

Reform of Russian Power Industry⁰

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Abstract

This paper takes a critical look at the challenges and achievements in the reform of the Russian power industry. Russian politics emphasized restructuring and privatization, which are widely seen as preconditions for attracting private investment. However, progress along this line has been slow and there is little hope that the current deadlock may be overcome anytime soon. This paper argues that the main problems of the sectors originate from the regulatory system, which is why tariff reform is the key issue.

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1 Introduction

In spring 2001, Arthur Andersen Consulting presented a report outlining the blueprint for reform of the Russian power industry to the Ministry of Economic Development. In line with the proposals from the management of RAO UES it called for vertical separation of generation and transmission, establishment of a competitive wholesale market and liberalization of tariffs including the abolishment of cross subsidies, and the centralization of the remaining regulatory functions. In essence, it proposed a model, which was implemented in England in the early nineties. At the time, this blueprint for reform was very much to the taste of western mainstream consultants, though it immediately raised concerns about the protection of the interest of minority shareholders during restructuring.

After almost two years of intensive debates, the State Duma finally passed a package of laws, on which Minister of Economic Development and Trade, Gref, was quoted to claim that it put Russia 'on the list of countries that have managed to create a market in the power sector'. Even a superficial glance at the package reveals that this claim is exaggerated, to put it mildly. In essence, the Duma endorsed the government to reform the sector — somehow, if it likes to do so, but certainly not too fast. The legislation remains vague as to the direction or timing of reform, the details of the wholesale market or the rules of tariff setting etc. In this sense the government has a free hand. It may decide to move or to keep things as they are for an indefinite transition period. However, should it move, then it is prevented from full liberalization of the market before July 2005, and even afterwards up to a third of power generation has to be sold under regulated prices to enable distributors to maintain low prices for private households. It is also not allowed to sell its stakes in hydro-plants. As the government owns a majority stake in RAO UES, which gives it, in principle, a strong leverage over the company, it is in fact difficult to see what the government can do now, what it could not do before the vote. With respect to tariff setting, the federation council blocked the attempt to curb the power of regional energy commissions by centralizing tariff regulation. In any case, two years ago the purpose of centralization was to prevent regional commissions from keeping tariffs unreasonably low. Today, with presidential elections approaching, the Federal Energy Commissions worries that regions raise tariffs too fast.

All together, this easily creates the impression that the last two years have been lost: A clear cut concept for reform has been watered down beyond recognition. The resulting legislative package allows the government to claim a success without making much change on the ground.

However, in this paper we argue that from the very beginning on the plans for reforms, did little to address the main problem, tariff regulation. The reformers failed to establish a credible regulatory framework and to develop clear targets for tariffs, in a vague hope that privatization and competition would make these painful steps redundant. Instead of focussing on tariff reform, much energy was wasted on the issue of restructuring, which appears neither necessary nor sufficient for attracting investment and increasing the efficiency of the power industry. Restructuring and privatization in the presence of a murky regulatory framework, however, invites exactly the kind of asset grabbing, which many critics fear is the ultimate aim of some key proponents of the reform.

The paper is divided into three sections. The first provides a critical assessment of the current state of the Russian power industry. The second reviews the recent attempts to reform the industry. In the third section, we argue why, under the present conditions in Russia, tariff reform should clearly precede restructuring and privatization.

2 The Russian Power Industry

2.1 Basic Features

	1990	1995	2000
Capacity (GW)	213,3	215,0	212,8
thermal	149,7	149,7	146,8
hydro	43,4	44,0	44,3
nuclear	20,2	21,3	21,7
Production (TWh)	1082	860	878
thermal	797	583	582
hydro	167	177	165
nuclear	118	100	131
Source: Goskomstat data			

With an installed capacity of about 215 GW the Russian power industry is about the same size as the Japanese, or the French and German industries put together. About 70% of the capacity consists of thermal plants, of which about 62% are fired with natural gas, 30% with coal and 8% with fuel oil. Hydro stations and

nuclear power stations contribute a little more than a fifth and a tenth of the capacity, respectively. A particularity of the Russian energy system is the high share of thermal cogeneration-plants, which provide the backbone of the heating system in the cities. They account for about a third of the capacity, but being used more intensively, they produce half of the electric power. While installed capacity changed only little, production decreased in response to the steep decline of demand, falling by about 20% from its 1990 Soviet-era peak. Over the same period peak-load consumption of electric energy fell from 160 GW to 130 GW. This trend reflects the economic decline during the period of transition and came to an end during the late

nineties. As nuclear and hydro stations have low operating cost compared to thermal stations, the latter have been hit most by the drop in demand. The last years witnessed a modest increase in demand, but the electric power industry still has large overcapacities. After a decade of very low investment, however, there is an increasing need to replace and upgrade worn out equipment.

An outstanding feature of the structure of electricity consumption is the large share of high voltage industrial customers. Leaving losses and internal consumption aside, they account for about sixty percent of the final demand. Although residential consumption, included in column ‘other sectors’, has increased

Consumption	1990	1995	2000	2001	90/01
	TWh	TWh	TWh	TWh	%
Industry	625,9	440,2	455,9	462,8	-26,1
Transport	103,8	65,2	60,9	63,1	-39,2
Agricultural	96,4	88,6	68,1	63,0	-34,6
Construction	18,8	12,4	10,0	9,9	-47,3
Other sectors	144,7	150,5	167,2	171,1	18,2
Subtotal	989,6	756,5	762,1	769,9	-22,2
Losses ^a	84,2	83,5	101,6	105,5	25,3
Total	1073,8	840,4	863,7	875,4	-18,5

^a from 1998 on incl. losses in intercity network.

Source: Goskomstat data.

substantially over the past ten years, its share is still small by international standards. This is also true for low voltage commercial demand. In relative terms, the decline of demand in transport, agriculture and construction was sharper than in industry. Nevertheless, due to the sheer size of industrial power consumption its decline between '90 and '95 had the most dramatic effect. The drop has been larger than today's total consumption of the residential and commercial sector together.

Within the industrial sector metallurgy accounts for the largest share of the consumption. Its role became even more prominent during the economic decline. With less than a 10% decrease of consumption it fared better than the energy sector (oil, gas, coal) whose consumption dropped by a fifth. Both together account now for two thirds of the industrial consumption.

