

## FORMING ELECTRICITY MARKETS IN THE COMMONWEALTH OF INDEPENDENT STATES AND ITS IMPACT UPON POWER SYSTEM DEVELOPMENT

by

**V.A.DJANGIROV\***  
CIS Electric Power Council

**V.A.BARINOV**  
Power Engineering Institute

(Russia)

### SUMMARY

The decade period of independent development of CIS states - the former USSR republics is finished in 2001. The changes in Commonwealth of Independent States (CIS) management structures that took place in this time, their impact upon the power systems development as well as the problems and tasks that are important for CIS states in the area of electric power industry are considered in the report.

**Keywords:** Electric Power Industry – Structure – Management – Impact - Development

### 1. INTRODUCTION

The most powerful interconnected power system – the Unified Power System (UPS) of the former USSR that was unique in the world and was controlled in the centralized manner -was created by the end of 80<sup>th</sup>. This UPS operated in parallel with power systems of Eastern Europe and Mongolia as a part of interconnected power system “Mir” of countries-members of COMECON. The installed capacity of UPS electric power stations by the end of 1991, when the USSR subdivided into independent states, constituted 288,2 mln kW. The considerable economic effect was achieved as a result of UPS creation.

The formation of independent states on the territory of the former USSR and the division of electric power property between them resulted in the fundamental changes of the structure of electric power industry

management. The own management organs and independent working subjects were created in the independent states, while the former principles of centralized management of the power systems work were disrupted that caused the necessity of quick creation of mechanisms of coordination of developing and functioning electric power industry in CIS states. For these purposes the states-members of CIS concluded in February 14, 1992 the agreement "On coordination of interstate relations in the field of electric power industry of Commonwealth of Independent States". In accordance with this agreement the CIS Electric Power Council and its constantly working organ – Executive Committee were formed.

The processes of structural transformations were begun in the electric power industry of CIS states. The deepest transformations in electric power industry took place in Armenia, Georgia, Kazakhstan, Moldova, Russia, and Ukraine. They resulted in the formation of different owners of electric power objects at the national levels and the formation of wholesale electricity markets. The structures of centralized management are kept in some another CIS states in much more degree than in the pointed countries, though the issues of electric power industry reformation are as well under consideration there.

The changes that took place recently in the structures of CIS states' electric power industry management, their influence on the development of this industry, the outlined ways of its further reformation as well as the problems and tasks of CIS states in this industry are considered below.

---

\* 7, Kitaigorodsky proezd, 103074, Moscow

## 2. PARTICULAR FEATURES OF REFORMING ELECTRIC POWER INDUSTRIES IN THE SEPARATE CIS STATES

The reformation of electric power industry in CIS states is carried out accordingly to the substantially different schemes. In the same time there are the general tendencies. It should be noted, that the juridical status of the electric power industry reforms in each state was established by the corresponding laws or the President's decrees and the governmental statements. The main rights and responsibilities of electricity producers, suppliers and consumers, the principles of forming and realizing the State policy in the area of electric power industry as well as the directions of market relations development were determined in the normative-legal acts that were adopted in CIS states.

Azerbaijan Republic. The vertically integrated company "Azerenergy" carries out the electricity production, transmission, distribution and the planning of power system development. It includes the repairing and building enterprises, R&D institutes and another subdivisions that are necessary for it. The concept of Azerbaijan electric power industry development up to 2010 as well as the project of this industry restructuring was developed. The decree of President of Azerbaijan Republic transformed the electric networks of Baku, Gaingy and Sumgait, which belonged before to the city authorities, in the joint stock companies for their subsequent privatization. The open tender was announced for it.

Republic Armenia. The Government and Energy Ministry of Republic began in 1997-1998 to carry out the reformation of electric power industry. The joint stock companies were formed as a result of restructuring vertically integrated Republican company. They include: electricity producer companies, electric company of HV transmission lines, four distributing companies and national dispatching center. The independent Energy Commission of Republic was also created for the regulation of this industry. The Energy Ministry of Republic began the privatization of electric power industry for attracting the private capital. The building-mounting subdivisions and some enterprises of auxiliary purposes were privatized. The first experience of generating power plants privatization was received. The 13 small hydro power stations were privatized on the basis of tender. The further program of power enterprise privatization foresees first the privatization of distribution companies and then the privatization of large electric power stations. The national dispatching center, the electric transporting company and the Armenian Nuclear Power Plant are not subject to the privatization. At the present time the Ministry of Energy and the Energy Commission are developing the rules of electricity market for the transient period (a few years) with the subsequent gradual market liberalization.

