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## **Methods of Investment Management in the Russian Electricity Transmission Industry**

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**Abstract:**

*The paper surveys the methods of investment management in the Russian electricity transmission industry: state regulation and corporate planning of investment activity. The analysis of these two methods highlights their features, advantages and disadvantages. The investigation of the forecasting and investment decision process is given with regard to the electricity industry restructuring. The algorithm of interests' alignment between the state and the electricity network company is provided through the mechanism of investment management. The analysis of the methods of investment management in electricity transmission in Russia shows that corporate planning of investment activity coexists on a parallel basis with state regulation of investment activity. Corporate planning conforms to the interests of the electricity network company. Elaboration of efficient investment programs is associated with the lack of reliable development forecasts, regional specific features, tight deadlines for preparing the investment programs, centralized investment decision-making.*

*A French approach for organizing the state forecasting system in Russia is also presented in the research and could be of use in Russia. Corporate planning of investment activity in France defers the goals of state regulation due to the fact that investment decisions are eventually made by the Regulator, which manages the electricity transmission company. Investment decision process is characterized by a larger degree of social responsibility taken by the electricity network company when making an investment decision. For that a special attention is drawn to public relations, whose interests are taken into account at the initial stage of investment process.*

**Key Words:** *electricity transmission; investment management; regulation.*

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## **1. Introduction**

A significant change in perceptions of operation and development of the electrical power systems took place all over the world during the last decades. In the middle of 1980s several countries started the implementation of market reforms associated with liberalization, privatization and restructuring of the electricity sector. Each country has had its own prerequisites for carrying out changes in organization and regulation of the industry. However, the lack of sufficient incentives for the regulated monopolies necessary to improve the efficiency of electricity generation, transmission, distribution and supply as well as the difficulties of state regulation of natural monopolies have been considered to be the main reasons of the electricity reforms in many countries. The reforms aim to improve the efficiency of the electricity industry, which leads towards additional investment required for development of the electrical power system.

The Russian electricity industry is not an exception. Restructuring the electrical power systems resulted in unbundling the business activities of the power companies and their eventual privatization. The major peculiarity of the Russian electricity industry is defined by northern conditions (60% of the territory of the Russian Federation) where there is inaccessibility, extra wage allowance, extra living costs, and lower return on investment. These factors determine the electricity industry development in the market. Due to northern conditions electricity generation is very much related to district heating, which influences the dispatching schedule of a power plant, and thus, the volumes of electricity and power delivered to the network.

One of the main issues in the Russian electricity industry resides in the development gap of electricity networks for the last 15 years. Large amount of investment has been required in order to overcome this gap. These investments provided by UES of Russia for electricity network expansion and capital improvement projects seemed to be insufficient. Besides, there has been a large disproportion in investment allocation between generating capacities, transmission and distribution networks.

Such an approach to investment management in electricity industry development has been oriented towards corporate needs, rather than towards scientific and economic logic associated with the proper development of the electricity industry and its segments.

In some other countries, and in France in particularly, the state social responsibility issues play a significant role, that is why the electricity reforms are implemented with due diligence; the long-term effect generated by any actions is thoroughly analyzed. For instance, any regulator's decision requires passing through the procedure of public acceptance. Due to this reason the rate of the electricity market liberalization is quite low in such countries.

Such “due diligence”, to our mind, should not be considered as a cornerstone of restructuring the Russian electricity industry. In this country, for example, the electricity legislation has been changing quite frequently for the last several years: we should refer to the issues of access to the network services, connection to the network, pricing principles for such services. The necessity to review the legislation might be explained by its shortcomings and weak conceptual framework, which is being observed at the implementation stage.

Our research aims to investigate the two methods of investment management in the Russian electricity transmission industry: state regulation and corporate planning of investment activity and to find out how they are used in order to transform the investment ideas into the investment projects. We compare these methods, where it is possible, with the French approach on how to organize, plan, forecast and regulate electricity transmission investment and development.

The issues of investment management in the electricity network companies haven't been very largely discussed in the scientific literature (*Pociovalisteanu et al., 2010*). We assume this is due to the fact that the above mentioned questions have been investigated with regard to the performance of the unified electrical power system. Due to the electricity reforms and the unbundling of business activities of the power company, the focus has started shifting towards market reforms, and consequently, towards investment into the competitive sectors, i.e. electricity generation. The issues of competitive markets, restructuring and deregulation in the Russian electricity industry are investigated in the papers of *Belyayev (2004; 2007)*; *Volkonsky, Kuzovkin (2007)*; *Gitelman, Ratnikov (2008)*; *Voropay (2004)*. Theoretical approaches to transmission investment and electricity reforms worldwide are presented in the research undertaken by *Joskow (2005; 2006; 2007)*; *Brunekeerft et al. (2005)*; *Newbery (2002)*; *Wu et al. (2006)*.

