

Market Reform of the Russian Power Sector – New Developments

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Introduction

In Russia coming up with an accurate prediction of the path that the process of power sector reform might take, the industry structure that will result in each of its phases and the evolution of the market design is not an easy task. The contemplated and already carried out structural changes imply the emergence of a large number of comparatively free economic agents and thus a high degree of decentralisation of decision-making, at least in the future, then RAO "UES of Russia" will either disappear or be converted into a somewhat different entity. The motives for market behaviour of these newly created entities should turn out to be quite different from those currently present in the power sector. Neither can one draw meaningful parallels with international precedents, as the power sector in Russia has no analogues anywhere else. Besides the sheer size of the system, its high technical and organisational integration and unified dispatch, it is also characterised by the still comparatively weak legal and business culture of the future market participants – the outcome of the preservation of a mostly command and control style of management that the industry inherited from the past. Admittedly, with the relentless efforts of RAO "UES of Russia", that is visibly changing for the better. While in other jurisdictions power sector liberalisation meant some change in the rules of the game, occurring as a result of an accord between the government, the power sector and its customers, in Russia these rules have to be developed from scratch whilst the reform itself is meant not only as a change in the nature of relationships pertaining to the trade in electricity but also to position electric energy in the legislative field as a tradable commodity subject to the civic legislation. All of this places the reform process at some risk, hopefully a manageable one.

Nevertheless, progress has been achieved in terms of structural changes, creation of market infrastructure entities such as the System Operator and the Administrator of the Trading System, the incorporation of the Federal Grid Company and, last but not least, commencement of limited market operations in November 2003.

Time Table

Although the main milestones of the reform process are sufficiently well determined in legislation, they do remain entirely under Government control and past practice shows that many delays should be expected. It is evident that the timing of events on its own has a significant influence on the outcome of the whole endeavour. For example, a delay of the full market liberalisation date might lead to a situation where the excess generating capacity is already exhausted while the advent of fully competitive pricing has yet to come. No doubt, fearing a price explosion, the Government will be quite reluctant to let fully liberalised market operations commence. This potential scenario is made more onerous by the fact that sizeable private investment in new capacity is unlikely without market liberalisation. Neither could one expect serious cost reduction within the industry without the pressures exerted by the market, never mind the cost cutting campaign conducted by RAO "UES of Russia". An additional threat is the inadequate rate of elimination of cross-subsidisation within the sector. Indeed, inability to bring cross-subsidisation to a minimum in time, due to political expediency, might in itself prevent market liberalisation.

The considerations above form a vicious circle of cause and effect, requiring strong political will to break. Without it the reform process may fail to deliver the benefits it was aimed to achieve.

The market behaviour of the future market participants

The functioning of the future power market will, for a time, primarily depend on the market design and the industry structure, established as a result of the restructuring of RAO "UES of Russia" and the regional AO-energos. However, the situation will not remain static for long. The market behaviour and investment decisions of the new market participants will determine whether the reform process will succeed in the establishment of a well functioning and reasonably competitive power market or, as it happened in other spheres, the industry will be carved up between a limited number of very large groupings with their customarily obscure multilayer ownership and hidden horizontal and vertical inte-

gration. The latter scenario is quite probable. Witness the acquisitions of the RAO and AO-energos shares, the fights over the composition of the generation companies and the debates on the mechanism for their privatisation. Clearly in the absence of proper State control over the consolidation of industry assets in a limited number of hands, one should expect the failure of the market to deliver the benefits expected from its operation. Instead we will see abuse of market power, monopoly pricing and very little investment in refurbishment of existing capacity, let alone new construction. Two avenues of prevention are discernable: (a) beefing up the antitrust legislation and its proper application; (b) ownership diversification, meaning a set of measures to attract ownership of generation assets by foreigners as well as native owners.