Republic Belarus. The State concern "Belenergo" carries out the management of electric power industry in Republic Belarus. The concern includes six Republican power associations as well as the enterprises of construction-mounting complex, the adjusting enterprises, R&D organizations. The Republican power associations are the vertically integrated power companies that include the electric power stations, electric networks and heating systems. The project of restructuring the Republic Belarus electric power industry was completed in 1999. The project envisages three stages of Republican electric power industry reformation that are not connected with the concrete time parameters. It is intended to divide the electricity production, transmission and distribution into 3 different structures at the first stage. In this case the large electric power stations are set apart into the independent companies (one or some) as the parts of State concern "Belenergo". It is intended to reform the Republican power associations into the distribution companies. In prospect the both structures can be associated with the different shares of mixed property. The transmission lines forming the systems will stay as the State property and will be not stockhold. It is supposed to create the independent republican energy commission, which will control an observance of rules on the wholesale trade of electric energy and the rules of relations between the electricity producers and consumers. The Energy Ministry of Republic Belarus was created in 2001.

Georgia. The separation of electricity production from its transmission and distribution was carried out at the initial stage of Georgian electric power industry reformation. 21 small hydro power stations of the total number of 32 were privatized. The joint stock companies were created on the basis of thermal and hydro power stations at the second stage of reforms. 51% of shares in them are temporarily staying as the property of State, while 49% will be sold accordingly to established order. The privatization of share holdings both of active power plants and those that under construction is permitted on the basis of international tender in accordance with the Statement of Government. Nine Regional distribution companies were formed.

Republic Kazakhstan. The structural changes in the electric power industry of Kazakhstan were carried out in accordance with governmental Statement that was adopted in 1996. As a result of these transformations:

- large electric power stations (excluding Combined Heat and Power Plans (CHP) of less than 100 MW capacity) were set apart in the independent enterprises. They were stock hold, and the most of them were privatized;
- CHP of middle capacity (less than 100 MW) together with heat distribution systems were transferred into the communal property of local management organs;
- regional joint stock distribution network companies

were formed on the basis of regional electric networks with voltage 110-35 kV and local networks with voltage 6-10 and 0.4 kV. Their functions include the electricity purchase, distribution and realization;

- national company KEGOG for the electric networks

control was created on the basis of assets of the main 220 kV and above electric networks. The main goal of company is the transfer of electricity to the subjects of wholesale market. Functions of the system operator of electricity wholesale market were charged with this company. The market is functioning on the basis of agreements between consumers, power-producing organizations and National company;

- all other enterprises of industry were allocated in the independent enterprises, which were stockhold and privatized.

The National company controlling electric networks and the regional distribution companies as the natural monopolies are being under the control of Ministry of Energy, Industry and Trade, while their services on electricity transmission and distribution are controlled by the agency of Republic Kazakhstan on regulation of natural monopolies, protection and support of small business. The experience of wholesale market functioning revealed a series of unsolved problems during its organization. The new "Law on electric power industry" was adopted in 1999, while in 2000 the Decree of government that foresees the additional measures on increasing the efficiency of electricity wholesale market as well as the creation of new market subject – market operator – the noncommercial organization with 100% capital belonging to the State and established by the participants of market themselves afterwards was accepted. In this case after the beginning of market operator work KEGOC will fulfill the functions of technical operator.

Kyrgyz Republic. Before 2001 the "Kyrgyzenergo" company represented the electric power industry of Kyrgyz Republic. In September 2001 joint stock companies "National Electric Network of Kyrgyzstan" and "Electric Power Stations of Kyrgyzstan" were created. The program for reforming the republican electric power industry foresees the formation of six joint stock distribution companies. The electric power stations, the transmission lines and substations with voltage 110 kV and above as well as the controlling and managing functions devoted to the newly created joint stock companies. The relations between companies will be built on the contracts (agreements) bases: the contracts for electricity purchase and selling as well as for electricity transit through the system-forming transmission lines. The sale of large share holdings (up to 70%) is foreseen in the companies on electricity distribution. The control share holding on electricity production and transmission is reserved for the State for the uncertain term up to making the separate decisions on them.