## **2. Electricity transmission as a natural monopoly**

We begin with the discussion of electricity transmission as a natural monopoly. It is well known that natural monopolies are such economic spheres where competition reduces economic efficiency, while increasing costs. It is less beneficial to have several competitors in the market than just one single company.

According to *J. Sapir (2004)*, the well-known definition of a “natural monopoly” is justified only from the position of the general equilibrium theory in the industry. In reality, a “failure of competition” occurs in the natural monopoly, for example, when the monopoly is created due to the decrease of marginal costs, and therefore, due to the increase in profitability. The other mechanism when the monopoly occurs is explained by the high costs of market entry and by the complementarity of goods and services. Thus we have a monopoly, which leads to transaction costs, that is why it explains the strategy of vertical integration.

Speaking of the efficiency, then vertical integration, to our mind, is the most optimal solution of business architecture in the electricity industry, particularly in Russia. High costs of market entry should result in maintaining the monopoly status. The generator having decided to deal with electricity production aiming to reduce its initial expenditures would probably prefer installing gas-turbine or gas-piston drive units of small capacity. On the contrary, when speaking of the investment project efficiency, nuclear or hydro power plants would be the most desirable. Even large gas-fired power plants (under otherwise equal conditions) will be more profitable due to the economies of scale. Thus, we believe that the competition in the Russian electricity industry is possible only if it is created artificially, having identified all the participants and their market behaviour.

Taking into consideration the above-mentioned features of the natural monopoly as well as its other characteristics (*Pindyck, Rubinfeld, 2001; Joskow, 2007*), we may conclude that electricity transmission is, indeed, a natural monopoly.

Electricity transmission is one of the stages of the technological process in the electricity industry that includes electricity generation, transmission, distribution and supply. This technological process has its peculiarities. Let us outline the most important features (*Gitelman, Ratnikov, 2002, pp. 13-16*):

- No time lag between electricity generation and consumption. This is a principle feature of the electricity industry due to unavailability of a large-scale commercial storage of electricity coupled with a high speed electricity transmission and distribution. Electricity generation regime is defined by electricity consumption. Unavailability of electricity storage requires availability of transmission capacity reserves. These reserves are determined by the norms; the costs necessary to create and maintain such reserves are included into the electricity price.
- Complexity and special working conditions of electricity generation and network facilities. Installations are characterized by a constructional complexity and a large amount of metal used for construction. These factors define significant investment expenditures into electricity facilities. Besides, the EPC and (pre)commissioning phases might have quite a long duration.

These peculiarities determine the investment management principles in electricity transmission. Ideally, investment management in the electricity network company is based on the principles of economic efficiency and expediency.

The principle of economic efficiency implies that there is an economic effect from investment. It may consist in cost reduction, power losses decrease or electricity supply increase. Thus, investment decisions are made with regard to these investment criteria. The principle of economic efficiency is also brought into effect by procurement actions, tenders, etc.

The expediency principle lies in the fact that investment decisions depend on investment goals, which stipulate the necessity to implement an investment project. Among others, reliability increase, quality improvement of electricity supply, social function of the electricity industry could be considered as investment goals. Such investment projects are most likely not financially feasible, although they may have an economic efficiency.

The peculiarities of the technological process in the electricity industry define the long-term life cycle of the electrical installations. Consequently, there is a great demand for large-scale investment targeted for long-term investment goals of the electrical power system development. Unfortunately, due to restructuring the electricity industry the owners and the management of electricity network companies are oriented towards short-term financial results allowing having a higher return on investment. However, one of the ways to create a shareholder value on a long-term basis is the implementation of the following principle: “Make strategic decisions that maximize expected value, even at the expense of lowering near-term earnings” (*Rappaport, 2006, p. 69*). This statement explains why the above-mentioned principles are not fully implemented in the electricity industry.

### **3. Methods of investment management in the electricity network company**

The research undertaken by the authors allows distinguishing the three following methods of investment management in electricity transmission: state planning, state regulation and corporate planning of investment activity.

State planning of the electricity industry development played a prominent role in a centralized planning system having taken place in the USSR. A famous GOELRO Plan (a plan for national economic recovery and development elaborated by the State Commission for Electrification of Russia), which was further replaced by a subsequent Five-Year Plan, was a method of defining, among others, the development priorities, terms and sources of investment finance necessary to insure the reliability and efficient operation of the regional electrical power systems.

