PN ABY-463
Q9056

A Report of the

Office of Energy and Infrastructure
Bureau for Research and Development
United States Agency for International Development

ENERGY EFFICIENCY POTENTIAL AND STRATEGY FOR RUSSIA

DRAFT

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Energy Efficiency Project
Project No. 936-5743
Contract No. PCE-5743-C-00-2073-00

July 1993

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ENERGY EFFICIENCY STRATEGY FOR RUSSIA

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INTRODUCTION

In the former USSR, economic growth focusing on energy production instead of efficiency has transformed the formerly beautiful country to a "Toxic Wasteland." Inefficient use of energy to a large degree has caused atmospheric concentration of harmful substances 10 fold of permitted limits in 90 cities with a total population of 42 million.

Improving energy efficiency is the cheapest and the most effective way to halt further environmental degradation. Presently, Russia is experiencing a painful transition to a market economy. The success of this transition to a large degree depends on achieving economic development and environmental protection by promoting energy efficiency.

It is clear that energy efficiency is the only way to meet energy demand in a less capital intensive and less polluting manner. The potential is large, but the experience in revealing this potential is limited. Much needs to be done to create the appropriate institutional infrastructure, to develop a proper legislative and regulatory basis, and to instigate a productive combination of market-driven approaches with judicious regulation to accelerate the adoption of efficient technologies. In addition, Russia needs to train experienced professionals and mobilize public and private leadership to make energy efficiency the engine for the future environmentally friendly economic growth in Russia.

Energy intensity in the former USSR is more than two times higher than that of market economies at the same stages in economic development. Energy conservation potential is enormous. Previous governments were confused as to how to deal with energy inefficiency problem. Transition to a market oriented economy in the states-successors of the USSR could create more favorable conditions for energy efficiency improvements. This paper evaluates the way the cost-effectiveness of energy conservation measures varies with energy prices and rates of return-on-capital. Based on this analysis, first approximation of energy price elasticities for energy consumption in industrial and residential sectors were estimated.

Russia's present difficulties in producing more energy demonstrate the enormous importance of using energy conservation measures at the earliest opportunity. This is important not only in dealing with economic and energy problems, but also as a means of dealing with social and environmental problems.

Chapter 1. ENERGY CONSERVATION POTENTIAL

1.1. Evolution of Energy Intensity

Social experiments in central-planned economies have shown that **any model of a central planning is less economically efficient than a competition mechanism**. There are countless examples of inefficient energy consumption in Russia but it seems useful to overview the integral indicators for the efficiency of energy use. The integral indicator for the efficiency of energy use is the energy-intensity of national income or gross domestic product (GDP).

The tendency for energy intensity to decline is a long-term historical trend.[1] Long- and medium-term fluctuations in energy intensity exist around the general trend, caused in part by structural changes in the economy (see Figure 1.1).

There is no definite answer if this trend existed in Russia under central planing economy. Official statistics overestimates rates of economic growth and, as a result, rates of energy intensity decline. According to Yu. Kononov, in 1930-1990 energy intensity of Russian GDP approximately doubled (see Figure 1.2). Therefore opposite to general historical trend was observed in Russia.

For many years the Russian economy had been developing under very inefficient command-administrative system. All the time economic disproportions had been accumulating, and at the edge of the 90's an evident indication of this system crisis has inevitably appeared: a slump of production, growing inflation, unreasonable price structure, serious ecological problems with a relatively low level of well-being in the background.

More recent economic history doesn't give us more certainty in the identification of energy efficiency trend. Official statistics indicates that in the USSR energy intensity of the GDP dropped by 10 percent between 1975-85. However, according to national income data adjusted for inflation, energy intensity actually rose by 14 percent[2]. Thus, while the process of energy conservation proceeded rapidly in the United States and Western Europe, the opposite occurred in the Soviet Union.

Evolution of energy intensity of national income in Russia in 1980-1992 is shown in Figure 1.3. Absence of more or less powerful incentives for energy conservation prevented energy intensity from decline in Russia. Energy intensity of the already inefficient economy increased by additional 28 percent in 1990-92.

The economic crisis has caused structural changes which have increased energy intensity and lowered economic productivity. Energy intensive sectors increased their relative shares in

national income, particularly in the second half of 1992. The required deep structural changes in the Russian economy have only reached their very early stage.

The structural factor had contributed negatively to the energy intensity of the national income. The economic output declined in larger proportions than energy consumption in residential and commercial sectors. As a result, these sectors' relatively stable consumption in the background of the reduced national income has contributed negatively to energy intensity.

Reduction of energy consumption will be 365 mln. tce in 1989-1992 if energy intensity is stable. Negative structural changes partly neutralize this reduction (by 100 mln. tce (see Figure 1.4). In addition, there was a contribution from the structural factor in the industrial sector. In 1990 five basic industries - ferrous and non-ferrous metallurgy, chemical industry, lumber, pulp and paper, building material production contributed only 31 percent of industrial VA (apart from energy sector) but consumed 71 percent of energy. Structural changes reduced the shares of less energy intensive industries (machinery, light and food industries) which have 6-10-fold lower energy intensity than metallurgy, the share of which in the industrial output became smaller.

As a result, negative structural changes in the industrial sector (at the two digit level) brought another 40 mln. tce to the negative structural changes contribution to energy efficiency in Russia.

The decline in production of some basic industries is already significant, and in 1992 will probably exceed the decline of GDP. This time should be used for reconstruction in these industries and for introduction of technological improvements, including energy-efficiency improvements.

1.2. Energy Conservation Potential for the Former USSR

1.2.1. Estimates of the Technical Potential for Energy Efficiency Improvement for the USSR

While exhausting oil, gas, and coal resources, the former USSR simultaneously has been accumulating the highest energy conservation potential in the world.

Two different approaches could be used to determine the scale and structure of the technical potential for energy efficiency improvements. First, as a reference point could be used the best technologies available. Comparison with present technologies will lead to the estimation of potential gains in energy efficiency. The other approach is to use present technologies in the most technologically advanced countries as a reference point.

There are several necessary steps to estimate technological potential for energy efficiency improvements:

(1) identification of the most efficient among existing or under development energy efficient technologies;
(2) identification of the scale of possible technology application;
(3) identification of the rate of technology penetration at the market place;
(4) estimation of the structure and scale of technological potential.

1.2.2. Cross-Country Comparative Analysis

Russia has a much higher energy intensity of national income than western countries (see Figure 1.5). The gap between energy use in Russia and the West has reached striking proportions. In 1992, the Russian economy was 72 percent more intensive than that of the United States and 250 percent more intensive than that of Western Europe.

The high level of energy intensity in Russia has several explanations. Among them there are some most important ones:

- production according to a state plan and a priory prescription of manufacturers and consumers provides no checking of really needed quantities of produced goods and services by market forces;

- the system of central distribution and rationing of products stimulates higher specific consumption of all factors of production;

- policy favored production over productivity produces shortages of all factors and leads to high rates of accumulation in the national income as a means of overcoming deficits by increasing production (investment goods are particularly heavy absorbers of embodied energy);

- shortage of investments for removal of old inefficient equipment in non-energy industries explains the obsolescence of capital stock and slow reduction or even growth of specific energy consumption;

- central distribution of the major part of fixed investments, absence of incentives for innovations consequently caused technological backwardness;

- low energy prices have done nothing to encourage energy conservation;

- absence of institutional infrastructure to promote energy efficiency.

Substantial differences can be found among countries in the indexes of energy intensity, differences which prevail over long periods of time. For example, energy intensity of GDP in the Netherlands and the Federal Republic of Germany is 1.9 times greater than that in Italy. Similarly, the index for Norway is 1.7 times that of Japan. These differences are not crucial

for the Netherlands or Germany. It is important to understand the factors which cause these differences to found the potential for energy efficiency improvements as through changes in production mix, as well as through technological innovations.

Detailed international comparative study of energy intensities undertaken by I.A.Bashmakov and A.A.Beschinsky was devoted to identification of the potential for energy efficiency in Russia.[3]

An important factor making the Soviet economy more energy intensive is the level of energy consumption in the fuel and energy complex itself. Former Soviet primary energy production per unit of national income is higher than that for many other countries. Another factor relates to inefficiencies in the extraction, processing, and distribution of energy resources and energy carriers in this country.

The industrial energy used in the former Soviet Union, the United States, and Western Europe totalled 18.5, 6.4, and 5.3 megajoules per dollar of national income respectively. Potential for energy efficiency improvements in industrial sector was estimated equal to 450 mln. tce.

A detailed analysis allows to explain the structure of the gap in industrial energy intensity between the United States and the former Soviet Union. Three key differences in the industrial energy intensity of national income were distinguished: products mix; technological structure; and the efficiency of specific technologies. The relative contribution of these three factors is 45:35:20 (see Figure 1.6). The final factor contribution originates from obsolete technological structure (see Table 1.1) and lack of proper maintenance. Therefore, the gap between the efficiency of energy use in the three major branches of the national economy cannot be explained only by the large specific consumption of materials in the economy. Technological factors (35+20 percent) are predominant. This gap can be narrowed by replacing old technologies and changing the product mix of the economy. Both approaches require major capital outlays and, therefore, a long period of time for full implementation.

In the transport sector, Soviet energy intensity practically matches that of Western Europe, but is only one-half that of the United States. Freight turnover per dollar of national income in the former Soviet Union, however, was 1.9, 2.9, and 4.7 times that of Japan, the United States, and Western Europe respectively. This extremely high figure for the Soviet Union is not only due to the large distances within the country, but also the higher material intensity of national income. Materials and energy transportation is responsible for 70-80 percent of the total freight turnover. Apparently, ineffective freight traffic and false entries in freight handling records affect these factors. As to the efficiency of energy use per unit of freight handled, the former Soviet Union lags behind Western Europe and Japan, but surpasses the United States.

The combination of these two factors explains why the energy expended per dollar of national income for freight transport is less in the Soviet Union than in the United States, and is rather close to a similar index for Western Europe and Japan. The main lever for improving the efficiency of energy use in transport is to reduce freight turnover per dollar of national income

by reducing material and energy intensity. Technological potential was estimated equal to 35-40 mln. tce.

Energy consumption per dollar of national income in the commercial and residential sectors does not differ significantly among the three regions. The fact that per capita energy delivered in the United States was in 1985 twice that in the Former Soviet Union is due to two factors: (1) discrepancies in the indexes that characterize the scale of the per capita commercial and residential energy related activities, and (2) differences in technical efficiency at the point of end-use. Differences in per capita energy consumption are mainly due to the gap in residential and commercial space available per capita. Former Soviets enjoy only 32 percent as much space per person as Americans, a ratio which virtually coincides with energy consumption per capita between the two nations.[4] In other words, the gap in energy consumption is due almost entirely to the gap in the standard of living.

Taking into account differences in energy use for space and water heating, adjusted for climate and the residential building structure (the combination of single- and multi-family buildings), suggests excessive energy expenditures in this sector in the Former Soviet Union, even considering the widespread use of electric heating in the United States. The excess in the Soviet Union is estimated equal to 34 mln tce.

The 1985 index for energy intensity for non-energy needs in the Former Soviet Union exceeded that of the United States and Western Europe by a factor of 1.8 and 2.2 respectively.

Total potential for energy efficiency improvements with the application of average and new western technologies in the former USSR in 1985 was estimated equal to 530-600 mln. tce or 29-32 percent of primary energy consumption.[5]

R.C.Cooper and L.Shipper found that replacing present energy-using technology in the USSR with average Western European technology could lower energy intensities in the former USSR by 25-33%, while replacing Soviet technology with the newest Western European and American technologies might lead to a 33-40% reduction in energy intensity.[6]

1.2.3. Identification of Efficient Technologies

Several attempts to produce inventory of technical options to improve energy efficiency for the former USSR were undertaken. Any study of energy conservation possibilities has to start with collecting and systematizing vast amounts of information on possibilities for efficient use of energy in various spheres.

In 1983 V.Dobrokhotov, I.Shinkarev, V.Arakelov et al. described new energy efficient technologies by sectors of energy consumption and by industries[7]. No effort to estimate the potential savings for the whole country due to full scale application of these technologies was made in this paper.

A similar study was carried out under the leadership of S.N.Yatrov.[9] About 350 technologies are described in this book. Description includes technical parameters, economic efficiency, possible applications, and authors or producers of this technologies. No effort to estimate total volume of energy efficiency improvements potential was made.

A significant number of books and articles were published with description of specific energy efficient technologies or vintages of such technologies.

1.2.4. Comprehensive Estimates of the Scale and Structure of Technological Energy Efficient Potential in the former USSR

One of the most recent studies for the former USSR, conducted at the Energy Research Institute (Moscow) and sponsored by the Advanced International Studies Unit at Battelle, Pacific Northwest Laboratory, contains the technical and economic parameters for 120 aggregate measures to improve energy efficiency.[10] The results of this study, which contains details on savings by energy carrier, are the base for estimates made for Russia which were taken as a basis for development of energy efficiency improvement policy by the Ministry of Fuel and Energy.
The results of this comprehensive potential inventory were presented in more or less detail in a number of publications.[11]

In Makarov and Chupyatov (1990), potential was presented by energy carriers and technological processes (see Table 1.2), as well as by economic sectors. 23 technologies were described by savings potential and specific investments required to implement these measures. In much more detail this potential was described in Bashmakov and Chupyatov (1991). In this publication 10 technologies were presented for the electricity generation sector; 17 technologies for energy sector; 65 technologies for the industrial sector and 19 technologies for the commercial and residential sector. All together, 111 technologies were described. Only limited paper space prevented authors from the publication of potential inventory with all details available. Complete description of the scale and structure of the technological potential is presented in Appendix 1, based on results prepared for the PNL.

The aggregated structure of the potential for energy efficiency is presented in Table 1.3. It is the first effort known to present energy efficiency potential in this format. This approach allows one to identify "blank spots" in our knowledge of energy efficiency potential. For instance, several empty cells in Table 1.3 clearly display the lack of knowledge on energy efficiency improvement opportunities in electricity and heat generation based on coal and petroleum, and in the agricultural sector. At the same time, this approach provides a very clear and systematic picture of the possible contribution of energy conservation to reducing energy consumption by sectors and energy carriers.

