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Already by September 2003 UES had agreed to the restructuring plans proposed by seventeen *energoss*; the others had until January 1, 2005, to submit their plans.⁹⁸ (The Duma proposed to push back the deadline on five separate occasions, but was rejected each time by the Federation Council.) However, the government continues to consider whether to sell some of the OGK shares for cash rather than exchange them for UES shares.⁹⁹

It is sign of the warped pluralism of Russian politics that several government ministers and the main progovernment party, United Russia, campaigned *against* the electricity restructuring, a major item of government policy. Deputy Energy Minister Viktor Kudryavyi lobbied against the reform, portraying it as part of a general strategy to shift the burdens of economic adjustment from the federal to the regional level.¹⁰⁰ Kudryavyi circulated among Federation Council members a Russian language version of a report, "Lights off," from the Amsterdam-based Transnational Institute. The report analyzed deregulation in the West over the past twenty years, concluding that private companies were not more efficient or reliable than state entities. In August 2003, Kudryavyi was fired from the government.¹⁰¹

Prime Minister Mikhail Kasyanov's top economics advisor Mikhail Delyagin quit after the plan was approved, saying, "I worked to oppose those plans; and after doing all I could, I resigned."¹⁰² In September, even though they had passed the bill, the Duma deputies tried once more to fire Chubais—according to one report, the sixty-second such effort.¹⁰³ The motion requesting his dismissal as head of UES fell twenty-five votes short of the required majority.

Approval of the plan enabled Chubais and the government to gain even firmer control over the UES board, which was chaired by then-presidential chief of staff Aleksandr Voloshin. The government held ten of the fifteen seats in recognition of its 53 percent stake. In the board newly elected on May 30, 2003, the number of directors representing the minority shareholders shrank from three to one (Seppo Remes, director of Vostokenergo and head of the European Business Club).¹⁰⁴

As part of the reform, the national wholesale market for power will be progressively liberalized over five years, with the OGKs allowed to sell 5–15 percent on FOREM in the first year, rising to 65 percent at the end of the transition period, with the remaining 35 percent being state-controlled "guaranteed deliveries" at fixed prices. Chubais rushed to introduce this market liberalization in time for the December 2003 State Duma elections, since he knew that prices on FOREM are lower than in regional *energoss*. Trading opened on November 1, 2003, with prices 5–10 percent below average. Chubais went even further by allowing five individual regions to cut local electricity prices by 20 percent, a blatantly political gesture.¹⁰⁵ But given the political turmoil around tariff increases, there seemed no easy solution to the ongoing payments crises in regions like Ulyanovsk, Kamchatka, and Primorskii Krai.

In May 2003 Gazprom and UES created a new company, Russian Communal Systems (RKS), with the ambitious goal of tackling the housing subsidy problem at its root.¹⁰⁶ The idea is straightforward. Housing utilities are a \$15 billion a year business with a scope for savings of \$2–4 billion if new technologies and energy conservation are introduced. RKS should be able to make a tidy profit by capturing these savings, at the same time taking these facilities off the hands of municipalities. RKS would assume the housing associations' energy debts, and in return would be given outright ownership of the housing stock, or a long-term lease. Some parts of the government vigorously opposed the plan. For example, State Construction Committee head Nikolai Koshman said he would not send any federal funds to housing systems that sign contracts with the company.¹⁰⁷ By the end of 2003 RKS had signed contracts with some twenty regions, including Tver, Kaluga, and Tambov, although Tomsk governor Viktor Kress was trying to back out of the deal signed by the Tomsk city mayor.¹⁰⁸

CONCLUSION

President Putin and Anatoly Chubais deserve some credit for having shepherded a complex and controversial reform measure through the legislative process. They went some way towards appeasing their domestic critics, and at the same time their reform won guarded approval from the international financial community.

The electricity reform is a complex package of legislation that provides a general framework for the privatization of the industry. It does not spell out who will get to own which parts of the industry, nor does it guarantee that the government will allow electricity prices to rise to a level sufficient to generate the investment the sector needs.

At this early stage it is impossible to predict whether the reforms will succeed or fail. The UES reform will take five years to implement—assuming everything goes according to plan. And the reforms of Gazprom, the railways, and the housing services will take even longer. The Soviet system of infrastructure monopolies cannot simply be dismantled overnight. Anyone interested in the ebb and flow of Russian power politics among the Kremlin, governors, and oligarchs will have to keep an eye on developments in this crucial sector.

NOTES

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The new plan tightens central state control over the operation of the electricity grid. The high-voltage transmission system will be retained in a state-owned Federal Grid Company (Federal'naya Setevaya Kompaniya) and administered through a Central Dispatcher Service (Sistemnoe Operator-Tsentrāl'noe Dispetcherskoe Upravlenie). The FSK and SO-TsDU, which are currently UES subsidiaries, will be returned to full state ownership (75 percent and 100 percent respectively). It will cost the government at least \$2 billion to buy back the shares in these companies.

The thirty-eight main generating stations under UES will be split up between ten wholesale generating companies (Optovye generiruyushchie kompanii, or OGKs), six thermal and four hydroelectric. The OGKs will then be spun off as independent companies. The distribution networks will also be restructured, with regional energos merging into twenty new territorial generating companies, while hiving off some power stations to the OGKs. Each energo will come up with its own restructuring plan, subject to approval by UES and by the Khristenko commission. Creating these unified companies should enable profitable regions to help out weaker neighbors.⁸² The plan's main potential advantage was that it should weaken the grip of regional elites and energy-guzzling oligarchs, who preferred to have individual power plants under their own control.⁸³

REGIONAL RESTRUCTURING

Already in 2002 as a first step towards reform Chubais had started the creation of six regional management companies to coordinate the work of energos in the most financially strapped regions.⁸⁴ For example, the Middle Volga Interregional Energy Company will combine the profitable Samara with the loss-making Saratov and Ulyanovsk.⁸⁵ The Far East Energy Management Company will take over Sakhalin and the troubled Kamchatka.⁸⁶ The four regions of Ingushetia, Kabardino-Balkaria, North Ossetia, and Karachaevo-Cherkessia will be merged into the North Caucasus Energy Management Company. Those companies have a combined debt of R3.5 billion. With few local energy sources, they import 90 percent of their electricity, and face high costs maintaining the power up into the mountains.⁸⁷ As Director Magomed Kaitov noted, "The situation is difficult but not hopeless."⁸⁸

The Northern Energy Management Company includes Arkhangelsk, Vologda, and Kostroma. Its head, Valentin San'ko, explained, "From the outset we had to fight with regional powers. Then they realized they had to reach agreement, eliminate the debts and start regular payments."⁸⁹ One day San'ko and Arkhangelsk governor Anatolii Yefremov drove out onto the ice of the

frozen river Drina and promised not to return to the shore until they had agreed on a payments schedule.