Consumption in industry^a	for 2001		90/01
	TWh	%	%
Total	352.6	100.0	-30.4
Oil, gas, coal	66.5	18.9	-20.3
Metallurgy	153.9	43.6	-9.5
Engineering	41.6	11.8	-55.2
Chemical industry	39.9	11.3	-42.3
Timber industry	19.2	5.4	-35.4
Light industry	4.9	1.4	-66.9
Food industry	10.3	2.9	-20.2
Construction materials	11.1	3.1	-49.8

Source: Goskomstat data

^a Only for large-scale and medium-scale firms excluding electric power industry.

At the same time, oil, gas and metallurgy provide the economic base for the most powerful Financial Industrial Groups in Russia. Most other sectors experienced a reduction of consumption between one and two thirds. As these trends were driven by economic decline, the traditionally low energy efficiency of the Russian economy did in fact fall

even further. The index of energy intensity, i.e., the ratio of industrial power consumption to output, increased to 143 in 1998 compared to the base year 1990 and fell to 128 since then. Yet, it is not clear to which extent this reflects (i) a structural shift towards more energy intensive industries, in particular non-ferrous metallurgy, (ii) underestimation of output in the shadow economy or even (iii) a true decline of energy efficiency.

2.2 Structure of the Power Industry

The current structure of the Russian electric power industry was shaped during a hasty and half-hearted privatization in the early 90th. The Government divided all non-nuclear stations between RAO UES and 74 regional energos while the nuclear power plants remained under state ownership. One nuclear plant was managed by the Ministry of Energy, all others by Rosenergoatom. In 2002, Rosenergoatom was consolidated into a generating company operating all nuclear plants including the newly commissioned Volgodonskaya Nuclear Power Plant.

Market Structure

UES plants	25 %
UES energos	49 %
Rosenergoatom	10 %
Irkutskenergo	6 %
Tatenergo	3 %
Krasnoyarskaya GES	3 %
industrial plants	4 %

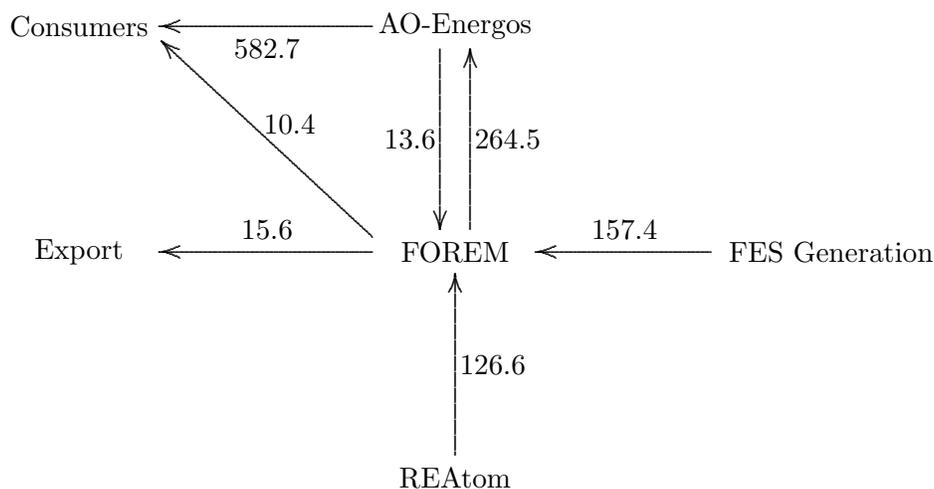
The distribution network, the regional transmission lines and some trunk lines connecting power plants and large customers to the interregional grid, were given to regional energos, which were granted a local monopoly on distribution. In addition, they obtained the majority of generation assets in their respective region including the cogeneration plants, giving them a 80% share in the heat-generation capacity.

However, most large hydro-stations and fuel-fired stations were given to RAO UES which also gained ownership over the high voltage transmission network and over the central dispatching unit, which manages interregional electricity flows.

The Federal Government retained a majority stake of 52,55% in RAO UES, which in turn was made a holding company for, mostly controlling, stakes in the regional energos. The remaining shares were given to employees or sold in voucher or cash auctions. Due to the weakness of the central government at that time the implementation in the regions proved to be difficult.¹ In particular Irkutskenergo and Tatenergo with a combined capacity of 9% prevented the transfer of shares and remained independent from UES. In 1999 UES lost control over the Krasnoyarsk hydroplant which was acquired by an aluminum smelter but it gained a controlling majority in Moscow's regional energo, Mosenergo, by handing over two large power plants. Today RAO UES controls almost three quarters of the installed generation capacity either through stakes

¹See Opitz (1999) for further details.

Figure 1: Energy Flows in Energy System in 2001 (in TWh)



in large power plants or in 72 out of 74 regional energos.

As many other industries UES was plagued by inefficient administration and poor internal controls allowing embezzlement and theft. Political conflicts with regional governments made it difficult for the company to establish control over its local subsidiaries and to implement a consistent strategy to cope with increasing problems of non-payment and barter deals. In spite of huge capacities, the security of power supply was undermined by unpaid fuel-bills and increasing wage-arrears. In 1998, Anatoly Chubais was made CEO of RAO-UES to bring the house in order. The following three years witnessed a successful corporate turnaround. Chubais put together a new team of top managers and replaced almost four out of five of the general directors at UES' 250 subsidiaries. By reorganizing sales, insisting on cash-settlements and cutting off non-payers, UES almost wiped out barter-deals, of which 40% were hidden losses anyway, increased cash-collection to almost a 100% and started to recollect debts. In 2001, the company reported its first profit of \$16.7 million under international accounting standards, compared to a loss of \$12 million in 1999. Investment almost tripled during same period.

The current Federal Wholesale Market of Electricity and Power FOREM was established by presidential decree in 1995, giving UES a 80% stake and Rosenergoatom the remaining 20% in the venture. About 44% of the final demand for electricity is obtained through the wholesale market. Since the largest power plants were transferred to UES and Rosenergoatom, they are the main suppliers to the wholesale market, together accounting for about 95% of total supply

(see figure 1 for details). The remaining 5% are provided by a small number of ‘surplus’ energos (Irkutskenergo, Tyumenenergo, Yakutskenergo, Orenburgenergo, Mosenergo). Regional energos account for 91% of the demand while the direct participation of large industrial customers contributes only a minuscule 4%. However, FOREM does not operate like a proper market. UES turned it into a clearing mechanism for power transactions carried out according to its own schedule.