Republic Moldova. The "Law on electric power industry" was adopted in 1998 and foresees the development of competition for the electricity production and power supply and the privatization of electric power enterprises in these two areas. In accordance with this Law the National Agency of Regulation in Power Industry (NARE) was formed, the division of activity on electricity production, transmission, dispatching and distribution was carried out. The State enterprise "Moldelectrica" was created and fulfills the tasks on electricity transmission and as a Dispatching center. Republican Moldova Parliament adopted in December 1998 the "Law on individual plan of privatization for the electric power industry", which foresees the two-stage privatization of electric power objects. It is intended to privatize the electric distribution enterprises at the first stage and then – three CHP. It was permitted for the foreign investors to buy the control share holding up to 100% in one or more electric distribution enterprises. At the second stage the Law permitted to investors to buy up to 70% of each enterprise's shares in the field of electricity production. In February 2000 the Government of Republic Moldova had sold three from five electric distribution enterprises to Spanish company "Union Fenosa". The Government is preparing to pronounce the tender for selling the two not privatized enterprises. The mentioned "Law on electric power industry" determined the main principles of organizing the wholesale electricity market in Republic Moldova. The commercial rules allow to the distribution companies to conclude the bilateral agreements with the companies that produce the electric energy and with those that import it. NARE has developed the project of Electricity Market Rules for providing the legal base of efficient functioning of electricity market in Republic Moldova. These rules foresee the formation of balancing market together with direct bilateral agreements.

Russian Federation. The reforms in Russian electric power industry were begun in accordance with the Decrees of President of Russian Federation that were confirmed in 1992. The Russian joint stock company of power and electrification (RAO "EES Rossii") was established in December 1992. The large electric power stations with capacity for thermal power plants - 1000 MW and above, for hydro power stations - 300 MW and above, the main HV transmission lines forming Russian UPS, the central and regional dispatching centers, the R&D organizations, the part of shares of each regional joint stock company "AO-energo", which were established on the basis of regional power systems, were transferred in RAO "EES Rossii" statutes capital. The branch joint stock companies were formed on the basis of electric power stations, the property of those was transferred to RAO "EES Rossii". The nuclear power plants are under the control of State concern "Rosenergoatom", which is responsible for their development and safe functioning. The Federal and

regional energy commissions being the regulating organs have been formed. The Federal wholesale electricity market was created. RAO "EES Rossii" fulfills the control over its development and functioning. The market operator is the Central Dispatching Center of Russian Unified Power System. At the present time there are more than 100 subjects of wholesale market including the regional joint stock companies "AO-energo", the large thermal and hydro power stations, nuclear power plants as well as the large consumers that were taken at this market.

The new Statement of Government of Russian Federation was adopted in July 2001 that determined the directions of further reformation of Russian electric power industry. These directions include: the transformation of Federal wholesale electricity market into Federal competitive electricity market, the formation of retail electricity markets, the establishment of Federal network company, system operator, administrator of trade system. It is intended to carry out the reformation of regional joint stock companies by means of separating the functions of electricity production from its transmission and supply. Three stages of reforms with total duration in 8-10 years have been foreseen.

Republic Tajikistan. The Ministry of Energy was established in Tajikistan in accordance with Decree of President. It includes the electric power industry (the State holding company "Barki Tochik) and the gas-oil industry (the State enterprises "Tajikneftegaz", "Tadjikgaz", "Tajiknefteproduct"). The Ministry of Energy is responsible for power engineering policy and the development of standards. The program of electric power industry reforming was developed. The consumers will receive the possibility to choose among the competitive power suppliers. The stockholding of twenty-four power objects has been recently carried out. Ten of them are the distribution companies, and fourteen are repairing-building ones. The preparatory work was fulfilled for the beginning of investment process by means of realization of the shares of newly established joint stock companies.

Turkmenistan. The Turkmenian Energotechnological Corporation "Kuvvat" carries out the power supply of consumers. The corporation includes 5 regional production associations, electric power stations, as well as repairing and some other enterprises.

Republic Uzbekistan. In 2001 the Decree of President transformed the Republican Ministry of Energy and Electrification into the State joint stock company "Uzbekenergo", which includes the coal and electric power industries. The means of electricity production, transmission and distribution belong to the State property. The building, repairing and adjusting organization and designing institutes were privatized accordingly to the different schemes. The concept of

developing electric power industry up to 2005 was recently developed and confirmed by the Government.

Ukraine. The reformation of Ukrainian electric power industry was begun in 1994 in accordance with the Decrees of President that foresaw the division of 8 vertically integrated territorial power systems in several generating power companies (4 – with thermal power plants, 1 – nuclear power plants, 2 – with hydro power stations), the formation of 27 regional distribution power supply companies, the creation of National Dispatching Center and State Enterprise "Ukrelectroperedacha"; the creation of National commission on regulation. The Agreement between the participants of wholesale market that determined its organizational structure was signed in 1995. In 1999 the amalgamation of National Dispatching Center with the state enterprise "Ukrelectroperedacha" and the creation of a single company "Ukrenergo" took place. The company "Ukrenergo" provides the functions of dispatching, organizing wholesale electricity market and electricity transmission by the HV line. The state enterprise "Energorinok" was set apart from the "Ukrenergo" in 2000. The functions of this enterprise include: organization of wholesale market work, wholesale electricity sale and purchase, economic dispatching, fulfillment of payments between the wholesale market participants, import of electricity. The privatization program developed in the Republic foresees the privatization of power supply companies (6 companies have been already privatized) and the privatization of energy production companies. The concept of three-stage reformation of current wholesale electricity market was developed. It foresees the introduction of free competition at the third stage.