The analytical process begins with accumulation and systematic organization of a vast amount of information on energy conservation opportunities in various spheres of consumption. Energy

conservation data base for the Former Soviet Union contains the economic and technical parameters for 120 aggregate measures. The criterion for including a measure is a minimum annual energy savings of 200 thousand tce. The measures considered are mainly to be realized in the most energy-intensive processes in industry, agriculture, transport, and buildings.

Aggregation of energy conservation measures was performed on the basis of similarity of technological functions and processes, at which they could be applied. For example, in one measure energy savings are assessed for illumination, including the use of efficient sources of light in the residential and commercial sectors and in industry where compact, sodium- and mercury-vapor and other lamp types are used. The extent of their use depends on the amount of equipment required. Heat-treating and heating furnaces burning gas and other fuels are regarded as individual aggregates. At the same time, sophistication of electric steel-melting furnaces is considered to be a measure for improving the structure of steel melting. Even larger scale aggregation can be performed. For example, improvement of energy systems at metallurgical plants including combination of the production of heat, electricity, and compressed air. These examples show that creation of aggregates was influenced by the initial data available for computing the following main parameters of the measure: cost of energy savings and total savings, which are affected by interaction of the components included in the measure.

Energy conservation measures almost always produce additional effects in technological processes, including higher productivity of equipment, improved product quality, reduced environmental pollution and social impacts. For example, extensive application of continuous casting of steel or the construction of high-grade highways are justified mainly by non-energy considerations and are taken to be expedient on an a priori basis for the purposes of this study. Depending on the relationship between the energy and non-energy effects of these measures, they are classified as dedicated or accompanying measures. For accompanying measures, investments cannot be prescribed solely on the basis of energy savings. Economic estimates are made below only for dedicated measures, the share of which comprises 60-70 percent of total savings identified. The items included in this analysis, then, do not include:

(1) contributions from structural change;
(2) measures producing savings less than 200 thousand tce per year;
(3) and accompanying measures.

It is obvious that energy savings potential alone is an insufficient criterion for evaluating the effectiveness of potential measures. Nevertheless, it is possible to determine whether it is economically preferable to invest in new energy supplies or in energy savings.

The amount of savings obtained was calculated by energy carrier, fuel type, and for total primary energy. Electric energy savings are calculated as primary energy required to produce electricity. The technological potential of energy conservation is evaluated for each measure, and is based on the hypothesis that the given measure is applicable for the entire expected volume of production using the given technology throughout the period under consideration.

Different approaches were used to calculate the amount of savings made depending on the specific circumstances associated with the measure. Generally, a comparison was made of the actual and forecasted specific energy consumption for providing certain products and services with a given technology, with an assumed coefficient for useful energy efficiency. The forecast values were found by evaluating the possibilities of reducing energy losses, reducing specific energy consumptions as a result of forecasted changes in technology, and also from an analysis of foreign publications.

Even this relatively restricted vision of the potential technically allows savings of 740 mln. tce or 36 percent of USSR's primary energy consumption in 1990. Up to 570 mln. tce of this potential was considered as economically realizable in the year 2005. If electricity and heat are estimated and calculated based on energy content of electricity, then technical potential for the year 2005 equals 501 million tons of coal equivalent (tce) of secondary energy or 25.4 percent of primary energy consumption by the former USSR in 1990.

Another estimate of the energy efficiency improvements potential in the former USSR was made by Yu. Sinyak.[13] His results are presented in Table 1.4.

While identifying energy saving potentials, three types of changes in energy demand were considered: structural changes - due to shifts in the national economy towards less energy intensive products and services; technology changes - due to the application of more energy efficient technologies and tools than in the current practice; and social changes - due to alterations in a life style and transitions to less energy wasting human behaviors.

In this analysis the difference between costs and benefits when referred to the quantity of energy saved illustrates the net-cost effectiveness. When put in a net-cost declining order, the measures are reordered in line with diminishing their cost effectiveness giving the priority scale for their application (see Figure 1.7).

As a result, in Table 1.4 and Fig.1.7 rough assessments of the ex-USSR energy saving technical potential for 2010 are given. The analysis of the energy saving potential shows that it is approximately equal to the estimate made above - 751 mln. tce, comparing with 740 mln. tce in the previous study. Including structural changes and a change in human behavior potential for improvement of energy efficiency is more than 50% of the 1991 energy demand or to about 40% of the "hypothetical" energy demand in 2010. According to Yu. Sinyak, about three forths of this potential can be realized with a "negative" cost which means that the introduction of these technologies will be followed by the total cost reductions for the economy as a whole because energy saving costs, as a rule, are less than the costs of the expansion of energy production.

1.2.5. Estimates of Economic and Market Potentials for Improvements of Energy Efficiency

There are three different notions of energy conservation potential. The **technological potential** of energy conservation is based on the hypothesis that the given measure is applicable for the entire expected volume of production using the best existing technologies. Its value depends not only on technological but also on geographic factors: do we speak about locally or globally available most advanced technologies? It depends on
accessibility of information about foreign technologies and the limitations of their efficient local adaptation. There is no doubt that an estimate with the best globally existed technologies version is much higher.

The technological potential of energy conservation, just like any other potential, presents only hypothetical possibilities without any serious limitations to its realization. However, these conditions in practice do not exist. Obstacles and limitations do exist in the implementing of technical potential. When transcending from the abstract definition of this potential to a specific analysis of the possibility of its realization, more and more new limitations appear, and this fact greatly truncates the initial estimate of the potential. These limitations, generally speaking, are quite numerous. Below we will concentrate our attention on an analysis of only some of them.

The first group of limitations will be called economic limitations. They reduce technical potential to **economic potential**. Let us consider two of them. The first is that the machine manufacturing industry can produce not more than a certain amount of energy conservation equipment in accordance with existing production capacities and/or the time required for creating new capacities. The second is that energy consumers can use not more than a certain amount of energy conservation equipment. This is in accordance with conditions for production, in particular, how long the overhauling period will last or how long it will take for replacing equipment at the plant. If the latter should have to be taken out of service ahead of time, substantial economic losses may be incurred to the user.

Generally speaking, in some cases, when prices for energy resources are exceptionally high, renovation of the most energy-intensive units of the equipment ahead of time may be justified economically. This option, however, is always accompanied by a lower output of products. Therefore, all subsequent calculations are based on normative lifetimes for the equipment and overhaul periods.

The so-called economic potential for each measure is determined with account taken of both these limitations (see Figure 1.8).

Each of these economic limitations is neither absolute nor ultimately inflexible. The first limitation depends on the amount of investment made in the productive capacity for energy conservation equipment. Therefore, an assumption has to be made as to the development of the machine building industries in order to assess the impact of this limitation on the realization of

energy conservation potential. The inflow of foreign capital could seriously weaken this limitation. To answer how much,
special analysis has to be done.

The second limitation can also be ameliorated by changes in policy. Policy options nclude changes in depreciation allowances, subsidies for the purchase and production o nergy conservation equipment, and successful implementation of structural reform.

The economic potential limited by market forces is called **market potential.** It is determined by market conditions, under which decisions are taken as to the introduction of energy conservation measures. First known effort to estimate the size of market potential was made by Bashmakov and Chupyatov.[14]

An analysis of such measures has shown that with a few exceptions, such as utilization of waste energy resources, their application does not lead to substantial additional expenditure of labor and materials. Therefore, in calculating additional operating expense, we can only include deductions for depreciation from the additional capital outlay. The rates of depreciation (the sum of deductions of renovation and overhauling) were adopted in accordance with official regulations. The levelized costs (LC) can be calculated in accordance with the following simplified formula:

$$LC = (E_n + a) * K$$

where

E_n = the normative capital investment payback ratio
a = the rate of equipment depreciation, and
K = the capital outlay for energy savings.

Capital outlay is accounted for in 1983 prices obtained from design offices and research institutes. When such data is not available, known prices of similar equipment are substituted. The capital outlay for the amount of equipment put into service was assessed on the basis of unit values. The amount of capital outlay was calculated as an addition to base equipment or as the difference between the cost of the more energy-saving and base equipment. It includes the cost of construction and installation, as well as the equipment purchase cost.

Evidently, the levelized costs greatly depend on the normative ratio for payback of capital investment. This coefficient cannot be the same for persons making decisions with different budgetary limitations. Moreover, it depends on the general economic situation of the capital market. The most strict demands for the payback period of energy conservation investment are imposed by household energy consumers. In accordance with many studies, this group of consumers makes investments with guaranteed payback periods of 1-3 years, that is, for values of the return-on- investment (ROI) 100 and 33 percent respectively. This index is strongly income dependent. Present decline of real incomes for people in the former USSR decreases their willingness to pay for energy conservation.

Energy consumers in the services sector impose, as a rule, less stringent requirements on capital outlay payback. Industry has perhaps the greatest possibility for fixed investments with long payback periods.

Two conclusions follow from these observations. First, because consumers in different energy sectors actually make decisions with different values of E_n, these different values should be used in our calculations. Second, it is important to understand the difference in results if the value of E_n used is optimum for the economy as a whole or is taken for a group of consumers in various energy consumption sectors. Many assessments of energy conservation potential do not account for these differences between social interests and the interests of individual enterprises and households. As a result, energy conservation potential is sometimes overestimated.

The economic effect from implementing energy efficiency measures was determined by taking the difference between the avoided costs of energy production and the levelized costs of the measures. The avoided costs were calculated for the amount of energy saved in accordance with marginal costs or prices of energy resources. Naturally, this result will directly depend on the anticipated price level.

An important related point here is the necessity of estimating parameters for the price elasticity of energy demand. So far as we know, no estimates have ever been made for price elasticity of demand for energy in the Soviet Union. It was often assumed that with stable energy prices over long periods of time and an administrative-command system of management, it is impossible to obtain meaningful estimates. Nevertheless, we not only believe that obtaining these coefficients is necessary, it is possible.

Of course, not all this potential is cost-effective with any given price of energy. The cost-effectiveness depends largely on energy prices and on capital budgeting hurdle rates such as the internal rate of return (IRR) or payback period. Previously in the former USSR, normative IRR was equal to 12 percent. With this IRR and even 1990 energy prices, nearly 90 percent of all potential is cost-effective (see Table 1.5). But **cost-cutting investments were invisible in the process of central planning and, as a result, in spite of cost-efficiency of the major part of the potential, a very insignificant amount of fixed investments was directed to the realization of energy efficiency measures.**

In new market conditions with high interest rates and capital shortages, cost-cutting investments could be made with shorter expected payback: probably not more than two years or with IRR=0.5. **For 1992 prices even with IRR=50 percent, 88 percent of the energy-efficiency improvement investments are cost-effective. When energy prices approach world prices, all measures under consideration and many additional measures become cost-effective.**

As seen in Table 1.5, the energy sector, and the residential and commercial sectors are the most sensitive sectors to IRR and energy price fluctuations. The power and heat generation sector is the least sensitive. This indicates that not all relatively expensive possibilities of energy conservation have been identified for this sector.

1.2.6. Indirect Economic Energy Conservation Potential

Only direct energy conservation potential is shown in Table 1.3. However, there exists an additional indirect potential (this concept was developed by I. Bashmakov[15]). The energy balance of any country can be presented in the following manner:

$$PE = A*PE+FE,$$

where PE = total energy consumption;

FE = final energy consumption;

A = $||a_{ij}||$, a matrix of coefficients, a_{ij} - energy carrier type i consumed to produce and deliver one unit of energy carrier type j.

The numerical example of this matrix is shown in Table 1.6. This table was produced based on detailed information on energy consumption in energy production and transformation sector by processes and by fuels. Energy consumption and losses at stages of production, transformation, enrichment, transportation (by pipelines) and distribution were included in the list of processes. For the sake of simplicity, the name "energy complex" is used for all these processes. Thus, this complex combines electricity and heat generation and energy sector activities according to the standard energy balances presentation by the OECD methodology.

The row "coal" in Table 1.6 shows how much coal was used in 1990 in the energy complex to produce, process, refine, transport and distribute coal, other solid fuels, oil, natural gas, electricity and heat. On the other hand, there is a need in petroleum, gas, electricity and heat to produce coal itself (see column "coal"). This table is a complete analog of the first quadrant in the input-output table.

With these data and volumes of total primary energy consumption by fuels, it is possible to calculate the amount of different energy carriers needed by the energy complex to transfer primary energy to secondary carriers and to deliver it to the final consumers:

$$EC=A*PE,$$

where EC - energy consumption by the energy complex.

The next step is a computation of the matrix of so-called "full" or "direct and indirect" coefficients, or, mathematically speaking, the matrix $(E-A)^{-1}$. Using this matrix, total energy consumption could be presented as a function of final energy consumption:

$$PE=(E-A)^{-1}*FE.$$

This matrix is presented in Table 1.7. Totals by columns in Table 1.7 show how much energy is needed to supply a final consumer a unit of secondary energy carrier. For example, to supply the final consumer a unit of coal, 0.11 units of energy would be consumed by the energy complex, and for electricity this ratio is 3.66, including 3.4 units of fossil fuels. This number is far above the normally calculated ratio for fossil fuels needed to produce a unit of electricity with given efficiency of power generation (2.6:1 ratio for the former USSR, the sum of first four elements in column "electricity" in Table 1.5). Therefore, because a more systematic approach is used, more complex, more correct and more significant results were obtained: **to produce a unit of electricity 3.4 units, not 2.6, of fossil fuels are needed and to produce a unit of heat 1.52, not 1.3, units of fossil fuels are required.**

On the other hand, data presented in Table 1.7 show how much energy could be **saved** in the energy complex if a unit of secondary energy is saved by final consumers. This, in turn, means that **energy efficiency improvements in the utilization of any secondary energy resource by final consumers are always accompanied by significant additional or indirect energy savings in the energy complex**. Normally, only calculations of partial indirect effects for electricity and heat are performed.