There appear to be problems with the current structure. RAO UES is accused of abusing its monopoly over the interregional high voltage grid and the wholesale market by preventing its competitors (Rosenergoatom) from access to the most lucrative customers, including exports, and by overcharging regional energos using the proceeds for new investment in generation. Regional energos, in turn, are blamed for abusing their franchise monopoly by favoring own production over cheaper supply from the wholesale market and their control over important trunk lines to prevent large industrial customers from direct access to the wholesale market. However, the substance of these claims is difficult to judge. In any case, there is little evidence, that the roots of the problems are to be found in the structure of the industry. This paper argues that it is mainly the ‘rules of the game’ and in particular the regulation of tariffs, which have to be blamed for the difficulties.

2.3 Regulation of Tariffs

Regulatory Framework

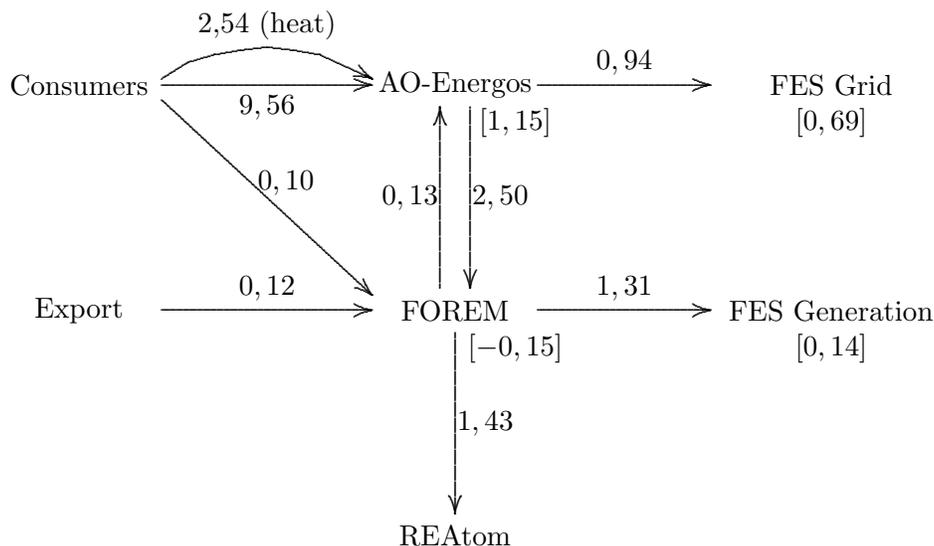
The legal framework for the regulation has been established in the Federal Law 41 ‘On Government Regulation of Electric and Heat Energy Tariffs in the Russian Federation’ which has been amended several times since its introduction in 1995. In principle, tariffs at the wholesale market and the usage fee of the transmission grid are regulated by the Federal Energy Commission (FEC) which is also in charge of domestic prices of gas and transport tariffs. Regional Energy Commissions (RECs) are supposed to determine tariffs at the retail level. However, many regions were slow to establish local RECs and the relations between the two levels of regulation are not clear. Tariff-setting is also ruled by government regulation. In 2002, the regulation ‘On the Pricing of Electric and Heat Energy’ specified principles for the pricing at wholesale and retail level. It has been supplemented by the Federal Energy Commission through a comprehensive set of ‘Methodological Recommendations’ explaining the details of how to calculate *economically sound cost* based on norms for fuel consumption, depreciation,

capital cost etc. In principle, tariffs should be set (i) to allow for cost-recovery and (ii) to leave enough funds for investment. It is worth emphasizing that the second principle leaves the decision over investments plans with the regulator.

In practice, however, all these detailed regulations, methodological recommendations etc. appear to be of fairly limited importance. Although the Federal Energy Commission regularly prepares proposals for the adjustment of tariffs, these are largely ignored once the political bargaining over the annual tariffs-hikes starts. Usually the big utilities Gazprom, RAO UES and the Railway Ministry negotiate simultaneously with the government. The utilities justify their demand for higher tariffs by pointing out cost increases and urgent investment needs. The ensuing political debate, however, will reflect all aspects of energy tariffs, from social hardships to pressure on inflation. Moreover, in Russian politics, there is very little agreement even over the basic principals of tariff policy and opinions on tariff increases cut across the usual political alliances. It is difficult to judge who makes the final decision, but the involvement of the prime minister or even the presidential administration is obvious. As this procedure is repeated at least once a year, accepted costs appear to follow closely previous cash-expenses and the tariff hike reflects a political trade-off between the need to provide some funds for investment and the desire to keep energy costs low.

At the retail level, regulation sets different rates for different groups of customers. As Regional Energy Commissions are often heavily pressured by local governors, the process of tariffs setting is even more politicized and opaque than on the federal level. Moreover, the regulation of retail tariffs suffers from a lack of coordination between regulation at the federal and at the regional level. In particular, there is no mechanism to translate an increase of fuel cost, wholesale tariffs, and average retail tariffs at the federal level into customer specific retail tariffs in the regions. In 2003, for example, already by March, many regions had raised tariffs by much more than the 14% that were stipulated by the government for the whole year. They claimed that rising input prices required sharp tariff increases to avoid regional energos going bankrupt. Since cost-based tariff regulation is legally established, the government was assumed to have little chance of forcing regions to lower prices by court decision. Nevertheless, several regional attorneys initiated legal proceedings and some regions bowed into political pressure and brought their tariff policy back in line with federal targets. Conflicts between regional and federal authorities about tariff policy are nothing new. However, until recently the main concern about regions independently setting tariffs was that tariff increases taking place too rarely or at too small rates would dry out investment resources of regional energos. In the run-up to the elections,

Figure 2: Cash Flows in Energy System in 2001 (in bln\$)



objectives seem to have been reversed.

In order to get a clearer picture of the practical implications of the current regulatory practice we look in more detail at the cash-flows between the different entities of the system, the retail tariff structure and the overall level of tariffs.