### **3. INFLUENCE OF NEW CONDITIONS ON THE ELECTRIC POWER INDUSTRY OF CIS STATES**

The new conditions rendered the considerable influence on the operating efficiency and the CIS states' power systems development. The data on electricity production in 1990-2000 are presented in Table 1. As the data of Table 1 show, the production of electricity was reduced almost by 30% since 1990 on the whole for the CIS states. This reduction took place significantly in Moldova, Georgia and Kazakhstan. In 1998 the electricity production was stabilized, while in 1999 the growth of production first took place by 1.7% in the whole for CIS, while in 2000 – already by 2.7%. The installed capacity of electric power stations in CIS states exceeds 320 mn kW. The share of thermal power plants is 70%, nuclear – 10% and hydro– 20%.

The functioning efficiency of CIS states' power systems was decreased lately and consisted of the increased specific fuel consumption for electricity production and the growth of electric energy losses in networks. For the last five years the putting into operation of new power

plants and electric networks decreased in the CIS almost by 10 times in comparison with 60<sup>th</sup>-80<sup>th</sup> of the 20<sup>th</sup> century. The data on putting into operation of new

generating power plants in 80<sup>th</sup> in the USSR and for the last decade in CIS are presented in Table 2.

Table 1

Electricity production in Commonwealth of Independent States  
in period of 1990-2000

bn kWh

Republics	Years										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Azerbaijan Republic	23.2	23.5	19.8	19.0	17.6	17.0	17.0	16.8	18.0	18.2	18.7
Republic Armenia	10.4	9.6	9.0	6.3	5.7	5.6	6.2	6.0	6.2	5.7	6.0
Republic Belarus	39.5	38.7	37.6	33.4	31.4	24.9	23.7	26.1	23.5	26.5	26.1
Georgia	14.2	13.4	11.5	10.2	7.0	7.1	7.2	7.2	8.1	8.1	7.4
Republic Kazakhstan	87.4	86.0	82.7	77.4	66.4	66.7	59.0	52.0	49.1	47.5	51.4
Kyrgyz Republic	13.4	14.2	11.9	11.1	12.9	12.3	13.8	12.6	11.6	13.2	14.9
Republic Moldova	15.7	13.2	11.2	10.4	8.2	6.2	6.2	5.4	4.8	4.1	3.6
Russian Federation	1082.2	1068.2	1008.5	956.6	875.9	860.0	847.2	834.1	827.2	846.2	876.0
Republic Tajikistan	18.1	17.6	16.8	17.7	17.0	14.8	15.0	14.0	14.4	15.8	14.3
Turkmenistan	14.6	15.0	13.2	12.6	10.5	9.9	10.1	9.5	9.3	8.8	9.8
Republic Uzbekistan	56.3	54.2	50.9	49.1	47.8	47.4	45.4	46.0	45.9	45.3	46.8
Ukraine	298.5	278.7	252.5	229.9	202.9	194.0	183.0	178.0	172.8	172.1	169
Total:	1673.5	1632.3	1525.6	1433.7	1303.3	1265.9	1233.8	1207.7	1190.9	1211.5	1244.0

Table 2

Total capacity of new power stations putting into operations in the USSR and CIS states, (mln kW)

Years	USSR						CIS									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Putting into operation	11.8	8.6	11.6	6.6	3.9	5.96	2.0	0.95	3.2	2.77	3.06	1.3	0.63	0.96	1.36	1.42

The deterioration of power systems' efficiency indicators at the former USSR territory is mainly connected with the destruction of previous principles for the coordination of managing the power systems operation.

To improve the situation the large work on developing and strengthening the integrating processes between CIS states in the field of electric power industry is carried out. A series of fundamental interstate documents that were necessary for organizing the joint operation of power systems was prepared and confirmed for it. In addition a series of bilateral and multilateral agreements between the power companies and the State

organs of CIS states was concluded.