The evolution of the regulatory paradigm

It is well known that minimisation of the regulatory risk is one of the significant determinants of success in attracting private sector investments into the power sector. The transformation of the regulatory regime in Russia is determined by the reform legislation containing a number of significant regulatory risks such as the right of the Government to impose an arbitrarily determined ceiling on market prices, a complex disconnection procedure for non-payment, limitation of the right to demand prepayment and legitimisation of the list of customers which cannot be disconnected under any circumstances. Moreover, the tariff setting becomes inextricably tied to the State budgeting process. In the transition period that means tariff reviews once per annum instead of twice previously and tariff increases determined by the State budget rather than by the increases in the revenue requirements of the power sector. That type of regulatory regime leads to the very cautious attitude of investors. The visible main thrust now is towards acquisition of the most liquid and attractive existing assets and no rush to invest in new construction. Unless some legislative and political impetus is provided to attract private investment in asset creation, new construction will continue to be financed as previously, i.e. through the investment component in the tariff and depreciation in a centralised, administratively driven fashion. Neither the efficiency nor the effectiveness of this process is comparable with that of private investments.

The influence of the power sector reform on the macroeconomic indicators

The ideology behind the liberalisation of the power sector was based on the belief that market relations in the sector will lead to the achievement of a reliable power supply at a cost comparable to

that of the existing paradigm, supported by a degree of doubt whether the existing paradigm is capable of delivering long-term reliability at all. Therefore, in the final count, the success of the reform process will be measured by the global cost of electricity to the economy and the long-term reliability of supply.

Some studies, carried out so far, indicate that even in the most pessimistic scenario, that of maximum increase in the revenue requirements of the sector and minimal growth in demand, free market prices (if allowed and the market is reasonably competitive) should not catastrophically exceed the level of regulated prices. This should not affect the macroeconomic indicators in any significant way. In contrast, if the market turns out to be inefficient, namely the scenario of the consolidation of industry assets in which a small number of large groupings materialises, one should expect the extraction of monopoly profits and a growth in electricity prices up to the "mass non-payment" threshold. In this case the burden on the economy may rise to an unacceptable level with all the "California syndrome" consequences.

The changes in customer behaviour

At this stage industrial consumption of electricity in Russia constitutes about 50% of the total consumption. 14% is consumed by construction and agriculture, 11% by transport and communications and 22% by households and the communal sector (the latter, in the final count, also supplies households). Despite the generally low energy efficiency of the economy, qualitatively the consumption in its various sectors is different. In some of them the demand is, for all intents and purposes, price inelastic. In others, notably domestic consumption, demand may grow even when tariffs increase since it is linked primarily to the level of real income of the population. All of the sectors of the economy have a significant potential for energy saving, including some of the energy intensive ones like smelters, chemical and petrochemical plants, etc.

The rate of change in the State ownership of assets and the degree of Government control over the management of the power sector enterprises

Two aspects need to be taken into consideration when analysing the Government's role in the management of the power sector. From the legal point of view the majority of non-nuclear power sector assets are controlled by companies not having direct State participation. In the Russian Federation the Federal power stations and the AO-energos are not classified as public sector enterprises be-

cause the State does not manage them directly. On the other hand, the State owning 52% of the shares in the Holding RAO "UES of Russia" has the ability to direct the running of its subsidiaries through corporate procedures. That also includes issues related to the restructuring of these companies. The State does own all the nuclear power stations. On these grounds we can state that, despite the formally low public sector share in the power sector, most of the enterprises in it are in the public sector with the exception of those in which RAO "UES of Russia" does not own a blocking number of shares (Novosibirskenergo, Bashkirenergo, Irkutskenergo and Krasnoyarskaja hydro power station).

The logic of the power sector reform dictates the exit of the State from the potentially competitive business areas (generation and supply) and increased State participation in the wires companies and the System Operator. The State will also retain its ownership of the hydro power stations.

