INTERNATIONAL ENERGY AGENCY

RUSSIAN ELECTRICITY REFORM

Emerging challenges and opportunities

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The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission takes part in the work of the OECD.

FOREWORD

The Russian government has embarked on a highly ambitious program of electricity reform. Russian policymakers have recognised that attracting timely and appropriate investment will remain a substantial and ongoing challenge, which can most effectively be addressed through the creation of efficient electricity markets operating in response to genuine price signals, within a robust and predictable legal and regulatory framework. Only such markets, in which competition is based on transparent prices that accurately reflect costs, can deliver the efficient, reliable and internationally competitive performance needed to meet the government's economic targets in the longer term. Such markets can attract the new investment that the industry will need, especially in order to ensure security of electricity supply beyond 2010.

If it is to succeed, the reform program will have to create market structures, market rules and a regulatory framework that will foster the emergence of competitive wholesale and retail markets in electricity. As in the many IEA member countries having taken steps in electricity reform in the past, many challenges are to be expected over the course of the Russian reform process, both at the policy stage and during implementation. This book does not attempt to address the many detailed issues that may arise but instead focuses on some aspects of the proposed reform that could have a key bearing on its ultimate success.

The book examines the proposed market structure and the importance of the diversity of ownership as well as the strength of the inter-regional grid system to maintain healthy competition and guard against regional congestion problems which would raise the possibility of regional monopolies forming and market power abuse. In this respect, Russia's extremely costly experience in privatising its oil sector over the early 1990s should provide a sharp reminder of the potential dangers of this process. A key to the success of competitive markets in electricity and eventually other parts of Russia's energy sector will be strong, well resourced, well informed, well-trained and independent regulators that can rise to the challenge of establishing access to network and other monopoly products and services on fair and reasonable terms for all market players. The IEA is concerned about the lack of resources and independence of the regulatory bodies in Russia, given the critical role these bodies will need to play to ensure against market power abuses in the face of powerful vested interests and dominant players such as Gazprom.

The recognition by the Russian government that tariff rebalancing and especially the removal of cross-subsidies is a necessary pre-condition for successful introduction of market reforms, is reassuring. Cost-reflectivity has been recognised as a principle objective of the reforms. The regime of vesting contracts now proposed for all users provides a means for dealing with this critical issue while at the same time allowing competitive wholesale and retail markets to be progressively introduced over the

remainder of the decade. The IEA commends the Russian Government's plan to use this period to gradually raise regulated end-user tariffs to levels consistent with the delivered price of electricity sourced through the competitive wholesale and retail market. Such rebalancing would allow customer choice to be extended progressively through the life of the vesting arrangements and ultimately to all users at the end of the vesting contract period if desired. The recent public backlash against monetization of certain public services demonstrates the importance of getting this balance right. Although the proposal is likely to extend the transitional period, it has the potential to provide greater stability, certainty and public acceptance to the implementation process, which would help to enhance the likelihood of the reform being fully and successfully implemented.

The IEA has been following the evolution of this critically important electricity reform process in Russia since it moved into its active phase in Spring 2003. We are heartened by the progress to date and the Government's newly reaffirmed commitment to the electricity reform process in late 2004. We consider the greatest challenges lie ahead in the many technical details that will need to be resolved to bring such a substantial reform to a successful conclusion. Time will tell whether the Government will maintain its resolve to complete the reform. It is our hope that this book will provide objective guidance and encourage efforts to see this reform through to a successful conclusion.

Claude Mandil
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In February 2005, the IEA held a Round Table on Electricity and Heat reform in Russia jointly with the Center for Strategic Research in which all interested Russian government and non-government agencies took part. The IEA gives special thanks to the Center for Strategic Research and the Center for Energy Policy for their active role in organizing this important meeting at which the findings of this book were presented and discussed.

The principal author of this book is Doug Cooke of the Energy Diversification Division within the Long Term Office. Isabel Murray, Russia Desk Officer of the Non-member Country Office, provided the Russian analysis and context. Gordon Duffus and Noé van Hulst supervised and encouraged the authors in this endeavour. Internal reviews and support by Peter Fraser and Ulrik Stridbaek as well as Nick Malyshev and William Tompson of the OECD also provided useful insights and input. Special thanks is given to other IEA Secretariat staff, notably to Olga Sorokina who provided much needed research assistance; to Bertrand Sadin, who prepared all the maps, figures and design for the cover; to Muriel Custodio for the book layout and to Scott Sullivan who edited the book.

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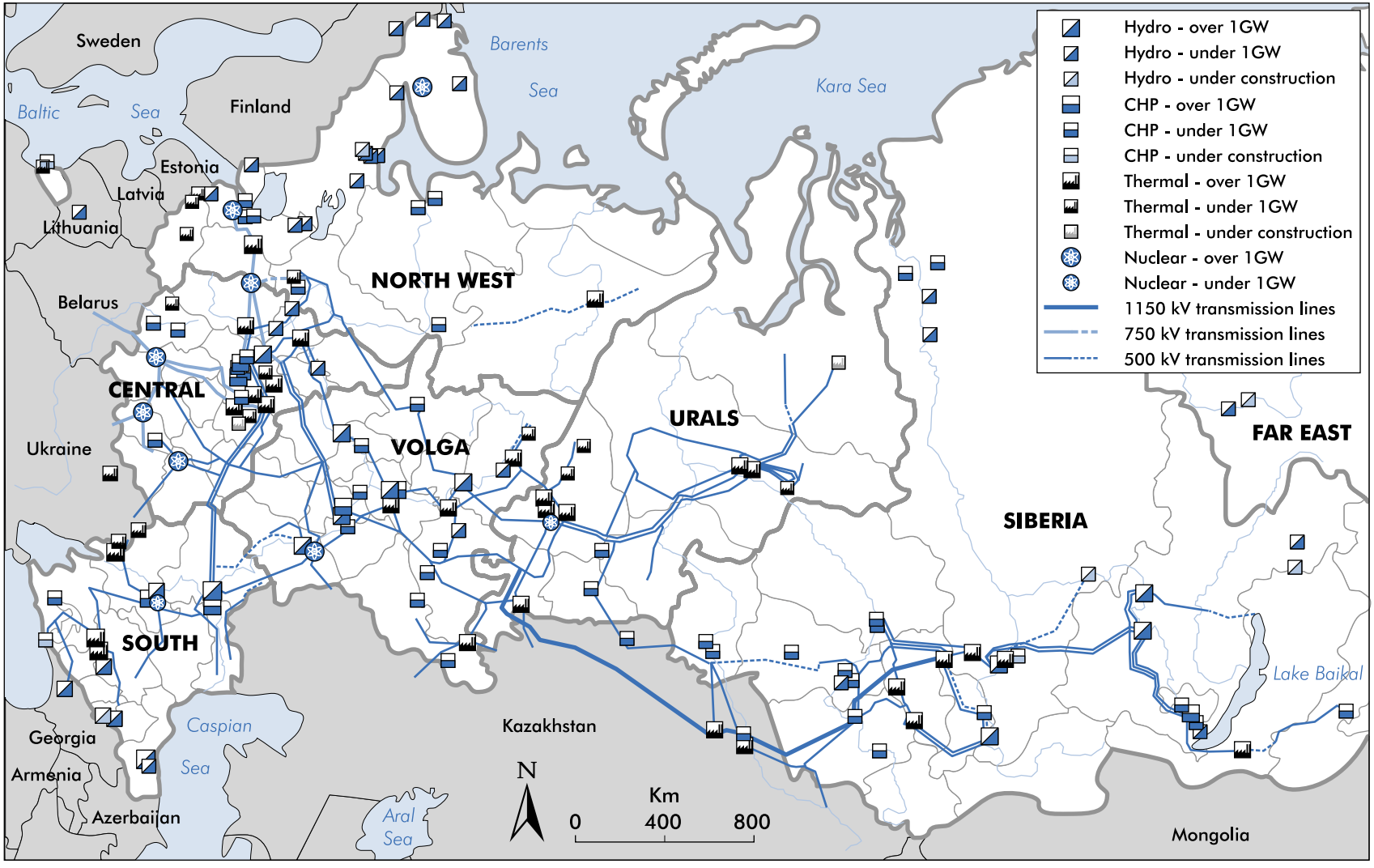

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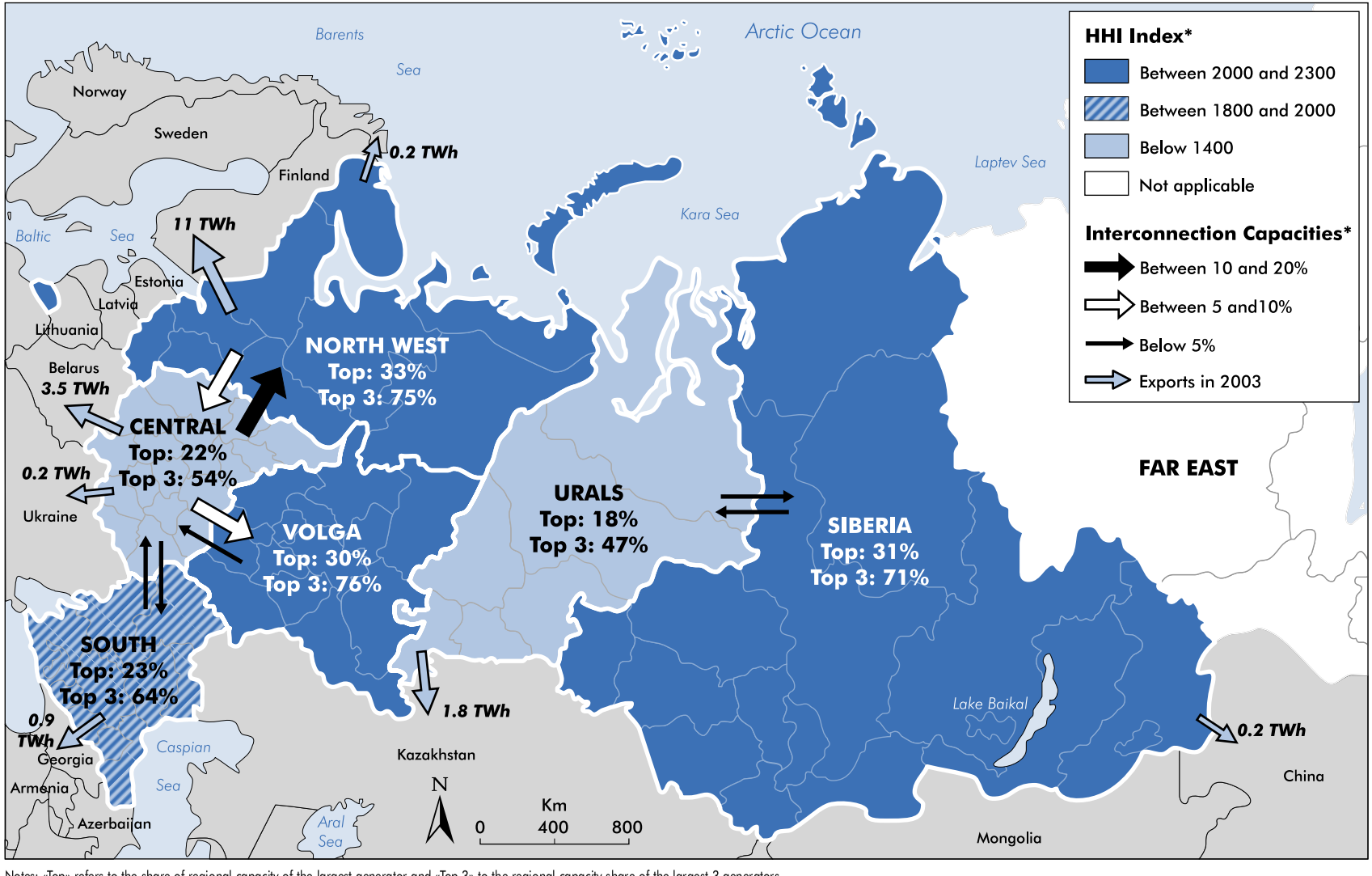

Notes: «Top» refers to the share of regional capacity of the largest generator and «Top 3» to the regional capacity share of the largest 3 generators.
HHI Index: The Herfindahl-Hirschman Index (HHI) is a conventional indicator of ownership concentration and market power. Scores above 1800 indicate a degree of market concentration consistent with the presence of market power. See Chapter III for more details. Interconnection Capacities: The potential trading capacity on interconnections as a proportion of maximum regional consumption as of 4th quarter 2004 (www.sp-cdu.ru/).

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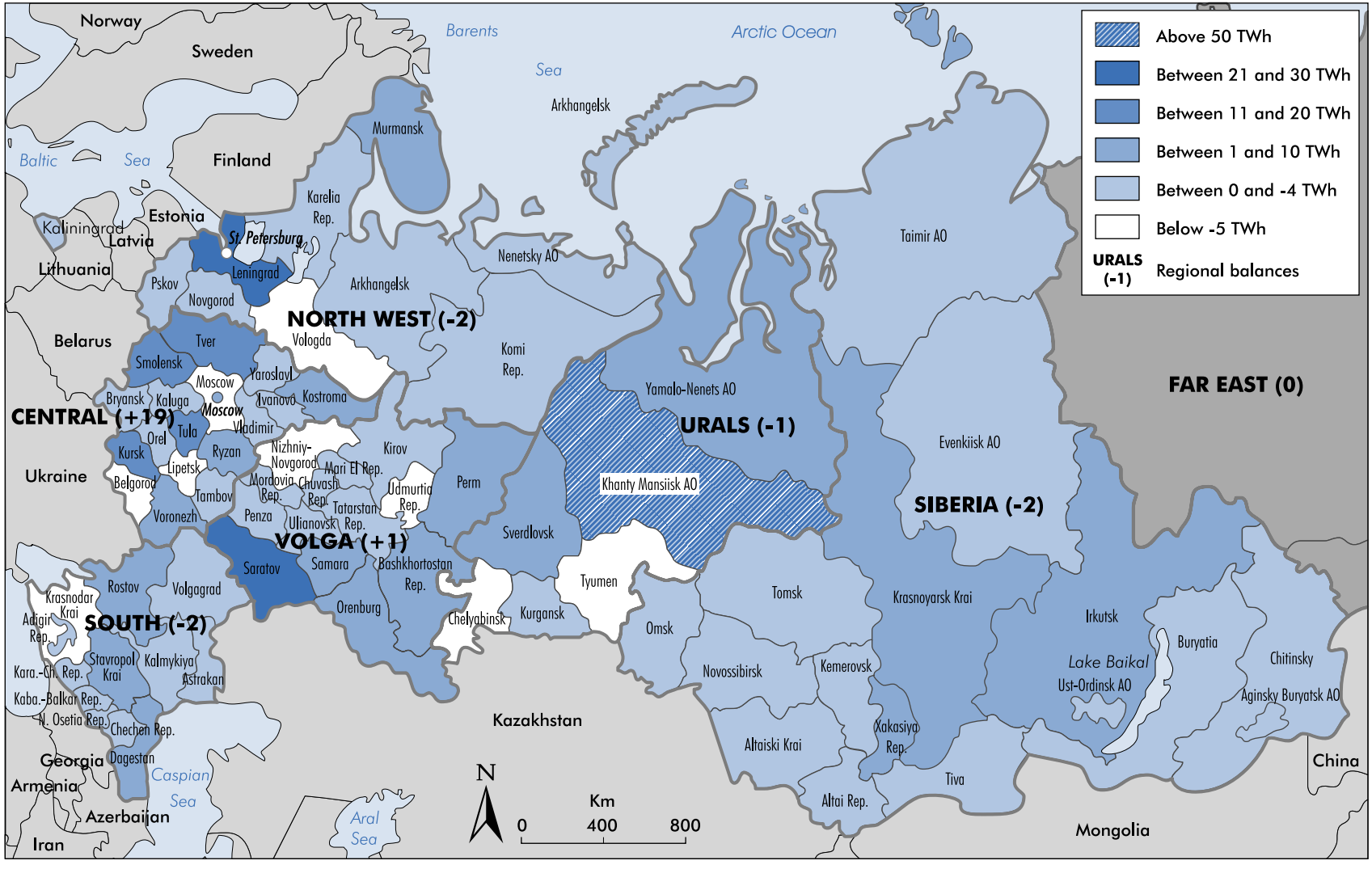


EXECUTIVE SUMMARY

ELECTRICITY REFORM: A KEY TO FUTURE PROSPERITY

Russia is pursuing a strategy of very high economic growth, with an objective of doubling its gross domestic product in ten years. Efficient and reliable electricity markets will be critical to the success of this policy.

The Russian government has embarked on a highly ambitious program of electricity reform. If it is to succeed, the reform program will have to create market structures, market rules and a regulatory framework that will foster the emergence of competitive wholesale and retail markets in electricity. Only such markets, in which competition is based on transparent prices that accurately reflect prices, can deliver the efficient, reliable and internationally competitive performance needed to meet the government's economic targets. Such markets would also attract the new investment that the industry will need, especially in order to ensure security of electricity supply after 2010. It is important the Russian Government use this window of opportunity for implementing electricity reform before the supply-demand balance begins to tighten across the market. If the reforms succeed, they could open the way to synchronizing the Russian network with that of Western Europe.

Many challenges are to be expected over the course of the reform process, both at the policy stage and during implementation. This book does not address the many detailed issues that may arise. It focuses on some aspects of the proposed reform that could have a key bearing on its ultimate success.

KEY ISSUES

Market structure and ownership

The emergence and development of a sustainably competitive marketplace will depend in large part on its structure.The government currently proposes to create as many as 26 wholesale generation companies which could compete among themselves across the entire wholesale market.

The proposal as it stands could produce considerable diversity of ownership and a highly competitive wholesale market structure. Overall, the three largest generators would control about 34% of generating capacity. The single largest, the aggregated hydroelectric generator, would control about 15%.

Network congestion can, however, be expected to provoke the appearance, from time to time, of separate regional markets within the wholesale market. This is most likely to

happen when supply is tight during peak periods. The structural diversity of the system could deteriorate seriously when this happens. Under the proposed restructuring, and with the existing integrated electric systems in place, the three largest generators in each region would control between 45% and 75% of regional generating capacity. This would imply that in, at least three of the six electricity systems that will ultimately form the competitive market, the concentration of generating capacity would amount to "market power."[1]

Further unbundling to create more generation companies at regional level could ease this concern. But it may not prove feasible, due to opposition from private stockholders. It may, moreover, be difficult to create commercially viable enterprises capable of raising capital for new investment.

Competition at wholesale level could also be strengthened by the creation of a robust transmission network linking major centres of generation and consumption. Indeed, this may be the best way to deal with the issue of market power, at least initially.

In a number of other countries, the initial restructuring and opening of electricity markets has been followed by a strong trend toward rationalization and concentration of ownership. Russia is likely to see a similar trend. As a result, regulation will be particularly important in the post-reform period. A strong, independent and well-funded competition regulator will be required.

It may also prove very difficult to establish a retail market structure which not only allows commercially viable companies to emerge but also maintains sufficient diversity to drive competition among them. It might help new participants to enter the market, thus strengthening competition, if they were allowed free access to information about customers in the competitive market. Improved metering and systems for switching retail customers from one company to another would also be helpful. But all this amounts to a major undertaking. The experience of other countries suggests that a very large commitment of time and resources will be required to bring it off.

The government proposes creating a network of from 70 to 80 "Guaranteeing Suppliers", each to operate within a small protected franchise. But it might be better to set up a smaller number of larger Guaranteeing Suppliers, which could effect greater economies of scale. A more compact group of Guaranteeing Suppliers could further the movement toward regulated tariffs that are more cost-reflective. At the same time, they would contribute to a more competitive retail market structure. Such a structure will be necessary in any case, if the free choice of supplier is ultimately extended to *all* electricity customers.

The government plans to maintain its control over nuclear and hydroelectric generation, or about 25% of Russia's total generating capacity. The continuance of government control may create pressures for government intervention in the market. It may also foster the suspicion that the government will seek to operate these assets in order to

1. "Market power" in the context of this book is the ability of a market participant to affect price by the quantity of the product it delivers to the market at a given point in time.

influence prices. The pressures to intervene could prove very hard to resist, especially after excess capacity is exhausted and wholesale prices start to rise. But the government must resist such pressures. Even the *perception* that it might be willing to intervene would damage the market's credibility and the confidence of market participants. Uncertainty about possible government interventions – or the impression of "regulatory risk" – would increase; efficient and timely investment would be discouraged. Such a perception must not be allowed to arise.

In the Nordic market, privately owned and managed hydroelectric generators now operate successfully in a competitive environment sensitive public issues, such as environmental impacts and fisheries management, could be handled through licensing. Bearing in mind the inherent importance of hydro generators in wholesale price formation, and given the concerns about continued government ownership, the government should give serious consideration to the combination of licensing with unbundling and the eventual privatizing of hydro assets.

Investment

Russia has huge investment needs. The International Energy Agency's *World Energy Outlook 2003* estimated the electricity sector's total investment requirement from 2003 to 2030 at about $380 billion. That figure amounts to 1.9% of the country's GDP over the period. But the bulk of this investment will not be needed till after 2010.

As it makes clear in the electricity legislation, the Russian Government is counting on efficient energy markets to attract new investment in generation. But there are serious doubts that the emerging electricity market *can* indeed attract the necessary capital. It is feared that potential investors may be put off by uncertainty about the direction of the Government's policy and about the shape of new regulations.

To meet these concerns, at this point the government has proposed a "capacity mechanism"[2], possibly a temporary one, supported by an Investment Guarantee Fund. The effectiveness of such mechanisms in other countries has been mixed. Some of them have been criticized as offering poor investment signals, and as being open to manipulation. Russia needs to exercise care in this respect. A poorly designed capacity mechanism could crowd out efficient private investment. Over time, it could help entrench a form of central planning which is incompatible with the operation and development of efficient markets.

A better case may, however, be made for a temporary capacity mechanism during Russia's transition period. It could operate as market structures, market rules and new regulatory arrangements are being put in place. It could also allow time for the substantial task of rebalancing tariffs. The breathing space thus achieved could be used by the government to allay doubts about the direction of its policy and regulatory practice.

2. "A "capacity mechanism" is a device to ensure that sufficient spare generating capacity exists to meet maximum peak demand.

The development of deep and liquid financial markets could also spur private investment. So would the regular publication of detailed information on electricity supply and demand and on growth trends.

Electricity reform will bring new patterns of use of the transmission network as the transitional period progresses. It could lead to congestion that would seriously undermine the development and operation of efficient electricity markets. Well-timed and precisely-located investments in transmission capacity will be required to meet this foreseeable problem.

That leads to a worrisome issue which is the likely rate of return on investments in regulated transmission facilities. A recent government resolution designed to clarify how regulated tariffs would be determined for the Federal Grid Company implies that returns will be well below what is required to attract new investment. But returns *must* be sufficient to ensure that needed new transmission facilities are funded and built.

The procedures for planning network additions and approving them will also have an effect on investment flows. These procedures will have to be made objective and transparent. They will have both to serve the market overall and to resolve key transmission issues quickly.

The creation of an independent national system operator could be helpful in this connection. The new body could be charged with providing accurate and detailed information about the transmission network's performance. It could thereby help to overcome the inherent conflicts of interest and the information gaps that plague so many efforts to oversee transmission planning and investment activity.

The proposed introduction of "locational" or "nodal" marginal pricing[3] could also improve transparency. It would allow market participants and regulators to identify and assess more effectively the options for alleviating network congestion.

Efficient price signals

Transparent price signals which truly reflect costs are an essential element in making decisions about managing and investing in competitive electricity markets. Prices tend to be very volatile, reflecting such unique characteristics of electricity as the fact that it cannot be stored, the inelasticity of demand for it in the short term and the need to balance electricity flows in real time. Because of this volatility, the Russian government is likely to come under pressure to intervene in the price-formation process, especially when sharp spikes occur.

Russia's electricity legislation would allow the regulator to apply price caps to moderate price spikes in the event of a supply shortage – or to stem the abuse of a dominant market position. The Federal Tariff Service would have the discretionary power to determine the level and duration of price caps. But when administered price caps have been imposed in other countries in the midst of a "price crisis," they have tended to be

3. These terms refer to the cost of either injecting electricity into a particular node of the transmission network at a certain moment in time, or withdrawing it. There will be more than 5000 such nodes in the Russian electricity network as a whole.

set too low. They have, in effect, masked *legitimate* price volatility, thereby distorting price signals and removing incentives for efficient market responses.

Another approach would be to create a wholesale spot-price cap, which would reflect the economic cost of consumption at the margin. This type of price cap is transparent and predictable. Using it would remove the uncertainty that follows on the use of arbitrary and discretionary price caps; it would also reduce pressure on the government to intervene in price formation. The government should seriously consider an economic price cap set in advance rather than administrative price caps.

Cost-reflective tariffs are a further pre-condition to successful market reform. Much progress has already been made in rendering tariffs more reflective of costs and in removing cross-subsidies between groups of electricity customers. But wholesale prices may need to rise another 40% before they become perfectly cost-reflective. It may be hard to achieve an increase of that order before 2006, when electricity customers will begin to source a portion of their consumption from the competitive wholesale market. The difficulty would grow out of the greater impact of the later phases of realigning the final electricity charges paid by customers.

RAO UES, the state electricity monopoly, and the government are developing a proposal to unwind cross-subsidies using a regime of regulated bilateral contracts. Under this proposal, up to 85% of total electricity consumption would be supplied through regulated vesting contracts, with the regulated proportion reduced over the contract period until all volumes are sourced from the competitive market at cost-reflective prices, possibly by around 2012. A special mechanism is also being developed to fund cross-subsidies equitably and transparently during the transition period while they are being unwound.

Although this proposal is likely to extend the transitional period, it provides a more certain and practical framework for unwinding the cross-subsidies while at the same time allowing competitive wholesale and retail markets, and customer choice, to be progressively introduced over the transitional period. It also provides the flexibility to allow the government to manage the rebalancing in a manner that is consistent with sound macro-economic management and which avoids causing undue financial stress, particularly for households. The recent public backlash against the monetization of certain public services demonstrates the importance of getting this balance right.

But there is a danger that the unwinding of cross-subsidies might stall. To avoid this, and to give impetus to the tariff-rebalancing process, the government must continue to drive the process to ensure that cross-subsidies are unwound, at least for industrial and commercial users, within the maximum 5 to 7 years period envisaged under the proposed vesting contract regime.

Convincing current and potential market participants that it will not unduly intervene in wholesale price formation is a challenge the government must meet. A combination of economic price caps and effective provisions for good corporate governance would help make the point. So would further unbundling and any move toward the government's divesting itself of its hydroelectric generating assets.

Financial markets

Financial markets that are deep, liquid and innovative can help electricity market participants manage the risks inherent in volatile wholesale markets. They will do this by allowing them to transfer those risks to other market participants who can manage them at lower cost.

Such markets can smooth wholesale price volatility without undermining efficient price formation, price signals or investment. In effect, they can remove one of the main rationales for regulatory intervention: the need to control price volatility in the interest of users.

So far, Russian policy makers have concentrated on developing a "financial transmission right," a device that would help market participants manage the risks attendant on congestion under a locational or nodal marginal-pricing regime. But the market now being designed will be much more likely to rely on other, market-driven instruments to assure effective risk management.

Financial markets to serve competitive electricity markets have been slow to develop in other countries, and they have suffered a lack of liquidity, particularly for longer-term products. Nord Pool is an exception. It has received active support from the transmission system operators, and indirect backing from member country governments.

The Russian government should consider initiatives to encourage participation in and the timely development of innovative financial markets. Nord Pool could provide a useful model.

Governance and regulatory arrangements

Good regulation starts with good governance. In a competitive electricity market, this means a clear delineation of the legal rights and responsibilities of all participants, the creation of effective accountability and appeal mechanisms and a guarantee of transparency. These arrangements should reinforce the incentives and sanctions that lead to good commercial behaviour.

In this respect, existing electricity legislation provides a good foundation. But many key details have yet to be resolved. The effectiveness of the law in practice will be largely determined by arrangements currently being made, and by how they will be enforced.

Regulatory processes must be – and must be seen to be – robust, objective, consistent and transparent. Failures in this respect could quickly erode the market's credibility, create regulatory risk and alienate private investors.

In some other countries, governments have sought to enhance confidence by setting up regulatory institutions as independent bodies with independent funding. This has happened most often where governments have retained some ownership in the market.

Russia's current reform proposals do not include independent regulatory institutions, and that is very regrettable. In the recent government restructuring, the federal agencies

charged with electricity sector regulation and the regulation of competition were both placed under the direct authority of the prime minister. There may be good reasons for this arrangement during the period when the market structure, market rules and a regulatory regime are being developed and put in place. But if they persist, there is a real danger that market participants will see a serious conflict of interest between the government as rule-maker and regulator and the government as a substantial market participant. If such perceptions are widespread, they could undermine the credibility of the regulatory regime and the regulatory decision-making process.

The creation of strong, well-financed and independent regulatory institutions would send a strong signal that the government is committed to effective regulation. The government should re-examine the issues of regulatory independence and the adequacy of the resources provided to the regulator. The goal should be to establish independent regulatory bodies as soon as the transition period is completed.

Regulatory functions are currently spread out among a number of regulators, market institutions and federal agencies. They are also divided between the federal government and the regions. This can lead to uncoordinated, even contradictory, interpretations and applications of the rules. The potential for regulatory uncertainty or risk is high. Managing this risk during the transition has been recognized by the government as a task that must be performed. But the same risks will exist *after* the transition period. A set of processes needs to be put in place to ensure effective, ongoing and transparent co-ordination among these bodies after the transition period.

Implementation

Russia's implementation strategy calls for the planning and execution of industry restructuring, market rules and regulatory reform to start at the same time and to be carried on simultaneously. The timetable calls for establishing the regulatory framework and the industry structure by around 2006. The whole of the broad and very ambitious program is to be completed in three stages by around 2012. If the deadlines are met, Russia will have done very well by comparison with other countries that have been through similar processes.

The idea behind moving various reform projects forward in parallel is to strike a balance between promptness and quality. Russian planners believe that the way they have chosen to proceed will both reduce uncertainty and risk during the transition and avoid design flaws. If it works, the plan will have kept the transition period as short as practicable. But it is not without risks and difficulties of its own.

Parallel implementation could lead to cascading delays where the integrated reform elements clash rather than complement one another. For example, the restructuring of government activities in 2004 slowed progress on market design and regulatory reform. It has already begun to affect the timetable for industrial restructuring. Minority private shareholders could complicate implementation with inflated claims for reparations or other delaying tactics.

Delays are endemic to complex and sensitive reform processes. Russia's implementation schedule has slipped already, and further slippage is to be expected. This, in itself, is not

necessarily a cause for great concern. More important is the government's commitment to complete the process. More worrying is the possibility of inappropriate compromises along the way.

The government's announcement in June 2004 that it would review the implementation process and that it was suspending all decisions on structural reforms sowed doubt about its commitment to reforms. There may be some cause for concern, but there are also optimistic signs. At RAO UES and in several federal agencies, officials are actively working to develop and implement the reforms. The December 2004 resolution on implementing the electricity reform provides further positive indications of renewed impetus. Nonetheless, the possibility that reform will be seriously delayed or distorted cannot be dismissed.

The government could advance implementation by pushing forward with work on key elements of market rules and regulatory arrangements, two dossiers which have fallen behind that of industry restructuring. Progress in these two areas could increase confidence in the regulatory process for corporate restructuring and the proposed asset sales.

Effective and consistent leadership from the government will be critical to keeping implementation on track and completing it successfully. The government initially established a system of co-ordinating committees to smooth the implementation process, but they have stopped functioning since the government restructure of June 2004. There have been recent efforts to revive such co-ordination, and they are very welcome. But further efforts may well be needed. Confidence in the government's commitment to the reform program would be enhanced if it were to set explicit deadlines for implementing the main transitional steps for full implementation of the reform.

Complementary energy reforms

Natural gas will be a key factor in the development and operation of competitive electricity markets. Gazprom is the overwhelmingly dominant supplier of natural gas to Russian thermal generators. The company may be seeking to expand its activities into electricity generation. If such diversification did occur, it would increase the incentive for Gazprom to discriminate against competing thermal generators, possibly by denying them competitively-priced gas. It could also lead to Gazprom's cross-subsidizing its commercial enterprises in order to strengthen the position of its own thermal generators. Such activities could undermine investment in, and competition among, electricity generators. The result would be high extra costs for electricity users and the economy as a whole.

Russian policy makers acknowledge the need for reform of the gas sector, but recent events suggest that it may not materialize in the near future. Effective gas market reform would, directly and indirectly, abet the development of competitive electricity markets. Regulated fuel supply contracts are being considered and may represent a positive first step to ensure that all gas fired generators enjoy non-discriminatory access to natural gas at fair and reasonable prices. Later, it should develop and implement a more comprehensive strategy for gas sector reform. A public recommitment to reform the domestic gas sector may also warrant consideration at this time.

I. THE RUSSIAN ELECTRICITY SECTOR: THE CONTEXT

ELECTRICITY GENERATION

Russia is the world's fourth largest generator of electricity, after the United States, China and Japan. In 2003, it produced 916 TWh, an 11% increase over 1998. Thermal generation accounts for 66% of total production, and two-thirds of that amount comes from natural gas. The balance is hydro-electric (17%) and nuclear power (16%). Nuclear-based generation increased by 42% from 1998 to 2003 and the load factor at nuclear power plants rose from about 55% in 1998 to 76% in 2003[4].

Russia is divided into seven regional grids, or Energy Systems. Almost 80% of Russian electricity is produced in four of these systems: Central, Siberia, Volga and Urals. The Central region is the most inter-regional electricity trader; it had almost 20 TWh of excess electricity in 2002. (See Annex 2 for more details).

Table 1 Electricity Generation by Region, TWh, 1991-2002

	1991	1995	1997	1999	2000	2001	2002
Central	249	190	187	190	195	197	197
Siberia	216	191	182	187	194	197	191
Volga	216	173	166	170	173	174	174
Urals	160	122	121	119	129	129	132
Northwest	99	79	80	83	85	86	86
South	77	67	61	59	59	65	67
Far East	48	38	36	37	41	42	42
Russia	1065	860	833	845	876	890	889

Source: *Economics and Energy of the Regions*, A.M. Mastepanov and V.V. Saenko, Moscow, 2001, and *Fuel and Energy Complex of the Regions of Russia*, Volumes 1 and 2, Moscow 2003.

Nuclear power production is largest in the Northwest system; it makes up about 25% of production in the Central and Volga systems. Hydroelectricity accounts for almost half of production in Siberia and almost a quarter in the Volga and Far East. Thermal

4. According to the *Strategy of Nuclear Power Development in Russia in the first half of the 21st Century*, endorsed by the Russian Government on May 25, 2000 and reiterated more recently in the journal RosEnergoAtom 1/2004, the load factor at Russian nuclear plants is expected to reach 80% by 2010, and to exceed 85% by 2020.

power generation accounts for 70% to 90% of production in the Urals, North Caucasus and Far East, and over half in the Siberia, Volga and Central systems.

Hydro generating capacity has remained fairly constant since 1990, as has its share in the fuel mix for electricity generation. Thermal capacity has increased only slightly, but the shares of the different fuels – oil, coal and natural gas – have varied significantly. Since 1990, fuel oil consumption for electricity generation has dropped 76%, while the share of natural gas in the electricity-input mix dropped 21% and coal's share actually increased 11%.

Table 2 Electricity Generation by Fuel, TWh, 1990-2003

	1990	1993	1995	1997	1999	2000	2001	2002	2003
Total	1082	956	860	833	845	876	890	889	916
Natural Gas	512	430	354	357	359	370	377	385	402
Coal	157	149	161	157	161	176	169	170	174
Hydro	166	173	175	157	160	164	174	162	157
Nuclear	118	119	100	108	122	131	137	142	149
Petroleum Products	129	83	68	52	41	33	30	27	31
Renewables	0	2	2	2	2	3	3	3	3

Source: IEA Statistics to 2002 and IEA estimates for 2003 based on RAO UES and RosEnergoAtom data.

GENERATING CAPACITY

In 2003, there were more than 700 electricity plants in Russia with a total generating capacity of 214 GW. Thermal and co-generation plants represent 69% or 148 GW of installed capacity; hydroelectric plants, 21% (44 GW); and nuclear plants, 10% (22 GW). Russia uses combined-heat-and-power generation extensively; it accounts for about a third of installed capacity. About 80% of generating capacity in the European part of Russia (including the Urals) is natural-gas based. In the Eastern part, over 80% is coal-based. The overall share of natural gas in the thermal fuel mix is 66%.

Before 1990, the age of Russian generating capacity was in line with other European countries. Since then, however, annual construction of new capacity has fallen by more than three-quarters. Over the past thirteen years, the condition of the Russian electricity sector has gone from bad to worse. This has not yet posed serious supply problems – because electricity demand dropped by a quarter over the 1990s. But the replacement and expansion of generating capacity will become an increasingly pressing issue as demand for electricity grows and is expected to go on growing. A hopeful first

sign that this trend is reversing is reflected in the financial results for RAO UES for the first 9 months of 2004[5], released in February 2005 which showed an increase in its fixed asset value of almost 1% reflecting capital additions in excess of depreciation.

Table 3 Construction of New Capacity, 1990-2003, GW

	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	2000	2001	2002	2003
GW	4.0	2.0	0.7	2.5	2.1	1.0	1.3	0.6	0.8	0.8	1.1	1.3	0.8	2.1

Source: RAO UES

According to Russia's 2003 Energy Strategy, electricity sector infrastructure has been depreciated by between 60-65% on average. According to the IEA[6], investment needed in new generating capacity is estimated to be $157 billion over the next 25 years, but the near-term needs will be relatively low, amounting to $1.5 billion a year to 2010. They will be about $7 billion a year in the longer term. About $21 billion will be needed to refurbish existing power plants to 2030. Over 80% of new generating capacity in the next 25 years is expected to be gas-fired, because gas-fired combined-cycle gas turbine (CCGT) plants are expected to be the lowest-cost option.

Investment in nuclear plants may account for nearly a quarter of total investments in new plants. It is not at all sure that funds will be available to finance these new plants. The IEA questions the nuclear sector's ability to overcome all the challenges it faces to attract this much investment to meet the ambitious outlook projected by the Russian authorities[7]. Furthermore, as the electricity market opens to competition, investment decisions will no longer be driven by centrally-planned strategies but by economic and decentralized decision making.

ELECTRICITY CONSUMPTION

Domestic electricity consumption totalled 618 TWh in 2002. Industrial consumption was about 320 TWh (52%), while households consumed about 143 TWh (23%) and transport and services 133 TWh (22%). Russia's per capita consumption is low by OECD standards, but its energy intensity is high.