During social and economic reforms held in Russia in 1990-2000s the vertical bureaucratic structure in the electricity industry was modified and partly unbundled. State planning as a method of investment management faded in importance.

Corporate planning and state regulation of investment activity prevail in a market system. Corporate planning has replaced state planning, while the status of electricity transmission as a natural monopoly defines the necessity of state regulation. Let us discuss these two methods of investment management in the electricity network company in detail.

#### ***State regulation of investment activity***

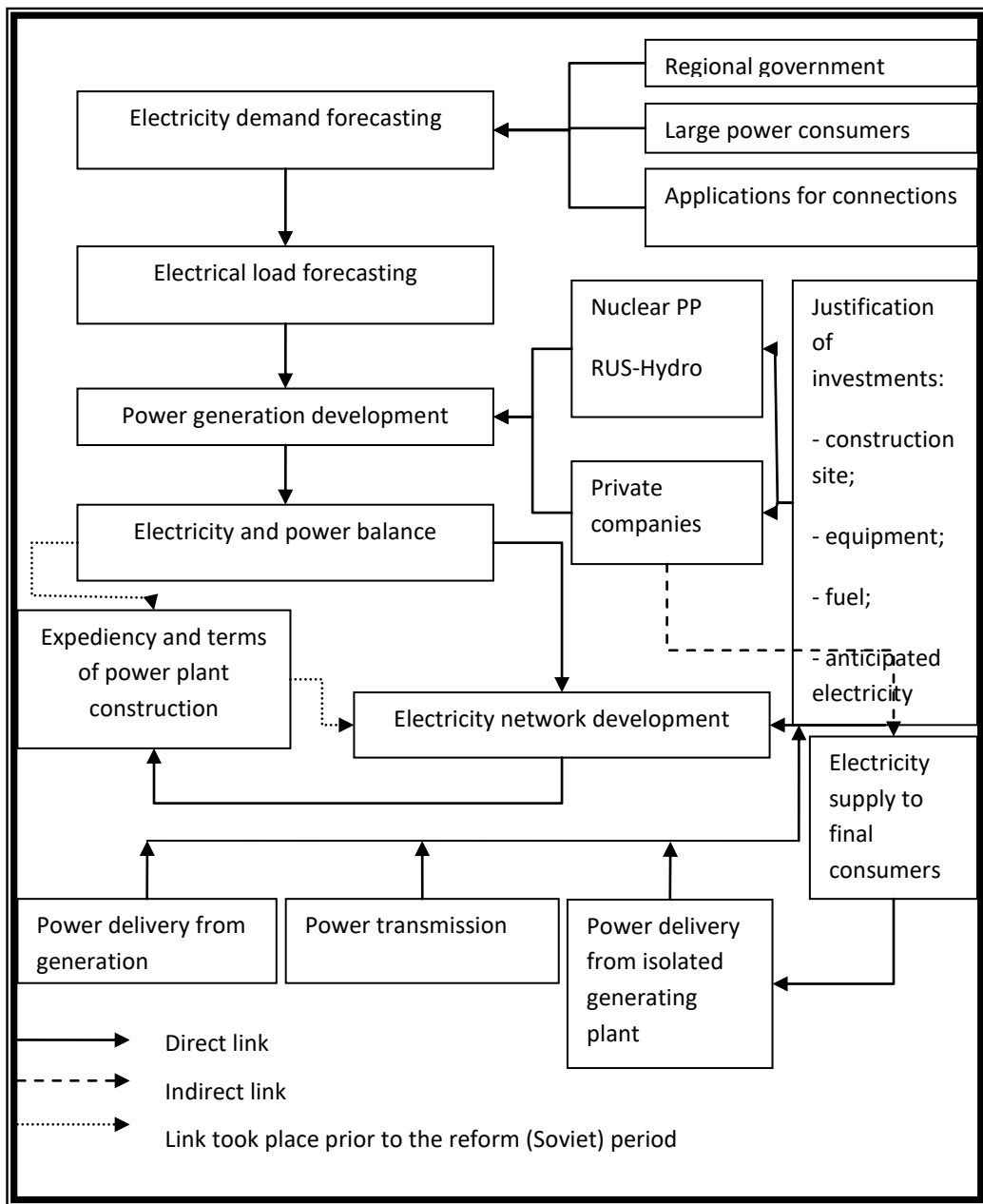
In Russia state regulation is performed at two levels: federal and regional. Federal Antimonopoly Service of the Russian Federation represents Federal Regulator, which regulates natural monopolies at the federal level with regard to tariff determination and control over the issues related to it. Federal Regulator also elaborates procedures and issues orders associated with its activity and the activity of Regional Regulators. Regional Regulators determine prices at the regional level. The regulator also advises on the investment program of the electricity network companies.

