With excessive capacity levels, generation companies are able to decommission the most worn-out facilities, and new mechanisms for attracting investors can be developed.
IN RUSSIAN AND ENGLISH

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ENERGY IN RUSSIA AND BEYOND

WE ARE ON THE WEB!
Dear readers,

Now is the time to reflect on the past year, but we decided to take a different road: in this issue of Energy Without Borders, many articles are dedicated to the future.

Throughout 2015, the Ministry of Energy of the Russian Federation has been working on a draft version of the Energy Strategy of Russia for the Period up to 2035, assisted by market experts and key stakeholders. The strategy attempts to project the future of the energy industry taking into account the drop in oil prices, the sanctions against the Russian energy sector and the new challenges it faces due to recent changes in the global markets. The document, which defines the energy industry’s strategy for the next 20 years, is expected to be reviewed at a meeting of the Russian Government early next year, after which new high-level roadmaps will be created for each sector of the energy industry, including electric power.

The draft version of the Energy Strategy assumes that in the future, the electric power sector will need a new mechanism to attract investments into generation: power plants are aging and need to be replaced with new ones. In the recent years, this issue has been alleviated thanks to capacity delivery agreements (CDAs), which helped commission about 20 GW of new up-to-date facilities in quite a short period of time. How will the sector be developing without the CDAs? This important and urgent question related to power plant construction and upgrading is the theme of the cover story in this issue.

At the same time, the CDA initiative brought new problems. As the old power plants remain in operation along with the new ones, competition among electric power generators and capacity providers is growing more intense. To stay ahead of competitors, companies will need to focus on improving efficiency in the nearest future, says CEO of Inter RAO Power Generation Management Timur LIPATOV in his extended interview to our magazine.

I wish you a rewarding reading experience and as usual, I look forward to your feedback. Please write to our editorial e-mail address: editor@interrao.ru. Taking advantage of this opportunity, I'd like to wish you happy Energy Professional’s Day. Good luck for the New Year and Merry Christmas!

Sincerely yours,
Editor-in-Chief

Anton NAZAROV
Strategy

Power Sector: Twenty Years After
In Early 2016, the Russian government is going to consider the draft Energy Strategy of Russia for the Period up to 2035 developed by the Ministry of Energy. The document provides an outlook for the development of the industry and sets targets for the power sector with a view to the next 20 years. Experts say this is an important document, but who will implement all the goals and how they will do it is not clear.

Expert Club

Crouch STARTup
Acceleration programs are becoming increasingly important for technology startups, including those in the energy sector. Emerging technologies may have a fundamental impact on the industry, but they need the right support to do this. Our experts discuss whether business accelerators can provide the most impartial and comprehensive support to startups, and speak about what’s needed to make actual projects based on serious R&D attractive to investors.

Interview

“Improving efficiency is essential for staying ahead of competitors”
It’s becoming increasingly difficult to make money in the energy market: with more and more power plants put into operation, the competition is growing more intense. In his interview with Energy Without Borders, CEO of Inter RAO Power Generation Management Timur LIPATOV speaks about what Inter RAO’s generation assets in Russia can expect the future to bring.

Cover Story

Is There Life after CDA?
Capacity delivery agreements have fulfilled their key mission: Russia is no longer worried about possible shortage of generation. However, the CDA boom has led to an unexpected problem: excessive generation capacity, which makes market players consider decommissioning rather than building new power generation units. Russia will have to start investing in the electric power industry again sooner or later. The cover story of this issue looks into possible mechanisms that may succeed CDAs.

Generation

CCS is Over, Problems are Still There
Yet another competitive capacity selection (CCS) process took place in late October. Although new rules were applied this year, its results expectedly brought rather gloomy prospects.

Results

A year of stable operation
Some might think that 2015 was not as eventful and dynamic for the Russian energy sector as the preceding five years. However, there was nothing that could completely change the rules of the game in the market and the sector either. It was more about doing business as usual and laying foundation for future breakthroughs. Our traditional annual review focuses on the year’s milestones.

News

A year of stable operation
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FOREIGN AFFAIRS
Country of Seasonal Generation
In the recent years, the energy sector in Georgia has been experiencing resurgence, evidenced by increasing investment, commissioning of new facilities, and infrastructure improvement. The country’s government has rolled out a large-scale energy sector development campaign with the aim to minimize the sector’s dependence on the seasonal factor.

INNOVATION
Age of Hydrogen Energy
In the 21st century, carbon-containing fossil fuels (coal, petroleum, and natural gas) might be gradually replaced with the new environmentally clean fuel – hydrogen. The “hydrogen approach” facilitates implementation of effective and elegant technical solutions. However, there is no sound technology to store hydrogen fuel cells.

NB
Expert in Radiators
The central heating radiator celebrated its anniversary in 2015. It was invented 160 years ago in Russia. To be more specific, the first radiator was created by Franz SAN GALLI – a Russian citizen of Italian descent who came from Germany and lived in St. Petersburg. Nevertheless, there’s no reason for us not to share the pride in this invention, which keeps homes warm all around the world.

EVENT CALENDAR
Major energy industry conferences, forums and exhibitions in December 2015 and the year of 2016.

PHOTO EDITOR’S CHOICE
Puffing in Style
A peculiar 97-meter Energy Tower in Roskilde, Denmark, generates heat and power by incinerating waste.
Crimea has been integrated into the Russian energy system. This historic milestone was reached after the inauguration of the first leg of a power line between the mainland and the peninsula.

Minister of Energy Alexander NOVAK said the additional 400 MW of electric power will cover 80–100 percent of the Russian peninsula’s electricity demand depending on the time of day, temperature and the output of wind and solar power generation facilities.

The first 200 MW line of the energy bridge to Crimea was opened on December 2. The second line became operational on December 15. Both of the times Russian President Vladimir PUTIN inaugurated energy supply.

Previously, 80 percent of Crimea’s electric power supply depended on the Ukrainian energy system, and when four high-voltage transmission lines in Kherson Region were blown up on November 22, electricity supply from the neighboring country was cut off completely. For a week, Crimea’s energy system was absolutely isolated.

Two more legs of the energy bridge from Russia to Crimea are expected to be commissioned in May 2016, bringing its overall capacity to 1,300 MW (excluding Ukrainian flows).

The Russian government has decided to cap the growth of utility rates at the lowest possible level. The minimum heat tariffs will stay the same in 2016 whereas the maximum rates will grow by 3.4 percent. These numbers were proposed by the Ministry of Economic Development. They will enable Russian regions to avoid any increase in district heating rates: local authorities are supposed to use the minimum values as the baseline for their tariff rates. Electricity rates for households will be indexed by 1–7.5 percent. In the 14 regions with power grids in critical condition, the increase will be 4.5–7.5 percent.

The Federal Antimonopoly Service and the Ministry of Energy earlier suggested higher indexation rates for heat, but the Ministry of Economic Development pointed to the fact that gas rates will grow by only 2 percent in 2016, and the overall increase in utility bills for households cannot exceed 4 percent.

The Ministry of Energy believes that the low indexation rates for electricity will stimulate cross-subsidies. For instance, Deputy Minister of Energy Vyacheslav KRAVCHENKO said that even if the rates grow by 7.5 percent, the subsidies will increase from 228 to 312 billion rubles in June 2016. 

Russian President Vladimir PUTIN has signed a bill with measures to improve financial discipline among energy consumers. Effective from January 1, 2016 the law introduces penalties on late payments for utility services and energy across all consumer categories, as well as defines the procedure for charging them. Households will have to pay a penalty once they fall 30 days behind on their bills. For those who fail to pay for 31 to 90 days, the penalty will be equal to 1/300 of the Central Bank’s refinancing rate for each day of the delay, and for delays exceeding 91 days the penalty will total 1/130 of the refinancing rate, which currently corresponds to an annual lending interest rate of 23.16 percent.

The government is taking these steps in an attempt to eradicate the situation when non-payers actually borrow money from energy providers. The document also introduces a payment guarantee system. The procedure for limiting electricity supply to non-disconnectable consumers has not been finalized yet.
850 billion rubles – the total debt owed by energy consumers in the fall of 2015, according to the Russian Ministry of Energy. 30% – the increase in global EV sales in 2015.

Power of the Bashkirian sun

The first stage of the 10 MW Buribayevskaya Solar Power Plant (SPP) has been launched in Buribay village, Khaibullinsky District, Republic of Bashkortostan. The launch was inaugurated by Russian Minister of Energy Alexander Novak during a video conference.

Thanks to the favorable geographical and climatic conditions, SPPs in southern areas of Bashkortostan can reach high levels of electricity generation: about 1,250 kWh per kWh of installed capacity annually. This is comparable to the levels in Central and Southern Europe, where solar power is used extensively.

Buribayevskaya SPP is the first of the seven power plants that Hevel Solar (a joint venture between Renova Group and RUSNANO) plans to build in Bashkortostan in the coming years. The total projected capacity of all the future SPPs in the region is 59 MW, and the total investment is estimated at over 6 billion rubles.

Monthly fee for... kilowatts

The Russian Ministry of Energy suggested that the country should replace its quotas on electricity consumption for households with a more complex system of consumption-driven rates in 2016. The draft document has lower rates for cost-conscious households consuming up to 150 kWh per month and higher rates for households consuming from 150 to 600 kWh or above 600 kWh per month. Moreover, electricity charges would be split into fixed and variable parts to isolate infrastructure maintenance into a separate component independent of the amount of electricity consumed, which is similar to a monthly subscriber fee.

The Ministry of Energy suggests that the fixed part total 20 rubles a month.

The document’s authors believe that a simple universal billing mechanism based on consumption volumes introduced across the country at the federal level could help correct the flaws of the current model and cut down cross-subsidies.

They said that tariff differentiation based on consumption volumes is used in more than 100 countries, including some of the CIS states.

Russia returns to Cuba

Inter RAO – Export and Cuban company Energoinimport have entered into an agreement to build four power generation units with a total capacity of 800 MW at two operating power plants in Cuba: a unit at Maximo Gomez ChPP in Mariel and three units at East Havana ChPP in Santa Cruz del Norte. With a total cost of 1.2 billion euros, it is the largest joint project of the two countries in the post-Soviet era. Construction is expected to be completed within nine years.

“The agreement is an important milestone for Inter RAO Group’s engineering business in Latin America,” said General Director of Inter RAO – Export Maxim Sergeyev. “We plan to install Russian equipment at the new facilities. Given the scale of the project, this will guarantee high utilization for Russian power plant equipment manufacturers in the long run and produce a multiplier effect along the entire value chain.”