During the economic decline that began in 1990, electricity consumption decreased by almost 30%, to 579 TWh in 1998. Consumption fell in all sectors except households, where it actually *rose.* From 1999 to 2002 electricity consumption increased to 618 TWh in 2002, but the rate of growth has declined since, possibly because of response to increasing electricity prices.

5. See *http://www.rao-ees.ru/en/news/pr_depart/show.cgi?020205fin.htm*.
6. International Energy Agency, (IEA), *World Energy Investment Outlook 2003 Insights*, (2003), pages 400-401 and 446.
7. See IEA, *Russian Energy Survey* (2002), pages 171 to 190.

Table 4 Russian Electricity Balance, TWh, 1990-2002

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Electricity Generation	**1082**	**1068**	**1008**	**956**	**876**	**860**	**847**	**833**	**827**	**845**	**876**	**890**	**889**
Imports	35	35	28	25	24	18	12	7	8	8	9	10	5
Exports	-43	-47	-44	-43	-44	-38	-32	-27	-26	-23	-23	-26	-18
Domestic Supply	**1074**	**1056**	**992**	**938**	**855**	**840**	**828**	**814**	**809**	**832**	**864**	**875**	**878**
Total energy sector	163	161	152	144	135	139	142	140	137	143	154	152	153
- coal mines	13	12	12	13	12	11	10	9	8	8	9	9	8
- oil & gas extraction	55	52	47	43	40	40	41	41	41	45	48	50	52
- oil refineries	15	14	13	12	11	11	12	11	10	12	12	12	13
- own use	72	74	70	67	62	59	61	61	65	65	67	67	69
- non-specified	8	8	9	9	10	18	19	18	13	13	17	13	10
Distribution losses	84	84	84	88	85	83	84	84	93	96	102	105	108
TFC	**827**	**811**	**756**	**706**	**635**	**618**	**601**	**590**	**579**	**593**	**609**	**618**	**618**
Industry	482	461	419	376	318	314	294	292	283	296	312	322	320
Transport	104	97	87	77	68	65	65	63	60	61	61	62	68
Agriculture	67	70	70	69	61	53	49	42	38	34	30	25	23
Services	67	67	65	62	61	60	61	60	62	62	64	66	65
Residential	107	116	116	121	126	126	132	133	135	140	141	143	143

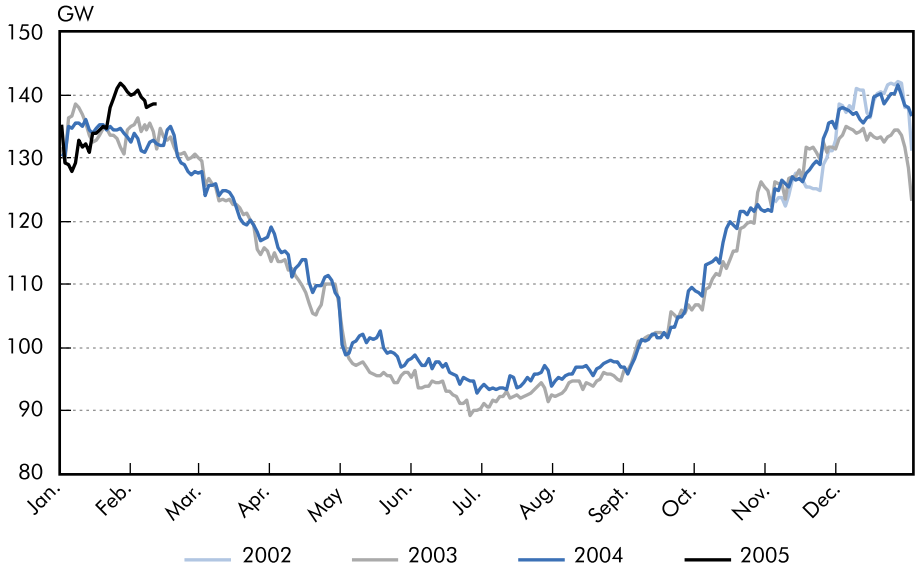
Source: IEA Statistics

Higher economic growth will continue to push up electricity demand if it is not offset by efficiency gains and customer demand resistance. The IEA projects electricity consumption growth of 1.3% a year from 2002 to 2030, with the strongest demand in the first decade. This is comparable to the projected 1.75% a year growth to 2020 of the moderate economic growth scenario of the Russian Energy Strategy[8].

Russian demand peaks in the cold winters. The highest peak demand over the last 12 years was recorded in 1993 and 1994 at 148.4 GW and 144.7 GW, respectively. Only since 2002 did peak demand reach into this range again at 142.0 GW. The highest hourly peak in 2005 (29 January at 141.9 GW) was 50% higher than the hourly minimum. The fact that Russia sprawls across eleven time zones helps to spread the impact of demand peaks on the electricity system, and to explain the relatively low variation between maximum and minimum demand. Future investments in the transmission network should allow Russia to take even more advantage of the time-zone effect.

8. See Russian Energy Strategy at *http://www.mte.gov.ru/docs/32/1779.html*

Figure 1 Russia's Seasonal Electricity Demand Pattern



Source: SO-CDU website *www.so-cdu.ru*

NETWORK

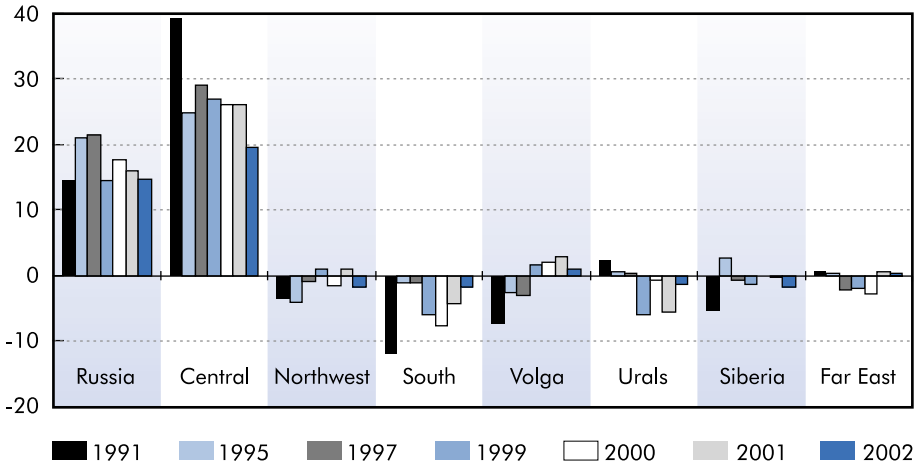
The Russian electricity network is linked by over 2.5 million km of national and regional transmission lines and local distribution lines, including over 145000 km of high voltage lines of between 220 and 1150 kV.

The chart below reflects the importance of the network in providing the necessary capacity to ensure reliable electricity flows between surplus and deficit regions of Russia. The regional energy systems were based on key electric power plants supplying electricity to the various sub-regions lacking sufficient electricity generation capacity. Very little inter-regional trade was envisaged or necessary under this centrally planned system. As shown below, the Central region is the key region where surplus electricity generation exists. Inter-regional flows from the Central region provide the needed electricity to other deficit regions, especially to the South and parts of the Northwest region[9]. Under the restructured electricity market envisaged by the reforms, inter-regional trade will be critical to ensure that inter-regional competition can be supported and not be constrained by network congestion. Sufficient network interconnection among regions will be essential to ensure against the formation of regional monopolies.

In its Energy Strategy, the Russian Government raised the concern that, because of weak connections in the existing network, the national grid may not provide the necessary access to generators and inter-regional trade flows in the future competitive market.

9. While the Northwest region imports some of its electricity needs from the Central Region, it exports electricity to Finland.

Figure 2 Regional and Overall Russian Electricity Surplus: Deficits, 1991-2002, TWh



Source: *Economics and Energy of the Regions*, A.M. Mastepanov and V.V. Saenko, Moscow, 2001, *Fuel and Energy Complex of the Regions of Russia*, Volumes 1 and 2, Moscow 2003

Weaknesses currently exist in practically all Energy Systems, at various levels. Weak connections will need to be strengthened in future. This concern is reflected in the investment program of the Federal Grid Company (FGC) with its focus in 2004 on strengthening sub-regional links (330 kV) within the Northwest region to ensure the unlimited use of the Kola nuclear plant as well as the inter-regional links (500 kV) between Siberia and the Urals energy systems and the European part of Russia[10].

As of 2004, the Federal Grid Company, with the approval of its regulator, the Federal Tariff Service, is forming its investment program on a 3-year basis. The Government also approved for the first time an investment program including a large portion to be financed by FGC debt. Of the almost $1 billion budgeted for investment by the FGC in 2004, only 55% was covered by the regulated tariff. The FGC investment plan for 2004 and beyond encompasses 2 main goals:

- Keeping pace with new generating capacity to ensure its use without limitation due to lack of network links;
- Ensuring the reliability of transmission capacity through the rehabilitation of existing network and construction of new lines, including the inter-regional links to ensure the functioning of the electricity market both physically and in terms of limiting market power abuses due to network congestion between regions.

The IEA estimates investment needs for transmission and distribution will be in the order of $200 billion over the next 25 years, but the near-term needs will be relatively low to 2010, amounting to $1 billion a year in transmission and another $3.4 a year in distribution. Investments needs in the network are expected to be higher than those for generation.

10. See the Federal Grid Company website and discussion on investment at *www.fsk-ees.ru/*

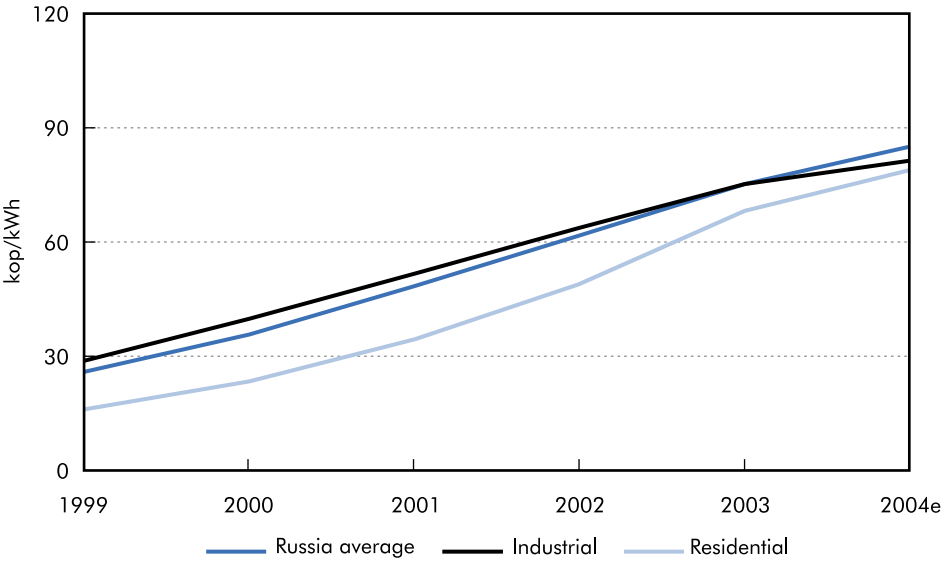
WHOLESALE AND RETAIL PRICES

Except for 15% of the wholesale market, electricity and heat prices continue to be subject to government regulation. At the federal level, the regulator is the Federal Tariff Service (FTS). It sets wholesale electricity prices, as well as transmission tariffs and RAO UES subscription fees. The FTS also sets maximum and minimum prices for retail electricity and heat. The actual prices as well as prices for the transit of heat and electricity over the network are set by Regional Energy Committees within the limits set by the FTS. Once the industry is deregulated, both wholesale and retail prices will be set by market mechanisms, while transmission and distribution prices, as well as the various subscription fees (to the system operator and market operator) will continue to be regulated by the FTS.

Over the last decade the Government has used its control of electricity tariffs to manage inflation and maintain the short-term competitiveness of the Russian economy. Prices have been based largely on social and political considerations. Over the 1990s, electricity prices rose only half as fast as industrial producer prices. As a result power companies have performed poorly, and investment in the sector has dropped dramatically. Regional Energy Commissions have continued the practice of cross-subsidizing to assist residential consumers, state organizations and agricultural consumers at the expense of industrial consumers.

Since 2000, electricity prices have risen faster than inflation, and residential tariffs have begun to catch up with industrial tariffs as some cross-subsidies have been phased out. In 2003, residential tariffs were just 10% lower than industrial tariffs; they had been 44% lower in 1999. The gap is expected to narrow, and tariffs to residents are expected to exceed those to industries in the next few years. Residential electricity tariffs would have to be from 25% to 40% higher to reflect fully the difference in costs.

Figure 3 Average, Industrial and Residential Tariffs, 1999-2004e



Source: Federal Tariff Service

In its efforts to keep inflation down below 10% (in contrast to almost 85% as late as 1998), the government has capped prices in the "natural monopoly" spheres – gas, electricity and railways. To stimulate efficiency and cost reductions in these industries, the Federal Tariff Service is seeking to refine its price-regulation mechanisms – by replacing "cost-plus" regulation with "price caps".

SECURITY OF SUPPLY

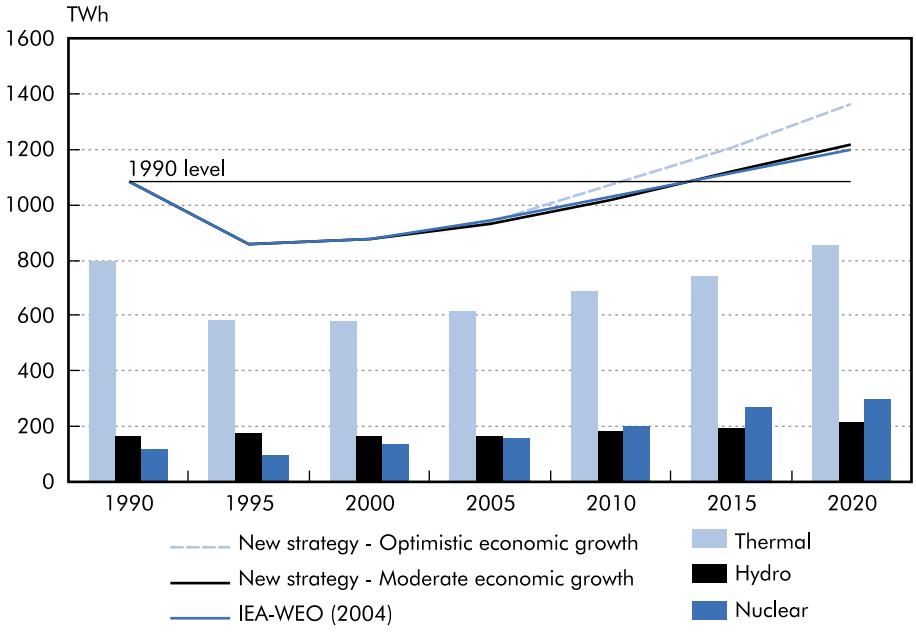
Russia's economy has grown phenomenally since the financial crisis of August 1998. GDP growth peaked at 10% in 2000, and has averaged almost 6% since then; growth was 7.3% in 2003. The Russian government projects growth of 6.2% per year over 2000-2007. In 2001, RAO UES projected that the combination of high economic growth and underinvestment in generating plants would reduce reserve margins below minimum tolerance levels by the period 2004-2006. Although increasing over time, peak demand to date in 2005 (141.9 GW) was, in fact, almost 5% less than that in 1993. With installed generating capacity of over 200 GW there is still considerable excess capacity that could be harnessed.

The dramatic drop in Russian GDP during the 1990s depressed electricity consumption. At the same time, investment in new capacity and maintenance plummeted. The construction of several nuclear power plant projects was halted in the late 1980s and early 1990s. Supply amply meets demand now[11]. Just when electricity supply is likely to become tight is hotly debated. The Russian Energy Strategy provides an optimistic and moderate economic scenario, shown in Figure 4. Conservative estimates, including those of the International Energy Agency, foresee little tightening of electricity supply until well into the 2010s[12]. This reflects an outlook where existing generating capacity will be used more efficiently based on market-driven decisions as well as the impact on the demand side of potentially higher electricity prices in the future.

A key issue which is poorly understood due to the paucity of reliable data at this point in time, is how much generating capacity which was mothballed over the 1990's can be effectively reconnected and used. Figure 5 below reflects the load factors in 1990 and 2003 for the various types of Russian generating capacity. Nuclear load factors have increased dramatically since 1990 by shortening the maintenance periods and by improving the fuel cycle and the component reliability. Hydro load factors have remained relatively stable over the last decade. Hydro load factors are dependent on regulatory practices and rainfall, but perhaps more importantly in the case of hydro

11. Based on Ministry of Energy data, in 2002, overall Russian electricity generation levels reached almost 85% of 1991 levels – a useful benchmark of pre-stagnation levels of electricity demand. This being said, regional constraints are already being felt. Certain electricity systems within Russia are nearing 90% of 1991 levels – Siberia (88.7%), the South (87.7%) and the Northwest (86.6%) regions. See Annex 2 for more details.
12 The 1990 level of electricity supply is used as a crude benchmark for electricity supply-demand tightening.

Figure 4 Electricity Generation: Russian Energy Strategy and IEA Outlook, TWh

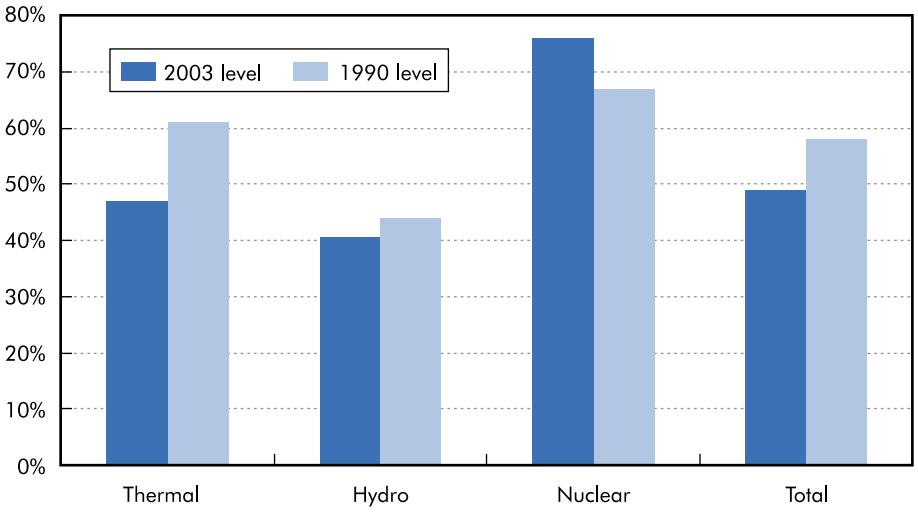


Source: Russian Energy Strategy at *http://www.mte.gov.ru/docs/32/1779.html* and the *World Energy Outlook*, IEA 2004

dams situated along the Volga (over 8 GW), the impact of increased load on the fisheries (with the Volga delta situated on the Caspian Sea) – not to mention the risks of floods to the huge population centres along the Volga river banks, factors importantly in how this hydro capacity is regulated and used. Hydro generating capacity in Siberia (20.7 GW) is much less impacted by these other factors.

The most significant variable is the load factor at thermal generating plants. This has dropped almost 15% since 1990, from levels of over 60% to 47% in 2003. Accounting for almost 70% of Russia's generating capacity, thermal load factors play a critical role. Given the non-payments and low electricity tariffs over the 1990s and the resulting lack of investment and accelerated depreciation of thermal generating capacity, there is little information as to the state of this large share of Russia's generating capacity apart from its age structure, with two thirds commissioned almost 25 years ago. What is known is that over the 1990s regulatory decisions were aimed at balancing load equally across all thermal power plants to ensure that all capacity irrespective of its relative efficiency continued to operate. The Russian Energy Strategy points to an increase in losses in the electricity transmission lines as a result of this inefficient use of thermal capacity generation. Thus as in normally functioning markets – based on economics and costs – where the most efficient plants are used at maximum capacity, over the 1990s in Russia the most inefficient thermal plants were used at the same lower load as those of the most efficient plants. How effective this policy was in ensuring that electricity units were not cannibalized for spare parts is the key question now. This will mean the difference between major new investments being needed in the sector or an ability to limit investment needs through refurbishment of existing capacity.

Figure 5 Load Factors, 1990 vs 2003



Source: IEA estimates based on Ministry of Energy of the Russian Federation, *Fuel and Energy of Russia*, Moscow, 2000.

At present the main risk to security of supply across Russia is the chance that the plants may not be able to accumulate enough fuel to meet peak load. Regulated long-term fuel supply contracts are being considered and may represent a positive first step to ensure that all generators enjoy non-discriminatory access to input fuel at fair and reasonable prices. In the 1990s, rampant non-payment was a key problem plaguing the electricity sector. By 2003, RAO UES had recovered most of the arrears, but non-payment, particularly by households, continues to be a problem in certain regions.

Inadequate repair and maintenance before the winter months could also pose a supply problem. In 2003-04, however, RAO UES ensured reliable and uninterrupted power supply to consumers despite extremely adverse weather in some areas.

Despite the current overcapacity in the Russian market, certain constraints are already visible on a regional level. Network extensions by the Federal Grid Company will be critically important to ensure inter-connection between the deficit and surplus regions and within certain regions. Electricity sector restructuring and liberalization will be essential in attracting investment when new generating capacity is needed. But it will take potential investors some time to evaluate Russia's success in implementing the various aspects of electricity sector reform. The time to move ahead with reform is now.

II. RUSSIAN ELECTRICITY SECTOR RESTRUCTURING

THE LEGISLATIVE AND CORPORATE FRAMEWORK FOR REFORM

In the Soviet era, the Russian electricity sector was vertically integrated, with no competition at the wholesale level and no choice of supply for consumers.

In July 2001, the Russian Government announced an ambitious plan to create a competitive electricity sector over the course of this decade[13]. The main objectives of the reform included improving the sector's efficiency and transparency, promoting investment and ensuring reliable supplies for all users. The Russian Government recognised that the achievement of these goals would be "…impossible without changing the existing system of economic relations and immediate structural reform of the electric power industry…"[14].

In 1992, Presidential Decrees 922 and 923 transformed the Russian electricity sector, with the exception of nuclear generators, into a single joint-stock corporation, United Energy Systems (RAO UES). All non-nuclear generation, transmission and distribution assets were divided between RAO UES and 75 regional power utilities known as *AO-energos*. RAO UES owns all of Russia's large thermal plants and hydro facilities, as well as the high voltage grid and the Central Dispatch Unit. It retains varying degrees of control over the regional *energos*, which in turn hold regional monopolies in supply and distribution, as well as the majority of co-generation assets in their regions. Minority shares in RAO UES and in its large power plants and *energos* were privatized. Nuclear power generation is100% owned by the Ministry of Atomic Energy. Nuclear plants are operated by the state company RosEnergoAtom[15].

In March 2003, a set of laws and regulations was adopted to set the reform in motion[16]. They mandated the break-up of vertically integrated structures into competitive generation and supply companies, on the one hand, and regulated transmission and distribution companies, on the other. The laws outlined the structure and rules for competitive wholesale and retail markets and for network and system operation. New regulations dealt with access, pricing, investment, institutional arrangements and crisis management.

13. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001).
14. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 2.
15. With the exception of the Leningrad nuclear power plant, which is independent.
16. See Annex 1 for more detailed discussion.

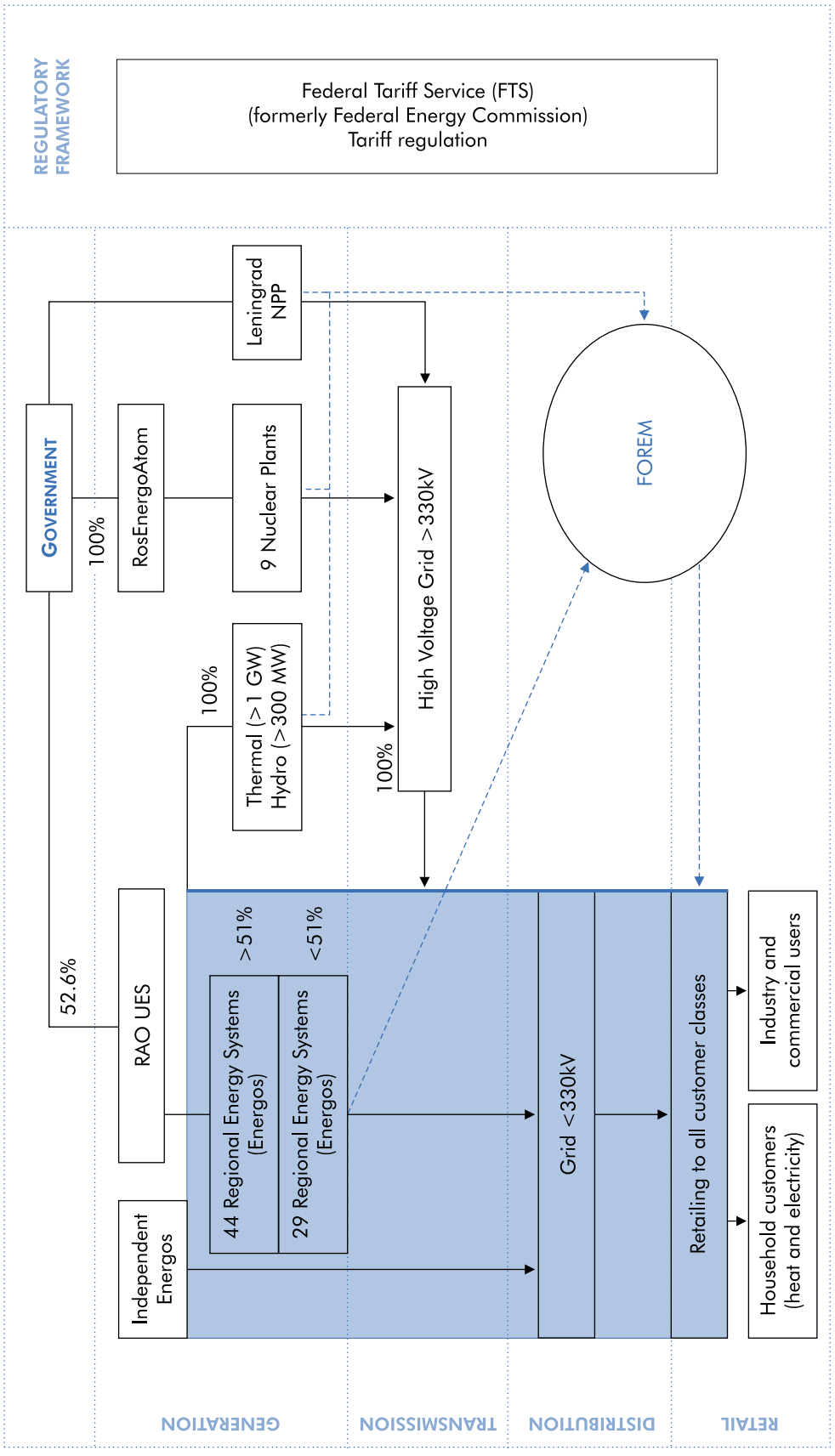
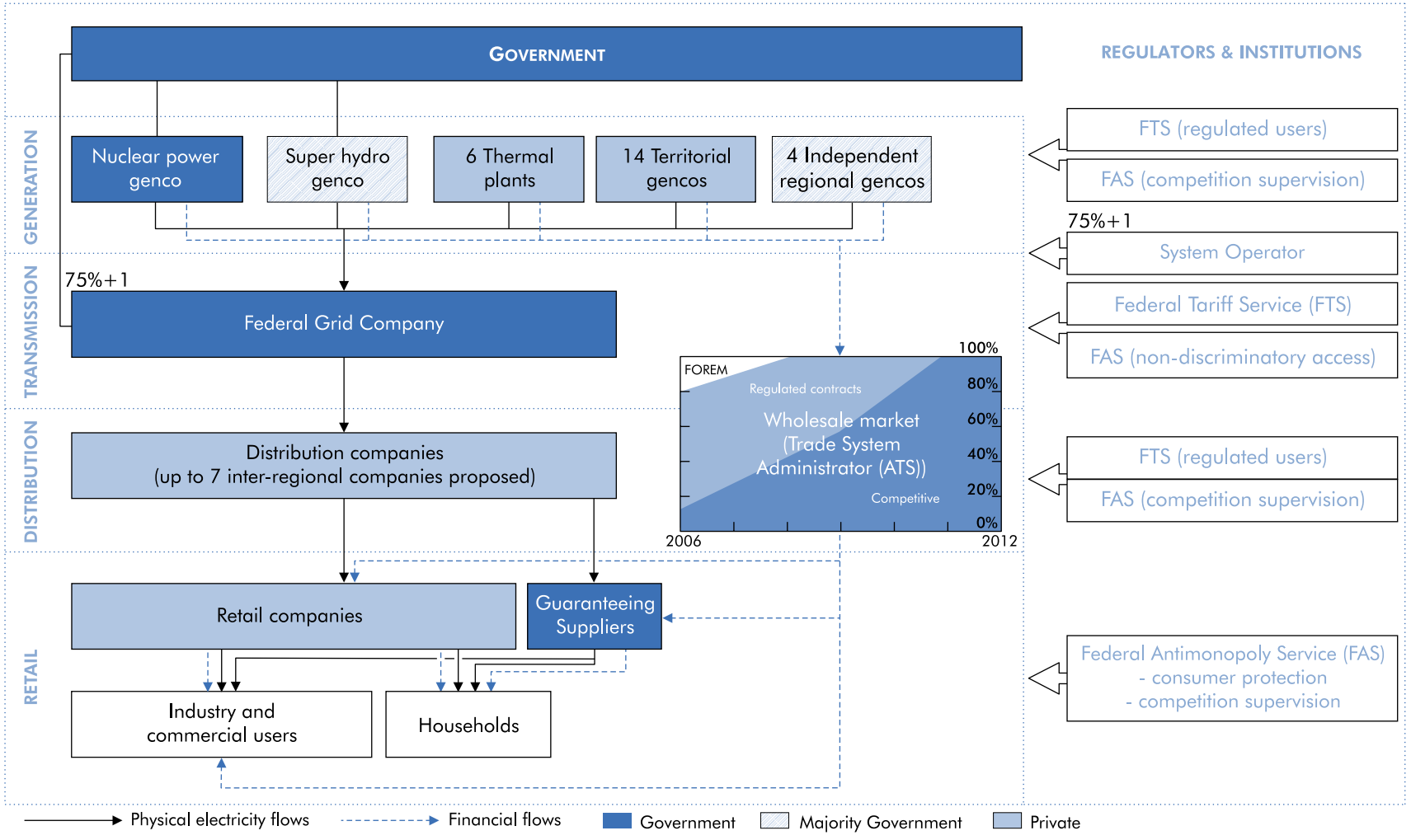


Figure 6 The Pre-reform Structure of the Electricity Market, 1992-2003

Figure 7 Proposed Reforms – Target Market Structure, 2006-2012



IMPLEMENTATION

On 29 May 2003, RAO UES adopted a "conceptual strategy" for the period 2003-2008", which has come to be known as the "5 + 5 strategy"[17]. It laid out the procedures for the corporate restructuring of RAO UES, defining the basic principles and processes of corporate restructuring of the electricity sector. On 27 June 2003, the government set out its own "action plan" for restructuring the electric power industry over the period 2003-2005. Thus, parallel corporate and government processes were set in motion, to complement one another as they were independently carried out. Implementation is currently progressing in parallel on several key elements of the reform program. The process can be divided into three phases[18].

Phase 1 (2003 – 2004)

RAO UES began its reform program of restructuring and incorporation. The reform program included the implementation of a new business model for RAO UES based on best practice models applied by large utilities around the world[19]. The key principle of the new structure was to create centres of responsibility in different lines of business of RAO UES (dispatching, transmission/distribution, generation, etc.) which had clearly defined goals set before them and the resources to accomplish them. The new business units formed in the process were given the tasks to increase efficiency and implement reforms in the subsidiaries under their management.

According to the original legislation, the physical unbundling of competitive and "natural monopoly" activities was to have been completed by 1 January 2005[20]. This has since been rescheduled to 1 April 2006[21]. Key steps during this phase included:

- the creation of wholesale generating companies;
- the creation of a national system operator;
- the transfer of transmission assets from RAO UES to the Federal Grid Company;
- the creation of inter-regional transmission companies;
- the creation of a Trade System Administrator (ATS) to operate the wholesale market;
- four pilot projects to provide a model for unbundling regional *energos*;
- a start to the restructuring of regional *energos* on a functional basis.

Trading arrangements for the wholesale market during the transition period were developed and implemented. Key elements included establishing rules for the

17. The reform plan was developed by RAO UES over the five year period 1998 and 2003 and is expected to be implemented between 2003 and 2008. Hence, the strategy is commonly referred to as the «5+5.» For more detailed information on the 5+5 Strategy see *http://www.rao-ees.ru/en/show.cgi?info/con2003.htm#1*.
18. See Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), *Concept of RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), pages 35-37, and Resolution 865-r (27 June 2003).
19. On 26 March 2004, the Board of Directors of RAO UES approved the new organizational structure of RAO UES's executive administration. For more details see *www.rao-ees.ru/en/business/report2003/6_2.htm*.
20. Federal Law #36-FZ, *On Specific Features of Functioning of Electric Power Industry During the Transitional Period and on Introduction of Amendments into Certain Legislative Acts of the Russian Federation and on Recognizing Certain Legislative Acts of the Russian Federation to Have Lost Their Force in Connection with Adoption (26 March 2003), Article 6*.
21. On December 28, 2004 Federal Law #178-FZ superceded #36-FZ.

transitional market and implementing the transitional wholesale market (with voluntary user participation) as of 1 November 2003.

Work proceeded on developing the legislative and regulatory framework. Key elements included:

- developing and ratifying transition period rules for the wholesale market;
- developing and implementing rules for non-discriminatory access to "natural monopolies";
- developing new principles and methodologies for regulated tariffs during the transition period;
- developing a regulatory framework for supervising competition;
- determining the scope and authority of the new regulatory bodies;
- setting standards for information disclosure and establishing certain dispute-resolution procedures;
- work on developing licensing arrangements for retail suppliers and Guaranteeing Suppliers.

Many of these arrangements were completed and others were well advanced in 2003. Delays occurred in 2004, however, due in part to the government reorganization in March. The deadline for the distribution of federal assets and the incorporation of wholesale *gencos* has been pushed back.

Phase 2 (2005 – 2006)

The restructuring and incorporation programs continue. Wholesale generation companies are to be created and incorporated. The regional *energos* are to be fully restructured. Territorial generating companies and inter-regional distribution companies are to be established. The transitional wholesale market will be extended to Siberia.

Decisions are to be taken on the reorganisation and incorporation of remaining RAO UES assets. The national system operator and the Federal Grid Company are to be separated from RAO UES. The remaining thermal generating companies are to be incorporated and sold off. The super-hydro wholesale generating company is to be incorporated. The territorial generation companies are to be incorporated and sold. A holding company for regional distribution assets is to be created. Remaining RAO UES assets are expected to be consolidated. A holding company is likely to be created for Guaranteeing Suppliers, isolated regional *energos*, non-consolidated regional generation companies and other non-core assets.

At the end of this process, the government will control at least 52% of the voting stock in the Federal Grid Company and the national system operator, a controlling interest in the super-hydro generator and unsold wholesale generating companies. It will own all nuclear facilities[22].

22. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Articles 8 and 12, and Federal Law #36-FZ, *On Specific Features of Functioning of Electric Power Industry During the Transitional Period and on Introduction of Amendments into Certain Legislative Acts of the Russian Federation and on Recognizing Certain Legislative Acts of the Russian Federation to Have Lost Their Force in Connection with Adoption* (26 March 2003), Articles 8 and 9.

The final version of the wholesale market guidelines and rules will be decided upon. Guidelines will be developed for retail markets. The decision will be taken to end the transitional period and launch the competitive wholesale and retail market. (But this decision is unlikely to enter into force before 1 January 2006).

Phase 3 (2006 – 2009)

The RAO UES restructuring program is to be completed during 2008-9. Competitive wholesale and retail markets will open progressively as cross-subsidies are unwound. Price controls will be removed for sales in the competitive sector. A regime of vesting supply contracts will be implemented for regulated electricity sales. The decision will be taken to extend customer choice to all users (some time after 2010 in all likelihood). And government equity in the FGC and the national system operator will increase to 75% of voting capital plus one share[23].

RESTRUCTURING PROCESS

The 5 + 5 Strategy calls for two distinct unbundling processes: one involving assets directly owned and managed by RAO UES and the other involving the assets of regional *energos*.

Unbundling of RAO UES assets is expected to proceed in two phases. Phase One involves incorporation and the beginning of a divestment program for six thermal generation companies.

Phase Two is expected to begin during the second quarter of 2006 with a resolution to create four holding companies to incorporate:

- the assets of thermal wholesale generating companies not previously divested;
- the assets of the super-hydro generating company;
- the assets of fully incorporated territorial generation companies; and
- the shares of the inter-regional distribution companies.

Individual companies within the holding-company structure will be independently separated and sold off. On completion of Phase Two, the holding company that will replace RAO UES will retain shares in Guaranteeing Suppliers, isolated regional *energos*, non-consolidated regional generation companies and other service assets.

The 5 + 5 Strategy proposes to unbundle regional *energos* on a functional basis in two phases[24]. In Phase One, transmission assets were transferred to the Federal Grid Company and to inter-regional transmission companies in exchange for equity. Regional dispatch-unit assets went to the national system operator. Repair and other service

23. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Articles 8 and 12.
24. *Concept of RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), pages 25-26.

enterprises were spun off. Phase Two will involve unbundling the remaining regional *energo* assets to create: regional generation companies, distribution companies, entities holding shares in inter-regional transmission companies and supply companies. In some cases, entities may also be created to hold assets destined for wholesale generation companies. In other, cases local heat utilities and repair or engineering companies may also be created. It was envisaged that Phase Two would proceed in three stages:

- Stage One: During the 2nd quarter of 2003, four pilot regional *energos* began their restructuring process, with the lessons learned incorporated into subsequent restructuring processes to enhance efficiency.

- Stage Two: A second group of *energos* was to have begun their restructuring process once the shareholders of regional *energos* involved in the pilot restructuring process had voted to proceed. Despite delays due to various unforeseen problems with a few of the pilot *energos*, the second group of regional *energos* (17) commenced their restructuring process during the 3rd quarter of 2003.