We believe that electricity transmission can be characterized by the three main trends of state regulation of investment activity performed by the electricity network company: (1) organization and priority determination of electricity infrastructure development; (2) approval of investment programs; (3) tariff regulation. In this paper we will speak more precisely about the first trend.

Organization and priority determination of electricity infrastructure development in Russia are based on a state planning system of the electricity industry development. The electricity infrastructure development is based on the following documents: (1) the strategy of the Electricity network development, (2) the forecast of electricity consumption, (3) development plan of the Unified power system of Russia for the next 7 years, (4) investment program of the electricity network company for the next 5 years. Some of these documents are elaborated by the electricity network company and are opined by the state authorities.

In Russia the change in perceptions on state planning system of the electricity industry development took place during the shift towards the market economy (fig. 1).

Today's electricity network development is regulated by the state. However, in case of the power generation deficit necessary to cover the consumers' load connected to the network, the electricity network company cannot purely by itself make the final decision concerning the development of the electrical power system. The application for connection submitted to the electricity network company is further transferred to System Operator, which on behalf of the state defines the priorities of electricity infrastructure and power generation development.



**Figure 1.** Forecasting and investment decision process in the Russian electricity industry

Nevertheless, a power plant construction decision, for example, may come up against some other issues associated with the evaluation of its installed power capacity, conditions of power delivery to the electricity network, network connection

charges, etc. This process lasts quite so long. A new consumer is not able and is not willing to wait for the decision to be approved for several years. As a rule, in such circumstances it will more likely decide upon construction of its own captive power plant.

From the point of view of the electrical power system development, investment decisions in Russia's electricity industry are in some cases (due to its controversy) made without considering the issue of interdependence and complementarity of electricity transmission and generation.

While analyzing the forecasting and investment decision making process in the Russian electricity industry at the state level we should highlight some peculiarities.

- The socio-economic development programs elaborated by the regional government are not always realistic. Therefore, there are difficulties with forecasting the electricity industry development in the region.
- There are no clear electricity demand definition criteria. Thus, there is an issue of forecast reliability, which was investigated earlier (*Belyaev et al., 2003, p.61; Danilov, 2004, pp. 123-128*).
- An independent authority is required to evaluate the necessity of a new power plant construction project implementation. It should be a state institution, which takes part in elaboration of expert findings on whether or not to build and to expand the electrical power generation facility. It should analyse the current status of the Russian electricity industry, investigate its impact on the national economy and environment, be aware of any bottleneck problem taking place in the electrical power system and the ways to solve it, have a vast experience in long-term forecasting, comprehensive statistical data, and qualified personnel, possess technologies and software necessary for long-range calculation of operating power modes, and make up forecasts and relevant analysis to support effective decision-making in the short and the long-run.

We believe it is necessary for the state forecasting and investment decision-making system in the electricity industry to be concentrated in single hands in order to cope with this kind of problems.

### ***Corporate planning of investment activity***

Investment corporate planning in the Russian electricity network company has its peculiarities. We would like to outline some of the features.

First, the investment program is a part of the business planning and budgeting systems in the electricity transmission company. We believe that such relationship takes into consideration the impact the investment program can have on financial and economic indices of company's business activity. The investment program is carried out with respect to the efficiency parameters of the electricity network company determined at the initial phase of a corporate planning cycle.



Second, the investment program insures and enhances the relationship between other corporate programs undergoing in the electricity network company. In particular, we speak of the cost-management program, the maintenance plan, social projects and other programs. This is the right decision, and it is explained by the integrated approach to investment policy.

Third, the electricity network company starts investment planning by making up a list of investment projects. This listing originates from the “bottom”, i.e. the transmission company’s affiliated branches operating electricity network facilities. This approach has both advantages and disadvantages. On the one hand, the engineers working at site are well aware of the technical condition of operated facilities. Comparing one or the other facility they may estimate the necessity of its technical upgrade or capital improvement. The “bottom” prefers maintaining their facilities in a good condition; therefore, the site has a subjective attitude towards making up a list of investment projects. However, the issues of network expansion or new construction projects are investigated by the main office experts and are originated from the state development plan of the Unified power system of Russia.