The active actions of CIS Electric Power Council states-members promoted to stabilize the situation and to begin the restoration of CIS states interconnected power system, which was separated in 1998-1999 and some parts were working separately. In June 2000 the parallel operation of Russian UPS and National power system of Kazakhstan was restored. In September 2000 the connection of power systems of Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, entering in the Central Asian interconnected power system, with the whole National power system of Kazakhstan took place for the first time. In August 2001 the Ukrainian and Moldavian power systems joined to the interconnected power

system of CIS states. Thus, the power systems of 11 from 12 countries are working now in parallel as one interconnected power system of Commonwealth of Independent States (IPSCIS). The power systems of Lithuania, Latvia and Estonia as well as the power system of Mongolia are operating in parallel with the IPSCIS. The transfer and exchange of electricity are carried out with the power systems of neighbouring states: Norway, Finland, Poland, Slovakia, Hungary, Turkey, Iran and China. All the technical problems of Armenian power system joining to the interconnected power system can be solved in the near future.

#### **4. MAIN PROBLEMS AND TASKS OF CIS STATES**

- The growth of obsolete equipment sizes creates the serious problem. At the present time 30% of generating equipment in CIS states depleted its service life. This share will constitute about 60% by 2010, while in 2020 – already 90%. The organs managing the power industry in CIS states pay much attention to this problem. Nevertheless the current modernization and the equipment replacement don't cover the volume of equipment that exhausted its service life. It may result not in so far future in the difficulties of power supply of national economy and population in CIS states. It means that measures for service life prolongation should be developed and realized for considerable part of old equipment.
- The increasing efficiency of CIS states' power system operation is an important task. It is necessary for it to create the system of coordinated management providing the optimization of the IPSCIS, the distribution of duties and the fulfillment of required standards of reliability as well as the just distribution of effect from the optimization of regimes between owners.
- The creation of efficient system of coordinated planning of the IPSCIS development is necessary with taking into account the diversity of interests for the different owners of electric power objects. The joint strategy of further CIS states electric power industry development should be developed on this base, and this strategy should be taken into account, when the strategy of electric power industry growth in separate CIS states will be developed.
- It is necessary to create the efficient mechanisms of pricing, which should provide the efficient functioning and sustainable development of IPSCIS.
- The problem of electric power station's fuel supply and the realization of coordinated policy on the optimization of CIS states' fuel balance has a special meaning under existing conditions.
- The harmonization of normative-legal base and working rules for the owners in different countries is exceptionally important task under conditions of carrying out the reformation of electric power industry. It should coordinate this process to all CIS states benefit for creating the future market space. The development

of joint concept of creating the interstate electricity market is also important.

- The widening integration of IPSCIS with IPS of foreign countries is of strategic interest. The first goal is a solution of the problem of using the already existing 11 HV ties between power systems of CIS states and the countries of Eastern Europe. It is also necessary to consider the sequence of realizing some other suggested now projects for power systems integration deepening that are intended for the creation of common continental electricity market being the basis of single energy space.

Several working groups on different directions for solving the problems that are important for CIS states have been formed. One of the main goals is to create the efficient interstate electricity market.

#### **CONCLUSION**

The formation of independent states at the territory of the former USSR and the structural transformations that are carried out in the power industry of CIS states resulted in the radical changes of power industry management structure and influenced greatly on the efficiency of functioning and the development of power systems in CIS states.

Large work on developing and strengthening the integrating processes between CIS states has been carried out. These actions assisted to stabilize the situation and to begin the restoration of the IPSCIS. In 2000 the parallel operation of Russian UPS and National power system of Kazakhstan was restored, and the connection of power systems of Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, entering in the Central Asian interconnected power system with the whole National power system of Kazakhstan took place for the first time. In 2001 the parallel operation of Ukrainian and Moldavian power systems together with IPSCIS has been restored. Thus, the power systems of 11 from 12 countries are now working in parallel as one interconnected power system of Commonwealth of Independent States. The power systems of Lithuania, Latvia and Estonia as well as the power system of Mongolia are operating in parallel with the IPSCIS. The transfer and exchange of electricity are carried out with the power systems of neighbouring states: Norway, Finland, Poland, Slovakia, Hungary, Turkey, Iran and China. All the technical problems of Armenian power system joining to the interconnected power system can be solved in the near future.

The stabilization of electricity production took place in 1998, while the growth of electricity production occurred first in 1999 on the whole for CIS by 1.7% and in 2000 – by 2,7%.

In the same time many problems should be solved for increasing the efficiency of functioning and providing the sustainable development of interconnected power

system of CIS states and, first of all, the harmonization of normative-legal base in their electric power industry and the creation of efficiently working electricity market as well as the coordination of plans for future development of CIS states' power systems. It is

expedient to consider the complex of technical and economic issues of the further widening of power pools integration on the Euroasian continent and the creation of the single energy space.