Predictably, Moscow city got to write its own highly favorable restructuring plan. Mosenergo will have to give up four power plants, but it will still be one of the largest power generators in the nation, and will remain a local monopoly. The city will be allowed to boost its stake in Mosenergo from the initial 3 percent to 51 percent.⁹⁰

CLOSING THE DEAL

At first, Chubais wanted to auction the OGKs for cash. Minority investors cried foul, fearing that their UES shares would become worthless, and that the auctions would be rigged to favor insiders. In March 2003, the board of UES approved a revised plan under which OGK shares will be offered to UES shareholders in proportion to their existing stake.⁹¹

The approval of the revised plan triggered a scramble for shares in UES and the profitable energos. In the course of 2003 investors spent about \$800 million for a 10 percent stake in UES, and another \$1.2 billion acquiring blocking stakes in over thirty AO-Energos.⁹² UES stock, which had slumped in 2000, doubled after the new plan was launched, although investors anxiously watched the reform's passage through parliament. In the course of 2003 UES market capitalization rose from \$3 to \$12 billion.⁹³ The new draft greatly favored companies such as MDM and Basic Element that had already bought significant stakes in UES and regional energos.⁹⁴ Basic Element sought cheap power for its Russian Aluminum plants, while MDM wanted a captive buyer for its coal. Basic Element and MDM already held a controlling packet of shares in the two largest producers, Irkutskenergo and Krasnoyarskenergo, and more than a dozen other energos. Also active in buying up shares were LUKoil, Tyumen Oil Company, and Interros, owner of Norilsk Nickel.⁹⁵

In October 2002 the main bill in the package of five reform measures passed its first reading in the State Duma and cleared the second reading in February 2003 by 260 votes to 159, with the liberal Yabloko joining the Communists in opposition.⁹⁶ No fewer than 1,800 amendments were submitted in the course of the bill's passage, of which 420 were incorporated.⁹⁷ One amendment, for example, barred any single company from acquiring more than 35 percent of the generating capacity in any one of Russia's seven electricity grid-zones. Still, with Putin's support the bill cleared the Federation Council, and was signed into law on March 31, 2003. In September 2003 the government issued the first of forty-nine decrees that spell out the mechanics of the restructuring.

At the same time, there was confidence that new investment and market competition would eventually reduce costs. In the face of fierce political opposition to price increases in 2003, Chubais changed his tune. He accepted that price increases would have to be delayed until after the industry had been restructured. Instead, Chubais started to argue that the reform would mean immediate lower prices for industrial consumers.

CREATING A COMPETITIVE MARKET

Upon taking office in 2000, President Putin gave Chubais the green light to restructure UES, in recognition of the fact that something had to be done to prevent a recurrence of the politically damaging payments crisis and consequent power shutdowns of 1996–1998.

In March 2000 Chubais proposed an ambitious program to separate the generation and transmission operations of UES and split the generators into a dozen companies that would be auctioned off.⁶⁹ The goal was to create competition among generating and transmission companies—to put the business into the hands of private, profit-seeking owners—and hence provide conditions for investment in expanding output. The plan promised to cut the cost of electricity for industrial consumers while at the same time increasing profits so as to attract buyers and boost investment.

Separation of generation and transmission facilities was seen as crucial. Under the existing system UES played a dual role as market operator and market participant, and thus had a vested interest in selecting its own plants to generate for the grid over competing plants owned by independent producers, even if they had lower costs.⁷⁰

This plan was attacked by regional elites fearful of losing their cheap power, by government officials who wanted to keep the infrastructure monopolies under tight rein, and by the communist opposition who saw it as another Chubais trick to deceive the population and enrich the oligarchs. The Chubais plan was even attacked by foreign investors who held a minority (about 30 percent) of UES shares. They feared that the profitable segments of the company would be sold off in sweetheart deals to Chubais cronies, leaving the national company with all the money-losing operations.⁷¹

The governors were generally hostile to the reform. For example, Krasnoyarsk governor Aleksandr Khloponin observed, “The right to set tariffs for the regions is to be transferred to the Federal Energy Commission. Unfortunately, at the federal level the energy lobby currently dominates over the real sector of the economy; so we will try to prevent that move. The second threat is the attempt to average out the tariffs between the European part of Russia and Siberia. That would be a disaster for us, and we have to do everything we can

to stop it.”⁷² In 2003, Khakassia president Aleksei Lebed went to court to try to stop UES from selling its 79 percent stake in the Sayano-Shushensk hydroelectric plant.⁷³ In April 2004 the Far East Federal Okrug Court ruled in his favor. Sayansk is the largest hydro plant in Russia, generating \$3 billion worth of power a year, 75 percent of which is sold at 1 cent per kWh to the Russian Aluminum-owned smelters located in the republic. When Yeltsin privatized Sayano-Shushensk in 1993 Khakassia was promised ten years of cheap electricity from the plant. Lyubov Sovershaeva, first deputy presidential representative for the North-West okrug, recognized that “many governors will lose control over local energy companies, and hence part of their tax base.”⁷⁴ Chubais tried to persuade them that the benefits of the plan—the ability to buy cheaper electricity on the national market, the stimulus to new investment in energy-rich regions—outweighed the risks.

The federal government itself was badly split over the Chubais plan.⁷⁵ The Energy Ministry was bitterly opposed, but the plan was pushed forward by Deputy Prime Minister Victor Khristenko, who headed the government commission overseeing the project, and German Gref’s Ministry of Economic Development and Trade.⁷⁶ Natalya Melikova argued that “Chubais wouldn’t have stood a chance without German Gref’s support.”⁷⁷ In January 2001 Putin created a commission under the State Council chaired by Tomsk governor Viktor Kress to study the problem—and to line up the governors behind the reform.⁷⁸ The Kress commission came back with a rival plan that favored preserving generation/distribution companies that would have continued to enjoy local monopoly power.

