Energy Reform and Fuel-Electricity Supply in the Russian Far East

MORIOKA Yutaka (Toyama University)

1. Introduction

The reform has been progressing in Russia's electricity sector. In line with the worldwide deregulatory reform trend, the aim is to introduce competitive mechanisms to this natural monopoly (regional monopoly) sector. It is well known that aged equipment is a serious problem in Russia; therefore, another aim is to attract the investment (including foreign capital) needed to replace the aged equipment and avoid an electricity supply crisis. In this paper, therefore, we discuss the problem of stable electricity supply, on which social stability heavily depends, from the electricity sector reform perspective. We pay close attention to the Russian Far East (RFE) too, where the electricity supply is the most unstable in Russia. We will see how to stabilize the electricity supply in the RFE.

2. Electric Power Industry in Russia

Seven OESs (Obedinennaya Energosistema [Combined Energy Systems]) are engaged in the generation, transmission and distribution of electricity in Russia (Table 1). The seven OESs are vertically integrated monopoly companies in their respective regions. As Table 1 shows, the RFE (OES East) and North Kavkaz are the smallest power companies with respect to unit capacity. Six OESs have been unified through the grid system and formed Unified Energy System (UES). OES East, however, has not been integrated into the UES and is now isolated. [1] We may say that OES East is one of the weakest power companies in Russia. Reform has not, consequently, progressed in the RFE at the same tempo as in Russia as a whole.

3. Fuel Supply in Russia

It is said that gasification(replacement by gas) is one of the main features of Russia's fuel-energy policy that has been carried out since the Soviet period. During the Soviet period, replacement by gas was executed mainly from an economic perspective in the latter half of the 80's; however, the importance of replacement by gas from the ecological perspective has also been pointed out. After the collapse of the Soviet Union, the Russian Government had

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Energy Reform, Russian Far East, Aged equipment, Investment funds, Electricity supply crisis

Table 1. Unit capacity of power stations, by type and OES as of Jan. 1, 2000.

OES	Unit capacity of power station							
	Total		Heat power station		Atomic power station		Hydraulic power station	
	GW	%	GW	%	GW	%	GW	%
UES RF	193.0	100.0	131.4	68.1	21.3	11.0	40.3	20.9
OES Center	52.7	25.8	36.8	70.4	10.7	20.7	4.7	8.9
OES Central Volga	23.9	11.6	13.6	56.9	4.1	17.0	6.2	26.1
OES Ural	41.1	20.0	38.7	94.3	0.6	1.5	1.7	4.2
OES Northwest*	19.5	9.5	10.8	55.2	5.8	29.9	2.9	14.9
OES North Kavkaz	10.9	5.3	8.4	77.3	—	—	2.5	22.7
OES Siberia**	45.5	22.2	23.0	50.8	—	—	22.2	49.2
OES East	11.5	5.6	8.4	73.9	0.05	0.4	2.9	25.7
Total	205.1	100.0	139.7	68.1	21.2	10.4	44.2	21.5

* Including Yantarenergo

** Including Taimyenergo

Source: Voronai N.I., Palamarchek S.I., Podkovalnikov S.V., Sovremennoe sostoyanie i voprosy elektroenergetiki Rossii, *Problemy prognozirovaniya*, No. 6., 2001, p.49.

Table 2. Structure of primary energy consumption

a. Structure of primary energy consumption in Northeast Asia, %, 1996

	Oil	Gas	Coal	Nuclear Power	Hydro, Geothermal, Solar, Wind Power
Russia	24.5	50.5	19.0	3.8	2.2
China	19.3	2.0	76.4	0.4	2.0
Republic of Korea	63.5	4.9	21.5	9.8	0.3
Japan	58.2	10.4	15.7	14.6	1.2
World	40.0	23.0	27.2	7.2	2.5

b. Structure of primary energy consumption in RFE, %, 1997

	Coal	Natural gas	Oil	Hydro, Nuclear Power	Others
RFE	45.1	9.7	34.4	7.9	3.0

Source: *Strategiya razvitiya toplivno-energeticheskogo potentsiala Dalnevostochnego ekonomicheskogo raiona do 2020* g., FEB RAS, 2001, p. 10,13.