In the long term, the State will own 75% plus one share in the Federal Grid Company (FSK) and 100% of the shares in the System Operator (SO). FSK was established as a 100% subsidiary of RAO "UES of Russia" and all of RAO's transmission assets will be transferred to it. Transmission assets (220 kV and higher voltage) belonging to the AO-energос in the process of AO-energo restructuring will be consolidated in the so-called Interregional Transmission Companies (MMSK). It is planned that FSK will hold shares in the MMSK and will own them eventually. It is not clear yet whether the State intends to increase its ownership of the distribution assets currently belonging to the AO-energос. They might be privatised eventually. Indeed, the State has enough means of controlling their activities through regulation.

At this stage we can surmise that the State has no intention of getting involved in the supply business. However, State participation or intervention of another sort might become necessary in the business of the so-called Guaranteeing Suppliers (suppliers of last resort).

In conclusion, disregarding the way in which enterprises in Russia are classified as being in the private or public sector, it is evident that as a result of the restructuring process, a significant number of companies without State ownership and not under State control will emerge and be active in the power sector. Hence, the State participation will diminish, but to what extent remains to be seen.

With the hydro power stations remaining in the public sector, State owned companies would generate approximately 35% of electricity, and probably more, if one considers the eventual decommissioning of inefficient CHP plants. State participation in the supply business should be limited and, if at all present,

will be concerned with the Guaranteeing Suppliers. With the development of retail markets it will diminish to an inconsiderable share of retail sales.

The main State owned and controlled enterprises will be the FSK and the SO and through the control of them, as well as through the State regulatory bodies, the Government has sufficient powers to control the operations of the power market and determine the way in which the sector in general will develop.

Market Development

Current Situation

Government Decree #793 of 1996 created the Federal Wholesale Capacity and Electric Energy Market (FOREM). The list of FOREM participants currently consists of the AO-energос, the Federal power stations, Rosenergoatom, a limited number of large industrial customers and some recently established supply companies. Certain limitations apply with regards to minimal levels of production or consumption of electricity necessary to qualify. FOREM membership has to be approved by the Regional Energy Commissions (REK's), the Federal Tariff Service (FST) and finally by the Government. FOREM membership is reviewed and approved annually and a special Government decree listing all the participants admitted to it is issued. In practice, the FST may admit new FOREM participants at any time during the year, which allows an admitted party to purchase electricity at FOREM prices. Access to FOREM is quite problematic in general, especially for an end-use customer. The REKs are very reluctant to allow it because an industrial customer, purchasing wholesale electricity and thus bypassing the retail prices of the local AO-energo, does not contribute to the cross-subsidisation of domestic consumers in the region.

As far as pricing is concerned, the FST determines the rates at which each FOREM seller of energy, i.e. the Federal power stations and those AO-energос that have excess generation, are allowed to supply capacity and energy to the FOREM market. Capacity payments are aimed to cover the fixed costs of the producers and a part of their regulated profits. The energy rates cover variable production costs and the remaining part of the regulated profits.

The volumes of production by each FOREM seller are planned in advance on an annual basis in the so-called "FST balance". This is worked out by RAO "UES of Russia" and then amended and approved by the FST. Theoretically, the "FST balance" is supposed to allocate production to each FOREM seller in such a way as to achieve the least cost of meeting the forecasted load, sub-

ject to the forecast of the level of water in the hydro dams, maintenance schedules and other pertinent factors. In practice this does not happen. Also, annual forecasts are a notoriously inaccurate basis for planning. Although the forecasts and volumes of production are adjusted quarterly, the "FST balance" is seldom, if ever, fulfilled.

The FOREM sales forecast is worked out by agglomeration of the purchase requests, which FOREM purchasers have to submit in the planning process. These figures are the estimates of net consumption of the AO-energос, namely end-use customer load forecasts less production of the AO-energo's own power stations. In this way the AO-energo can decide whether to run its own generation facilities or purchase power from FOREM. This decision, in theory, should be made on price considerations. In practice, it is affected by other factors, some of which are political. As a result, cheap federal power stations sometimes operate with a low load factor while inefficient plants run full blast.