One peculiarity of the policy process was that reform of the power sector was delegated to the head of the existing power monopoly, and many of the key actors influencing the process were companies with a piece of the pie—owners of shares in UES and regional energos. This can be seen either as a strength (wisely co-opting key players with potential veto power) or a weakness (abdication of the government’s responsibility to lead). Thus as Petra Opitz explains, “Prospects for reform are expected to result not from political decisions, as was characteristic for regulatory reform in other countries, but from the economic interest of the already established players in the power market.”⁷⁹ Or as Illarionov put it, the Chubais plan was “a case of privatization when Cabinet officials are ‘privatized’ by private companies and corporations.”⁸⁰

Chubais was able to persuade the government to reject the Kress plan, but he was forced to amend his own draft and accept stronger state control of the electricity market after the breakup of UES.⁸¹ The revised plan was approved by Mikhail Kasyanov’s government on July 11, 2001. The plan was dubbed “5+5” because it was five years in the making and will take five years to implement.

based on the investment plans they want to fund, and in response the government scales back both the investment projects and the tariff increase allowed.

In the August 1998 financial crash the ruble lost 75 percent of its value. This widened the gap between domestic and export prices in dollar terms, making the cross-subsidization problem even more acute. Oil and gas producers had even more incentive to switch supplies to exports, while UES as before could not share any of the fruits of the export boom. The 1998 crash triggered a general economic recovery in Russia, which helped UES customers meet their payments to UES. However, Chubais claimed that UES was actually being forced to sell electricity below production cost. It is hard to say whether or not this is true, given the nontransparency of Russian accounting. But if it were true, then the increase in demand for electricity as GDP grew meant a widening subsidy gap for UES, and more pressure on its already exhausted physical capacity. So, like in California in 2000, economic growth actually makes this problem worse rather than better.

Fearful of popular discontent, the state continued to keep utility price increases below the general rate of inflation. The price of electricity compared to the general producer price index doubled between 1992 and 1996 but fell back to the 1992 level by 2000.⁵² From 1998 to 2000 the prices of gas, transport, and electricity dropped by 20 percent, 23 percent, and 39 percent respectively, relative to the industrial producer price index.⁵³ The head of the national tariff body, the FEK, Georgii Kutovoi, was seen as sympathetic to the "family," Yeltsin's inner circle represented by figures such as Sibneft's Roman Abramovich and aluminum magnate Oleg Deripaska.⁵⁴ These businessmen opposed Chubais' pleas for higher electricity prices, which would cut into the profits of the manufacturing industries they control. Also they wanted to weaken UES in order to maximize their chances to get control of parts of the company during its privatization.

Putin followed the same policy of price controls after 2000, wanting to postpone harsh price increases until after the structural reforms of these monopolies have been completed. In January 2002 the government fixed a limit of rate increases for the upcoming year of 20 percent for gas, 18 percent for electricity, and 16 percent for railways, below the increases approved by the FEK (35 percent, 32 percent, 26 percent), and much less than those requested by the companies themselves (38 percent, 44 percent, 66 percent).⁵⁵ Likewise the increases for 2003 were 14 percent for electricity, 20 percent for gas, and 12 percent for rail, less than half the raises requested by the companies (25 percent, 40 percent, and 50 percent respectively).⁵⁶ In December 2003 the government announced the maximum electricity tariffs for three years out: 13 percent in 2004, 8.5 percent in 2005, and 7.5 percent in 2006.⁵⁷

At the regional level, some REKs tried to hold down tariff increases, while others pushed them up. Moscow mayor Yuri Luzhkov opposed Mosenergo's

request for a 38 percent increase in 2003, and the REK reduced it to 15 percent.⁵⁸ In Rostov the REK allowed a tariff increase of only 10 percent for 2004, including an 8 percent rate of return, while the regional energo said 14 percent was needed to generate necessary investments.⁵⁹

In 1995 as a first step to introducing some market competition to the industry, a regulated national power market was established, FOREM (Federal'nyi Optovoi Rynok Elektroenergetiki-Moshchnosti). FOREM rates were cheaper than in local markets. For example the Lebedinskii GOK smelter cut energy from 33 percent to 20 percent of costs by switching to FOREM.⁶⁰ Regional governors discouraged local industry users from going into FOREM, since such a move cut the revenue of the local energo. Chitaenergo charged the Zhirekensk molybdenum plant 63 cents for power it could buy off FOREM for 25 cents per kWh.⁶¹ Stavropolenergo lost R390 million in 2002 when the fertilizer giant Nevinnomysskii azot went onto FOREM.⁶² Chelyabinsk authorities require the local energo to buy more expensive coal from local mines, and forced the REK to hold down tariff increases in the run-up to the 2000 gubernatorial election.⁶³

The introduction of presidential envoys in May 2000 added another layer of complexity to this regional bargaining. The envoys actively intervened when a crisis broke, but their strategic goal was to weaken regional executives' control over AO-Energos and REKs. Thus Kemerovo governor Aman Tuleev complained that the presidential envoy to the Siberian Federal Okrug Leonid Drachevskii "is making decisions on vital issues: electricity tariffs, rail transport tariffs, energy strategy, inter-regional issues."⁶⁴

Spring 2003 saw a surge of regional tariff increases in excess of the 14 percent national target, with an average increase of 29 percent in the first half of the year.⁶⁵ Tariff increases broke the national target in twenty-six regions, ranging from 17 percent in Moscow to 73 percent in Irkutsk. In part, the price surge reflected Chubais' tough policy towards regions that could not pay their bills. Partly, it was political: the governors could blame Chubais for the price hike in response to their unhappy constituents. Another factor driving some governors to raise electricity prices was the fact that the FEK was allowing an increasing number of industrial plants to buy power on the cheaper FOREM national market.

In April 2003 the ostensibly pro-government United Russia Party seized on the tariff increases as an issue to attract popular support, and presented a 2.6-million-signature petition to the FEK demanding that it rein in the regional regulators.⁶⁶ Regional procurators got into the act, ordering REKs in eight regions to review their tariff increases.⁶⁷ Governor Konstantin Titov fired the Samara REK after it approved a 41 percent price increase.⁶⁸

Initially, Chubais had argued that in order to improve the financial health of UES and regional energos, the price of electricity would have to be doubled.

in generation averaged 18 percent (compared with 40 percent in West Europe) and losses in transmission 12 percent (5 percent in West Europe).⁴⁰ The whole topic of energy conservation is largely untapped. There is, therefore, vast scope for improved efficiency from investment in new technology.