- Stage Three: Restructuring of a third group of regional *energos* (15) commenced during the 4th quarter of 2003; a fourth group (4) commenced during the 1st quarter of 2004; a fifth group (5) commenced during the 2nd quarter of 2004; a sixth group (4) commenced during the 3rd quarter of 2004; a remaining group of regional *energos* (3) commenced their restructuring based on a variation of the basic model for restructuring by end-2004. By the end of 2004, 52 regional *energos* had begun the restructuring process[25].

Table 5 Key Milestones Passed by Regional Energos in the Restructuring Process

	2003	2004
Regional *energos* with restructuring plans approved by the Board of Directors of RAO UES	34	52
Regional *energos* with restructuring plans registered by the State	0	5
Regional *energos* which held their shareholders' meeting to approve their restructuring process	3	36

Source: RAO UES Information Bulletin on the Reform of the Russian Electricity Sector, January - November 2004 at *http://www.rao-ees.ru/ru/reforming/*.

Inter-regional integration of some generation and distribution assets will proceed following completion of Phase Two. Before integration, special management companies will be established to ensure that assets to be integrated are operated in an integrated and co-ordinated manner.

25. Note the other 21 regional energos in which RAO UES is a shareholder are located in Siberia or the Far East, currently not part of the restructuring process.

DIVESTMENT PROCESS

Under the 5 + 5 Strategy, all existing shareholders would be entitled to receive a *pro rata* shareholding in the new enterprises created through the restructuring process. However, *pro rata* distribution in this particular context could unduly dilute existing shareholdings across a range of companies, potentially reducing liquidity and value. To address this concern, the 5 + 5 Strategy proposes that the divestment process incorporate a competitive share-exchange mechanism to enable existing shareholders to choose the businesses within which they wish to concentrate their equity.

The 5 + 5 Strategy originally proposed a two-step process.

- Step One: Shareholders would be entitled to exchange their existing RAO UES or regional *energo* shares for shares in newly incorporated entities on a *pro rata* basis, with the exchange ratio set by the RAO UES Board of Directors.
- Step Two: Shareholders would be able to bid for 'unclaimed" equity in the newly incorporated entities through an auction process, with existing RAO UES and regional *energo* shares forming the bidding currency. The minimum exchange ratio would equal the ratio set for the initial share exchange.

The government would not participate in this process. Hence, as RAO UES shares are exchanged for shares in the new incorporated entities and cancelled, the government's proportional share in the remaining assets of RAO UES will increase, enabling it to increase its equity in the Federal Grid Company and national system operator as mandated in the Electricity Act.

Further divestment can be expected following this initial process as the government increases its equity in the Federal Grid Company and the national system operator to achieve a 75% plus one voting share.

On completion of the divestment process around 2008-9, the government will wholly own nuclear facilities and possibly the system operator. It will retain majority ownership of the hydro wholesale generation company, the Federal Grid Company and inter-regional distribution. It will retain some stake in other local assets, potentially including Guaranteeing Suppliers. The government is expected to sell off all the thermal generating companies and most, if not all, of the territorial generating companies, along with some retailing enterprises. The market operator will be wholly owned and operated by market participants, subject to government regulation.

TRANSITION PERIOD WHOLESALE MARKET ARRANGEMENTS

The wholesale market for the transition period began trading on 1 November 2003. Its objectives include[26]:

26. Decree #526, On Restructuring the Electric Power Industry of the Russian Federation (11 July 2001), page 4 and Concept of RAO UES's Strategy for 2003-2008 – The 5+5 Strategy, RAO UES, (29 May 2003), page 1.

- developing and testing the market infrastructure required to operate a fully competitive wholesale market;
- providing an opportunity for market participants and institutions to develop experience in a competitive wholesale market;
- introducing genuine market-based price signals for wholesale electricity investment and consumption.

Key features of the transitional competitive wholesale market reflect in part the arrangements that are envisaged for the fully competitive wholesale market. An important exception is that total trade volumes may not exceed 15% of total planned production.

Box 1 Key Features of the Transitional Wholesale Market

Main components of the transitional period wholesale market include a regulated sector, a competitive sector and a deviations sector.

- At least 85% of individual planned production and aggregate planned consumption must be sourced from the regulated sector. Prices and generation volumes are set by regulation.
- 15% of individual planned production and aggregate planned consumption (up to 30% of individual consumption) may be sourced from the competitive sector, either through bilateral contracts negotiated between the parties and registered with the Trade System Administrator (ATS), or through a day-ahead spot market operated by the ATS.

  Market participants electing to sell or purchase from the spot market may submit up to three price/quantity bids for each hourly trading interval, covering a 24 hour period one day in advance of dispatch. ATS determines the optimal dispatch and associated market clearing price based on these bids, subject to any technical limitations advised by the national system operator.

  ATS provides a settlement service based on metered production and consumption, incorporating losses and congestion costs on a nodal basis (nearly 5 300 nodes).
- Imbalances between planned or dispatched hourly production and consumption are resolved through the real-time deviations sector. Prices for balancing services are regulated and determined according to prescribed methodologies. The cost per unit will vary depending on the nature and cause of the imbalance, with financial incentives to discourage voluntary imbalances.

  Eligible market participants include:
- Generators with total installed capacity of at least 25 MW and the capability of supplying at least 5 MW at each of their network connection points.

- Consumers with equipment capable of accepting at least 20 MVA in total and 5 MVA at each of their network connection points.

- Retailers with supply contracts to final consumers of no less than 20 MVA in total and 5 MVA at each network connection point (Guaranteeing Suppliers will not be subject to this requirement).

  All market participants must possess a contract for the supply of transmission services, sign ATS's membership agreements, and possess approved metering and data communications equipment (incumbent FOREM[27] participants have two years to meet this latter requirement).

PROPOSED TRANSITIONAL MARKET IMPLEMENTATION PROCESS

The transitional period wholesale market will be introduced in two and possibly three phases.

Phase One began with the introduction of the transition period market in November 2003 and was to run for at least nine months. It included European Russia and the Urals. During this phase, producers were required to make 15% of their production available to purchasers on the wholesale market. For purchasers, however, participation in the market was voluntary. They could buy their entire electricity requirement from the regulated sector if they wished. Excess capacity bid into the competitive market was to be folded back into the regulated sector and sold at regulated prices.

Phase Two was to begin in the third quarter of 2004 but has been deferred. The main change was to be mandatory participation. Buyers and sellers were both required to trade 15% of their electricity on the competitive market. The transition market was to be extended to Siberia at this time. However, it is likely that the transitional market model will be replaced from 1 January 2006 by a new model involving a system of regulated bilateral contracts which will be gradually wound back over 5 to 7 years and replaced by electricity purchases from the competitive wholesale market.

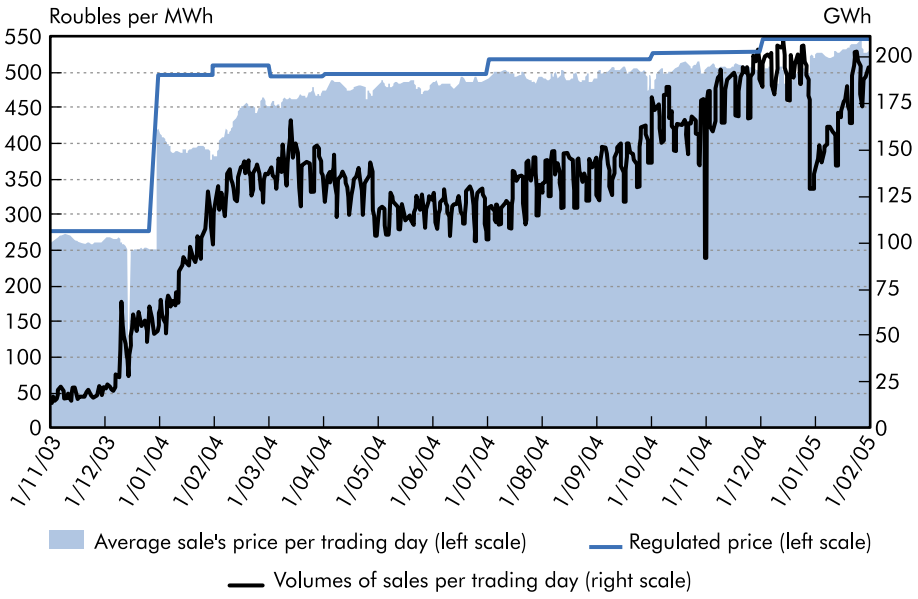
In March 2003, the deadline for compulsory separation of natural monopoly assets was set for 1 January 2005. Since it was assumed that the unbundling process would take from one to two years, the restructuring was expected to be complete by 2007. On 28 December 2004, a new law was passed extending the deadline for compulsory separation of natural monopoly assets to 1 April 2006. The timeframe now envisaged for completion of the restructuring in practice is Spring 2008.

27. FOREM is the federal electricity exchange that allows excess capacity to be traded at regulated prices.

Transitional wholesale market performance

Daily volumes traded in the competitive sector have increased steadily from around 1% of average total supply in November 2003 to between 8% and 9% at the beginning of 2005. Participation has also grown steadily, with between 80 and 90 registered participants actively trading by the beginning of 2005. Daily spot prices have varied from 262 roubles per MWh in November 2003 to 549 roubles per MWh in February 2005, around 3% below the regulated price quoted in FOREM.

Figure 8 Transition Period Wholesale Market Trading - Nov. 2003 to Feb. 2005



Source: ATS website *http://www.np-ats.ru/*

IMPLEMENTATION CHALLENGES AHEAD

Establishing a sound strategic policy direction for progressing the electricity reform program represents a considerable achievement. However, greater challenges lie ahead. International experience indicates that electricity reform can raise many technical issues in relation to market design, market structure and regulatory arrangements. Emerging issues tend to be complex, often interrelated and sometimes specific to particular circumstances. Such details matter enormously in the context of implementing electricity reform, and can be expected to determine the extent to which the Government's strategic policy agenda is ultimately translated into practice. Experience has shown that inappropriate responses to technical details affecting market design, market structure or regulatory arrangements can have the potential to frustrate strategic policy objectives, distort reform outcomes, and possibly even derail reforms entirely, as was the case in California and Ontario[28]. Establishing effective price signals and allowing market

28. See IEA (2002b) and IEA (2003a) for further commentary on the experience in California and Ontario.

participants to respond to them may prove to be one of the greatest challenges facing Russian policymakers and regulators.

International experience also suggests that "winners" and "losers" can be expected to emerge as a consequence of undertaking such substantial reforms, and that stakeholders may seek to influence implementation in a manner that could seriously distort the substance or timing of the reforms. Managing the transition in a way that secures support from key stakeholders, balances competing interests and maintains the essential integrity of proposed market design, market structure and regulatory arrangements has proven to be a considerable challenge in other reform processes, and may prove to be so for Russian reformers. However, given the technical challenges inherent to electricity reform and the potential for undue compromise to fundamentally undermine successful implementation, it is important that every effort be made to ensure that the strategic policy directions are translated into practice to the greatest extent possible.

III. MARKET STRUCTURE AND OWNERSHIP

The competitiveness of the wholesale and retail market structures that emerge from the reform process will largely determine whether the new market can achieve real efficiency gains while limiting the abuse of market power.[29] Experience in other countries points to the importance of separating those elements of the market that are subject to competition from those considered part of a natural monopoly. In light of the same experience, it is important that there be enough horizontal and vertical unbundling to promote competition at each step in the value chain.

WHOLESALE MARKET STRUCTURE

Russian policy makers recognize the importance of maximizing competition among generators, both within and among regions, both to promote efficient wholesale markets and to avoid abuses of market power. The government currently proposes to create as many as 26 wholesale generators and territorial generation companies which could compete among themselves across the entire wholesale market. A key aim of this proposal is to spread ownership as evenly as possible, by technology, by location and by size.

The proposed distribution of generating capacity among companies is shown in Table 6.

The proposal may deliver considerable diversity of ownership and a highly competitive wholesale market structure. Overall, the largest firm – the aggregated hydroelectric generator – would control about 15% of total generating capacity, while the three largest would control about 34%. The situation would, in this respect, compare favourably with that in other reformed electricity markets.

The last column of Table 6 shows the results of an analysis of structural diversity using the Herfindahl-Hirschman Index (HHI). The HHI is a conventional indicator of ownership concentration and market power. Total scores above 1 800 on the HHI indicate a degree of market concentration such that one or more companies could abuse a strong market position.[30] The total score in our analysis of the Russian government

29. Experience in the United States and the United Kingdom illustrates well the influence that market structure can have on efficiency and competitiveness. See Joskow (2003) and Green (2004).
30. The HHI is calculated by adding the sum of the squares of the percentage market shares of each participant. For example, a market consisting of five competing suppliers, each with a 20% share of the market would have an HHI score of 2000 (i.e., 20^2 x 5). Views vary on what score constitutes the threshold for potential abuse of market positions. The US Justice Department considers a score of 1000 or less indicative of a competitive market. Others place the threshold as high as 1800.

Table 6: Proposed Competitive Wholesale Market Structure - Total Distribution

Company	Technology	Proposed Ownership	Capacity (MW)	Share of Total Capacity (%)	Cumulative Total (%)	HHI Index
Hydroelectric Genco	Hydro	Public Majority	27074	14,6%	14,6%	214
RosEnergoAtom	Nuclear	Public	22194	12,0%	26,6%	144
Irkutskenergo	Hydro	Public Majority	12882	7,0%	33,6%	48
Territorial Genco 3	Thermal	Private	10549	5,7%	39,2%	32
Wholesale Genco 6	Thermal	Private	9160	4,9%	44,2%	24
Wholesale Genco 1	Thermal	Private	9041	4,9%	49,1%	24
Wholesale Genco 4	Thermal	Private	8730	4,7%	53,8%	22
Wholesale Genco 2	Thermal	Private	8695	4,7%	58,5%	22
Wholesale Genco 5	Thermal	Private	8689	4,7%	63,2%	22
Wholesale Genco 3	Thermal	Private	8442	4,6%	67,7%	21
Tatenergo	Thermal	Public Majority	7003	3,8%	71,5%	14
Territorial Genco 7	Thermal	Private	6849	3,7%	75,2%	14
Territorial Genco 1	Thermal	Private	6093	3,3%	78,5%	11
Bashkirenergo	Thermal	Public Majority	5064	2,7%	81,2%	7
Territorial Genco 11	Thermal	Private	4377	2,4%	83,6%	6
Territorial Genco 8	Thermal	Private	3943	2,1%	85,7%	5
Territorial Genco 4	Thermal	Private	3692	2,0%	87,7%	4
Territorial Genco 9	Thermal	Private	3434	1,9%	89,6%	3
Territorial Genco 6	Thermal	Private	3199	1,7%	91,3%	3
Territorial Genco 12	Thermal	Private	3157	1,7%	93,0%	3
Territorial Genco 10	Thermal	Private	2999	1,6%	94,6%	3
Territorial Genco 2	Thermal	Private	2428	1,3%	95,9%	2
Territorial Genco 13	Thermal	Private	2360	1,3%	97,2%	2
Territorial Genco 5	Thermal	Private	2358	1,3%	98,5%	2
Novosibirskenergo	Thermal/Hydro	Public majority	2170	1,2%	99,7%	1
Territorial Genco 14	Thermal	Private	646	0,3%	100,0%	0
Total			185227	100,0%		652

Note: About 17 GW could not be identified and has not been included here. Auto-production, small plants and mothballed plants account for most of the missing capacity. About 11 GW of capacity in the Far East is also not included in this analysis.

Source: IEA analysis based on generating capacity figures from Ministry of Energy of RF, *Fuel and Energy of Russia*, Moscow, 2000, *Economics and Energy of the Regions*, A.M. Mastepanov and V.V. Saenko, Moscow, 2001, *Fuel and Energy Complex of the Regions of Russia*, Volumes 1 and 2, Moscow 2003 and on the Russian government's Ordinance 1254-r, of 1 September 2004, spelling out the composition of generating companies in the reformed wholesale market and Territorial Generation Company asset base taken from the resolution of the RAO UES Board meeting on 23 April, 2004 available on the RAO UES Website.

proposal was 652. In other words, the structural reforms now contemplated would, overall, yield a fairly diversified market structure (see Map 2).[31]

The government initially proposed to create four separate hydroelectric companies, but it was recently announced that there would be only one. This change will increase market concentration, adding about 25% to Russia's overall HHI score. But the nation-wide picture is still one of diversified ownership.[32] The overall concentration of ownership would increase by 54% in HHI terms – and the total would rise to about 1000 – if the government's ownership of nuclear and hydroelectric were considered in aggregate. But the overall outcome would still be consistent with a fairly diversified market structure.

Regional analysis

Network congestion is likely, however, to provoke the appearance from time to time of regional markets within the national wholesale market. During such periods, prices and dispatching patterns will reflect local supply-and-demand. Fewer generators will be involved, and they will have increased opportunities to abuse their strong market positions. It is important, therefore, to consider the *regional* implications of the proposed wholesale market structure.

The diversity of the proposed system appears a good deal less impressive when viewed from a regional perspective. Table 7 shows the proposed distribution of generating capacity on a regional basis[33]. In most cases, there will be from four to eight substantial generators in each region. In three regions, the largest single generator would control 30% or more of the region's total capacity, approching the 35% maximum share which, under the terms of the Electricity Law, would trigger price regulation and possibly forced unbundling. The three largest firms in each region would control between 47% and 76% of total regional generating capacity, with the highest shares of combined ownership in the Volga and North West regions. These figures are comparable to those in several European Union countries, but they are higher than those which the EU Commission regards as consistent with a competitive market structure (see Map 2).[34]

31. Caution is necessary here. A growing body of analysis suggests that the HHI substantially *understates* the likelihood of potential abuses of market power in electricity markets. In such markets, generators with relatively low market shares can exercise considerable market power in certain circumstances. The HHI does not reflect the market power that can arise from varying combinations of technology or from cross-ownership. See OECD (2003) for further discussion of combined technologies and *A Powerful Competition Policy* (2002) for cross-ownership.
32. See Troika Dialog, Russian Market Daily, 28 October 2004, page 4 and *WMRC Perspective*, 28 October 2004. With the original four hydro companies, the HHI total was 522. Further concentration of the wholesale structure may result from the decision *not*, as previously expected, to break up Mosenegro, the very large company providing heat and light to the Moscow region. That decision will, however, have little effect on the Russia-wide picture.
33. Before-the-fact analysis of the potential regional implications is a problematic exercise. Experience in the Pennsylvania-New-Jersey-Maryland market suggests that it is impossible accurately to predict the actual points of congestion that will emerge in a competitive-market situation. So, the regional sub-markets that would be stimulated by congestion cannot be mapped or analyzed at this stage. The uncertainty is even more acute in Russia, due to the distortion of efficient dispatching caused by current regulatory arrangements; once competition is introduced, the country could see radical different patterns of network usage. Nevertheless, the implications of regionalization are too important to ignore. They can be illustrated by way of a reasonable proxy. We have chosen existing integrated electricity systems to describe the potential impact of regional market separation on competition among generators in the wholesale market.
34. See EU Commission, *Third Benchmarking Report on the Implementation of the Internal Electricity and Gas Market* (draft, March 2004), Table 1, page 4 and Table 3, page 17, for comparative measures of wholesale market concentration in the EU.

Table 7 Proposed Competitive Wholesale Market Structure - Regional Distribution

Company	Technology	Proposed Ownership	Capacity (MW)	Share of Total Capacity (%)	Cumulative Total (%)	HHI Index
Central						
RosEnergoAtom	Nuclear	Public	10834	22,1%	22,1%	488
Territorial Genco 3	Thermal	Private	10549	21,5%	43,6%	462
Wholesale Genco 3	Thermal	Private	5025	10,2%	53,8%	105
Hydroelectric Genco	Hydro	Public Majority	4509	9,2%	63,0%	84
Wholesale Genco 6	Thermal	Private	3580	7,3%	70,3%	53
Territorial Genco 4	Thermal	Private	3206	6,5%	76,8%	43
Territorial Genco 6	Thermal	Private	2561	5,2%	82,1%	27
Wholesale Genco 5	Thermal	Private	2400	4,9%	87,0%	24
Territorial Genco 8	Thermal	Private	2247	4,6%	91,5%	21
Wholesale Genco 1	Thermal	Private	1885	3,8%	95,4%	15
Territorial Genco 2	Thermal	Private	1167	2,4%	97,8%	6
Wholesale Genco 4	Thermal	Private	1100	2,2%	100,0%	5
Total			**49063**	**100,0%**		**1333**
Northwest						
Territorial Genco 1	Thermal	Private	6093	32,9%	32,9%	1082
RosEnergoAtom	Nuclear	Public	5760	31,1%	64,0%	967
Wholesale Genco 6	Thermal	Private	2085	11,3%	75,2%	127
Territorial Genco 2	Thermal	Private	1261	6,8%	82,1%	46
Wholesale Genco 3	Thermal	Private	1060	5,7%	87,8%	33
Territorial Genco 9	Thermal	Private	719	3,9%	91,7%	15
Wholesale Genco 4	Thermal	Private	630	3,4%	95,1%	12
Territorial Genco 4	Thermal	Private	486	2,6%	97,7%	7
Wholesale Genco 2	Thermal	Private	430	2,3%	100,0%	5
Total			**18524**	**100,0%**		**2293**
South						
Hydroelectric Genco	Hydro	Public majority	2526	22,5%	22,5%	508
Wholesale Genco 2	Thermal	Private	2400	21,4%	44,0%	459
Wholesale Genco 6	Thermal	Private	2245	20,0%	64,0%	401
Territorial Genco 8	Thermal	Private	1696	15,1%	79,1%	229
Wholesale Genco 5	Thermal	Private	1340	12,0%	91,1%	143
RosEnergoAtom	Nuclear	Public	1000	8,9%	100,0%	80
Total			**11207**	**100,0%**		**1820**
Urals						
Wholesale Genco 1	Thermal	Private	7156	18,1%	18,1%	326
Wholesale Genco 2	Thermal	Private	5865	14,8%	32,9%	219
Wholesale Genco 4	Thermal	Private	5400	13,6%	46,5%	186

Bashkirenergo	Thermal	Public majority	5064	12,8%	59,3%	163
Wholesale Genco 5	Thermal	Private	4949	12,5%	71,8%	156
Territorial Genco 10	Thermal	Private	2999	7,6%	79,3%	57
Territorial Genco 9	Thermal	Private	2715	6,8%	86,2%	47
Hydroelectric Genco	Hydro	Public majority	1503	3,8%	90,0%	14
Territorial Genco 5	Thermal	Private	1426	3,6%	93,6%	13
Territorial Genco 7	Thermal	Private	1070	2,7%	96,3%	7
Wholesale Genco 3	Thermal	Private	882	2,2%	98,5%	5
RosEnergoAtom	Nuclear	Public	600	1,5%	100,0%	2
Total			**39629**	**100,0%**		**1196**
Volga						
Tatenergo	Thermal	Public majority	7003	30,0%	30,0%	897
Territorial Genco 7	Thermal	Private	5779	24,7%	54,7%	611
Hydroelectric Genco	Hydro	Public majority	5030	21,5%	76,2%	463
RosEnergoAtom	Nuclear	Public	4000	17,1%	93,3%	293
Territorial Genco 5	Thermal	Private	932	4,0%	97,3%	16
Territorial Genco 6	Thermal	Private	638	2,7%	100,0%	7
Total			**23382**	**100,0%**		**2287**
Siberia						
Hydroelectric Genco	Hydro	Public majority	13506	31,1%	31,1%	967
Irkutskenergo	Hydro	Public majority	12882	29,7%	60,8%	880
Territorial Genco 11	Thermal	Private	4377	10,1%	70,9%	102
Territorial Genco 12	Thermal	Private	3157	7,3%	78,1%	53
Territorial Genco 13	Thermal	Private	2360	5,4%	83,6%	30
Novosibirskenergo	Thermal/ Hydro	Public majority	2170	5,0%	88,6%	25
Wholesale Genco 4	Thermal	Private	1600	3,7%	92,2%	14
Wholesale Genco 3	Thermal	Private	1475	3,4%	95,6%	12
Wholesale Genco 6	Thermal	Private	1250	2,9%	98,5%	8
Territorial Genco 14	Thermal	Private	646	1,5%	100,00%	2
Total			**43423**	**100,0%**		**2092**

Note: About 17 GW could not be identified and has not been included here. Auto-production, small plants and mothballed plants account for most of the missing capacity. About 11 GW of capacity in the Far East is also not included in this analysis.

Source: IEA analyses based on capacity figures from Ministry of Energy of RF, Fuel and Energy of Russia, Moscow, 2000, Economics and Energy of the Regions, A.M. Mastepanov and V.V. Saenko, Moscow, 2001, Fuel and Energy Complex of the Regions of Russia, Volumes 1 and 2, Moscow 2003 and on the Russian government's Ordinance 1254-r, of 1 September 2004 and Territorial Generation Company asset base taken from the resolution of the RAO UES Board meeting on 23 April, 2004 available on the RAO UES Website.

The HHI analysis on a regional scale gives a mixed outcome. The proposed restructuring would lead in the Northwest, Volga and Siberian regions to concentrations of ownership high enough to encourage the abuse of strong market positions. The same is true, to a lesser extent, of the Southern region. The decision to create a super-hydroelectric generating company has little impact on the regional concentration analysis, because the government's original proposal envisaged aggregating hydroelectric ownership at

a regional level in most cases. The only exception was in the Central region, where the original proposal called for two smaller hydro generators[35]. Because of their modest market shares, the combination of these two companies will have little effect on the general concentration of ownership in the Central region. This is not to imply, however, that the creation of such a large and technologically flexible generating company might not in practice have a significant regional impact on competition (see Map 2).

Regional residual demand

Another revealing indicator of market concentration and the risk of excessive market power is the potential share of residual demand controlled by each generator. "Residual demand" means the amount of demand that remains to be met after all plants but one are running at full capacity. In these circumstances, which typically arise when supply is tight, the generator who controls the last remaining capacity can, if he wishes, exercise considerable market power and sell at super-normal prices. A generator's ability to price-gouge depends largely on the overall supply-demand balance for a given hourly interval, the relative elasticity of demand and the availability of imports from other regions. Also crucial is the size of the generator's ability to control residual capacity within each region[36].

Because demand, nationwide, remains lower than total capacity, it is unlikely in the short-term that any of the proposed generators could abuse its market position on a national scale. But opportunities to exercise market power in relation to residual demand are likely to occur on a regional basis. Indeed, there are some regions where tight supply conditions have already begun to emerge. Table 8 shows that the proposed restructuring would lead to cases where a single generator could control the remaining capacity to meet residual demand.

As Table 8 demonstrates, the largest generator in at least two of the six regions would have both the ability and the incentive to control the remaining capacity to meet residual demand. The two largest generators in three of the regions would dominate the supply to meet residual demand. This situation could lead to collusion and other forms of market manipulation. Technological or seasonal problems affecting one of the two large companies could sharply increase the other's ability to control the available capacity to meet residual demand. This could become an issue in the Central and Northwest, where the publicly-owned nuclear generator RosEnergoAtom will be one of the two top firms. Like other nuclear facilities, RosEnergoAtom has little flexibility of response at the margin. Its flexibility could be still further diminished by its price-taker status.[37] Flexibility may also emerge as an issue in the Siberian region, where the two dominant generators will both be hydro firms, whose ability to respond could be limited by seasonal water flows and other constraints on water use.

The ability of companies to abuse a dominant market position could emerge on a regional level in a variety of circumstances – when the constraints on the inter-regional

35. The proposal would have split ownership of the region's hydroelectric capacity between Wholesale Genco 7 and Wholesale Genco 10. The shift to a single hydro company adds only 30 points (some 2.5%) to the region's overall HHI score.
36. See OECD (2003) for further discussion of this issue.
37. Under the Electricity Law, nuclear generators would not bid a price but only provide a certain quantity of electricity to be dispatched at the system marginal price.

network limit trade or when peak demand or extraordinary events lead to a tightening of the supply-demand balance. Similar risks could develop at various points on the supply curve and at different times of the year or even times of day. (Trading in electricity is unique, in that discrete markets are formed for each trading interval throughout the day.)[38]

Table 8 Residual Capacity Shares of Two Largest Generators in Each Region

		Region					
		Central	N-West	South	Urals	Volga	Siberia
Largest Generator	Total Capacity (MW)	10834	6093	2526	7156	7003	13506
	Max. Residual Capacity (MW)	285	333	126	1291	1224	624
	Residual as % Total Capacity	2,6%	5,5%	5,0%	18,0%	17,5%	4,6%
	Residual as % Regional Capacity	0,6%	1,8%	1,1%	3,3%	5,2%	1,4%
Second Largest Generator	Total Capacity (MW)	10549	5760	2400	5865	5779	12881
	Max. Residual Capacity (MW)	5524	3675	155	465	749	8504
	Residual as % Total Capacity	52,4%	63,8%	6,5%	7,9%	13,0%	66,0%
	Residual as % Regional Capacity	11,3%	19,8%	1,4%	1,2%	3,2%	19,6%

Note: About 17 MW could not be identified and is not included here. Auto-production, small plants and mothballed plants probably account for the missing capacity. About 11 GW of capacity in the Far East is also not included in this analysis.

Source: IEA analysis based on generating capacity figures from Ministry of Energy of RF, *Fuel and Energy of Russia*, Moscow, 2000, *Economics and Energy of the Regions*, A.M. Mastepanov and V.V. Saenko, Moscow, 2001, *Fuel and Energy Complex of the Regions of Russia*, Volumes 1 and 2, Moscow 2003 and on the Russian government's Ordinance 1254-r, of 1 September 2004 and Territorial Generation Company asset base taken from the resolution of the RAO UES Board meeting on 23 April, 2004 available on the RAO UES Website.

Maximizing diversity of ownership

Further unbundling of generation capacity to produce more regional generation companies would reduce the risk of market power abuse without cutting into economies of scale. By selling off individual generating assets, the government could reduce the costs of entry for potential market participants. This might increase the pool of new investors, including large Russian companies, thereby augmenting diversity of ownership and making the structure more competitive.[39] But this solution may not be feasible. Current minority shareholders could sabotage it. And it may prove difficult to create commercially-viable enterprises capable of raising the capital for new investment.

38. Trading intervals of one hour have been proposed, meaning that there would, in effect, be 24 separate wholesale markets every day. This unique feature of electricity markets reflects the special characteristics of the product: the fact that it cannot be stored and the need instantaneously to balance supply and demand.
39. For further discussion, see *Structural and Design Issues in the Russian Electricity Reforms – A Policy Note*, World Bank, June 2004, pages 20 to 22.

The reform plan seeks to strike a delicate balance between maximizing the diversity of ownership and creating viable businesses. To this end, it envisages the creation of a number of wholesale thermal generating companies of about equal size, each with assets in several regions. But some of the proposed companies are still quite large in absolute terms; so there is room yet for further diversification of ownership. The distribution of assets outside these integrated energy systems to the new generation companies could discourage international investors who felt they lacked the local expertise to compete. It could also encourage a later trend toward regional rationalization, which would increase the concentration of ownership.

Alternatively, competition could be developed by the encouragement of inter-regional trade through a strong transmission network linking main centres of power production and consumption. This would be one response to worries about regional market power.

DIVERSITY OF OWNERSHIP

Diversity of ownership is a precondition for efficient wholesale electricity markets. But the effectiveness of such diversity will depend heavily on the asset owners' sensitivity and responsiveness to price signals.

Large domestic companies which are already shareholders in RAO UES could dominate private ownership after the coming divestitures. Table 9 provides a rough estimate of the stakes in the company held by its largest shareholders.

Table 9 Estimates of Major Shareholdings in RAO UES as of June 2004

Owner	Sector	Proportional Interest (%)
Russian Federation	Government	52
Gazprom	Energy (Government controlled)	10-13
ESN-Energo	Energy (ENEL – Italy)	5
MDM	Aluminium	4-5
National Reserve Bank	Financial (Government)	4
Evraz Holding	Steel/Metals	2-3
SUAL / CES	Aluminium	1-3
LUKoil	Oil	2
FPG (Ukraine)	Financial/Industrial group	2
InterRos	Financial/Industrial group	1-2
YUKOS	Oil	1
Norilsk Nickel	Nickel	1
Other Shareholders	(n.a.)	11-13

Source: Troika Dialog, Russian Market Daily, 3 June 2002, page 4.

Investors with substantial interests in other lines of business may not necessarily respond to price signals from the electricity market in the same way as those for whom power generation is the core business. (For example, if an aluminium company was to

control generating capacity and use its production for its own needs, in effect setting the price for itself, that kind of de facto vertical integration would reduce the reach of competition.) If responses vary too much from an efficient market one, the overall competitiveness and efficiency of the market may decline. One way to parry this risk is by organizing an efficient divestiture process in which barriers to new entrants are kept at a minimum and the greatest possible diversity of ownership – both domestic and foreign – is encouraged.

A prominent feature of the post-reform ownership structure is that the government will continue to own all the country's nuclear facilities, a controlling stake in the super-hydro generation company and possibly the residual generation assets that do not find a buyer. The state's nuclear and hydro assets alone account for over 49GW, or about a quarter of Russia's total generating capacity (excluding the Far East).

Government ownership in itself may not be a problem, particularly in the nuclear field. Because of their special technology, there are strong incentives for any owner of nuclear facilities in a competitive market to operate as base-load generators. Keeping nuclear facilities in public hands may be the more efficient way to deal with politically sensitive issues such as nuclear safety and the secure disposal of nuclear waste. But public ownership of a large part of the country's generating capacity is bound to raise doubts among other market participants about the government's neutrality. They will see a clear conflict of interest between the government's role as rule-maker and regulator and its role as a competitor in the market.

Continuing government control of hydro generators could lead to pressures on the government to intervene in the market. The perception may arise that the government continues to operate these assets in order to influence the market's behaviour. Such pressures may be hard to resist, especially after excess capacity is absorbed and wholesale prices start to rise. But it is vital that the government resist such pressure. Even the idea that the government might be willing to intervene in this way could damage the market's credibility and the confidence of market participants. Uncertainty would grow, increasing regulatory risk; efficient and timely investment would be discouraged. Such a perception must not be allowed to arise.

A strong expression by the government of its commitment to good corporate governance, and the publication of a business plan for its hydro and nuclear assets, could allay some of the market's concerns. Officials at RAO UES are currently working on new corporate governance guidelines based on international best practice. This is a very positive step.

On the other hand, the recent announcement that the government may impose a special tax on the "superprofits" of hydroelectric generators does give cause for concern. Such a tax could sharply reduce the normal commercial incentives for operators to perform efficiently and responsively. Since hydro plants are highly flexible and well able to respond to volatility in the market, a move that blunted their responsiveness could impair the process of price formation and the efficient operation of the market. It could open the door to more government intervention in the commercial activities of these businesses. That in turn would make it easier for future governments to intervene in the pursuit of public policy objectives.

In the Nordic market, privately owned and managed hydroelectric generators now operate successfully in a competitive environment. Sensitive public issues, such as public safety, environmental impacts and fisheries management, could be dealt with through licensing. Bearing in mind the inherent importance of hydro generators in wholesale price formation, and given the concerns about continuing government ownership, the government should give serious consideration to the combination of licensing with unbundling and the eventual privatization of hydro assets once the target market is operating effectively.

RETAIL MARKET STRUCTURE

Establishing a competitive retail market is a basic element of electricity market reform. Retail markets accommodating a number of independent and commercially viable firms can create a dynamic commercial environment that will drive efficiency benefits through the value chain to end users. They can facilitate customer choice. They can make available cheaper and more innovative products and services. In turn, customers who have the possibility to choose their suppliers can maintain competitive pressure on the retailers. And customer choice will lead to greater elasticity of demand in the long run. Greater elasticity of demand can provide the best short-term responses to imbalances between supply and demand; it can moderate price spikes and generally reduce the volatility of wholesale prices; it will help moderate possible abuses of market power; over the long run, it will help reduce the need for new investment in generation and transmission to deal with demand peaks. Finally, greater elasticity could help ensure that all customers in the competitive part of the market, especially small ones, would have steady access to reliable and competitively-priced electricity.

Russian policy makers recognize the importance of creating a robust competitive retail-market structure. They have included it among the strategic objectives of the reform. Details of the retail market are not yet settled, but a network of 70 to 80 Guaranteeing Suppliers will be created to provide a regulated default service and retailer of last resort service to small and vulnerable users. Each of these companies will have a protected local franchise. Other competitive suppliers will be established, but their number and the rules governing how they will compete remain uncertain.

Competitive electricity retailing is a high-volume, low-margin business which affords large economies of scale. Competitive retail markets tend to consist of a few large companies that have attained the critical mass they need to assure their commercial viability, together with some smaller "boutique" companies which are often the source of innovative new products[40]. Larger retailers often try to manage their exposure to the risks of volatile wholesale markets through vertical integration – both owning

40. See EU Commission *Third Benchmarking Report on the Implementation of the Internal Electricity and Gas Markets* (draft, March 2004), Table 5, page 19, for figures illustrating this trend in EU states.

and operating peak capacity. The fact that deep and liquid financial markets are unlikely to exist in Russia for some time may further exacerbate the tendency toward integration.

A key challenge for the retail market structure will be to allow commercially viable companies to emerge while maintaining enough diversity to drive competition among them. Even very small incremental costs could discourage some potential players. It might help a good deal if they were given free access to information on the usage patterns of smaller customers in competitive markets.

Certain practical steps will have to be taken to facilitate competition and choice. Metering equipment will be needed, as well as data management systems and systems to handle customer switching. The relatively underdeveloped state of metering in Russia could delay the onset of retail customer choice and full competition. Choice could be limited initially to large industrial users equipped with adequate meters, then gradually extended to smaller customers as appropriate metering equipment is deployed. The time required for this process, as well as its cost and complexity, are considerable. They will be relatively higher for the smallest business and household customers.[41]

Another critical determinant for the success of retail markets will be the rate at which cross-subsidies are unwound.

The scale of "horizontal concentration" will have to be carefully considered to ensure that an appropriate balance is struck between promoting competition and maintaining commercial viability. The scale and nature of vertical integration may need to be carefully watched, lest it allow existing companies to suppress competition in local markets. One solution to these issues may be a form of "extra-territorial" market structure in which retail companies with a large customer base in the competitive market compete with one another in several different regions. This set-up would resemble the structure that has been proposed for wholesale generating companies. In any event, vertical integration will probably remain the most attractive means of risk management in Russia, until more affordable financial instruments become available.

Relations between retailers in the competitive sector and the Guaranteeing Suppliers may also require attention, especially if the latter are to be associated with local distribution network companies and permitted to compete for competitive-sector customers. In this case, it may be hard to assure open access to local distribution networks on fair and reasonable terms.