FOREM purchasers are fined if their consumption exceeds that in their purchase request. Bearing in mind that these requests are submitted ex-ante (for the 12 months of the next year) and the load is quite weather sensitive, it is easy to err. The typical AO-energo response to this is inflating the figures in the purchase request, thus avoiding the fine for exceeding the limit (there are no sanctions for low consumption). The effect of this behaviour on scheduling and dispatch of generation and thus on the overall cost of supply is quite detrimental.

Another FOREM feature is monthly metering and billing. This in itself causes some uneconomic and plainly dysfunctional behaviour, the aim of which is to avoid fines and fulfill the plan contained in the "FST balance".

The wholesale prices, payable by FOREM purchasers, are calculated as the average of the producers' prices weighted by their planned volume of production. Then a number of additional manipulations of the resulting figures occur to allow for some regional cross-subsidisation. On occasion the FST is persuaded to increase some of the sellers' tariffs in the middle of the year but is very reluctant to amend the prices paid by FOREM purchasers. The result of the inadequacies of the whole system is the so-called "tariff imbalance" or, in plain terms, shortage of revenue, collected from purchasers, as opposed to the amounts payable to producers. Over the years, the "tariff imbalance" has added up to a quite significant sum. This is a debt, owed primarily to the Federal power stations of RAO, in all probability never to be fully repaid.

FOREM uses another peculiar practice. Each FOREM seller is administratively linked to a number of purchasers, who are jointly supposed to

cover the seller's revenue requirement. In the past when cash collection was problematic, such pairing was extremely important. Indeed, being tied to a problematic debtor meant serious financial problems to a power producer.

Quite obviously, FOREM is a structure flawed by definition. It neither leads to least cost dispatch, nor does it stimulate cost-cutting. It is financially opaque and it can't balance the books.

Emergence of the Competitive Sector

As of 1 November 2003, FOREM purchasers in European Russia and the Urals were given a right to buy up to 30% of their energy needs, and FOREM sellers got a right to sell energy, produced by up to 15% of their available capacity, at unregulated prices. This segment of the wholesale market employs a marginal price formation mechanism whereby sellers' offers and purchasers' bids are used as input to a security constrained optimal day ahead scheduling algorithm. It produces locational marginal prices (LMP) for power and an optimal "day ahead" schedule of production for, at least, a part of the generation capacity. However, a purchaser has the opportunity to run away from this competitive segment of the market as he retains the right to purchase energy at the regulated price if the LMP at his point of supply turns out to be higher than the regulated price. This puts a natural ceiling on the competitive sector prices and makes its existence useless in terms of producing a correct economic signal, both to producers and consumers. Despite this, the whole endeavour has to be rated as positive as it gave the opportunity to develop, install and test software, train personnel and, in general, provided the market participants with a taste of what it means to operate in a competitive environment. Currently, approximately 10% of the total FOREM turnover is traded in this competitive sector, run by the Administrator of the Trading System.

Production and consumption schedules, both for the regulated and competitive segments of the market, are produced "day ahead." Obviously, production and consumption in real-time deviate from these schedules and some arrangements are required to keep the frequency at 50 Hz and price the deviations from schedule, both those occurring due to a System Operator dispatch instruction and those occurring due to changes in demand or events in the generation environment. At this stage, the System Operator dispatches the system as he deems fit (sometimes uneconomically) and deviations are priced through the application of coefficients by which the regulated price is multiplied for each particular set of circumstances. These coefficients are set by the FTS.

Due to the peculiarities of the civil legislation, establishment of the competitive sector required a fairly

elaborate legal structure. In it each FOREM seller enters a framework commission agreement with the ATS and the ATS enters a framework sales agreement with each FOREM purchaser. In the terms of these agreements, ATS takes power from a seller on commission and then sells it to a purchaser. Purchasers in the "day ahead" market have to provide financial guarantees (cash in the bank) for their intended purchases, otherwise they are not allowed to submit bids. The system in effect constitutes prepayment but is not called that.