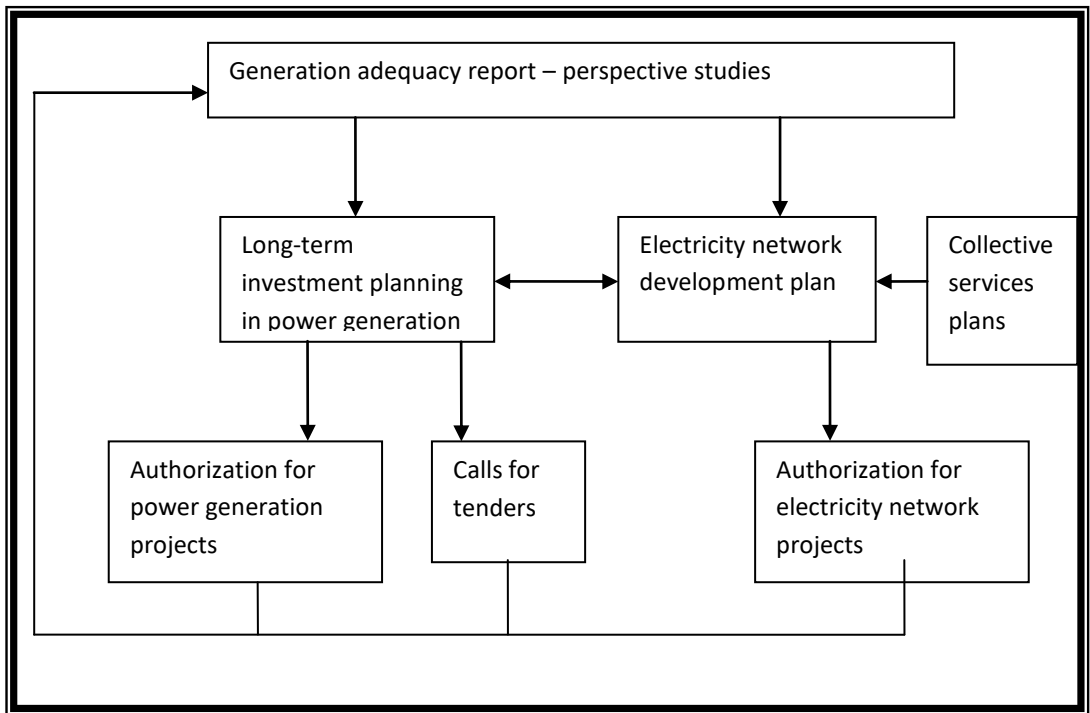
Fourth, all the investment projects are divided into large, middle and small projects (according to the investment amount and the amount of non-current assets of the electricity network company). Large investment projects are supposed to get through the additional approval procedure due to larger scale and risks associated with their implementation. We believe that ranking the investment projects should be based on the principle “strategic importance” rather than on the principle “scale of the project”. Even small and middle-scale projects might have a more significant impact on the development of the electricity network company. Listing the strategically important investment projects will allow the company’s management to concentrate on the social, economic and financial results of project implementation.

Fifth, the approval of the investment project depends on some aspects such as economic efficiency and sources of investment finance that play a prominent role while determining cash-flow necessary for the project implementation.

The particularity of the sources of investment finance lies in the fact that the electricity network development is accomplished directly or indirectly at the expense of the electricity consumers by including the required investment expenditures into the regulated tariffs in the form of the profit to be gained at the end of the regulated period. The volume of investment finance also depends on the depreciation amount covered by the regulated tariffs and on the loans provided by the financial institutions.

How to predict and forecast the regulated tariffs and the required and affordable investment? The reply is the “Development Forecast” project. It is an instrument for controlling the electricity industry development. This forecast has been prepared on an annual basis (since 2002) by Energy Forecasting Agency. The forecast horizon is eight years. Among the project participants there are electricity and heat generating,

transmission, distribution, supply companies as well as System Operator. The goal of this development forecast is to prepare such an investment and operation program of a power company that insures the non-critical development of the Russian electricity industry by maintaining the electricity and power demand-supply balance with respect to the future growth rates of the electricity and heat tariffs.



**Figure 2.** Organization of the electricity industry development forecasts in Russia

The corporate forecast for each type of business activity comprises a number of performance (both operational and financial) indicators that provide the detailed characteristics of the future operation and investment program of various power companies. This information is used then to make up a joint forecast for the whole Russian electricity industry. The joint forecast results in the mid-term investment program based on the development strategy of the electricity market participants taking into account the margins of the regulated electricity tariffs. Such an investment program also depends on technical conditions of the facilities as well as on the development plan of the electrical power system.

The “Development Forecast” project has indeed many positive aspects. Although as we may outline it has some disadvantages.