Guaranteeing Suppliers will perform a necessary service for regulated customers, especially during the transition period. But they could eventually be used to maintain

41. The prohibitive cost of installing meters has often led to the use of "profiling" to estimate the electricity-use patterns of customers in competitive markets. But profiling is a very dull tool compared to interval metering. The data it produces are averages, and often inaccurate. It offers retailers little incentive to innovate or compete among themselves. Recent advances in metering technology and the economies of scale attendant upon installing meters *en masse* (as has been done in Italy) have improved the cost-effectiveness of large-scale deployments of metering equipment. For the foreseeable future, however, this kind of massive deployment will still be too expensive for Russia, except perhaps in some densely-populated urban areas.

artificially low retail prices. This would make the move to cost-reflective pricing difficult or impossible. The proposal to create a large number of fairly small, locally-based Guaranteeing Suppliers could exacerbate the risk in areas where local authorities exercise strong influence over operational matters, such as tariff setting.

The government will have to deal actively with these issues. It could reduce the risk of local authorities attaining undue influence over companies – or "capturing" them, – by creating larger Guaranteeing Suppliers. These larger companies would operate over larger regions, such as the existing integrated electricity systems, or they could be associated with the proposed inter-regional distribution companies. Larger Guaranteeing Suppliers would be better able to capture economies of scale, thereby keeping down the tariffs charged to regulated customers. Larger entities could also facilitate the eventual shift to free customer choice; they would possess the critical mass needed to transform themselves into commercially viable retail businesses serving smaller customers in the competitive market.

In the longer term, particularly if free choice is extended to household suppliers, it may make sense to reconsider the role of Guaranteeing Suppliers altogether. Alternatives exist, including direct public subsidies or public tenders with private firms to provide retailer-of-last-resort services. Some such approach might offer a cheaper way to maintain a safety net for vulnerable customers, while reducing distortions to the competitive market.

POST-REFORM RATIONALIZATION: A THREAT TO DIVERSITY AND EFFICIENCY

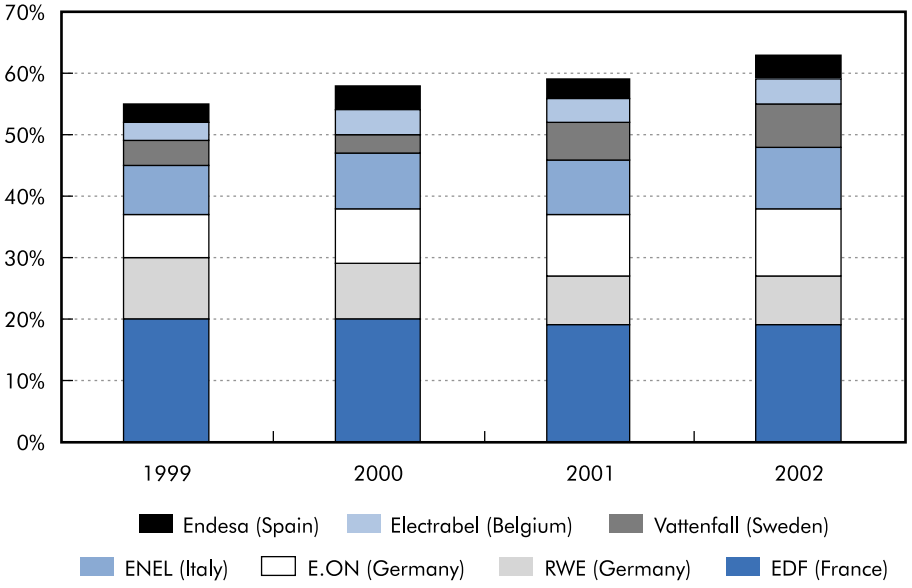
In several countries, the initial restructuring and opening of electricity markets has been followed by a strong trend toward rationalization and concentration of ownership. Between 1998 and 2002, the European Union's internal electricity market saw 96 major mergers and acquisitions. Mergers were most frequent in countries with a diverse market structure, such as the United Kingdom, and in countries with large customer bases in the competitive sector and a strong potential for commercial development, such as Germany, the Netherlands and the Nordic states.[42] By 2002, seven large utilities had grown to dominate the EU internal electricity market, controlling nearly two-thirds of all electricity sales. Figure 9 shows the evolution of these companies' market share.

These companies continue to grow rapidly. Some analysts predict that the EU electricity market will be dominated by just five large companies in 2010.[43]

Rationalization has led to complex corporate structures involving portfolio generation (companies that own different types of generation capacity and cross-ownership). Companies owning a mixture of baseload and peaking capacity can influence spot-price formation through bidding strategies that push up the system marginal price, especially in times of tight supply.

42. Centre d'Economie Industrielle, Ecole Nationale Supérieure des Mines de Paris (CERNA), *Mergers and Acquisitions in the European Electricity Sector: Cases and Patterns* (July 2003)
43. *Ibid.,* pages 114 to 131 contain further discussion of these trends.

Figure 9 Evolution of Concentration in the European Internal Electricity Market



Source: Centre d'Economie Industrielle, Ecole Nationale Supérieure des Mines de Paris (CERNA), *Mergers and Acquisitions in the European Electricity Sector: Cases and Patterns (July 2003) Figure 6, page 163.*

These practices could significantly reduce the effect of market competitiveness and open the way to collusion. Regulators in the Nordic market estimate that cross-ownership has reduced competitiveness in their jurisdiction by an amount equivalent to a 28% increase in ownership concentration. According to that calculation, the structure of the Nordic wholesale market has moved from fairly diversified to moderately concentrated, according to HHI analysis.[44]

Regulatory supervision of the rationalization process has proven to be quite difficult. Some of the mergers that have occurred can be justified on the grounds of improved efficiency: economies of scale; better risk management; lower transaction costs; and better, cheaper access to financing.[45] But the undue concentration that has resulted from unchecked rationalization could hamper the development of robustly competitive and efficient markets.

The Russian electricity sector is likely to see similar trends emerge after the market is in place. As a result competition regulation will become more important than ever. If the regulator fails to act effectively, the results could include a less efficient market, a substantial reduction of competitiveness, and increased opportunities for the abuse of market power. Efforts must be made to balance commercial considerations with the need for efficiency.

44. Nordic Competition Authorities, *A Powerful Competition Policy: Toward a More Coherent Competition Policy for the Nordic Market for Electricity Power* (June 2003), page 54.
45. See National Economic Research Associates, *Consolidation in the EU Electricity Sector: Report to the Dutch Ministry of Economic Affairs* (April 2003).

Russian policy makers recognize these risks. One of the options they are considering is a moratorium on mergers and acquisitions for a certain period after privatization.[46] This move would certainly address the issue of undue concentration. It is appealing as a short-term measure, since it would give the Federal Anti-Monopoly Service time to refine its expertise in supervising the reformed electricity market. On the other hand, a moratorium could, especially if long-lasting, hinder efficient market development and operations, ultimately imposing additional costs on consumers. The longer a moratorium remains in force, the greater the efficiency loss and costs might be. There are no simple regulatory solutions that can replace effective competition supervision. Some degree of judgment and discretion will be required of regulators in dealing with structural and behavioural issues in the new market.

The supervision of competition is almost sure to be contentious. The regulator can expect to come under intense pressure, particularly in connection with merger and acquisition cases. The proposed legislative framework provides the regulator with general policy guidelines and broad legal powers, but the actual interpretation and application of competition rules will ultimately be done on a case-by-case basis. The regulator will need to be credible. He must be seen to be acting transparently, objectively and impartially. He will need adequate resources, as well as independence and resolve. The government may need to review the issues of regulatory independence and regulatory funding. In particular, the regulator must be given the means to perform sophisticated technical investigations or to outsource such work.

46. Raised during discussions with Russian officials of the Russian Ministry of Economic Development and Trade during the IEA mission to Moscow in November 2004.

IV. INVESTMENT

THE INVESTMENT CHALLENGE

The World Energy Investment Outlook 2003 estimated that investment requirements for the Russian electricity sector over the next three decades would be on the order of $380 billion, or 1.9% of the country's gross domestic product. About $200 billion would go to improve existing transmission and distribution networks, about three-quarters of that to upgrade the distribution network. The remaining $180 billion would be used to expand generating capacity to meet growing demand. Generating capacity would approximately double over the thirty years, adding 204 GW. But a good half of this new capacity will not be needed before 2020. Existing infrastructure will easily meet demand until 2010. Between now and then, investment needs would be on the order of $6.5 billion a year, with two-thirds of that amount going to refurbish transmission and distribution networks[47]. So the period till 2010 offers a window of opportunity for implementing electricity reforms before supply-demand balances tighten and investment needs balloon.

Russian policy makers recognize the major challenge involved in attracting timely investment. They believe it can be most effectively handled by the creation of efficient electricity markets.

Conservative sentiment in international financial circles and the worldwide competition for limited investor capital are just two of the factors that will magnify the problem in the short term. The collapse of Enron and the financial difficulties of many merchant power plants in the US have shaken investor confidence in the electricity sector generally, and financial institutions have become more discriminating in their lending to electricity projects. The ten largest merchant energy companies are reported to be refinancing debt of about $31 billion, and $47 billion in US power-sector debt is expected to mature in 2007. As a result, more and more power stations have come on the market; according to some estimates, the volume of generating capacity looking for buyers has increased by 30% over the past year. Worldwide, about 80 GW of generating capacity is currently up for sale[48].

47. International Energy Agency, *World Energy Investment Outlook 2003 Insights*, (2003), pages 400-401
48. Terzic B., Liberalization of the Russian Power Sector: What is Needed to Advance Reform? presented at the United States Russia Business Council seminar on, "Liberalization of the Russian Power Sector: Opportunities for Investment and Modernization", 9 June 2004.

ATTRACTING INVESTMENT IN POWER GENERATION

Although the reform proposal is rooted fundamentally in the proposition that price signals stimulate efficient investment responses, the Electricity Law reflects the concern that such signals may not prove strong enough to attract needed timely investments in power generation, particularly during the transition period. The law includes a provision enabling the government to make "safety-net" investments in generating capacity if the market fails to deliver an adequate response.

A capacity payment mechanism and investment guarantee fund are being considered to address this concern[49]. The capacity payment mechanism is expected to commence in 2006. Key features of the proposal may include:

- long-term capacity supply contracts for existing and new generating capacity to provide revenue certainty during the transition period and during the capital pay-back period;
- associated long term fuel supply contracts covering the term of the capacity contracts;
- a requirement for electricity retailers to enter into long term capacity contracts with generators (for delivery of capacity up to 3 years in advance);
- an annual capacity auction process to allow contract parties to manage potential imbalances; and
- costs to be passed through to users.

The Investment Guarantee Fund has been proposed as a regulated "safety-net" to address critical short-term investment requirements between 2005 and 2008 before the capacity mechanism becomes fully operational. At present, it is likely that the Fund will target specific projects totalling around 4000 MW of new capacity. The fund may be enlarged from 2009-10 to enable it to respond to critical investment needs should the capacity market fail to deliver an appropriately timed or located response. It is anticipated that market participants would pay a levy to finance the Fund's operations.

Several arguments are used in favour of capacity mechanisms. They are said to smooth investment cycles and reduce investment lags[50], that they reduce the high cost of capital and that they deal with the risk associated with underinvestment in peak capacity[51]. Essentially, such mechanisms are used to ensure that enough capacity always exists to meet peak demand. In the absence of such mechanisms, it is argued, the government

49. Details are drawn from Russian Federation, Decision #2124 (27 December 2004) and bilateral discussions between IEA and RAO UES officials and from Troika Dialog, *Liberalization Clarified*, issued 21 January 2005.
50. The investment cycles argument is based on the notion that the combination of uncertainty, underdeveloped financial markets (i.e. weak forward price signals for investment), and the capital intensive nature of generating investment may excessively lag investment responses.
51. IEA, *Competition in Electricity Markets*, (2001) pages 94-95.

would come under heavy pressure to intervene in the market whenever investment lags led to long periods of high prices.

Various forms of capacity mechanisms have been used in electricity markets in the United Kingdom, Continental Europe and North America. Mechanisms based on direct payments to generators have been tried. So have licensing obligations on retailers to enter into contracts for additional capacity, as have regulatory obligations on system operators to maintain "capacity banks" to be released into the market in response to certain triggering events. Box 2 describes the mechanisms used in the original England and Wales Pool and in the Pennsylvania New Jersey Maryland Interconnection.

Box 2 Capacity Mechanisms in the UK and the US

United Kingdom (England and Wales Pool), 1990-2001

Capacity payments were made to all available power stations, whether they actually generated electricity or not. These payments were defined by a very complex set of rules aimed ultimately at reflecting the cost to the user of a supply interruption. This figure was the product of two quantities, the "value of lost load" or VoLL, expressed in pounds sterling per kWh, and the loss of load probability or LoLP. As there was no demand-side bidding from which actual figures could be drawn, the VoLL had to be estimated. It was first set at £2000/MWh in 1990 and increased annually in line with the retail price index. In 2000, it stood at £2816/MWh.

LoLP was meant to indicate how much capacity was available relative to forecast demand. Hence the figure was higher when capacity was scarce. This amount (LoLP x VoLL) was charged on all electricity that was sold, and it was paid out to the owners of all capacity that had been declared available but not been scheduled for dispatch. The size of payments varied greatly, depending on available capacity relative to demand as measured by the LoLP.

The English capacity mechanism was widely criticized as not providing the right signals to investors. It was said to be prone to manipulation. The mechanism was abandoned in 2001, when the Pool was replaced by the New Electricity Trading Arrangements.

Pennsylvania New Jersey Maryland (PJM), 1998 to the present

Participants in PJM must meet capacity obligations. These obligations are set annually for each "load-serving entity." They are equal to the entity's expected peak contracted volumes, plus a reserve margin. The annual obligations are determined on the basis of analysis by PJM using the standards of the North American Electric Reliability Council. The reserve margin which load servers must maintain has usually been set at between 15% and 20% of their peak contracted demand.

Load servers can meet their obligations with capacity credits traded on the PJM's own Installed Capacity market (ICAP). The ICAP began operation in October 1998, along with the PJM spot market. The obligations can also be met through self-supply or bilateral contracts. When load servers fail to meet their capacity obligations, the system operator submits mandatory bids to purchase the difference. Such mandatory bids are set at the Capacity Deficiency Rate, which is the maximum regulated price and has stood between $170 and $180 per MW per day since the market opened. Load servers who fail to meet their capacity obligations incur a Capacity Deficiency Penalty equal to the Capacity Deficiency Rate. The fines are paid to the system operator, who redistributes them to registered capacity providers (generators). Fines are doubled on days when the system suffers an actual physical shortage.

ICAP was recently replaced by the Unforced Capacity Obligation mechanism, a refined and simplified version of the ICAP program.

Sources: IEA, Security of Supply in Electricity Markets (2002), pages 92 to 93, and pages 158 to 160. PJM, Capacity Adequacy Credit Markets (2004), see *http://www.pjm.com/services/training/downloads/20040809-aep-dpl-dvp-lse-training-2004-capacity-markets-%26-ec.pdf*; PJM, Fundamentals of Unforced Capacity (2004), which can be viewed at *http://www.pjm.com/services/training/downloads/unforced-capacity-pdf*; Creti and Fabra, Capacity Markets for Electricity, Centre for the Study of Energy Markets Working Paper 124, February 2004, pages 4 to 5.

So far, evidence on the effectiveness of the mechanisms is mixed. In the UK, capacity payments were widely criticized for providing poor incentives for investors and for being susceptible to manipulation. They were dropped in 2001. The New Electricity Trading Arrangements operate without any capacity mechanism. On the other hand, the PJM market has attracted much new investment in generating capacity. Rates of investment have exceeded rates of demand growth. But it is hard to gauge the importance of the Installed Capacity market in attracting investors. Other factors, particularly the transparency and efficiency of price formation in the PJM market, may have played an equal or greater role in stimulating well-located investments in generation. Allegations have also been made about the abuse of market power in PJM's Capacity Credit Market[52].

The design of capacity payment mechanisms is a delicate task. Poorly designed mechanisms run the risk of crowding out efficient private investment. In the worst case, they will tend to entrench a form of central planning which is incompatible with competitive markets. Capacity payments can also distort markets and reduce efficiency in other ways. They can foster collusion and other forms of market manipulation. They can give existing companies a competitive edge. They can lead to inefficient and inappropriate investment, and even encourage over-investment. They can discourage flexible responses to peak prices[53]. In some mechanisms, poor definition of the trigger events that release extra capacity into the market can create uncertainty that further distorts market operation and investment decisions.

52. See Creti I. & Fabra N., *Capacity Markets for Electricity*, Centre for the Study of Energy Markets Working Paper #124 (February 2004) for a discussion of market power abuse in the PJM Capacity Credit Market in 2001.
53. IEA, *Competition in Electricity Markets*, (2001) page 96.

A key argument in favour of capacity mechanisms is the fear that market price signals may be too weak to elicit prompt and efficient investment. But recent developments in Australia's National Electricity Market suggest that this fear may be overdrawn. In Australia, there is evidence that competitive spot-price signals determined subject to an economic price cap[54] have indeed evoked substantial, timely and well located investment in power generation.

Box 3 Generation Investment in Australia's NEM: 1998-2002

Australia's National Electricity Market opened in 1998. Since then, demand has grown at about 3.7% a year, with the highest growth rates in Queensland, at 12.3%, and South Australia, at 9.4%.

Surplus capacity that existed before the NEM opened was largely absorbed. More than 3300MW of new capacity was commissioned between 1998 and 2002, a 9.6% increase in capacity overall. New investments were generally well-timed and new capacity was sited mainly in areas with tight supply-demand balances and highest average spot prices. Nearly 80% was in Queensland and South Australia.

In South Australia, two years of high prices led to the addition of over 300 MW of new peaking capacity. In addition, a 500 MW baseload power station was commissioned. The total of 800 MW represented a 30% increase in the region's total generating capacity.

New investment in generating capacity and network interconnections helped reduce spot prices in Queensland and South Australia considerably. In South Australia, they fell from AUS $61 per MWh in the period 1999-2000 to AUS $32 in 2001-2002. In Queensland, they dropped more than 20%, from AUS $45 to AUS $35 over the same period.

The NEM's Triennial Review for 2002 noted that average spot prices were beginning to converge across the market at or near the threshold for new entry with some weather-related seasonal variations. The same document noted that new investments had fully met the market's reliability requirements.

Source: IEA, *World Energy Investment Outlook 2003 Insights* (2003), Box 7.6; IEA, *Power Generation Investment in Electricity Markets* (2003), pages 64 to 71.

The Nordic Council of Ministers and the governments of Australia and the United Kingdom have all given serious study to capacity mechanisms. In each case, the need for such mechanisms was rejected in principle. (The Nordic Council of Ministers did, however, permit such mechanisms during a transition period, while efforts were made to improve responsiveness on the demand side[55]).

54. The spot price cap in the NEM, referred to as the Value of Lost Load, was initially set at AUD$5000/MWh. It was subsequently increased to AUD$10000/MWh in April 2002. See *www.accc.gov.au/content/index.phtml/itemId/87606*. The concept of the Value of Lost Load is further discussed in footnote 76 below.
55. Nordel 2002, *Action Plan: Peak Production Capability and Peak Load in the Nordic Electricity Market*, Nordic Council of Ministers and Nordel, 29 October, and Council of Australian Governments Energy Market Review, Toward a Truly National and Efficient Energy Market, December 2002, Chapter 3.

A case can indeed be made for using a capacity mechanism during a transition, as new market structures, new rules and new regulatory arrangements are being developed and implemented. Investment in new generation slumped during the period when the California reform package was being developed, reflecting investor uncertainty and their worries about the shape of future regulation. But investment picked up again once the legislation was enacted and investors had had time to observe the market's performance. Similar patterns emerged during other restructuring processes in the US[56]. This may be pertinent in Russia, where key details of the wholesale market remain to be worked out and where substantial rebalancing of tariffs will be required if cost-reflective wholesale prices are to be achieved.

There may also be a case for capacity mechanisms in situations where constraints other than a sheer lack of capacity are the issue. This is the case in systems where hydroelectric generation dominates, and water shortages can limit production. In such situations, price signals will not necessarily elicit new investment, since the underlying capacity to meet peak demand (under "normal" rainfall conditions) already exists. The argument in favour of using capacity mechanisms is very strong in the particular case of New Zealand, which not only relies heavily on hydro power but is also isolated, by its island status, from international electricity trading[57].

Another case in which a capacity mechanism may be desirable is that of a system where the system operator is required regularly to redispatch large volumes of electricity to ensure reliable system operation and where redispatch is not fully reflected in the competitive marginal-price formation process. This leads to lower marginal prices than would otherwise obtain. This is a particular problem in some parts of the US Northeast, especially New York City, where interventions and redispatch by the system operator have, on occasion, slashed marginal prices in the system. Among other things, these practices have shaved legitimate peak profits (scarcity rents) of generators who might otherwise have met residual demand, thereby blocking an important signal to potential investors in peak power generation. The fact that it is nearly impossible to site new power plants in the city has exacerbated the issue. Some contend that peak investment will not occur in this situation without some form of capacity mechanism[58].

The need for a capacity mechanism is, of course, sharply reduced when the price of reliability interventions is adequately reflected in the system's marginal prices. In Australia's NEM, for example, an intervention by the system operator that suspends competitive price formation automatically triggers market rules that set the marginal price in the system at the Value of Lost Load (currently AUS $10000 per MWh) for the length of the operation. As noted above, investment in the NEM has been sufficient to maintain reliable supplies in a period of rapidly growing demand.

56. Ishii J and Yan J, *Investment Under Regulatory Uncertainty: U.S. Electricity Generation Investment Since 1996*, CSEM WP 127, March 2004, pages 5 to 6.
57. The New Zealand Government has addressed this risk in a recent policy statement which included the introduction of a capacity mechanism to meet a 1-in-60 year drought.
58. See Joskow and Tirole (2004) for a more detailed discussion of this phenomenon.

In Russia, the proposed priority dispatch order could distort price formation and mask scarcity rents like in the US Northeast. This may warrant further study and careful monitoring to ensure that it does not undermine efficient investment, particularly in peaking plants.

Advocates of a capacity mechanism in Russia argue that it would tend to offset the negative effects of policy and regulatory uncertainty. Potential market participants and investors are waiting to see the precise rules to be applied in the future wholesale market. There is a concern that the government may seek to manage wholesale prices as supply-demand balances begin to tighten by setting price caps at very low levels. In this environment, it is contended, some sort of capacity mechanism will be necessary to ensure the viability of many existing generators once the market is in place. It has been recently estimated that almost 90% of the future value of Russian generating assets will be determined by the size and nature of the capacity payments to be introduced[59]. Some participants will find the prospect of such support appealing, as it would strengthen their asset values during the transition period. There is a school of thought which goes still further and advocates an ongoing capacity mechanism, even after the transition period. The argument is that the confluence of underdeveloped capital markets, inexperienced electricity-market participants and an untried legal and regulatory framework render a long-term capacity mechanism necessary in the Russian context[60].

The argument is not entirely convincing. Aside from its probable negative effects on efficient price formation and market development, long-term capacity payments representing a very high proportion of generator asset values could very well inflate those values unduly. This would discourage international participation in the coming divestiture process, and it could limit the potential of new owners to raise funds for subsequent investments[61]. Ultimately, fundamental questions of policy or regulatory uncertainty can only be effectively addressed directly by governments. A transitional arrangement would give the Government an opportunity to build its policy and regulatory credibility by addressing the key uncertainties likely to affect market-driven investment responses, supported by restating its strong and ongoing commitment to electricity market reform and competitive price formation.

The Swedish government recently introduced a transitional capacity mechanism in the face of an emerging shortage of peaking capacity. Under the mechanism, the Swedish system operator, Svenska Krafnat, contracts for capacity reserves of up to 2000 MW per year from 2003 to 2008. One goal of the program is to encourage the emergence of sustainable means to manage Swedish peak-capacity needs beyond the

59. Renaissance Capital, *Russian Electrics: The Cost of Uncertainty*, August 2004, page 39. The benefits of a capacity mechanism in addressing policy and regulatory uncertainty and ensuring commercial returns necessary to attract new entry generation investments are discussed on pages 31 to 42.
60. World Bank, *Structural and Design Issues in the Russian Electricity Reforms: A Policy Note*, Infrastructure and Energy Services Department, Europe and Central Asia Region, June 2004, pages 29 to 31.
61. Inflated asset values could reduce the breadth of interest in the auction process, with the potential to ultimately reduce ownership diversity and underlying wholesale market competitiveness. Limited access to international capital markets and the current poor financial condition of several large international utilities could further undermine interest among international utilities. International experience suggests successful purchasers that paid too much for the assets have experienced financial stress which has undermined their capacity to raise capital for new investment, and led several to exit the market.

country's transition period. It is seen as a catalyst for commercially-driven products, such as options-based instruments[62] and those that promote greater responsiveness on the demand side. At the same time, Svenska Kraftnat, the Swedish system operator will start work with industry on developing financial-risk-management products that will encourage the building of adequate capacity reserves. A research and development project will be commissioned to study demand sensitivity to price signals during peak periods. The Swedish government will conduct a review before the end of the transition period to determine whether voluntary, market-driven arrangements can be expected to produce an appropriate response[63]. Russian policy makers might consider the Swedish approach as a model when they seek to elaborate a capacity mechanism for the transition period.

Price signals can be strengthened by effective financial markets. Such markets, when they are both liquid and deep, can reduce the volume risk to investors by ensuring that there will be robust demand for their production. Price risks can be managed through sophisticated financial trading and risk-management products.

Because of the very long lead times for new investments in electricity generation, some experts doubt that the price signals provided by short-term balancing, spot and financial markets are really effective in eliciting such investments in a timely fashion. In most other countries, investors interested in long-term projects supplement the information they derive from short-term market signals with their own analysis of underlying trends in supply and demand.

Better access to full and accurate information on supply-demand balances and trends would bolster efficient decision-making by investors. It would complement the information they get from the price signals sent them by financial markets. Regulators and market institutions in several countries already supply just this kind of useful information. Examples include the Joint Energy Security of Supply Report in the UK and the annual Statement of Opportunity by NEMMCO in Australia. Publishing such valuable data, including regular projections of medium- and long-term trends in the growth of regional supply and demand, would help to facilitate an efficient and timely investment response. This could provide an alternative to extending capacity mechanisms beyond the transition period.

INVESTMENT IN TRANSMISSION

The ultimate success of the reform program will depend, in large measure, on the performance of the transmission system. An efficient transmission network linking the six regions of the proposed electricity market would deliver real economic benefits. It would improve market competitiveness and capacity utilization, thereby postponing the need for some expensive investments in generating capacity. It would improve reliability through more efficient arrangements for sharing reserve capacity.

62. See Oren S., Ensuring Generation Adequacy on Competitive Electricity Markets, University of California Energy Institute, Energy Policy and Economics #7 (June 2003), for further discussion of the potential for developing capacity obligations based on hedging obligations consistent with a financial option.
63. See the Peak Power Reserves Act (2003) for further details. An excellent summary of the key features of this program is provided in the Fact Sheet issued by the Swedish Ministry of Industry, Employment and Communications (May 2003).

Some of these benefits are already being reaped, through transfers from surplus to deficit regions. Some experts warn that parts of the network are overloaded and that it may, indeed, be approaching the end of its economic life. Nevertheless it appears that the system still has considerable excess capacity in some places. Moreover, the Federal Grid Company, which controls most of Russia's transmission infrastructure, has undertaken a program of network augmentation[64] (Map 2 gives an indication of interconnection capacities between regions).

Electricity reform, with the unbundling and independent decision-making it implies, is likely to change radically the way the transmission network is used. As a result, decisions relating to network use and investments affecting network operation and performance that were once made in a centrally coordinated way within vertically integrated utilities are made by a number of independent market participants. Decentralised decision-making can fundamentally change utilisation of transmission networks. Previously stable and relatively predictable patterns of network use have in many cases been replaced with less predictable usage, greater volatility of flows and greater use of long-distance transportation, reflecting growing inter-regional trade.

Although the proposed regime of regulated bilateral vesting contracts[65] may prolong current more stable and coordinated patterns of transmission network use initially, their effect will diminish as they are wound down over a 5 to 7 year period. More independent decision-making can be expected to assert itself over this period and with it a fundamental change in the pattern and possible volume of transmission network use. Inter-regional flows in the transitional period wholesale market are beginning to reflect this trend[66].

Changes in network flows, wrought by new trade patterns and increasing demand could lead to significant new congestion.

Correctly timed, located and sized investments can resolve these issues. But such investment will not necessarily be forthcoming. It is not always easy to identify economic opportunities to alleviate congestion and to maintain reliable transmission capacity. In other reformed electricity markets, the issue of ensuring regulated returns sufficient to attract new investment has also proved to be a contentious one.

INVESTMENT RETURNS

In the past, transmission tariffs were set as a function of the volume of transmission services provided to RAO UES. They were not subject to separate economic regulation. Regulation of the Federal Grid Company (FGC) began only in June 2003. Tariffs are now based on cost-plus methodology, which allows FGC to pass on all allowable costs and to recover an "economically justifiable" return. FGC has the right to retain for two years any savings over the various allowable costs after which they are redistributed to users via lower tariffs. The electricity legislation calls for annual price reviews[67].

64. *OECD Economic Surveys;* Russian Federation, Vol.2004/11 (September 2004), pages 198 to 199.
65. The proposed regime of vesting contracts is discussed in Chapter 5 Efficient Price Signals.
66. See ATS daily trading data at *www.np-ats.ru*
67. *Renaissance Capital, Russian Electrics: The Cost of Uncertainty, August 2004, page 53.*

Cost-plus regimes provide little incentive to cut costs or improve efficiency. It is probable that, once the inflationary situation has sufficiently stabilized and the market is in place, some form of CPI-X methodology[68] will be introduced followed by a more sophisticated form of incentive regulation based on the capital-asset pricing model. It will be of crucial importance, at that point, to properly determine and evaluate the asset base. The results of this important exercise will have a strong influence on future operational and investment incentives to network owners.

In other countries, this process has proved difficult and contentious. It is hard, in the first place, to set a market value for network assets that were built in an era of central planning. Moreover, changes in network usage after the reform is in place may well strand certain existing assets, thereby undermining the initial determination of the asset base.

Determining a regulated rate of return on those assets can also be a contentious affair. Authorities are called upon to strike a delicate balance between lowering network charges and providing returns that will stimulate new network investment when and where it is needed. Underinvestment in transmission networks and interconnectors has been a thorny issue in the US, and it now appears to be emerging in Europe, particularly in the wake of the power failures of 2003.

Regulators are beginning to explore some innovative models designed to create financial incentives for more efficient performances, and especially for cost reductions. An incentive-based approach of this kind could reduce Russia's high network losses, which result from inefficient operation and maintenance, rather than the technical losses incidental to all electricity transmission. It would appear that the Federal Tariff Service is likely to focus on cost-reduction incentives, at least initially[69].

Returns on network investments need to be competitive with other investments that have similar risk characteristics. Russia's electricity legislation recognizes this point and calls for commercial rates of return on regulated network investments. But a government order in February 2004 indicated that returns should lie somewhere between the lowest yield on Russian government bonds and the refinancing rate of the Central Bank of Russia[70]. The resulting pre-tax return on FGC assets is likely to be around 3.1% for 2004-05, well below a commercial return on capital[71].

The *World Energy Investment Outlook 2003* points out that the risk premium on energy investments in transition economies can be sharply increased because of their underdeveloped organizational and institutional structures and by the lack of clarity and transparency in their energy, legal and regulatory arrangements. Investor perceptions of the high risks in these countries can drive up borrowing costs. They can also reduce borrowing capacity and debt-maturity period[72]. Russian officials will have to bear these problems in mind when setting the returns on electricity network investment.

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68. CPI-X methodology means one that reflects inflation less an efficiency factor x.
69. IEA, Summary of Second Russian Mission, (December 2003), FTS discussions.
70. See Resolution #109 of 26 February 2004.
71. IEA bilateral discussions with FGC representatives (February 2005) and Renaissance Capital, *Russian Electrics: The Cost of Uncertainty*, August 2004, page 54.
72. International Energy Agency, *World Energy Investment Outlook 2003 Insights*, (2003), Chapter 3.

The regulatory risk perceived by investors may be heightened by the prospect of an annual price review as provided for in the electricity legislation. Other countries have adopted a longer period between reviews, often of five years. Using a longer interval allows a greater degree of certainty in predicting cash flows. This reduces the perception of regulatory risk and so eases the transmission owner's task in raising capital for network extensions. With longer review periods, transmission owners need not fear that the gains they achieve by cost cutting will be immediately redistributed through tariff adjustments. This may encourage them to respond to the efficiency incentives provided by regulated price caps.

Planning and approval process

The planning and approvals processes are key factors in assuring efficient investment. These processes must be transparent and objective. They must deliver results that are beneficial to the market overall. During the transition to a free market, they should help in quickly removing constraints on transmission to allow trade between deficit and surplus regions.

In the regulated regime in force in many IEA countries, the planning role is played by the transmission system operator in place, who then, in a number of cases, develops investment proposals based on the planning he has himself carried out. This model is not without its risks. Both at the planning stage and in the working out of investment proposals, a transmission system operator in place may well be tempted to favour extension of the existing network over competing alternative approaches. These could include: new generation, other network investment or even demand response.

Most regulatory regimes rely on an electricity regulator to keep the system operator in line. But the regulator can do this effectively only if he has the information and the technical expertise to fully evaluate the planning process and related investment proposals. The regulator can be at a particular disadvantage if he has to rely on technical advice and information provided by the transmission system operator in place. Uncertainty, dispute and delay are endemic in this kind of situation. Access by the regulator to accurate and reliable information about the operational condition of the network is crucial to the effectiveness and credibility of the planning and investment-approval processes.

Nodal pricing could enhance transparency about the performance of transmission networks, allowing both regulators and participants to better identify cost-effective options for network expansion and investment. It could also help regulators develop better performance initiatives.

Separation of the roles of the national system operator and transmission owner may also help here. An independent system operator would be in a position to gather accurate and timely information on network capability and performance, whilst also possessing the technical expertise to effectively interpret and apply such information to undertake transmission planning on a whole of market basis. Removing planning and related functions from the for-profit sector could also enhance the incentives to transmission owners to operate their networks more efficiently and maximize their profitability. In the longer run, it could open the way to other approaches to relieving congestion by generators, by alternative network providers and possibly by some form

of demand response. In a word, it would help create a level playing field for finding the timeliest and least expensive response to network constraints, thereby serving the interests of all users.

But separating the roles of system operator and transmission operator does raise some new issues. The technical roles and responsibilities of both parties will need to be clarified. And care must be taken to ensure that the system operator does not act in a way that devalues transmission or otherwise causes undue financial damage to the transmission owner. The two roles should be separated only after these issues are resolved and where co-ordination costs do not exceed the potential benefits. For the moment, the Russian government has recognized both problems and is addressing them through bilateral service contracts. Independent system operators in the Northeast of the United States or the Australian NEM, which employ a similar separation of system operation and transmission ownership functions, may provide useful models to consider in the Russian context.

Other approval processes – approval for construction and siting and the application of environmental standards – also affect the potential for new transmission investment. They need to be made efficient, objective and consistent if they are to be accepted, and found credible, by all parties.

V. EFFICIENT PRICE SIGNALS

Cost-reflective and transparent price signals are an essential ingredient of timely decisions on investment in, and the operation of, competitive electricity markets. They create incentives for efficient behaviour in an environment marked by independent and decentralized decision-making at each step in the supply chain. Cost-reflective prices are also critical for the financial viability of market participants.

But cost-reflective electricity prices tend to be volatile, particularly short-term wholesale prices. It is essential for price formation in a competitive market that fluctuations in price not be unduly masked or capped where they reflect movements in the underlying supply-demand balance. If they are distorted, they will send the wrong signals and communicate the wrong incentives.

Governments with reformed electricity markets often come under pressure to intervene in the price-formation process, especially when prices spike. Their responses will have a major effect on the actions of participants and on the market as a whole. Inappropriate intervention harms market efficiency. Actions supporting efficient price formation can encourage flexibility, including demand response, and stimulate needed investment[73].

WHOLESALE PRICE VOLATILITY

Several designs for wholesale electricity markets in other countries have included price caps. Electricity cannot be efficiently stored and demand for it is relatively inelastic in the short term. As a result, generators meeting residual demand can – in the absence of price caps or similar devices – set very high prices, way above the value of electricity consumed at the margin[74]. In markets where price caps are imposed, it is essential to determine a price level which, while it protects consumers from gouging, does not unduly distort price and investment signals.

The Russian Electricity Law calls for the imposition of a regulated price regime whenever capacity shortages lead to unacceptably high wholesale prices. If that were to happen, competitive price formation would be suspended and replaced by a regulated

73. There are several recent examples including the Nordic market during the winter of 2002-03; Ontario during the summer of 2003, New Zealand Electricity Market during 2001 and 2003; Victoria and South Australia in the Australian National Electricity during 2001 and 2002; and California during 2000-01. See IEA publications: Power Generation Investment in Electricity Markets (2003) and Security of Supply in Electricity Markets: Evidence and Policy Issues (2002) for further discussion of these events.
74. If consumers were able or willing to disclose their marginal value of reducing consumption then price limits would not be needed. However, in the absence of such information an economically meaningful proxy can promote more efficient market functioning. Market power in the context of setting prices for residual demand is further discussed in Chapter III on Market Structure and Ownership.

pricing regime. Details of how this would work are expected to be published in the Wholesale Market Rules during the third quarter of 2005[75].

Regulated price regimes can suffer from several weaknesses. Often, the trigger mechanism is based on a price ceiling that does not take into account the underlying supply-and-demand situation. As a result, regulated price caps can mask *legitimate* price volatility and undermine incentives for efficient market responses through the electricity supply chain. Regulatory discretion can reduce this problem. But the introduction of discretion in this area could also create uncertainty and expose governments to backroom pressures to intervene. Regulatory discretion in price-capping may also create regulatory risk and could lead to inappropriate government action to manage prices in the future.

Poorly thought-out price caps can have the unintended consequence of driving market participants to the edge of bankruptcy. In California in 2001, a retail price cap prevented utilities from recovering their spiralling wholesale costs. Price caps that are set too low distort efficient responses to price volatility. They discourage both efforts at demand flexibility and inter-regional investment.

Inappropriate price caps can also prevent the development and use of financial products that could shield consumers from wholesale-market volatility. Such instruments could achieve the price stability that price caps are designed to ensure, but without the drawbacks of capping. Box 4 illustrates the potential distortions that price-capping can bring, even when applied during a temporary shortage.