Electricity is the first item in the list of integral (direct plus indirect) energy conservation effects produced by saving a unit of energy, followed by heat, oil, natural gas, coal, and other solid fuels. Direct reduction in final energy consumption by dFE is, therefore, accompanied by the indirect reduction equal to:

$$dPE = (E-A)^{-1}*dFE.$$

Indirect energy savings appear as a result of structural changes in the energy complex induced by technological changes. If the final consumer needs less electricity, then all distribution and transportation losses and individual electricity use by power plants related to production and delivery of this unit to the consumer, are not incurred, as well as all energy embodied in and needed to produce, transform, and deliver coal, oil, and natural gas to power plants to produce this unit of electricity.

Therefore, **any improvement in energy efficiency by final consumers is accompanied by overall structural shifts in the energy complex and these structural shifts bring about additional energy conservation benefits without added costs. There is no need to spend a penny to get this side-effect, it comes automatically.** While a private investor gets direct effect from any technological measure, a society enjoys side effects. The calculation of side effects can be a basis for sharing the burden of energy efficiency improvements between a private investor and a society.

Utilizing this approach could significantly change present estimates of energy conservation potential, as well as estimates of economic costs and benefits.

1.2.7. Integral Economic Energy Conservation Potential

The technological energy conservation potential for the former USSR described above was used to calculate direct and indirect effects of identified technological measures to improve energy efficiency. The potential is divided into two parts:

- energy efficiency improvements in the energy complex;
- and energy efficiency improvements by final consumers.

For the first set of calculations, only the final part of the potential is considered.

There are numerous possibilities to improve energy efficiency in the energy complex of the former USSR. But calculations for indirect effects for these measures should be viewed differently, because any measure to improve energy efficiency in the energy complex results in impacts on the values of direct coefficients or leads to changes in the matrix A (A'). Therefore, correct calculations of the indirect effect should be done based on new matrix:

$$dPE=(E-A')^{-1}*dFE.$$

In this case, the indirect effects would be lower. Based on the distribution of measures by sectors, fuels, and processes in the energy complex, matrix A' is estimated. Based on this new matrix, indirect energy conservation for all technological measures are estimated in Table 1.8.

The indirect effect is very significant: generally speaking, any unit of energy saved by improving energy efficiency of technologies is accompanied by an additional 0.69 units of energy savings ((250.4+95.4)/(288.7+211.5)=.69) produced as a side effect of structural shifts caused by these improvements.

Similar calculations were made by I. Bashmakov[16] on the basis of the most recent input-output table for the former USSR.[17] The eighteen-sector input-output table contains four energy industries: "Electric power," "Oil and gas," "Coal," and "Other fuels." All deliveries of energy to consumers are presented in Leontiev's tables in monetary units. Therefore, there is no direct correspondence with the data we used in the above calculations. These four sectors were aggregated into one energy sector. Then matrixes of direct and full coefficients were estimated.

According to these results, the full coefficient for aggregated energy sector is equal to 1.5. In other words, one unit of energy cost saved by final consumer produces additional 0.5 units of energy cost savings due to the reduction of energy consumption in the energy complex.

Remembering that electricity is much more expensive than fossil fuels, and oil is more expensive than coal and natural gas, results in physical units should not coincide with results for costs. Hence, it could be concluded that results produced by two different methods are very close. This gives additional confidence to state that **any unit of energy saved in processes of energy**

efficiency improvement on the average is accompanied by free additional 0.7 units of energy saved in energy sector.

This general ratio could be applied when no information on distribution of energy conservation measures by types of energy carriers is available. In the case where this information does exist, more precise calculations based on the matrix A could be made.

The energy complex consumes not only energy but also other products. The reduction of energy demand due to energy efficiency improvements would lead to the reduction in needs for these products by the energy sector or would produce additional structural shifts in the economy. Calculations made using the input-output table show that this additional effect is relatively small: reduction of energy consumption by no industry, except transport, exceeds .03 percent. For the transport and communication industry, this reduction was more than 3 percent.

This effect is not surprising because energy resources constitute 30 percent of railroad freight turnover, 43 percent of international water freight, 26 percent of internal water turnover, and 3.3 percent of automobile freight turnover.

Transforming data to metric tons and using specific energy consumption by transport modes,[18] energy consumption reduction by freight transport was estimated. Transport fuel conservation due to energy consumption reduction equals to 3.2 million tce (2.28-railroads, 0.43 water-sea, 0.1-water-rivers, and 0.41-trucks).

Economic energy conservation potential in terms of primary energy does not include reduction of secondary energy carriers - electricity and heat - due to double counting. If calculated traditionally (taking into account only efficiency of electricity and heat generation), it would be equal to 619 million tce. Based on the approach presented in this paper, this potential equals to 672 million tce. Including 3 million tce - reduction in transport energy consumption caused by reduced energy resources transportation as a result of direct and indirect effects of implementation of technological potential, the integral primary energy consumption reduction effect of energy efficiency improvements up to the year 2005 equals to 675 million tce or 34 percent of 1990 energy consumption in the former USSR in 1990.

1.2.8. Structural Economic Changes and Energy Efficiency Improvements

The process of transformation to a market economy could not be successful if the old economic structure is preserved. Structural changes are necessary. The economy could be structured in many different ways, and changes of all these structures directly or indirectly would effect overall energy efficiency. Only two kinds of impacts from structural changes would be investigated here:

- changes in the final product structure; and
- changes in several basic materials' intensities.

To estimate possible effects of structural changes on the energy intensity and energy consumption, a set of calculations based on the 1988 input-output table were implemented. The 1988 input-output table contains four energy industries: "electrical power," "oil and gas," "coal," and "other fuels." It creates some difficulties in implementing calculations, because oil and gas are not separated. To transfer results from monetary to physical units the next procedure was applied: monetary values were divided by physical units taken from energy balance for 1988. Average prices were received as a result of this procedure. These prices were very close to real prices. That gives more confidence in the reliability of calculation results.

The effects of four different measures were estimated:

1. Reduction of capital investments in 1988 by one third;

2. Complete elimination of losses (this is, of course, the extreme case, because this item in the input-output table includes terminated construction projects, abandoned dry oil and gas wells, and accidental losses of livestock. These losses are not avoidable completely);

3. Reduction of military purchases by two thirds (in the 1988 input-output table there is an item in the final demand called "other users," which lists delivery to the military including delivery of arms and weapons--data never before published in the former USSR[19]);

4. Military research and development, as well as current expenditures of military end-products (e.g. ammunition, fuels) is included in public consumption. This component of final demand was reduced by 20 percent to reflect the reduction of military spending and reduction of over-consumption by bureaucratic apparatus; and

5. Reduction by 10 percent of ferrous and non-ferrous metals and building materials intensities in all branches of the economy as a result of better management and equipment maintenance, and more rational utilization of these materials.

One important feature for all these experiments is holding constant personal consumption. In other words, these structural changes bring about changes in value added or national income, and other economic indicators but not in private consumption.

There are two major structural changes which could bring significant economic benefits: reduction of investment intensity of the economy (169 million tce) and its de-militarization (another 110 million tce). The total reduction due to all five measures implementation is 340 million tce or 305 million tce in terms of primary energy consumption (see Table 1.9). This is more than annual energy consumption in Germany.

Effects from structural changes come for free as a side effect of programs to improve overall efficiency of the economy. Of course, these programs are not free from expenses, but it is very difficult to attribute any of these investments directly to energy efficiency improvements.

If private consumption would grow by, say, 10 percent, in 1990-2005 with preservation of existing economic structure, the structural energy conservation potential also would be larger than in 1990 by 10 percent or would be equal to 374 million tce (335 million tce in terms of primary energy).

The total energy efficiency improvements' potential in the former USSR in 2005 includes 675 million tce in technological potential (direct and indirect contributions to primary energy reduction) and 335 million tce in structural potential. All together, this equals to 1010 million tce in the year 2005, or 51 percent of 1990 level of primary energy consumption of the former USSR and 8 percent of world energy consumption.

1.3. Costs of Energy Conservation Programs

Existence of energy conservation potential is necessary, but is not sufficient to allow for realization of energy efficiency programs. In a market economy, implementation of these measures should be cost effective. Therefore, costs of energy conservation programs should be considered and compared with costs of equivalent energy services provided by increasing energy supply. The cheapest ways to deliver energy services to final consumers should be realized.

Several important points should be mentioned before a discussion of costs:

1. Costs could be attributes only to direct energy improvement projects; indirect energy conservation and contribution from structural changes is a free by-product.

2. Only net costs should be considered. In other words, difference in investment costs of efficient equipment and the regular equipment is attributed to the difference of energy consumption by these two types of equipment. Some efficient equipment could cost less than regular one, therefore, negative investment costs are possible.

3. Some technological measures are implemented by reasons not directly related to energy efficiency improvements. For example, the extensive application of continuous steel casting and construction of quality highways are mainly justified by non-energy considerations. These measures could be classified as accompanying measures, and have zero costs because investments are not solely prescribed on the basis of energy savings.

4. Some dedicated energy efficiency improvements have additional benefits in terms of higher other factors productivity. These effects are not taken into consideration.

5. The method of energy conservation measuring should be directly specified. Results could be monitored in terms of secondary energy or primary energy, including only direct or also indirect effects.

6. Investments in energy efficiency would be made by private and commercialized enterprises, and therefore demand for payback not more than two years is expected.

7. Limitations of manufacturing industry to produce more energy efficient equipment and limitations of consumers to replace regular equipment ahead of lifetime by energy efficient equipment were already considered in the process of technological potential estimation.

It has been shown that natural gas holds the largest potential for improving its efficiency of use. According to V. Gandkin and L. Shamis, in 2005 specific capital investments to produce and deliver natural gas to the final consumers would cost 300 rub. 1990/tce.[20] More than 92 percent of the integral technological conservation potential is less capital intensive than additional production of natural gas.

If only this part of the potential is considered, the following conclusions from analysis of energy efficiency improvement capital costs could be made:[21]

- **620 million tce/year could be saved up to the year 2005 with specific capital investments less than 300 rub. 1990/tce/ year or $ 60/tce/year (assuming a 5 rubles to 1 dollar exchange rate for 1990);**

- **The total amount of investments needed for the whole potential realization equals to 41 billion rub. in 1990 prices or $8 billion:**

- **Average direct investment costs of 1 tce/year of primary energy saved equals to 73 (1990) rubles or $ 15, and average integral costs correspondingly 64 rubles and $ 13.**

- **Energy conservation potential in Russia and the former USSR is not only the largest in the world, but also the cheapest. Russia could be called the Saudi Arabia of energy efficiency. If a 20 percent discount rate is applied and average lifetime of energy conservation measures equals to 10 years, the average levelized cost of a barrel of oil equivalent saved in Russia is only 40 cents.**

1.4. Estimates of Technical Potential for Improving Energy Efficiency in Russia

Potential for energy efficiency improvements considered above was not developed as a sum of potential by former Soviet republics. After Russia became an independent state, there was no current inventory of technical potential for energy efficiency improvements. Significant reduction of energy production in 1990-1992 (see Figure 1.8) mainly because of investment crisis -energy sector was one of the most investment intensive (see Figure 1.9) - have attracted serious attention to the development of energy efficiency policy.

Technical potential inventory should be the basis for this policy. The demand for this inventory was met by supply in a very simple manner: data for inventory of technical potential received for the Former USSR were interpolated for Russia. This interpolation was made by V.P. Chupyatov. It was the natural simple solution of a very complex problem in relatively limited time frame. **The question is: how reliable are results?**

Presently namely those results are taken as official data and also cited in many non-official publications.[22] They are presented in the Table 1.10. More detailed description of the Russian technical potential for energy efficiency improvements is presented in Appendix 2.

Several observations are valid for this inventory.

First. It should be mentioned that inventory for the Former USSR was first made in 1988-1989 and technical data received for this inventory are relatively obsolete - more than 6-8 years old. That definitely reduces the quality and value of these results.

Second. Methodology of the interpolation is extremely important. This methodology was never described. Therefore, special investigation was undertaken to discover this methodology and to check consistency of produced results.

Third. The investigation and cross-checking of the results of energy efficiency potential inventory for Russia have shown some improvements and deteriorations of the quality of results comparing with what was done for the Former USSR.

The improvements are the following:

(1) potential is better structured;
(2) energy efficiency improvements potential in transport and agricultural sectors are described in more detail than that for the Former USSR;
(3) minimum and maximum values are presented comparing with single points estimates for the Former USSR.

Several serious items could be listed among deteriorations:

(1) lower number of technologies (73 against 111);
(2) non-consistency of results received with data presented in energy balance;
(3) over-simplification of cost data extrapolation.

Comparison of data presented in Table 1.11 with data presented in energy balance for Russian Federation brings very serious criticism to results of inventory for Russia:

- there are number of white spots in the table, for example no improvements presented for electricity consumption in pulp and paper industry and in agriculture, no heat utilization improvements options in transport and agriculture;
- energy efficiency potential in agriculture (64 mln.tce) is larger than energy consumption in this sector;
- petroleum products utilization efficiency improvements to consumption ratio109% percent in pulp and paper industry is 84% and in agriculture 252% which is impossible to have;
- natural gas utilization efficiency improvements to consumption ratio is 84% in building materials industry and for whole industry is 79% which is too high;
- electricity utilization efficiency improvements to consumption ration is 67% in machinery.

Careful comparison of data presented in the Appendix 2 with those presented in the Appendix 1 also shows several inconsistencies: potential for Russia in the year 2000 in few instances is larger than potential for the Former USSR in the year 2005. Among those technologies are: improvement of efficiency of heating furnaces in oil refining; introduction of effective heat generators in residential and commercial sectors; equipping large energy consumers with meters, and some others.