Whole Sale Tariffs: Directing Cash Flows within the System

The overall picture of cashflows within the system (figure 2) has been obtained from data on income and cost of the FEC which are given in table 1. The bulk of payments from customers goes to the regional energos which then pay to FES Grid for access to the high voltage grid and to FOREM for energy. At current levels of retail and wholesale tariffs the FEC figures put the energos' profits at 1.1 bln\$ in 2001. FOREM pays for energy mainly to Rosenergoatom and the RAO UES power stations (FES-Generation). In 2001, the average wholesale tariff was about 10\$/MWh, but being set individually for each plant, tariffs vary widely. Operating cost range from 0.5 \$/MWh for the Sayano-Shushenskaya hydro station up to 17.9 \$/MWh for Cherepetskaya, an old coal-fired plant. Accordingly, the two plants sold power at an average price of 1.2 \$/MWh and 20.1 \$/MWh, respectively.² Under the current system of pricing

²Note, that higher average prices for less efficient plants do not necessarily indicate economic inefficiency, since high cost plants should only be dispatched during peak load when the marginal value of power is high.

according to individual plant cost, no power station can make significant profits. Obviously, this would change when cost-based pricing would be replaced by uniform pricing as it is the case in most competitive systems. Such a move would make most hydro-stations and some of the newer gas-stations highly valuable assets. In 2001, the FOREM run an operational loss of 0.14 bln\$ while FES Generation, i.e., the power plants of RAO UES, made a profit of 0.14 bln\$. All regional energos have to pay a fixed fee for the usage of the transmission grid, which is based on their total deliveries to final customers, not on their volume of trade in the whole-sale market. In the recent past, grid fees have been increased to provide RAO UES with the means to finance investment. Hence, FES grid became the point in the whole-sale market where profits accumulated. In 2001, grid profits reached 0.7 bln\$ out of a revenue of 0.9 bln\$. Obviously, access fees to the grid do not reflect economically sound costs but the political desire to accumulate resources at a particular point in the system. As it happens, it is the only one which is under complete control of RAO-UES. Not surprisingly, this policy remained controversial and independent energos refused to pay grid fees in 1999. Overall, the current regulation of grid fees and wholesale prices can be understood as a system of transfer prices, which allows profits to be shifted fairly easily within the system.

Tariff Level: Subsidizing the Economy?

Since the collapse of the Soviet Union power tariffs have decreased in real terms from their already low levels. In 1998 devaluation brought a further sharp drop of tariffs in dollar terms, down to less than a tenth of the European average. Since then, tariffs have steadily increased in real terms. Nevertheless, the level of power tariffs in Russia has drawn a lot of criticism for being far too low by international standards. Recently, the issue has also been raised in trade negotiations. The American and European metallurgic industries argue that low tariffs constitute an unwarranted subsidy to their Russian competitors. However, the appropriate price for power in Russia cannot be derived from tariffs in other countries but from the cost of power supply in Russia.

At the current level of average retail tariffs of 17\$/MWh the power sector runs a profit of 1.83 bln\$ according to the calculation of the FEC (see the consolidated figures in table 1). The most important single cost item are fuel costs, almost two thirds of which are expenditures on natural gas. RAO UES spends about 2.5 bln\$ on gas annually at a regulated price of 19\$/tcm. Since the cost of coal, the second largest item in the fuel bill, heavily depends on regulated

rail freight rates, these too are affected through tariff policy. On the other hand, the cost of Gazprom, the coal industry, and the Russian railway depend on regulated power tariffs. Hence, the first, and perhaps most important observation, is that the profits in the power industry are at the mercy of the regulator, not only from the side of revenues but also from the side of cost. In particular, uncompensated changes of gas tariffs can move profits easily between the power industry and Gazprom. Any improvements which can be achieved in areas such as labor productivity, efficiency of dispatch, marketing etc. are quite irrelevant compared to the impact regulatory decisions have on the profit of RAO UES. Anyone who invests in the sector under the current regime simply takes a bet on future regulatory policy.

Concerning the adequacy of the average level of power tariff, two questions have to be answered: (i) how should tariffs be set at given fuel costs and (ii) how should gas prices and, less important, freight tariffs be set to achieve adequate fuel costs.

Since current fuel costs, labor costs and repairs can be covered by revenues, the first question is essentially one about the return on the provision of power capacity. Efficiency requires that capacity should earn a return when capacity constraints, accounting for safety margins, are binding. For an industry which happens to be in long run equilibrium, this implies that tariffs have to ensure a competitive (risk adjusted) return for the replacement cost of capacity. Even at current fuel prices, this would require at least a doubling of average tariffs. However, as argued above, the Russian power industry still faces substantial excess capacities even at low tariffs. From the point of view of economic efficiency, it is therefore quite appropriate not to pay a return on the provision of capacity.³ Given current overcapacities it is sufficient if tariffs are high enough to generate funds for repairs. However, at some point in the future when capacities are fully used, tariffs would have to increase sharply in order to signal the new scarcity to consumers and to justify investment.

While such a bang–bang approach has some theoretical appeal, common sense suggests to adopt a more gradual approach in practice. Already for political reasons tariffs can only be increased gradually. Such an increase is also needed in order to obtain a clear picture of what capacity is truly needed in the power industry in the long run. It is to be expected that even modest increases in tariffs will induce the Russian industry to become more energy efficient and, hence, prevent scarce funds from being wasted on investment in new capacity in power generation and transmission. Delaying the adjustment has long–term structural effects as new investment is

³In a market economy, the role of prices is to balance demand and supply, not to provide a return on excessive investment in the past.

guided into sectors of industry, transport and agriculture which appear profitable only because they obtain power cheaply. Although the only practical way to improve the energy efficiency is to increase tariffs, it is difficult to come up with an optimal price path for the adjustment from excess capacity to a balanced situation. Arguably, an increase in the range of 5 - 10\$/MWh appears reasonable.⁴

However, this neither implies that the additional revenues, should necessarily accrue to the owners of the existing facilities nor that they should be spend on investment in the power industry. The capacities of the Soviet area were privatized under a particular regulatory regime. It distributed the rents from past investment among electric power users through low prices. If this regime is changed and tariffs are raised to a level which attracts new investment, rents will be redistributed. They may be left as a windfall profit to current shareholders or be shifted to society at large through the tax system.