Table 3. Structure of fuel consumption at conventional power stations

	1970	1975	1980	1985	1990	2000			
						Russia	Central Area	Siberia	RFE
Natural gas	23.8	22.0	24.2	40.3	59.0	64.0	87.5	7.0	12.9
Oil	23.5	29.5	35.7	25.9	13.0	5.0	6.5	0.8	9.6
Coal	52.7	48.5	40.1	33.8	28.0	29.0	6.0	92.2	77.5
Others	—	—	—	—	—	2.0	—	—	—

Source: Prepared by the author from *Energetika SSSR v 1986-1990 godakh*, Energoatomizdat, 1987, p.30; *Novaya Energeticheskaya Politika Rossii*, Energoatomizdat, 1995,p.265; Chemodanov V.I., Bobyleva N.V., Chelkova N.G., Sokolova N.Y., Razvitie generiruyuschikh moshnostei UES Rossii i usloviya toplivoobespecheniya elektrostantsii v eriod do 2020g., *Elektricheskie stantsii*, No.6., 2002, p.38; Tchourachev V.N., Prospects of Fuel Supply to Power eneration in the Asian Regions of Russia, *Research Report*, No.5., C-FES Toyama University, 2003, p.3.

adopted the policy "Gazovaya Pauza "(to increasingly raise the ratio of gas in primary energy consumption for 10～15 years from 1995). Consequently gas has taken an important position in primary energy consumption and the fuel balance of conventional power stations (Table 2, 3.).

While replacement by gas is progressing in Russia as a whole, in the eastern area of Russia (RFE, Siberia) coal remains the main energy source, and this situation will not change for some time. In the Energy Strategy to 2020, it is planned to increase the ratio of coal in the fuel balance of conventional power stations in Russia as a whole, and to increase the ratio of gas in the fuel balance of conventional power stations in the RFE to 48%. [2] However, it is not easy to obtain both goals. The reason is cost. If coal is transported from Siberia to the Russian European Area (REA), the transport cost will be about three times greater than the mining cost.[3] Besides the population is more concentrated in the REA, and it is difficult to increase coal consumption there, which produces a much more negative effect on the environment in comparison with gas. As far as the gas price is concerned, its domestic price is limited to 10～20% of the international level; therefore it is not realistic to make gas companies in Sakhalin supply gas to the RFE at this price level. The large difference between the international and domestic gas price is the main barrier in the replacement by gas of the RFE. As a result, it is the present task in the RFE to increase the coal production and to adopt clean coal technology.

4. Electricity Sector Reform

As mentioned earlier electricity sector reform is now taking place in Russia, and it is scheduled to be carried out according the process shown below: [4]

Steps of electricity sector reform

[First stage]

By 2002, to provide the framework of conditions for a competitive market.

(1) To enforce the laws (to establish about 14 laws, including amendment of the Civil Code, Federal Law on the electricity

supply, and the Federal Law on natural monopolies)

(2) To form an electricity wholesale market.
  ① To establish a Federal Grid Company (Federalinaya Setevaya Kampaniya [FSK]).
  ② To establish an independent system operator (SO).
  ③ To establish a generating company (GK).

By 2004:

(1) To accomplish reform of the Unified Energy System (UES).
(2) To begin reform of the isolated Energy System.

[Second Stage (2004~2006)]

(1) To accomplish enforcement of the rule of law.
(2) To enforce the competitive mechanism in the electricity wholesale market.
(3) To introduce independent suppliers into the retail market.
(4) To examine the possibility of integrating the FSK and SO.

[Third Stage (2006~)]

(1) To accomplish the framework conditions for the competitive market by expanding the wholesale market and the grid system, including the isolated energy systems.
(2) To complete the institutional conditions for the reform.

According to this program, the reform begins with providing the framework conditions for restructuring. Consequently, an isolated Energy System like the RFE, where OES East has not integrated with the UES and where competition between generating companies hardly works, is not scheduled to be combined with the competitive market any time soon; it will not be until after 2006 that a competitive market will be introduced into the RFE.

Let's look at an interesting point in the electricity sector reform in Russia. It is the power company (UES) that insists on separating the vertically integrated electricity supply system (creating a competitive market). On the contrary, local governments and public opinion oppose the separation of generation and transmission from the perspective of a stable electricity supply (Table 4).

Inside the electricity sector, there are not a few specialists, especially engineering staff, who support the vertically integrated electricity supply system to maintain a stable electricity supply.[5] Both sides recognize that the Russian electricity sector has serious problems (aged equipment and a lack of investment funds to replace them) and that restructuring is needed to solve these problems. UES, which supports the reform program, intends to make a success of electricity supply as a business by

Table 4. Recognition on the separation of generation and transmission

UES	Establishment of Generating Company (GK) and Federal Grid Company (FSK) are needed to provide a competitive electricity market.
Local Governments	We oppose the separation of generation and transmission from the perspective of a stable electricity supply.

restructuring, so that Russia's electricity sector can attract private investment, both domestic and foreign. On the other hand, many specialists, especially engineering staff, regard a stable electricity supply as an absolute priority in the electricity sector; therefore they insist on retaining the vertically integrated electricity supply system during the restructuring. [6)]

5. The Electricity Sector in the RFE

The electricity supply in the RFE is managed by eleven energos (power companies) and Bilibinskaya atomic power station (Table 5). As for the aged equipment and the profit rate, the RFE, where the electricity supply is the most unreliable in Russia, is in a serious condition (Table 6, 7.). Accordingly, electricity sector reform will be carried out under tough conditions in the RFE.