- Data reliability given in the forecast. On the one hand, only a small number of large companies are ready to provide the power company

with the vision of their development. As a rule, this is a strategic information, and therefore, confidential. One should not count on this source of information. On the other hand, the regional government may provide the power company with various socio-economic development plans whose implementation might take place in the future. However, the majority of these projects may not come into effect at all. We believe that such an active position of the regional government might be explained by the desire to highlight the necessity of the electrical power system development in the region. If the electricity industry potential in the region is high, then we have higher indices of social and economic development, therefore, the less organisational and financial problems need to be coped with by the regional government in the future. Such a diplomatic approach is based on the principle “the more is better”. However, it does not reflect the critical evaluation of the forecasted demand in electricity and power.

- Scenario framework does not fully take into consideration the regional features of the electricity industry development. This document only provides the general tendencies of social and economic development of the country and does not investigate the specific cases. Regional Energy Programs could be a due addition to the scenario framework though the issue of their elaboration is not yet decided.

#### **4. Mechanism of investment management in electricity transmission**

Let us now display the algorithm of interests' alignment between the electricity network company and the state, while managing the investment in electricity transmission. This algorithm is presented in the mechanism of investment management (fig.2) and it explains how the investment projects should be planned, organized and implemented in the electricity network company.

The mechanism incorporates such elements as the efficiency of capital renewal, the investment ideas, the methods of investment management, the sources of investment finance and the investment management process. The latter can be divided into three phases: pre-investment, investment and post-investment.

The pre-investment phase is a preliminary stage of investment activity where the investment ideas are arisen as a result of efficiency assessment of assets renewal. Using one of the methods of investment management these ideas are transformed into specific investment proposals and are included into the list of investment projects. The clarification of the sources of investment finance and the evaluation of the investment project efficiency according to the investment goals and investment criteria are carried out at this phase. The methods of state regulation and corporate planning of investment activity should be interdependent and mutually complemented.

The investment phase could be called the phase of active investment as the investment decisions are made and volumes of investment finance are approved at this stage.

A return on investment is carried out at the post-investment phase. The ways to get a return on investment vary. They depend to a large extent on the peculiarities of pricing schemes for the regulated services rendered by the electricity network company as well as on the sources of investment finance. The latter include the corporate income devoted to the operation development (which is included into the regulated tariff), network connection charges, federal and regional budgets, borrowed assets. A correspondence of results to the initial investment goals is analysed at this stage as well.

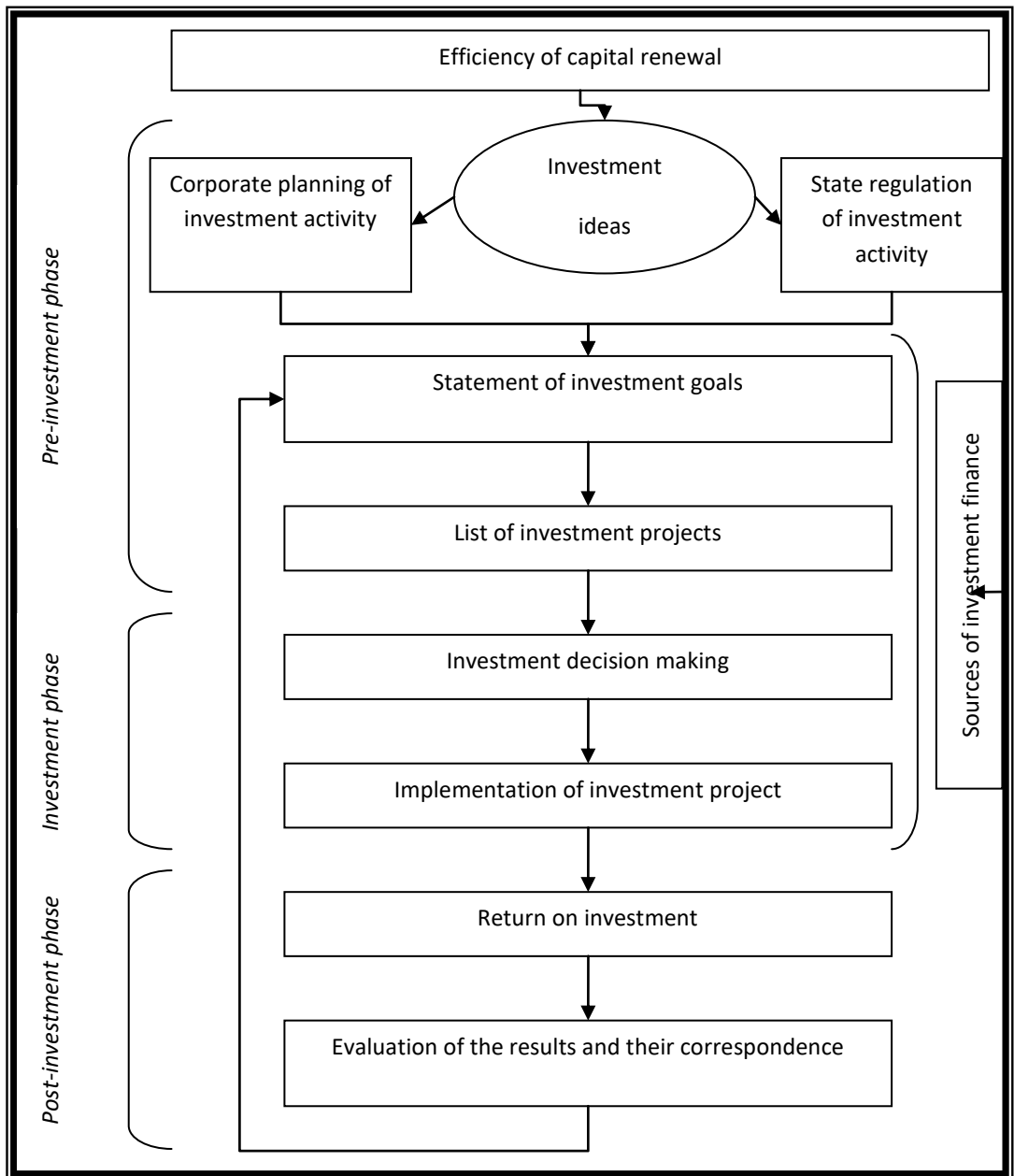
In Russia the pre-investment and investment phases are of high priority. The return on investment is expressed in the amount of corporate income, and eventually, in dividends, which are regulated and do not depend neither on the efficiency of the investment project, nor on the amount of assets of the electricity network company. The absence of motivation to evaluate the results and their correspondence to the initial investment goals is explained as we believe by this reason.

