The Contribution of Innovation Activity to the Output Growth of Emerging Economies: The Case of Kazakhstan

Sholpan Smagulova*, Saltanat Mukasheva**

Abstract

The purpose of this study is to analyse the state of the energy industry and to determine the efficiency of its functioning on the basis of energy conservation principle and application of innovative technologies aimed at improving the ecological modernisation of agricultural sectors of Kazakhstan.

The research methodology is based on an integrated approach of financial and economic evaluation of the effectiveness of the investment project, based on calculation of elasticity, total costs and profitability, as well as on comparative, graphical and system analysis.

The current stage is characterised by widely spread restructuring processes of electric power industry in many countries through introduction of new technical installations of energy facilities and increased government regulation in order to enhance the competitive advantage of electricity market.

Electric power industry features a considerable value of creating areas. For example, by providing scientific and technical progress, it crucially affects not only the development but also the territorial organisation of productive forces, first of all the industry.

In modern life, more than 90% of electricity and heat is obtained by Kazakhstan's economy by consuming non-renewable energy resources: different types of coal, oil shale, oil, natural gas and peat. Therefore, it is significant to ensure energy security, as the country faces a rapid fall back to mono-gas structure of fuel and energy balance.

However, energy resources in Kazakhstan are spread very unevenly.

Its main supplies are concentrated in northern and central parts of the republic, and the majority of consumers of electrical power live in the southern and western areas of the country.

However, energy plays an important role in the economy of industrial production and to a large extent determines the level of competitive advantage, which is a promising condition for implementation of energy-saving and environmentally friendly technologies. In these circumstances, issues of modernisation and reforms of this sector in Kazakhstan gain more and more importance, which can be seen in the example of economically sustainable solutions of a large local monopoly company, significant savings in capital investment and efficiency of implementation of an investment project.

A major disadvantage of development of electricity distribution companies is the prevalence of very high moral and physical amortisation of equipment, reaching almost 70-80%, which significantly increases the operating costs. For example, while an investment of 12 billion tenge was planned in 2009 in this branch, in 2012 it is planned to invest more than 17 billion. Obviously, despite the absolute increase, the rate of investment is still quite low, as the total demand in this area is at least more than 250 billion tenge.

In addition, industrial infrastructure, including the objects of Kazakhstan electric power industry, have a tangible adverse impact on the environment. Thus, since there is a large number of various power projects that are sources of electromagnetic radiation, the environment is deteriorated.

Hence, there is a need to optimise the efficiency of the organisation and management of production activities of energy companies, to create and implement new technologies, to ensure safe production and provide solutions to various environmental aspects. These are key strategic factors to ensure success of the modern energy sector of Kazakhstan.

The contribution of authors in developing the scope of this subject is explained by the fact that there was not enough research in the energy sector, especially in the view of ecological modernisation. This work differs from similar works in Kazakhstan in the way that the proposed method of investment project calculation takes into account the time factor, which compares the current and future value of profit from the implementation of innovative equipment that helps to bring it to actual practise.

The feasibility of writing this article lies in the need of forming a public policy in the industrial sector, including optimising the structure of energy disbursing rate, which complies with the terms of future modernised development of the domestic energy sector.

Keywords : Kazakhstan, Energy Saving, Investment, Innovation, Ecology.

JEL Classifications : O13, O31, O33, O44, O53

* Professor, Faculty of Economics and Management, Turar Ryskulov Kazakh Economic University (KazEU). 55 Zhandosova Street, Almaty, 050035, Republic of Kazakhstan. Tel: +7-727-377-13-34, Fax: +7-727 377-13-34, E-mail: tavld@mail.ru

** Corresponding Author, PhD student, Department of Management and Marketing, Al-Faraby Kazakh National University (KazNU). 71 Al-Farabi Avenue, Almaty, 050038, Republic of Kazakhstan. Tel: +7-727-330-49-22, +7-701-777-66-24. E-mail: alsalta82@mail.ru

I. Introduction

Active man-induced activities over the past three decades have led to an increased burning of fossil fuels, which filled the atmosphere with the so-called "greenhouse" gases. In order to combat the global climate change, foreign countries implement various measures to reduce emissions and use energy-saving programs.

In order to ensure the sustainability of the national economy, especially in post-crisis conditions, taking into account the aftermath of depression, and even the so-called latent course of the crisis, governments tend to support the priority sectors of the economy, to diversify its structure. Given the negative results of the financial crisis, companies and enterprises will gradually increase the production of goods on a global scale, which in turn will lead to the entire greater global demand for energy raw materials. At the same time, the environmental degradation takes place, and the reserves of mineral resources (oil, coal and gas are rapidly declining. In this situation the governmental and business activities on energy conservation are top priorities.