It is less clear whether UES needs investment to expand capacity. Given that GDP has fallen by 40 percent since 1991 but electricity generation by only 20 percent, UES probably has adequate generating capacity. UES has about 11 percent of excess capacity over maximum peak load, which is below the 20–25 percent excess capacity found in developed economies. But given that Russia is spread over eleven time zones, and can move some electricity between regions, it does not have the same peak-load problems as smaller-sized countries. Only in 1998 did UES introduce such a basic cost-saving device as a 30 percent discount for industrial night users (which will help reduce the peak excess capacity required).

In April 1998, UES got a new chief executive: Anatoly Chubais, the former deputy prime minister and architect of Yeltsin's controversial privatization programs. Chubais made it a priority to cut down on payment arrears and to force customers, under threat of cutoff, to pay in cash and not in bills of exchange or barter. A January 1998 government decree set out procedures for cutting off nonpayers (who would get two months warning) and a list of exceptions—institutions such as hospitals and defense installations that could not be shut down.⁴¹ A presidential decree introduced a 50 percent discount for cash payments, and the proportion of electricity sales paid for in cash increased from 35 percent in 1999 to 92 percent in 2001, although UES was still owed \$5 billion in unpaid bills.⁴² In this war on arrears, Maksim Rubchenko argues, "UES has accomplished a decisive victory over both the governors and non-payers. . . . The main weapon in this war was disconnection, and like in any war it was the innocent who suffered."⁴³

By 2000, the energetic leadership of Chubais had turned the tide of the arrears crisis, although the problem remains acute in a dozen or so bankrupt regions. However, Chubais failed to persuade Yeltsin or Putin to allow electricity prices to be increased at a rate faster than general inflation.

THE TARIFF PROBLEM

It is impossible to say what would be a "fair" market price for Russian energy. There is no "world market price" for energy since it costs money to move it from point of production to point of use.

Soviet planners were not very cost conscious, and they built generating capacity based on strategic rather than market calculations. As a result, production costs vary by a factor of 10:1, from the least efficient to most efficient

generating plants. As a result the prices charged to consumers also vary, from as much as 9.8 cents per kWh in Kamchatka to 1.1 cents in Krasnoyarsk and 0.6 cents in Irkutsk.⁴⁴ The financial health of regional electricity companies also varies widely. For example, in the Urals region alone profitability ranged from 5 percent in Chelyabinsk to 40 percent in Tyumen.⁴⁵

The lowest costs are enjoyed by hydroelectric power stations, which have a strong incentive to increase sales by finding new customers outside their region, or by encouraging customers to relocate to their region. Aleksandr Khloponin, former Norilsk Nickel director-turned-governor of Krasnoyarsk, explained that "we buy half of Khakasiya's electricity, but at double its price within Khakasiya. Why? Because we're different regions."⁴⁶

Critics argue that UES is a hopelessly inefficient monopoly that disguises its poor management and political favoritism by asking for ever-higher tariffs.⁴⁷ Controversial presidential advisor Andrei Illarionov accused UES and the other utilities of profiteering and paying their directors high salaries, while expanding their grip on the economy and absorbing an ever-larger share of investment. He said, "Calculations show the rates for electricity and rail transport are 40 percent overpriced on average."⁴⁸ Chubais had a shouting match with Illarionov on Russian TV.⁴⁹ Illarionov's ire seems to be driven in equal measure by his personal animus towards Chubais and his quite rational fear that Russia's economy is becoming deindustrialized through excessive dependency on energy exports. A more balanced approach was taken by respected reform economist Yevgenii Yasin. He argued that the current chaotic tariff policy produces massive inefficiency and waste, and the real issue is not the level of tariffs but their compatibility with market incentives.⁵⁰

National targets for electricity tariffs are set on an annual basis by the Federal Energy Commission (FEK), which is close to the Energy Ministry. A 1999 effort to shift the FEK to the Ministry for Anti-Monopoly Policy failed. Electricity rates for each province are set by the Regional Energy Commissions (REKs). In February 1997 a new law on federal regulation of electricity and heat tariffs took the commissions out from under the jurisdiction of regional governments and gave them independent legal status, but in practice they remained under the sway of regional governors.

The overall situation is quite confusing, with one commentator arguing that "all basic economic tariffs in Russia are set by different bodies and on the basis of different principles" and "The Federal Energy Commission does not know the first thing about market methods of regulation of tariffs."⁵¹

Prior to August 1998 tariffs were reviewed every three months, using a formula of costs plus a reasonable rate of return. Since then the national tariffs have been set once a year, in January, after face-to-face bargaining between energy barons and government leaders. The executives argue for higher tariffs

1991 energy intensity was 0.71 tons of oil equivalent (toe)/\$1000 and electricity intensity was 0.86 kWh/\$, compared to an OECD average of 0.27 toe and 0.44 kWh/\$ respectively.²⁸ GDP fell faster than electricity output in the 1990s, making the Russian economy even more electricity dependent. By 1997 electricity intensity reached 1.05 kWh/\$ compared to 0.43 kWh/\$ in the Organization for Economy Co-operation and Development (OECD).

With 650,000 workers, UES is Russia's largest company. Blocks of shares in UES were sold to its workers and the public for vouchers in 1994, and subsequently for cash to domestic and foreign investors, while the government held onto a controlling 53 percent stake. By 2000 foreigners were thought to own 30 percent of the shares (a figure that includes a lot of Russian offshore capital). Seventy-two legally independent regional generating companies (AO-Energos) were created, with UES holding a majority stake in fifty of them and minority (49 percent) stakes in all but four of the remainder. In addition, fourteen individual power plants were turned into independent corporations. That left UES accounting for 73 percent of Russian generating capacity and 85 percent of electricity distribution as of 2000.²⁹

The other main electricity generator is the Ministry of Atomic Energy. Nuclear power accounts for 15 percent of total supply (but 40 percent in the Central Black Earth region).³⁰ The atomic power stations are forced to sell most of their electricity at fixed prices to the monopsonist UES, so they are also starved for cash.