At first glance the question of adequate gas tariffs looks similar to power tariffs. When the Soviet Union disintegrated, demand plummeted on the background of large production and transportation capacities. However, natural gas can always be saved for the future to extend the usage of existing fields and to delay the high cost of developing new fields. It can also be exported. Currently, the Russian power industry pays for gas less then a fifth of prices in Western Europe, and not even half of the 44\$/tcm Russia agreed to pay for gas imports from Turkmenistan in the near future. Hence, there can be little doubt that gas tariffs should increase at least by 20\$/tcm which would justify an increase of average power tariffs for customers by approximately 4.5\$/MWh.

Taken together, this would justify an immediate increase of average tariffs by 10 – 15 \$/MWh yielding a reasonable level of tariffs in the range of 28 – 33 \$/MWh.

Tariff Structure: Diverting Cash out of the System

A much criticized feature of retail tariff regulation is cross subsidization between different groups of customers. As the figures in table 2 show, residential tariffs are much lower than industrial tariffs. And in particular, medium voltage industry and commerce pay the highest rates.⁵ As with the level of tariffs, cross-subsidization raises two issues. First, it is often taken for granted

⁴Renaissance Capital (2002) estimate a somewhat higher range of 6–14 \$/MWh from international figures on capital expenditures.

⁵There is however substantial variation in the degree of cross-subsidization across regions. In some regions agriculture obtains electric power cheaper than industry and city residents. In other regions it is the opposite.

that cross-subsidization is economically inefficient. Second, it is important to understand who would gain and who would lose if the rents created by cross subsidization were abolished during the reform.

It is a sound economic principle to charge every group of customers tariffs as close as possible to marginal cost. As it is more expensive to serve low voltage customers this would, in fact, require higher tariffs for residential users. However, if tariffs deviate from marginal cost for some reason, then the elasticity of demand has to be taken into account. The stronger demand responds to a change in price, i.e., the higher the price elasticity of demand, the more important it is to keep tariffs close to marginal cost in order to minimize the efficiency loss from price distortions. As a rule, industrial users have a much higher price elasticity than households. In Western countries, where prices are usually *above* marginal cost in order to recover fixed cost of capacity, tariffs for residential users exhibit a higher ‘mark up’ on marginal cost than those for the industry. In this sense, households subsidize the industry. However, in Russia the situation is reversal. As tariffs are *below* marginal social cost firms increase energy consumption much more than private households in response to low prices for power. In spite of cross-subsidization, Russian households’ power consumption is only half of that of Western European households, whereas the Russian industry consumes more than twice as much as their counterparts (OECD (2002)). In order to limit wasteful power consumption it is, therefore, much more important to bring industrial tariffs close to marginal cost. In other words, from the viewpoint of economic efficiency the current cross-subsidization of residential households by the industry is not a particularly important problem.⁶

Cross-subsidization, however, creates rents which have to be defended in the political process and may be threatened by economic reform. In this respect, the most remarkable feature of current retail tariffs are the highly favorable rates for ‘resellers’. With an average tariff of 9\$/MWh these firms obtain power even cheaper than residents who pay 16\$/MWh. They resell it at much higher, privately negotiated rates to industry and sometimes to municipalities. Since resellers do not provide any additional service, the mark up can be seen as a pure profit margin. Resellers are usually politically well connected to the power structures in the regions. They can be seen as an instrument deliberately designed to divert funds out of the current system. If one accepts a tariff of 30\$/MWh as a reasonable figure for power tariffs under the present conditions in Russia, then the implicit subsidy to residents is in the order of 0.85 bln\$ per year,

⁶In fact, rebalancing tariffs, that is increasing household tariffs while decreasing industrial tariffs may even decrease efficiency (Hubert (2002b))

Table 2: Consumption and Tariffs

Groups of consumers	consumption (TWh)				revenues (bln. \$)				tariffs (\$/MWh)			
	95	00	01	02	95	00	01	02	95	00	01	02
Total supply	590	589	592	594	15.84	7.50	9.82	11.63	27	13	17	20
including:												
Industry (≥ 750 kWA)	296	295	301	300	9.32	4.19	5.35	6.11	31	14	18	20
Industry (≤ 750 kWA)	19	24	26	28	0.76	0.45	0.64	0.79	41	19	24	29
Railways	26	26	28	29	0.95	0.35	0.48	0.62	37	13	17	22
Municipal transport	5	5	5	4	0.20	0.07	0.09	0.10	44	16	21	24
Commerce	40	44	47	48	1.58	0.84	1.16	1.33	40	19	25	28
Agricultural consumers	46	25	21	19	0.97	0.27	0.33	0.38	21	11	16	20
Residential	34	46	49	49	0.31	0.38	0.57	0.77	9	8	12	16
residential areas	17	14	13	12	0.17	0.13	0.17	0.19	10	9	13	16
Resellers	107	106	101	104	1.54	0.78	1.01	1.30	14	7	10	13
Transmission	182	172	172	165	2.41	1.08	1.42	1.49	13	6	8	9
Total output	772	760	764	759	18.25	8.59	11.24	13.12	24	11	15	17

Source: compiled from RAO UES Data

while obscure resellers benefit a staggering 1.77 bln\$. This is much more than is collected from residential users at current rates. Even if resellers' tariffs would only be raised to the current rates of railways and municipal transport, revenues would increase by about 1 bln\$. Obviously, this mechanism for milking the power industry creates a strong lobby which will resist any centralization of the regulation of retail tariffs. It is also worth noting that low voltage industry and commerce pay rates which are close to what, according to our estimates, would be an adequate level.

3 The Reform Process

3.1 The New Drive

In contrast to other countries, in Russia, it was the management of the dominant firm, RAO-UES, that initiated a new round of reforms of the power sector. Backed by a study of Arthur Andersen Consulting (2001), it drafted a far-reaching reform plan in spring 2001. Its main focus lay on the attraction of sizeable private investments into the sector (RAO-UES (2001)). UES estimated the investment necessary to ensure reliable power supply at USD 70 billion in the period 2000-2010. Since neither the state nor UES itself were able to provide these funds, it was argued that the sector had to be restructured and the legislative base changed in a way such that private investment became possible and attractive. The way to achieve this was to unbundle and

disintegrate the various functions performed by UES, introduce competition in generation and distribution and reform the regulation and organization of the natural monopolies transmission and dispatch. While all power generators were to be reorganized as independent Joint Stock Companies to enhance competition, and were obliged to sell all their electricity at the wholesale markets (the pools), transmission services were to be concentrated within UES through the purchase of high-voltage transmission lines and regional distribution networks from regional energos. The energos would have been left with little more than the cogeneration plants. Energy transmission (dispatch) was to be administered and controlled by a single system operator. The wholesale market was to be fully deregulated after sufficiently many power generators had begun to sell their power through it. Excluded from the market would only be those regions where technical restrictions to competition applied. Tariffs for power transmission (and generation in the transition period) were to be regulated at federal level by the Federal Energy Commission. They were to consist of two components: the wholesale market price for power plus a transmission component. Cross-subsidization should gradually be abolished. The UES plan emphasized the need to change the legislative base of the sector, which was to prove a stumbling stone for the reform.