Fourth. Cost estimates (specific investments and levelized costs) were simply equally multiplied by 25 times. Enormous changes in price proportions since the second half of 80'es made all costs very uncertain and significantly reduced data presented as a means to get insights into the costs of energy-saving investments. Previous results could serve a very crude guide in looking for least-cost options.

Effort to update cost data by correction on inflation shouldn't be done this simple as it was. In reality, on the one hand, costs of investment goods grew slower than the general rates of inflation, and these costs grew with different rates for the technologies included in the inventory. For example, prices of building materials and sources of light had very different rates of growth. Present uncertain and very dynamic price situation makes it very difficult to adjust former costs estimates to present conditions. On the other hand, having different price indexes, it is possible to make much more reliable costs extrapolations to identify low-cost/no-cost measures to save energy.

All these comments make the estimates of energy efficiency potential in Russia presented in many official documents not reliable. This, in turn, undermines confidence to the data used officially for developing national policies and programs to improve energy efficiency.

Obvious need for reliable inventory of energy efficiency potential as a milestone for proper policy development does exist.

Table 1.1. Technological and vintage characteristics of equipment in the former SU official inventory, April 1, 1986

	Technological level			Age composition			
	Best world standard[a]	National standard[b]	Obsolete[c]	Below 5 years	6-10 years	11-20 years	Over 20 years
Energy equipment							
Steam boilers	10.5	52.9	36.6	26.1	26.8	31.3	15.8
Waste-heat boilers	5.7	48.5	15.8	19.2	22.2	35.4	23.2
Steam turbines	2.6	36.6	60.8	8.6	13.2	28.6	49.6
Gas turbines	5.2	76.3	18.5	23.7	46.4	29.9	.
Hydro turbines	2.0	21.5	76.5	4.7	6.3	17.4	71.6
Diesel engines[d]	6.7	52.3	41.0	31.0	32.8	23.4	12.8
Electrothermal equipment							
Electric arc furnaces	4.9	38.6	56.5	18.6	16.2	31.1	34.1
Metal treating furnaces	7.8	47.4	44.8	34.0	24.8	23.4	17.8
Induction melting & heating equipm.	9.8	51.5	39.1	30.4	25.0	30.4	14.2
Electric welding equipment							
Open-arc welding machine	12.2	50.0	37.8	43.2	33.8	18.9	4.1
Contact welding machine	7.1	44.7	48.2	27.9	27.8	33.8	10.5
Total industry	16.0	55.9	28.1	32.0	27.1	26.2	14.7
Energy industry	14.0	59.8	26.1	36.3	23.7	23.6	16.4
Iron & steel	14.3	56.6	29.1	28.2	24.0	26.4	21.4
Chemicals	16.0	53.1	30.9	28.9	29.4	25.6	16.1
Machinery	19.9	54.1	26.0	32.0	28.3	29.8	9.9
Food industry	14.6	53.1	26.9	28.4	32.6	29.4	9.6
Construction	10.7	58.5	38.8	29.1	27.7	26.3	16.9

a. Best-practice world standard or higher.
b. Currently accepted national standard but requiring modernization in the near future.
c. Outdated and should be replaced; d. Other than automobiles and tractors.
Source: Based on Gosudarstvennii Komitet (1988).

Table 1.2. Magnitude of energy savings potential in the FSU by sector, 1990, MTOE[a]

	Actual consumption[b]	Estimated consumption with bestpractice world standard technologies	Savings potential
Electricity, total	150	106	44
Motive power	91	70	21
Lighting	15	7	8
Electrothermal use	15	8	7
Electrolysis	7	6	1
Other	8	6	2
Grid losses	14	9	5
Steam & hot water, total	**299**	**203**	**96**
Residential/municipal heating and hot water	73	41	26
Space heating in production	67	45	22
Technological needs	128	98	30
Network losses	31	13	18
Direct consumption,total	**669**	**445**	**224**
Metallurgy	109	53	56
Other industry (excl. energy)	130	98	32
Residential/municipal	149	95	54
Agriculture	68	42	26
Transport	130	94	36
Non-energy use & raw materials	112	91	21
Conversion losses, total	**234**	**109**	**125**
Electricity	181	77	104
Heat	53	33	20
Own use andlosses in production, processing and transport	**91**	**66**	**25**
TOTAL	1,443	928	515

a) All data are converted from million tons of "standard fuel" in the original source to MTOE by multiplying by 0.697.

b) "Actual consumption" figures in the original source are predicted values. Actual total consumption turned out to be 8% less than the predictions. Hence, the aggregate savings appearing in the table should also be reduced by this percentage.

Source: Makarov and Chupiatov (1990), p. 6.

Table 1.3. Technological Energy Efficiency Improvement Potential in 1990-2005 and Energy Balance of the Former Soviet Union in 1990[1]

(million tce)

	Coal	Other Solid Fuels	Oil	Gas	Hydro	Nuclear	Elect-ricity	Heat	Total
Indigenous Production	425		811	964	28	79			2338
Exports	-23		-217	-125			-5		-370
Imports	9		24	2					-35
Stock Changes	-7		-7	-18					-32
Primary Energy Consumption[2]	70.1 404	0 30	58.4 611	220 823	28	79	-5		500.4 1971
Electricity. Generation	-80	-7	-27	89.9 -100	-28	-79	137		89.9 -185
CHP Plants	8.5 -70	-1	-80	23.8 -228			73	211	32.3 -95
District Heating	-43	-7	-71	10 -118				182	10 -56
Own Use&Losses	12 -18		7.2 -32	20 -91			10.1 -49	30.1 -35	79.4 -226
Final Energy Consumption	49.6 192	16	51.2 402	76.3 286			45.6 155	66.3 359	288.8 1409
Industry	22.8 92		6.5 82	48.1 115			28.4 94	36.8 254	142.6 637
Agriculture	10	3	3.3 62	3 20			.6 16	.4 7	7.3 118
Transport			40 156	3			13	2	40 174
Residential& Commer.	26.8 85	13	1.4 17	25.6 89			16.6 33	29.1 95	98.9 331
Non-Energy Use	5		85	59					148

[1] Numerator - energy efficiency potential; denominator - energy consumption.

[2] Totals for secondary energy carriers.

Source: I. Bashmakov. Costs and Benefits of CO_2 Reduction in Russia. 1992 Presented September 28-30, 1992 at International Workshop on Costs, Impacts and Possible Benefits of CO_2 Mitigation. IIASA, Laxenburg, Austria. p. 1- 25.

Table 1.4. Energy/CO2 Saving Potential for the ex-USSR in 2010.

	Process	Measure	Savings, Mtoe	$/t C	mln.t C/ Mtoe	Cost, mln.$	Carbon reduced, mln.t C
Manufacturing sector	Ind.furnace	Consumption	-28.17	-238.55	-.96	-6422	-26.92
		Insulation	-2.39	-315.62	-.55	-415.21	-1.32
		Electr.penetr.	-1.83	-49.55	-1.55	-140.40	-2.83
		New types	-7.75	-308.28	-.55	-1312.08	-4.26
	Steam	Consumption	-11.97	-183.50	-.96	-2099.50	-11.44
		FBC boiler	-1.41	35.23	-1.08	53.76	-1.53
		GT+WH/coal	-.70	-64.59	-.93	-41.24	-.65
		GT+WH/oil	-.70	-198.18	-.97	-135	-.68
		Steam-cogen	-1.41	-130.29	-.99	-181.05	-1.39
	Space heat	Consumption	-142.25	-70.83	-.96	-9629.54	-135.95
		FBC boiler	-14.79	35.23	-1.08	564.48	-16.02
		NG boiler	-29.58	67.90	-1.08	2175.60	-32.04
		GT+WH/coal	-4.58	-64.59	-.93	-274.56	-4.25
		GT+WH/oil	-4.58	-198.18	-.97	-877.50	-4.43
		Heat pump	-6.34	77.07	-1.33	650.16	-8.44
	Electricity	Lighting	-24.65	-752.35	-.62	-11480	-15.26
		Elec.motor	-16.90	-176.16	-.64	-1900.80	-10.79
	Motor fuel	Engine(30% impr.	-13.38	1431.30	-.83	15857.40	-11.08
		Electr.penetr.	-3.52	-128.45	-1.39	-630.00	-4.90
	Coke	30% savings	-14.79	587.20	-1.08	9340.80	-15.91
Transportation	Freight	Engine(30%)	-14.44	1431.30	-.83	17109.30	-11.95
		Electr.penetr.	-14.44	-128.45	-1.39	-2583	-20.11
	Pass.intercity	Engine(30%)	-6.34	1431.30	-.83	7511.40	-5.25
		Electr.penetr.	-8.45	-128.45	-1.39	-1512	-11.77
	Pass.urban	Engine(30%)	-2.82	1431.30	-.83	3338.40	-1.33
		Electr.penetr.	-4.23	-128.45	-1.39	-756.00	-5.89
	Electric	Electr.motor	-4.23	-513.80	-.60	-1310.40	-2.55
Households and service	Space heating	Consumption	-166.90	-95.42	-.96	-15281.76	-160.15
		FBC boiler	-14.79	35.23	-1.08	564.48	-16.02
		NG boiler	-14.79	67.90	-1.08	1087.80	-16.02
		GT+WH/coal	-7.39	-64.59	-.93	-443.52	-6.87
		GT+WH/oil	-7.39	-198.18	-.97	-1417.50	-7.15
		Heat pump	-5.63	77.07	-1.33	577.92	-7.50
	Electic appliances	Lighting	-8.45	-752.35	-.62	-3936	-5.23
		Electr.motors	-2.11	-176.16	-.64	-237.60	-1.35
Electricity generation	Electricity	Nuclear	-4.65	4.40	-10.95	224.14	-50.89
		Hydro+other	-1.34	18.35	-10.76	264.10	-14.39
		Steam NG	-34.51	99.09	-2.67	9128.70	-91.13
		NG C-C	-26.76	62.39	-2.05	3423.80	0
		Steam Coal	-34.51	44.04	-1.24	1881.60	-42.72
		Coal C-C	-10.56	95.42	-1.16	1170.00	-12.26
		Other	-24.65	-60.92	-1.22	-1830.15	-30.04
Total			-751.06			10076.03	-832.67

Table 1.5. Impact of Energy Prices and Internal Rate of Return on Cost Efficiency of Energy Conservation Measures in the Former USSR

(million tce)

	IRR=0.12			IRR=0.5	Maximum potential
	Energy Prices[1)]			Prices[1)]	
	1990	1991	1992	1992	
Electricity and Heat Generation	130.9	130.9	132.2	130.9	132.2
Energy Sector	40.7	29.3	70.9	40.7	79.3
Industrial Sector	134.5	121.5	149.6	134.0	149.6
Residential and Commercial	98.7	56.3	99.1	99.1	98.9
Total	404.8	338.0	451.8	404.7	460.1
Percentage of Total	88.0	73.0	98.2	88.0	100.0

[1)] Under suggestion that these real prices would last until 2005

Source: I. Bashmakov. Costs and Benefits of CO_2 Reduction in Russia. 1992 Presented 28-30 September 1992 at International Workshop on Costs, Impacts and Possible Benefits of CO_2 Mitigation. IIASA, Laxenburg, Austria. p. 1- 25.

Table 1.6. Intermediate Energy Consumption by the Energy Complex in the Former USSR in 1990

(million tce)

	Coal	OSF	Oil	Gas	Electr.	Heat
Coal	18.0	.3			222.3	117.1
Other Solid Fuels					20.0	1.[illegible]
Oil	.8	.02	25.6	6.0	86.7	141.6
Gas	1.3		4.0	86.2	215.6	243.1
Electricity	3.0	.01	10.0	4.4	30.2	1.5
Heat	3.2		16.6	4.0	1.0	10.0
Total Energy Consumption	404.0	30.0	611.0	823.0	209.5	393.3

Sources: I. Bashmakov. Costs and Benefits of CO_2 Reduction in Russia. 1992 Presented 28-30 September 1992 at International Workshop on Costs, Impacts and Possible Benefits of CO_2 Mitigation. IIASA, Laxenburg, Austria. p. 1- 25.

Table 1.7. Modified Direct Coefficients of Energy Consumption by Energy Complex per Unit of Total Energy Consumption (tce/tce)

	Coal	OSF	Oil	Gas	Electr.	Heat
Coal	.0289	.01			.9814	.2680
Other Solid Fuels					.0955	.0034
Oil	.0020	.0005	.0419	.0073	.4138	.36
Gas			.0065	.089	.7409	.544
Electricity	.0050	.0003	.0157	.0052	.1224	.00373
Heat	.0077		.0198	.0047	.0047	.0173

Source: I. Bashmakov. Costs and Benefits of CO_2 Reduction in Russia. 1992 Presented 28-30 September 1992 at International Workshop on Costs, Impacts and Possible Benefits of CO_2 Mitigation. IIASA, Laxenburg, Austria. p. 1- 25.

Table 1.8. Direct and Indirect Technological Energy Conservation Potential in the Former USSR

(million tce)

	Final Energy Consumers			Energy Complex			Total
	Direct[1)]	Indirect	Total	Direct	Indirect	Total	
Coal	49.6	77.8	127.4	20.5	23.4	43.9	171.3
OSF		5.6	5.6		1.4	1.4	7.0
Oil	50.9	54.9	105.8	7.2	20.0	27.2	133.0
Gas	76.3	96.4	172.8	143.3	44.8	188.1	360.8
Electr.	45.6	10.3	55.9	10.1	3.4	13.5	69.4
Heat	66.3	5.4	71.6	30.9	2.4	32.9	104.5
Total	288.7	250.4	539.1	211.5	95.4	306.9	846.0

[1)] Only conservation of secondary energy carries.

Source: I. Bashmakov. Costs and Benefits of CO_2 Reduction in Russia. 1992 Presented 28-30 September 1992 at International Workshop on Costs, Impacts and Possible Benefits of CO_2 Mitigation. IIASA, Laxenburg, Austria. p. 1- 25.