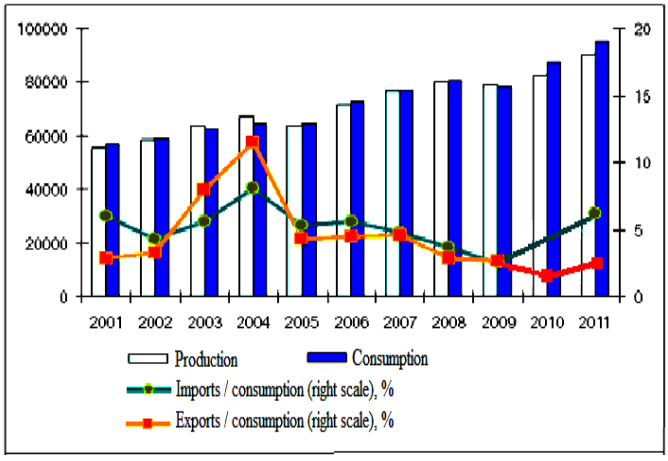
Problems of sustainable productivity growth based on innovation, increased reliability of technological processes, reduction of harmful emissions into the atmosphere are crucial areas of governmental regulation, since small and open economy, such as the one of Kazakhstan, has a fairly large area (9th place in the world), and natural resources (oil, iron ore, coal, etc.), but insignificant amount of labour force, amounting up to 8.9 million people from the general population 16.4 (Table 1).

There is no doubt that for such a large territory there is an apparent lack of manpower in the country. Therefore, in order to achieve the progressive development, Kazakhstan should ensure the economic growth by reducing the expenses, implementing the principles of economy modernisation, introducing new technologies, training of staff.

During research it was found that for the sustainable growth of productivity and income, taking into account the specific aspects of the economy one should consider the level of production and consumption of electricity in the Republic of Kazakhstan (RK) on the basis of innovation activities. Oneexample of such development can been viewed in cheaper energy, leading to significant economies of scale of production, i.e. a rapid growth of production will take place.

Thus, in the next decade in Kazakhstan the technological basis of the energy sector is expected to be undergorevolutionary changes, which will entail fundamental changes in the organisational structure of energy economy, in this context, the relevance of this study is determined by identification of rational directions of development and search for optimal ways to enhance innovation technologies, efficiency of production and use of energy. This means that energy efficiency is one of the most vital issues in the modern world and the place of Kazakhstan among the economically developed countries as well as the welfare of its citizens depends on the results of solving this problem.

II. Institutional Reforms of the Electric Energy Sector



Source: Official data from the Agency on statistics of the Republic of Kazakhstan (2012)

<Figure 1> Production and consumption of electric power, million kWh

The conducted analysis demonstrates that over 90% of all electricity generated in Kazakhstan was produced by thermal stations, and the rest of it was generated by hydroelectricity, which indicates that there are almost no alternative stations to them in the RK. At the same time, 11 power plants, generating 50% of electricity, are part of large industrial companies and manufacture and supply electrical energy for them. Since 2001, growth in electricity consumption in Kazakhstan increased by 4.9% on average per year (Figure 1). Thus, according to Figure 1, if 48,663.6 million kW / h of electricity was

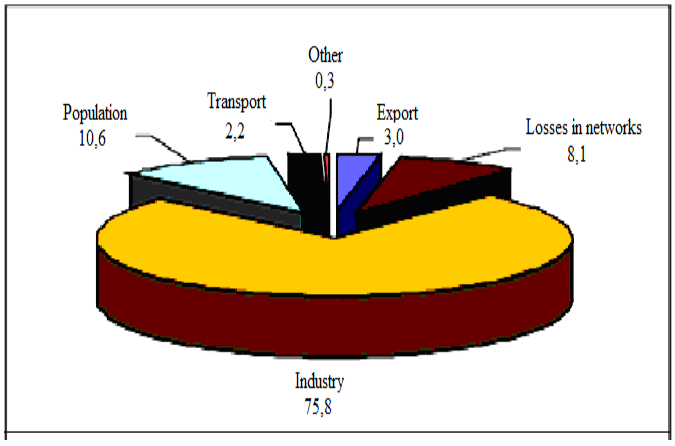
<Table 1> Social and economic determinants of Kazakhstan, 2001-2011

Determinants	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Population in million	14736421	14800959	14866837	14951200	15074767	15219291	15396878	15571506	15982343	16204 617	16441959
GDP, %	113,5	109,8	109,3	109,6	109,7	110,7	108,9	103,3	101,2	107,3	107,5
Investments into the main capital, in million tenge (1 US dollar = 148 Kazakh tenge)	n/a	n/a	1327864	1703684	2420976	2824523	3392122	4210878	4585298	4653528	4839669
The share of innovation products in GDP, %	n/a	n/a	1,07	1,27	1,58	1,53	1,19	0,69	0,51	0,66	0,69
Averagemonthly nominal salary, US dollars	118	133	155	208	256	324	428	505	456	527	610

Source: Official data from the Agency on statistics of the Republic of Kazakhstan (2012) n/a –no data

produced in 2001, 86996.4 million kW / h were generated in 2011, which was an increase of 79%. In 2009 there was a slight decrease in production and consumption of electricity due to the decline in industrial production because of the global financial crisis.

The industrial consumption accounts for 75% of total electricity consumption, the households account for 10.5%, transport uses up to 2.2%, 3.0% is exported, the loss equals to 8.1% (Figure 2).



Source: Official data from the Agency on statistics of the Republic of Kazakhstan (2012)

<Figure 2> The share of electricity consumption by sector, %

Over the past few years quite promising and high-quality institutional reforms of the electricity sector have been carried out in Kazakhstan:

- a Joint-stock company "National Welfare Fund (NWF JSC)", "Samruk-Kazyna" (2008) has been founded;
- a plan of action for the development of power industry of Kazakhstan for 2007-2015 has been drafted;
- the Law of RK "On natural monopolies and regulated markets" has been approved;
- The Government program of Forced industrial-innovative development (FIID) of Kazakhstan, part of which is a program of the electricity industry development for 2010-2014. While implementing this program, the state will almost completely abandon the import of electricity.
- the Law of RK "On energy saving and energy efficiency" as of January 13, 2012 was introduced.
- the Law of RK "On introducing amendments and adjustments to some legislative acts on energy conservation and energy efficiency issues" as of January 13, 2012, entered into force, etc.