In March 2003, we visited the Far Eastern Managing Energy Company (FEMEC) in Vladivostok, which controled the electricity supply in the Primorii region (one region of the RFE).[7)] We interviewed executives of this company and questioned them on the problems they faced. Some of the answers we obtained are given below:

[On electricity sector reform]

(1) If we leave the aged equipment problem unsolved, a crisis in the electricity supply will occur three to five years from now. To avoid this crisis, we have to attract investment funds for replacing our equipment. This cannot be done under the present centralized system.

Table 5. Power companies (Energo) in the RFE

Energo	Region	Installed Capacity, MW	Generated Electricity, Million kwh
Amurenergo	Amurskaya oblast	507	1303.6
Zeiskaya hydro-electric power station	Amurskaya oblast	1330	3917.7
Dalenergo	Primorskii Krai	1166.6	3709.3
LuTEK	Primorskii Krai	1495	4103.3
Khabarovskenergo	Khabarovskii Krai	2153.1	7245.3
Kamchatskenergo	Kamchatskaya oblast	526.7	1452.2
Magadanenergo	Magadanskaya oblast	535.2	469.4
Chkotskenergo	Chukotskii avtonomnyi okrug	167.8	219.4
Bilibinskaya atomic power station	Chukotskii avtonomnyi okrug	48	166.7
Kolmaenergo	Magadanskaya oblast	900	2421.7
Sakhalinenergo	Sakhalinskaya oblast	630	2218.4
Yakutskenergo	Yakutiya	2051.2	6809.7

Source: Prepared by the author from Kalashnikov V.D., *Problemy Strategicheskogo Planirovaniya Energetiki Regiona*, FEB RAS, 2001, p. 122.

Table 6. Rate of aged equipment in RFE power companies, %, 2001

Energo (Power Company)	Rate of aged equipment
Amurenergo	44.2
Zeiskaya hydro electric power station	23.8
Dalenergo	56.5
LuTEK	38.9
Kamchatskenergo	42.0
Magadanenergo	43.0
Kolmaenergo	25.9
Sakhalinenergo	53.6
Okhinskaya cogeneration station	70.9
Khabarovskenergo	47.0
Yakutsenergo	47.4

Source: Vostokenergo (http://www.vostok-energo.ru)

Table 7. Profit rate in Russia, %, 2002

Sector, Energo	Profit rate
Total*	14.4
Industry*	18.5
Electricity*	15.7
Vostokenergo	- 2.3
Amurenergo	5.8
Dalenergo	- 1.8
Kamchatskenergo	- 14.1
Magadanenergo	- 17.4
Chukotenergo	- 32.1
Skahalinenergo	- 20.8
Khabarovskenergo	- 5.5
Yakutsenergo	13.1
Zeiakaya hydro electric power station	2.6
Kolmaenergo	36.4
LuTEK	9.8

* Profit rate in 2001.

Source: Prepared by the author from Vostokenergo (http://www.vostok-energo.ru); Finasy Rossii, Goskomstat, 2002,p.117.

(2) Therefore, we have to separate the vertically integrated system and introduce competitive mechanisms into the electricity sector.
(3) In the RFE, which is different from the REA and Siberia, where it is possible to introduce competition between the electricity suppliers, prerequisite conditions for the reform should be provided first of all. Consequently, the vertically integrated system will be kept for the present.

[On the fuel supply problem]

(1) The fuel balance for conventional power stations is the following: Coal transported from Siberia --- 40% Local coal --- 60%
(2) Gasification (replacement by gas) in the RFE is planned but the outcome is uncertain.
(3) LuTEK (Power-Coal integrated company in Luchegorsk) achieved its planned coal production and fed a stable fuel supply to the power station last winter (2002~2003).

[On the aged equipment problem]

(1) We reinforced it with repairs.
(2) We rode out this winter without accidents by reinforcing the repairs and replacing boilers and turbines.