Table 1.9. Impacts of Structural Changes on Energy Consumption in the Former USSR[1] (EJ)

	1	2	3	4	5
Electricity	.67	.74	.97	1.22	1.37
Oil and Gas	4.18	4.71	6.27	7.5	8.3
Coal	.85	.93	1.2	1.61	2.00
Other Fuels	.08	.1	.12	.15	.16
Total	5.78	6.42	8.56	10.49	11.83

1. Reduction of capital investments in 1988 by one third.
2. Complete elimination of losses.
3. Reduction of military purchases by two thirds.
4. Reduction of public consumption by 20 percent (to reflect the reduction of military spending and reduction of over- consumption by bureaucratic apparatus).
5. Reduction by 10 percent of ferrous and non-ferrous metals and building materials intensities in all branches of the economy as a result of better management and equipment maintenance, and more rational utilization of these materials.

[1] Each column shows cumulative reduction of energy consumption including previous measures. The 1988 input-output table was used to calculate reduction of energy production; energy export was held constant, therefore, all reductions were attributed to energy consumption.

Source: I. Bashmakov. Costs and Benefits of CO_2 Reduction in Russia. 1992 Presented 28-30 September 1992 at International Workshop on Costs, Impacts and Possible Benefits of CO_2 Mitigation. IIASA, Laxenburg, Austria. p. 1- 25.

Table 1.10. Energy Savings Potential in the Russian Federation in 2010

	Natural gas, bln m3	Petroleum products, mln tons	Coal, coke, mln tons	Electri-city, bln kWh	Heat, mln GCal	Total, mln tce
Fuel and Energy Complex	45-60	15-17	33-39	40	160 -180	150 -180
- oil production	5-10					6-12
- coal production	3-4			10		3.5 -4.5
- energy carriers transportation	8-9		7-8	30	150 -170	52-59
- electricity and thermal energy	32-42	10-12	26-31			80-96
- oil refining		4.7-5			9-10	8-9
Residential and Commercial Sector	10	0.6-0.8	21-23	90-105	120 -145	85-95
Agriculture	1.4-1.5	35-41	1.5 -1.7	8-10	4	54-64
Transport		29-34				42-50
Industries						
- general measures	32-42	6-7	12	140-175	75-100	71-89
- metallurgy	10-13	0.5				
- machine building	12-15	2	10-11	20-24	5-6	34-39
	3-4	0.5		55-60		14-17
- construction materials	10-11.5	1.7-2	2-2.5	8.5-10	40-45	20-23
- chemistry and petrochemistry	5-6			4-5	12-15	9-10
- timber and paper	.3-.7	1-2			35-40	8-10
Total	90-100	85-100	70-80	350-420	450 -540	480 -570

Table 1.11. Energy Conservation Potential Related to Energy Consumption, 1990.

Parameter	Coal	Other solid	Oil	Gas	Electricity	Heat	Total
Electricity Generation	4.5*	0	2.3	6.9			13.7
	74.2	0.8	26.7	60.8			162.5
CHP Plants	23.8	0	12.5	37.5			73.8
	40.6	1.2	23.9	158.9			224.5
District Heating	2.7	0	1.2	4			7.9
	31.7	5.8	40.1	95.9			173.12
Own Use and Losses	8.0	0	7.0	10.6	1.2	25.8	52.6
	0.4	0	12.2	80.1	34.6	20.1	147.6
Industry:							
Iron & Steel	11.0	0	2.7	16.7	2.9	0.9	34.2
	45.5	0	4.3	26.3	8.9	10.0	95
Non-Ferrous Metals	0	0	0.3	0	1.5	1.1	2.9
	0.1	0	3.8	2.5	12.0	6.0	24.3
Chemical	0	0	0	6.6	0.5	2.1	9.2
	0	0	5.2	4.5	8.5	39.9	58.1
Machinery	0	0	0.8	-4.1	7.6	0	4.3
	0.3	0	3.2	6.1	11.4	31.9	53.0
Constructive Materials	2.5	0	2.7	13.1	-1.2	6.5	23.6
	3.2	0.1	6.6	15.6	3.7	12.3	41.5
Wood, PP&P	0	0	2.4	0.8	0	5.7	8.9
	0.1	0.5	2.2	0.4	3.0	16.0	22.3
Total Industry	13.5	0	9.9	48.0	32.7	30.8	134.9
	50.6	0.8	30.5	60.8	53.5	139.8	335.9

Parameter	Coal	Other solid	Oil	Gas	Electricity	Heat	Total
Transport	0 / 0.3	0 / 0	49.5 / 108.5	0 / 0.5	0.1 / 7.6	0 / 5.4	49.6 / 122.4
Residential/ Commercial	23.0 / 39.6	0 / 11.0	11.0 / 18.1	11.7 / 32.5	12.8 / 21.4	20.4 / 99.2	78.9 / 221.7
Agriculture	1.7 / 2.3	0 / 1.0	60.4 / 24	1.7 / 1.4	0 / 8.3	0 / 10.9	63.8 / 47.8
Total Final Consumption	38.2 / 96.2	0 / 19.6	130.8 / 255.7	61.4 / 132.3	45.6 / 97.5	51.2 / 275.6	327.2 / 876.8

*) in all data presented numerator - Energy Conservation Potential (maximum), denominator - Energy Consumption (CENEf).

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4. The latter ratio is 34 percent.

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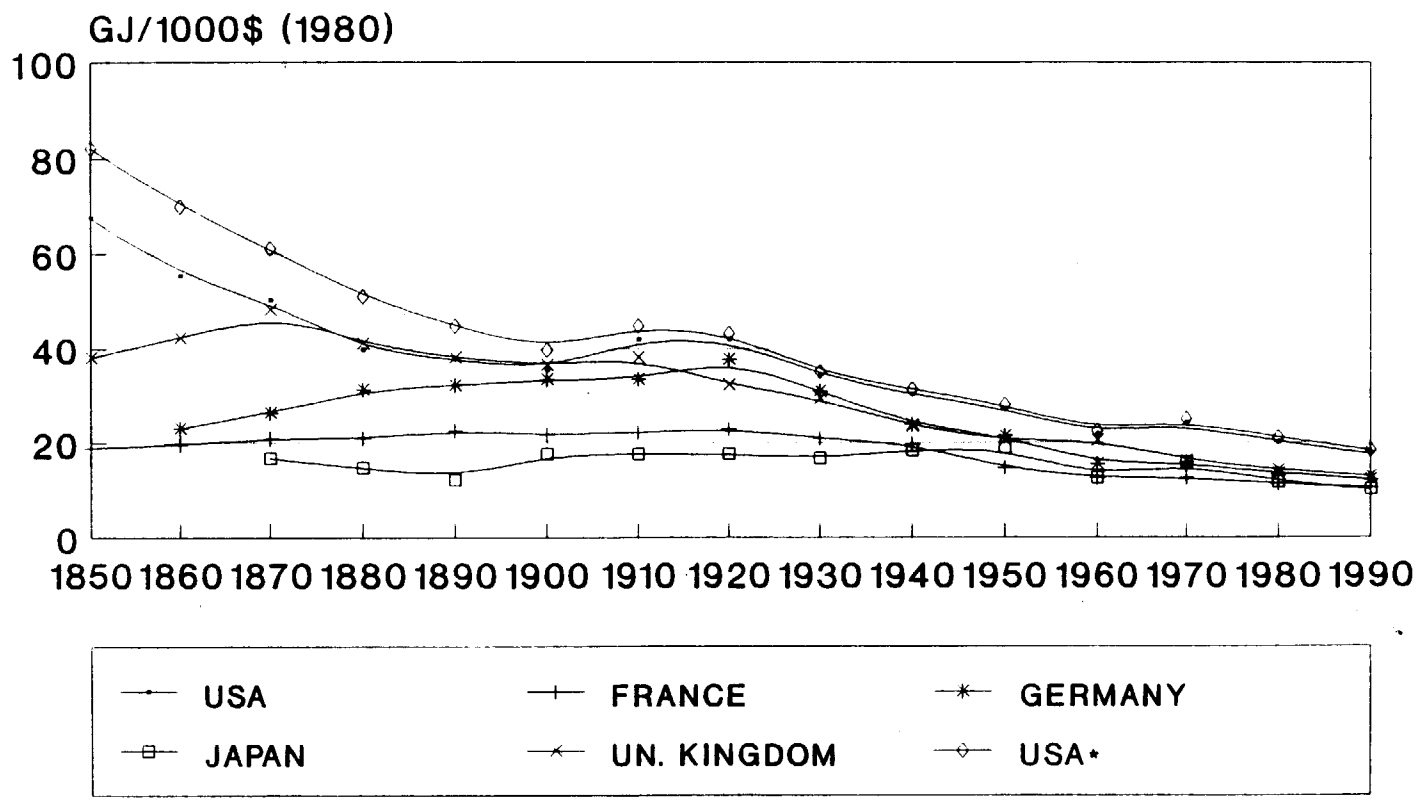
Figure 1.1
GDP/Energy Ratio
Commercial Energy and Wood