The agreement was signed in the presence of Deputy Prime Minister Dmitry Rogozin and Cuban Vice President of the Council of Ministers Ricardo Cabrisas Ruiz.
OmskRTS and TomskRTS started operating as two independent district heating businesses integrating heat networks and supply in Omsk and Tomsk Regions.

Moscow Power Supply Company opened a shared call center in Orel to provide services to customers of Inter RAO Group’s power supply companies in Moscow, Moscow Region and Orel Region. In 2016, the call center will also start servicing customers from Tambov, Saratov and Leningrad Regions, as well as from St. Petersburg.

Russia’s Ministry of Energy presented a draft version of the 2035 Energy Strategy at a government meeting. The cabinet of ministers recommended that the document be modified taking into account the new macroeconomic forecast prepared by the Ministry of Economic Development.

Inter RAO Group completed restructuring of TGC-11, spinning off its Tomsk power generation operations into a separate company, Tomsk Generation. Headquartered in Omsk, TGC-11 now includes all of the power plants in the city.

Inter RAO Group commissioned a new coal-fired generation unit with an installed capacity of 225 MW at Cherepetskaya TPP in Tula Region.

The Russian Direct Investment Fund and ROSSETI kicked off a joint project involving deployment of smart grids. The first stage will cover Kaliningrad, Tula and Yaroslavl Regions. A total of 2.7 billion rubles will be invested at this stage.

The month marked the beginning of commercial electric power supply from Finland (Nord Pool Spot market) to Russia. Inter RAO supplied some 1,800 MWh of power. The capacity was 140 MW.

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Evgeny DOD stepped down as RusHydro’s Chairman of the Management Board, a post he had held since November 2009. The new Chairman of the Management Board and General Director elected by the Board of Directors for the next five years is Nikolay SHULGINOV, who was previously employed by SO UPS.

At the Eastern Economic Forum, Inter RAO Group presented a project to build a power line between Russia and Japan. The amount of electricity transmitted may reach 20 billion kWh annually; investment is estimated at 7 billion US dollars.

The first phase of Buribayevskaya Solar Power Plant in Bashkortostan was put into operation. Once the second phase is started, bringing the plant’s capacity to 20 MW, it will become the largest SPP in Russia.

The competitive capacity selection for 2016 was the first one to be based on the elastic demand curve. The total volume of selected capacity was 196,881 MW.

Russian President Vladimir PUTIN signed a bill with measures to improve financial discipline among energy consumers.

At the end of the month, RusHydro plans to start the second phase of Blagoveschenskaya CHPP, increasing the plant’s installed electric capacity by 120 MW to 400 MW and expanding its installed heating capacity by 188 Gcal/h to 1,005 Gcal/h.

Russia held its first long-term competitive capacity selection (for 2017–2019).
Capacity delivery agreements have fulfilled their key mission: Russia is no longer worried about possible shortage of generation. However, the CDA boom has led to an unexpected problem: excessive generation capacity, which makes market players consider decommissioning rather than building new power generation units. Russia will have to start investing in the electric power industry again sooner or later. The cover story of this issue looks into possible mechanisms that may succeed CDAs.

**RESPONDING TO THE THREAT**
The capacity delivery agreement program was developed as a response to the threat of power generation shortage. It seems that almost everybody has heard about the so-called “Chubais’ cross”: a chart displaying possible generation crisis in the late 2000s.

Russia’s electricity consumption growth reached a post-Soviet high of 4.6 percent in 2006. “This figure was used as the basis for forecasts, and the Master Plan for Power Facilities Layout included an average estimated growth rate of 4.3 percent per year. Consumption should have risen by 40 percent by 2014 versus 2007,” Alexandra PANINA, Member of the Supervisory Board of Market Council, said at a conference devoted to the Russian power industry.

A program for construction of new generation facilities, which was developed based on this forecast, was sold to investors together with a controlling stake in generation companies. The CDA scheme guaranteed that investors would receive a fast and high return on investment, and the government also introduced fines for failure to deliver the facilities in time. CDAs boosted investment activity in the industry: the annual investment in generation capacity peaked at 603.2 billion rubles in 2011. According to the Ministry of Energy, a total of over 3.6 trillion rubles was invested in construction of new generation facilities between 2008 and 2014. As a result, the installed capacity of the Russian power system rose by over 20 GW within a short period of time.

**DOUBLE-EDGED SWORD**
Apart from all the benefits, the CDA boom caused an unexpected problem: excessive generation capacity. The point is that actual figures differed much from the forecast. The CDA program was based on the estimates that power consumption would reach 1,380 billion kWh in 2014. However, demand for electricity has been fairly steady at 1,060 billion kWh in the past several years. “The actual demand turned out to be well below the estimates: the forecast made in 2008 exceeded the actual power consumption in 2014 by 30 percent, which is equal to the annual output of a 61 GW combined heat and power plant given a 60 percent utilization rate,” Alexandra PANINA said. According to the Association of Electricity Consumers, about 20 GW is generated in excess today.

Neither generation companies, nor consumers benefit from the excessive capacity. Consumers have to pay for the excessive power. Generators have two reasons to complain. First, lower competitive capacity selection prices (as a result of the CCS for 2016, the weighted average prices in the first pricing zone dropped 7.8 percent versus 2015). Second, the large amount of cheap power generated under CDAs

**Over 3,6 trillion rubles**
was invested in construction of new generation facilities in Russia between 2008 and 2014*

CDA projects alone increased Russia’s installed capacity by over 20 GW

*According to the Ministry of Energy.
affects prices in the day-ahead market (DAM). For example, System Operator of the United Power System estimates that generators are willing to sell over 20 GW in the day-ahead market for competitive capacity selection prices, i.e. they agree to sell at any price and even operate at a loss.

LET’S DO IT LATER
Generation facilities totaling 7.6 GW are yet to be delivered under the CDA program, and generation companies are doing their best to increase the efficiency of the remaining projects. They started by exchanging projects. This year, T Plus

Generation facilities totaling 7.6 GW are yet to be delivered under the CDA program before 2017

Companies seeking to extend the deadline for projects under CDAs*

Gazprom Energoholding
Unit at Troitskaya TPP: from August 1, 2015 to April 1, 2016.
Unit 9 at Serovskaya TPP: from September 1, 2015 to January 1, 2016.
Unit at Ryazanskaya TPP: from July 1, 2015 to January 1, 2016.
Novocherkasskaya TPP: from December 1, 2015 to June 1, 2016.
MOSENERGO’s CHPP-20: from December 1, 2015 to June 1, 2016.

Fortum
Unit 1 at Chelyabinskaya TPP: from August 1, 2015 to January 1, 2016.
Unit 2 at Chelyabinskaya TPP: from October 1, 2015 to January 1, 2016.

Joint venture between TGC-2 and Chinese company Huadian

Quadra
Units at Dyagilevskaya CHPP, Aleksinskaya CHPP, Kurskaya CHPP-1 and Voronezhskaya CHPP-1: to an indefinite time.

E.ON Russia
Unit 3 at Bereevskaya TPP: formal extension to October 1, 2015.

*According to Market Council.

(formerly KES-Holding) transferred its obligations related to Novoberezinskoyevskaya CHPP to Tatarstan-based Generation Company. Inter RAO seeks to undertake obligations under CDA related to construction of power generation unit No. 10 at Gazprom Energoholding’s Serovskaya TPP and build the unit at its site in Verkhny Tagil. Also, regulators are being pressed to extend the construction deadlines and cancel the fines. "Companies are willing to extend the deadline for a total of some 4.5 GW of capacity," a source from Market Council told Energy Without Borders. In November, it was reported that Gazprom Energoholding wanted to abandon one of its projects under CDA in exchange for remission of fines for other facilities. This issue was discussed at a meeting hosted by Deputy Prime Minister Arkady Dvorkovich. Documents prepared for the meeting state that in case its CDA is cancelled, Gazprom Energoholding will have to return the funds that were allocated for construction of new facilities when the company purchased the assets. According to Kommersant, “about 13 billion rubles should be charged by imposing the so-called emission fine based on the principles of the CDA program” to the benefit of energy market consumers.

Possible cancellation or amendment of CDAs is always discussed at the highest level as the obligations are fixed by government decrees, and similar decrees are required to change them. Besides, consumers represent one of the parties to the agreement, and their approval is also needed. “This issue is not only up to the government or the ministry. In a certain sense, this is an issue that should be addressed by the market, because CDAs are bilateral agreements, and consumers also play a certain role in this process,” Alexei Tessler, First Deputy Minister of Energy, said in an interview with TASS.

THE MOOR HAS DONE HIS DUTY
Despite all its drawbacks, the CDA program has successfully fulfilled its key goal, which was to increase the generating capacity of combined heat and power plants, including flexible equipment, by 20 GW. Experts say capacity shortage (“Chubais’ cross”) is not something to worry about now.

*Investments in thermal power generation are expected to slow down
across most of the Russian energy industry. All generation companies are planning to cut their investment by 30 to 50 percent versus 2014 and 2015 in the near future,” said Natalya POROKHOVA, Chief Expert at Center for Economic Forecasting, Gazprombank. New facilities are expected to be built only in the nuclear power sector, as well as in some regions with local energy issues, including the Far East and Kaliningrad.

The government started thinking about building new power plants in Kaliningrad in 2014. The need to make Kaliningrad’s energy system independent was identified after the neighboring countries threatened to shift away from concurrent operation of energy systems, which could cause power supply problems in the region. This October, the government approved a list of generation facilities to be constructed there by 2019: three gas-fired CHPs and one coal-fired CHP with a combined capacity of 1 GW. The financing mechanism resembles the CDA program, but has better terms for the investor, Kaliningrad Generation, a subsidiary of ROSNEFT EGAZ. The projects will be subsidized via an increase in prices for power generated by plants of Inter RAO Power Generation for consumers in the first pricing zone.

Sources of funding construction projects in the Far East have not been approved yet except for 50 billion rubles allocated by the government from the budget directly to RusHydro. The Ministry for the Development of the Russian Far East proposed making the wholesale market pay the costs, just like in Kaliningrad; however, this proposal was opposed by generators, consumers and energy market regulators. “It’s impossible to put more pressure on the wholesale market,” Maxim BYSTROV, head of Market Council, said in October.

**DECOMMISSIONING INSTEAD OF COMMISSIONING**

Delivery of new generation capacity accompanied by stagnating power consumption allows the industry regulators to take a break, experts say. “With excessive capacity levels, generation companies are able to decommission the most worn-out facilities, and new mechanisms for attracting investors can be developed without undue hurry,” said Alexey FADEEV, an analyst from the Institute of Natural Monopolies Research (IPEM).