RAO-UES' ambitious plan met opposition from various sides including the federal government, in particular presidential advisor Andrei Illarionov, and regional authorities, that were afraid to be stripped off their distribution networks and lose regulative power over regional retail markets. They favored a consolidation of regional energos and wanted to retain vertical integration at regional level, with the national grid company only in charge of the high-voltage network. The division and potential redistribution of assets in the course of the reform has also been a constant concern for minority shareholders, who suggested a pro-rata sharing of property rights as the way forward to avoid violations of shareholder rights. To reconcile the opposing positions the Government drafted its own reform program in Summer 2001, which, surprisingly, was welcomed by both sides.

3.2 The Government's Plan

In principle, the plan still endorsed the idea of vertical separation, but it moderated the RAO-UES proposal in various important points. By 2004, UES was to be split into several power generating companies, a national transmission company, a unified system operator, and a holding company managing stakes in regional energos. The energos were to be consolidated to

form about 40 instead of the now more than 70 companies. However, no detailed schedule was laid out for the vertical unbundling of the energos. The agenda of the reform stipulated that by February 1, 2002, the federal grid company and the system operator should be established, each as a 100% subsidiary of RAO-UES. The responsibility of the grid company was reduced from the original UES proposal to managing only the high-voltage and some important trunk transmission lines, i.e., regional distribution networks were to be left with the energos. Accordingly, major asset transfers were avoided. The single system operator was to unify the central dispatch unit and the regional dispatch units within a hierarchical structure, thus effectively re-establishing the centralized system which was lost during the early reforms. The system operator took over the functions of the UES National Dispatch Department in July 2002, while the regional dispatch departments are planned to be included in 2003. If these plans were finally realized, they would be still 1-2 years behind schedule. Once the centralization is completed, UES will have increased leverage over local energos and independent producers. This could be used to increase the capacity utilization of its own plants for which it claims higher cost efficiency.

According to the plan, generating companies would sell their energy in the wholesale market. As was suggested early on in the reform process, the ownership rights of the generating companies were to be given to UES shareholders on a pro-rata basis. The state's 52% share of potentially competitive companies would step-by-step be swapped into bigger shares of the grid and dispatch company (75+% and 100%, respectively). This arrangement was meant to protect the rights of UES' minority shareholders, but it was not made clear how the assets that were to be included in the swap should be valued (Brunswick (2001)).

If the reorganization of the wholesale market would have been completed by summer 2002, as was planned, it could have been the first step towards competition. A new non-profit partnership, the Administrator of the Trade System (ATS) would have replaced FOREM. The influence of UES in this planned venture was to be curbed by limiting its stake initially to 50%, scheduled to decline to a mere 25% within a year. The inclusion of representatives of the largest producers and consumers in the working group developing the concept for ATS was to ensure that all interests were taken into account. According to UES, the constituent assembly of the ATS was held in November, 2001. However, since then, little was seen of the activities of this body. At the end of 2002 UES agreed to sell its 80% stake in FOREM to the Administrator of the Trading System for 196 mill. rubles. However, at the same time UES urged the Government to retain a majority 50% votes in the ATS.

Another major point of the Government program was the centralization of the regulatory regime. Based on the Federal Energy Commission, a Unified Tariff Agency was to be established, subordinating the regional commissions. This agency was to set tariffs not only for electricity but for all natural monopolies, that is, power, gas, railways and telecommunication, a move that could be expected to increase transparency and consistency of tariff policies. However, little has happened and there are still several different agencies that regulate tariffs in Russia.

3.3 Recent Legislation

To provide the regulatory and legal base for the restructuring of the sector amendments to various federal laws were required. These amendments passed the Duma in first reading in October 2001, with opposition being voiced by the Communist and Yabloko fractions. After the first reading, the ratification process stalled. The crucial second reading, initially scheduled for December, was postponed several times. Presumably, one reason for the deputies' reluctance to debate the package were the approaching national elections and the fear that rising electricity tariffs might disgruntle voters. Pressure from business groups is also likely to have played a part. To save the tottering compromise, president Putin made premier Kasyanov personally responsible for the State Duma's approval of the reform package. This strategy finally succeeded in the parliament ratifying the amendments in second and third reading in February 2003.

On March 12, the Federal Council approved five of the six laws of the reform package. But the reform the deputies agreed on was far from what was originally suggested. Any schedule for power market liberalization is now abandoned. Instead, the government can freely decide upon if and when to liberalize the market and to allow large consumers to choose their supplier, the only restriction being that this must not happen before July 1, 2005. Until then, the government sets annual limits for price increases. Even after liberalization, up to 35% of all power produced have to be sold to 'guaranteeing suppliers'. These are obliged to supply energy at regulated prices to all customers that demand it. In addition, it should be noted that the government is free to issue any supplementary decrees to regulate the electricity industry. During a transitional period, that is not restricted in length, several other regulations apply, such as price caps and limits on volumes of power sold at unregulated prices.

One law had to be sent back to a reconciliation commission. It would have given federal authorities the right to regulate regional tariffs. The federal council considered this to violate

the rights of the regions.

4 Tariff Reform versus Restructuring

4.1 Sequencing

From the viewpoint of economic policy there are two major tasks with respect to the Russian power industry. First, tariffs have to be raised so that they reflect more adequately the social opportunity cost of power supply. Second, investment has to be guided into the sector in order to adjust from a situation with large but aging overcapacities towards well maintained capacities which suit the long term needs of customers. Compared to these two tasks, others, such as increasing the operational efficiency of the industry, appear to be of second importance. The tariffs regime, however, plays the key-role in all areas. It determines how much revenue the sector can extract from different customers, how much profits are made at the various points in the system, hence, how much funds are available for repairs and investment, and the strength of incentives to increase operational efficiency.