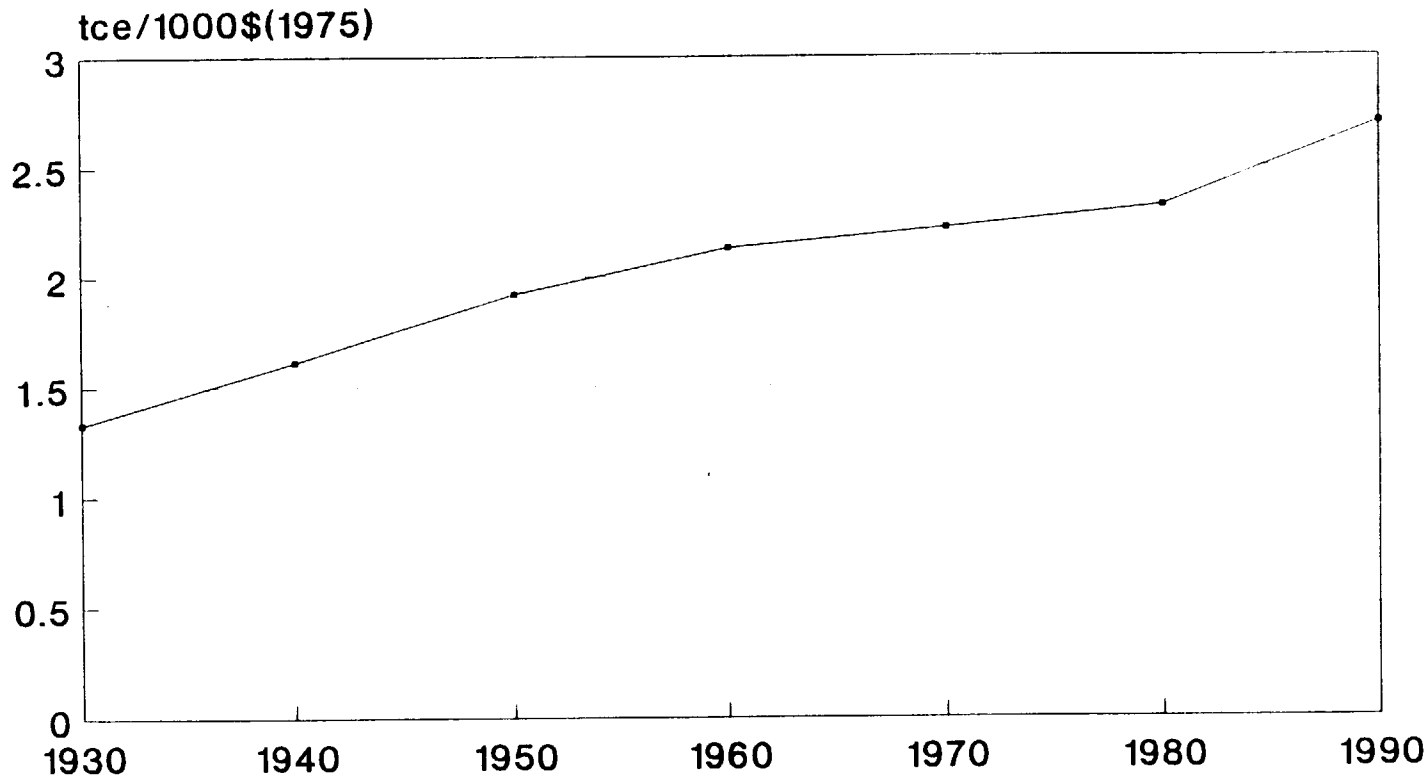


inc. animal power

I. Bashmakov. What are the Current Characteristics of the Global Energy Systems. 1992.

Figure 1.2

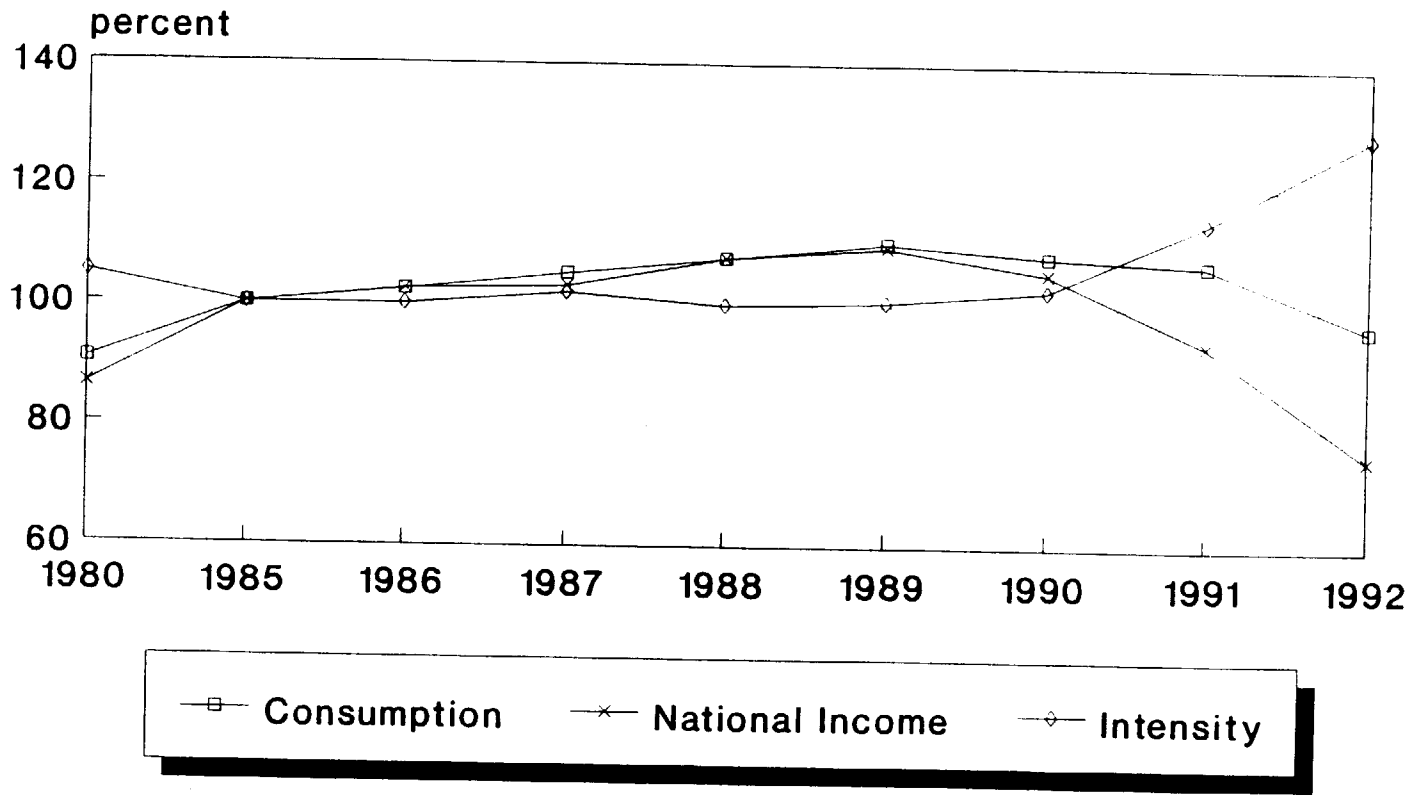
Russia: Energy Intensity Evolution 1930-1990



Yu. Kononov, International Workshop on Costs, Impacts and Possible Benefits of CO2 Mitigation.IIASA, Luxenburg, Austria

Figure 1.3

Energy Consumption, National Income and Energy Intensity: 1985=100

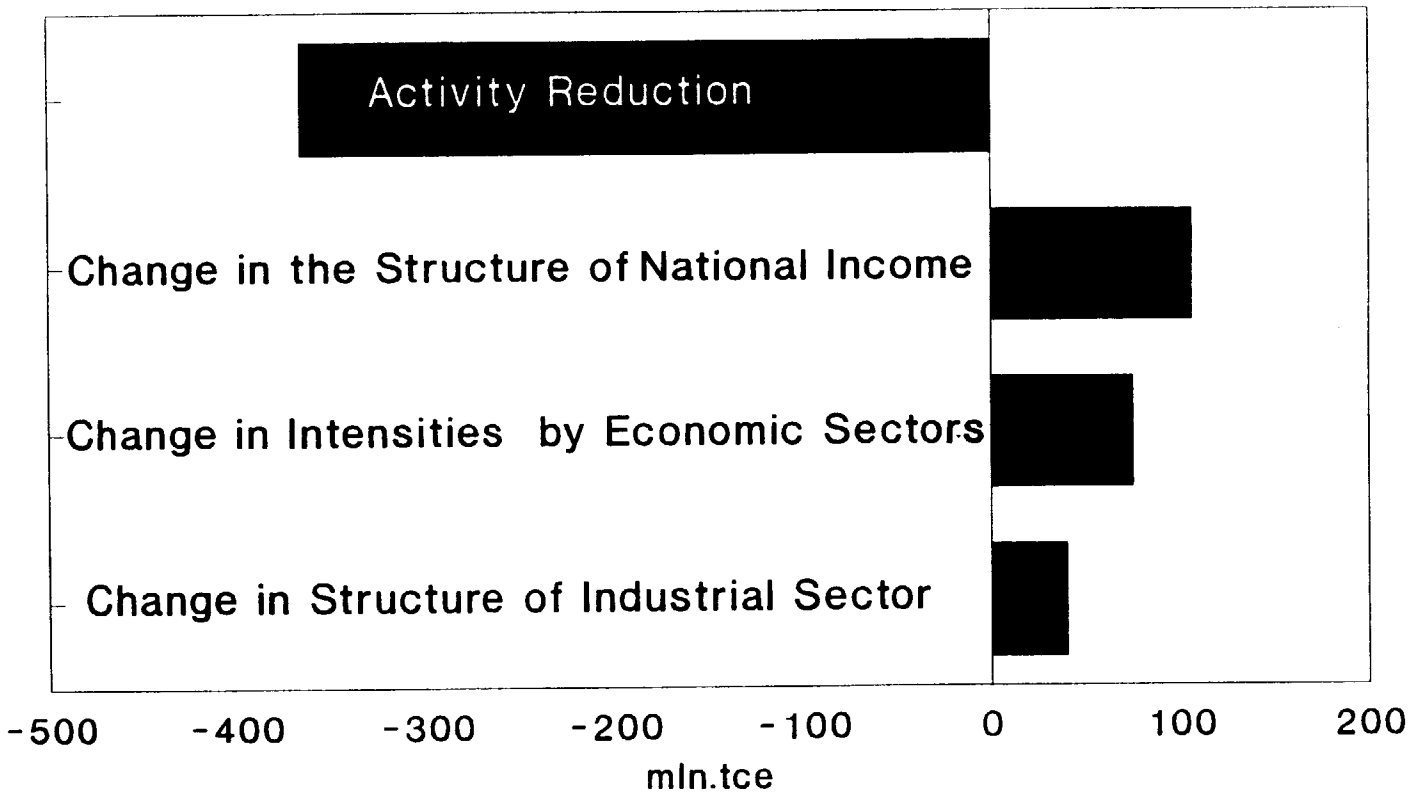


I. Bashmakov, Energy Efficiency in Russia: Starting Conditions and Future Directions, 1992

Figure 1.4

Factors of Energy Intensity Evolution

1990-1992

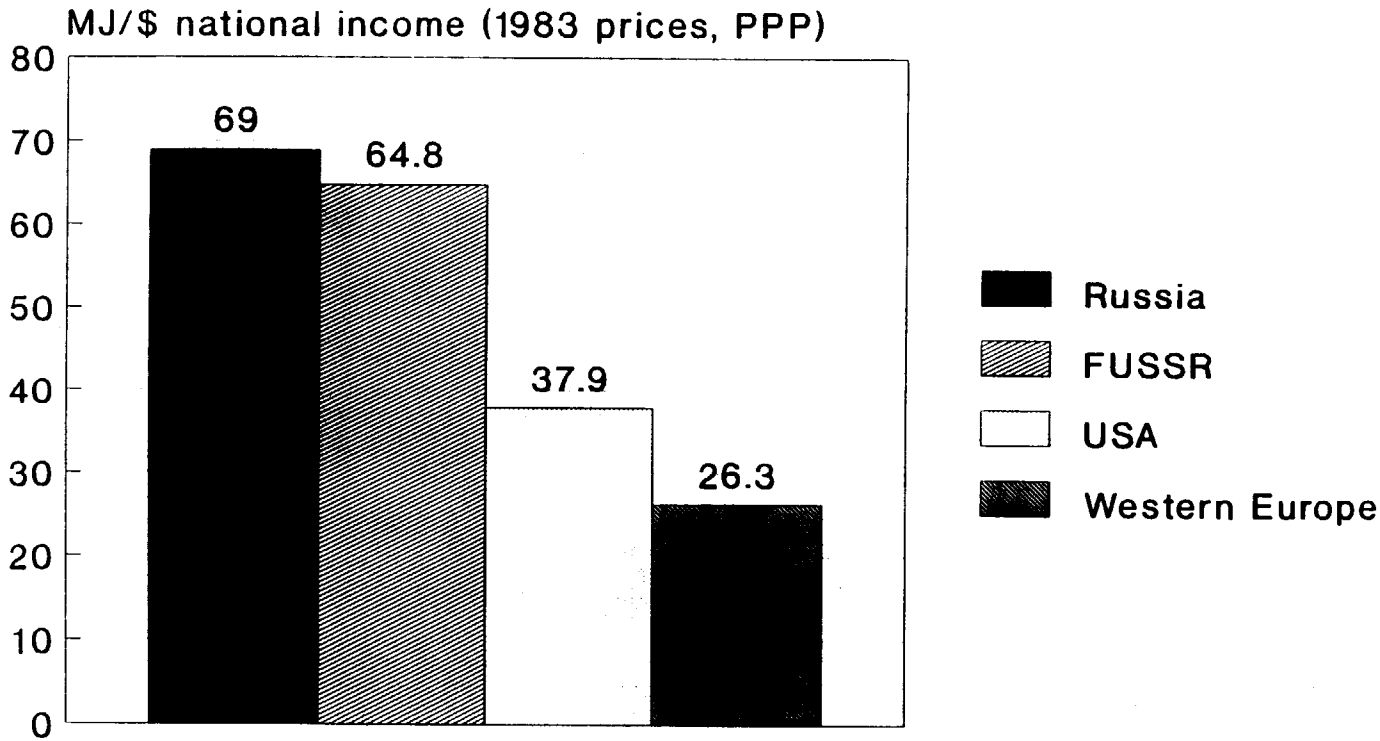


I. Bashmakov, Energy Efficiency in Russia: Starting Conditions and Future Directions, 1992

Figure 1.5

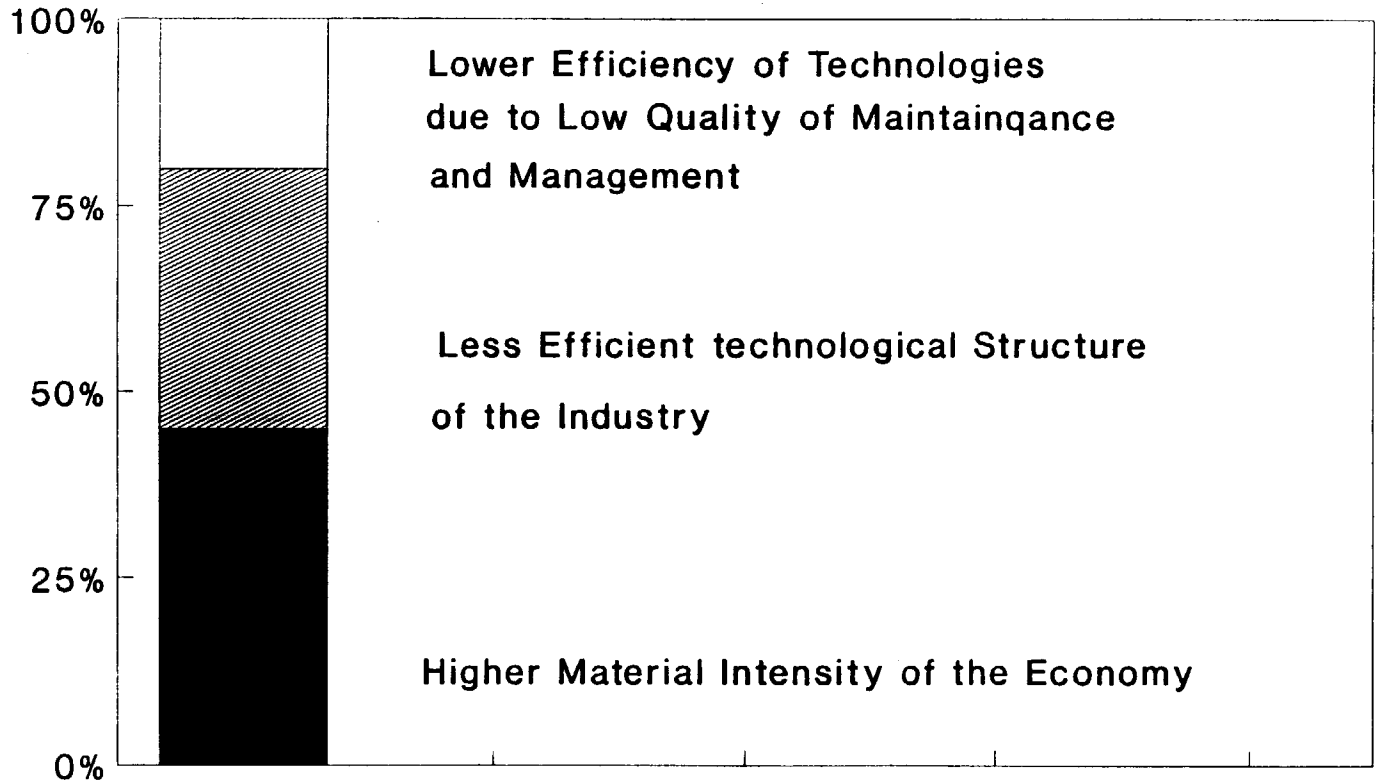
Energy Intensity of National Income 1991

Russia versus the FUSSR, the USA and WE



I. Bashmakov, Energy Efficiency in Russia: Starting Conditions and Future Directions, 1992

Figure 1.6
Structure of the Gap in Ind. Energy Efficiency Between Russia and the USA