Box 4 Victorian Government Intervention in the National Electricity Market

In the Australian state of Victoria, a strike at major generating facilities in January 2000 caused a shortfall at a time of peak demand. This situation triggered a cap on wholesale prices known as the Industrial Relations Force Majeure price cap (IRFM). The IRFM, which was in place for about a month, produced an average market price in Victoria of AUS $34/MWh vs an estimated market price of AUS $87/KWh. The low price cap eliminated economic incentives to increase short-run capacity or to cut demand beyond existing interruptible contracts.

A combination of unplanned generation outages and very high summer temperatures led the National Electricity Market Management Company (NEMMCO) to practice rotating power cuts on 3 February 2000. The Victoria government restricted electricity usage during peak hours, and this ended the rotating cuts. In the event, restrictions were kept on far too long. This, combined with the price caps, meant that during the period of restrictions Victoria exported electricity to neighbouring states where prices were freely set.

According to some investors, certain potential investments in peak generation were actually deferred as a result of the government's intervention.* But higher spot prices in the following year, together with an anticipated tightening of supply, have since encouraged investment in peak capacity.

* Victoria Department of Natural Resources and Environment, Security of Supply Task Force Report, September 2000.
Source: IEA, *Power Generation in Electricity Markets* (2003), page 67.

75. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 32, Resolution 865-r (27 June 2003), Item 49, and Resolution 966–r (17 July 2004), Item 49.

An alternative approach would be to use a wholesale price cap that reflects the economic value of consumption at the margin. The UK and Australia, among others, use wholesale price caps based on the system value of lost load (VoLL)[76]. VoLL-based price limits are superior to arbitrary price caps in that they maximize the opportunity for economic price formation and efficient responses to price signals, while also protecting the consumer from excessive price-gouging. VoLL price caps can be set in advance in a fully transparent manner, thus avoiding the vagaries of regulatory discretion and reducing pressure for government intervention.

TARIFF REBALANCING

The Russian Government has worked hard to achieve cost-reflective pricing, but so far the success is only partial. Figure 3 in Chapter I indicates that considerable efforts have been made to improve the cost-reflectiveness of electricity prices to final consumers. On average, regulated tariffs have increased by about 240% in nominal terms over the last four years, with residential tariffs rising by 340% and industrial tariffs by 200%. With the unwinding of cross-subsidies, residential prices have risen from about 60% of those charged to industries in 2000 to near parity in 2004. These are positive developments, and they have made prices more nearly reflective of costs. Better debt collection and the resulting rundown of arrears have also improved the sector's commercial viability.

But Russian electricity prices are still very low by international standards, and they will not yield the returns that will probably be needed to attract new investment. Average prices for residential consumers and government agencies were about 2.3 US cents per kWh in 2003[77]. Industrial users paid about 2.5 cents. By comparison, average prices in IEA countries in 2002 were about 11.4 cents for residential consumers and about 5.9 cents for large industrial users[78].

Further major adjustments will be needed to achieve more cost-reflective prices. Estimates of the magnitude of the required rebalancing vary considerably, often because of regional differences. However, the total value of cross-subsidies remaining to be unwound is estimated at about $2-3 billion per annum[79]. One recent estimate suggests that if residential tariffs are to be made fully cost-reflective, they would have to be 25% to 40% higher than industrial tariffs[80].

76. The value of lost load (VoLL) can be defined as the monetary value placed on a marginal unit of electricity consumed. System VoLL refers to the highest monetary valuation among all potential consumers for the marginal unit of electricity consumed. Hence, VoLL defines the maximum price consumers would be willing to pay in exchange for not having to reduce electricity consumption at the margin.
77 Presentation of 2003 results by the Federal Energy Commission (now the Federal Tariff Service) and presented in the RAO UES Annual Report 2003 at *www.rao-ees.ru/en/business/report2003/10_2.htm*.
78 IEA *Energy Prices and Taxes*, Q2, 2004, tables 19 to 20.
79 Anatoly Chubais, CEO of RAO UES, stated in an interview in late 2004 that he estimated the total cost of cross-subsidies between customer classes at 60 billion roubles per annum. This was corroborated by another RAO UES official in discussions with the IEA (February 2005) that it estimates the total cost of cross-subsidies resulting from subsidies between customer classes as well as those special purpose subsidies to pensioners and other vulnerable groups, and between regions to be in the order of 65-80 billion roubles per annum, or $2.3-2.8 billion per annum. The majority of this subsidy is related to general transfers from industrial consumers to households.
80 Troika Dialog, *Russian Market Daily*, 8 September 2004, page 4.

Average wholesale electricity prices have increased sharply since 2000, reaching about $18 per MWh in the third quarter of 2004. The World Bank estimates that Russian wholesale tariffs need to rise 40% more – to the range of $25 to $30 per MWh – in order to cover long-run marginal costs. That will be hard to do, because of the large additional cost it would impose on users.

Rebalancing tariffs and removing cross-subsidies are necessary pre-conditions for market reform. Competitive price formation is expected to deliver cost-reflective pricing in those sectors open to competition. Revised regulatory arrangements can ensure commercial returns for network services and more cost-reflective prices for regulated customers. Electricity market reform can help in the tariff rebalancing task by encouraging greater efficiency and so reducing the absolute level of cost-reflective prices.

The challenge is large and the need to move ahead with the rebalancing task is a matter of priority. Some large users are said to have been denied full access to the transitional "free" market because their withdrawal from the regulated sector would have harmed existing energy suppliers financially. Such reports point to the need for arrangements to allow customer choice while cross-subsidies are still being unwound.

The current proposal for addressing this challenge focuses on creating a regime of regulated bilateral contracts, known as vesting contracts[81]. It is envisaged that these contracts will largely replace existing regulated supply arrangements from January 2006[82]. These vesting contracts would provide a means of guaranteeing the supply of electricity at a fixed regulated price through the value chain from generator to retailer to end customers. The regulated price will be determined by the Federal Tariff Service, and may be increased annually to help unwind cross-subsidies. A complex web of contracts is likely to emerge which would tie particular users and retailers to a number of generators and *vice versa*.

It is envisaged that the period of the vesting contracts would vary by customer group. Large energy-intensive users would be offered vesting contracts for up to 10 years. Households and other vulnerable users would be offered vesting contracts for up to 3 years; while other commercial users would be offered contracts for 1 year. Consideration may be given to rolling over the vesting contracts at least once for the household and commercial groups depending on their ability to secure affordable electricity from the free market.

During the vesting contract period, it is envisaged that cross-subsidies would be funded more transparently. Among the options being considered are transfers from free-market participants to help fund subsidies for the regulated portion of electricity purchases during the transition period, or direct budget funded subsidies from the

81. Vesting contracts have been proposed to enable Guaranteeing Suppliers to contract for electricity supplies at a regulated price consistent with the regulated tariff set for small volume consumers which they are obliged to supply, thus shielding them from price risk exposure to the competitive wholesale market.
82. The following description is drawn from Russian Federation, Decision #2124 (27 December 2004) and bilateral discussions between the IEA and the Russian ministries of Economic Development and Trade, and Industry and Energy; the ATS (the free market operator); and from Troika Dialog, *Liberalization Clarified*, 21 January 2005, pages 4 to 5.

federal government. A combined option may be more likely, with initial transfers being replaced by budget-funded subsidies once the competitive market becomes the dominant source for electricity purchases[83].

A key feature of the proposed vesting contracts is that the amount of electricity provided at a regulated price would be progressively reduced each year so that by the end of the contract period, ideally, all purchases would be sourced from the free market at cost-reflective prices. It is expected that up to 85% of total electricity purchases will initially be covered by vesting contracts, and that the total regulated portion will reduce by around 15% per annum. End users may have the choice of replacing some or all of their vesting contracts with purchases from the free market, but they would not be able to go back once they elect to leave.

The proposed regime of vesting contracts is likely to create a very complex regulated contractual web that may discourage users from switching to the free market during the transitional period. It is also likely to extend the transitional period out to around 2012 if it is implemented in January 2006.

However, it also possesses several positive features. Such a mechanism provides a clear and more certain path for gradually unwinding cross-subsidies while at the same time allowing competitive wholesale and retail markets to be progressively introduced over the transition period. It provides flexibility to allow the Government to manage the rebalancing in a manner that is consistent with sound macro-economic management and which avoids causing undue financial stress, particularly for households. The recent public backlash against the monetization of certain public services demonstrates the importance of getting this balance right. Effective management of tariff rebalancing will be critical to maintaining the public credibility of the reform and ultimately to its successful implementation. The proposal would also support the commercial viability of all existing generators by providing greater certainty of cash flows during the restructuring period. This may also help to strengthen asset values during the forthcoming divestment process.

But there is a danger that the unwinding of cross-subsidies might stall, perpetuating a distortion of efficient price formation. To help minimize that risk, and also to give impetus to the rebalancing process, it will be important for the Government to continue to drive the process to ensure that cross-subsidies are unwound, at least for industrial and commercial users, within the maximum period envisaged under the proposed vesting contract regime.

Such action would send a positive signal to potential market participants and prospective investors, reaffirming the Government's commitment to establish economically sustainable electricity markets and to ensure commercial returns for network service providers.

83. Russian Federation, Decision #2124 (27 December 2004).

GOVERNMENT OWNERSHIP AND PRICE FORMATION

As noted earlier, the Russian Government will retain control over the nuclear and hydroelectric generators, representing around 25% of total generating capacity. There is a risk that substantial ongoing government ownership of generating capacity could be used to manage wholesale market prices. Government-owned generators could, for example, engage in a form of counter-trading in which they would dump large volumes of cheap electricity onto the market. They could, in this way, displace mid and peak price offers that might otherwise set the system marginal price during peak periods. Even price-taking plants[84] would be in a position to influence wholesale market price formation through a strategy of this kind.

Ongoing Government control of strategic generating assets could create pressures for Government intervention, which may prove difficult to resist as excess capacity is absorbed and wholesale prices begin to rise. It is very important for the Government to resist such pressure. Intervention may succeed in controlling wholesale spot prices in the short term, especially where Government-owned generators control the majority of excess capacity. But it is likely to distort the efficient development and operation of the market and may delay the development of efficient forward price signals for investment. Even the perception that the Government might be willing to intervene in this manner could damage market credibility and the confidence of market participants. It could promote uncertainty, exacerbate the impression of regulatory risk and discourage needed investment.

A key challenge for the Government will be to convince current and potential market participants that it does not intend to intervene unduly in wholesale market price formation. Achieving this is essential to attracting substantial private investment in the longer term. The writers of the electricity legislation took a step in the right direction by expressing a strategic commitment to open and competitive wholesale and retail markets, and by defining the scope of Government regulatory authority in this context. But the potential for Government interference in the day-to-day operation of wholesale electricity markets remains considerable.

Further assurances may be required to convince market participants of the Government's commitment to genuine electricity market reform. The OECD said in a recent report that a commitment from the Government to refrain from using its generating assets to manage wholesale prices and a commitment to withdraw from the generation sector soon after the transition would provide a reassuring signal to investors[85].

A combination of economic price caps and effective arrangements for corporate governance, together with further unbundling – and ultimately the privatization – of the Government's hydroelectric assets could help to ease concerns. These moves would send a strong signal of the Government's commitment to establish efficient electricity markets that respond to genuine price signals.

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84. Price-taking plants include nuclear and hydro facilities during the spring thaw and combined heat-and-power facilities during winter.
85. *OECD Economic Surveys;* Russian Federation, Vol.2004/11 (September 2004), page 197.

VI. FINANCIAL MARKETS

Wholesale electricity markets are extremely volatile, reflecting the underlying characteristics of electricity. Volatility in primary physical delivery markets, such as day-ahead spot markets, exposes market participants to a range of commercial risks. Efficient, cost-effective management of these financial risks is crucial to the development of efficient electricity markets. This will become even more important in the Russian context to the extent that the dispatch priority proposed for regulated vesting contracts exacerbates network congestion and nodal price volatility for free market participants.

Financial markets that are liquid, deep and innovative offer efficient ways for market participants to deal with the commercial risks of volatile wholesale electricity markets, by transferring the risks to those who can manage them at least cost[86]. Financial markets can underpin the development and operation of efficient electricity markets in several other ways including:

- providing transparent signals for efficiently timed and sized investment;
- increasing transparency and competition in ways that will facilitate efficient price formation through bilateral contracts;
- reducing transaction costs and risk-management costs, thus facilitating the entry of new participants in the market;
- reducing incentives for generators to abuse their market power in the contract period, during which their revenues will be largely derived from fixed-price financial contracts that limit the use of bidding strategies to drive up spot prices;
- reducing the need to employ more expensive and less efficient means of mitigating these risks, such as physical hedging through vertical integration;
- providing efficient ways to manage risks under a nodal pricing regime through the creation of financial transmission rights[87];
- helping to create greater financial certainty, and thereby reducing the risk premium investors and financiers attach to electricity market investments; and
- improving access to capital markets, a particularly important issue in the Russian context[88].

86. A financial market can be defined as liquid and deep where a trader can immediately buy or sell a standard market product and where large orders can be executed without affecting the market price. Liquidity is a function of, among other things, the volume of trades, the number of market participants and transaction costs. For further discussion see Newbury, *et al*, Liquidity in the Dutch Wholesale Electricity Market (May 2003).
87. For a discussion of the ideal nature and scope of financial transmission rights and their potential to facilitate efficient risk management where congestion is priced on the basis of locational marginal prices see Hogan W., Market-based Transmission Investments and Competitive Electricity Markets, August 1999.
88. International Energy Agency, *World Energy Investment Outlook 2003 Insights*, (2003), Chapter 3, pages 57 to 99.

Efficient, liquid and deep financial markets[89] can smooth wholesale-price volatility without undermining efficient price formation, price signals and investment. Accordingly, they can obviate a principle rationale for distortionary price caps and other regulatory instruments designed to manage price volatility. Encouraging the development of financial markets ought to be an important policy priority[90].

DEVELOPMENT OF FINANCIAL MARKETS

Russian policymakers are aware of these issues. They are giving priority to the development of a financial transmission right (FTR) to help market participants manage their exposure to transmission congestion risks under the proposed nodal pricing regime. ATS (the wholesale market operator) and RAO UES are jointly developing an FTR product modelled on instruments currently being traded in the Pennsylvania New Jersey Maryland market.

At the same time, financial markets are expected to emerge to support efficient risk management. In other countries, markets offering a variety of products[91] have emerged as market participants developed a clearer understanding of their financial risk exposures. But they have developed slowly, and have suffered from illiquidity, particularly for longer-term products. In the best cases, financial transactions have reached around ten times the volume of underlying physical trade, well below the ratio considered consistent with liquidity and depth in some other financial and commodity markets.

Several factors can affect the development of innovative, liquid and deep financial markets for electricity, including:

- access to a credible price reference (typically the wholesale spot price);
- lack of awareness and sophistication and involvement among market participants and financial intermediaries;
- limited range of financial trading mechanisms and products;
- transaction costs;
- degree of vertical integration;
- quality of the regulatory arrangements and regulatory distortions;
- cyclical factors affecting market participants' willingness to trade (tightening supply-demand balances may encourage generators to limit certain offerings, such as peak-power contracts)[92].

89. Newbury, *et al*, Liquidity in the Dutch Wholesale Electricity Market (May 2003), page 4.
90. Joskow, *The Difficult Transition to Competitive Electricity Markets in the US*, (Cambridge Working Paper in Economics CWPE 328, May 2003), pages 30 to 31.
91. The typical range of products includes over-the-counter products (typically bilateral financial contracts between electricity generators, retailers and large users), and exchange traded products (such as contracts for difference, futures, forwards and put/call options).
92. KPMG (2002), *Development of Energy Related Financial Markets*, Report to the Council of Australian Governments Energy Market Review Secretariat: Final Report, September 2002

Current efforts to develop an effective FTR instrument are appropriate and need to be completed before the introduction of the target market. However, Russian policymakers could also consider initiatives to encourage participation in, and the timely development of, innovative and efficient financial markets, especially given the expectation that unregulated purchases will need to be secured from the competitive market from January 2006. The transitional wholesale market may provide opportunities to introduce market participants to financial risk-management issues. Realistically, however, most learning in this area is likely to occur only after the target model is introduced.

ATS is playing an active role to help educate market participants about effective financial risk management. ATS is in the process of conducting a series of progressively more complex trading simulations, which aim to introduce market participants to the risks and consequences of trading in nodally-priced wholesale markets. Two simulation exercises are complete, with a third planned for mid 2005. This final simulation exercise will endeavour to introduce market participants to the full trading model proposed for the target market and will aim to emulate all facets of trading in that environment with the exception of settlements. This is a very positive development that will promote understanding of the financial risks inherent to trading in wholesale electricity markets. This in turn could provide a catalyst for the development of financial markets.

The proposed regime of vesting contracts could also support the orderly development of effective financial markets by releasing previously regulated volumes to be traded on the competitive wholesale market, possibly at a rate of up to 15% of total consumption per annum throughout the vesting contract period.

In the Nordic market, the market operator – Nord Pool – has promoted the development of effective financial markets by offering a range of financial products. Box 5 provides an overview of the Nordic Power Exchange and its main financial products.

Box 5 Overview of the Nordic Power Exchange and Products

Nord Pool ASA, a subsidiary of the market operator Nord Pool, runs a financial derivative exchange – the Nordic Power Exchange. Several financial products are traded on the exchange. They are used for price hedging and risk management by participants in the Nordic power market and for commodity trading. Nord Pool Clearing, a subsidiary of Nord Pool, provides a clearing service for all standard contracts traded in the bilateral market.

The reference price for all derivative contracts is the Nord Pool system marginal price. Financial contracts are entered into without regard to technical conditions, such as congestion and access to network capacity. Price hedging is achieved by a combination of physical procurement on regional and national spot markets and exchange-based financial contracts. Contract periods range from one day to four years. Market participants are required to lodge a security deposit underwritten by a bank guarantee. The main exchange-traded financial products include:

Futures contracts: This product covers short-term financial trading up to nine weeks in advance of final settlement. Weekly products can be purchased for the nine-week period up to one week before final settlement. Weekly products are converted into daily products for the week before final settlement. Futures contracts are subject to daily marked to market settlement, with final cash settlement based on the spot reference price. ("Marked to market" refers to the process of regularly calculating the market value of a financial asset so that its price reflects the price it would fetch in the market, if it were sold immediately.)

Forward contracts: This product covers trading up to four years in advance of final settlement. Monthly products can be purchased on a six-month rolling cycle. Quarterly and annual contracts can also be purchased, with annual contracts converted into quarterly contracts for the year leading up to final settlement, and quarterly contracts converted to monthly contracts in the last six months. There is no marked to market settlement in the interval prior to the due date.

Contracts for difference: This product allows counterparties to hedge spot-price risks associated with forward contract trading across pricing zones within Nord Pool. It is akin to a forward contract determined by the difference between the area price (a pricing zone within Nord Pool) and the Nord Pool System price. Contracts for difference (CfD) can trade at positive or negative prices. CfDs trade at positive values when the market expects area prices to be higher than the Nord Pool system price and at negative values when area prices are expected to be below it.

Option contracts: This product provides the purchaser a right to buy (a call option) or sell (a put option) an underlying contract at a predetermined price and date in the future. Option contracts can only be executed on the exercise date (the third Thursday in the month before the delivery period). Underlying contracts are quarterly and annual forward contracts. New options series are listed for trade on the first trading day after expiry of the previous options series.

Source: Nord Pool Annual Report (2003) and Trade at Nord Pool's Financial Market, Nord Pool ASA (April 2004). For further information see *www.nordpool.com/nordpool/financial/index.html*.

The Nord Pool approach has proven quite successful, producing what are perhaps the best developed electricity forward and futures markets to date. Nord Pool may provide a useful model for Russian policymakers to examine in the context of complementing policies to encourage the timely development of innovative and efficient financial markets.

VII. GOVERNANCE PROVISIONS, REGULATIONS AND INSTITUTIONS

Regulatory arrangements establish the boundaries and ground rules for transactions between market participants at each step in the value chain. They exert a pervasive influence on the formation, operation and development of competitive electricity markets.

Good regulation starts with an effective governance framework. Effective governance is critical to the success of electricity market reform. Governance arrangements should establish responsibility and accountability for all involved parties, including the government, market institutions, regulators and market participants. Good governance arrangements will ensure that accountability and responsibility is clearly assigned in accordance with the role and function of each stakeholder, so that the parties best able to manage particular responsibilities at least cost are held accountable for them.

In an electricity market, governance arrangements should clearly delineate the legal rights and responsibilities of stakeholders, improve transparency and create appropriate mechanisms to ensure accountability and the right of appeal. Together, these actions provide the foundation for a mutually-reinforcing web of incentives for appropriate behaviour and performance.

LEGISLATIVE FRAMEWORK

The legislative framework should translate the government's policies into practical rules and regulatory requirements. It should codify the responsibility and accountability of stakeholders, particularly those of the market institutions and regulators. At a minimum, the legislative framework should set out:

- the rules governing market and system operation and participation;
- the nature and scope of regulatory and institutional functions and powers;
- the legal rights, responsibilities and obligations of each stakeholder;
- any transitional arrangements and their duration.

Where discretion is granted to executive bodies, the legislative framework should clearly prescribe the nature, scope and limits of discretionary powers. This may prove a difficult task, especially where responsibilities may be overlapping and somewhat ambiguous. Economic regulation in electricity cannot be divided simply between

policy on the one hand and administration on the other. Details matter greatly in electricity markets. Regulatory interpretations and decisions on matters of detail can decisively influence the strategic policy outcomes. As a result, it is sometimes claimed that regulators "make policy on the run".

However, regulators do need some flexibility if they are to do their jobs properly. At the same time, policymakers need to make the intent of regulatory arrangements clearly understood. It is up to them to create a framework that will provide regulators with the guidance and sanction they need to perform their functions in a predictable and transparent manner that is consistent with strategic policy objectives. At the same time they must allow enough flexibility so that regulators can make "micro-policy" decisions on technical matters[93].

Equally important are mechanisms to uphold legal rights and enforce accountability, and procedures for changing the market rules. These mechanisms and procedures should be robust and rapid, and they should be applied objectively and transparently.

The electricity legislation of March 2003 provides a good foundation for establishing effective governance and regulatory arrangements. However, many of the key details are yet to be worked out. Important details have been identified and a process has been initiated to deal with them. This may not be an easy task.

REGULATORY PRINCIPLES AND INSTITUTIONAL ARRANGEMENTS

Regulatory and institutional bodies responsible for administering regulations day-to-day – including third-party access to networks, network tariffs, market operation and system operation – need to apply the rules and provisions established by the legislator with integrity.

Several principles for best practice regulation are beginning to emerge, including:

- effective and timely communication with all involved parties;
- transparency of process, including effective consultation with stakeholders;
- consistency of the regulatory processes and predictability of decision-making;
- the flexible use of regulatory instruments in response to changing market conditions;
- autonomy from political or economic influence;

93. The distinction between "macro" and "micro" policy-making and its implications for regulatory discretion and the development of effective regulatory frameworks is further discussed in Brown A. Regulators, Policy-makers, and the Making of Policy: Who Does What and When do They do it?; *International Journal of Regulation and Governance* (June 2003).

- efficiency and cost-effectiveness of information collection and other administrative processes; and

- effective accountability, including clearly defined decision-making processes, public reporting, the publication of the reasons underlying determinations, and a well-established right of appeal[94].

Application of these principles will contribute to regulatory decisions that are – and are perceived to be – robust, objective, consistent and transparent. This is critical for strengthening the credibility of market institutions and promoting confidence among market participants. The application of best-practice regulatory principles can also create incentives for better performance, improved productivity and innovative product development. They can help produce adequate returns on investment, and prices reflecting minimum incremental costs[95].

Some countries with reformed electricity sectors have sought to enhance confidence in the regulatory framework and institutions by establishing these institutions as independent bodies with independent funding. This has often been the case where governments retain some ownership of market assets. Several advantages have been ascribed to independent regulatory arrangements, including:

- improving economic efficiency in a market-based framework by shielding day-to-day regulatory functions and enforcement from political intervention;

- improving regulatory quality by ensuring a high level of sector-specific technical expertise;

- ensuring a stable and predictable regulatory environment;

- improving transparency.

But institutional independence may not be a practical option where the governance framework is incomplete or weak. One alternative mechanism is regulation by contract[96]. Regardless of the mechanism, maximising the quality, consistency and objectivity of regulatory decision-making ought to remain the key objective.

Concerns have also been raised in other countries about the possibility that regulatory discretion may create uncertainty and confusion. Regulatory discretion is a necessary component of an effective regulatory regime. It provides the flexibility regulators need to maintain effective incentives for efficient performance. Some regulators have

94. These principles are further discussed in Berg S. *Developments in Best Practice Regulation: Principles, Process, and Performance; The Electricity Journal* (July 2000), ACCC – Utility Regulators' Forum Discussion Paper (1999), and Eurelectric, Report on Regulatory Models in Liberalised European Electricity Markets, (January 2004).
95. Berg S. Developments in Best Practice Regulation: Principles, Process, and Performance; *The Electricity Journal* (July 2000).
96. For further discussion of regulatory contracts see *Regulation by Contract: A New Way to Privatise Electricity Distribution?*, World Bank, Energy and Mining Sector Board Discussion Paper #7 (May 2003).

sought to address the problem of uncertainty by issuing non-binding statements of regulatory intent[97].

Russia's current reform proposal does not include such an independent regulator. That is a serious omission. Under the 2004 restructuring of government activities, the federal agency responsible for electricity sector regulation (now the Federal Tariff Service) and the agency responsible for competition regulation (now the Federal Antimonopoly Service) were initially incorporated into new administrative units under the authority of the Ministry of Economic Development and Trade[98]. More recently, these agencies have been placed under the Prime Minister. There may be good reasons for doing this during the transitional period. But there is a serious risk that perceptions of conflict of interest may arise resulting from the Government's being not only the rule maker and regulator but also a substantial market participant. Such perceptions could undermine the credibility of the regulatory regime and could damage confidence in the objectivity and integrity of regulatory decision-making processes.

The creation of strong, well resourced and independent regulatory agencies would send a clear signal of the Government's commitment to effective regulatory arrangements. Table 10 provides an overview of the key activities and resources of certain European electricity regulators. Ex-ante regulatory regimes involve the regulator taking the initiative to set regulated tariffs and conditions of access for regulated services in advance. They are becoming more common in liberalised electricity markets and a similar approach is proposed for the Federal Tariff Service in the Electricity Law. Table 10 highlights several emerging features of successful ex-ante forms of regulation. In particular it indicates that ex-ante regulation is relatively demanding and requires significant resources in staff and funding. It also shows that successful regulators possess substantial administrative powers to collect information; to resolve disputes and to set terms and conditions of access for regulated services. Finally it shows that regulators also possess considerable independence from the policy arm of government, with the majority in this sample subject to little or no direct government influence.

The Government may wish to re-examine issues of regulatory independence and resource adequacy, with a view to establishing independent economic and competition regulators beyond the transition period.

Wholesale market operation

The electricity law foresees that the wholesale market operator will ultimately be wholly owned by private market participants and operated as a not-for-profit company. The market operator would retain responsibility for regulating market entry, and for developing and enforcing the wholesale market rules. This market would be the first example of industry self-regulation in Russia.

Some concerns have been raised about the possibility that disagreements among market participants could stall the development and enforcement of market rules, or that the

97. For example, see the *Australian Competition and Consumer Commission's Draft Statement of Regulatory Intent*, which raises several important issues relating to the determination of the maximum allowable revenues of electricity transmission companies, efficiency incentives, service standards, information disclosure requirements to the ACCC, and "ring-fencing" requirements. (Available at *www.accc.gov.au*).
98. Russian Government Ordinance #204 of April 9, 2004 *"on the Federal Tariff Service"*.

Table 10 Key Features of European Electricity Regulatory Agencies

Country	Regulatory form	Network access conditions	Dispute settlement	Ministry involvement	Information collection powers	Staff numbers	Annual budget 2003 (€m)	Change in budget since 2002 (€m)
EU 15 Countries and Norway								
Austria	Ex-ante*	Regulator	Regulator	General guidelines	strong	60	8	-1.0
Belgium	Ex-ante	Regulator	Regulator	no	strong	99	17	+2.0
Denmark	Ex-post**	Regulator	Regulator	yes	strong	25	2.5	+0.5
Finland	Ex-post	Regulator	Regulator	no	strong	16	1.25	+0.25
France	Ex-ante	Regulator	Regulator	Tariff approval	strong	96	12	+3.0
Germany***	n.a.	Not Regulated	Competition authority	n.a.	n.a	n.a.	n.a.	n.a.
Greece	Ex-ante	Ministry	Regulator	Tariff approval	strong	40	4.4	+0.4
Ireland	Ex-ante	Regulator	Regulator	no	strong	39	10	+4.0
Italy	Ex-ante	Regulator	Regulator	General guidelines	strong	104	18.6	+0.6
Luxembourg	Ex-ante	Ministry/ Regulator	Regulator	n.k.	strong	2	0.3	0.0
Netherlands	Ex-ante	Regulator	Competition authority	Issues instructions	strong	55	7.0	+1.0
Portugal	Ex-ante	Regulator	Regulator	no	strong	53	6.4	-0.3
Spain	Ex-ante	Ministry	Regulator	yes	strong	187	21.0	+2.0
Sweden	Ex-post	Regulator	Regulator	no	strong	42	3.0	0.0
United Kingdom	Ex-ante	Regulator	Regulator	no	strong	302	57.0	-1.0
Norway	Ex-ante	Regulator	Regulator	no	strong	33	1.8	n.k.
EU Accession Countries								
Estonia	Ex-ante	Regulator	Regulator	n.k.	n.k.	11	0.3	0.0
Latvia	Ex-ante	Regulator	Regulator	no	strong	68	1.7	+1.2
Lithuania	Ex-ante	Regulator	Regulator	Instructions	strong	50	0.6	0.0
Poland	Ex-ante	Regulator	Regulator	Supervision	strong	258	6.7	-1.3
Czech Republic	Ex-ante	Regulator	Regulator	no	strong	88	3.8	+0.6
Slovakia	Ex-ante	Regulator	Regulator	no	Limited	57	1.5	0.0
Hungary	Ex-ante	Ministry	Regulator	Tariff approval	strong	95	6.2	+1.8
Slovenia	Ex-ante	Regulator	Regulator	Non-eligible	strong	22	1.5	-0.4
Cyprus	Ex-ante	Regulator	Regulator	Instructions	strong	7	0.5	+0.5
Malta	n.k.	Regulator	Regulator	n.a.	n.k.	15	0.3	n.k.
EU Candidate Countries								
Romania	Ex-ante	Regulator	Regulator	no	strong	78	1.6	n.k.
Bulgaria	Ex-ante	Regulator	Regulator	no	strong	85	0.7	n.k.
Turkey	Ex-ante	Regulator	Regulator	no	strong	283	25.0	+17.0

n.a. = no regulator n.k. = not known
* ex-ante: The regulator sets tariffs and terms and conditions for access in advance
** ex-post: The regulated company sets tariffs and terms and conditions for access which the regulator can change after the fact in response to complaints.
*** New regulatory arrangements are being introduced in Germany, which will include ex-ante regulation consistent with the requirements of the EU Directive.
Source: EU Commission, *Third Benchmarking Report on the Implementation of the Internal Electricity and Gas Market* (March 2003), Annex A, Table 2, page 14.

market operator might be unduly influenced by particular market participants. So far, the ATS rule-making mechanism appears to be working effectively. Over a six month period in 2003, it succeeded in developing and implementing agreed wholesale market rules for the transition period.

International experience in this area has been mixed. The Pennsylvania New Jersey Maryland (PJM) market has operated successfully with a wholesale market operator owned by the market participants. Market participants also own the wholesale market operator of the New Zealand Electricity Market. But concerns over the market operator's failure to develop and implement rules to ensure security of supply in extreme circumstances led the New Zealand Government to develop a regulatory solution. It created the Electricity Commission which is responsible for rule-making and market development issues of a strategic nature, while market participants kept their responsibility for rule-making on technical issues. The New Zealand example illustrates the limitations of self-regulation in electricity markets. It also demonstrates the importance of governance arrangements that assign responsibility to those parties best able to manage them at least cost.

Overall, international experience suggests that private ownership of the market operator can work effectively where there are clear incentives for efficient performance consistent with the interests of all market participants and with government policy objectives. Careful monitoring of the proposed arrangements may be required, particularly during the transitional implementation phase. In Russia, the Federal Antimonopoly Service (FAS) is carrying out such monitoring. It also has last-resort enforcement powers to ensure timely development of market rules during the transitional period.

CO-ORDINATION OF POLICY, REGULATORY AND INSTITUTIONAL BODIES

The electricity reform package calls for a separate market and system operator, and it separates system operation from the transmission system owner. It also reallocates responsibilities for network regulation between the Federal Tariff Service (FTS), which will regulate the transmission system, and the Regional Energy Commissions (RECs), which will regulate local distribution networks subject to tariffs set by the FTS.

Efficiency in this context will require effective co-ordination:

- between the market and system operator, to ensure efficient dispatch in all circumstances, and to ensure efficient and timely responses to shortages or other emergencies;
- between the FTS and the regional commissions to minimise the risk of inconsistent interpretation and application of the tariff-setting regulations and thereby reduce regulatory risk;
- among the policy bodies, market institutions, regulatory agencies and the competition authority, to ensure that seamless and complementary regulatory arrangements are established; and

- among the different government agencies with responsibilities for other matters affecting the electricity sector, such as investment approvals.

Russian policymakers have recognized the risk of poorly coordinated policy development and implementation during the transition period. It will remain a significant challenge after the transition as well.

Following the transition, it is envisaged that co-ordination between the key agencies and other parties will largely be managed through a web of bilateral contracts and on the basis of reporting requirements established by the electricity legislation. These arrangements will provide meaningful support for effective co-ordination. In practice, however, some responsibilities may be hard to define precisely. There will be a need for ongoing informal co-ordination[99]. Some regulatory activities may require multilateral or closely sequenced co-ordination to avoid incompatible or contradictory decisions and undue delays in decision making.

After the transition, there will be a real risk of un-coordinated and possibly contradictory interpretation and administration of the rules and regulations. The risk will be greatest where regulatory responsibilities are spread among several government agencies and between national and regional governments. Poor co-ordination can increase the impression of regulatory risk, create uncertainty and undermine confidence in the market. Comprehensive processes need to be established after the transition to achieve transparent, effective and ongoing co-ordination among these bodies.

99. For example, in the Australian National Electricity Market where system operation has been separated from transmission ownership, the allocation of responsibilities for maintaining aspects of system reliability (particularly in relation to network control ancillary services) has proven difficult in practice and required considerable ongoing co-ordination based on informal agreements.

VIII. IMPLEMENTATION

Implementation of electricity reform has proven to be a complex, sensitive and time-consuming exercise. Not only are the specific details often complicated in themselves, but the elements of a reform package tend to interact. The process requires careful management of the sensitivities of all involved parties. Experience in other countries suggests that key features of an effective implementation process are likely to include:

- a thorough strategy with clear goals, which identifies the potential risks and provides a well-thought-out sequencing of the development and implementation phases of each element of the reform; in general, it is best to establish the legal and regulatory framework, and the market structure, before the market opening and major asset sales;
- an open and transparent process that facilitates the integrated co-ordination, development and implementation of the reform, and provides for:
  - clear communication with and between stakeholders on specific implementation details;
  - consultation with stakeholders and their participation in the development and implementation of specific elements of the package;
- transitional programs to facilitate the testing of the new arrangements and to develop the expertise of all involved parties;
- the allowance of enough time to develop and implement the elements of the reform package;
- ongoing government leadership to ensure that the implementation process is carried out on schedule and that roadblocks are cleared quickly and effectively.

Russia's proposed implementation strategy is built around the parallel development and implementation of industry restructuring, setting up competitive markets and regulatory reform in three stages. The initial timetable proposed that the key components of market design and the regulatory framework be dealt within a first stage, to be completed by 2005. It was also envisaged that key elements of industry restructuring would also be undertaken during this first phase. These elements included the creation and incorporation of several large thermal generating companies and the creation and physical separation of regulated transmission businesses. Selling off the Government's thermal generating assets was also originally scheduled to begin during phase one.

The broad timetables set for implementing the subsequent phases remain unchanged. The incorporation and divestment of regional assets into separate generating and network businesses is scheduled for subsequent phases[100], with restructuring still expected to be completed during 2008. The target competitive wholesale and retail markets are expected to commence operations during the second phase, in 2006. Eventually it is envisaged that all customers will be given free choice. However it is unlikely that substantial customer choice will emerge much before 2009 or 2010, when the first tranche of regulated vesting contracts for households is expected to expire.

The implementation strategy is broad and very ambitious. Successful implementation of the whole package within the currently proposed timeframes would represent an enormous achievement, rivalling, and in some respects exceeding, the best national performance to date[101].

The parallel implementation process was designed to meet this ambitious schedule. It seeks to strike a balance between timeliness and thoroughness, to minimize uncertainty and risks during the transition period and to avoid design flaws to the greatest extent possible. The process, if it goes smoothly, will keep the transition period short, reducing uncertainty and risk.

But the plan is not without its own risks and challenges.

Parallel development exposes the implementation process to the risk of cascading delays. Progress on market design and regulatory reform slowed in 2004 due the restructuring of Government activities. That slowdown has begun to affect the timetable for industry restructuring. For example, the pace of asset restructuring may well outstrip certain aspects of government decision-making, thereby delaying subsequent steps in the restructuring process[102].

The differing pace of development of major elements of the reform program increases the risk of uncoordinated and inconsistent progress. Under-informed decisions may be made on the development and implementation of the market, and these could distort the final outcome. Uncertainty over the precise nature of market rules and regulatory arrangements could also hinder the concurrent divestment process, reducing investor interest and depressing asset values[103]. It may still be possible to reduce these risks by rationalizing the sequence for implementing key components of the reform.