Indeed, the most urgent issue now is decommissioning of old power plants rather than delivery of new ones. Alexandra PANINA estimates that over 17 GW of excessive capacity will be offered in the wholesale market in 2016. The Ministry of Energy and generators are discussing various options for decommissioning and mothballing power plants, but they haven’t reached an agreement so far. The competitive
The focus of investment in the thermal power generation industry should shift to upgrading to improve the efficiency of most plants
capacity selection rules, however, already encourage suppliers to withdraw capacity from the wholesale market. “Based on the new CCS model, the lower the volume of selected capacity is, the higher the prices are, which means suppliers have a very good reason for reducing the volume of supply, mothballing or decommissioning inefficient, lossmaking facilities,” a source from Market Council said.
At the CCS for 2016, generation companies did not submit bids for a total of 4 GW. Perhaps, this is the volume of capacity to be decommissioned. Gazprom Energoholding has announced plans to decommission facilities totaling 1.5 GW. Inter RAO is going to shut down 831 MW of capacity as soon as 2016 and considers removing an additional 3.7 GW from the grid later, Timur Lipatov, CEO of Inter RAO Power Generation Management, said in October.

LOOKING FOR INVESTMENTS
Meanwhile, the problem is not solved for good. According to Krzhizhanovsky Energy Institute, over 52 percent of Russian thermal power plants are at least 30 years old and 7 percent of plants are even older. CHPs are aging and generators will have to replace them with new facilities sooner or later. Besides, the draft 2035 Energy Strategy states that the capacity of Russian generation facilities should increase by 30 to 60 GW by the end of the period (some of this will be represented by NPPs and HPPs). The document also emphasizes the need to develop a new mechanism for attracting investments in the power and heat supply sectors “to streamline the investment process between 2016 and 2020 and in the future.”

What kind of mechanism should it be? First, it should ensure return on investment in the foreseeable future, Alexey Fadeev said. Second, it should ensure an appropriate price growth rate that would allow the industry to comply with the rate determined by the Ministry of Economic Development. Third, it should stimulate competition between generation companies and be a long-term program. “The CDA mechanism met only the first two requirements. It was a one-shot initiative that did not bring any competition; generation companies were provided with lists of facilities they should build,” the expert said.

He believes that one of the basic approaches that could be used in the future is the investment guarantee mechanism, which had been discussed as an option before 2010. At that time, it was suggested that regulators (the Ministry of Energy, System Operator of the United Power System, etc.) should determine the required level of standby capacity, construction sites and deadlines, just like in CDAs. Besides, regulators were expected to set the maximum cost for each project. The investment guarantee mechanism was developed as a market tool in which every construction project should be auctioned among generation companies at Dutch auctions. This is potentially a long-term mechanism: such auctions for construction sites can be held every year, just like it happens today with RES generation projects. “So, the investment guarantee mechanism meets all of the four above-mentioned requirements and, therefore, is the most appropriate solution in the current environment,” Alexey Fadeev said.

Natalya Porokhova believes that when the economy stabilizes, the focus of investment in the thermal power generation industry will be shifted to upgrading, which will improve the efficiency of most plants.

A few years ago, generation companies asked the government to enable equipment upgrades at the expense of consumers (i.e. get return on investment by putting additional pressure on the wholesale market). Today however the wholesale market is almost “going to pieces” anyway because of all its obligations, including CHPs, NPPs and HPPs under CDAs, must-run generators and Kaliningrad. This is why regulators are very unlikely to make the wholesale market pay modernization costs as well, so generators will have to do it on their own, guided by the market environment. For example, Inter RAO Power Generation Management uses targeted approach to renovation and upgrade programs, improving equipment when it’s economically feasible only (for more details read our interview with the company’s CEO Timur Lipatov in this issue).

With the investment slowdown in the power sector and the public debates over the 2035 Energy Strategy, now is the best moment to discuss a mechanism that might replace CDAs.

By Anna MILINA
and Sergey KARAULOV
CCS is Over, Problems are Still There

Yet another competitive capacity selection (CCS) process took place in late October. Although new rules were applied this year, its results expectedly brought rather gloomy prospects.

The competitive capacity selection results were one of the main themes of the Russian Power annual conference held in November. Alexandra PANINA, Vice President of Marketing and Sales at Inter RAO Power Generation Management, set the pace for discussions by unveiling the 2016 CCS results and sharing her vision of how this process may influence the Russian energy sector in the next few years.

Wrong Assumptions Lead to Wrong Conclusions

In the context of CCS, power consumption forecasts were such wrong assumptions. According to the forecast that served as a basis for the Master Plan for Power Facilities Layout developed back in 2008, power consumption should have grown annually by 4.3 percent, which means this level should have risen by 40 percent between 2007 and 2014. Besides, it was assumed that facilities with a total installed capacity of over 30 GW would be decommissioned due to the end of their lifetimes. However, generators started to extend the lifetimes and launch new facilities across the board under capacity delivery agreements (CDAs). The gap between the expected and actual levels of energy consumption was observed right after the approval of the master plan, i.e. back in 2008, which eventually led to a 30-percent difference in 2015.

As a result, instead of the expected shortage of generation facilities, CCS faced a serious problem of excess capacity, with about 15 GW not selected during the 2015 CCS. Alexandra PANINA said it was expected that under the same rules operating in the capacity market the growth of excess capacity would be even more evident during 2016 CCS. It never happened though. During the new CCS, almost the entire volume of the offered capacity was selected, including the capacity that is subject to mandatory purchase in the wholesale market (CDAs and new NPPs and HPPs) and must-run generation – a total of 196.9 GW (including 28.5 GW delivered under CDAs and new HPPs and NPPs, and 14.6 GW of must-run generation), which is 13.5 GW more compared to the previous CCS (183.6 GW), where 15.4 GW of the offered capacity was not selected. This result was achieved thanks to a new CCS model.

“Many various options of the new CCS model were suggested. The selection is already over, but to be honest, I think the best model is the one we proposed within the scope of partnership between generators. It involved a little different mechanism that would encourage generators to improve their generation assets and launch programs aimed at decommissioning of inefficient generation equipment. Our proposals in this area were not approved through,” Alexandra PANINA said at the conference.

The Ministry of Energy chose the model that uses the so-called elastic demand curve. An indisputable advantage of this model is that it solves the problem of capacity price collapse caused by the growing competition between suppliers and, consequently, psychological pressure on the size of their price bids.

According to the new model, the selection is conducted in two pricing zones and a single price for suppliers and buyers is determined for each pricing zone (previously, the selection involved division of pricing zones into free power transfer zones). Today, the demand in the competitive capacity selection is determined by the sloping demand curve: the maximum price corresponds to the estimated volume of consumption with the minimum required reserve capacity (140 GW in the first and 39.4 GW in the second pricing zone). When the volume of selected capacity increases, the CCS price falls. When the volume of offered capacity grows by 12 percent of the specified volume, the price decreases from 150,000 rubles per 1 MW per month in the first pricing zone and 210,000 rubles in the second pricing zone to 110,000 rubles and 150,000 rubles, respectively. These parameters are approved by the government. Values of prices used to determine the demand in the 2016 CCS were approved by Decree of the Russian Government No. 1651-r dated August 27, 2015.

In the previous model the demand was a fixed value equal to the minimum
“Given that companies’ pricing strategies have no effect on prices, the cost of power is determined by the slope of the demand curve, and the slope of the demand curve is initially determined by the government, I would take the liberty to say that the prices are regulated, not free.”

required volume of capacity, and the volume of the supply exceeding this level could not be selected irrespective of the asking price.

**INVISIBLE HAND OF THE GOVERNMENT**

Alexandra PANINA said generators who passed the competitive selection used a standard approach: no one submitted a bid that was higher than the sloping demand curve, as they concluded that knowingly low bids would not affect the final price but would ensure the capacity passes the selection. This raises doubts about whether the market principles are applied in this model.

As a result, the 2016 CCS prices in the first pricing category declined almost 8 percent versus 2015. Besides, it should be noted that last year, prices in the first pricing zones were determined for each free power transfer zone (FPTZ), and they differed greatly by FPTZ. The 2016 CCS was surely successful for generators operating in the Urals, as prices rose by 6 percent there. But it was not so successful for Moscow where prices dropped 15 percent.

Besides, the CCS prices were heavily influenced by the decision to ignore power transfers between pricing zones (it was made just a few days prior to the selection) and changes in the procedure for calculating HPP capacity (the capacity offered by HPPs increased, which also influenced the model prices). Also, a source from Inter RAO said changes in the deadlines of commissioning CDA facilities proposed by certain market players were not taken into account.

“Several facilities under CDA that were to be commissioned next year will actually be put in operation some time later. Nevertheless, this capacity was accounted for as if it becomes available in 2016. It happened because Market Council needs several days to register deadline changes after the corresponding government decree is published. It did not happen and knowingly irrelevant capacity was offered for the CCS,” Alexandra PANINA said.

**MUST-RUN GENERATORS MUST BE OUT**

The prospects of must-run generators are yet another important issue closely tied with CCS. The new model forces them to operate under much harder conditions compared to other generation companies that passed the selection. According to the new model, prices of must-run generators for 2016–2019 must not exceed prices which they charged to supply power in 2015. In this situation generators whose rates will allow them to survive three indexations without losses are likely to retain their status of must-run generators. Those generators that cannot afford it and will become loss making compared to CCS prices will try to return to the selection. Apparently, it will reduce must-run generation within several years: the facilities will be either returned to the selection or decommissioned. Alexandra PANINA said the 2019–2020 period is expected to see the peak of decommissioning activities.

In this context, the future does not seem very positive. According to the estimates of System Operator of the United Power System, the volume of excess capacity will be growing. This does not only mean that CCS prices will be falling: the increasing gap between prices in the day-ahead market and growing gas prices will eventually make certain generators unprofitable.

“Today, there are many unprofitable generators that only survive thanks to profit making generation facilities (for example, CCPPs). However, if the current trends persist, sales in the day-ahead market will become loss making, and we will be changing the wholesale market rules again, trying to solve some new problem,” Alexandra PANINA says.

*By Sergey GRIGORIEV*
In Early 2016, the Russian government is going to consider the draft Energy Strategy of Russia for the Period up to 2035 developed by the Ministry of Energy. The document provides an outlook for the development of the industry and sets targets for the power sector with a view to the next 20 years. Experts say this is an important document, but who will implement all the goals and how they will do it is not clear.

**FORCE MAJEURE VS PLAN**

The government has made numerous attempts to establish energy sector’s strategic goals in a special document: Russia’s first ever energy strategy was adopted in 2003. It was supposed to run until 2020 and be adjusted every five years. Just as planned, a new version, the Energy Strategy of Russia for the Period up to 2030, was approved in 2009. Another five years later, it was time to update the strategy again, but force majeure circumstances emerged: global oil prices slumped and the West imposed sanctions against the Russian energy and banking sectors. The government took a break to develop a new strategic document.