I. Bashmakov, Energy Efficiency in Russia: Starting Conditions and Future Directions, 1992

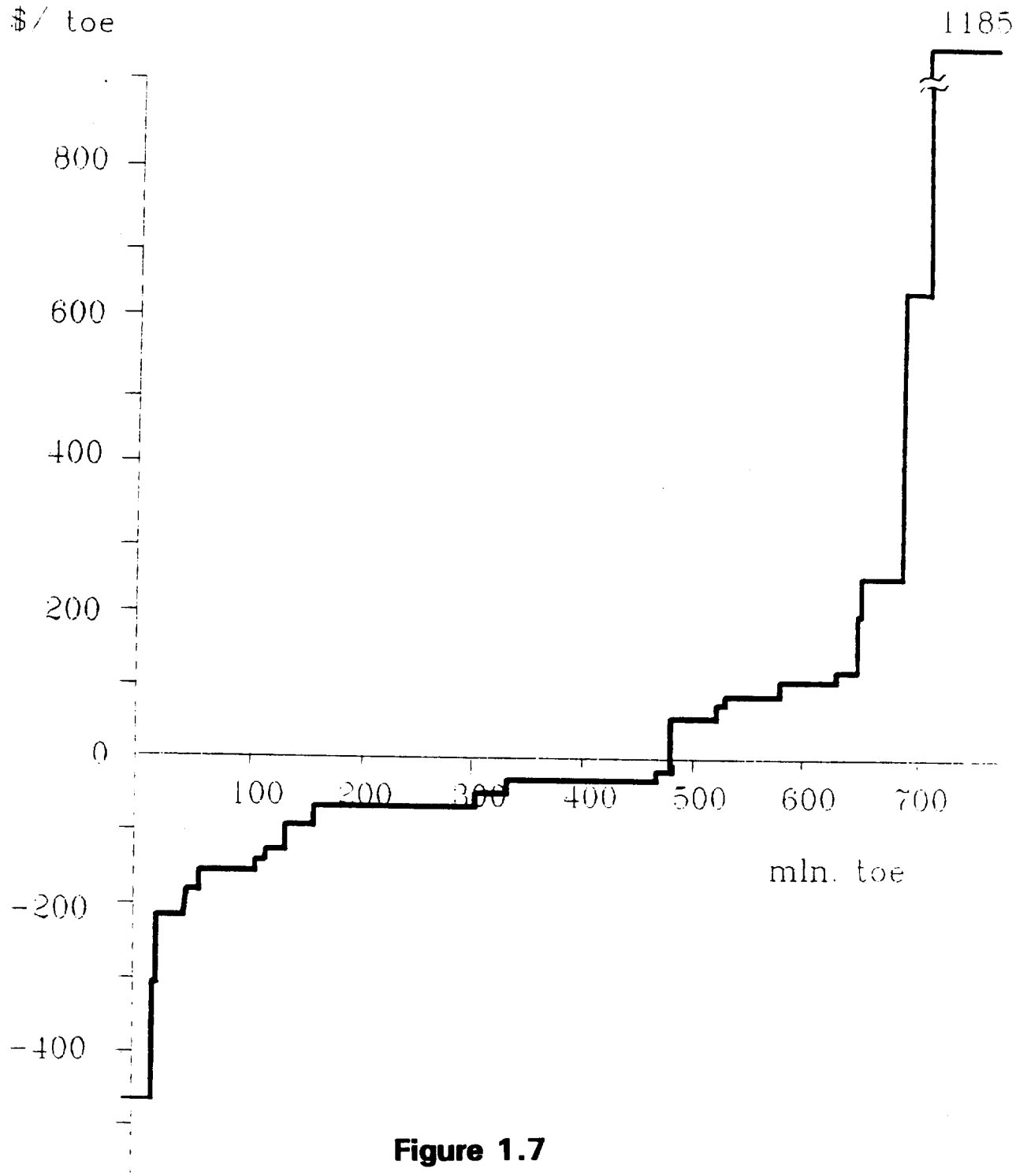
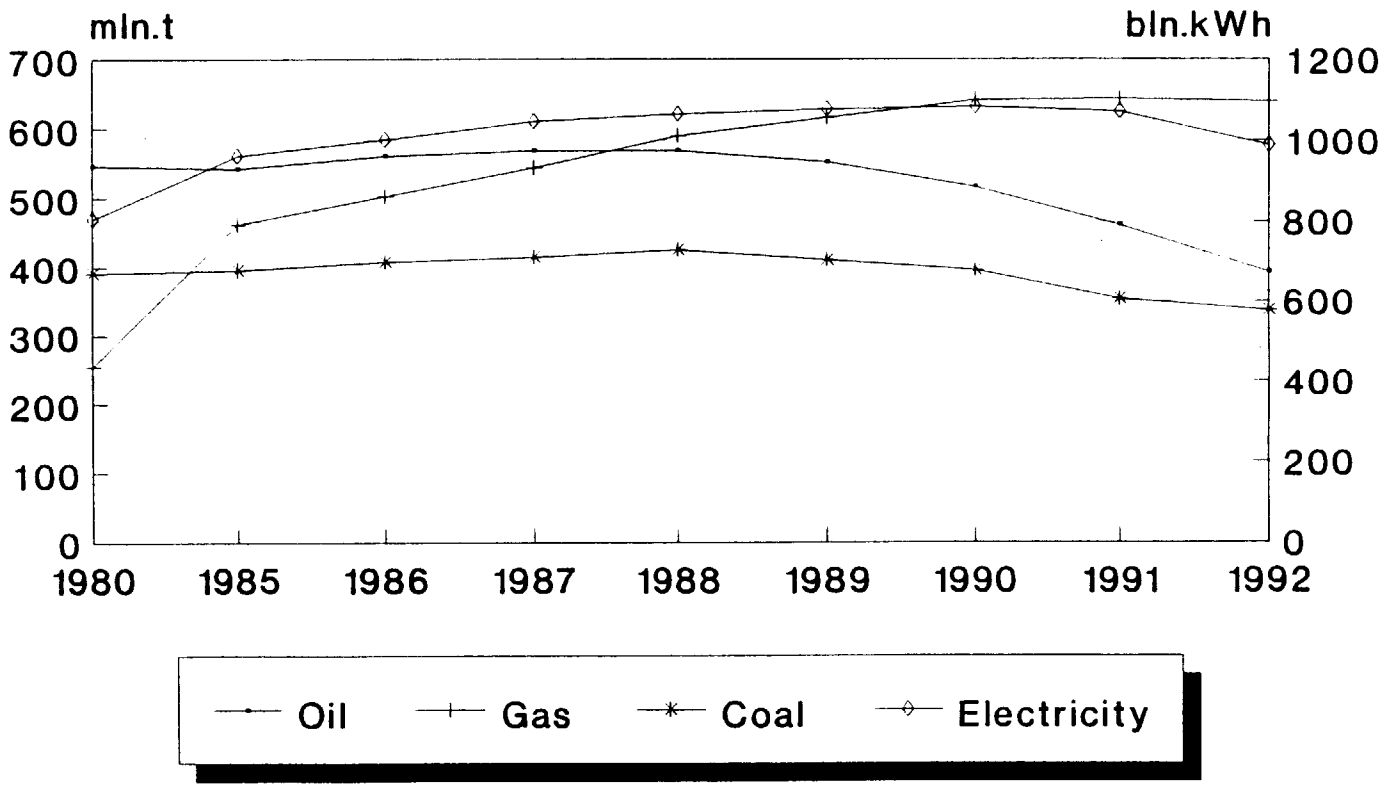


Figure 1.7

THE EX-USSR. COST EFFECTIVENESS OF ENERGY SAVINGS

Figure 1.8

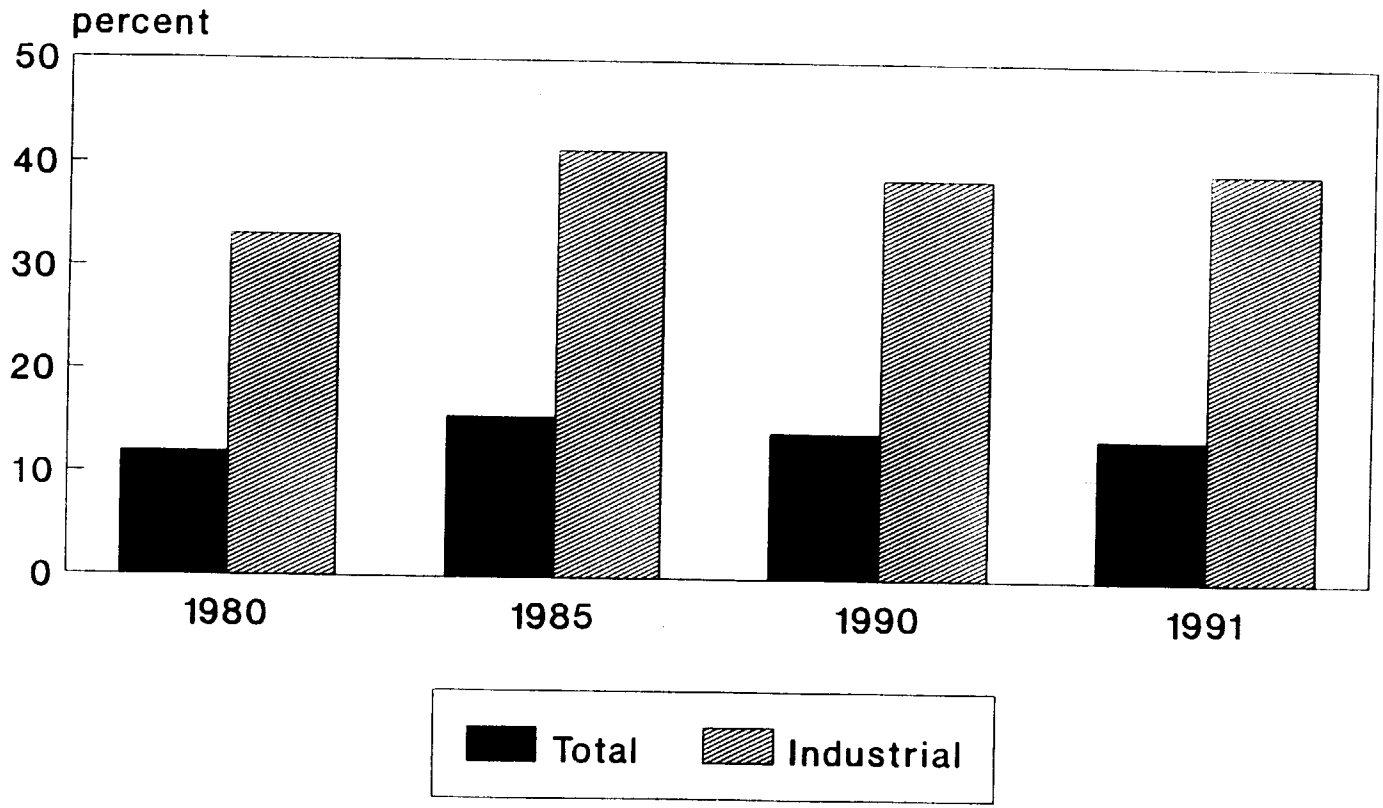
Energy production in Russia 1980-1992



I. Bashmakov, Energy Efficiency in Russia: Starting Conditions and Future Directions, 1992

Figure 1.9

Share of Energy Sector in Capital Investments in Russia



I. Bashmakov, Energy Efficiency in Russia: Starting Conditions and Future Directions, 1992

Chapter 2. STATISTICAL DATA ON ENERGY SUPPLY AND DEMAND

Unreliability of energy statistics in the Former USSR made people realize long ago that in Russia the past is as unpredictable as the future.

Compiling a database on energy consumption in Russia seems a rather difficult procedure. The reasons for this are as follows:

- different methodologies for data collecting, accounting and processing while calculating similarly called indicators by different federal organizations (Roscomstat, Ministry of Fuel and Energy, Ministry of Economics, other departments and institutions);

- lack of a single methodology for calculations in the industries of the energy sector;

- faults of the professional, technical and technological levels of collecting data on different indicators in primary data collecting and processing and in intermediary units of the statistics system;

- intentional falsification of data (to a certain extent) in the interest of some institutions;

- absence of data on a number of balance indicators of the International Energy Agency (IEA) in the Russian statistics;

- long time period for compiling composite energy balances (once in five years) which alone provides a most detailed picture of energy consumption;

- absence of a column "statistical discrepancies" in the balance struck in accordance with the methodology of the Federal Committee for Statistics of the Russian Federation, so the balance is struck with zero saldo, and the indicators are distorted. Most of all it effects columns "export-import" and "non-specified sectors".

The following can serve a good example to demonstrate the quality of the Russian statistics. When comparing the data in tables 2.6 and 2.7 for oil and gas condensate production, one can't but see the difference - 393 and 399 mln tons.

In "Business MN" newspaper, No.15, 1993 there was an article on oil production statistics. It claimed that 394.02 mln tons of oil and gas condensate were produced by enterprises of the Ministry of Fuel and Energy; the extraction amount of 32 joint ventures (Belye Nochi, Amkomi, Yugansk-Frakmaster) was estimated at no less than 8 mln tons. 20 geological enterprises of Roskomnedra and 9 enterprises of Rostopprom, on having received significant export quotas,

increased extraction which in 1993 was no less than 4.4 mln tons. Statistics for about 30 more companies with Russian private capital involved in oil extraction and getting their profit in the form of raw oil or those exploiting stripper wells are practically unavailable. Data from different sources allow to estimate their total extraction in 1992 at more than 1.5 mln tons. Therefore total oil and gas condensate extraction is assessed at 408 mln tons, which significantly exceeds the data provided by the Federal Committee for Statistics - 393 mln tons, the data of the Ministry of Fuel and Energy - 395.8 mln tons, and the data of VNIIKTEP - 399 mln tons. The number of 408 seems too small though, for enterprises lower the amounts of extracted resources.

The most complete information on energy production and consumption was presented in fuel-and-energy balance of Russia for 1990. Certain data in that balance has a security classification "secret", they are not easily available and publication is prohibited. Other data are verified and changed, after which several non-identical assessments of (?) appear which characterize the state of Russian energy sector in 1990 (see table 2.1).

One of these assessments was made by IEA experts after getting access to fuels and energy balances of Russia and the Former USSR prepared by the Federal Committee for Statistics of the Russian Federation (see table 2.2 and source). Before this their assessments for the Former USSR were mainly based on the analysis by experts of separate pieces of information.