Modern power engineering of the national economy includes the entire scope of enterprises,

installations and structures, links them to economic relations, which ensures the functioning

and development of energy resources production (manufacture) and of all the processes of transformation to the ultimate consumer units.

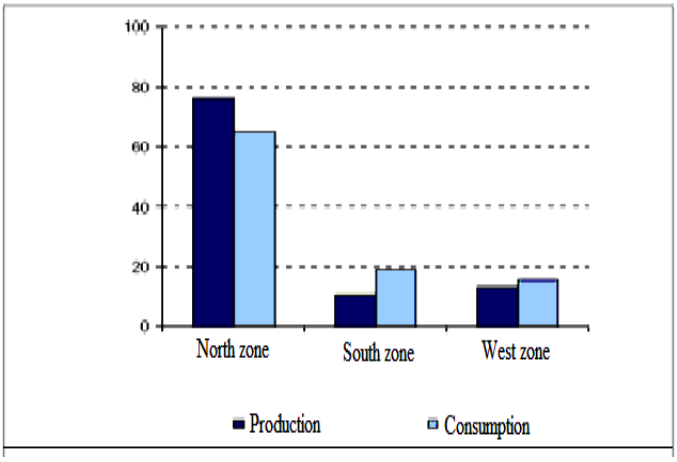
In general, the Republic is self-sufficient in electricity supply, the net imports are insignificant, but due to current network systems the Southern and Western regions of Kazakhstan are forced to import electricity, while the Northern region is obliged to export to Russia (Table 2).

<Table 2> Ratio of consumption, import, export, loss in networks during electricity manufacturing

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Production	100	100	100	100	100	100	100	100	100	100	100
Import	6,2	4,3	5,5	7,8	5,4	5,7	4,8	3,7	2,5	6,6	6,9
Export	3,0	3,4	7,8	11,1	4,3	4,6	4,6	2,9	2,7	0,5	0,7
Net import	3,2	0,9	-2,3	-3,3	1,1	1,1	0,2	0,8	-0,2	6,1	6,2
Consumption	103,2	101,0	97,7	96, 8	101,1	101,1	100,2	100,8	99,7	106,1	106,2
incl. losses in networks	11,7	10,0	9,7	10,2	10,6	9,5	9,6	8,9	8,2	9,5	9,6

Source: Official data from the Agency on statistics of the Republic of Kazakhstan (2012)

Kazakhstan is divided into three main energy regions. The vast amount of electricity (70%) is produced in the northern part of Kazakhstan (Fig. 3). An apparent lack of electricity infrastructure in the country prevents the provision of electricity to the southern and western regions and calls for cross-border trade with neighbouring countries.

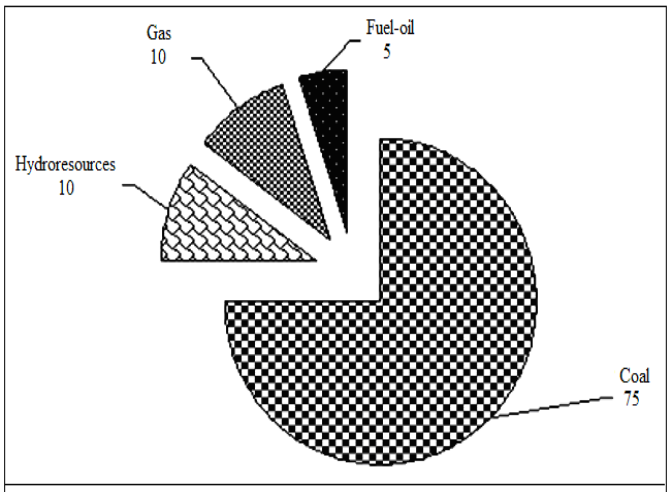


Source: Official data from the Agency on statistics of the Republic of Kazakhstan (2012)

<Figure 3> Electricity production by region, thousands of kilowatt-hours

A dominant natural resource to generate electricity in the RK is coal which can be explained by hugecoal reserves in the Northern and Central Kazakhstan, where the largest state power stations were built. These regions are self-sufficient in electricity supply, and potentially have some it in surplus, which can be offered to domestic and foreign markets.

The Southern Kazakhstan does not have sufficient primary energy resources, its power generation is based on imported coal and gas imports. The region of Western Kazakhstan partially covers its electricity needs by importing it from Russia. However this region, unlike the Southern part of the country, has its own reserves of hydrocarbon fuels. With the development of existing fuel resources Western Kazakhstan can get an opportunity to meet their own needs (Figure 4).



<Figure 4> Production of electricity in Kazakhstan, in %

Of the investigated models of scientific and innovative development of the industrialised countries, Kazakhstan is inherent in the direction in which the country focuses on encouraging innovation by means of developing the innovation infrastructure. This situation is explained by the fact that the basic foundations of the energy sector of the economy are morally and physically in a worn-out condition. In other words, the following industry has a very high amortisation of equipment: 70% of the generating equipment, 65% of the electrical network, 80% of the heating network are worn-out, which brings it to the critical value (Makhmutova & Akhmetov, 2011). This calls for a need for modernisation and innovation through increased investment in fixed capital, aimed at creation and reproduction of fixed assets. The data in Table 1 demonstrate an increase in inflow of investment resources from 2003 to 2011 by 3.6 times, including in the power branch. However, over the past three years, the growth pace began to decline, due to the global crisis, decline in domestic demand and GDP, lack of funding, companies with low-management in the field of innovative technologies, etc.