This March, the Ministry of Energy presented the draft 2035 Energy Strategy, which was sent for revision after discussions. The Ministry of Energy published the final version in September. Sergey PIKIN, Director of the Energy Development Fund and member of the Public Council under the Ministry of Energy, said the “Energy Strategy became clearer and more readable.” However, the document still arose many questions. For example, head of the Public Council under the Ministry of Energy Herman Gref was very skeptical about the forecast for oil prices the strategy is based on. “What if oil prices stand at 40 to 50 US dollars within the next 10 years? I don’t think oil will cost 40 dollars, but 50–55 dollars is quite a realistic scenario. What will we do if prices stand at 50 or drop below 50 US dollars?” he asked and recommended that the Energy Ministry consider less optimistic estimates for oil prices when planning strategic indicators for the industry. Energy Minister Alexander NOVAK agreed that that Energy Strategy did not duly consider more negative global trends and promised that the Strategy would be refined. However, it is not likely to happen before it is approved by the government, as the version submitted by the Energy Ministry to the government in October did not include the third scenario.

**TWO SCENARIOS**

The draft 2035 Energy Strategy includes two scenarios: the conservative one and the target one. They are pretty much alike with regard to the next five years; however, from a longer term perspective the difference is that the target scenario is based on a more favorable situation in external markets. Both scenarios are adjusted for the sanctions imposed by the EU and the US against the Russian energy sector, as well as a decline in prices for hydrocarbons.

“The Energy Strategy is based on the assumption that the energy intensity of GDP will drop 1.6-fold by 2035, with electricity intensity of GDP declining 1.4-fold. Russia will be producing about 525 million tons of oil and 821–885 billion cubic meters of gas. The authors of the Strategy believe that “Russia will...”

“The energy sector makes up over 25 percent of the country’s GDP, almost 30 percent of its budget, over two thirds of export earnings and 25 percent of total investment. The situation in the energy sector has a direct impact on other areas, including the environment, people’s health, utility rates and gasoline prices. This is why it is clear that this issue is relevant to almost everyone in our country.”

Dmitry MEDVEDEV, Prime Minister of Russia, at the meeting devoted to draft 2035 Energy Strategy held in March 2015.
ensure stable production of oil and natural gas condensate at 525 million tons, boost production of gas by 40 percent and increase production of coal by 24 percent by raising exports and developing coal-fired power complexes,” Alexey Teksler, First Deputy Minister of Energy, said while presenting the draft Energy Strategy of Russia during the meeting of the State Duma Committee for Energy.

The government sets a goal to step up production of a certain resource to a certain level. However, such targets are possible in the planned economy only and their use in the market economy raises serious questions, said Alexander Grigoriev, head of the Energy Research Department of the Institute of Natural Monopolies Research. Igor Yushkov, Senior Analyst at the National Energy Security Fund, agrees with his colleague: “The current version of the energy strategy looks like a forecast, but it also contains certain targets. Since it has targets, I wonder if we have planned economy or market economy. If we have market economy, how can we force market players to implement goals set by this document?”

The situation is really rather tricky. Target oil production indicators are close to the current level: in 2014, Russia produced about 527 million tons of oil and is not planning to reduce output, as Alexander Novak said. The growth of gas production to 821–885 billion cubic meters by 2035 is impossible without large-scale investment in the development of new gas production centers and new sales channels. Gazprom, which is directly affected by the Energy Strategy, has openly questioned its feasibility. “We doubt that the goals set by the plan of gas industry development can be achieved,” Head of Gazprom’s East-Oriented Project Coordination Directorate Viktor Timoshilov said in October.

The developers of the Energy Strategy acknowledge that the Russian energy sector is facing a range of internal problems and extraordinary international challenges. The domestic demand for energy resources is limited by low economic growth rates. Maintaining production amid the deteriorating reserve mix and increasingly ageing fixed assets requires investment in new technologies. The growth of the global demand for hydrocarbons is slowing down, because the majority of countries seek to diversify their energy mix and develop non-carbon energy sources. Besides, new producers emerge, for example, the US, thanks to its breakthrough in unconventional oil and gas production, can soon stop importing them altogether and even start exporting gas by 2020.

To eliminate the risks, Russia will require significant investment to maintain production levels, develop hard-to-reach fields, modernize processing equipment and build adequate energy transport infrastructure. The eastern direction

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**Table: Russia’s position in terms of production and export of energy resources in 2014**

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Production</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>12.7–12.9% of global production</td>
<td>2nd in the world</td>
</tr>
<tr>
<td>Natural gas</td>
<td>16.7% of global production</td>
<td>1st in the world</td>
</tr>
<tr>
<td>Coal</td>
<td>4.3% of global production</td>
<td>6th in the world</td>
</tr>
<tr>
<td>Nuclear energy</td>
<td>7.1% of global production</td>
<td>3rd in the world</td>
</tr>
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</table>

**Market analysis and forecast show the potential for increasing production of natural and associated gas**

- 2020: 13% from 639 to 821–885 bn cbm
- 2020: 29–39% from 639 to 821–885 bn cbm

*According to the 2035 Energy Strategy
**Including gas condensate
$2.3 trillion to be invested in the development of the energy sector by 2035

requires special attention, as Asia-Pacific countries are rapidly increasing their demand for oil and gas, including LNG, and may become large oil and gas markets in the foreseeable future. “The fast-growing demand in the Asia-Pacific market creates an opportunity for Russia to increase its exports of oil and petroleum products by 1.8–2.2 times and natural gas, by 8–9 times to this region by 2035,” the document states.

NEW ENERGY MIX

The energy strategy precisely describes the challenges faced by the Russian energy sector, said Dmitry BARANOV, Leading Expert at Finam Management. “It contains a comprehensive analysis of the situation, proposes solutions to existing and potential issues, defines the key development areas for the industries forming the foundation of the energy sector,” the expert noted. “This is a document that will undoubtedly be used for further development of the oil, gas and coal industries, as well as the entire Russian energy sector.”

As to the electricity market, the Energy Strategy proposes changing the mix of producers. The installed capacity of power plants will rise by 13 to 25 percent, from 250 GW to 282–312 GW, but this process will be mainly driven by non-thermal power plants. The output of NPPs is to increase by 40 to 80 percent; HPPs, by 20 to 30 percent. Generation of green energy will grow many fold.

These plans raise legitimate concerns among thermal generation companies. “Power generated by NPPs is 70 percent more expensive than that generated by CHPPs. A reduction in the share of CHPPs through their replacement with NPPs will lead to an unwarranted increase in power prices for consumers,” Yury EROSHIN, Vice President of Fortum, said in November. The company’s management believes the Energy Strategy should set a target for the share of CHPPs in the energy mix to increase at least by 5 percent by 2035 versus 2015.

The Strategy outlines the key problems of the electric power industry: difficulty in forecasting the demand and reserves, depreciation of fixed assets, lack of incentives to decommission inefficient facilities, constantly changing approaches to pricing, etc. “Will the Energy Strategy solve today’s problems? No, it won’t. No problems will be solved: neither those related to the competitive capacity selection, nor those of must-run generators, nor many others,” said Sergey ESYAKOV, First Deputy Chairman of the State Duma Committee for Energy.

The document, in fact, contains just recommendations, lawyers say. “As a strategic industry-specific document of the Russian Federation, the draft Energy Strategy of Russia for the Period up to 2035 is not a regulatory act as such,” Andrey LEBEDEV, CEO at Krikunov & Partners, noted. “The document does not contain specific instructions to executive authorities on the development of any draft regulatory acts, requirements to their content and completion deadlines.” Without it, the measures envisaged by the Strategy are a mere wish list that does not have any legal effect either for executive authorities or for the business.

The Ministry of Energy insists that the Energy Strategy provides an overall target vision, and all the details will be set out in the master plans for development of each specific industry – gas, oil, coal and power. This way, the energy sector will have both the strategy and detailed roadmap for development. Preparation of master plans will be launched if the Russian government approves the draft 2035 Energy Strategy. The disputes over the strategy are scheduled for the first quarter of 2016.

By Anna MILINA

Russia can increase power generation by 6 percent by 2020 and by 27 to 43 percent by 2035 (from 1,062 billion kWh to 1,352–1,514 billion kWh). The priority goal is to develop non-thermal power plants, increasing their installed capacity by 29–49 percent and power generation by 40–60 percent. The central heating capacity will rise 2 to 6 percent between 2015 and 2035 (from 1,300 to 1,325–1,380 million Gcal).
Refrigeration units and booster compressor stations for oil and gas production, refining and transportation facilities

Standard design of GEA Sirius boosting compressor station, including screw compressor driven by electric motor, input separator filter, fine gas filter at the unit output, compressor lubrication system, oil and gas cooling systems, power supply and control systems, as well as supplementary systems, have more than 75% of Russian components.

The main imported component is a screw compressor. GEA production area is located in Klimovsk, Moscow Region, and represents over 2,500 m² of equipped production area.

Happy Power Engineer’s Day and Happy New Year!

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Engineering for a better world
Crouch STARTup

Acceleration programs are becoming increasingly important for technology startups, including those in the energy sector. Emerging technologies may have a fundamental impact on the industry, but they need the right support to do this. Our experts discuss whether business accelerators can provide the most impartial and comprehensive support to startups, and speak about what’s needed to make actual projects based on serious R&D attractive to investors.

“In my opinion, startups in the energy industry – just like in other non-IT sectors – have not been very successful in our country. There are several reasons for this, but the main one is that in Russia, startups are in most cases created by research groups who don’t know how to run a business. And they’re not supposed to know this. While in other countries there is a community of technology entrepreneurs eager to support scientists in building businesses, in Russia this community is still in its infancy. This is why when large businesses decide to work with startups, they’re usually bound for a major disappointment. First, they need to find the right startup. In most cases, startups don’t even try to make contact with larger companies because they usually believe that once they have a good product, the companies will find them. An efficient way to find startups is to hold contests. For instance, OMZ has TECHNOSTART, which the company runs in partnership with Energy Without Borders Foundation. However, finding the right startup is only the beginning of the journey. The hardest part is when companies attempt to integrate startups into their business operations. And that’s when accelerators come into play to bridge the gap in competencies. They do help entrepreneurs get rid of certain illusions and start speaking the language of business.”