REGIONAL REBELS

Four AO-Energos, in Tatarstan, Bashkortostan, Irkutsk, and Novosibirsk, became independent of UES, with the regional government holding a majority stake. Irkutsk is a special case because its vast hydro stations generate 7 percent of the nation's electricity at very low cost. In 1992 Governor Yurii Nozhikov blocked the transfer of Irkutskenergo to UES. Yeltsin dismissed Nozhikov in March 1993 but was forced to reinstate him in the face of public protests. In 1996 Yeltsin signed a bilateral treaty recognizing Irkutskenergo as the joint property of the federal and regional governments. In 2001 Putin started canceling these bilateral treaties, and in February 2001 a court reduced the Irkutsk government stake to 16 percent, leaving 25 percent with UES.³¹ The two aluminum giants SUAL and Oleg Deripaska's Rusal own 30 percent and 10 percent respectively. Together they bought 88 percent of the company's power, and their managers effectively took over the plant in 2001. By 2003 Irkutskenergo had a market capitalization of \$435 million.

Similarly, the powerful presidents of Tatarstan and Bashkortostan retained control over their republic energos in 1992. UES owns 21 percent of Bashkiren-

ergo versus 40 percent held by the republic government. These two energos even refuse to pay grid rent contribution (*abonplata*) to UES, which in the case of Bashkortostan runs to R1 billion a year, or 20 percent of their receipts.³² Similarly, UES held only 14 percent of the stock in Novosibirskenergo. In 2001 after a protracted court battle UES managed to remove the company's head, but was still not able to place its favored candidate in the post.³³

AN INDUSTRY IN CRISIS

It was ironic that in Russia's energy-driven economy the electricity monopoly was one of the main casualties of market reform. UES was the "pig in the middle" between cosseted, cash-rich oil and gas producers and subsidized consumers. UES was paying close to market prices for many of its inputs (gas, fuel oil, coal, rail transport) but faced strict price controls over its own sales.

The price of electricity was held down by the government in order to subsidize industrial and domestic consumers, and was effectively frozen from 1996 to 1999. As of April 2002 domestic consumers were paying an average of 56 kopeks (1.8 cents) per kilowatt/hour (kWh).³⁴ Ukraine and Georgia were paying 4 cents per kWh for imports of Russian electricity, while residential customers in Europe and the United States were paying 8 cents per kWh.³⁵ Moreover, in Russia the industrial price averaged 2.6 cents/kWh—higher than the residential price, while in the west big industrial customers get a discount and pay close to 4 cents/kWh. Thus Russian industry gets cheap energy, and cross-subsidizes even cheaper energy for households. Given that 55 percent of electricity is consumed by industry and only 10 percent by households, the prices charged to industrial consumers are more important to the financial viability of UES and regional energos than the prices charged to households.

Despite these low prices, for most of the 1990s municipalities and firms were able to get away with not paying their bills, because electricity was perceived and treated as a public good.³⁶ Shutoffs of firms or cities for nonpayment triggered popular protests and coordinated actions by regional and national leaders.

UES and most regional energos ran at a loss, running up debts to their own suppliers. By 1998 the situation was critical: UES was losing \$1 billion on annual revenues of \$7 billion.³⁷ UES was unable to invest in new capacity to replace its capital stock, 60 percent of which was beyond its planned life span. UES claimed to need \$21 billion over the next five years just to maintain existing capacity.³⁸

UES is clearly inefficient by international standards: output per employee is 0.9 kWh compared to 7.9 in Korea and 8.6 in Brazil.³⁹ Thermal efficiency

were made and empires were built. But for the ordinary people too it meant basic services—heat, light, transport—continued to be provided at low cost. A huge number of vested interests had a stake in the preservation of the status quo.

But economic reformers realized that the monopoly reform would mean more efficient use of resources, leading to faster economic growth and a higher standard of living for Russia as a whole. But the immediate losers from such a policy—people and companies who would face higher energy bills—were more politically salient than the more diffuse and hypothetical long-term beneficiaries. Most of the incumbent bosses of the monopolies were happy with the existing arrangements, and only a minority (such as Chubais) were willing to gamble on radical change. So the political economy of regulation reform was trapped in a status quo that has proved very difficult to dislodge.

The last serious effort to tackle these problems came in the spring of 1997, with an effort to raise domestic energy prices by liberal deputy prime ministers Anatoly Chubais and Boris Nemtsov. The liberals' "spring offensive" was defeated by opposition from a broad spectrum of domestic constituencies, especially households and industrial consumers who benefited from the low prices. Deputies in the State Duma and regional governors in the Federation Council used protests from these groups as an excuse to scuttle the reform. The problem in 1997 was that the monopoly reform was tied to a broader range of policies—such as an anticorruption drive and privatization of telecommunications—which were opposed by industrialists and regional bosses, who might otherwise have stood to gain from monopoly reform. Chubais and Nemtsov were politically isolated, and Yeltsin was unwilling or unable to help them overcome the opposition to change.

Russia's Monopolies during the Transition to Market

Yeltsin's privatization campaign left most of the infrastructure monopolies with a new legal status but did not change their monopoly character. The 1995 Law on Natural Monopolies classified as natural monopolies the oil and gas pipeline networks along with electricity transmission, railways, telecoms, and airports.

The oil sector itself was not regarded as a natural monopoly, with the exception of the pipeline system, which was handed over to a single entity, Transneft. Production and refining of oil was split among more than a dozen regionally based companies, in most of which the government stake has now been sold off.²⁶ Oil accounts for only 6 percent of Russian electricity generation, while natural gas accounts for 43 percent (followed by coal, 19 percent; hydro, 19 percent; and nuclear, 12.5 percent).

Unlike oil, the natural gas ministry was privatized as a vertically integrated concern, Gazprom, controlling 88 percent of gas production and the long-distance and local distribution pipelines. Similarly, the electricity sector was turned over to a single integrated company, Unified Energy System (UES). The Russian state continued to hold a controlling stake in UES and Gazprom (53 percent and 40 percent respectively, as of 2003), although the government did not play an active role on their supervisory boards during the Yeltsin era. The railroads were transferred to the Russian Railways Corporation, which started operations on October 1, 2003.

The drastic and chaotic introduction of market reforms left Russia with a dual economy. On one side were transactions taking place at competitive prices. On the other side, large tracts of the economy were still conducted in state-regulated prices—especially housing, transport, and the energy infrastructure. The government softened the impact of market transition by providing cheap energy to households and to industrial customers. By the mid-1990s most of this parallel economy was conducted in barter—either physical goods or scrip of various types, including tax and payments arrears. After 1999 the proportion of barter and noncash payment was gradually reduced, from 50 percent of all industrial transactions to less than 10 percent.