There are basically two approaches as to the timing of moves:

1. Start with a reform of tariff regulation to ensure a gradual adjustment of power tariffs to opportunity cost of society, adequate inflow of funds for investment and incentives for efficiency. After the new regulatory framework is firmly established, gradually restructure and perhaps privatize the industry, while at the same time develop the necessary checks against the abuse of market power.
2. Start with restructuring and privatization with the perspective to develop the new regulatory framework later. A conservative approach would entail the promise to liberalize at least some tariffs as soon as the conditions are right. An aggressive one would deregulate prices fast and develop the regulatory checks against the abuse of market power only later in the view of practical experience.

As a matter of fact, the current situation results from the second approach being adopted, but only halfway carried out, in the early nineties. The recent drive for reform can be seen as a continuation of this approach. However, the emphasis on restructuring and privatization has many drawbacks. As the most obvious one, it requires a valuation of the assets in place which

is hardly possible if the rules of the game are not yet determined. The resulting regulatory risk decreases the value of the assets and gives an undue advantage to investors which are politically well connected and therefore in a better position to influence the shaping of the regulatory framework at a later stage. Furthermore, due to the particularities of the power industry the difficulties of achieving competition are often underestimated and the gains from competition are often overestimated. As we argue in more detail below, privatization and competition are no substitute for a reform of the tariff system.⁷

Since a sensible regulation of tariffs can already solve most of the present problems of the Russian power industry, it should be at the center of the reform. However, this requires a new compromise on how to distribute the rents from past investment. The main reason for the slow progress of reforms so far is that this issue has not been solved. It appears that a new tariff regime has to accommodate or subdue the interests of three groups in particular: voters who are interested in residential tariffs, regional power structures who use resellers to skim of cash flow, and the high-voltage industry, in particular non-ferrous metallurgy, who use most of the cheap energy.

4.2 Restructuring for Competition?

In most Western countries it was rightly taken for granted, that it would be good for society if monopoly rents are squeezed by opening the power industry for competition. The only disagreement was about how to achieve competition, given that bottleneck facilities such as the transmission and distribution networks are natural monopolies. Unfortunately, this presumption may be wrong when prices are distorted as heavily as they currently are in Russia. If tariffs are already too low from the society's point of view and competition lowers them even further, incentives to use electric power efficiently will decline, hence economic welfare will decrease. The mark-up which a monopolized power industry can charge over competitive prices effectively acts like a tax. In other words, as long as fuel is subsidized, it might well be better to have monopoly profits in the electric power industry, rather than that competition drives prices even further away from society's cost.

This is true not only for the overall level of prices for electric power but also for the structure of tariffs. As argued above, cross subsidization of residential consumption by industrial users

⁷The following subsections draw on a more comprehensive assessment of the international experience in Hubert (2002a).

is efficient under the present circumstances. However, competition will work to reverse this pattern for two reasons. First, even if both submarkets, for high voltage industrial customers and for low voltage residential customers would be competitive, prices for residential users would be higher. This is because it is more costly to serve them and because their price elasticity is lower, hence they will be charged a higher mark-up to cover fixed cost. Second, international experience suggests that, if competition works at all, then it will be in the field of bulk power for high voltage customers not for residential customers. Hence, the result will be asymmetric: competition for industrial customers, monopoly for residential customers. Given the substantial overcapacities, large industrial customers will be able to obtain steep discounts, once they are entitled to choose their supplier. The energos, in turn, will attempt to raise tariffs for residential and small commercial customers, to compensate for the loss in revenue. If the German experience is indicative, such a reversal may come about within a year or two. Hence, if the move towards competition in the power industry is to enhance economic efficiency, it will be necessary to reduce price distortions in the fuel sector very fast and to keep residential tariffs under separate regulation.

Even if one accepts competition, as a long term aim, it is doubtful whether restructuring through vertical separation is needed to have competition in power generation. In fact, the experience with vertically separated systems is not very encouraging. England and California clearly failed to ensure competition between the power generators after separating generation from transmission.⁸ Whereas the German experience shows that workable competition can be achieved with integrated structures, provided that access to the high voltage grid can be assured. Once high voltage customers are allowed to choose their supplier the trade of long-term contracts for base load will develop fast. In order to ease this process, payments for access to the transmission grid have to be simple even if this comes at the cost of incomplete reflection of temporary transmission constraints (Hubert (2002a), Haupt, Pfaffenberger (2001)).

⁸There is now a vast literature on market power in deregulated electricity industries. For California see Borenstein, Bushnell, Wolak (2000), Borenstein, Bushnell, Stoft (2000), Borenstein, Bushnell (2001), Borenstein (2001), Bushnell, Wolak (1999); for the British experience see Wolfram (1999), Newbery, Pollit (1997), Wolak, Patrick (2001); a European perspective is given in CEPR (2000) and Newbery (2002) points to deficits in the regulatory framework of most European Countries.

4.3 Restructuring to Attract Investment?

The leadership of RAO–UES has repeatedly claimed that its plans for reform, if implemented, will help to attract strategic (foreign) investors. However, this can be easily dismissed as wishful thinking. First, given the size of the installed capacity and the low efficiency of energy usage it is doubtful that much investment in new capacity is warranted. As argued above, a modest increase of real tariffs may reduce demand substantially and at the same time generate enough internal funds to finance repairs and upgrading. However, in order to attract new entrants tariffs would have to be raised much higher, not only covering expenses for fuel, labor and repairs but also yielding a healthy profit margin on new investment. Such an increase would deliver huge windfall profits to the owners of existing capacities and appears extremely unlikely in the near future.

Second, *strategic* investors would be needed to implement new technologies, new organizational structures or new business practices. However, commissioning a power plant, transmission line, or transformer station are standard tasks which do not need a *strategic* investor. Such investors would be useful to improve management practice and increase operational efficiency. Though, the corporate turn around at RAO–UES shows that considerable improvements in this direction can be achieved within the present structure. Given the current regulatory framework, any investor would have to be politically well connected in order to protect his profits, which in turn raises concerns about insider deals at the stage of transfer of assets.