At the beginning of the exercise the plan was to increase the volume of the competitive sector gradually, from the initially allowed 15% of generating capacity, to a higher level. Soon it became clear that no better results would materialise, as in this construction, with the price ceiling in place, the situation would only become worse.

New Thinking – Regulated Bilateral Agreements

In the very beginning of the market design process a target model was selected as the most suitable one for Russian conditions. Its main feature is optimal central scheduling and dispatch, using security-constrained optimisation with simultaneous participation of sellers' offers and purchasers' bids, producing locational marginal prices. What we are witnessing now is a gradual movement towards its implementation, in all probability with the addition of a capacity market to prevent price spikes and attract investment in new capacity. Several factors influence the design of the steps that should finally lead to the full implementation of the target market model. These are primarily: inability to do away with cross subsidisation of domestic consumers and so-called budget organisations (school, hospitals, etc.), lobbying by specific industrial consumers who currently enjoy very low tariffs and the government's reluctance to forfeit its control over electricity prices in one go.

To deal with these considerations and to bring the regulated sector of FOREM into a more palatable form, the concept of regulated bilateral agreements (RBA) was put forward. The proposal consists of the following. For the purpose of implementing RBAs the customer base is divided into three large groupings. Guaranteeing Suppliers and supply companies serving domestic consumers form Category 1. Supply companies serving large energy-intensive power users or these users purchasing energy on their own form Category 2 and the rest form Category 3. A certain set of criteria will be used to classify an industrial consumer qualifying for Category 2.

RBAs will be offered to Category 1 for three years, to Category 2 for five years and to Category 3 – annually renewable. RBAs are supposed to come into being in 2006. Energy sold under RBAs will initially amount to the full historical consumption of Categories 1 and 2, gradually going down year after year.

Generators will be forced to enter into RBAs, initially committing up to 85% of their planned output for these purposes. Later on the volumes will be reduced in tandem with the reductions for purchasers. The participation of purchasers in RBAs is voluntary. Energy purchases of customers in Category 3, covered by RBAs will be determined as a remainder of the generators' commitments after meeting the demand of Categories 1 and 2.

Each purchaser will enter into RBAs with a number of generators, however RBAs are not voluntary pairings of producers and purchasers. Instead of that, the packages of RBAs for each purchaser, both in terms of the list of his counterparties and the amount of capacity and energy each producer will be deemed to supply to this customer contractually, are determined externally through a calculation in such a way that the average unit price, payable by the customer for energy supplied under all the RBA's is close to his regulated price. Generator tariffs, which determine the prices customers pay, will not be set by the FST annually as is the current practice. Instead they will be indexed each year using inflation parameters, fuel price indexes and changes in taxation.

An RBA constitutes a financial obligation on the part of the purchaser to pay a generator with whom he entered into an RBA, an amount of money equal to the contractual amount of energy times this generator's energy tariff plus the contractual amount of capacity times this generator's capacity tariff. This payment has nothing to do with the actual consumption of the customer or the actual production of the generator. The "day ahead" planned levels of production and consumption are determined through the "day ahead" market into which generators submit offers and customers submit bids. Deviations from the contractual amounts due to the results of the operation of the "day ahead" market are dealt with at its LMP's. Deviations from the production and consumption schedules in real-time are priced in accordance with the rules of the balancing market.

Generators are not allowed to disengage from the RBAs into which they entered while customers can reduce their coverage or terminate their RBAs all together. If the latter is done, a purchaser has to terminate all his RBAs at once but has to continue paying the contractual capacity payments.

As can be seen, RBAs are an attempt to transform the regulated sector of FOREM into something more acceptable, while still retaining some degree of control over tariffs, primarily for domestic consumers and the very vociferous large industrial customers, at least for a limited number of years. The current thinking is that in the future, RBAs, instead of forced marriages, will become voluntary financial contracts between producers and purchasers.