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100. Originally, the Federal Law "on the Functioning of the Electricity Sector over the Transition Period" (FZ#36) of March 26, 2003 set the deadline for compulsory separation of natural monopoly assets for January 1, 2005. Assuming the subsequent corporate and legal restructuring process of unbundling would take about 1-2 years to complete, the legislation originally envisaged completion of industry restructuring by 2007. On December 28, 2004 the Federal Law 178-F3 was passed amending the earlier law and extending the deadline for compulsory separation of natural monopoly assets to April 1, 2006. This law thus shifts the envisaged completion of industry restructuring in practice to Spring 2008.
101. IEA, *Competition in Electricity Markets* (2001), pages 29 to 54.
102. Renaissance Capital (August 2004) notes that the reform plan calls for the functional separation of AO-energos to be followed by their integration into larger generation and distribution businesses. However, such integration cannot proceed without asset valuations, which are impossible to calculate in the absence of properly defined rules and regulations. While the first auction was planned for the 1st quarter of 2005, the official deadline for creating the market rules was the 3rd quarter.
103. Incomplete development of the regulatory framework and market rules may have contributed to the Korean failure to attract international interest in that country's generation divestment in 2003. The investment climate was also undoubtedly affected by the negative sentiment in international financial markets following the collapse of Enron and the bursting of the merchant power-plant bubble in the US. Renaissance Capital 2004 raises similar concerns in the Russian context, noting that the lack of adequate legislation and market rules "makes Russian generating companies barely investable (sic) at present".

Dealing with minority shareholders in the existing generating entities presents an immediate challenge. The issue needs to be handled in a way that avoids alienating or disenfranchising existing private shareholders while at the same time maintaining the integrity of the reforms and ensuring that the implementation process moves ahead. Parallel implementation magnifies the problem by providing existing shareholders with strong incentives to lobby for market design and regulatory arrangements which serve their particular interests[104]. Such tactics by private minority shareholders could upset the implementation schedule and even distort the content of the proposed reforms.

DELAYS IN IMPLEMENTATION

Delays have begun to emerge in the implementation process. Figure 10 provides an overview of the parallel implementation process, identifying key milestones for corporate restructuring, market design and regulatory reform. It compares the original and revised deadlines for completion of key tasks[105]. It indicates that at least 15 of the original 49 milestones have been passed, including some key features of the new regulatory arrangements and the introduction of the interim wholesale market for the transition period. Although progress has been made to date, it shows that progress on market design and regulatory reform slowed in 2004 following the restructuring of Government activities earlier that year. As a result, implementation of several key steps is likely to be delayed by up to a year or more. These delays combined with the decision by the prime minister in June 2004[106] to review the implementation process and to suspend all decisions on structural reforms until 2005, created uncertainty for the corporate restructure, and has begun to affect the timetable for industry restructuring. This is acknowledged in a recent Government resolution and reflected in the recent decision to extend the deadline for completing the *AO-energo* restructuring by a further 12 months[107].

Delays have been common in electricity reform processes in other countries, reflecting the inherent complexity and sensitivity of the task. In Russia, implementation timeframes have already slipped, and further slippage may be expected. Of itself, slippage is not necessarily a cause for concern. Much more important is the strength of the Government's commitment to complete the process successfully and without making compromises that could distort the result.

The Prime Minister's announcement in June 2004 created uncertainty about the Government's commitment to the reforms. But such concerns should not be overstated. RAO UES and a number of Federal Government agencies continue to work hard on developing and implementing the reforms. Many of those involved believe that the

104. *OECD Economic Surveys;* Russian Federation, Vol.2004/11 (September 2004), pages 192 and 193.
105. Information has been drawn from RAO UES 5+5 Strategy (May 2003), Ordinance #865-r (27 June 2003), Ordinance #966-r (17 July 2004) and Russian Federation, Decision #2124 (27 December 2004) which contains the revised implementation timetable.
106. The Prime Minister's decision was announced in an interview after a high level government meeting on 25 June 2004.
107. Russian Federation, Decision #2124 (27 December 2004).

Figure 10 Key Components of the Electricity Reform Implementation Program

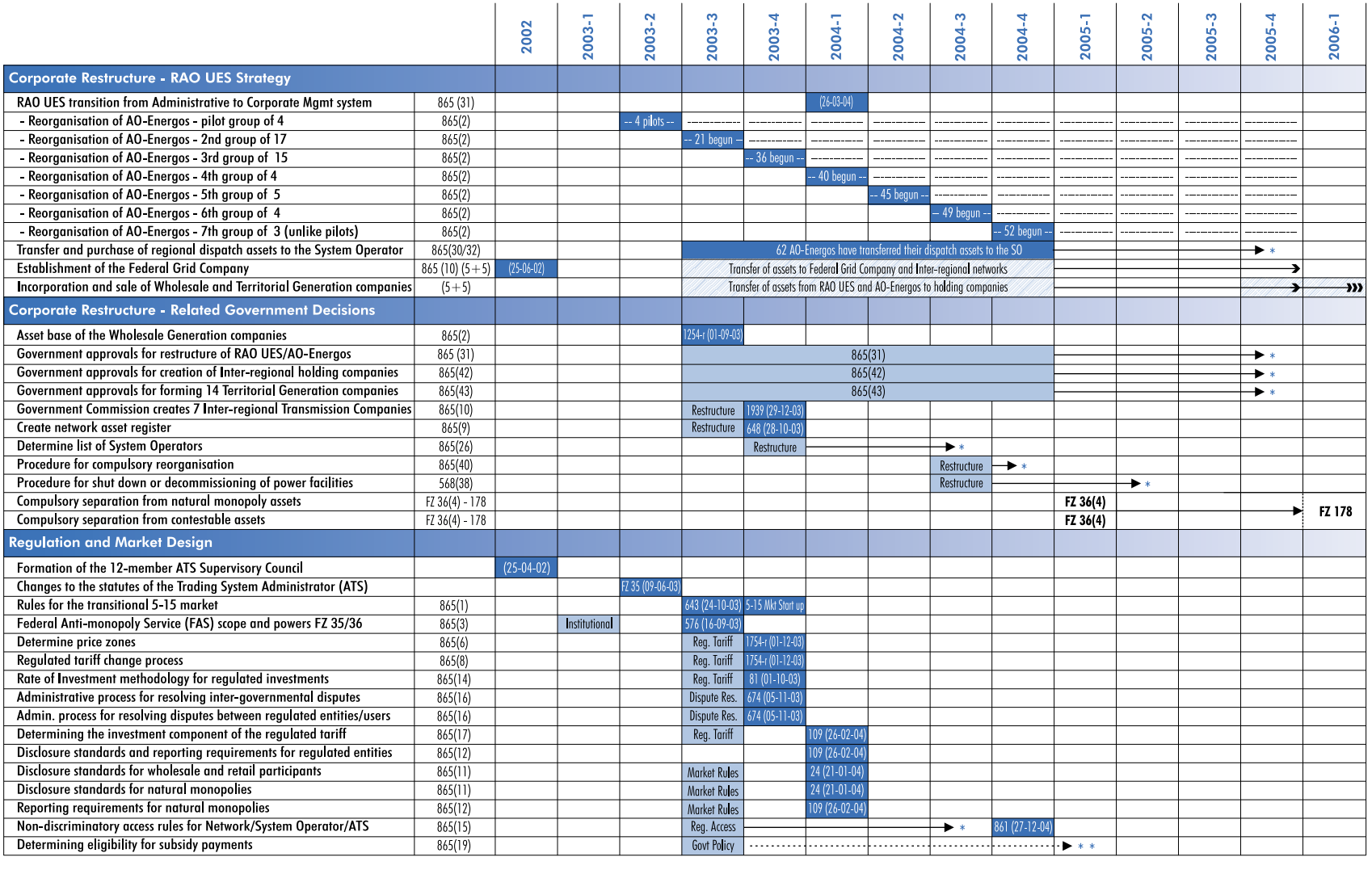
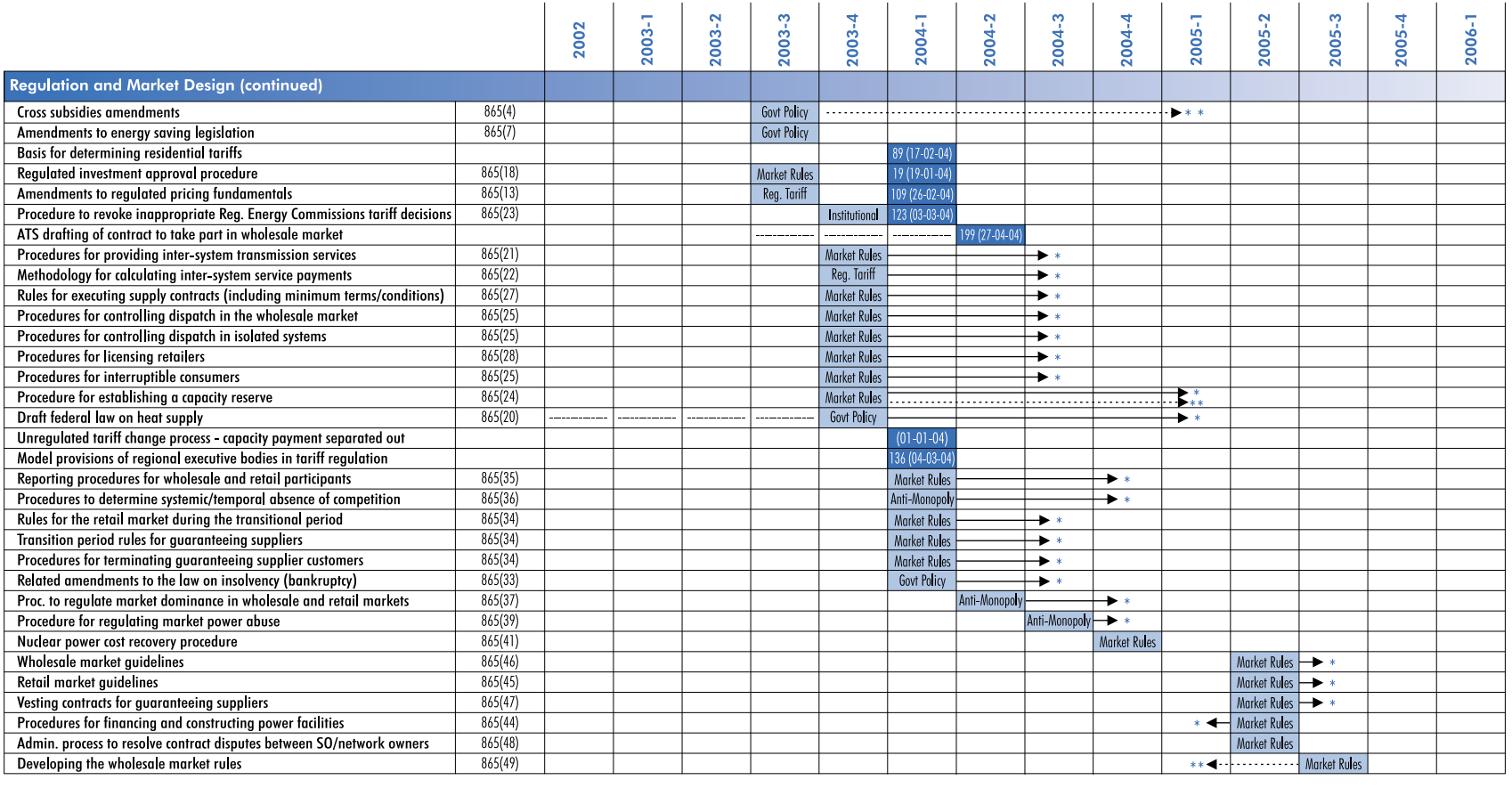


Figure 10 Key Components of the Electricity Reform Implementation Program (continued)



Legend:

Market Rules — Deadlines set in Ordinance 865-r of 27-06-2003

123 (03-03-04) — Deadlines met - Regulation number and date of implementation

5+5 Concept of the RAO UES strategy for 2003-2008 (May 2003)

→ * Based on revised timetable set out in Ordinance 966-r of 17-07-2004

⇢ ** Based on newly revised timetable set out in Government decision 2124 of 27-12-2004

Sources: Ordinances of the Russian Federation as indicated in the exhibit including 865-r (27 June 2003); 966-r (17 July 2004) and Decision 2124 (27 December 2004).

process has gone too far now to be completely abandoned. Nonetheless, the risk that reform will be delayed or distorted remains.

The most promising sequencing of implementation would start with clarifying the key elements of the restructure, market design and regulatory framework. It would then move on to asset sales and the phased introduction of customer choice. The Government now has an opportunity to strengthen the process by advancing its work on market rules and regulatory arrangements, a dossier which is beginning to fall behind that on industry restructuring. By so doing, it could help to reduce the risk of cascading delays and uncoordinated or contradictory implementation, while also enhancing regulatory certainty in the divestiture process. The vesting contracts proposal could support this process by providing greater stability, certainty and public acceptance during the transition period, allowing the Government to strengthen the implementation process so that the reform can be fully and successfully completed.

The proposal to delay the privatization of wholesale generation companies until the completion of a short initial operating period may provide a further opportunity to deal with emerging imbalances in the implementation process. It may also provide potential investors with time to observe how the wholesale companies are likely to perform in practice. The breathing space could leave them with a sounder assessment of the companies' risk and return potentials. But too much delay in the divestment process could be very counterproductive. It could bring further uncertainty and undermine confidence in the Government's commitment to key elements of the reform. In this regard, the recent statement by the chairman of the Inter-Ministerial Commission on Electricity Reform reaffirming the Government's commitment to divestment is reassuring[108]. Similar positive signals from senior members of the Government, together with continued tangible progress toward establishing the wholesale generation companies, may be necessary to reinforce the message and to strengthen confidence among private stakeholders.

Given the breadth and complexity of implementation and the limited resources available to pursue it, it may be well to review the priority given to certain of its components, with a view to focusing efforts on those of most immediate importance. Implementing the final tranches of customer choice could, for example, be put off until other critical elements of the program have been implemented and are operating effectively. The introduction of full customer choice can raise many complex and sensitive issues, and can be very resource intensive and expensive to implement. A failure to get this aspect of the reform right would undermine public support for electricity reform. It could also encourage inappropriate and expensive intervention in electricity markets, as occurred in California and Ontario.[109]

A greater investment of time and resources may be required in Russia than elsewhere to introduce full customer choice for households. Russia needs first to establish cost-reflective prices; to install appropriate metering and information technology; to alert

108. See the Chairman's statement following the first meeting of the Inter-Ministerial Commission on Electricity Reform, 24 November 2004.
109. See IEA (2002) and IEA (2003) for further commentary on the experience in California and Ontario.

and educate the public about how best to exercise choice; and to set up an effective consumer protection regime. Because of these challenges, it may make sense to extend the phase-in period for introducing full customer choice, and possibly the number of phases. This would allow for implementation of the more immediate priorities, while also leaving time to achieve the pre-conditions for extending customer choice to smaller-volume users. As proposed, vesting contracts could be used to manage the transition, and to support tariff rebalancing, which is still another critical precondition for customer choice.

EFFECTIVE LEADERSHIP AND CO-ORDINATION

Effective and consistent leadership from Government will be required to resolve the many policy issues and detailed technical questions that will emerge over the course of the transition, and to maintain momentum toward a successful completion. Transparent and impartial management of the reform process can boost market confidence, reduce perceptions of risk and encourage private participation and investment. A transparent and inclusive process involving all stakeholders will also strengthen credibility, confidence and the commitment of all parties to a successful outcome.

A system of co-ordinating committees was initially established to supervise the implementation, to foster integration of the parallel implementation processes and to ensure smooth progress. But the committee structure ceased to operate effectively throughout most of 2004 after the administrative restructure of Governmental functions. The re-establishment in August 2004 of an Inter-Ministerial Commission on Electricity Reform and the Commission's first meeting on 24 November 2004 were very positive developments[110]. More recent statements, in particular the December 2004 decision to accelerate development of proposals on several key aspects of the reform including the corporate restructure, the wholesale market model, unwinding of cross-subsidies, and the investment guarantee mechanism, with proposals to be submitted for Government consideration before the end of the 1st quarter 2005[111], provide further positive indications of renewed impetus to progress the reform.

Although the new body possesses the same membership as the previous body, it does not possess the same formal powers to resolve disputes and to drive the reform as the previous body, which was headed by a Deputy Prime Minister. It is likely that the new body will need to rely more on building consensus among its members, which may be a relatively time consuming process that may slow implementation to some degree. Time will tell whether this body has the capacity to achieve timely consensus and to drive the reform process effectively. Two immediate challenges that need to be addressed during the first half of 2005 include finalising the wholesale market

110. The new Inter-Ministerial Commission was created by a resolution of the Minister of Industry and Energy of August 2004 #84. Its membership includes the Ministry of Industry and Energy, the Ministry of Economic Development and Trade, the Federal Antimonopoly Service, the Federal Tariff Service, the Ministry of Justice and the Federal Agency of Atomic Energy.
111. Russian Federation, Decision #2124 (27 December 2004).

rules and the arrangements for managing the unwinding of cross-subsidies. These will provide an important test of the effectiveness of the new co-ordinating process as delays in resolving them would delay implementation of the next key step in the reform process scheduled for 1 January 2006. Should undue delays emerge in resolving these and other key issues, then further efforts may be required as a matter of urgency to ensure effective supervision and co-ordination that can drive timely development and implementation of the reform.

Confidence in the Government's commitment to the reform program could be further enhanced by adopting explicit deadlines for the main transitional steps toward full implementation of the reform. Public commitments to this effect would add impetus to the implementation process.

VOLUNTARY PARTICIPATION IN THE TRANSITIONAL WHOLESALE MARKET

The transitional wholesale market has provided an opportunity to test the mechanics of the market trading processes, information and settlement systems. So long as participation in the market remains voluntary, it is unlikely to provide a meaningful test of the market's overall design and its capacity to deliver efficient results, both in the area of price formation and that of market responsiveness to price signals.

Voluntary participation sets an effective ceiling on competitive prices. As soon as the system marginal price is forecast to exceed the regulated price, users have a clear incentive to switch to the regulated sector. Price movements in the 5/15 Market since its commencement in November 2003 illustrate this point.

As a result, the transition model's ability to clear the market efficiently under tight supply-demand conditions has not been properly tested yet. This weakness may limit the efficiency of spot-price formation and the effectiveness of spot-price signals, particularly when supplies are tight, which is precisely when spot-price signals are of greatest importance.

Were voluntary participation to remain in force for any great length of time, it could weaken the effectiveness of price signals for new investment. It could also distort other aspects of market operation and development by depressing bilateral supply contract prices in the short term, and by reducing cash flows and hence asset values. In the end, it could unnecessarily complicate the task of determining the value of assets to be sold off by RAO UES.

This weakness would be resolved by mandatory user participation, which is now scheduled to be introduced in January 2006 with the new vesting contract regime. With mandatory participation, spot prices are likely to exceed regulated prices during periods of tightening supply. Such a situation will provide a far more useful test of the robustness of the market design and of its capacity to deliver efficient price formation and responses to price signals.

IX. COMPLEMENTARY ENERGY REFORMS

Natural gas will continue to be an important factor in domestic electricity markets. Gas-fired generators produced 43% of total electricity in 2002. They represent two-thirds of Russia's thermal generating capacity. So the implications of natural-gas pricing and accessibility should not be ignored. Efficient market development will be greatly influenced by the ability of incumbent and potential new entrant generators to negotiate access to sufficient volumes of competitively-priced natural gas on fair and reasonable terms.

Gazprom is the overwhelmingly dominant supplier of natural gas to domestic thermal generators. The company's recent investment activity suggests that it may also seek to diversify into electricity generation. It is one of RAO UES's largest minority shareholders. That position could allow it to secure a controlling interest in as many as two of the six thermal wholesale generating companies to be auctioned off under the divestment program[112].

This possibility raises the concern that Gazprom might discriminate against competing thermal generators by denying them access to sufficient competitively-priced gas, or might cross-subsidize its commercial activities to strengthen the competitive position of its own generators. Such activities could undermine the entry of new participants, impede investment and distort competition between thermal generators[113].

Natural gas prices are also currently low by international standards and compared to domestic coal and oil supplies. The question arises of whether they are sufficiently cost-reflective. Low gas prices would appear to be beneficial for the electricity sector. But decisions on investing in power generation could be distorted where gas is supplied to generate electricity below cost. This situation could discourage the use of the most efficient gas-fired technologies. It could reduce diversity of supply and market efficiency over the life of an investment, and that could distort the development and operation of electricity markets for decades to come[114]. Low gas prices may also discourage efficient development of gas reserves, with potentially negative implications for electricity generators' access to gas in the future.[115]

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112. Troika Dialog estimates that Gazprom purchased over 10% of total RAO UES stock in the six-to-eight-month period to April 2004. As of June 2004, its shareholding was estimated at around 13%. Troika Dialog also estimates that minority shareholders controlling at least 6% of total RAO UES stock are in a strong position to buy one of the six thermal generation companies to be auctioned between 2006 and 2007. On this basis, Gazprom might be able to secure two of the companies. See Troika Dialog, Russian Market Daily, 9 April 2004, 3 June 2004, and 8 June 2004.
113. Such practices may increase the possibility of price manipulations that would feed directly into the spot-price formation process. This could seriously undermine efficient pricing in bilateral contract and financial markets, where the spot price is a key reference point for negotiations. The negative impact would be magnified where the dispatch priority mechanism limits the pool of competing generators which can set the wholesale spot-market price to those dependent on gas supplies from Gazprom. This could be a particularly acute issue during the winter peak-demand season.
114. International Energy Agency, *World Energy Investment Outlook 2003 Insights*, (2003), page 402.
115. See International Energy Agency, *Russia Survey 2002*, Gas Chapter and *Security of Gas Supply in Open Markets*, (2004), Annex on Russia for further discussion on the Russian gas sector.

Policymakers have recognized the important links between electricity markets and the natural gas sector. Regulated fuel supply contracts are being considered and may represent a positive first step. The Government explicitly acknowledges the need for structural reform of the natural gas sector to support the introduction of electricity market reform[116]. But recent developments suggest that true gas market reform is unlikely to materialize in the near future.

Reforms in the natural gas sector could affect the issues of competitive neutrality and pricing in ways that would support the ongoing development and operation of competitive electricity markets. The Government could therefore review and strengthen arrangements for non-discriminatory access to natural gas for all gas-fired generators until more comprehensive gas sector reforms can be implemented. The Government should also consider renewing its commitment to natural gas reform. As a first step, it could develop a strategy to promote access to competitively-priced gas on fair and reasonable terms for domestic gas-fired electricity generators before the end of the transition period.

116. Decree 526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001).

ANNEX 1
OVERVIEW OF THE ELECTRICITY MARKET REFORM PROGRAM

In July 2001, the Russian Government announced an ambitious strategy to create a competitive electricity sector over the course of this decade[117]. The reform strategy builds on several earlier reforms implemented through the 90s.

A legislative package including six items of new and amending legislation to implement the reform strategy was passed by the Russian Parliament in March 2003 and ratified by the President on 5 April 2003[118]. Among other things, the legislative package authorises:

- fundamental structural reform of the electricity sector;
- the introduction of competitive markets at the wholesale and retail level; and
- reform of the principles and arrangements underpinning the regulatory regime to ensure its relevance for the new industry structure and competitive electricity markets.

Following passage of the legislation, the RAO UES Board of Directors released the company's strategy for restructuring the electricity sector by 2008[119].

Annex 1 provides an overview of the objectives and main elements of this reform program.

REFORM OBJECTIVES AND PRINCIPLES

Principle objectives of the reform program include improving the operational efficiency and transparency of the electricity sector, promoting efficient investment in the sector and ensuring reliable electricity supplies for all users. These objectives reflect the fundamental importance of access to reliable and efficient electricity supplies for economic growth and for maintaining and improving living standards in modern economies. The Russian Government has recognised that the achievement of these goals

117. *Decree #526, On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001).
118. In particular, Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003); and Federal Law #36-FZ, *On Specific Features of Functioning of Electric Power Industry During the Transitional Period and on Introduction of Amendments into Certain Legislative Acts of the Russian Federation and on Recognizing Certain Legislative Acts of the Russian Federation to Have Lost Their Force in Connection with Adoption* (26 March 2003).
119 *Concept of RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003).

would be "…impossible without changing the existing system of economic relations and immediate structural reform of the electric power industry…"[120].

Key policy principles underpinning the reform program include:

- maintaining reliable electricity supplies;
- industry restructuring based on:
  - vertical unbundling of contestable activities from network services and system operation;
  - horizontal unbundling of contestable components of the value chain to support the development of competition among generators, retailers and other industry service providers such as repairs and maintenance;
- freedom of choice and freedom of trade among contestable market participants;
- reliance, where possible, on competition and competitive market structures based on freedom of commercial transactions and freedom of choice to help create a stable system for meeting electricity demand;
- non-discriminatory access for all users to regulated services on fair and reasonable terms (*i.e.*, network services, system operator services and market operator services);
- ensuring commercial rates of return for regulated services;
- creation of a stable and non-discriminatory environment for business and regulatory activities;
- balancing the economic interests of market participants and final consumers;
- integrity of technical and safety standards;
- ensuring financial transparency of electricity markets and of the activities of regulated entities; and
- protecting the rights of investors, creditors and shareholders through the restructuring process[121].

KEY ELEMENTS OF THE TARGET INDUSTRY STRUCTURE

Industry structure

A comprehensive restructure of the electricity sector is proposed including all existing assets owned or controlled by RAO UES, all existing assets of regional energos and any other public utility enterprises owning or operating electricity infrastructure[122]. Principal elements of the proposed industry restructure include:

120. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 2.
121. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 2 to 3, and Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 6.
122. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 5.

- vertical unbundling of RAO UES and existing vertically integrated regional energos to create separate generation, transmission, distribution and retailing businesses;
  - this unbundling process will include aggregation of regional energo generation, distribution and retailing assets to form regional generation, distribution and retailing companies;
  - it will also involve physical separation of competitive elements of the value chain (wholesale generation and retailing) from "natural monopoly" elements (network services and system operation);
- horizontal unbundling of generation assets to promote the development of sustainable competition between generators; and
- horizontal unbundling of retailing functions, including the creation of guaranteeing suppliers to serve regulated consumers and to operate as a retailer of last resort;
- separation of network ownership and system operation functions; and
- the creation of a separate market administrator for the wholesale market.

A diagrammatic representation of the proposed industry structure is presented in Figure 7 (Chapter II).

Generation

Restructuring of the generation sector has as its key objectives:

- the creation of commercially viable generating businesses that will be able to attract investment capital; and
- the creation of sufficient independent generating businesses to create vigorous and sustainable competition at the wholesale level[123].

Seven large wholesale generating companies are to be created out of federal generating plants controlled by RAO UES. Six of these companies will be formed from thermal generating assets, while the remaining company will be formed from hydroelectric assets. Each of the thermal wholesale generation companies are expected to have installed generating capacity of between 8000 MW and 10000 MW. Thermal generating assets will be assigned to companies on an ex-territorial basis, to support the development of competition across the wholesale market[124]. Some of the thermal generating companies may also include generating assets currently owned by AO-energos. The approved list of assets to be incorporated into the seven wholesale generating companies is presented in Box 6, as are the assets of the Federal Nuclear Generation company, RosEnergoAtom.

123. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), pages 8 to 9 and *Concept of RAO RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), page 13.
124. The ex-territorial principle refers to the distribution of assets between companies across the market to ensure that no single company controls excessive capacity in any particular geographical (and potentially pricing) region within the contestable wholesale market.

Box 6 Asset Base of Proposed Wholesale Generation Companies

Federal Generation Company 1	**Region**	**MW**
Orenburgenergo	Urals	2430
Permskaya GRES	Urals	2400
Mosenergo	Central	1885
Sverdlovenergo	Urals	1502
Tyumenenergo	Siberia	824
Total		**9041**

Federal Generation Company 2	**Region**	**MW**
Tyumenenergo	Urals	3280
Stavropolskaya GRES	South	2400
Troitskaya GRES	Urals	2059
Sverdlovenergo	Urals	526
Pskovskaya GRES	NW	430
Total		**8695**

Federal Generation Company 3	**Region**	**MW**
Kostromskaya GRES	Central	3600
Cherepetskaya GRES	Central	1425
Gusinoozerskaya GRES	Siberia	1260
Pechorskaya GRES	NW	1060
Chelyabenergo	Urals	882
Kharanorskaya GRES	Siberia	215
Total		**8442**

Federal Generation Company 4	**Region**	**MW**
Tyumenenergo	Urals	4800
Berezovskaya GRES-1	Siberia	1600
Mosenergo	Central	1100
Smolenskenergo	NW	630
Permenergo	Urals	600
Total		**8730**

Federal Generation Company 5	**Region**	**MW**
Reftinskaya GRES	Urals	3800
Konakovskaya GRES	Central	2400
Sredneuralsk GRES	Urals	1149
Nevinnomisskaya GRES	South	1340
Total		**8689**

Federal Generation Company 6	**Region**	**MW**
Ryazanskaya GRES	Central	2640
Novocherkasskaya GRES	South	2245
Kirishi GRES	NW	2085
Krasnoyarskaya GRES	Siberia	1250
Vologdaenergo	Central	630
Mosenergo	Central	310
Total		**9160**

Federal Hydro Generation Company (Super Hydro)

Central Region	**MW**
Volgagradskaya GES	2541
Mosenergo	1000
Nijegorodskaya GES	520
Verkne-Voljskix Cascades	448

South Region	**MW**
Dagenergo	1320
Zelechukskiy GES	530
Stavropolenergo	465
Zaramagsk GES	101
SeveroKavkazenergo	78
Kabbalkenergo	32

Urals Region	**MW**
Votinskaya GES	1020
Kamskaya GES	483

Volga Region	**MW**
Voljskaya GES	2300
Chuvasenergo	1370
Saratovskaya GES	1360

Siberia Region	**MW**
Sayano-Shushenskaya	6721
Bureyskaya GES	3000
Boguchanskaya GES	2000
Zeiskaya GES	1330
Novosibirskenergo	455
Total	**27074**

Box 6 Asset Base of Proposed Wholesale Generation Companies (continued)

Federal Nuclear Generation Company (RosEnergoAtom)

Central	**Type**	**MW**
Kursk	RBMK	4x1000
Smolensk	RBMK	3x1000
Kalinin	VVER	2x1000
Novovoronezh	VVER	2x417
Novovoronezh	VVER	1000
Total Capacity		**10834**

Urals	**Type**	**MW**
Beloyarsk	BN	600

Volga	**Type**	**MW**
Balakova	VVER	4x1000

Northwest	**Type**	**MW**
Leningrad	RBMK	4x1000
Kola	VVER	4x440
Total Capacity		**5760**

South	**Type**	**MW**
Rostov	VVER	1000
Total Capacity		**4000**

Total for 5 Regions	**22194 MW**

Source: Russian Government Ordinance 1254-r, of 1 September 2004, which spells out the composition of federal generating companies in the reformed wholesale market, updated information concerning combining all hydro assets into one Super Hydro, Russian Government Ordinance 1367-r, of 25 October 2004, and generating capacity figures from Ministry of Energy of RF, *Fuel and Energy of Russia*, Moscow, 2000, A.M. Mastepanov and V.V. Saenko, Moscow, 2001, *Fuel and Energy Complex of the Regions of Russia,* Volumes 1 and 2, Moscow 2003 and nuclear power plant capacities of RosEnergoAtom at *http://rosatom.ru/?razdel=225*.

In addition to the wholesale generation companies, the reform strategy calls for the creation of several territorial generation companies. Formation of these companies will seek to maximise economies of scale and commercial viability, without compromising the development of a competitive wholesale market environment[125]. Some of these companies may also incorporate heating assets, including boiler plants and distribution networks, and may jointly operate heating supply activities with municipalities. They may also develop related business activities to facilitate financial hedging against price volatility in the electricity and heat sectors. The RAO UES Board of Directors has approved plans to create fourteen such companies. The proposed list of generating assets to be incorporated into these companies is presented in Box 7.

Other generator market participants will include RosEnergoAtom which will remain wholly owned by the Russian Government[126], and generation companies based on the assets of "independent" *AO-energos*[127].

125. *Concept of RAO RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), page 14.
126. Federal Law #36-FZ, *On Specific Features of Functioning of Electric Power Industry During the Transitional Period and on Introduction of Amendments into Certain Legislative Acts of the Russian Federation and on Recognizing Certain Legislative Acts of the Russian Federation to Have Lost Their Force in Connection with Adoption* (26 March 2003), Article 9.
127. These are AO-energos which are not controlled by RAO UES and include Irkutskenergo, Bashkirenergo, Tatenergo and Novosibirskenergo.

Box 7 Asset Base of Proposed Territorial Generation Companies

	Region	MW
Territorial Generation Company 1		
Lenenergo	NW	3257
Kolenergo	NW	1922
Karelenergo	NW	914
Total		**6093**
Territorial Generation Company 2		
Arkhenergo	NW	1058
Yarenergo	Central	660
Tverenergo	Central	257
Kostromaenergo	Central	215
Novgorodenergo	NW	190
Vologdaenergo	Central	35
Pskovenergo	NW	13
Total		**2428**
Territorial Generation Company 3		
Mosenergo	Central	**10549**
Territorial Generation Company 4		
Tulaenergo	Central	1453
Lipetskenergo	Central	554
Smolenskenergo	NW	412
Orelenergo	Central	342
Tambovenergo	Central	307
Kurskenergo	Central	212
Voronezhenergo	Central	176
Ryazanenergo	Central	100
Brianskenergo	NW	74
Belgorodenergo	Central	62
Total		**3692**
Territorial Generation Company 5		
Kirovenergo	Urals	940
Chuvashenergo	Volga	852
Udmurtenergo	Urals	486
Marienergo	Volga	80
Total		**2358**
Territorial Generation Company 6		
Nijnovenergo	Central	1271
Ivenergo	Central	835
Vladimirenergo	Central	455
Penzaenergo	Volga	340
Mordovenergo	Volga	298
Total		**3199**
Territorial Generation Company 7		
Samaraenergo	Volga	3495
Saratovenergo	Volga	1422
Orenburgenergo	Urals	1070
Uliyanovskenergo	Volga	862
Total		**6849**

	Region	MW
Territorial Generation Company 8		
Volgogradenergo	Central	1767
Rostovenergo	South	947
Kubanenergo	South	732
Astrakhanenergo	Central	480
Stavropolenergo	South	16
Total		**3943**
Territorial Generation Company 9		
Permenergo	Urals	1428
Sverdlovenergo	Urals	1286
Komienergo	NW	719
Total		**3434**
Territorial Generation Company 10		
Tyumenenergo	Urals	1517
Chelyabenergo	Urals	1002
Kurganenergo	Urals	480
Total		**2999**
Territorial Generation Company 11		
Kuzbassenergo-1	Siberia	2345
Omskenergo	Siberia	1655
Tomskenergo	Siberia	377
Total		**4377**
Territorial Generation Company 12		
Kuzbassenergo-2	Siberia	2345
Altaienergo	Siberia	812
Total		**3157**
Territorial Generation Company 13		
Krasnoyarskenergo	Siberia	2090
Khakasenergo	Siberia	270
Total		**2360**
Territorial Generation Company 14		
Chitaenergo	Siberia	508
Buriatenergo	Siberia	138
Total		**646**
Independent Territorial Generation companies:	**Region**	**MW**
Irkutskenergo	Siberia	12882
Tatenergo	Volga	7003
Bashkirenergo	Urals	5064
Novosibirskenergo	Siberia	2170

Source: Territorial Generation Company asset base taken from the resolution of the RAO UES Board meeting on 23 April, 2004 available on the RAO UES Website at *http://www.rao-ees.ru/en/news/pr_depart/show.cgi?230404boa.htm.*, and generating capacity figures from Ministry of Energy of RF, *Fuel and Energy of Russia*, Moscow, 2000 and A.M. Mastepanov and V.V. Saenko, Moscow, 2001, *Fuel and Energy Complex of the Regions of Russia*, Volumes 1 and 2, Moscow, 2003.

Some small regional generation assets that are not entitled to participate in the wholesale market may also remaining in government ownership following the restructuring of *AO-energos* assets[128].

Overall, up to twenty-six generating companies with the capacity to compete on the wholesale market may be created as a result of the restructure.

Bulk and inter-regional transmission

The Federal Grid Company (FGC) was established in June 2002. Its primary function is to own, maintain and develop the transmission "backbone" facilitating the bulk transfer and delivery of electricity between major generation and load centres. The Russian Government considers that aggregation of these assets under a single owner will contribute to maintaining reliable electricity supplies, support efficient regulation and facilitate the development of efficient electricity markets and inter-regional trade[129].

FGC's infrastructure will include all transmission assets with a rated capacity greater than or equal to 330 kV, and other transmission assets with a rated capacity of between 220 kV and 330 kV where those assets provide a critical connection between significant generation and load centres. FGC's assets will also include all the associated infrastructure required to operate those facilities[130]. Previously, transmission network assets were largely controlled by RAO UES, with some controlled by AO-energos. Seven inter-regional transmission companies were originally proposed to facilitate the transfer of AO-energo transmission assets to FGC control[131]. At present, it is likely that a single holding company will be established as a wholly owned subsidiary of the Federal Grid Company for these assets.

FGC will be prohibited from buying or selling electricity and will be required to enter into contracts to serve eligible market participants. Transmission network services are deemed a natural monopoly under the Electricity Law and will remain subject to access and tariff regulation[132]. Regulatory arrangements are described in a later section.

The Russian Government will own a substantial portion of the FGC, with the Electricity Law mandating that it ultimately hold at least 75% plus one voting share of the authorised share capital[133]. It is currently a wholly owned subsidiary of RAO UES, and is planned to become an independent company by 2008.

128. Regional generators may be created as a result of the AO-energo restructuring and not be merged with territorial generation companies. They would not be entitled to participate in the wholesale market – essentially small generators with the primary function of meeting local heating load. See Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 37 and *Concept of RAO RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), page 15.
129. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 5 to 6 and Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Articles 7 to10.
130. Russian Government Decision #881, *About Criteria for Deeming Transmission Power Lines and Objects of Electronetwork Services to be part of a Unified National (whole-Russian) Power Grid* (21 December 2001).
131. Russian Government Resolution #1939-r (29 December 2003).
132. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 9.
133. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 8.

Inter-regional distribution

It was originally proposed to merge the existing AO-energo distribution assets to form up to five inter-regional distribution companies. These companies are intended to own and manage network assets with a rated capacity of less than 220 kV (including related ancillary equipment); principally regional electricity distribution networks. Key objectives of this component of the restructure are to ensure that each distribution company has sufficient capital to ensure its commercial viability and sufficient scope of activities to maximise economies of scale.

RAO UES's 5+5 Strategy originally envisaged that these companies would have a regulated asset base of at least $500 million and that their scope of operation would extend to one of the five existing integrated energy systems encompassing western Russia and the Urals.

On 23 April, 2004, the RAO UES Board approved a proposal to create four interregional distribution companies: Central and South; Northwest; Volga and Urals; and Siberia[134]. Their capitalisation is likely to be well over the minimum thresholds contained in the 5+5 Strategy, with industry sources estimating capitalisation of around $1190 million, $630 million, $1720 million and $860 million, respectively[135]. Decision on the establishment of a fifth interregional distribution company in the Far East of Russia will be taken in the future taking into account the specific decisions on the restructuring of the regional energos.