DMITRY STEPKIN, DIRECTOR OF INNOVATION PROJECT DEVELOPMENT, UNITED HEAVY MACHINERY PLANTS (OMZ):

“Corporate accelerators are becoming a standard business development tool. Companies use them as a window to the world of new technology and an opportunity to assess their readiness to apply the open innovation model and work in strategic collaboration with small businesses. RVC and other development institutions provide methodological assistance to managers in charge of science and innovations, run educational programs dedicated to open innovation, hold competitions and carry out support programs. However, it takes time for this kind of support to yield fruit. This is why this year the nationwide startup accelerator GenerationS decided to step inside corporations, find change leaders, launch these tools together with people in charge of deploying new technology, and see what happens. The program has shown that state-owned corporations in Russia are open to collaboration with small businesses: a number of young companies are already in talks about pilot implementation of new technology with NPO Saturn, Moscow United Electric Grid Company, RAO Energy System of East and other corporations.”

GULNARA BIKKULOVA, DIRECTOR OF INNOVATIVE MARKETS DEPARTMENT AND MANAGEMENT BOARD MEMBER, RVC; HEAD OF GENERATIONS, A NATIONWIDE STARTUP ACCELERATOR:

“The main problem faced by many technology startups in Russia is that small and medium-sized businesses engaged in R&D lack opportunities for efficient collaboration with large businesses and state-owned corporations. To change this, Russia needs to build strong market relations; however, the only step taken by the government so far is the law compelling large state-owned enterprises to source a certain percentage of their supplies from small and medium-sized businesses. As for accelerators, it depends on how you define them. If you see them as an environment creating favorable conditions to speed up the process of overcoming bureaucratic barriers and ensure smooth interaction between technology developers and their potential customers, then of course such accelerators are necessary and useful. There are examples of truly consistent support when acceleration programs perform the task of deciphering future technologies and prospective models for companies lacking their own resources in the field. In this case, they often become integrated into the company’s strategic documents regulating its long-term development. But some companies are imitating this activity, and accelerator support is merely formal.”

DOMINIQUE FACHE, CHAIRMAN OF THE BOARD OF DIRECTORS, RUSSIAN TECHNOLOGY FUND (FRANCE):
“The major cause of the low survival rate among new technology ideas in our country is that their authors are almost completely detached from the market and unaware of the needs of future customers. Startups develop new technology and then look for customers who would want it – not the other way around, as it should be. Other problems include difficulties with pilot integration and patenting issues, as well as lack of capabilities, expertise or team members who could take charge of the marketing tasks. In spite of all these difficulties, foreign investors are willing to become business angels and participate in Russian venture projects. In the course of preparation to Slush, a conference in Finland, I co-developed the agenda of meetings with international investors. More than 600 investors (most of them being either business angels or representatives of venture funds) specified explicitly that they were interested in finding project partners in the CIS. I think there are two groups of methods for developing innovations at corporations. The first one is based on in-house innovation and corporate entrepreneurship, and the most efficient tools in this case would be in-house innovation sandboxes and incubators. The second group is open innovations, when corporations bring in external expertise to develop their operations, technologies, products and businesses. Companies’ acceleration needs are related to testing or creation of new growth points, including launch of new products and search for disruptive products, technologies and business models. As long these efforts are managed competently, they always produce a significant impact while requiring smaller investments, both in the projects and acceleration process.”

“I think the myth about dummy projects with a beautiful façade skimming the cream off was made up by those who failed to attract investors. All in all, innovations are appealing when they are global, when they have the potential of entering any market. I’m allergic to the term ‘import substitution’ because I try to focus on the examples of Kaspersky and ABBYY, which are operating and are profitable not because somebody issued an order but because their products are among the world’s best. Innovations are popular nowadays because the government told us so, but there are no experts with the required competencies to do that, nobody to define the tasks. All they do is hold a nice presentation and report on the number of project participants, but when they are asked how many deals they have actually concluded, they have nothing to say. With time, however, this fad might transform into a transparent business process. As for the commercialization stage, one of the most important things is to partner up with leading industrial players – for example, in the framework of GenerationS. I’ve spent a lot of time working on projects in Samara where we did a lot together with NPO Saturn. When a project developer works on a product in tight collaboration with its potential future consumer from day one, the investment potential of that product increases as the availability of an industrial partner helps mitigate risks.”

“In Russia, technology startups have so far been managed by engineers and scientists, who don’t have any experience in attracting private investment (venture, angel or corporate investments). At various competitions, such startups usually only have a couple of minutes for their presentation, and it’s true that in many cases, it’s the projects which stand out visually that people remember. However, such projects might receive awards, but not professional investment. Only due diligence can show whether the company has any real potential and what the risks are. On the other hand, companies with ambitious R&D projects do not necessarily succeed – especially if the management has no clear idea about the commercialization process and its stages or about product management for the go-to-market stage. And naturally, companies need to learn to present themselves both to potential investors and strategic partners, which can provide different types of support at different stages. I think that in today’s market economy, innovative solutions and technologies are critical for the successful development of corporations. To find such solutions companies usually build special tools for working with the external environment. These tools include corporate accelerators and competitions that help find startups and manage the deal flow.”

What does “accelerator” mean?

In the context of automobiles, “acceleration” means increasing velocity. Essentially, acceleration programs do the same with respect to startups. Accelerators speed up the implementation of already developed business strategies by setting specific objectives and identifying prerequisites for attracting investors.
“Improving efficiency is essential for staying ahead of competitors”

It’s becoming increasingly difficult to make money in the energy market: with more and more power plants put into operation, the competition is growing more intense. In his interview with Energy Without Borders, CEO of Inter RAO Power Generation Management Timur LIPATOV speaks about what Inter RAO’s generation assets in Russia can expect the future to bring.

You have been with Inter RAO Power Generation Management since the beginning of 2015. How would you describe the company in terms of quality, reliability and focus on innovations?

Speaking about competitive position, Inter RAO Power Generation stands out from other market players for its diversification. Our company is diversified in terms of geography, technology and fuel types. This gives us a competitive edge because when prices in the first pricing zone drop, we still have generation in the second pricing zone. When coal prices rise in Kazakhstan, our gas-fired plants can compensate for the decreased output of coal-fired plants. If gas prices go up, we can generate additional electricity at our coal-fired plants. We also have facilities in non-pricing zones, which can become an advantage in tough market conditions. Let’s take the late 2014 and early 2015 as an example. Historically, electricity prices in Siberia have been significantly lower than in Europe thanks to the extensive use of cheap hydropower. However, at that time, market prices for electricity dropped considerably in the European part of Russia. Because of low water levels in Siberia, local prices, in contrast, rose significantly during that period. As Inter RAO Power Generation owns quite a few power plants in Siberia, it managed to meet its revenue targets, which would have been impossible had the generation facilities been clustered in one area. The second advantage is what we normally regard as a drawback. Market leaders usually have one or two major assets that generate most of the revenues and keep their performance indicators high. We don’t have them, so we’re not so much exposed to technology risks as these market players are. I mean, if something happens to this major source of income, their whole business is affected. Inter RAO Power Generation would never end up in this situation.

What are the company’s growth areas?

Inter RAO Power Generation is quite a young company. It was established in 2011 and it’s going through the same development and growth stages as any other young business. We have put together assets of OGK-1, OGK-3, former assets of Inter Rao – various power plants, with their own business processes, their own practices. It took some time to integrate those assets and merge them into a single company. I believe that the stage of organic growth is now over. Today, the company is going through the second stage, which is focused on efficiency improvement. That’s what we are prompted to do – not only by the business growth patterns but also by the market and the economic situation in general. There’s only one way to stay profitable – to cut costs.

The company’s strategy is aimed at enhancing the efficiency of electricity generation; however some of the equipment is becoming obsolete, it’s been in operation for years. How do you improve efficiency in this situation?

There are different methods for bringing down costs; 30 percent of our costs are fixed and 70 percent are variable, of which nearly 95 percent is fuel. Therefore it’s essential to focus on fuel. And here we can use some methods that were used in earlier days. In the Soviet Union, there were fuel consumption norms and standards that set specific baseline fuel consumption rates. The best option was selected out of three choices: either based on standard equipment properties (i.e., best practice for units with a similar structure), or design value, or best operational practice. We applied that knowledge to evaluate the potential for increasing fuel efficiency of our equipment: we measured actual consumption in different modes and in much detail to pin-point excessive consumption. Then we performed...
factor analysis to understand the gap between the baseline value and the actual value: how much we lose in condensers due to vacuum problems, how much we lose because of air leakage in furnaces or exhaust ducts from the back pass of the induced-draft fan, how much we lose when we underheat live steam, and so on. For each of these factors, we have developed compensating measures: fix the condenser, replace isolated pipes in the high-pressure superheater, and so forth. All the measures are planned out in terms of their economic efficiency in specific market conditions and are automatically included in investment or maintenance programs. Inefficient measures are set aside as additional savings potential unfeasible in the current market situation, and wait for the right time to come. I can't claim that it's our new in-house know-how: we're reintroducing methods that had been used earlier, properly and with great care. Also, we have a series of investment initiatives aimed at increasing revenues or cutting costs. These include recertification of CDA units, primarily combined cycle and gas turbine units, by improving gas turbines to achieve nameplate values in operation. They also include construction of cooling towers at plants that use one-through cooling and pay too much for water. If the government continues with its initiatives, the rates will grow 4.65-fold by 2025. To get rid of this sizeable portion of costs, we plan to build cooling towers at Irkutskaya and Permskaya TPPs; we have already put their design out to tender. As for fixed costs, Inter RAO Power Generation is shifting from limit-based to demand-based management, focusing on how much money is actually required and why. Some of the budget items are the same for all our plants. And these budget items have never been benchmarked. For instance, why would one plant spend more on cleaning than another one? We look into this and then decide how much money would be sufficient. We have already succeeded in cutting down semi-fixed costs this year, and another major reduction is going to happen next year. It will be crucial for us to keep up the performance without any trade-offs in quality or reliability.

You're talking about cost reduction. Will there be any staff cuts?
We do have some plans, but it's a long-term initiative. Right now our headcount levels are rather high. One of the performance indicators used in the industry is the number of employees per megawatt of installed capacity. In our company it's 0.53 FTE/MW. Companies regarded as market leaders have lower figures: 0.3 FTE/MW at Enel or a little over 0.4 FTE/MW at E.ON. In general, this often leads to a situation when an individual's salary at our company is lower than the salaries paid by our competitors. Consequently, we are unable to retain our best people. As a CEO, I don't like this situation. We're going to change it. But since people are our key asset, we are going to handle this very carefully and cautiously. We'll start with administration and management and improve their performance by reducing bureaucracy and streamlining business processes. At the moment, we're still at the point when we have to consider our options very carefully – and then re-consider them once more.

Does this mean that the payroll will be optimized?
It doesn't mean the payroll will be cut down. It will be optimized to make the company more competitive as an employer.