It is estimated that an average of no more than 1% of GDP (Table 1) is spent on innovation in the country while the developed countries allocate 6.4% of GDP to it. Given the fact that Kazakhstan does not enough manpower, but an excess of natural resources, we propose to enhance the implementation of innovation to help increase the GDP production while modernising the electric power sector, as there is a high direct correlation between the both. The path that Kazakhstan has chosen lies in the technologies transfer, what Japan and South Korea once did at some point. Technological modernisation assumes that the State will provide significant assistance to electric power companies in such a transfer.

For instance, the FIID State programme (2010, 2014) launched a systematic approach through industrialisation of the seven core priority sectors: chemical, nuclear industry, engineering, pharmaceuticals, building industry, energy, transport to innovate and create economic sectors in the future economy on the basis of labour productivity growth which will result in diversification of the national economy.

III. Evaluation of Implementing Innovation Technologies

During the lastdecade, increased production of GDP led to an growth in electricity demand. Econometric research shows that a significant factor influencing the level of GDP in the country is the electricity sector. Thus, the assessment of elasticity of electricity consumption in relation to GDP ratio is around 0.55%. The economic interpretation of the elasticity indicates that a 1% growth in real GDP leads to a 0.55% increase in electricity demand.

In future, if this trend persists, Kazakhstan will have obvious problems with the lack of its own offer on the backdrop of increased demand from manufacturing companies and enterprises. The main measure to eradicate this negative situation is the introduction of energy-saving technologies based on innovative equipment that will reduce flexibility and allow for the industrial sector's own energy resources.

Let us consider a practical example of the company in the energy sector: Company AlmatyEnergoSbyt represents a natural monopoly of the largest metropolis in Kazakhstan, in the city of Almaty (population equals to about 1.5 million people).

The State authority in accordance with the legislation of the RK, coordinating the natural monopolies and on the regulated markets (including the energy sector) is the Agency of the Republic of Kazakhstan on Natural Monopolies Regulation (ANMR). Its main activities include the development of proposals for the formation of public policy in the management of economy sectors, regulation and supervision of natural monopolies in terms of rates, price controls on those entities of the goods market that occupy a monopoly position, including the electricity sector and to some extent the ecology sector. Generally, environmental problems have earlier been investigated by A. Pigou (Pigou, 1920), who devoted great attention to issues of state regulation in the environmental sector. However, except for state intervention and regulation, the only positive influence on the environment can be made by the enterprises themselves. (Coase, 1937)

Therefore, the electricity prices are set by the Company AlmatyEnergoSbyt in accordance with the requirements of ANMR, and as a result, the disbursing rate structure for consumers is made of:

- purchasing electricity from suppliers (55.5%),
- cost of transportation and delivery (38.4%),
- overhead costs for services and other (6%).

Since 2009 Kazakhstan has introduced a new mechanism of prices regulation. In particular, the base rate in 2009 grew by 9.9%, in 2010 by 17.6%, and in 2011 by 13%, which is associated with a general increase in prices by electricity producers due to introduction of limit rates, as well as with the repayment of investments, called to create new facilities, bring about expansion, renovation, reconstruction and modernisation of existing facilities.

Thus, due to the differentiated electricity rates, only in 2010, depending on the volume of consumption and the zones of day, about 248 million kW / h of electricity was saved, accounting for 2.3% of total electricity consumption by the population. For example, the production of a specified amount of electricity would have cost 62 thou-

sand tons of coal (1,000 carriages) with a value of about 3 billion tenge (about $ 21 million).

However, the annual increase in electricity tariffs, both for the population as well as for manufacturing enterprises is costly measure. For this reason, we propose an innovative investment project and modernisation of energy production in order to obtain economic benefits through the use of environmentally friendly energy-saving technology "Luminous paint", which is consistent with all the necessary standards, as proven by sanitary and epidemiological tests, radiological regulations, certificates, allowing to produce and distribute these products.

Accumulating the energy of light during the day, or accumulating it from artificial light, an image applied by the "Luminous paint" starts to glow in the dark or when the lights are turned off. The paint contains of the luminescence materials which have the property to store light energy and then radiate it for a long time period. When applied in the production of raw materials it allows illumination to last up to 6-10 hours. The glow may occur due to the slow oxidation of substance in the air (such as white phosphorus, luciferin in some insects, microbes, fungi, fish). Such substances without access to an oxidant (i.e. oxygen) are not illuminated, and with increasing temperatures the illumination of these substances goes up (Germanovich & Turilin, 2010). The technology "Luminous paints" can be applied in mines, tunnels, pipelines, underground, escalators, transitions, sightseeing caves, illumination of tall buildings, bridges, road markings, construction of traffic signs, information boards pointing on highways, warning signs of vehicles etc.Let us carry out financial and economic analysis of funds needed to implement an innovative project by AlmatyEnergoSbyt Company. In the preparatory period, the following scope of work must be performed:

1) a bank loan should be obtained;
2) a contract for rental of premises should be signed;
3) the staff should be selected;
4) contracts for the supply of raw materials and consumables should be signed The basic amount of capital investment is associated with acquisition of raw materials and associated costs (Table 3). The project does not imply the use of its own funds, and will be financed through a long-term loan taken in one of the commercial banks, for instance, in Halyk Bank (for 10 years at 13% per annum, in the amount of 5,121,000 tenge). It is assumed that the repayment will be made in equal instalments.