The regulatory history began in 1990–1991 with the passage of a Russian Federation Law on Monopoly. But at that time the main issue was regulation of monopolies not on efficiency grounds but simply as part of the general battle with price inflation.²⁷ Hence the law defined "monopoly" as any firm with a 35 percent market share, and some 2,000 companies were listed as monopolies. Once the general market transition had settled down, attention turned to the smaller group of "natural monopolies." In February 1995 presidential decree no. 220 initiated the creation of regulatory commissions, and the August 1995 law no. 147 "On natural monopolies" provided the legal framework.

THE CREATION OF UES

UES is the pivotal actor in the drama of delayed monopoly reform. UES has very limited opportunities to export electricity, so unlike Gazprom or the oil companies it cannot use export earnings to cross-subsidize its domestic customers. The UES corporation bears the whole burden of the gap between domestic and export energy prices.

Lenin famously said in 1920 that "Communism equals Soviet power plus electrification of the whole country." The Soviet Union went on to develop the world's second-largest power grid, and the whole economy was built around energy-intensive industries such as metal refining and chemicals. In

plant.¹² In February 2001, Putin dismissed Energy Minister Aleksander Gavrinn, and at the same time he removed Nazdratenko from office. However, rather than being arrested as most observers anticipated, Nazdratenko was promoted, to become head of the State Fisheries Committee. (See Elizabeth Wishnick's chapter in the first volume of this work for a detailed discussion of Nazdratenko and Primorskii Krai.)

Despite Nazdratenko's departure the same pattern repeated the next winter. Dalenergo shut off three Primorskii Krai cities in December 2001 in response to arrears of R64 billion, and in January and April 2002 some Pacific fleet installations were briefly shut off in Vladivostok and Kamchatka, including the radar tracking the International Space Station.¹³ Putin visited the Far East in August 2002 and told the assembled governors, in his typically laconic style, "The region has more problems than solutions."¹⁴

Ulyanovsk was another problem case. Its governor, Yurii Goryachev, pursued an aggressively antimarket economic policy. In December 2000 he was replaced by Vladimir Shamanov, an ex-general who was elected with Kremlin backing. However, Shamanov faced street protests in November 2001 when he raised utility prices, even though the new fees still only covered 48 percent of the cost.¹⁵ The Ulyanovsk regional *energo* owed UES more than R3 billion for past deliveries. Putin met with Chubais and advised him to "reach an informal agreement with regional leaders" in Ulyanovsk.¹⁶ However, the region again ran up R90 million worth of debt in 2002. In January 2003, street protests and threats of action from the procurator forced Shamanov to rescind a proposed 43 percent utility rate increase.¹⁷ The same month in Ulyanovsk region eighty people protested the termination of electricity for their village of Silikatnyi by blocking the Volgograd-Kazan railway line. (Shamanov had the power restored by paying the unpaid R700,000 bill.)

In November 2001 UES cut electricity supplies to Kalmykia by 50 percent because the republic owed \$20 million for past deliveries—the equivalent of two years' supply.¹⁸ In Tomsk in January 2002 the city tramlines were cut off. In Smolensk, the presidential representative persuaded Governor Aleksandr Prokhorov to transfer ownership of the city's distribution company to the *energo* in partial payment of energy debts.¹⁹ Electricity debts in Amur reached R500 million by March 2003, with the city of Blagoveshchensk facing periodic outages. Governor Leonid Korotkov decided that the media were to blame. He told a press conference "Will you, journalists, feel good if you get high royalties for your inflammatory articles but those articles lead to the bankruptcy of the Amurenergo joint-stock company?"²⁰

In late 2003 Kamchatka was bankrupt and had stockpiled less than one-third of the fuel it needed for winter. "A very difficult situation is being aggravated by a public feud between the region's governor and Petropavlovsk Mayor," explained Deputy Prime Minister Vladimir Yakovlev.²¹ As of Janu-

ary 2004 Petropavlovsk owed R84 million and needed an additional R174 million for new fuel oil supplies.²²

In Moscow, residents were more protected than elsewhere, with fees covering only 17 percent of the cost. This meant that 43 percent of the Moscow municipal budget was spent on subsidizing housing and utilities.²³ In 2002 the council decided to move towards 100 percent cost recovery for those with incomes above R8,500 (\$300) a month—but fully two-thirds of residents fell below that threshold and would continue to be subsidized.

THE PROBLEM OF MONOPOLY REGULATION

Even mature capitalist economies face daunting problems in devising policies to regulate monopolies, especially what are often called "natural monopolies."²⁴ In the 1980s, from Latin America to Europe it was fashionable to deregulate these industries: shifting assets from state to private ownership and promoting competition in the provision of these services. The results were mixed, producing some catastrophic failures even in mature capitalist economies, such as the California energy crisis of 2000 or the grid failure in the United States and Canada in August 2003.²⁵

A "natural monopoly" is a sector where for technical reasons it is most efficient to have a single provider of the product or service in question, and where demand is fairly price-inelastic due to lack of close substitutes. "Natural monopolies" are not the product of Mother Nature, but the result of past decisions about what kind of infrastructure to build. "Infrastructure monopoly" is a more appropriate and less loaded term to use than "natural monopoly."

In the absence of fair market competition, infrastructure monopolies become inefficient and wasteful. Cost-plus pricing gives no incentive to cut waste or phase out inefficient technologies. Strict price controls squeeze profits and deter new investment. The problem is particularly acute in the Russian economy, since for seventy years the infrastructure was developed on non-market principles. Simply lifting price controls, as was done with most industries in 1992, would not solve the problem since monopoly suppliers could simply hike prices without fear of competition.

Monopoly reform faces both practical and theoretical problems. On the conceptual front, economic theory has found it difficult to come up with market-based solutions to the provision of goods and services in sectors dominated by a single or small number of producers. There is no easy off-the-shelf global "best practice" solution for Russian reformers to adopt.

On the political front, the maintenance of the infrastructure monopolies became an integral part of the political, economic, and social fabric of Russia during the 1990s. For the men in charge of those companies, it meant fortunes

the chaotic mass privatization of 1992–1994 and the corrupt “loans for shares” privatizations of 1995–1996. In 2000 Putin gave Chubais the green light for reform, and left it up to him to bargain with business interests and regional leaders and come up with a plan that could be passed into law by the Federal Assembly.