Some people think the energy industry is making a lot of money out of CDAs. However, if not for the power generation units built under CDAs, would you be able to stay in the black, to make profit?
The current trend in the industry is that everyone's making money out of CDAs and wasting shareholders' money to cover losses incurred by old power generation units. We plan to capitalize on efficiency improvements, which I have already described. We will also optimize the repair and maintenance schedule and scope at our top-performing power plants by bringing in more contractors and reducing utilization at the plants with negative power supply margins.

Speaking of the electricity and capacity markets, where are Inter RAO Power Generation's power plants relative to competitors?
I believe we're quite competitive. Firstly, we have a lot of gas-fired plants, including relatively new facilities – K-300 and K-800 units. In terms of semi-fixed costs, gas-fired generation has its advantages over coal-fired generation. We're working on our semi-fixed costs to reduce them, which will give us an extra competitive edge during the competitive capacity selection.

New generation facilities account for a large percentage of our assets: 6 out of 18 power plants were built in the 21st century.
Secondly, we’re diversified into different pricing zones; therefore any CCS failures in one zone will be partly offset by successes in the other pricing zone. The accident rate of gas-fired units has been decreasing in the recent years, and right now we’re developing a targeted program focused on further accident rate reduction. This is important given the increased fines. Also, we have unique power plants such as Zhubginiskaya TPP which are capable of reaching their full capacity in as little as 20 minutes, whereas for other plants, it takes hours and tens of hours. At Zhubginiskaya TPP, we use the advantage of peak hours – the hours of maximum electricity and capacity prices – running the plant during this time every day. New generation facilities account for a large percentage of our assets: 6 out of 18 power plants were built in the 21st century. Therefore, they will surely remain profitable in the electricity market for a long time. So we feel quite all right. We know how the market is evolving. We know our stability margin – we consider it to be high, and we’re working to make it even higher.

As competitive capacity selection is now held once in four years, is it difficult for you to make accurate price projections? A lot is being said about forecasts that predicted electricity consumption growth in our country, while in reality there has been hardly any growth at all.

The new CCS model based on elastic demand is much less sensitive to forecasting errors. Nowadays, inaccurate capacity demand projections will only affect the price at which the capacity will be sold. It’s true that if demand turns out to be higher, the price will end up being understated. But all this is much less significant compared to the flaws of the previous system that would simply cut off the capacity that had not been selected.

Do you support the new model?

Well, it has both its advantages and disadvantages, just like everything else. In terms of the forecasting accuracy, it’s better. However, it also has its weaknesses stemming from its poor ability to stimulate decommissioning of inefficient, obsolete equipment – this is a serious problem for the electricity market. I believe that right now the consumer community and Market Council tend to underestimate what’s going on in the industry. All generators are seeing their margins squeezed, profitability reduced. On the one hand, it’s good for consumers as prices seem to be decreasing. But on the other hand, the electricity market has never enjoyed excess profits. Reduced margins will result in inadequate funding for maintenance programs and investment projects. Altogether, this will lead to a crisis in the industry, which has been barely starting to get on its feet in the recent decade and a half after the collapse in the 1990s. It will last for some time by drawing on the accumulated reserves. And later, the lagged effect of inadequate maintenance and investment will start to build up. Consumers will end up paying more.

Inter RAO often proposes new market regulation mechanisms and acts as an active expert in the field. Do you think that the rules of the game in the market are not perfect and they need to be adjusted or simplified?

I think that the wholesale electricity and capacity market is one of the greatest achievements of the energy industry. The sector has become truly deregulated, shaped by the demand and supply forces. It’s true that we often put forward proposals, but it’s more like fine-tuning of the minor flaws that can only be discovered using the trial and error method. The rules could be simplified by introducing a tariff, but I strongly oppose simplification. If we do this, there will be no point in reducing costs or upgrading equipment. I believe that the market mechanism should be preserved, but just like any life form, it needs continuous fine-tuning.

Russia currently has an excess of generation capacity, and there’s hardly any need for new power plants. But to what extent are the plans of the nuclear power sector threatening or aggravating the situation for the thermal power generation in this context? ROSATOM seems to be planning to add quite a lot of new capacity in the next few years.

“Threatening,” “aggravating,” – these verbs very accurately describe generators’ attitude to the nuclear program. For us it will mean larger excess of capacity, greater pressure on the market, and extra losses in the wholesale market’s total revenues. However, this program – or to be more exact, the government’s effort – also has its synergies, such as higher utilization of facilities developing competitive technologies for the international market. We understand that the nuclear sector also requires development, and we take this into account. Our goal is to be the most efficient company in the thermal power generation market. We need this in order to withstand the pressure exerted on the market by the growing volume of very cheap installed capacity.

The key problem – both in the heat business and in power supply – is non-payments by consumers. Have you made any progress in this area?

Unfortunately, we haven’t. All companies in the power supply sector have seen their account receivables grow this year, and we are not an exception.
About 55 percent of the debts are owned by power supply companies that have already gone bankrupt; EnergoStream accounts for the lion’s share of this. The remaining 45 percent is owned by power supply companies that can be called traditional non-payers – the ones from the North Caucasus, Volgogradenergosbyt, Yantarenergosbyt, which used to have no payment problems, has been recently added to the list. These supply companies are part of the common settlement system, so they pay – or to be exact, don’t pay – equally to all vendors. We are taking targeted approach to companies that have exited from the common settlement system.

In the heat sector, there are problems as well. Our customers currently owe us some 1.4 billion rubles. The aggravating factor is that the heat sector is loss-making for us in general: given the current tariff rate, the total deficit across all the heat subsidiaries and affiliates is about 460 million rubles a year. The heat business is essentially unprofitable, and we take that into account. The root cause is that tariff rate decisions – in our opinion – are not exactly fair. At some facilities, our salaries exceed the value included in the rate by the regulator based on its own statistics. In other cases, some costs are excluded from the rate because the regulator sees them as optional, and so on. In the context of loss-making rates, debts for heat become a really grave problem. We’re actively working on this in the regions, primarily in court.

And what about debts owned by E4 Group, which was expected to build the fourth unit at Permskaya TPP – have you got the advance payment back? Are there any problems in funding the construction of this facility, which is being built under a CDA?

I think our parting with E4 Group went well for us. We got our advance payment back after suing the guarantor bank. The money is in our account now. We have reassigned the contracts critical for the project and moved on. Construction work is in progress. We plan to complete the shell, core and utilities by the end of the year. And we’re rapidly increasing the number of contractor employees at the site: it is expected to reach 700–800 by the end of the year. If we do that, we will be able to announce a successful start of the project.

And what company is the general contractor now?

Right now we have no general contractor. Inter RAO Power Generation is implementing the project based on the multi-lot model, and Inter RAO – Engineering is acting as our agent.

Have you already applied this approach at some other power plants?

Yes, we have. The same model is being used to build Unit No. 10 at Verkhnetagilskaya TPP. I think that this approach is reasonable, considering the current situation in the contractor market, and it has already proven its high efficiency.

Our customers currently owe us some 1.4 billion rubles. In the context of loss-making rates, debts for heat become a really grave problem. We’re actively working on this in the regions, primarily in court.

The new power generation unit at Verkhnetagilskaya TPP is not secured by a CDA. What about return on investment? Are you going to postpone the commissioning? There’s no CDA, so there will be no fines…

There’s no need for us to do that. Gas and steam turbines and their generators will be installed on their foundations this year. The commissioning is scheduled for the fall of 2016. But we have to decide when to start the plant – in 2016 or in 2017 – based on economic considerations. Without a CDA, the facility will not be profitable. In general, we will be making money on electricity, capitalizing on the capacity and hoping for higher prices in the day-ahead market and better CCS results accompanied by accelerated decommissioning in our geography.

Return on investment could be secured by reaching agreement with Gazprom Energoholding to transfer Serovskaya TPP’s CDA to Verkhnetagilskaya TPP. What stage has your negotiation process reached?

We’re currently in the process of preparatory negotiations. We definitely want to have that CDA handed over to us. The energy system in the Urals region has too much excess capacity now. It’s wrong to commission a second generation facility and thus make consumers pay more in geographies where this situation could be avoided. I believe that in this regard, a decision to transfer the CDA would be absolutely sensible.

And an informal question… What’s your hobby?

Sports. Right now my favorite sport is hockey. I like team sports, so it doesn’t make much difference to me what sports to do as long as it gathers a large, strong and positive team. Just like other team games, hockey reveals people’s true personality and helps them understand their strengths and weaknesses, learn to interact efficiently and achieve common goals.
The best views of St. Petersburg
apartments | penthouses | villas
One of the special features of the Georgian energy system is that the country both imports and exports electricity. That’s where the seasonal problem stems from: starting in September through March, Georgia imports electricity from Russia, Azerbaijan, Turkey, and Armenia. And vice versa, from April through August power is exported. According to Electricity System Commercial Operator, the volume of power imported from January through September amounted to 434.8 million kWh, whereas the export reached 614.8 million kWh. This has to do with the seasonal filling rate of reservoirs and consequently, with ups and downs in electric power generation by hydropower plants.

It is worth noting that Georgia has abundant hydropower resources: there are about 25 thousand rivers in the country, including 300–400 rivers with sufficient energy generation potential. That is why the country focuses on hydropower development in the first place. However, the government realizes that too much focus on hydropower will not solve the seasonal problem. Therefore, new combined heat and power plants are being commissioned at the same time.

Construction of the 239 MW Gardabani combined heat and power plant was completed recently, with efficiency indicators 40 percent higher compared to the old CHPPs.

“In the last three years, we added almost 400 MW of power generation capacity. That’s more than the total new capacity commissioned over the two preceding decades. And that’s not the limit,” says Georgia’s Minister of Energy and Deputy Prime Minister Kakhaber Kaladze. This year, the Georgian government approved a development plan for Georgia’s energy sector until 2025. The key objective of the energy sector is to make Georgia as self-sufficient in energy as possible. Along with building new generation facilities, the plan envisages active revamping and upgrading of the operating energy assets. “We’re planning to invest 700 million euros in energy infrastructure upgrades, which is a significant amount for our country,” the country’s Minister of Energy says. “We have investors from basically all over the world – Turkey, Norway, the USA. Recently, we signed a contract and launched construction of the 280 MW Nenskra HPP. The tender was won by Korea Water Resources Corporation K-water. The company is supposed to invest about 1 billion US dollars in this project.” Another major project involving construction of Shuakhevi HPP and Koromkheti HPP is funded by the Indian Tata group. In addition, India decided to invest 1.2 billion US dollars in Georgia’s biggest hydro power plant, the 702 MW Khudoni HPP. The European Bank for Reconstruction and Development is willing to invest in a 20 MW power plant construction, with the total demand for investment worth 30 million US dollars.