Distribution services, like transmission services, are considered a natural monopoly and will be subject to access and tariff regulation[136].

It is envisaged that inter-regional distribution assets will be majority publicly owned by 2006, with the Russian Government holding at least 52% of the total share capital[137]. The 5+5 Strategy suggests that the Government may consider disposing of its controlling interest in these companies at a later stage once effective regulatory arrangements have been implemented[138].

Retailing and local distribution

Retail sector restructuring has among its main objectives:

- the creation of sufficient commercially viable, financially transparent and independent retailing business to support the development of effective and sustainable competition among retailers supplying contestable customers, so that those customers may exercise genuine choice; and
- ensuring that potentially vulnerable consumers are protected and have access to reliable and affordable electricity services[139].

134. For more details of the RAO UES Board meeting on 23 April, 2004 see RAO UES website at *http://www.rao-ees.ru/en/news/pr_depart/show.cgi?230404boa.htm*.
135. Troika Dialog, *Russian Market Daily*, 26 April 2004, page 4.
136. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 22 and 41.
137. *Concept of RAO RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), page 12.
138. *Concept of RAO RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), page 13.
139. Decree *#526, On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), pages 4 to 5 and Federal Law #35-FZ, On the Electric Power Industry (26 March 2003), Article 6.

To achieve these objectives, the reform strategy envisages the creation of local distribution, guaranteeing supply and competitive supply functions. Existing AO-energo assets will be redistributed to create companies to provide these services. It is envisaged that local distribution and guaranteeing supplier functions may be combined to form a single business, and that supply activities may be combined with local generators (ie. generators that would not be eligible to participate in the wholesale market) to form vertically integrated generation and retail companies[140].

Guaranteeing Suppliers are expected to be the basic form of supply company to be created from restructuring AO-energo retailing assets. They will be responsible for providing regulated default retail services for small consumers that do not possess a supply contract with a competitive supplier[141].

Each Guaranteeing Supplier will be licensed to provide regulated default retail services within an exclusive franchise. Within this region, a Guaranteeing Supplier will have a legal obligation to supply any credit-worthy consumer, and hence to be the retailer of last resort in the event that a competitive supplier serving consumers within its franchise fails.

Guaranteeing Suppliers' retail margins and their contractual terms and conditions for default supply will be regulated. They will be permitted to pass though other costs of procuring and transporting electricity for default services. It appears that Guaranteeing Suppliers will also be permitted to offer competitive retail products, and hence to compete with other competitive suppliers serving customers within its exclusive default franchise. Whether this also applies to Guaranteeing Suppliers that are combined with regional distribution companies is not clear.

Regional distribution companies may own and manage local distribution networks and would be responsible, along with Guaranteeing Suppliers, for ensuring reliable electricity supplies to local (largely residential) consumers. Regional distribution services, like other transmission services, are considered a natural monopoly and will be subject to access and tariff regulation[142].

The strategy provides for the establishment of competitive electricity supply companies which would be able to serve contestable end-users. Supply companies created through the AO-energo restructuring and which are not licensed to provide guaranteeing supplier services would become competitive supply companies.

Competitive retailers would be able to freely negotiate supply contracts with contestable customers, including the terms and conditions of supply and the agreed retail price[143].

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140. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 5.
141. Further details relating to the proposed role and function of guaranteeing suppliers is provided in Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Chapter VII (Articles 37-41), *and Concept of RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), page 14 to18.
142. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 37.
143. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 37.

System operation

An independent, national system operator will be created from RAO UES's Central Dispatch Unit and the system operating assets of AO-energos to manage electricity flows on the integrated transmission network serving the wholesale market. Key responsibilities of the national system operator will include:

- optimising daily dispatch schedules for generation and network services;
- enforcing physical compliance with the contractual supply obligations of market participants;
- procuring system reliability services, and enforcing reliability and quality standards;
- participating in the development of electricity supply and demand projections;
- implementing emergency procedures (e.g. load shedding);
- co - ordinating planned maintenance and decommissioning of generating and network infrastructure; and
- participating in the formulation of technical requirements for network connection[144].

Local system operators may dispatch load within their service area, subject to any dispatch instructions issued by the national system operator. Separate system operation is permitted in isolated electricity systems.

System operation is deemed a natural monopoly and will be subject to regulation of access terms and fees. The system operator and its affiliated entities are prohibited from participating in any commercial activities in the electricity market, reflecting its fundamental role for credible and efficient market operation[145].

The national system operator will be required to enter into bilateral contracts for the provision of its services with market participants, and market participants will have the right to sue for damages caused as a result of the system operator's negligence[146]. Market participants will be required to comply with dispatch orders and will be liable for failure to execute directions, except where there is a risk to public safety or equipment.

The Russian Government will own a substantial portion of the national system operator, with the Electricity Law mandating that it ultimately hold at least 75% plus one voting share of the authorised share capital[147]. The system operator is currently a wholly owned subsidiary of RAO UES, and is planned to become an independent company in 2005 or 2006.

Further consideration will be given to combining the system operator and the FGC once the Russian Government has obtained its full equity interest in both entities[148].

144. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 14.
145. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 12 (activities) and Article 16 (deemed monopoly service).
146. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 18.
147. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 12.
148. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 7 and Concept of RAO UES's Strategy for 2003-2008 – The 5+5 Strategy, RAO UES, (29 May 2003), page12.

Market operation

A wholesale market operator – the Trade System Administrator (ATS) – has been established as a not-for-profit partnership between wholesale market participants, including the Russian Government. Key responsibilities of ATS include:

- managing trading and settlement in the wholesale electricity market, including:
  - registering bilateral buy-sell contracts;
  - maintaining a register of eligible wholesale market participants;
  - organising metering and data collection required to enable settlement based on actual production and consumption;
  - managing interactions with the system operator to maximise efficient wholesale market outcomes subject to feasibility constraints;
  - developing and publishing projections of supply and demand to facilitate efficient market responses;
- developing wholesale market rules;
- ensuring market participants comply with wholesale market rules; and
- developing and administering a pre-judicial dispute resolution mechanism[149].

It is envisaged that ATS will also provide a counterparty service to facilitate wholesale market trades once legal issues have been resolved[150].

Governance arrangements have been implemented to ensure that ATS conducts its activities in an impartial manner that reflects the interests of all its stakeholders. In particular, the by-laws establishing the ATS stipulate that no member may control more than 20% of the voting rights, that sellers and buyers be equally represented on the Coordination Council of the Trade System Administrator (akin to its Board of Directors), and that the interests of all wholesale members be taken into consideration in ATS decision-making processes.

ATS activities are also overseen by the Coordination Council of the Trading System Administrator. Responsibilities of this Coordination Council include:

- monitoring compliance of the ATS, the system operator and the Federal Grid Company with the wholesale market rules, including taking actions to protect the interests of market members and consumers;
- monitoring wholesale market operation, including the possibility of a member of the Council working with ATS management in an advisory capacity; and
- proposing amendments to the market rules[151].

149. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 33.
150. The counterparty service would involve ATS assuming the counterparty risk associated with all transactions between generators and retailers/large users made through the wholesale market, on a net basis. By assuming this counterparty risk, ATS can help to facilitate trade between market participants, helping to build liquidity/depth in the primary trading market (important for efficient price formation), and helping to create a foundation for the development of financial risk management products.
151. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 33.

ATS services will be provided on a contractual basis, with the terms and conditions including the service fees regulated by the Federal Anti-monopoly Service. ATS will also be required to contract with the system operator for its services.

Other activities

The restructuring program also envisages the creation of independent repair and maintenance companies operating in a services market. It also envisages the establishment of independent research and design facilities including seven regional technology centres providing a full range of engineering services and a RAO UES engineering centre focusing on refurbishment and new construction projects[152].

KEY ELEMENTS OF THE MARKET DESIGN

Electricity sector reform proposes to fundamentally change the environment for transactions throughout the value chain. In particular, it proposes the creation of a robust, competitive wholesale market and the formation of efficient retail markets to ensure efficient and reliable power supplies. Network services will remain regulated, but will ultimately be regulated in a new way, based on principles of open access and tariff-based incentives for cost-effective performance. This section focuses on the key features of the proposed wholesale and retail market design. Network regulation will be addressed in the subsequent section.

Wholesale market design

Although the final form of the market design and rules for the proposed wholesale market are yet to be finalised, the Electricity Law and the Transitional Wholesale Market Rules give some indication of the likely key features of the proposed market design and rules.

Key objectives of the wholesale market design include promoting the development of a robust and competitive wholesale electricity market characterised by:

- open and non-discriminatory access for all eligible wholesale market participants;
- freedom of choice for participants and the right to negotiate the terms and conditions of transactions, including the electricity price, subject to established legal and regulatory requirements;
- transactions based on unconditional compliance with contractual and payment obligations; and
- non-discriminatory application of the market rules between existing and new facilities[153].

151. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 33.
152. *Concept of RAO UES's Strategy for 2003-2008 – The 5+5 Strategy*, RAO UES, (29 May 2003), pages 15 to 16.
153. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 32.

Eligible members of the wholesale market will include:

- generators connected to the network that control generating capacity above the minimum threshold to be determined in the Wholesale Market Rules;
- large electricity users connected to the network with declared consumption in excess of minima to be established in the Wholesale Market Rules;
- retailers with declared purchases exceeding minima established in the Wholesale Market Rules;
- guaranteeing suppliers; and
- the Trade System Administrator (ATS), the system operator, FGC and regional network operators (only to an extent necessary to compensate for economic losses on their networks).

At this stage, it appears that the key components of the wholesale market will include: a bilateral contracts market; a day-ahead spot market; and an intra-day balancing market.

Wholesale market participants will be free to enter into bilateral supply contracts with other eligible market participants. Contractual terms and conditions, including the price, will be determined individually by negotiation between the parties, subject to meeting the requirements of the Wholesale Market Rules and relevant laws. Market participants will be obliged to notify ATS of their contracted volumes, via long-term notification, so that these volumes can be accommodated in the dispatch process.

Bilateral contracts are expected to be the dominant form of primary transaction in the wholesale electricity market. Secondary trading and derivative trading on financial markets would also appear to be permitted, though no explicit support for the development of these financial markets is provided though the market design.

It is envisaged that ATS will operate a single, day-ahead spot market for each wholesale pricing zone[154], and a centralised dispatch service in cooperation with the system operator. Although the detailed features of the target spot market and dispatch process are yet to be finalised, it appears that it will be based on a double auction model. Under this model, eligible market participants could submit a range of price and quantity offers (to supply) and bids (to consume) to ATS for each trading interval, at least 24 hours in advance of actual dispatch. Participation would be voluntary. Trading and dispatch would probably occur on an hourly basis, at least initially. An optimal (least cost) dispatch schedule would be developed by ATS for each trading interval on the basis

154. At present it is expected that the wholesale pricing zone will initially include most of European Russia and the Urals, and will ultimately be extended to Siberia during the second half of 2005. A single pricing zone reflects particular features of the local infrastructure (5+5 Strategy, page 16). However, the Electricity Law would permit the development of multiple pricing zones where regular binding transmission constraints emerge. Alternatively, it is possible that locational marginal pricing may be introduced within the wholesale pricing zone, eliminating the need for multiple pricing zones at a wholesale level.

of the bids received and other dispatch priorities established by the market rules[155], with the least cost offers and bids accepted until the projected market is cleared. The day-ahead spot price would be determined by the marginal offer or bid that clears the projected market, and this offer or bid would set the system marginal spot price for a particular trading interval.

This optimal *ex-ante* dispatch schedule would be forwarded to the system operator to determine whether it is technically feasible to implement, taking into account the current operating condition of the network, technical losses and potential points of congestion. The system operator would prepare a modified dispatch schedule accounting for network and other technical constraints, where necessary, and submit it to ATS. ATS would subsequently undertake actual dispatch reflecting any technical constraints.

Imbalances caused as a result of implementing the modified dispatch schedule, or as a result of an unanticipated change in demand or failure of dispatched generation to operate as bid, would be met in the real-time, intra-day balancing market. Price setting and dispatch in this market would operate according to the same principles as the day-ahead spot market, with the lowest cost offers (to increase or decrease generation) and bids (to reduce or possibly increase consumption) accepted until the market is cleared. The marginal offer or bid that clears the balancing market would set the system marginal balancing market price for a particular trading interval.

ATS would be responsible for settling spot and balancing market transactions. It would collect cash payments from eligible users and distribute them to dispatched generators according to metered consumption and production. Balancing charges could be allocated on a causer pays basis or averaged across all users in some form of uplift charge.

The Electricity Law also provides for the possibility of wholesale price caps in the event that price volatility exceeds limits to be specified in the Wholesale Market Rules. It also provides for a capacity mechanism and investment guarantee fund to ensure a timely, efficient generation investment response, at least during the transition phase, and to help moderate price volatility. The Law also seeks to minimise the scope for economic withholding by requiring market generators to make their entire operating capacity available for sale in the wholesale market except in specific circumstances[156].

Technical network losses associated with the transportation of electricity would be the responsibility of generators and be incorporated into the price of wholesale market

155. See Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 32. This Article includes the dispatch priority for certain classes of generation. First priority is given to generators providing reliability services and to nuclear generation (to the extent required to meet safety and other operational requirements). Second priority is given to hydroelectricity generators (to the extent that they need to run to meet technological or environmental requirements) and thermal cogenerators (where operation is driven by heating demand). Third priority is given to output associated with registered bilateral contracts. In each case ATS must factor such volumes into the optimal dispatch schedule. Generators dispatched on this basis are price-takers from a spot-market perspective and can not set the spot price. Volumes covered by a registered bilateral contract may be bid into the spot market but will forfeit priority dispatch rights and receive the spot market price if dispatched.
156. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 29, 32 and 46 and *Concept of RAO UES's Strategy for 2003-2008* – The 5+5 Strategy, RAO UES, (29 May 2003), page 16.

transactions. Other network losses would be the responsibility of network service providers, and they would be permitted to enter into electricity supply contracts to meet this obligation.

Services provided by market institutions would be secured through legally binding contracts. All market participants would be required to enter into service delivery contracts with ATS, the system operator and with network service providers, to help clarify responsibilities and strengthen commercial accountability for service delivery and payment. The system operator will also be required to establish service contracts with ATS and the FGC. Contracts with the market institutions would be subject to regulated terms and conditions. Such arrangements may help to reinforce incentives for appropriate performance and reduce the level of risk associated with market participation. Contracts would not override principles of non-discriminatory access, especially to the network, ensuring that regulated network capacity is made available to serve dispatched generation and load.

Retail market design

As with the wholesale market, the final form of the market design and rules governing the creation, operation and development of retail markets are yet to be finalised. However, the Electricity Law and other policy statements give some indication of the objectives and principles underpinning the proposed retail market reform.

Key objectives of the retail market design include:

- establishing robust and efficient retail electricity markets;
- accommodating the gradual introduction of effective competition and customer choice; and
- achieving effective consumer protection to ensure access to reliable and affordable electricity services for all end users[157].

Market participants will include:

- contestable consumers;
- licensed retailers;
- licensed Guaranteeing Suppliers;
- regional electricity network operators providing transmission services;
- local system operators; and
- local generators that are not eligible participants of the wholesale market[158].

157. Decree #526, *On Restructuring the Electric Power Industry of the Russian Federation* (11 July 2001), page 4.
158. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 37.

Bilateral contracts are expected to provide the foundation for retail market transactions. A fundamental principle of the proposed retail market design is that retail market participants will have freedom to enter into supply contracts with other eligible market participants of their choice. It is envisaged that contractual terms and conditions, including the price, would be determined individually by negotiation between the parties, subject to meeting the requirements of the Retail Market Guidelines and other relevant laws. Guaranteeing Suppliers would be required to make their supply contracts public.

Retail prices for contestable customers are expected to be cost-reflective, incorporating the actual cost of electricity purchased on the wholesale market, the cost of regulated network services and a competitively priced retail margin. Cost-reflective pricing would permit full cost recovery, which is a critical pre-condition for the development of commercially viable and efficient retailers.

Consumer protection will be primarily addressed through a network of licensed Guaranteeing Suppliers. These Suppliers will be required to make a default regulated retail product available to any eligible retail consumer within their exclusive franchise area[159].

Following the introduction of the target competitive wholesale and retail markets, retailers' capacity to offer services on regulated terms and conditions will be guaranteed for a period through a system of vesting contracts. Under this arrangement, market participant generators will be required to enter into one year (commercial users), three year (households) or five to seven -year (large energy-intensive users) supply contracts with retailers at regulated prices[160]. It is anticipated that the proportion of regulated supply will be gradually reduced over the course of these contracts until most or all supply is sourced from the competitive wholesale market at cost-reflective prices. It is possible that vesting contracts may be rolled-over beyond the initial contract period.

Beyond the vesting contract period, it is envisaged that vulnerable, low income residential consumers may be eligible for subsidy assistance though a budget-funded safety net scheme that would ensure payments are made to their Guaranteeing Suppliers[161].

The legislation provides for the eventual curtailment of electricity supplies to users who are not covered by the safety net scheme and who default on their electricity payments[162].

Key market rules that will affect retail market transactions and prescribe the nature and boundaries of retail competition and choice will be addressed in the Retail Market Guidelines, which are scheduled for publication during the third quarter of 2005[163].

159. The proposed role, function and regulation of guaranteeing suppliers is summarised in the section on Retailing and local distribution on page 108.
160. Russian Government Decision #2124 (27 December 2004) and discussions with Ministry of Industry and Energy officials.
161. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 38.
162. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 38.
163. Russian Government Ordinance #966-r (17 July 2004), Item 21.

KEY ELEMENTS OF THE REGULATORY ARRANGEMENTS

Proposed electricity reforms will affect all aspects of the existing regulatory regime, and require a fundamental transformation of certain elements, especially those relating to access and pricing of regulated network services. The following section briefly describes the objectives and key features of the proposed regulatory arrangements.

The main objectives and principles of the proposed regulatory regime include:

- maintaining system integrity and security;
- ensuring access to reliable and affordable electricity for small consumers;
- creating a commercial environment that will attract efficient investment and support the operation and development of a reliable and competitive electricity sector;
- ensuring non-discriminatory access to regulated services on fair and reasonable terms;
- ensuring effective regulation of non-competitive elements of the electricity sector; and
- providing access to the information required to support efficient market operation and development[164].

A comprehensive and integrated regulatory framework has been proposed to achieve these objectives, which will affect participation and transactions at each step in the value chain, including:

- regulation of entry (and exit in some cases) to wholesale and retail markets;
- regulation of market structure, market operation and conduct, through market rules and through more general forms of competition supervision;
- regulation of prices and access to network services and to other regulated services including those provided by market institutions;
- regulation of new investment, including construction approvals and rates of return in regulated sectors; and
- regulation to protect consumer interests[165].

It is proposed to use a combination of government regulation and public ownership of key infrastructure facilities to implement and enforce the regime[166]. The regulatory regime will be supported by an integrated system of bilateral contracts for the provision of "natural monopoly" services to help strengthen incentives for efficient service delivery and improve accountability through the value chain.

164. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 20.
165. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 21.

In most cases the detailed regulatory provisions are yet to be finalised, however the Electricity Law identifies the key components of the regulatory regime and gives some indication of its likely features[167].

Competition supervision and non-discriminatory access

The Federal Anti-monopoly Service (FAS) has responsibility for competition supervision, including *ex-ante* regulation of mergers and acquisitions, *ex-post* regulation of market conduct on a case-by-case basis, and consumer protection. It is also responsible for regulating non-discriminatory access to "natural monopoly" services and regulating the activities of the Trade System Administrator (ATS)[168].

Competition supervision

Competition in wholesale and retail markets will be subject to regulatory supervision with the objective of timely identification, prevention, restriction and/or termination of undue market power and discriminatory commercial practices, including:

- collusion between electricity suppliers to affect prices;
- unjustified refusal to enter into contracts for the sale or purchase of electricity;
- unjustified refusal to enter into contracts for the provision of network services, dispatch services or services of the wholesale market operator;
- discriminatory treatment of wholesale or retail market participants; and
- price manipulation, especially resulting from abuse of a "unique" position in wholesale or retail markets[169].

The new Competition Law is anticipated to focus on monitoring and assessing the structural and behavioural dimensions of competitiveness in wholesale and retail electricity markets. Several key regulatory indicators are expected to be adopted including:

- movements and levels of wholesale and retail prices;
- measures of wholesale market power, including market power resulting from changes in ownership and control of generating assets; monitoring of generator ownership against legal maximum installed capacity restrictions, and temporal market power resulting from technological constraints (generation and network);
- indicators of collusion between wholesale and retail market participants; and
- indicators of abuse of a unique or dominant position[170].

The Electricity Law envisages a combination of *ex-ante* and *ex-post* measures to help regulate competition in these markets, including:

167. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Chapter 5 (Articles 23-29), supplemented with observations drawn from the summary record of discussions with senior representatives of the FTS, FAS, MEDT (December 2003, unpublished).
168. See Russian Government Resolution #189 (7 April 2004) confirming FAS functional responsibilities at *http://www.government.gov.ru/data/news_text.html?he_id=103&news_id=14003*.
169. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 25.
170. See FAS presentation on draft Competition Law, 18 January 2005 at *http://www.fas.gov.ru/competition/443.shtml*.

- provision of information to regulatory authorities to facilitate effective monitoring of market participant conduct and enforcement[171];
- structural measures to address market concentration including restrictions on maximum legal levels of generator ownership within a wholesale market pricing zone, supervision of mergers and acquisitions, and forced unbundling and/or reallocation of wholesale market members' assets where concentration restrictions are breached[172];
- price regulation, particularly where competition is weakened by technical or structural limitations, or where competition is weak temporarily[173];
- non-discriminatory access provisions (discussed below); and
- direct intervention to control the transactions, new investments and acquisition of existing assets of "natural monopolies", including obligations to supply on fair and reasonable terms[174].

Technologically isolated systems will not be opened to competition unless the pre-conditions exist to facilitate effective competition, or until they become interconnected with the national transmission network.

The legislative framework for competition supervision has been established in the Electricity Law and will be further developed in the new Competition Law. Further sub-ordinate legislation is proposed to clarify detailed elements of the framework including:

- an ordinance to establish the criteria and procedures for determining where a systemic or temporal absence of effective competition exists;
- an ordinance to establish the criteria and procedures for anti-monopolistic control of wholesale and retail markets, and for assessing the presence of undue market dominance; and
- an ordinance establishing the criteria for determining abuse of generator/supplier market power[175].

It is anticipated that other matters relating to competition supervision will be addressed in the wholesale market guidelines, which are scheduled for publication during the third quarter 2005.

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171. Federal Law #147-FZ, *On Natural Monopolies* (as amended) (17 August 1995), Articles 8 and 13 in particular provide further guidance on information disclosures requirements. These powers are echoed in Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 25, which require wholesale and retail market participants to regularly file information about their performance with the FAS, and provide access to any information regarding their performance to FAS officials on request.
172. No supplier will be permitted to own more than 35% of total installed generating capacity within a wholesale market pricing zone. Where these limits are breached, the regulator will be permitted to introduce price regulation for up to 6 months, and pursue a program of asset unbundling.
173. Federal Law #147-FZ, *On Natural Monopolies* (as amended) (17 August 1995), Article 6 and Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Articles 25 and 27. In particular, Article 27 identifies price spikes resulting from a tightening of supply and demand during a peak demand period (or even during intra-day peak periods) as a potential trigger for the introduction of price caps. The legislation requires such price caps to be removed once the "temporal coincidental deficit of electricity" is resolved.
174. Federal law #147-FZ, *On Natural Monopolies* (17 August 1995) as amended), Articles 6 and 7.
175. Russian Government Ordinance #865-r (27 June 2003), Items 36, 37 and 39, respectively.

Non-discriminatory access

It is proposed to apply non-discriminatory access regulation to the services of "natural monopolies", including:

- dispatch services provided by the system operator,
- wholesale market services provided by the Trade System Administrator;
- transmission and distribution services, including physical connection subject to technical requirements; and
- Guaranteeing Suppliers regulated services for retail customers[176].

Under the regime, market participants are entitled to enter into bilateral supply contracts for these services. These contracts incorporate regulated terms and conditions and provide a consistent, legally enforceable right of access on fair and reasonable terms. Key features of these contracts include: maximum capacity entitlements; technical, safety and metering standards; user and service provider obligations (including service standards, information disclosure and obligation to pay for services); and *force majeure* issues. These contracts are public documents. Minimum timeframes for executing key features of the contracts are prescribed by regulation[177].

The reform proposals also envisage that non-discriminatory access would be supported by other features of the regulatory framework including: tariff setting for regulated services; information disclosure; and dispute resolution procedures.

Enforcement of non-discriminatory access to electricity transmission and dispatch will be governed by the electricity legislation, anti-monopoly legislation, provisions contained in the Wholesale Market Guidelines and rules for non-discriminatory access to dispatch, network and market operator services[178].

An ordinance establishing detailed provisions for non-discriminatory access in wholesale markets, network services, system operation and ATS was released on 27 December 2004[179]. Further provisions addressing non-discriminatory access to "natural monopoly services" for retail market participants will be incorporated into the Retail Market Guidelines, which are scheduled to be published during the third quarter of 2005[180].

Tariff and price regulation

The Electricity Law indicates that prices in the electricity sector will be determined by negotiation between market participants, with the exception of services provided by "natural monopolies" including:

- prices for power supplied in an environment characterised by limited competition;
- prices for system reliability and capacity reserve services;
- fees for Trade System Administrator services;

176. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Articles 9, 14, 16-17, 21, 26, 30, 33-34, 37 and 41.
177. Russian Government Ordinance #861 (27 December 2004).
178. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 25 and Russian Government Ordinance #861 (27 December 2004)
179. Russian Government Ordinance #861 (27 December 2004).
180. Russian Government Ordinance #865-r (27 June 2003), Item 45, page 14.

- prices for heat;
- fees for electricity dispatch services;
- fees for network connection; and
- fees for Guaranteeing Suppliers[181].

The final pricing principles and methodology for setting regulated tariffs are yet to be determined. Interim arrangements are currently based on a cost-plus methodology, where regulated businesses pass on all costs and recover an "economically justifiable" return as determined by the regulator. Regulated prices are typically reviewed annually. At present, the rate of return for transmission services has been set at around inflation plus 1% to 2% per annum. Details relating to the current interim arrangements are contained in Ordinance 109 (of 26 February 2004) and Ordinance 893 (of 31 December 2004).

It is probable that, once the inflationary situation has sufficiently stabilized and the market is in place, some form of CPI-X methodology will be introduced followed eventually by more sophisticated forms of incentive regulation based on the capital-asset pricing model and benchmarking.

Other features of the proposed regulated pricing regime may include:

- approved tariffs shall apply for at least 12 months, except for system reliability services[182];
- regulated service providers can retain savings over the various allowable costs for up to two years, after which they may be redistributed to users via lower tariffs;
- regulated rates of return should be comparable with rates of return achieved in other industries with similar risk profiles[183]; and
- regulated prices should not incorporate cross-subsidies between different customer classes[184].

The Federal Tariff Service's (FTS) responsibilities include developing pricing principles and tariff methodologies, and setting maximum and minimum price caps and tariffs for regulated services nationally and on a regional basis. FTS's capacity to enforce regulated regional tariffs and to influence the activities of Regional Energy Commissions (RECs) will be enhanced by certain provisions of the Electricity Law, including:

181. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 23.
182. It was suggested during interview that rate of return determinations may be reviewed annually, and that the current low inflation outlook may permit inflation-indexed regulated tariffs for a period of up to 3 years.
183. In discussions with Russain Officials during the IEA mission to Moscow in December 2003, it was suggested that a risk-free rate of return based on the Government re-financing rate may be contemplated for local equity investments, while a rate of return based on an inter-bank rate may be contemplated for foreign equity investments.
184. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 23.

- FTS will have authority to repeal a REC decision in relation to regulated tariffs where it is inconsistent with the pricing principles or maximum and minimum tariffs set by FTS[185];
- FTS will be empowered to approve the appointment or dismissal of the chair/chief executive of a REC; and
- RECs will be required to obtain FTS approval to exceed published regional tariffs[186].

Among other things, federal regulatory agencies will be empowered, within their scope of responsibilities, to:

- issue binding orders to market participants, executive bodies and local authorities;
- request information about emergencies and infrastructure failures;
- considerer complaints by purchasers of electricity services and collect supporting information from electricity service providers;
- apply sanctions for violations of the Electricity Law or other relevant laws; and
- take legal action and participate in legal proceedings in relation to the application or violation of the Electricity Law[187].

Regional governments, through associated RECs, will be responsible for matters including:

- implementing distribution tariffs within the bounds determined by the FTS;
- setting supply fees for Guaranteeing Suppliers; and
- setting heat tariffs, with heat tariffs of cogeneration facilities to be within the bounds established by the FTS[188].

RECs will be permitted to delegate responsibility for regulating tariffs for heat only facilities within a particular municipal region to the relevant local government, and will have the power to repeal those tariffs where they are inconsistent with the pricing principles.

Regulated service providers that do not comply with regulated tariffs will be liable for any losses resulting from non-compliance, pursuant to Russian law. The regulator may undertake a compliance audit of regulated entities once every two years[189].

185. Russian Government Ordinance #123 (3 March 2004).
186. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 21 and 24. Summary Record: 2nd IEA Mission (November-December 2003) (unpublished), page 31. Also Ordinance #865-r (Item 23).
187. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 21.
188. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 21.
189. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 23.

Investment policy and regulation

Greater reliance on private investment is a fundamental principle underpinning the Government's investment policy. Key objectives of the Government's investment policy include:

- ensuring stable development of the sector;
- attracting private investment to all segments of the sector; and
- reinforcing government control over the effectiveness of investment in natural monopolies[190].

The policy recognises the need to create a favourable investment climate conducive to private participation if these policy objectives are to be met. Hence, the policy emphasises the need to create stable conditions for business activities, founded on strong private property rights, and economically justified rates of return on investments in regulated activities. It also incorporates principles of protection and support for Russian producers.

Investment policy for regulated network infrastructure will focus on improving the overall efficiency of the electricity sector including through the removal of transmission constraints for net power flows and increasing transmission capacity to accommodate potential generating capacity. The FGC will be responsible for developing the national transmission network, including network planning and investment. Network planning and implementation processes will be subject to regulatory procedures that are yet to be defined[191]. Other entities will have the right to construct new transmission lines; however detailed provisions elaborating on the nature and scope of this right are yet to be developed. All new transmission investment proposals will be required to undergo an expert review in the course of obtaining necessary industrial safety, technical safety and environmental approvals[192].

The Government will make projections of supply-demand balances for individual wholesale market price zones, and undertake "safety net" investments in generating plants to prevent capacity deficits where an appropriate and timely market response is not forthcoming through an investment guarantee fund[193]. A capacity mechanism is also being developed to ensure adequate generation investment. The Government may also apply provisions relating to decommissioning of electricity infrastructure to require owners to delay closure for up to two years where decommissioning may lead to a deficit in wholesale supply. Owners would be eligible for compensation in the event that continued operation resulted in financial losses[194].

Investment policy for nuclear facilities is based on the creation of an economic and regulatory environment that will facilitate the accumulation of internal investment funds and attract external investment capital, in accordance with the national investment program developed for the nuclear industry.

190. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 29.
191. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 10.
192. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 42.
193. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 29.
194. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 44.

Further sub-ordinate legislation is proposed to clarify detailed elements of the regulatory framework for new investments including:

- an ordinance to establish procedures for regulating the investment programs of natural monopolies including the system operator;
- an ordinance to determine the terms, conditions and procedure for maintaining technological capacity reserves and compensating service providers; and
- an ordinance to establish procedures, terms and conditions for the construction and financing of electricity facilities[195].

Technical regulation and emergency provisions

Technical regulations will be applied to ensure the reliable and safe operation of electricity infrastructure and to help prevent operational emergencies. The proposed technical regulatory regime will include the establishment of appropriate technical regulations, and monitoring and enforcement by government agencies to ensure compliance.

Matters to be addressed by the technical regulatory regime will include:

- technical and technological safety in the electricity sector;
- the quality of electricity and heat;
- establishment of capacity reserve standards;
- the design of electric and heat installations;
- monitoring the operation of electricity and heating infrastructure, including ensuring compliance with operational safety rules and technical standards; and
- compliance with specific safety requirements for the nuclear power sector[196].

Technical regulations currently exist in relation to these matters, and are likely to continue to apply under reformed electricity market arrangements. Establishment of capacity reserve standards are expected to be addressed in the ordinance on technological capacity reserves[197].

Specific emergency provisions are also proposed under the Electricity Law including:

- application of an emergency dispatch procedure to allow the system operator to manage the system in a manner that will protect critical infrastructure when reliability standards and other technical standards relating to secure operation of the system are breached[198];
- procedures for system operators and network service providers to execute partial or full curtailment of supplies (i.e. load shedding) to any or all customers, including Guaranteeing Suppliers' customers, in the event of an emergency[199];

195. Russian Government Ordinance #865-r (27 June 2003), Items 18, 24 and 44.
196. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 28.
197. Russian Government Ordinance #865-r (27 June 2003), Item 24.
198. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 15.
199. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Articles 21 and 38.

- procedures for activating interruptible supply contracts with dispatchable customers to help alleviate emergency situations[200]; and
- suspension of the wholesale market in the event of "extraordinary" circumstances[201].

Specific rules and procedures governing emergency dispatch will be addressed in the wholesale market rules, which are scheduled for publication during the third quarter 2005[202]. Provisions relating to curtailment are likely to be addressed in the transitional retail market rules and subsequent guidelines[203]. It is likely that the rules and procedures for government regulation in the event of limited competition would apply in cases where the market is suspended as a result of an emergency situation.

Information disclosure

Access to accurate and reliable information is critical for effective price formation, which is a precondition for transparent and efficient operation and development of competitive electricity markets based on decentralised decision-making in response to price signals. Accurate and reliable information is also a precondition for effective regulation of "natural monopoly" services.

The proposed industry restructuring will assist by helping to improve the transparency of cash flows through the value chain. Proposed regulatory initiatives on information disclosure have the potential to complement and greatly strengthen access to, and transparency of, market information, helping to further reduce transaction costs for market participants, and improve market efficiency.

Provisions contained in the Law on Natural Monopolies and proposed in the Electricity Law would integrate information collection and disclosure into the regulatory regime and have the potential to facilitate disclosure of information throughout the value chain. Key features include:

- the creation of an information disclosure system and compliance regime for wholesale and retail market participants;
- establishing information disclosure standards and the associated compliance regime for consumers including information on products and unbundling of electricity charges;
- establishing information disclosure standards and the associated compliance regime for "natural monopolies" including:
  - disclosure of information on the capacity and operational/technical status of networks;
  - prescribing regulatory powers to access operational and accounting information; and
  - requirements for public dissemination of prescribed information; and
- application of activity-based accounting rules for all market participants[204].

200. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 38.
201. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 27.
202. Russian Government Ordinance #865-r (27 June 2003), Item 49.
203. Russian Government Ordinance #865-r (27 June 2003), Item 34 and 45.
204. Federal Law #147-FZ, *On Natural Monopolies* (17 August 1995) as amended), Articles 13 and 14, and Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Articles 20-22, 25-26, 33 and 43.

Detailed provisions prescribing the disclosure standards for market participants and "natural monopolies", including related reporting requirements, were addressed in ordinances published during the third quarter 2003. Further regulations regarding the content for regular disclosure of information by wholesale and retail market participants were released during the first quarter 2004[205]. Reporting procedures will be clarified in a forthcoming regulation.

Appeals and dispute resolution

Rights of appeal and dispute resolution procedures provide a means to strengthen the accountability and transparency of regulatory and institutional decision-making, providing a discipline for regulatory institutions that can help to reduce regulatory uncertainty, risk and costs. They also provide a means of supporting enforcement of property rights, and building the credibility of market institutions and confidence in the markets they regulate. These issues are of particular importance in electricity markets given the necessarily pervasive influence of regulatory and institutional decisions over critical day-to-day activities such as dispatch and the provision of network services.

Legal recourse to judicial processes of appeal and dispute resolution are created by the regime of bilateral contracts governing the provision of services between market participants, between market participants and market institutions, and between market institutions[206]. These contractual arrangements provide the primary mechanism for establishing rights of appeal and dispute resolution in relation to these services[207]. Regulatory decisions in relation to pricing and tariffs and more generally in relation to decisions of bodies regulating natural monopolies will be subject to legal appeal[208].

The Electricity Law also proposes an administrative process to consider complaints regarding non-discriminatory access to transmission services and to make binding rulings[209]. An out of court settlement process has also been proposed to address a relatively limited group of specific cases[210].

Although it would appear that there are no rights of appeal in relation to the contractual terms and conditions established by regulatory authorities for services provided by "natural monopoly" suppliers, including the terms and conditions governing network services and Guaranteeing Supplier services, it is possible that a regulated entity's "right" to "natural justice" in this context may be addressed through an open and transparent negotiation process leading to the development of the binding terms and conditions.

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205. Russian Government Ordinance #865-r (27 June 2003), Items 11, 12 and 35, respectively.
206. Market institutions in this context refer to the market operator (ATS), the system operator and network services providers.
207. Services covered by this contractual framework include: wholesale market operation services (by ATS), dispatch services (provided by the system operator), national and regional transmission and distribution network services, supply contracts between market participants in wholesale and retail markets, supply contracts with Guaranteeing Suppliers, and service contracts between market institutions (eg. between the market and system operator and between the system operator and network service providers).
208. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 23 and Federal Law #147-FZ, *On Natural Monopolies* ((17 August 1995) as amended), Article 15.
209. Federal Law #35-FZ, *On the Electric Power Industry* (26 March 2003), Article 26.
210. For example, Article 7 of the Electricity Law proposes an out of court settlement process to resolve disputes where it is alleged that the system operator has violated contractual conditions for use of network facilities. Similarly, Article 35 of the Electricity Law proposes an out of court settlement process to resolve disputes in relation to an ATS decision to strike a market participant from the participant register.

Procedures for administrative resolution of disputes between market participants, between regulated entities and market participants, and at an inter-governmental level are addressed in an ordinance released during the fourth quarter 2003[211].

Administrative bodies have been established within RAO UES and ATS to provide an initial process for dispute resolution in relation to non-discriminatory access. Ultimately, disputes which can not be resolved through the administrative process would be referred to the FAS.