<Table 3> Total costs necessary to open a business

№	Determinant	Total, tenge
Current expenses at the initial stage		
1.	Rent including utilities	6000
2.	Goods purchases	4600
3.	Office supplies - rent	30
4.	Telecommunications and Internet	5000
5.	Transport expenses	1000
	Total:	46600

The cost of one ad unitis 55,000 tenge, then, provided that within a month 50 billboards can be installed and arranged, and one billboard requires 1 kg. paint, one can calculate the monthly expenses: (4600 +55000) * 50 = 2,980,000 tenge.

The energy sector is characterised by a high unit of weight of the basic means of production, which is associated with a significant capital-intensiveness of the energy projects. Based on the available data, the total costs (TC) on the establishment of billboards this month can be calculated:

TC = 2980000 + 320000 + 6000 + 5000 + 1700 + 30000 = 3700 tenge.

Let us define the articles of fixed and variable costs per month based on the usage of new environmentally-friendly and energy-efficient technologies (Table 4).

<Table 4> Determining the costs for installation of «Luminous paint»

№	Costs	Total
1	**Fixed costs**	
1.1	Rent	6 000
1.2	Loan repayment	42675
1.3	Salary for employees	320 000
1.4	Telephone and Internet services	5 000
1.5	Electricity costs	1700
1.6	Insurance fees	-
Total fixed costs		*374 375*
2	**Variable costs**	
2.1	Rent of office equipment	30 000
2.2	Costs for purchasing raw materials	230 000
2.3	Costs for purchasing advertising boards	2000
2.4	VAT	357 600
2.5	CIT	660 000
2.6	Social tax	64 000
2.7	Pension fund fess	64 000
2.8	Deposit for the rent	4 000
Total variable costs		*4600*
	Total:	4975

Provided that the useful life of "Luminous paint" is 30 years old, and the total cost is 4,533,975 tenge, we can calculate the annual costs:

4,533,975 tenge / 30 years = 151 133 tenge

A comparative analysis of the application, for example, of billboards covered with glowing colours and the usual «Light box» showed significant savings due to introduction of innovative equipment (Table 5).

<Table 5> A comparative analysis of alternative options

Costs for installation of «Light box»	Costs for installation of advertising boards, covered with illuminated paint	Saving from implementing ""Luminous paint"
22 tenge	4533 tenge	18 tenge

Based on the established rates for electricity, we can calculate the cost of servicing one Light box, that works only at night, particularly from 19.00 to 07.00 per month:

200000 + 90 + 60+ 22 + 30 + 50000 + 1= 454 tenge

Then the cost of 50 «Light boxes» would amount: 454 135 * 50 = 22.706.750 tenge.

Net earnings (NE) of the project can be calculated using the following formula:

NE = Gross Profit - Taxes = 12,493,200 tenge.

Hence, using the technology "Luminous paint" for the design of outdoor advertising one can save: 22,706,750 tenge - 4,533,975 tenge = 18,172,775 tenge

Therefore, we can calculate the cost-effectiveness (R) Project: R = 1551850/2980000 = 0.5. The coefficient R = 0,5 is positive, so the investment project is profitable.

In the energy sector, when taking into account the features of current economic development with a significant duration of projects'implementation and the uncertainties of the initial information linked to it, it seems appropriate to consider the payback indicator as the most important one, which determines the investment attractiveness of the project at best. Return on investment (ROI) can be calculated through the ratio of total costs to profit: ROI = 2,980,000 / 1,551,850 = 2 years.

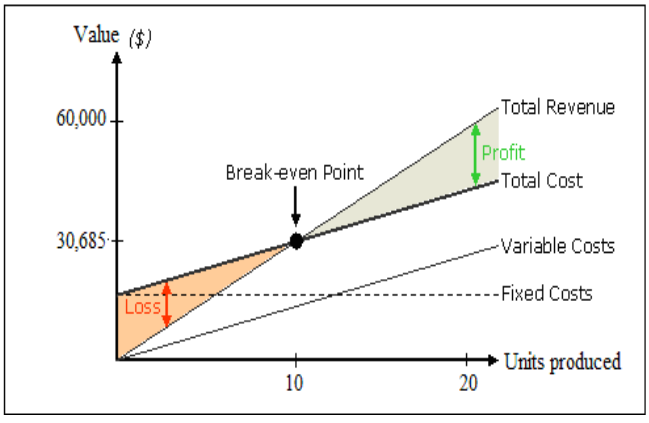
This implies that the investments in this project will be repaid in 2 years.

In order to show the volume of output at which the amount of shared profits from the sale of goods or services will be equal to production costs, it is necessary to calculate the break even point. In other words, if the amount of profit is less than the break even point, the company will incur losses, and its continued activity will not be appropriate (see Figure 5).

The Break-even Point in this investment project equals 10 units, therefore, starting with the 11th unit, the project will maximise net income on the basis of implementation of innovation.