“Our number one investor is the Russian Inter RAO Group,” says Kakhaber Kaladze. “As a major shareholder of the Georgian electric grid company Telasi, Inter RAO has invested a lot in grid development in Tbilisi and actually created a distribution network for the population and economy of the Georgian capital, which means over 500 thousand consumers.” According to the Georgian National Energy and Water Supply Regulatory Commission, Inter RAO has invested 168 million US dollars in the country’s energy sector since 2000. The three power plants owned by Inter RAO in Georgia have the total capacity of over 820 MW. But the key point stressed by Georgia’s Minister of Energy is that the seasonal shortage of power is compensated by purchasing electricity in Russia, leveraging Inter RAO’s capabilities.
Generation

Georgia’s energy system

Power generation

Total capacity

3,400 MW

3 combined heat and power plants with installed capacity

700 MW

25%

2700 MW

75%

59 hydro power plants with installed capacity over 2,700 MW

2600 MW

Completed projects

Key generation facilities

- Tbilisi TPP – 1,700 MW
- Inguri HPP – 1,300 MW
- Mtkvari CHPP – 600 MW
- Zhinvali HPP – 130 MW
- Khrami HPP-1 – 112.8 MW

- Larsi HPP – 19 MW
- Kazbegi HPP – 6 MW
- Aragvi HPP – 8 MW
- Paravani HPP – 86 MW
- Pshavela HPP – 1.9 MW
- Shilda HPP – 5 MW
- Khadori HPP – 5 MW
- Akhmeta HPP – 9.1 MW
- Pshavela HPP – 1.9 MW
- Gardabani CHPP – 239 MW

Scheduled projects

- Nenskra HPP
- Shuakhevi HPP
- Koromkheti HPP
- Khudoni HPP

Power transmission

- Georgian State Electrosystem is the country’s main power grid company
- Sakrusenergo is the company transmitting power via 500 kV tie-lines stretching from the west to the east of Georgia
- Telasi is one of the major grid companies in Georgia engaged in power distribution and supply in Tbilisi

Power supply network in Georgia

449 substations = 2 substations 17 substations 156 substations 274 substations

21 km = 330 kV

572 km = 500 kV

1,565 km = 220 kV

3,134 km = 35 kV

3,907 km = 110 kV

Total length

9,154 km
In the 21st century, carbon-containing fossil fuels (coal, petroleum, and natural gas) might be gradually replaced with the new environmentally clean fuel – hydrogen. The “hydrogen approach” facilitates implementation of effective and elegant technical solutions. However, there is no sound technology to store hydrogen fuel cells.

**ALTERNATIVE SOLUTION**

Generating power and supplying it to consumers is an ordinary task; the real challenge is to ensure its efficient long-term storage for back-up purposes in case of power outage. Energy storage is a simple process. The only task is to convert it into a different form without significant losses, for instance, electrical energy to mechanical energy or back. This principle is employed by pumped storage hydro power plants that play an important part in the operation of major power grids.

Smaller-scale methods involve energy storage in its chemical form (various kinds of widely used chemical rechargeable batteries). So far, solutions to the energy storage problem have been based primarily on technologies invented in the early 20th century – diesel and petrol generators. This method has its drawbacks, and the efficiency rate of such devices is not that high – 30–40 percent, which translates into financial losses.

But an alternative solution does exist – standby power supply systems based on hydrogen fuel cells. Noiseless and green, they will soon become the basic solution for guaranteed power supply.

**STORAGE FOR THE HYBRID**

Environmental friendliness (zero emissions of carbon and other hazardous substances) is an intrinsic quality of the hydrogen energy sector. Therefore in many cases the “hydrogen approach” facilitates implementation of highly effective and elegant technical solutions that are often economically efficient as well. However, the actual share of such systems in the global energy industry is still negligible. The key hindrance is the lack of sound solutions for hydrogen energy storage. Today, there are several major technologies applied in hydrogen energy systems.

One of the solutions is to store hydrogen as a liquid (similar to storing liquid propane in cylinders). Hydrogen turns into liquid at 21 K (−252°C) or less at normal atmospheric pressure. Its storage and use in the liquid phase require complex cryostats as well as liquefying and pumping systems.

The second solution, just as obvious, is to store hydrogen as a compressed gas. This approach is associated with other challenges: a standard metal cylinder for hydrogen (volume – 50 liters, pressure – 150 bar) weighs about 80 kilograms and contains a little over 650 grams of hydrogen. This proportion is absurd – the “container” weighs more than 100 times as much as its “contents”.

Reversible complex metal hydrides are a promising option for hydrogen storage. This approach is associated with other challenges: a standard metal cylinder for hydrogen (volume – 50 liters, pressure – 150 bar) weighs about 80 kilograms and contains a little over 650 grams of hydrogen. This proportion is absurd – the “container” weighs more than 100 times as much as its “contents”.

The fundamental operation process of such systems is based on the following sequence: water – hydrogen – storage – electricity + water.

**INNOVATION**

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**Age of Hydrogen Energy**

“Yes, my friends, I believe that water will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable. Some day the coalrooms of steamers and the tenders of locomotives will, instead of coal, be stored with these two condensed gases, which will burn in the furnaces with enormous calorific power.

JULIUS VERNE,
The Mysterious Island
The first element of the system is an electrolyzer, which is connected to the mains and to the household water pipeline and generates hydrogen for standby purposes. As the water needs to be especially clean, filters are installed at the system inlets. The hydrogen is stored in the form of a hydride, which allows for long-term storage. As the storage reservoir gets filled up, the heat emitted in the course of hydride production needs to be abstracted. Cold water from the water supply pipeline is used for that purpose. Heat abstraction involves the reverse process – use of hot water. Quick hydrogen extraction can be performed whenever there's a need for it (for example, during power outages in the external grid). In the fuel cell, gaseous hydrogen is combined with air oxygen, producing electricity and water. The resulting electricity, converted to the appropriate voltage, is supplied to the internal grid. The hybrid hydrogen storage system also ensures efficient hydrogen purification (up to 99.99% and above).

**PURE ADVANTAGE**
The reliability of this kind of systems is very high since they are free from energy intensive elements – moving parts, pipelines or other high pressure gas assemblies. Moreover, there are no high temperature processes. These factors also explain the high safety of relevant installations – the probability of a major accident approaches zero. The working medium in the system is water. The exhaust consists of water and oxygen, which ensures absolute environmental friendliness and cheap maintenance. Naturally, it requires some maintenance efforts, but the relevant costs and degree of complexity are significantly lower than those of the conventional standby diesel generator maintenance process. The high energy efficiency of hydride-hydrogen systems should also be emphasized. The electrolyzers used in the system have the efficiency rate of approximately 75%, while the efficiency of low-temperature solid polymer electrolyte systems is about 55%, which results in an overall efficiency rate a little over 40%. This is slightly higher compared to other types of systems. And since such systems are still at the early stage of development, they have a great potential and their properties will undoubtedly improve over time, along with a reduction in associated costs.

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Leading Researcher at Lebedev Physical Institute of the Russian Academy of Sciences

**IGOR OSIPOV,**
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Project Manager at Inter RAO UES Power Efficiency Centre
The central heating radiator celebrated its anniversary in 2015. It was invented 160 years ago in Russia. To be more specific, the first radiator was created by Franz SAN GALLI – a Russian citizen of Italian descent who came from Germany and lived in St. Petersburg. Nevertheless, there’s no reason for us not to share the pride in this invention, which keeps homes warm all around the world.

Even nowadays, some people prefer the vintage style and gladly buy cast iron radiators of the highest quality, particularly those accordion-like devices which have a unique design. A popular trend is to paint multi-colored patterns on traditional radiators.

**DESCENDANT OF THE FURNACE**

Curiously enough, central hot-water heating was invented in England back in 1675 to keep greenhouses and winter gardens warm. As for residential houses, everyone preferred the furnace until the 1830s. However, it’s only good for smaller spaces with low ceilings. But how does one keep a whole palace warm? In St. Petersburg with its chilly climate and large stone houses, central heating became an urgent issue.

The first time that Russian engineers successfully implemented the European hot-water heating system was in 1714 at the Summer Palace of Peter the Great, who was a big admirer of new inventions. That system was based on large-diameter pipes; however, the surface area of their contact with air was too small for efficient heating. A little later, in the 18th century steam-heating systems were invented. The performance of both types of heating systems benefited from the ingenious invention, the cast iron radiator.

**SAN GALLI’S “HOT BOX”**

The central heating radiator was invented in 1855 by a Russian subject with Prussian and Italian ancestry. The future inventor Franz SAN GALLI was only 19, when he moved from his homeland Pomerania to St. Petersburg to make a living in 1843. He became a citizen of the Russian Empire in 1851.

He worked at the Baird Works where he learned the ropes of metal processing and casting. In 1853, he decided he had learned quite enough to start his own business and opened a workshop in Ligovsky Avenue. At first, the workshop was busy with minor mechanical and blacksmith jobs, and then a cast iron shop was opened.

He was doing pretty well but to become truly successful, he needed a technological breakthrough. The talented engineer continuously training at European plants that he was, he did achieve that goal. Using an English technology, his shops started to make cast iron pipes for water supply and sewage. And later, he designed his own “Heizkörper”, which means "hot box”
In 2005, a bronze monument was erected at the gatehouse of Samarskaya TPP (one of the oldest power plants in Russia, commissioned in 1900) to celebrate the 150th anniversary of the radiator. The sculptural group includes a traditional radiator and a cat getting warm on a windowsill above it. The device in the monument was copied from the old radiators in Samara Art Museum installed in the early 20th century. The monument was created by a local sculptor Nikolay Kuklev in German. The shops started mass production of cast iron radiators, and soon the "hot boxes" were heating the vast greenhouses in Tsarskoye Selo, imperial palaces, and city manors.

The radiator was intended for the central hot-water heating system, but at the same time it found its application in steam heating systems, developing as an alternative. The "hot boxes" quickly gained popularity in Russia and were exported to Europe and the USA. Very soon, the workshop in Ligovsky Avenue that initially employed 12 metal workers and tinsmiths grew into a large casting and mechanical plant producing specialty equipment for indoor water supply, heating and sewage systems, gas lanterns, metal frameworks for construction, and artistic castings.

Franz SAN Galli was awarded a title of nobility and the honorary title of Manufacture Councilor, and he was promoted to the rank of Actual Civil Councilor and received five awards.

HALF-CENTURY-LONG WARRANTY
In the 19th century, cast iron radiators were smooth and decorated with cast metal artwork. In the 20th century, they started to come with fins, since having the same weight they possess better heat pickup properties: 140 W for a smooth cast iron radiator versus 165 W for a finned radiator. Standard cast iron radiators consist of six to nine sections, or sometimes fewer or more (some radiators are known to have as many as 25 sections!). The key advantage of cast iron radiators is their reliability. The minimum service life is 50 years. It’s curious to know that when painted dark colors, cast iron heaters radiate more heat.