Chubais’ dogged pursuit of electricity reform has been an impressive political achievement. Given the hostility towards Chubais felt by most of the Russian public and by many of his business rivals, it was only Putin’s political protection that enabled Chubais to play the role that he did. The whole process stretched out over four years, and is still not complete. It would thus be premature to try to judge the success of a reform that is still, as of mid-2004, only half-implemented.

THE POLITICS OF POWER CUTS

Civil society and social movements are exceptionally weak in contemporary Russia. Workers do not strike even if they are not paid for months, and ordinary citizens rarely take to the streets to protest the war in Chechnya, arrears in pensions, or anything else. But in Russia’s fiercely cold climate, dramatic images of schools or apartment blocks being shut off from electricity and heat still have the capacity to trigger a strong political response. People take to the streets in protest, the national media shows up, and mayors, governors, and presidential representatives leap into action.

The fact that the electricity sector was undergoing market reform between 2000 and 2004 heightened the tension. “The energy sector serves two masters. On one side, it is going over to business principles. On the other side, the sector is regarded by politicians as an instrument of social services.”³

Most apartments were privatized in the course of the 1990s, but house and flat dwellers remained heavily dependent on the communal service organizations that provided them with heating, gas, electricity, and water, and looked after building repairs, garbage disposal, and the upkeep of common areas.⁴ These agencies were typically run by the local municipality. Some housing was owned by industrial enterprises, but in the course of the 1990s most of these loss-making operations were transferred to local councils. Housing units run by municipalities are less likely to be subject to disconnection than housing that is still owned by a bankrupt company or farm. Consumption of heat and gas by individual households was typically not metered. One-third of the heating for houses is provided by cogeneration from power stations run by UES.

Residents lobbied to prevent utility price increases. Even though federal standards said that customers should pay 90 percent of heating costs, in prac-

tice most councils were only able to recover 40 percent of costs through user fees.⁵ Part of the problem is the long list of categories of residents (low income, pensioners, veterans, etc.) who are exempted by federal legislation from paying the full fees. In 2001 housing services cost a total of R360 billion (\$13 billion) nationwide, of which only R170 billion was paid by the residents.⁶ Unable to bridge the gap, municipalities ran up arrears with UES, who threatened to cut off nonpayers. (The first step is usually reducing the temperature of the hot water, and not a complete closedown.) The municipalities in turn complain that UES is badly run, failing to provide the required heat or accurate and timely reports of the services provided.⁷

Nonpayment was a nationwide problem in 1997–1998, but by 2000 it was concentrated in a few troublesome regions that had inadequate local power supplies and particularly inept or corrupt governors. The problem regions included Ulyanovsk, Kalmykia, Amur, Primorskii Krai, and distant Kamchatka. According to Mikhail Delyagin, in winter 2001–2002, 100,000 people experienced electricity or heating cuts lasting more than a day; but in 2002–2003 as a result of the tariff increases, the number rose to 2.1 million people.⁸

Particularly hard hit were regions in Siberia and the Far East that generated power with coal imported from other provinces.⁹ Coal corporations like Rosugol and the railways were less willing to sell and deliver on credit than were UES and Gazprom, which provide the power in European Russia.

Primorskii Krai was the setting for the most protracted and nasty energy war. Inept and corrupt leadership combined with a collapsed economy, an excess of military facilities, a virulent mafia, and high transport costs from European Russia to produce a chronic electricity crisis. Payment arrears and power outages dogged the region throughout the 1990s. During his nearly two-term tenure, Governor Yevgenii Nazdratenko built up a powerful set of allies among his fellow governors and in the federal government.

Things came to a head in the summer of 1999, as Nazdratenko prepared for reelection that December. First Deputy Prime Minister Nikolai Aksenenko, a foe of Chubais and hence a friend of Nazdratenko, visited Vladivostok in July and ordered UES to solve the debt problem by cutting tariffs.¹⁰ Nazdratenko won the election, and in September 2000 he secured the appointment of his deputy governor, Yuri Likhoda, to be director of the regional electricity company, Dalenergo.

However, each winter saw the same pattern in Primorskii Krai: the suspension of coal deliveries because of nonpayment, causing shutdowns of electricity for hours at a time, leading to street protests and frantic appeals for help to Moscow. The winter of 2000–2001 was particularly cold, and nationwide the federal government doled out R14 billion in extra assistance for fuel purchases.¹¹ Spring 2001 saw a wave of protests from Ivanovo to Yekaterinburg, where military police acted to prevent the cutoff of power to a defense

The “shock therapy” of price liberalization in 1992 quickly brought market forces into play in most areas of the Russian economy—but energy and utilities were exempted, with prices in those sectors remaining under state control. Similarly, privatization moved swiftly in retailing and manufacturing, where state ministries were broken up into independent corporations based on individual plants. But the Yeltsin government ducked the question of privatization of the infrastructure monopolies, so it was left up to the Putin administration to devise an ownership structure and regulatory framework for these sectors.

Putin focused his attention on this issue soon after taking office as acting president on December 31, 1999, but the complexity of the problem and the political controversies that it engendered meant that there was scant progress during the four years of his first term in office. In his annual address to the Federal Assembly on May 16, 2003, Putin acknowledged the problem. “State tariffs for the products and services of the infrastructure monopolies are increasing at a higher rate than the growth of prices in the free sector of the Russian economy. As a result, the excess distribution of economic resources in favor of the monopoly sector is increasing, and its share of the Russian economy is growing. Meanwhile, this monopoly sector is not showing great efficiency. Thus the monopolists are suffocating the competitive sector of our economy.”¹

The infrastructure monopolies, together with public housing, are all tightly connected. The railways carry the coal that generates much of the electricity that powers the railways and heats the housing. Altering the price or operating conditions of any one of these industries has an immediate impact on all the other links in the chain of monopolies. However, in the interests of clarity and brevity, this chapter will concentrate on the reform of the electricity sector, leaving aside Gazprom and the railways.

A REGIONAL CHALLENGE

Reform of the infrastructure monopolies was also a central element in Putin’s drive to reestablish the power of the federal center over regional leaders. Regional governors and republican presidents had managed to gain effective control over regional electricity companies during the Yeltsin years, so the Putin reform would involve stripping them of their power to influence the distribution and pricing of electricity on local markets.

Russian consumers were used to cheap, highly subsidized power. They were willing to protest, in the streets and at the ballot box, when efforts were made to hike prices or, worse still, to cut off factories, public institutions, or housing complexes for nonpayment of utility bills. Typically, municipal authorities and regional governors colluded with these popular protests, plead-

ing with federal authorities for relief and passing responsibility for the crisis up the chain of command to Moscow.