A necessary condition for sustainable development of utilities is its good financial state. A criterion of economic efficiency of investments in the modernisation of a power facility while considering the-alternatives is at least discounted cost for the billing period, which consists of introduction of innovative equipment and the period of normal operation. For that reason we will conduct a financial analysis of the investment project. Let us consider key performance indicators of the investment project, taking into account the discount:

- a net present value (NPV) of the investment project (NPV),
- Internal Rate of Return (IRR).



<Figure 5> Calculation of break-even point

NPV or net present value of the investment project (NPV) is the difference between the discounted income in time from the project and the investment costs for it, and is calculated as follows:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \mathrm{K} + \frac{CF_n}{(1+r)^t} = \sum_{k=0}^{n} \frac{CF_k}{(1+r)^k}$$

where CF is a money flow;
r is rate of discount.

NPV demonstrates the investor the gain or loss from investments of funds into the project as compared to income gained from keeping money in the bank. In our case, NPV of the project for 10 years has a fairly high rate, namely 42%, indicating that the prospects of the project are high. Thus, taking into account the above mentioned calculations, we can assure that our proposed project on the introduction of technology "Luminous paint" is quite effective. The proposed idea does not require any additional costs, the amount of investment is sufficient, moreover, the project will be effective already at the initial stage of its implementation and will recover the costs fairly quickly, in 2 years.

The advantage of the mentioned business idea used in comparison with other developments in the field of production of clean energy has to do with the fact that it does not require allocation of additional land, it does not cause damage the environment, and the used technical methods function regardless of weather conditions, there are no problems with the delivery of components and raw materials. New energy-saving technologies not only preserve the environment and open new perspectives in the development of high technology, but also represent an economic benefit for Kazakhstan, contributing to a significant decrease in costs that are associated with high costs for energy. The opportunity of energy saving technologies would allow us to repeatedly reduce the costs of electricity consumption.

Consequently, the introduction of this innovative project can have a positive impact on lowering the base rate offered by Almaty EnergoSbyt by introducing energy saving technologies and modernisation of technologies in Kazakhstan, which in general will reduce the elasticity of the sector and ensure the national economy of energy resources.

IV. Challenges and Prospects

However, the intensity of efforts to promote energy conservation in Kazakhstan is still only in its infancy. A disturbing phenomenon in electric power industry, as well as in the whole industry of the country, is a disproportionate ratio of labour productivity and the level of average nominal salary. For example, in the national economy, the annual increase of the index of labour productivity was 4-6% on average for 10 years, while increase of an average salary amounted to 15-17% (Table 1). That is, the increase of wages rates is ahead of productivity by at least 10%, which proves a fairly high level of expenses for Kazakh economy.

In this context, the issues related to the rational use of energy resources in Kazakhstan and the use of innovative technologies become more and more important, and based on this fact the authors have revealed the following problems.

Given the vast territory of Kazakhstan the task of oil, coal and natural gas transportation becomes cumbersome, from the exploitation site immediately to power plants, also the transmission of electricity from the site of production to the consumer. This signifies a lack of attracting investment into infrastructure, equipment, technical installation, proving the expensive nature of the energy sector as a whole.

When oil and coal are exploited, burning oil and gas produces harmful substances in the form of nitrogen oxides, gaseous compounds, choking emissions of not fully processed waste, which reduces the environmental component of the atmospheric air of the country. The southern and western regions of the country remain particularly vulnerable in this respect.

Due to the fact that enterprises of the energy sector are the main market of the natural monopoly that is regulated by government agencies, a competitive relationship has not yet been developed, which leads to an ambiguous setting of electricity rates. In fact industrial enterprises and the household sector do not have alternatives to choose their electricity supplier because of that.

Proposed in this study, the innovative project requires funding, which can be covered by a loan from a commercial bank in Kazakhstan at a quite high rate of 13% per annum, while the state could support in form of asoft loan or by providing tax holidays or partial coverage of the bank interest, or by promoting the reconstruction of the existing generating capacities.

According to the results of observations, the majority of private entities can not invest into their own innovation in the energy system and the industry in Kazakhstan, as a significant deposit to cover the loan is required, there are also a distraction for an extended period from major material resources, high costs for the maintenance of power equipment in working condition, a long-term turnaround, as well as high risks of uncertainty, which altogether does not encourage entrepreneurs to attract resources into the energy sector.

The country does not have a fully developed effective methodology on energyrates, on one hand, which fairly relates to the transfer of the repair costs and restoration of worn-out equipment, on another hand there is lack of adequate accounting procedures of hourly trading in winter and summer periods. In spite of a certain effect due to introduction of the differentiated rates for electricity since 2009, no significant progress in modernising the energy sector has happened yet.

The global crisis is still ongoing, there is some volatility on the stock and oil markets, which presents certain difficulties in calculation of future inflation that should be placed at least at the mid-term perspective. Special attention should be paid to the questions of an indefinite state of price factors, directly affecting the formation of state policy on a fair system of energy rates. A groundless growth of rates of energy consumption and falling purchasing power could provoke social unrest and massive explosions.

In order to solve the above mentioned problems, the following recommendations and ways to improve the functioning of the energy market in Kazakhstan should be considered.

Given the high degree of amortisation of generating capacity, a focus should be made on developing alternative energy sources in Kazakhstan, according to the basic provisions of the State program of forced industrial-innovative development of Kazakhstan, which stresses the need to develop nuclear energy and the use of environmentally friendly technologies.