## **5. French approach and its application in Russia**

Are there any best practices worldwide that we could refer to in order to suggest some improvement measures, which might bring some input into the Russian electricity industry? One of the cases researched was France.

We believe that the French approach for organizing the state forecasting system could be of use in Russia. In this European country the major role in the forecasting process is played by the Energy Regulatory Committee (CRE). CRE is managed by nine independent directors, who are responsible for relevant fields of expertise of the regulator, particularly in judicial, socio-economic and technical spheres. It, in fact, controls the management of the French electricity transmission company. Thus, the system approach being a fundament of the French electricity industry regulation allows combining various aspects of the routine regulation of the electricity network companies and of the forecasting and long-term planning of the electrical power system development. Therefore, state regulation of investment activity prevails over corporate planning as methods of investment management in the French electricity transmission industry.

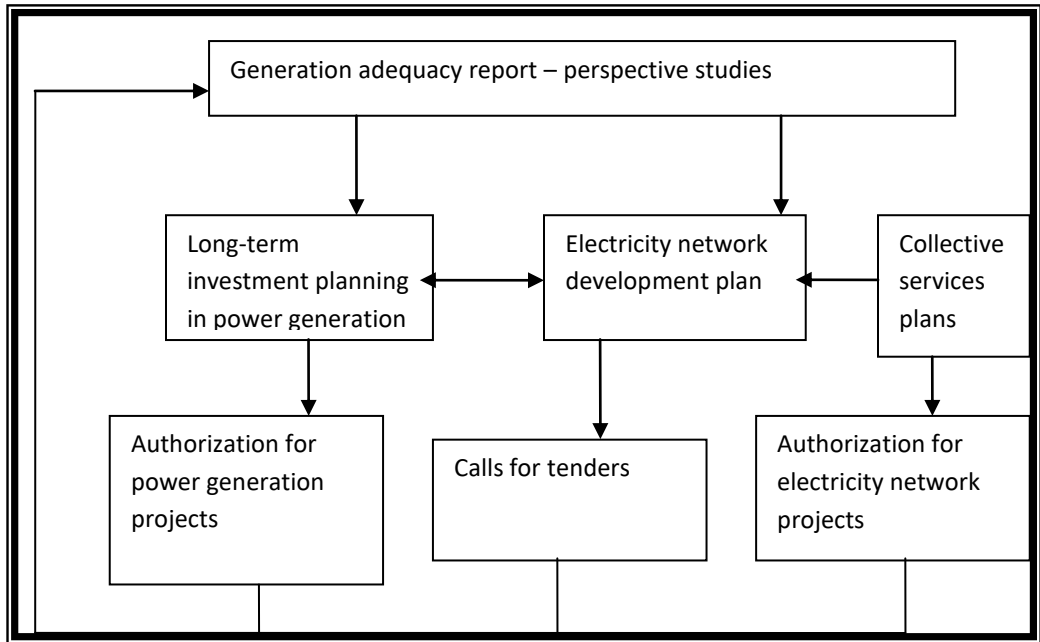
Investment decisions in France, both electricity network and power generation development, are based on the electricity network development plan. This plan represents an essential part of the general logic of forecast elaboration in the middle and long-term of the electrical power system development. It is an element of the forecasting and investment decision process in the French electricity industry (fig. 3).



