 billion) into the modernization of seven out of its eleven thermal power plants between 2011 and 2016 in order to add 3.4 gigawatts of new capacity. “It may be too

early to evaluate the Kirishi project,” says Sizev, “but what we can say is that in technical terms, the project has been successful. We reached the planned parameters.” At the moment, OGK-2 is building new units in the Cherepovets and Serov power plants, with Siemens CCPPs at their core. A third unit is in the planning stage.

Proof of Concept

Kirishi’s experience proves: The integration of high-tech systems into a much older infrastructure works. “Unit 6 was completely subordinated under the new control system by Siemens,” says Kirishi’s Director Andreyev. Of course, there was some adjusting work to do, especially between the Siemens equipment and the already existing steam turbine. But months of close cooperation between Siemens specialists and the local staff made the system work. Over the last months, Andreyev has had visits from colleagues working at other power plants all over the country who want to see how the experiment has turned out. The lighthouse project has begun



“More efficiency, more capacity” – Yuri Andreyev, the Director of Kirishi power plant.

to cast its beacon across the country. There is certainly a feeling of pride in what is now one of Russia’s most advanced power plants: The lamps along the road leading to unit 6 are festooned with blue banners and white letters saying “CCPP 800 – Record in Power.” They were decorated on the occasion of the visit of Vladimir Putin who came to Kirishi to launch the modernized unit in March. Indeed, today the CCPP at Kirishi is the country’s most powerful one.

The Future Is Bright

These days, when Grigory Otpetov takes a short break and strolls into the cafeteria for a cup of tea, he may happen to bump into his grandson: Having finished his studies, Sergey Otpetov is now an electrician in charge of the high-voltage equipment on the station. The smiling, athletic 26-year-old, who is married and the father of a four-year-old son, radiates an infectious optimism: “It’s an interesting, prestigious place to work, even more so with the current rapid progress. I think the new gas turbines were just the first step in that direction.” That’s why Sergey is certain about his future in Kirishi. It may not be the most beautiful city on earth, but it is certainly one of the best-looking provincial towns in Russia. “After all,” says Sergey with another smile, “people will always need electric power.” After the end of the working day, Sergey and his grandfather go their separate ways: While Grigory returns to his dacha in the beautiful countryside surrounding Kirishi, Sergey goes waterskiing on the Volkhov River, just a short distance away from the power plant. It’s white nights now here in the north of Russia, and in the never-ending warm summer nights there’s a lot of time to spend. ■

Graphics: independent

Moritz Gathmann has been working in Russia since 2008 as a correspondent for various German magazines and newspapers. His articles have appeared in *DER SPIEGEL* magazine, *Süddeutsche Zeitung*, *Frankfurter Allgemeine Zeitung*, and others.

In a Nutshell



By 2030, according to Russian government estimates, the energy demand of the around 142 million population is likely to increase by 50 percent. The current thermal power plants were built in Soviet times and are in need of modernization. In order to meet the rising energy demands, new power plants will be built. In parallel, however, the efficiency of existing plants needs to be raised.

Meeting the Challenge

In March 2012, Siemens introduced its first repowering project in Russia. Unit 6 of the Kirishi thermal power station, which had been powered by an aging steam turbine, was upgraded by adding one new control system, two generators and two 279-megawatt gas turbines.

Repowered

In Kirishi, the result is a combined cycle power plant (CCPP) that increases the efficiency of the unit from **38 to 55 percent**. Its capacity nearly tripled from **300 to 800 megawatts**. The OGK-2 Joint Stock Company, owner of the Kirishi power station, plans to invest 165 billion roubles (more than €4 billion) into the modernization of its thermal power stations until 2016.

Award-winning Russian documentary filmmaker Vitaly Mansky visited Kirishi power station together with *Living Energy* author Moritz Gathmann. View his film online:



→ siemens.com/living-energy

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