At the same time, the management of gas, electricity, and railways was the object of vigorous contestation among Russia’s new private business elites. Access to cheap sources of local energy was the key to success in Russia’s booming metals and chemicals industries, which were earning tens of billions of dollars in exports. On the other hand, the companies producing oil and natural gas wanted to minimize domestic sales and maximize exports. The export price for oil was twice as high as the domestic price, and for gas five times as high. Export customers were also more reliable when it came to paying their bills, and more useful when it came to hiding revenue from the tax man through transfer pricing.

Regional political leaders usually cooperated with the oligarchs who ran local factories to ensure that cheap power stayed within their province, providing jobs and tax revenue. By the end of the 1990s there were several cases of business leaders themselves being elected as governors, such as Sibneft’s Roman Abramovich in distant Chukotka (see Natalia Zubarevich’s chapter on big business in this volume). Sometimes oligarchs and governors fell into vigorous and occasionally violent conflict. The Yeltsin administration’s policy of decentralization after 1994—signing bilateral treaties giving special powers to individual regions—had compounded the problem.

In 1992 the electricity industry was turned into a national monopoly corporation, Unified Energy System (RAO UES). Seventy-two legally independent regional generating companies (AO-Energos) were created, with UES holding a majority stake in most of them. The power to set electricity prices devolved to Regional Energy Commissions (REKs) that were set up in most of Russia’s eighty-nine federation subjects after 1996.² In most regions control over decision making in the AO-Energos and REKs quickly fell into the hands of the regional governor or republican president, although some regions saw fierce battles for control between rival groups. This deeply embedded patronage system thwarted efforts by electricity managers to reform prices with a view to promoting greater efficiency and stimulating much-needed investment.

Thus Putin faced a huge challenge in breaking up these cozy regional relationships and freeing the sector to embark on the daunting task of reform. Devising a system for operating the electricity industry in the context of Russia’s new market economy would not be easy; implementing such a system would be even more difficult.

Putin did not come into office with a blueprint for change. The main force driving the electricity reform was Anatoly Chubais, who was appointed head of RAO UES in 1998 and still held the post as of 2004. Chubais is perhaps the most controversial figure in Russian politics, being held responsible for

to fifty-four. See Nikolai Medvedev, "Biurokratizm, zameshannyi na dollare," *Nezavisimaia gazeta*, May 30, 2002.

70. Vyacheslav Baskov, "Repetitsiia razgroma," *Obshchaia gazeta*, no. 47 (November 22, 2001).

71. This procedure, established by a presidential decree, contradicted the Civil Code, which states that registration is the function of the Justice Ministry. See Andrei Galiev, "Malomu biznesu predlozhen novyi dialog," *Ekspert*, no. 44 (November 22, 1999): 6.

72. The fourth law, "On technical regulation," passed at the end of 2002, lays the foundations of a unified approach to technical regulation and standardization. See Marina Sokolovskaia, "Doliu vziatok v sebestoimosti obeshchaiut snizit'," *gazeta.ru*, January 31, 2003.

73. Oleg Zamulin, "Ottepel'," *Ekspert*, no. 13 (April 7, 2003); and Oleg Zamulin and Yekaterina Zhuravskaia, "Malyi biznes: luchshe ne znachit khorosho," *Vedomosti*, February 18, 2003.

74. "Ot redaktsii: Malyi proryv," *Vedomosti*, January 29, 2003.

75. Irina Khakamada, "Malyi biznes: chto v Davose khorosho, v Rossii," *Vedomosti*, February 10, 2003.

76. Irina Khakamada and Anastasia Onegina, "Kudrin otkazal Iuzhanovu," *Vedomosti*, March 5, 2003.

77. Zamulin, "Ottepel'."

78. Khakamada, "Malyi biznes."

79. Natalia Neimysheva and Dmitrii Simakov, "Gref poka bessilen," *Vedomosti*, July 26, 2002.

80. Maxim Rubchenko and Aleksandr Ivanter, "Zakat reform," *Ekspert*, no. 1 (January 13, 2003): 23; and Aleksandr Petrachkov, "MNS izgotovilo putevoditel' po biznesu," *gazeta.ru*, April 28, 2003. The attempts to lower small business tax burden in 2002 also were criticized. See Oganian, "O gosudarstvennoi," 49.

81. Bekker, "Biurokratov ukrotiat v dva etapa"; Natalia Neimysheva and Boris Grozovskii, "Vse proshche i proshche," *Vedomosti*, February 21, 2003. The taxes on small businesses are also being revised; see Ivanova, "'Malen'kie' dozhдали's'."

82. See, for example, Ye. V. Popovskaia, "Opyt provedeniia obsledovaniia malykh predpriatii v Goskomstate Rossii," 22.

83. Goskomstat Rossii, *Regiony Rossii*, vol. II (2001), 334.

84. Goskomstat Rossii, *Regiony Rossii*, vol. II (2000), 366.

Power Struggle: Reforming the Electricity Industry

Peter Rutland

Reform of the electricity monopoly is a fascinating case study of the confluence of three major trends in Vladimir Putin's political strategy: strengthening central power, introducing market competition, and reining in the oligarchs. Studying this reform helps us to understand Putin's apparently paradoxical pursuit of both authoritarian power and market reform.

The privatization of the electricity industry should increase efficiency and stimulate investment. At the same time, it will weaken regional leaders who have used their control over local energy companies to subsidize municipal housing and favored industrialists. By creating a more competitive energy market, the reform should thwart oligarchs bent on capturing cheap local energy sources.

During his first term as president, Putin accumulated an impressive record in economic policy. Gross domestic product (GDP) grew at an average of 6 percent a year and important tax and legal reforms were implemented. However, there was still much unfinished business. Seventy years of central planning followed by ten years of "wild capitalism" left a mass of problems to address. After 1991 powerful groups emerged, such as the business oligarchs and regional leaders, who developed a strong vested interest in preserving the gains they made in the first half of the decade, and who resisted further reform. Probably the most serious challenge was the pervasiveness of corruption and accompanying lack of rule of law, problems that will take decades to solve.

Among the unfinished business left for President Putin was the infrastructure monopoly problem. Russia inherited from the Soviet Union an economy structured around huge centralized monopolies controlling the natural gas, coal, railways, and electricity industries, and the network of oil and gas pipelines.

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