211. Russian Government Ordinance #674 (4 November 2003).

ANNEX 2
ELECTRICITY TRENDS IN RUSSIA'S REGIONS

Russia is divided into seven regional grids, or Energy Systems. Almost 80% of Russian electricity is produced in four of these systems: Central, Siberia, Volga and Urals. Table 2.1 below presents the installed generation capacity by region as well as the maximum demand on that capacity by region during the first quarter 2004 and forecast for 2005. In many regions, maximum demand in 2004 surpassed the levels of installed thermal generation capacity, controlled largely by RAO UES. Total installed capacity includes the 22 GW of RosEnergoAtom nuclear generation capacity as well as the 44 GW of hydro generation capacity.

Table 2.1 Regional Installed Generating Capacity vs Maximum Capacity Demand, GW

Regional Electricity System	Installed Capacity (2002) GW		January GW		February GW		March GW	
	Thermal	Total	2004	2005e	2004	2005e	2004	2005e
Central	34	49	37	38	37	38	36	37
Urals	37	40	31	33	31	32	29	31
Siberia	22	45	28	29	27	28	26	27
Volga	13	23	13	13	13	13	12	12
Northwest	10	19	12	12	12	12	11	11
South	8	11	8	9	8	8	8	8
Far East	9	11	7	7	6	6	6	6
Overall Russia	**133**	**198**	**133**	**140**	**132**	**134**	**126**	**130**

Note: About 17 GW could not be identified and has not been included here. Auto-production, small plants and mothballed plants account for most of the missing capacity.

Source: Installed capacity data from Ministry of Energy of RF, Fuel and Energy of Russia, Moscow, 2000, Economics and Energy of the Regions, A.M. Mastepanov and V.V. Saenko, Moscow, 2001, Fuel and Energy Complex of the Regions of Russia, Volumes 1 and 2, Moscow 2003. Factual and forecast maximum regional capacity demand at www.so-cdu.ru/main.php?&menu_id=415&menu_module=menu&unique=4234bb7e2057f.

During the economic decline that began in 1990, electricity consumption decreased by almost 30%, to 579 TWh in 1998. The drop in electricity demand was most marked in the Central and Volga Region where industries were most affected by the economic slow down of the 1990s. The Central region saw its industrial production drop almost 2.5 times over this period. The electricity needs of the heavy industrial sector of the Urals and Siberia meant that the decline in electricity supply and demand was less marked in these regions (see Table 1 in Chapter I). Table 2.2 below provides

the breakdown of industrial output from key industrial sub-regions (oblasts, okrugs and krais) within Russia for 2004. In this respect it shows how important the availability of reliable electricity is to these regions – a key factor in past Russian economic growth and increasingly so for the future, if Russia is to meet its political goal of doubling GDP over the coming decade.

Table 2.2 Share of Industrial Output by Key Sub-regions of Russia, 2004, %

Sub-region	Region	Share of Industrial Output
Khanty-Mansiisk AO	Urals	9.4%
City of Moscow	Central	5.1%
Sverdlovsk oblast	Urals	4.2%
Moscow oblast	Central	4.1%
Samara oblast	Volga	4.0%
Chelyabinsk oblast	Urals	4.0%
Republic of Tatarstan	Volga	3.7%
City of St. Petersburg	Northwest	3.6%
Krasnoyarsk krai	Siberia	3.3%
Republic of Bashkortostan	Volga	2.7%
Kemerovsk oblast	Siberia	3.1%
Yamalo-Nenets AO	Urals	3.0%
All others		49.8%

Source: *http://www.economy.gov.ru/wps/portal*

From 1999 to 2002 electricity consumption increased to 618 TWh in 2002, but the rate of growth has declined since, possibly because of response to increasing electricity prices. The overall level of electricity supply remains at 83% of 1991 levels, a benchmark in terms of pre-financial crisis levels and potential supply and demand tightening. That being said, certain regions are reaching 1991 levels, a benchmark for tightening of the supply and demand balance within the region. Regions where this is most marked in 2002 include Siberia (88.7%), the South (87.7%) and the Northwest (86.6%)[212].

Table 2.3 Electricity Supply in 2002 versus 1991

Overall Russia	83.4%
Siberia	88.7%
South	87.7%
Northwest	86.6%
Far East	86.4%
Urals	82.4%
Volga	80.2%
Central	79.0%

212. IEA analysis based on generating capacity figures from Ministry of Energy of RF, *Fuel and Energy of Russia,* Moscow, 2000, *Economics and Energy of the Regions,* A.M. Mastepanov and V.V. Saenko, Moscow, 2001, *Fuel and Energy Complex of the Regions of Russia,* Volumes 1 and 2, Moscow 2003.

RUSSIAN ELECTRICITY SUPPLY AND DEMAND BY REGION[213]

The following provides a description of electricity generation capacity by energy region as well as trends over the 1990s and early 2000s of the regional supply and demand balances. As shown in Map 3, the regional energy systems in Russia are based on key electric power plants supplying electricity to the various sub-regions – and in only a few cases to neighbouring regions – lacking sufficient electricity generation capacity. Very little inter-regional trade was envisaged or necessary under the centrally planned system. As shown below, the Central region is the key region where surplus electricity generation exists. The Central region is the largest inter-regional electricity trader; it had almost 20 TWh of excess electricity in 2002 (see Figure 2 in Chapter I). As Map 3 and the following regional assessments show, the Volga region is the only other region which has a surplus electricity balance. Its small surplus is provided to the Urals to cover its slight deficit. Inter-regional flows from the Central region provide the needed electricity to other deficit sub-regions within the Central region as well as to the Southern region and parts of the Northwest region[214].

In this respect, Map 3 and the text below reflects the importance of the intra and inter-regional electricity grid network in providing the necessary capacity to ensure reliable electricity flows between surplus and deficit sub-regions and regions of Russia. Under the restructured electricity market envisaged by the reforms, inter-regional trade will be critical to ensure that inter-regional competition can be supported and not be constrained by network congestion. Sufficient network interconnection among regions will be essential to ensure against the formation of regional monopolies.

The Central electricity system

The Central region is the most economically developed region of Russia in terms of standards of living and wealth of the country. Making up just under 4% of Russia's land mass, over 25% of Russia's population lives there. It contributes to over 30% of national GDP, over 40% of federal budget revenues and over 20% of the country's industrial production. The Moscow oblast (region) plays the leading role, accounting for almost 70% of the region's GDP, 45% of its industrial output and almost 85% of the region's contribution to the federal budget. The Central region has also the widest divergence between rich and poor regions with about a tenfold difference between the city of Moscow and the poorest sub-region.

The industrial sector of the Central region focuses mainly on added value activities such as machine building (including car manufacturing), metallurgy, petrochemicals, refining, construction and building materials (accounting for over half of industrial production), food industries (about 20%) and electricity generation (about 20%).

213. Regional information and electricity balances are taken from Ministry of Energy of RF, *Fuel and Energy of Russia*, Moscow, 2000, *Economics and Energy of the Regions,* A.M. Mastepanov and V.V. Saenko, Moscow, 2001, *Fuel and Energy Complex of the Regions of Russia*, Volumes 1 and 2, Moscow 2003

214. While the Northwest region imports some of its electricity needs from the Central Region, it exports electricity to Finland.

In contrast to its major contribution to Russian economic development and growth, the Central region is not well endowed with natural resources. It imports its natural gas needs (which makes up about 65% of regional TPES) to fuel its electricity needs. It generates the most electricity of all Russian regions, accounting for over 20% of total Russian generation. Electricity in the Central region is produced mainly from thermal centralized heat and power plants (CHP) as well as nuclear power plants. The major electricity power plants of the region are listed below.

Table 2.4 Major Generating Capacity of the Central Region

Nuclear Power Plants (NPPs)		
Kursk NPP	4x1 GW	RBMK reactors
Smolensk NPP	3x1 GW	RBMK reactors
Kalinin NPP (in Tver)	2x1 GW	VVER reactors
Novovoronezh NPP	1 GW	VVER reactor
	2 x 0.4 GW	VVER reactors
Total Nuclear	**10.8 GW**	
Thermal Power Plants		
Mosenergo	13.8 GW	Gas / Fuel Oil
Kostromskaya GRES	3.6 GW	Gas / Fuel Oil
Ryzanskaya GRES	2.7 GW	Coal / Fuel Oil
Konakovskaya GRES (in Tver)	2.4 GW	Fuel Oil
Cherepetskaya GRES (in Tula)	1.4 GW	Coal / Fuel Oil
Total Thermal-based capacity	**33.5 GW**	
Total Hydro-based capacity	**4.5 GW**	
Total Electricity Capacity	**48.8 GW**	

Sub-regional Electricity Supply-demand Balances of the Central Region

Almost half of Russia's nuclear generating capacity is located in four of the Central region's sub-regions. They cover the electricity needs of the Central region as well as the electricity deficits of other neighbouring regions through inter-regional transmission.

Tver oblast is a large industrial centre with electricity generation playing a key role. The Kalinin nuclear power plant (2 GW) and the Konokovskaya thermal power plant (2.4 GW) are located in this oblast and are both qualified as inter-regional power plants. Tver oblast generated 24 TWh of electricity in 2002 and consumed only 6 TWh, supplying the surplus to other oblasts in the Central region and the Northwest Region.

Smolensk oblast is a large industrial centre with electricity generation an integral part given the 3 GW of nuclear capacity within its limits. This power plant is qualified as an inter-regional power plant providing surplus electricity to the Northwest region.

Table 2.5 Central Region, Deficit-surplus Balance (TWh)

							2002 as a % of 1991	
Oblast	**1991**	**1995**	**1999**	**2000**	**2001**	**2002**	**Demand**	**Supply**
Tver	18	11	16	16	17	18	70%	90%
Smolensk	18	14	17	17	18	17	68%	86%
Kursk	15	11	15	15	12	13	77%	85%
Kostroma	17	8	10	9	10	8	72%	55%
Moscow city	16	16	9	10	8	8	111%	92%
Ryzan	13	7	6	7	7	6	71%	57%
Voronezh	-1	1	2	3	3	4	76%	116%
Orlov	-3	-2	-2	-2	-2	-2	66%	128%
Tambov	-4	-3	-3	-3	-2	-2	71%	111%
Ivanovsk	-4	-2	-3	-3	0	-3	64%	48%
Bryansk	-5	-4	-3	-3	-3	-3	64%	68%
Yaroslav	-3	-2	-3	-3	-3	-4	83%	64%
Kaluga	-5	-4	-4	-4	-4	-4	84%	85%
Tula	2	-1	-3	-3	-4	-4	66%	36%
Vladimir	-7	-4	-4	-4	-4	-4	71%	124%
Lipetsk	-8	-7	-6	-6	-6	-6	84%	102%
Belgorod	-11	-10	-10	-11	-11	-11	94%	95%
Moscow oblast	-8	-6	-8	-10	-10	-13	94%	76%
Total	**39**	**25**	**27**	**26**	**26**	**19**	**84%**	**79%**

Kursk oblast is one of the major agro-industrially developed region of Russia. Electricity generation plays a key role both in terms of supporting industrial development (heavy metal, petrochemical refining, machine building and food industry) and in terms of generating electricity for neighbouring deficit regions. The Kursk nuclear power plant (4 GW) generates about 95% of the region's electricity. This amounted to 20 TWh in 2002 with regional demand of only 7 TWh.

Kostroma oblast is one of the least economically developed within the Central region. The key asset of the region is the major thermal power plant (3.6 GW) on which is derived over 40% of the region's industrial output. In 2002, 12 TWh was generated in the Kostroma region, while only 3 TWh was consumed. The surplus electricity was provided to deficit sub-regions of the Central region.

Moscow city (generating 49 TWh in 2002) is nearing 1991 levels while supplying to the Moscow oblast and other deficit areas in the Central region. Moscow city consumed about 41 TWh in 2002, thus leaving about 8 TWh of surplus to cover needs of the surrounding Moscow oblast. The oblast is a major deficit region, generating about 21 TWh in 2002 but consuming 34 TWh.

Ryzan oblast, like others in the Central region, has a strong agro-industrial base. It also has a major thermal power plant, the Ryzanskaya GRES (2.7 GW) which is qualified as an inter-regional power plant. The oblast has plenty of spare capacity and provides surplus electricity to other oblasts in the Central region as well as to the Volga region.

Voronezh oblast has a large agro-industrial base which consumes about 80% of its electricity generation. The surplus, given the generation from the Novovoronezh nuclear power plant is provided to neighbouring deficit sub-regions.

Belgorod oblast is an agro-industrial centre of Russia with a major heavy metal manufacturing industry (from which over 40% of the region's industrial output is derived) as well as an important food industry. Despite its major industrial base, this sub-region has only minor installed electricity generation capacity (.08 GW) and is thus a major deficit region, dependent on surplus electricity from other sub-regions within the Central region.

The Northwest electricity system

The Northwest region is very diverse in terms of the economic development of its 11 oblasts and autonomous okrug(s). The main economic activity is focused on development of the region's natural resource base and related industrial processes. The northern and northeastern parts of the region are industrial-based in terms of production and refining of various natural resources (forestry and related products, oil, coal, rubber, steel, etc.). The trading port of Murmansk, which is ice-free, plays an increasingly important role in the Northwest region's economic development. The southwestern part of the region is the key industrial part, specializing in machine-building, petro-chemicals and forestry-based industrial production. Just over 10% of Russia's GDP is generated in this region as well as about 12.5% of its industrial output. It ranks second among regions in terms of attracting foreign investment and fourth in terms of contributions to the federal budget.

St. Petersburg is the key city in this region, contributing about two fifths of the region's GDP, just over 30% of the region's industrial production and about half of the region's contribution to the federal budget. Four of the region's 11 sub-regions (St. Petersburg, Murmansk, Vologda and the Komi Republic) account for about 80% of the region's GDP, 70% of its industrial output and about three-quarters of its contribution to the federal budget.

The Northwest region is one of Russia's wealthiest in terms of mineral resource base. It encompasses huge resources of heavy and precious metals, a well as a significant part of Russia's oil and gas resources, almost 90% of which are situated in the Komi Republic

and the Nenets Autonomous Okrug. The Barents and Pechora Sea are key in terms of the region's oil and gas potential. This is where the Shtokman and Prirazlomnaya oil and gas fields lie.

The Northwest electricity system is characterized by a heavy dependence on nuclear-based electricity generation. About 40% of total generation comes from the region's nuclear power plants (5.8 GW out of the region's total installed capacity of 18.7 GW). A significant part of electricity comes from decentralized heat and diesel electric power stations with capacities ranging from 1 to 2500 MW. Over the 1990s electricity generation dropped almost 20% given the lack of demand, although exports to Finland continued. Some parts of the Northwest system, lying closer to the Central region, import their electricity needs from the Central region. The major electricity generating plants of the region include:

Table 2.6 Major Generating Capacity of the Northwest Region

Nuclear Power Plants (NPPs)		
Leningrad NPP	4x1 GW	RBMK reactors
Kola NPP	4x.44 GW	VVER reactors
Total Nuclear	5.8 GW	
Major Thermal Power Plants		
Lenenergo	4.7 GW	Gas / Fuel Oil (some coal)
Kirishkaya GRES (Leningrad Oblast)	2.1 GW	Gas / Fuel Oil
Pechora GRES (in Republic of Komi)	1.1 GW	Gas / Fuel Oil
Total Thermal-based capacity	**10.1 GW**	
Total Hydro-based capacity	**2.8 GW**	
Total Electricity Capacity	**18.7 GW**	

Sub-regional Electricity Supply-demand Balances of the Northwest Region

The Leningrad Oblast generates almost 3 times as much electricity as it consumes – 35 TWh versus 15 TWh 2002, given its major electricity assets including the Leningrad NPP (4 GW) and the Kirishkaya thermal power plant (2 GW). Surplus electricity is supplied to other deficit parts of the Northwest Region as well as for exports to Finland and Norway.

The Murmansk oblast is also significant in terms of its installed electricity capacity and generation, given it includes the Kola NPP (1.76 GW) as well as hydro power plants (5 in the order of 150-200 MW). Surplus generation is supplied to other deficit parts of the Northwest region as well as for exports to Finland and Norway.

St. Petersburg is supplied by LenEnergo with installed capacity of almost 10 GW including the nuclear power plants discussed earlier. Within the city itself are several large thermal plants mostly fuelled by natural gas. The city is dependent on supplies from the surrounding Leningrad Oblast as it generates only half of the electricity it consumes.

The Vologda region's electricity demand is about twice its own generation (13 TWh vs about 6 TWh in 2002). It imports electricity from the Tver and Kostroma sub-regions of the Central energy system.

Table 2.7 Northwest Regional Surplus – Deficit Balance (TWh)

							2002 as a % of 1991	
	1991	1995	1999	2000	2001	2002	Demand	Supply
Leningrad oblast	21	16	19	18	22	21	91%	95%
Murmansk oblast	3	3	4	5	4	4	76%	88%
Komi republic	1	0	0	0	0	0	81%	81%
Pskov oblast	-2	-1	0	0	1	0	100%	88%
Nenets AO	0	0	0	0	0	0	51%	51%
Archangelsk oblast	-1	-1	-1	-1	-1	-1	87%	82%
Novgorod oblast	-4	-2	-2	-2	-2	-2	71%	102%
Kaliningrad oblast	-3	-2	-3	-3	-3	-3	101%	36%
Karelia republic	-4	-3	-3	-3	-3	-4	90%	88%
Vologda oblast	-7	-6	-6	-6	-7	-7	93%	98%
St. Petersburg city	-6	-7	-8	-8	-10	-10	105%	80%
Total	**-3**	**-4**	**1**	**-1**	**1**	**-2**	**90%**	**91%**

The South electricity system

The Southern region is very diverse in terms of the economic development of its 13 oblasts and republics. Of major importance to this region's economic development and stability, are the key oil and gas pipelines as well as railway lines which link it to the countries of the Caucasus, the Middle East and southern Europe, by way of the Black, Azov and Caspian Seas. This also raises the region's strategic importance. The region focuses on large-scale agricultural production, as well as the production of coal and machines for the energy, transportation and agricultural sectors. The Southern region is also known for its tourism-business with resorts attracting millions of tourists in the summer months. However, it is one of the poorer regions of Russia, contributing less than 10% to the nation's GDP and to only about 6% of its industrial output.

The region is relatively well endowed with natural resources, however, its coal resources are mostly anthracite and much of its oil fields (high in sulfur and wax) are highly depleted (averaging over 80%). Its natural gas resources are estimated at 11 trillion m3, with some major fields still undeveloped. The region's hydro potential is estimated at almost 15 GW with only about 4 GW of capacity in place. The major electricity generating plants of the region include:

Table 2.8 Major Generating Capacity of the Southern region

Nuclear Power Plants (NPPs)		
Rostov NPP	1 GW	VVER reactor
Major Thermal Power Plants		
Stavropol GRES	2.4 GW	Gas / Fuel Oil
Novocherkasskaya GRES	2.3 GW	Gas / Fuel Oil / Coal
Nevinnomisskaya GRES	1.3 GW	Gas / Fuel Oil
Total Thermal-based capacity	**7.7 GW**	
Total Hydro-based capacity	**2.3 GW**	
Total Electricity Capacity	**11.0 GW**	

Table 2.9 South Regional Surplus – Deficit Balance (TWh)

							2002 as a % of 1991	
	1991	**1995**	**1999**	**2000**	**2001**	**2002**	**Demand**	**Supply**
Stavropol Krai	16	12	9	10	10	10	68%	62%
Rostov oblast	-5	0	-2	-2	2	5	67%	116
Dagestan republic	0	0	0	0	0	1	114%	153%
Ingushetiya republic	0	-1	0	0	0	0	78%	0%
Volgagrad oblast	-5	1	1	-1	0	0	70%	84%
Astrakan oblast	-1	0	0	0	0	-1	92%	0%
Kalmykiya republic	-1	-1	-1	-1	-1	-1	64%	0%
Adigir republic	-1	-1	-1	-1	-1	-1	75%	86%
Chechen republic	2	-1	-1	0	-1	-1	91%	0%
Karachaevo-Cherkess rep.	-2	-1	-1	-1	-1	-1	71%	0%
Kabardino-Balkar rep.	-2	-1	-1	-1	-1	-1	66%	94%
North Osetia republic	-2	-1	-2	-2	-2	-2	83%	90%
Krasnodar Krai	-10	-8	-7	-8	-9	-9	95%	89%
Total	**-10**	**-2**	**-6**	**-8**	**-4**	**-2**	**77%**	**85%**

Sub-regional Electricity Supply-demand Balances of the Southern Region

Most of the sub-regions of the Southern region are close to being self-sufficient in terms of electricity demand – or very close to meeting their demand by imports from the Stavropol or Rostov sub-regions, the Central region or through imports from Ukraine. In 1999 imports were in the order of 6 TWh, half the amount of imports in 1991. Although imports increased in 2000 to a level close to 8 TWh, with the commissioning of the Rostov nuclear power plant (1GW) in 2001, imports shrunk dramatically – to about 2 TWh in 2002.

Stavropol krai is the key surplus electricity sub-region within the Southern electricity system. It has a developed electricity system, with installed capacity of 4.3 GW with 10% based on hydro power plants. The largest plant in this region is the Stavropol thermal plant (2.4 GW) and the Nevinomiskaya thermal plant (1.3 GW). Surplus electricity is supplied to the deficit regions of the Southern region.

Krasnodar Krai has a developed electricity infrastructure based mainly on thermal fuel, with installed capacity of 1.1 GW, the largest installation being that of the Krasnodar CHP (750 MW) fuelled by natural gas. Deficit electricity demand of this sub-region (9 TWh in 2002) is supplied by the Central region.

The Urals electricity system

The Urals region encompasses 6 sub-regions and is renowned for its natural resource base including major oil and gas fields on which most of its economy is based. The region holds 55% of Russia's discovered oil and natural gas reserves. Almost 80% of the region's oil reserves are found in the Khanty-Mansiisk autonomous okrug (key fields include the Samatlor, Mamontov, Fedeorov and Priobskoye). Over 95% of the region's natural gas resources are located in the Yamalo-Nenets and Khanty-Mansiisk autonomous okrugs, a third of which are offshore in the Karsky Sea. Russia's largest producing natural gas fields are located in this region, including Urengoy, Yamburg, Medvezhe, Zapolyarnoye and the Komsomols fields.

The Urals' industry focuses on oil and gas production and petrochemicals as well as heavy and precious metals, machine building and metal works. Major industrial centres include Ekaterinburg (known for its heavy machine building) and Chelyabinsk (known for its production of heavy metals and military industrial complex), with over 1 million inhabitants, each. The region produces almost 15% of Russia's GDP, ranking it the third most important in terms of regional industrial output and economic strength. It generates about 14% of overall Russian electricity while it consumes about 15%, the deficit supplied from the Volga region.

Electricity production decreased dramatically over the 1990s in the Urals. About 70% of demand is industrial-based. Most generation is thermal (Reftinskoykaya, Troitskaya, Iriklinskaya, and Permskaya GRES. The major electricity generating plants of the region include:

Table 2.10 Major Generating Capacity of the Urals Region

Nuclear Power Plants (NPPs)		
Kursk NPP	**0.6 GW**	BN reactor
Major Thermal Power Plants		
Surgut GRES-1 (Khanty-Mansiisk)	4.8 GW	Gas
Reftinsk GRES (Sverdlovsk)	3.8 GW	Coal
Surgut GRES-2 (Khanty-Mansiisk)	3.3 GW	Gas
Troitsky GRES (Chelyabinsk)	2.1 GW	Coal
Tagilsk GRES (Sverdlovsk)	1.5 GW	Gas / Coal
Middle Urals GRES (Sverdlovsk)	1.2 GW	Coal / Fuel Oil
Total Thermal-based capacity	**37.3 GW**	
Total Hydro-based capacity	**1.7 GW**	
Total Electricity Capacity	**39.6 GW**	

Table 2.11 Urals Regional Surplus – Deficit Balance (TWh)

							2002 as a % of 1991	
	1991	**1995**	**1999**	**2000**	**2001**	**2002**	**Demand**	**Supply**
Khanty Mansiisk AO*	60	52	55	54	52	56	63%	0%
Sverdlovsk oblast	9	-1	-4	2	1	2	81%	73%
Yamalo-Nenets AO	1	1	1	1	1	1	81%	71%
Kurgansk oblast	-6	-4	-4	-4	-3	-3	91%	91%
Chelyabinsk oblast	-9	-10	-12	-11	-11	-10	0%	94%
Tyumen oblast*	-52	-38	-43	-43	-45	-47	0%	145%
Total	**2**	**1**	**-6**	**-1**	**-5**	**-1**	**84%**	**82%**

* note: The Tyumen oblast encompasses the Khanty Mansiisk AO, thus their surplus-deficit balance should be considered together.

Sub-regional Electricity Supply-demand Balances of the Urals Region

The Tyumen oblast includes both the Khanty Mansiisk and Yamalo-Nenets autonomous okrugs. The Khanty Mansiisk autonomous okrug (AO) is ranked as the fourth most economically developed region within Russia given its major contribution to the country's GDP, natural resource wealth and industrial base. Most of the oblast's electricity generation capacity is located in the Khanty-Mansiisk autonomous okrug, including the Surgut-1 and -2 thermal power plants (3.3 GW and 4.8 GW, respectively) based on associated gas.

Sverdlovsk oblast is a major electricity generation centre with installed capacity of over 9 GW, mostly based on coal. The largest plant is the Reftinskaya coal-fired power plant (3.8 GW). Sverdlovsk also generates nuclear power from its Beloyarsk nuclear power plant (0.6 GW). It generated about 43 TWh in 2002, while consumed over 40TWh, the small surplus provided to other Urals deficit sub-regions.

Chelyabinsk oblast is one of the most industrial of Russia. It has a developed electricity sector with a total installed capacity of almost 5 GW, mostly coal-fired, including the Troitsky thermal power plant (2 GW). Despite this, it is a deficit electricity region receiving its excess needs from the Khanty Mansiisk autonomous okrug.

The Volga electricity system

The Volga region is very diverse in terms of the economic development of its 14 oblasts and republics and one autonomous okrug. Although not especially wealthy in natural resources, its position between two rich regions – Siberia to its east and the Central region to its west – brings with it important economic links to both regions and multiplier effects in terms of human resources and industry. Key transport routes cross the Volga region – the Volga river itself, a key transport route, rail and the major oil and gas pipelines from Siberia.

The Volga region ranks as Russia's leading region in terms of industrial output, contributing almost 20% to the nation's GDP and about 25% of its industrial output. Over two-thirds of the Volga region's industrial output comes from five oblasts and republics: Republics of Tatarstan and Bashkortostan as well as the oblasts of Samara, Perm and Nizhniy-Novgorod). Machine-building and metal works are the key industrial activities of the region, accounting for almost 30% of industrial output. This includes automobile manufacturing, ship building and construction of airplanes. Oil refining and petrochemical industries are also very important.

Table 2.12 Major Generating Capacity of the Volga Region

Nuclear Power Plants (NPPs)		
Balakova NPP	4x1 GW	VVER reactors
Total Nuclear	**4 GW**	
Thermal Power Plants		
Tatenergo	5.8 GW	Gas / Fuel Oil
Bashkirenergo	4.9 GW	Gas / Fuel Oil
Total Thermal-based capacity	**13.4 GW**	
Total Hydro-based capacity	**6.2 GW**	
Total Electricity Capacity	**23.6 GW**	

Traditionally the region was a deficit one in terms of electricity generation. Needed electricity was provided by the Central and Urals regions. However, over the past years, in connection with a more rapid rate of decline of electricity demand relative to the rate of decline of generation, the Volga region has become a surplus region. It has all types of electricity generation – thermal, hydro and nuclear – but capacity is very unevenly spread with only six of the fifteen sub-regions generating surplus electricity. The major electricity generating plants of the region include:

Sub-regional Electricity Supply-demand Balances of the Volga Region

Saratov has a balanced economic base, both industrial and agricultural with electricity generation playing a major role in its economic output. Installed capacity of its 8 power plants totals almost 7 GW, including 4 GW of nuclear power from the 4 VVER plants at the Balakova site. Saratov is a major surplus electricity sub-region (generating 39 TWh versus demand of 12 TWh in 2002) with its excess provided to other deficit sub-regions within the Volga region.

Samara is one of the most important sub-regions of the Volga region, encompassing an important machine building and metal works industry. It has a well developed electricity sector with 10 electricity generation plants totalling almost 6 GW of installed capacity, including a hydro facility of just over 2 GW. Although a heavy consumer of electricity (22 TWh in 2002), Samara is a surplus electricity sub-region (2 TWh in 2002), supplying other deficit sub-regions within the Volga region.

The Perm oblast has a developed electricity infrastructure with almost 6 GW of installed capacity. Its surplus electricity is provided to neighbouring deficit regions within the Urals system.

The Republic of Bashkortostan has a very developed electricity infrastructure with over 5 GW of installed capacity. It appears only as a slightly surplus region in terms of electricity generation (24 TWh in 2002), given that its own demand for electricity is so high (23 TWh in 2002).

The Orenburg oblast has a developed electricity infrastructure with almost 4 GW of installed capacity. Its surplus electricity is provided to neighbouring deficit regions within the Urals system.

The Republic of Tatarstan also has a very developed electricity infrastructure with over 7 GW of installed capacity, about 75% from thermal power plants and the rest from hydro. The Nijnikams hydro plant and the Zainsky thermal power plant generate about half of the Republic's electricity needs. Despite its large generating capacity, the Republic of Tatarstan (supply-demand in the order of 23 TWh/year 2002) is a slightly deficit sub-region, receiving its small deficit needs from the Volga region.

The Nizhniy-Novgorod oblast has a developed electricity infrastructure with over 2.4 GW of installed capacity. However, its demand for electricity is such that it needs to import electricity from neighbouring Central regions, in the order of 13 TWh/year in 2002 – and this is increasing.

Table 2.13 Volga Regional Surplus – Deficit Balance (TWh)

							2002 as a % of 1991	
	1991	1995	1999	2000	2001	2002	Demand	Supply
Saratov oblast	12	11	19	25	26	27	76%	135%
Samara oblast	1	2	5	3	3	2	76%	80%
Perm oblast	5	5	1	1	1	1	93%	80%
Bashkortostan republic	-2	1	0	0	0	1	72%	79%
Orenburg oblast	7	5	4	3	1	1	86%	63%
Tatarstan republic	7	0	0	0	-1	0	79%	64%
Chuvash republic	0	1	-1	-1	-1	-1	77%	63%
Mari El republic	-4	-2	-2	-2	-1	-1	54%	0%
Mordovia republic	-3	-2	-2	-2	-2	-2	68%	76%
Penza oblast	-4	-3	-3	-3	-3	-3	68%	79%
Kirov oblast	-5	-3	-3	-4	-3	-3	68%	75%
Ulianovsk oblast	-3	-3	-4	-4	-4	-4	85%	54%
Udmurtia republic	-6	-4	-4	-5	-5	-5	80%	85%
Nizhniy Novgorod ob.	-13	-9	-10	-11	-12	-13	82%	73%
Total	**-7**	**-3**	**1**	**2**	**3**	**1**	**79%**	**82%**

The Siberia electricity system

The region of Siberia encompasses 16 sub-regions and is renowned for its natural resource base including major coal mines, huge river systems on which major hydroelectricity facilities have been constructed or are in the planning stage, heavy and precious metals, and forestry. The region's oil and natural gas resource potential is still unclear, with the need for major investments in exploration to understand the recoverability of rough estimates. To date, it is Russia's leading region in terms of coal and steel and the second most important region in terms of forestry products.

About 80% of Russia's discovered coal reserves are located in Siberia, over half in West Siberia in the Kuznetz (Kemerovsky oblast) and the Gorlovsky (Novosibirsk oblast) hard coal basins and the Kansko-Achinsk (Kemerovsky oblast) brown coal basin. Estimated oil resources are in the order of 12 billion tonnes, of which barely 2 billion tonnes are under development mainly in the Tomsk oblast where 18 of the

region's 21 oil fields are located. Estimated total natural gas resources are in the order of 30 trillion cubic meters, located mainly in the eastern part of the region. The largest discovered fields include the Kovikta, Yurubcheno-Takomsky, Sobinsky and Yaraktinsky fields in the southeast part of the region, as well as the Pelyatkinsky and Deryabinsky fields in the Taimir autonomous okrug. The major electricity generating plants of the region include:

Table 2.14 Generating Capacity of the Siberian Region, GW

Major Thermal Power Plants		
Berezovskaya GRES	1.6 GW	Coal
Gusinoozersky GRES (Rep. Buryatuya)	1.3 GW	Coal
Kranoyarsk GRES	1.3 GW	Coal
Tom-Usinsk GRES (Kemerovsk)	1.3 GW	Coal
Belovskaya GRES (Kemerovsk)	1.2 GW	Coal
Nazarovskaya GRES1	1.1 GW	Coal
Irkutsk Tets	1.1 GW	Coal
Sibirsky Chemical Generator (Tomsk)	1.1 GW	Coal
Total Thermal-based capacity	**21.5 GW**	
Total Hydro-based capacity	**23.2 GW**	
Total Electricity Capacity	**44.7 GW**	

Sub-regional Electricity Supply-demand Balances of the Siberian Region

The potential hydroelectric resources of the Siberian region are estimated at over 110 GW or 40% of Russia's hydro potential.

The Republic of Xakasiya in Southeast Siberia has a well developed electricity system with installed capacity of over 7 GW, over 95% of which from the Sayano-Shushensk hydro facility (6.4 GW). Although an energy-intensive region, given its developed industry based on its natural resource wealth, the Republic of Xakasiya is by far a surplus sub-region of Siberia with a supply-demand balance in 2002 of 9 TWh. Surplus electricity is provided to other deficit sub-regions of Siberia.

Irkutsk oblast encompasses the Ust-Ordinsk and the Aginsky-Buryatsk autonomous okrugs. It is also among the most industrially developed sub-regions of Siberia with a large part of its economy based on metallurgy, electricity generation, forestry and pulp and paper. Irkutskenergo (one of four independent energos, not included within RAO UES) includes 21 electric power plants, three of which are large hydro facilities. Installed capacity is in the order of 13 GW, of which almost 70% is based on hydro.

In 2002, Irkutskenergo, generated 57 TWh covering the needs of the oblast as well as its autonomous okrugs and providing the surplus electricity (6 TWh) to other sub-regions within the Siberia system.

Krasnoyarsk krai encompasses the autonomous okrugs of Taimir and Evenkiisk and the large industrial cities including Krasnoyarsk, Norilsk, Kansk and Achinsk. It is one of the largest industrially developed sub-regions of eastern Russia, based on its rich natural resources. It has a well developed electricity infrastructure with installed capacity in the order of 12 GW, including the Krasnoyarsk hydro facility (6 GW). It generated 49 TWh in 2002, but given its energy-intensive industry, little surplus generation is available for neighbouring sub-regions.

Kemerovsk oblast encompasses the large coal mines of the Siberian region including the Kuznetsk and Kansko-Achinsk basins as well as other natural resources thus providing a basis for heavy and precious metals mining and industrial base. It has a well developed electricity system with installed capacity in the order of 5 GW based on locally mined coal. Given its energy-intensive industrial base, the Kemerovsk oblast is a deficit region despite it generation of 28 TWh in 2002. Its deficit is provided by other surplus sub-regions within the Siberian system.

Table 2.15 Siberia Regional Surplus – Deficit Balance (TWh)

							2002 as a % of 1991	
	1991	1995	1999	2000	2001	2002	Demand	Supply
Xakasiya republic	18	19	12	16	18	9	126%	74%
Irkutsk oblast	11	12	5	2	2	6	96%	89%
Krasnoyarsk Krai	-1	1	-1	2	2	1	88%	91%
Taimir AO	0	0	0	0	0	0	0%	0%
Evenkiisk AO	0	0	0	0	0	0	0%	0%
Ust-Ordinsk AO	0	0	0	0	0	0	0%	0%
Aginsky Buryatsk AO	0	0	0	0	0	0	0%	0%
Buryatia republic	-1	-2	-1	-2	-1	0	79%	95%
Altai republic	0	0	0	0	0	0	123%	0%
Tiva republic	-1	-1	-1	-1	-1	-1	85%	0%
Chitinsky oblast	-2	-2	-1	-1	-1	-1	80%	98%
Novossibirsk oblast	-6	-5	-1	-1	-2	-1	77%	106%
Tomsk oblast	-4	-4	-2	-3	-3	-3	72%	75%
Omsk oblast	-3	-3	-3	-3	-3	-3	73%	64%
Kemerovsk oblast	-8	-7	-3	-5	-5	-4	87%	98%
Altaiski Krai	-7	-5	-6	-6	-5	-4	72%	88%
Total Siberia	**-5**	**3**	**-1**	**0**	**0**	**-2**	**87%**	**89%**

The Far East electricity system

The electricity system of the Far East is isolated from the Unified Energy System of Russia and has become increasingly dependent on expensive imported coal, transported sometimes thousands of kilometres for this region's electricity needs. For this reason, the construction of the Bureyskaya hydro facility has been given the highest priority within RAO UES and the Russian government at both the federal and regional levels. In July 2003, at the opening ceremony of the first hydroelectric unit, the Russian President stated that this hydro facility should become the fundamental element of the Far East's economy – the foundation for constructing new plants and creating new jobs in the region[215]. Total capacity of the Bureyskaya hydro plant is expected to be 2 GW, thus increasing the region's installed capacity by 20% to 13 GW. The expected average annual generation from this new hydro facility will be in the order of 7 TWh and will add to current total regional annual generation of almost 40 TWh.

Table 2.16 Far East Regional Surplus – Deficit Balance (GWh)

							2002 as a % of 1991	
	1991	1995	1999	2000	2001	2002	Demand	Supply
Rep. Sakha	1350	480	775	828	1279	1379	91%	93%
Xabarovsk krai	-990	840	1175	1099	1055	844	67%	82%
Magadan oblast	300	170	160	164	161	161	62%	62%
Chukotka AO	0	0	0	0	0	0	77%	77%
Kamchatka oblast	0	0	0	0	0	0	83%	83%
Sakhalin oblast	0	0	0	0	0	0	76%	76%
Primorsk krai	-120	-790	-560	-1418	-990	-300	79%	77%
Amursk oblast	140	640	-2525	-2381	35	-712	84%	73%
Evreisky AO	-930	-930	-940	-1022	-1029	-1054	113%	0%
Total	**-250**	**410**	**-1915**	**-2730**	**511**	**317**	**78%**	**79%**

215. See *www.rap-ees.ru/en/news/pub_uesr/show.cgi?090703bur.htm*.

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Russian Federal Anti-Monopoly Service	*http://www.fas.gov.ru/*
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Russian Federal Ministry of Economic Development and Trade	*http://www.economy.gov.ru/*
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