Aluminum, steel, and bimetallic radiators that appeared in the mid-20th century also have fins. Design of radiators from alternative materials was encouraged by the use of circulation pumps in heating systems (invented by the German engineer Wilhelm Opländer in 1928). The high heat retention properties of cast iron became an obstacle in regulating heat exchange...

Nowadays new types of coatings with better durability are developed to improve the corrosion resistance of materials used in hot-water radiators. The latest know-how is anode radiators made of high purity aluminium (98%), protected against any kind of corrosion, circulating currents and hydrogen emission.
The Fourth International Forum on Energy Efficiency and Energy Saving ENES 2015 was held on November 19–21 in Moscow. International cooperation was the main theme of the event this year.

A major event dedicated to the development and implementation of energy efficient solutions and development of the energy industry, ENES 2015 gathered over 11,000 participants from Russia and abroad. The forum featured more than 25 meetings, panel discussions, conferences and roundtables. During breaks between discussions and presentations, the participants had a chance to visit the trade show, which showcased groundbreaking energy efficiency and saving technology. Over 40 Russian and international companies presented their stands.

The opening of the exhibition and the plenary session titled "International cooperation: towards energy efficient economy and development of power engineering" was attended by Deputy Prime Minister Arkady DVOORKOVICH, Energy Minister Alexander NOVAK, Mayor of Moscow Sergey SOBYANIN, Sberbank's CEO and Chairman of the Executive Board Herman GREF and others.

"In 2015, the energy intensity of the Russian economy was down 9 percent versus 2007," Energy Minister Alexander NOVAK said. He emphasized that energy efficiency is the key factor of the Russian economy's competitiveness today. "Thanks to its natural resources, huge development potential and high-powered technology in the field of nuclear energy systems, Russia is the world's largest energy producer by far," said Rodney John ALLAM, Nobel Prize winner, Chairman of the Global Energy Prize Committee and 2012 Global Energy Prize laureate. "Therefore, when choosing the program of cooperation in the energy sector, Russia should be led by its own interests and focus on the areas where its benefits are maximized."

The main event of day 2 was the first meeting of Energy Ministers of the BRICS countries, who signed a memorandum of understanding in relation to energy saving and energy efficiency. "The memorandum states that the parties will create an energy efficiency team that will handle issues concerning joint development of technologies, financial instruments, a register of infrastructure projects and their funding sources, sharing of information and experience in R&D, forecasting the future of the global and domestic energy sectors and development of cooperation in the youth field," Alexander NOVAK said. This day also included the awards ceremony for the ENES 2015 All-Russia Contest of Energy Efficiency and Energy Saving Enhancement Projects. Altai Power Supply Company's project was named the best customer service system in an energy company.
ENERGO-PromExpo 2015: The X Anniversary Universal Exhibition
December 15–17, 2015, Yekaterinburg, Russia

The ENERGO-PromExpo 2015 forum is meant to coincide with Energy Professional's Day and combines the 10th universal exhibition of the same name, a nationwide showcase of research and engineering projects of undergraduate and post-graduate students and young scientists, and an inter-regional conference, competitions and festive events. The event aims to present cutting-edge technology and equipment ensuring energy efficiency, reliability and environmental safety in municipalities, enabling its participants to share experience and information related to development of advanced energy technology and showcase state-of-the-art energy saving and environmentally friendly technology.

January 18–21, 2016, Abu Dhabi, UAE

The international event that combines a forum and an exhibition is held annually in late January at Abu Dhabi National Exhibition Center. The World Future Energy Summit includes two integrated energy and environment trade shows featuring about 600 exhibitors from 30 countries. The exposition occupies 40,000 square meters. The event provides companies developing and using advanced renewable energy technologies and systems with an opportunity to find potential investors for their projects. Apart from the exhibition, Abu Dhabi hosts a conference dedicated to renewable energy sources.

Nuclear Power Asia 2016: The XVII International Nuclear Power Conference
January 20–21, 2016, Jakarta, Indonesia

The first Nuclear Power Asia conference was held in Malaysia in January 2010. The conference has proved itself as a good platform for Asian nuclear power experts to share information about successful projects and experience of leading operators, as well as consider nuclear power opportunities in the region.

ENERGY MEXICO OIL GAS POWER 2016 EXPO & CONGRESS
January 26–28, 2016, Mexico City, Mexico

The event was initiated by Jesús Reyes Heroles, former Mexican Energy Minister, currently Managing Partner at Energea. It is expected that ENERGY MEXICO 2016 will become a platform for private energy initiatives. This will be the first and only event in Mexico to gather experts in hydrocarbons, gas, electricity and renewables from all over the world.

Klimahouse 2016: The XII International Exhibition on Energy Efficient Construction Technology
January 28–31, 2016, Bolzano, Italy

The exhibition has been held annually since 2006 and become a trendsetter in energy efficient construction. Today, homes require much heat and power. With the climate change, economic crisis and rising energy prices, energy efficiency is becoming increasingly important. It is particularly important to consider energy costs when designing buildings and then install energy saving equipment. This is why Klimahouse attracts numerous exhibitors and visitors. Last year about 40,000 people attended the event.
Energy Industry 2016: The XXII International Exhibition and Forum
February 9–12, 2016, Samara, Russia
The largest energy forum in the Volga region will allow the participants to present technological knowhow, share experience with Russian and international manufacturers and enter new markets for power generation equipment and materials. The exposition is divided into several themed zones, including energy sector, power engineering, electrical equipment and others. The event will be co-located with a research-to-practice conference featuring company heads and experts in the industry, as well as research organizations and businesses.

ELECRAMA-2016: The XII International Exhibition of Electrical and Industrial Electronics Industry
February 13–17, 2016, Bangalore, India
The exhibition has been held since 1990 every other year in various locations (usually in Delhi or Mumbai). At first, it was held once in three years, but in view of the importance of the energy and power sectors for the Indian economy, it was decided to organize the exhibition more frequently. The ELECRAMA exposition exceeds 60,000 square meters and features over 800 exhibitors from 23 countries. The organizers expect about 125,000 visitors.

ELEKTRO 2016: The XXV International Exhibition Dedicated to Electrical Equipment, Automation and Lighting Engineering
June 6–9, 2016, Moscow, Russia
The leading power industry trade show in Russia and CIS countries, ELEKTRO has been held since 1972. It usually features cutting-edge power engineering technology, including electrical equipment for various industries, advanced energy saving technology and materials, next-generation power units and innovation projects and solutions. Apart from the exhibition, ELEKTRO has a broad agenda focusing on the most important issues for the Russian energy and power engineering industries. In 2015, over 400 exhibitors from 23 countries participated in the event, and the exposition occupied 20,000 square meters. The event is expected to reach similar heights this year.

World Smart Energy Week 2016: The X International Smart Energy Show
March 2–4, 2016, Tokyo, Japan
The global smart energy week will comprise five sections displaying technologies, equipment and services related to smart grids, photovoltaic (solar) power generation, photovoltaic systems, eco building, recycling technologies and rechargeable batteries, as well as a new wind power trade show. 2016 will see seven exhibitions held simultaneously: PV and power generation systems; production technologies; hydrogen fuel cells; rechargeable batteries; smart grids and others.
EnERgIA 2016: the XIII International Energy and Energy technology Fair
October 25–27, 2016, Tampere, Finland
The key themes of ENERGIA, which has been held every other year since 1996, are power generation and distribution, power plant maintenance, operation and equipment, and types and sources of energy, as well as power plant engineering.

INNOPROM: The VII International Trade Fair
July 10–14, 2016, Yekaterinburg, Russia
The trade fair has been annually held at Yekaterinburg-EXPO Exhibition Center since 2010. The main theme of INNOPROM 2016 will be industrial networks. The key sections will be automation, urban technologies, energy technologies, machine building and others. As always, the exhibition will feature Russian and foreign companies, including manufacturers of equipment for heat and power generation, transition and distribution, as well as energy efficiency. In 2016, India will be the event’s partner country: the trade fair will invite numerous Indian companies and include a whole range of events attended by government members of both countries.

St. Petersburg International Economic Forum
June 16–18, 2016, Saint Petersburg, Russia
The annual Russian business and economic event was held in Saint Petersburg for the first time in 1997. Since 2005, it has been attended by the Russian president. Every year, the event gathers more than 4,000 people from 60 countries, bringing together such important people as heads of states and political leaders, chairmen of governments and deputy prime ministers, ministers, governors and heads of major Russian and foreign companies. A range of events of the forum is traditionally dedicated to the energy industry. Besides, many important agreements are signed by energy market players during the forum.

ENERGIA 2016: The XIII International Energy and Energy Technology Fair
October 25–27, 2016, Tampere, Finland
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POWER-GEN Russia 2016: The XIV International Conference & Exhibition
October 25–27, 2016, Moscow, Russia
In 2015, Russia Power, a well-known energy event, was renamed POWER-GEN Russia to be in line with PenWell’s successful family of global events. Also, the time of the exhibition was shifted from April to October to fit into the global calendar of POWER-GEN events. The exhibition remains a premier meeting platform for Russian and foreign energy experts. The world-class event will bring together major Russian and international companies displaying state-of-the-art technologies and services for manufacturers, service providers and end consumers. Special emphasis will be given to the Russian hydropower industry.

ENES 2016: The V International Forum on Energy Efficiency and Energy Saving
November 2016 (to be detailed), Moscow, Russia
Despite its young age, the ENES forum on energy efficiency and energy saving has become one of the biggest and most important events in the Russian energy sector. In 2015, the forum participants were greeted by Russian President Vladimir PUTIN. He said that the forum “involves the participants in a professional and substantive dialogue over the development of the energy sector, allows them to share best practices and offers solutions to topical problems.” The forum includes a large exposition displaying the key solutions and innovations in the industry, as well as numerous meetings, discussions, plenary sessions and roundtables.
An unusual 97-meter tower has recently risen in the town’s skyline of Roskilde, Denmark. This is not just a peculiar skyscraper with an original design (the massive building looks like a giant rusty snail). This is a real power plant. The Energy Tower generates heat and power by incinerating waste from nine surrounding municipalities.

The tower was designed by Erick van EGERAAAT, a Dutch architect. The façade, made of dark-brown aluminium plates, is decorated with circular holes. At night, lights installed in the holes transform the building into a gently glowing beacon, which according to the designer’s vision is a symbol of energy production. All lights are bright, powerful, and of course, energy-saving.

Members of the royal family, including His Majesty Crown Prince Frederik of Denmark, attended the inauguration of the power plant, which can be safely called a piece of art.
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