**Figure 3.** Mechanism of investment management in electricity transmission

The study of the scenarios of the demand growth and of the power generation development in a long-term is the basis of the generation adequacy report. The latter defines conditions of the power supply reliability at the national level. The long-term investment planning in power generation (*Programmation pluriannuelle des*

*investissements de production électrique 2005 – 2015*) determines the goals of power generation development with regard to the regional energy security. This document is, in fact, a homologue of the Regional Energy Programs elaborated in Russia. It provides among others the analysis of environmental issues, CO<sub>2</sub> emission quotas.



**Figure 4.** Forecasting and investment decision process in the French electricity industry (Schéma de développement du réseau public de transport d'électricité 2003-2013, p.3)

The collective services plans reflect the necessity to implement a long-term planning of the nine public policies structured for territory distribution (arrangement) by integrating the required conditions of sustainable development.

The generation adequacy report and the collective services plans are the elements for preparing the long-term investment planning in power generation, which reflects strategic goals of power generation development. These goals are achieved through the authorization system for power generation projects and in some cases through the calls for tenders.

The study of the electricity infrastructure development is carried out via pre-requisites defined by the electricity network company out of the generation adequacy report, the long-term investment planning in power generation as well as out of the data collected at the local level. This study allows to determine the margins and other conditions that could influence the development of the electrical power system

for the next 10-15 years and to take them into consideration while elaborating the electricity network development plan.

Alternatively, identifying the limitations in the electricity network development plan contributes to the localization of new power generation plants to be mentioned in the long-term investment planning in power generation. As a matter of fact, locating a power plant at a specific site is in most cases determined by transmission constraints in the area.

The analysis of the investment decision process in electricity transmission shows that this process in France compared to the one in Russia is characterized by a larger degree of social responsibility taken by the electricity network company when making an investment decision. For that a special attention is drawn to public relations, whose interests are taken into account when the ideas on the investment project appear. Consequently, the comments and remarks expressed by the public are considered during project engineering.

Thus, electricity network development in France, which is a public economic sector, inseparably connected to the investment project approval process not only at the state level but also at the public level. Investment project implementation has a direct impact on the public interests and the social and economic development of the country.

As a general comment, we should note that both the French and the Russian approaches to organization and priority determination of electricity infrastructure development are based on the electricity network development plan.

The peculiarity of this trend of state regulation of investment activity performed by the Russian electricity network company resides in the lack (unlike in France) of integrated approach interconnected with all the steps of electricity supply process. Liberalization of the electricity market followed by restructuring the electrical power systems resulted in the unbalance of interests of market participants. This problem was already discussed in the economic literature (*Belyayev et al. 2003, p.61*). As a result, nowadays there exists a one-sided approach to the electricity network development in Russia oriented towards the resolution of current and evident problems of electricity supply without taking into consideration the alternatives of power plant development, mainly heat power plants.

In today's environment as we assume the state has less capabilities on how to evaluate and to predict where, when and by who a new power plant construction project will be carried out.

## **6. Conclusion**

The analysis of the methods of investment management in electricity transmission in Russia shows that corporate planning of investment activity coexists on a parallel basis with state regulation of investment activity. State regulation provides the electricity network company with clear strategic goals and strategic initiatives regarding the electricity infrastructure development. Corporate planning considers the interests of the electricity network company. Elaboration of the efficient investment programs is associated with the difficulties of reliable development forecasting, regional features, tight deadlines for preparing the investment programs, centralized investment decision making.

The French approach to managing investment in electricity transmission could be of use in Russia. Corporate planning of investment activity in France conforms to the goals of state regulation due to the fact that investment decisions are eventually made by the Regulator, which manages the electricity transmission company. Investment decision process is characterized by a larger degree of social responsibility taken by the electricity network company when making an investment decision. For that a special attention is drawn to customers, public service users, whose interests are taken into account at the initial stage of investment process.

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