[On the support to the RFE]

(1) We receive support from the UES and the Ministry of Energy for the construction of this power station (Bureya hydraulic power station) and high-voltage transmission lines (500 KV). [8]
(2) Vice-Minister of the Ministry of Energy Kudryavyi is paying close attention to the improvement of the fuel-electricity supply problem in the RFE, including the construction of 500-KV transmission lines and promotion of replacement by gas. [9]

This interview reveals what is happening in the electricity sector of the RFE:

The aged equipment problem presents a serious problem in the RFE as well as in Russia as a whole. If this problem is left unsolved, it seems quite probable that an electricity supply crisis will occur in the not-too-distant future. It is the plan of executives of FEMEC to carry out electricity sector reform and attract private investment to replace obsolete facilities in order to avoid the crisis. This is the same solution recognized by the executives of UES. Strengthened repairs are merely temporary measures; the construction of a new power station (Bureya hydraulic power station) and high-voltage transmission lines (500 KV) are fundamental solutions that must be accomplished. It is expected that the Ministry of Energy and UES will support this matter.

6. Conclusion

The fuel-electricity sector is in a serious condition. From 2002 through 2003, the crisis in the electricity supply has been avoided as a result of the efforts of individual power companies and temporary repairs to equipment for example. These efforts have, of course, limits and cannot be fundamental solutions. Therefore, it is necessary to construct power stations and high-voltage transmission lines, and to fully replace obsolete facilities. This requires a massive amount of investment funds.

The current electricity sector reform is

strongly linked to the task of avoiding the crisis and attracting the required investment funds. As for how to carry out the reform, there are two groups. One supports the separation of generation and transmission, and the introduction of competitive mechanisms to the electricity sector. The other regards the stable supply of electricity as the priority task, and insists on retaining the vertically integrated electricity supply system. Finally we briefly examine the prospects for the electricity sector, which depend on which method is selected to accomplish reform.

Executives of UES intend to make a success of the electricity supply as a business, and they believe the reform should be carried out according to this policy. Therefore, the stable electricity supply depends on whether the Russian electricity business is attractive enough to bring in private investment or not, if reform is completed along this course.

On the other hand, if the gradual way (maintaining the vertically integrated system, introduction of a regulated electricity market, for example) is selected, a stable electricity supply is regarded as the priority task of the electricity sector as it was before. As a result, the electric power industry is not regarded as a business. It may be difficult, consequently, for the Russian electricity sector to attract the so-called the West and their investment funds.

As a stable electricity supply regulates the stability of Russia and the RFE, we will have to pay close attention to the consequence of the restructuring in the Russian electricity industry.

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NOTES

(1) The RFE is currently integrated with Siberia through 220-KV transmission lines; its capacity, however, is not sufficient for power interchange. Therefore, the construction of 500-KV line is needed.

(2) Chemodanov V.I., Bobyleva N.V, Chelnokova N.G., Sokolova N.Y., Razvitie generiruyuschikh moshnostei UES Rossii i usloviya toplivoobespecheniya elektrostantsii v period do 2020g., *Electricheskie stantsii*, No. 6., 2002, p.45.

(3) Dolin Y.E., Opanasenko S.N., Problemy effektivnosti toplivoobespecheniya teplovykh elektrostantsii, *Energetik*, No.3., 2003, p.3.

(4) Sinyugin V.Y., Reformirovanie otrasli uje nachalos, *Energetik*, No.3., 2002, p.2-3.; Izumi Sakaguchi, Kaikakuni idomu Rosia Dennryoku bunnya, *Chosa-Geppo*, No.2., 2002, Rosia-Too- Bouekikai.

(5) Vice-minister of the Ministry of Energy Kudryavy, who is one of the leaders of opposition to the separation of generation and transmission, is a Doctor of Engineering.

(6) There are different opinions among those who oppose the separation of generation and transmission: Electricity, which is a fundamental social infrastructure, should not be regarded as a commodity.

As electricity has unique characteristics (simultaneity of generation and consumption, it is necessary to prepare reserve capacity), it cannot be treated as a usual commodity. Consequently, it is better to introduce competitive mechanisms gradually than to deregulate radically.

Djangirov V.A., Barinov V.A., O rynochnykh preobrazovaniyakh v elektroemergetike, Energetik, No.4., 2001, p.6.

Among them, there is strong anxiety about the construction of power stations, which take a lot of capital and time, being neglected by the reform (introducing the competitive mechanisms).

(7) We interviewed the following managers of Far Eastern Managing Energy Company (20 March 2003).

Aleksei V. Kakaulin (1st Deputy General Director)
Oleg A. Onisenko (Deputy General Director)

Vadim K. Mironenko (Deputy General Director) FEMES controls Dalenergo and LuTEK.

(8) The first unit of Bureya hydraulic power station began to work in June 2003. It is expected that Bureya power station will improve the electricity supply in the RFE.

(9) According to Deputy General Director Oleg A. Onisenko, he met Vice-minister of the Ministry of Energy Kudryavy the day before this interview.

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