As noted above, modernisation of the energy sector in the country isimpossible without the governmental support, which provides for the introduction of government guarantees and financial investments into the energy sector, based on legislative acts, government programs and development plans of the industry.

By investing into energy-efficient solutions the State will provide both energy security and sustainable growth, as well as job creation, improvement of economic activity and of the environment, will enhance favourable conditions on behalf of institutional frameworks for direct foreign investment in the electric power industry of Kazakhstan, i.e. by means of state subsidies, transfers, tax incentives, co-investment projects.

However, the Government should strengthen the long-term lending to the Kazakh sector of energy production and distribution by second-tier banks, should increase the competitiveness of the electricity on the domestic and foreign markets, taking into account innovative technologies in order to achieve a more energy-efficient economy; it is also necessary to carry out modernisation of the backbone enterprises of the Republic. For example, only 13 of the largest Kazakh companies account for more than 40% of total electricity consumption in the country; a rational and economical use should be implemented, as well as optimisation of production modes, transmission, transportation and consumption of electricity and thermal energy. The Government should improve the quality of electricity services for the public and businesses through development and revision ofrates, implement structural and regulatory reforms, depending on the modernisation of industry, ensure regular monitoring, reporting and evaluation of the implementation of institutional reforms in the energy sector, actively implement innovative technologies and look for ways to use renewable energy sources in order to achieve hydro power.

It is expected that in the Republic of Kazakhstan, covering the energy needs in the nearest future will take place with the following changes in energy demand: the share of coal will increase, the share of natural gas will drop, the share of hydro power will grow, nuclear power will develop as well.

With a view of improving the electrical power sector, it is proposed to positively impact on energy efficiency of the sector, which should include measures for modernisation of fixed assets, quality management, attracting massive investment, usage of advanced foreign scientific and technological potential, and new innovative thinking to increase the attractiveness for investment.

V. Conclusions

During the course of the study I have made the following conclusions.

Currently, issues of energy saving are particularly acute, which, according to estimations, allow to reduce the level of energy consumption in the world by 2020 by20-25%. Forecast evaluation demonstrate that due to ease of use and technological properties of electrical energy, the dynamics of its global consumption will continue to outpace growth in energy consumption from an average of 3% to 5% per year.

The analysis of institutional reforms has been carried out, as well as analysis on the state of development and assessment of the availability of natural resources for the needs of electric power industry of Kazakhstan, which revealed some positive changes leading to improvement of the legislative aspects.

The particularity of energy industry has to do with the fact that it can not set the volume of production on its own and has to manufacture as many products as needed for the Kazakh consumers at the moment. Furthermore, while the Northern regions have a surplus, the Southern and Western areas import electricity from neighbouring countries, which demonstrates the disproportionate allocation of power on the territory of Kazakhstan.

However, the relative distance restrictions of electricity transportation and technological features of interaction of electric power systems, coupled with economic indicators of the value of exported electricity narrow the export possibilities from Kazakhstan.

The study stipulated that energy waste due to high amortisation of electrical power equipment and consequently large losses in its production, transportation and delivery, according to estimations, the potential for energy saving in general for Kazakhstan is at least over 20% of its current consumption. This suggests the need for a focused state energy conservation policies based on the use of innovative measures to save energy.

Although the energy sector uses different approaches to pricing, the State, on behalf of the Agency of theRepublic of Kazakhstan for Regulation of Natural Monopolies, performs a regulatory function in setting electricity rates. The volume of sales in the energy sector can be enhanced also through special rates for increased reliability of supply. At the same time, differentiated rates should be flexible and tailored to specific production and consumption of electricity for certain regions of Kazakhstan, restraining the growth of rates by stimulating the reduction of costs for the manufacturer and encouraging economical energy use by consumers.

A choice of the most effective investment decisions based on economic evaluation of the innovative project was made; it consists in comparing the capital costs for all sources of funding, operating costs and other expenditures with cash flow that will occur during sales of the manufactured energy products.

The methods of financial and economic efficiency of the innovative project has shown that energy conservation should be carried out in the country not only by reducing energy consumption, but also by encouraging its sustainable use. The use of energy saving technologies results in a decrease of consumption of high-quality fuels by many energy-intensive industries, while ensures a high efficiency, reliability, production and maximum safety of the equipment with minimal harmful effects for the humans and the environment.

Implementing the investment project as an example of a natural monopoly AlmatyEnergoSbyt through the use of environmentally friendly energy-saving technologies “Luminous paint” will result in increased reliability and saved money on the basis of full and effective use of available resources, in increased capacity of power plants, and in reductions in annual fuel consumption.

The use of innovative technologiesby the Kazakh companies can have a significant positive impact on the environment, taking into account the efficiency of energy technology. Therefore, energy-saving policy must become an economic lever to improve the competitiveness of domestic enterprises on a market where it can generate more revenue by optimising costs and to encourage the modernisation of economic sectors in Kazakhstan.

Undoubtedly, the development of energy facilities with upgraded modernised energy structures requires considerable investment and is of strategic importance for the economic growth of Kazakhstan. In this regard, forecasting the investment needs in energy resources and restructuring the energy are very important issues in solving the feasibility problems on technical and economic parameters and in implementation of alternative industrial and innovative options for energy management in the light of environmental issues.

Received: May 12, 2012.
Revised: June 24, 2012.
Accepted: July 18, 2012

References

Annual Energy Outlook (2006), US DOE/EIA, 2006, from http://www.-eia.doe.gov.