New Thinking – Balancing Market

Currently the balancing market operates using regulated generator prices and regulated coefficients, rewarding deviations from scheduled production or consumption at the request of the System Operator and punishing deviations due to the decision of the market participant. This scheme of things does not provide for efficient dispatch or formation of economically efficient price signals for participants.

It has been planned to introduce a competitive balancing market gradually, starting perhaps already in 2005. It will operate on the basis of generator offers and offers of customers who are capable and willing to change their load for a price. The optimisation routine used in running the balancing market has the cost of maintaining supply and demand in balance as its objective function. The purpose is to minimise this cost. The System Operator will use suitable software to aid him in dispatching the system in the most economic fashion. Deviations from scheduled production and consumption will be priced at LMPs.

Operation of the competitive balancing market will again require some very elaborate contractual arrangements. Neither are the tax implications clear so far, but work on these aspects of the problem is currently under way.

New Thinking – Capacity Market

The target model of the market initially did not contemplate any trade in capacity. However, the notion of its necessity to prevent price spikes and to attract investment emerged in the course of development.

During the period of transition to a fully liberalized market, so far planned towards the end of the decade, capacity shall be paid for at regulated prices in the same fashion as today. A competitive capacity market is planned to commence operations in the end of 2008. In it capacity will be purchased and sold in annual cycles. However, the start of the annual cycle will not be the beginning of the calendar year but the month of December, when the system peak typically occurs. The capacity market will have the following main features:

- ! An annual forecasted capacity balance will be compiled for each of the system areas in which there is not permanent internal system constraints;
- ! The SO will calculate the amount of capacity required to maintain reliability within each of these areas, dividing it into categories by type of generation technology and determining the share of each type in the total amount required;
- ! The SO will calculate a reliability factor for each area as the ratio of required capacity and the forecasted peak demand in the area;
- ! Each market participant will have to pay for capacity an amount equal to his individual peak demand times the area reliability factor less his own generation capacity within the area, if any;

! The SO will certify both the installed capacity and that planned to be commissioned and compile a register of capacity in respect of which obligations to make it available can be sold in the market;

! It will be possible to trade capacity either through a bilateral agreement or through an auction conducted by the SO;

! Market participants may enter into bilateral agreements for capacity until December 2008. These agreements will then count capacity obligations for the period of December 2008 – December 2009 will be determined;

! Centralized trade in capacity will start in the end of 2005 when the SO will run the first auction for capacity available in the period 2008-2009. All generators that did not sell capacity through a bilateral agreement may participate in this auction. Payments for capacity bought at the auction will become due in December 2008. The price payable by a capacity purchaser will equal the weighted average of the marginal auction prices for each category of capacity;

! Starting from December 2008 a capacity seller has to offer capacity into the day ahead market in the following quantities;

- 100% during all peak hours
- not less than 90% during all intermediated hours
- not less than 80% during all off-peak hours

! A seller of capacity incapable of fulfilling the above obligations has to pay penalties calculated on the basis of the cost of commissioning new capacity (the fastest possible to construct).

Conclusions

This paper analyzes some aspects of the environment in which the power sector reform in Russia takes place and some risks inherent in its course. Despite these it can already be stated with certainty that the process has reached the point of no return.

As is always the case, predicting the outcome of the reform process is a difficult task due to the interlinking effect of the many factors influencing it. We hope that, despite the clear obstacles, the main aims of the reform will be achieved.

In addition this paper aims to inform about some of the aspects of the new thinking in market design. It is clear that no significant deviations from the target model are discernable. We see an evolution towards a more complete structure and a quite careful approach to the solution of the problems of transition to a fully liberalized market.

The emerging design indicates that, if all the plans materialize, Russia will have one of the best and most efficient power markets in the world. □