Finally, investment in power installations is highly idiosyncratic and of long duration. Hence, a stable business environment and protection against ex post exploitation of the investor are of outmost importance. The proposed restructuring is ambivalent in this respect. The consolidation of local energos may increase their ability to act as a reliable counterpart in long term contracts. However the dismantling of the mother company RAO-UES would remove one of the few players with a substantial standing in business.

This sceptical view is supported by the limited experience of new investment from deregulated industries. For example, in England, still serving as a blueprint for long term restructuring in Russia, new generators did not enter the market because it was competitive, but because the incumbents enjoyed market power and maintained a very high level of prices (Newbery (1998), Hubert (2002a)). Furthermore, the new, so called ‘independent power producers’, did not take the risk of selling into the volatile spot market. Instead, they formed closed alliances with regional distributors and perfectly hedged price risk for a period of 15 years. Long term

contracts for fuel and electricity also protected them against the regulatory risk. Hence, if the British experience is indicative, independent investment in new capacity will be through long term contracts between RAO–UES, (or regional energos) buying the output, the (foreign) investor, and Gazprom selling the fuel.⁹ Given the substantial risk of ex–post opportunistic behavior, however, internal investment, financed out of cash–flow, will dominate the industry for a long time.

4.4 Operational Efficiency

Although increasing the operational efficiency appears less important than gradually increasing tariffs and carefully guiding investment, it is still an important long–term task. International experience in a number of countries has shown that substantial reductions of fuel and labor cost can be achieved by moving from cost–plus regulation to fixed–price regulation. Policy makers have to commit to tariffs, which do not appropriate the profits from improved efficiency and abstain from forcing the industry to favor local fuels over imported ones.

A commitment to a particular tariff schedule is difficult to achieve when unexpected external developments create large windfall profits or losses which threaten the viability of the industry. Politicians would be forced to intervene and once this happens it is difficult to distinguish between profits (or losses) for which the industry should be held responsible for and those which have been beyond their control. One possibility to decrease the need for intervention is a formula for the calculation of tariffs which already takes into account the most important external factors determining the cost of the industry. Electric power tariffs should automatically be adjusted to the development of fuel prices, wage level etc. roughly in proportion to their contribution to total cost. Given the uncertainty regarding the development of relative prices, such a more complex formula can last for a longer period than a simple rule based only on inflation. In order to strengthen further the credibility of the schedule the regulator could strike a formal contract about the tariff formula lasting for three to five years. The power industry would then be entitled to damages from breach of contract if policy makers renege on their promises.

In theory, competition can be an additional powerful tool to increase the operational efficiency. The threat of losing market share and profits puts pressure on the management to increase

⁹This is exactly what the German Utility E.ON is asking for in the negotiations about a new power plant in Petersburg.

operational efficiency and reduce cost, which are difficult to achieve through clever price-cap regulation alone. Market discipline would also help them to fend off political pressure of local governors. However, so far there is little evidence that these gains are very large in the power industry.

References

- Arthur Andersen (2001): Russian Electricity Sector Reform, Report to the economic ministry, (confidential but widely circulated).
- Borenstein, Severin, James Bushnell, Frank Wolak (2000): Diagnosing market power in California's restructured wholesale electricity market, National Bureau of Economic Research
- Borenstein, Severin, James Bushnell (2001): Electricity Restructuring: Deregulation or Reregulation? Is there a coherent vision for competitive electricity markets. *Regulation*, Vol. 23(2)
- Borenstein, Severin, James Bushnell, S. Stoft (2000): The Competitive Effects of Transmission Capacity in a Deregulated Electricity market. *RAND Journal of Economics*
- Borenstein, Severin (2001): The Trouble With Electricity Markets (and some solutions). University of California Energy Institute
- Brunswick Warburg (2001): Power sector reform. A new valuation approach for a new sector.
- Bushnell, James, Frank Wolak (1999): Regulation and the Leverage of Local Market Power: Reliability Must-Run Contracts in the California Electricity Market. POWER Working Paper PWP-070, University of California Energy Institute
- Centre for Economic Policy Research, CEPR (2000): A European Market for Electricity? Monitoring European Deregulation 2.
- Government of the Russian Federation, Resolution of 11 Juli 2001 No. 526, On reforming the electricity sector of the Russian Federation, Moscow (unofficial translation by RAO-UES).
- Haupt, Ulrike, Wolfgang Pfaffenberger (2001): Wettbewerb auf dem deutschen Strommarkt — Drei Jahre nach der Liberalisierung, mimeo, bremer energie institut.
- Hubert, Franz (2002a): Reform of Russian Power Industry — Which lessons from Abroad? in: Modernization of the Russian Economy — Achievements and Perspectives, State University — Higher School of Economics
- Hubert, Franz (2002b): Cross subsidies in Russian electric power tariffs: not as bad as their reputation (in Russian), *Economic Journal of the SU-HSE*, 2002 (2)
- Newbery, David M. (1998): Competition, contracts, and entry in the electricity spot market. *RAND Journal of Economics*, Vol. 29, No. 4, pp. 726-749
- Newbery, David M., (2002): European Deregulation: Problems of Liberalising the Electricity Industry, *European Economic Review*, Vol. 46
- Newbery, David M., Pollitt Michael G. (1997): The Restructuring and Privatisation of Britain's CEBG - Was It Worth It? *The Journal of Industrial Economics* 45:3.
- OECD (2002), *Economic Surveys: Russian Federation*
- Opitz, Petra (1999): The (Pseudo-) Liberalisation of Russias Power Sector: The Hidden Rationality of Transformation, Discussion Paper, Deutsches Institut für Wirtschaftsforschung, Berlin
- RAO-UES (2001): Reform of Russian electricity industry. Moscow
- Renaissance Capital (2002): The Economics of Tariff Reform, mimeo, Moscow
- Wolak, Frank, Robert H. Patrick (2001): The impact of Market Rules and Market Structure on the Price Determination Process in the England and Wales Electricity Market, National Bureau of Economics Research, Working Paper No W8248
- Wolfram D. Catherine (1999): Measuring Duopoly Power in the British Electricity Spot Market. *American Economic Review*, Vol. 89, pp. 805-826
- Working Group of the presidium of the state council of the russian federation on questions regarding the reform of the electricity sector (2001): About the state concept for the reform of the electricity sector (in russian)