BP Statistical Review of World Energy (2011), p.l.c., London.

Davis, S.C. & Diegel,S.W. (2004), Transportation Energy Data Book: Edition 24. Oak Ridge: Oak Ridge National Laboratory, from http:// www.cta.ornl.gov/data/index.shtml.

Lee, R. (2003), The petroleum industry in the 21st century, CERA Week, Houston, from http://www.exxonmobil.com/newsroom.

Stoft, Steven (2002), *Power System Economics: Designing Markets for Electricity, Piscataway,* N.Y.: IEEE Press (with Wiley-Interscience).

Lewis, Craig (2011), Driving Clean Local Energy and Delivering the New Energy Economy (Four Corners Green Living Expo Presentation on CLEAN Programs, April 2011), Accessed 6/9/11, from http:// www.tinyurl.com/3rj6y6x.

Germanovich, V. & Turilin, A. (2010), Alternative sources of energy, practical design on the use of wind energy, solar, water, earth, biomass, St. Petersburg: Science and Technology.

Smagulova S.,(2011), *Management and development of institutional reforms in Kazakhstan*, Moscow: State University of Management.

Makhmutova, M. & Akhmetov, A. (2011), *Kazakhstan's Electricity Sector: How to improve efficiency and attract investment for modernization*, Almaty: Soros Foundation-Kazakhstan.

Pigou, A. (1920), *The Economics of Welfare*, London: Macmillan, from http://www.econlib.org/library/NPDBooks/Pigou/pgEW.html.

Coase, R. (1937), "The Nature of the Firm", Economica 4(16), 386–405.

Bazilian, Morgan & Roques, Fabien (2009), Portfolio Optimization in the Energy Sector: A Tribute to the work of Dr Shimon Awerbuch, Analytical Methods for Energy Diversity & Security.

Charles, Plott & Smith, Vernon (2008), "Handbook of Experimental Economics Results", North – Holland.

Lazard, (2009), Levelized Cost of Energy Analysis, Version 3.0., Accessed 2/25/11 from http://www.tinyurl.com/49gc24l.

Berman, R.(2006), *Economics of Natural Resources and Environment*, Moscow: TEIS.

Auty, R.M. (1999), The IMF Model and Resource-Abundant Transition Economies: Kazakhstan and Uzbekistan, Working Paper 169, November.

Babak, V. (2001), Kazakh Oil: Economic Booster or Dead Weight, Central Asia and Caucasus.

Beck, R.W. (2009), Distributed Renewable Energy Operating Impacts and Valuation Study, Phoenix: R.W. Beck, Inc., Seidman Research Institute, W. P. Carey School of Business, from http://www.aps.com/_files/solarRenewable/DistRenEnOpImpacts Study.pdf.

Capros, P. (2003), European Union –25 Members Energy and Transport Trends to 2030, Presentation on PRIMES and ACE Mathematical Models, from http://www.europa.eu.int/comm/energy/russia/events/doc/2003_presentation_energy_transport_trends_2030.pdf.

Chubais, A. (2009), Economics and Management in Modern Russian power industry: A guide for managers of energy companies, Moscow

Smith, B. (2008), *Experimental Economics*, Moscow: IRISEN.

Croucher, Matt & Hill, Alex (2009), The Market-Determined Cost of Inputs to Utility-Scale Electricity Generation, Seidman Research Institute, W. P. Carey School of Business, from http:// www.azsmart.org/.pdf.

Energy Information Administration (EIA), (2009), Electricity Cost Module, from http:// www.eia.doe.gov/oiaf/aeo/assumption/-pdf/electricity.pdf.

Energy Policies of IEA Countries (2004), Review. OECD/IEA, 2004, Energy Policies of IEA Countries: Canada, Review, OECD/-IEA.

Galbraith, J. (2008), The New Industrial State, Moscow: AST.

Global Economic Prospects, (2005), World Bank, from http://www.worldbank.org.

ICF International, (2007), Energy Efficiency Market Potential Studu, Plano: IFC International, from http://www.aps.com/_files/various-/ResourceAlt/ICF_APS_Market_Potential_Report_08-24-07.pdf.

International Energy Agency, (2011), World Energy Outlook 2011, from http://www.iea.org/weo.

Mankiw, N. Gregory, (2008), *Brief Principles of Macroeconomics*, 5th edition, Harvard University: South-Western College Pub.

Meshimbaeva, A.E. (2010), "Environment and Sustainable Development of the Republic of Kazakhstan", Statistical Yearbook, Statistics Agency, Astana.

PIRA Energy Group, (2004), Retainer Client Seminar, New York.

Rogalev, N. (2005), *Energy Economics*, Moscow: Moscow Power Engineering Institute.

Stanca, L. (2006), "The effects of Attendance on Academic Performance: Panel Data Evidence for Introductory Microeconomics", The Journal of Economic Education, 251-266.

Stoeckl, Natalie (2004), The Private Costs And Benefits Of Environmental Self-Regulation: Which Firms Have Most To Gain?, Business Strategy And The Environment, 13, 135–155.

Wilensky, P.& Livshits, V. (2001), *Evaluating the effectiveness of investment projects, Theory and Practice*, Moscow: Delo.

Wiser, Ryan & Mark Bolinger, (2010), Wind Technologies Market Report (U.S. Department of Energy, August 2010), Accessed 01/11/2011, from http:// www.tinyurl.com/4bq67uc.