Another assessment of the balance was made by experts of Energy Research Institute of the Russian Academy of Sciences based on the fuel and energy balance of the Federal Committee for Statistics and other inventories of different institutions for 1990 in accordance with the IEA's methodology. It was presented in "Russia's Energy and Greenhouse Gas Emission", 1992 (see table 2.3).

This paper also includes data of the Federal Committee for Statistics of the Russian Federation on energy consumption, which in a number of positions differ from those of the balance (see table 2.4).

Some indicators of the development of the Russian energy sector in 1990 are presented in the "Concept of the Russian Energy Policy in the New Economic Conditions" (see table 2.5).

In the table 2.6 there is CENEf's version of the balance which considered all the above mentioned assessments and also a number of additional sources of information. Since the initial data are disbalanced and contradictive, CENEf's version cannot be regarded as an ideal balance. It must be seen just as another attempt.

Information on export and import of energy out of Russia is not very reliable, since in 1990 there were no customs on Russian borders. This unreliability reflected in considerable differences in foreign trade indicators (see table 2.1). Differences in energy production measuring are comparatively small: 1875-1844 mln tce (1.7%), but the export data vary from 743 to 659 mln tce and import data vary from 229.1 to 63.8 mln tce, that is 3.6 fold. And CENEf's experts estimate it at 97.1 mln tce.

As a result, primary energy consumption data also differ considerably. The main reason for all these variations is oil and gas statistics.

The difference in final energy consumption indicators is 6.2 percent (931-877 mln tce). (?) energy consumption for hard fuels varies from 130.3 to 115.3 mln tce, for oil and petroleum products - from 259.5 to 279.3 mln tce, for gas - from 141.4 to 296.7 mln tce.

In general, accurateness of measuring the main energy consumption indicators for Russia can be assessed at about 10%, but for many balance indicators it is even lower.

While developing their own balance version, CENEf's experts meant to combine the best of all the previous versions (for example, in the Energy Research Institute energy consumption was divided into electricity generation and CHP plants, which was not done by the IEA's experts; also energy consumption was divided into sectors in more detail in maximum accordance with the IEA's methodology), and if those versions differed too much, to select the data which are, in our opinion, most accurate.

The data on Russia's energy supply and demand for 1991 and 1992 are not systematized, because, as we have already said, the fuels and energy balance in Russia is struck once in five years. Table 2.7 reflects Fuel and Energy Production and Export provided by the Federal Committee for Statistics of the Russian Federation. Tables 2.8 through 2.12 present preliminary information on different energy resources production and consumption in Russia in 1990-1992. We used data for 1990 while verifying the balance indicators.

So it is clear now that in Russian statistics an assessment of reliability of the initial data by experts is of major importance.

Table 2.1 Comparison of Russia's Energy Balance 1990 Estimations

mln.tce

Parameter	Source	Solid Fuels	Oil	Gas	Nuclear	Hydro	Electricity	Heat	Total
Production	1	311.0	740.0	738.0	45.4	20.6			1854.0
	2	303.6	742.5	732.9	45.0	20.4			1844.4
	4	261.8	736.5	736.0	14.5	20.5			1875.0
	5	303.6	742.5	736.7	44.9	20.4			1848.1
Export	1	53.5	414.0	251.0			5.5		743.0
	2	53.1	415.6	185.0			5.4		659.1
	4	n.a.	425.0	232.5			n.a.		701.0
	5	53.1	415.6	243.8			5.3		712.5
Import	1	37.6	80.9	106.2			4.3		229.1
	2	28.6	35.2	n.a.			n.a.		63.8
	5	28.6	35.2	29.0			4.3		92.8
Total Primary Energy Supply	1	300.0	392.9	587.0	45.4	20.6			1345.0
	2	279.1	362.1	544.2	45.0	20.4			1245.4
	3	269.6	382.3	613.3	n.a.	n.a.			*1265.3
	4	n.a.	n.a.	n.a.	14.5	20.5			1270.0
	5	279.1	362.1	525.6	44.9	20.4			1231.1
Total Final Consumption	1	135.8	286.0	110.8			105.6	292.4	931.0
	2	130.3	259.5	141.4			98.9	260.4	890.5
	3	115.3	279.3	269.7			108.4	277.0	1049.7
	4	n.a.	n.a.	n.a.			132.0	296.9	n.a.
	5	115.8	255.7	132.3			97.5	275.6	876.8

*solid, liquid fuels and natural gas total

Sources:
1 - Energy Statistics and Balances of Non-OECD Countries 1989-1990, International Energy Agency OECD/IEA, 1992
2 - "Russian Energy and Greenhouse Gas Emissions", Moscow, Energy Research Institute, 1992
3 - Fuel and Energy Balance of Russia, Goskomstat of Russian Federation 1991.
4 - Russia's Energy Policy Conception in New Economic Conditions, Moscow, Sept.1992
5 - Russia's Energy Balance prepared by CENEf experts for "Energy Efficiency in Russia" draft

Table 2.2. Energy Balance of Russia, 1990

Russia 1990[1]

Thousand toe

	Solid Fuels	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro/ Other	Elec-tricity	Heat	Total
Indigenous Production	217398	517282		516242	31755	14373			1297049
Import	26287	49241	7319	74311			3020		160178
Export	-37433	-238908	-64122	-175290			-3818		-519570
Intl. Marine Bunkers			-1897						-1897
Stock Changes	3199	2735	3121	-4122					4933
TPES	209451	330350	-55578	411141	31755	14373	-798		940694
Transfers/Returns									
Statistical Differences	5488	-512	586						5562
Public Electricity					-31755	-14373	24827		-21301
Autoproducers of Electr.									
CHP Plants	-83353	-1507	-45468	-154414			67884	209096	-7763
District Heating	-33835	-1	-16903	-66292					-117031
Gas Works	62								62
Petroleum Refineries		-281543	280181	-3795					-5157
Coal Transformation	5944								5944
Liquefaction			6467						6467
Other Transformation	-29		-5712						-5742
Own Use	-5686		-2153	-99453			-10777	-554	-118624
Distribution Losses	-3071	-7599	-369	-9722			-7281	-4045	-32089
TFC	94970	39188	161050	77464			73855	204497	651020
INDUSTRY SECTOR	43293	38376	34519	45268			44429	110968	316853
Iron and Steel	32119		2993	18421			6140	6961	66634
Chemical	210	38242	3848	3109			5998	27913	79320
(of which:Feedstocks)									
Non-ferrous Metals	1099		2588	1723			7773	4164	17346
Non-metallic Minerals									
Transport Equip. & Mach.									
Machinery	1092	5	2019	4281			7904	22325	37626
Mining and Quarrying	3188	50	8657	3433			6874	10831	33034
Food and Tobacco	909	1	3058	1149			1500	8427	15044
Paper, Pulp and Printing									
Wood and Wood Products	456		1540	254			2392	11148	15791
Construction	3130	78	9125	11166			3869	12815	40183
Textile and Leather	18		34	30			1202	4044	5329
Non-specified Industry	1070		655	1702			777	2342	6547
TRANSPORT SECTOR	247	51	74398	351			5332	3804	84178
Air									
Road	2	6	45423	335					45766
Rail	67		5974				4214		10254
Internal Navigation	1		6395						6396
Non-specified Transport	177	45	16603	16			1118	3804	21763
OTHER SECTORS	48252	149	49726	26249			24095	89725	238194
Agriculture	2564	12	16710	983			4298	7635	32202
Comm. & Pub. Services	21776	110	5755	9554			7944	23985	69124
Residential	15782		6827	13259			7721	48453	92042
Non-specified Other	8128	27	20434	2452			4132	9652	44825
Non-Energy Use	3179	612	2407	5597					11795
MEMO ITEMS:									
Electricity Generated (GWh)	*NA*		*NA*	*NA*	*121851*	*166867*			*1078037*
Public	*NA*		*NA*	*NA*	*121851*	*166867*			*1078037*
Autoproducers									

(1) See Section I. Issues of Data Quality, Former CPEs, on page 17.

Source: Fuel and Energy Balance of Russia, GOSKOMSTAT of Russian Federation 1991.

Source: Energy Statistics and Balances of Non-OECD Countries 1989-1990, International Energy Agency OECD/IEA, 1992 p.345

Table 2.3. *Primary Energy Balance, Russia, 1990*

mln. tce

	Coal	Other	Oil	Gas	Nuclear	Hydro	Geo.Sol.	Electricity	Heat	Total
INDIGENOUS PRODUCT	276.1	27.5	742.5	732.9	45.0	20.4				1844.4
IMPORTS:	28.6		35.2							63.8
EXPORTS:	-53.1		-415.6	-185.0				-5.4		-659.1
STOCK CHANGES				-3.7						-3.7
TOTAL PRIMARY ENERGY SUPPLY	251.6	27.5	362.1	544.2	45.0	20.4		-5.4		1245.4
TRANSFORMATION AND ENERGY SECTOR	-144.1	-4.7	-102.6	-402.8	-45.0	-20.4		104.3	260.4	-354.9
ELECTR. GENERATION	-43.6	-1.3	-14.1	-63.1	-44.0	-20.4		81.9		-104.6
DISTRICT HEAT	-36.6	-2.5	-31.5	-87.2	-1.0				140.8	-18.0
CHP PRODUCTION	-63.9	-0.9	-36.3	-165.0				48.6	141.6	-75.9
OWN USE & LOSSES			-20.7	-87.5				-26.2	-22.0	-156.4
TOTAL FINAL CONSUMPTION	107.5	22.8	259.5	141.4				98.9	260.4	890.5
INDUSTRY TOTAL	57.6	11.7	27.9	76.6				62.8	140.3	376.9
TRANSPORT TOTAL	0.3		128.3	0.4				7.6	5.4	142.0
AGRICULTURE	2.4	1.1	27.5	1.4				6.1	10.9	49.5
RESIDENTIAL/COMMER	40.3	10.0	12.9	32.6				22.5	103.7	222.0
NON-ENERGY USE	7.0		62.9	30.2						100.1

Source: "Russian Energy and Greenhouse Gas emission", I.Bashmakov Editor, Moscow, Energy Research Institute, 1992, p 26.

Table 2.4. *PRIMARY ENERGY CONSUMPTION, 1990*

th.tce

Energy resources / **Parameter**	Coal	Other Solid Fuels	Liquid Fuels	Natural Gas	Electricity	Heat	TOTAL
Consumption, th.t c.e.	242212	27433	382288	613322			1265255
Electricity Generation	74188	803	26692	133734			235417
CHP Plants	40561	1165	23941	101641			167308
District Heating	31326	5801	40082	103019			180228
Own Use and Losses	415	35	12227	5263	21970	16279	56188
Industry	50125	793	30496	61126	61492	133909	337941
Iron & Steel	45513	3	4288	28244	19423	9950	107421
Non-Ferrous Metals	130	1	3793	2641	11195	5955	23715
Chemical and Petrochemi	11	4	5175	4766	8640	39921	58517
Machinery	317	3	3229	6564	11459	31916	53489
Wood, Paper, Pulp & Prin	94	543	2212	390	3444	15951	22635
Constructive Materials	3225	101	6568	16714	3437	12377	42422
Textile & Leather	23	2	49	46	1730	5791	7641
Food and Tobacco	812	136	5182	1761	2163	12047	22101
Transport	306	11	118250	73002	10974	5436	207980
Agriculture	2275	968	23991	1508	6147	10921	45810
Residential/Commercial	39559	10969	18083	34978	22403	103578	229569
Other	1838	752	10156	4631	7372	23110	47860
Non-Energy Use	1619	6136	78370	94420			180545
Total	95722	19629	279346	269665	108389	276954	1049705

Source: Fuel and Energy Balance of Russia, GOSKOMSTAT of Russia, 1991

Table 2.5.

Russia's Energy Supply and Demand, 1990

	Consumption	Production	Export	
			CIS	other countries
Primary energy, mln.tce	1270	1875	356	345
Electricity, bln. kWh	1074	1082		
- hydro		167		
- nuclear		118		
Heat, mln. GCal	2076			
Oil and Gas Cond., mln.t		515		
Natural Gas, bln.m3		640	92	110
Coal, mln.t		396		
Motor Fuels, mln.t	103			
Oil and Petroleum Products, mln.t			160	135

Source: Russia's Energy Policy Conception in New Economic Conditions, Moscow, Sept. 1992, p.9,37-38

Table 2.6.

Primary Energy Balance, Russia, 1990

mln. tce

	Coal	Other Solid	Oil	Gas	Nuclear	Hydro	Geo.Sol.	Electricity	Heat	Total
INDIGENOUS PRODUCTION	276.10	27.50	742.50	736.70	44.90	20.40				1848.10
IMPORTS:	28.60		35.20	29.00				4.31		97.11
EXPORTS:	53.10		415.60	243.80				5.33		717.83
STOCK CHANGES	n.a.	n.a.	n.a.	-3.70						-3.70
TOTAL PRIMARY ENERGY SUPPLY	251.60	27.50	362.10	525.60	44.90	20.40		-1.02		1231.08
TRANSFORMATION AND ENERGY SECTOR	-146.49	-7.81	-102.94	-395.72	-44.90	-20.40		98.36	275.88	-344.03
Statistical Difference	8.94	0.06	3.43	-2.43				-0.11	0.33	10.22
ELECTR. GENERATION	-74.19	-0.80	-26.69	-60.80	-44.00	-20.40		90.10		-136.78
CHP Plants	-40.56	-1.17	-23.94	-158.87				42.90	136.42	-45.21
DISTRICT HEATING	-31.33	-5.80	-40.08	-95.91	-0.90				144.86	-29.16
Waste Heat Recovery Units									14.73	14.73
OWN USE & LOSSES	-0.42	-0.04	-12.23	-80.14				-34.64	-20.13	-147.60
TOTAL FINAL CONSUMPTION	96.17	19.63	255.73	132.30				97.45	275.55	876.83
INDUSTRY TOTAL	50.56	0.79	30.50	60.77				53.46	139.84	335.91
Iron & Steel	45.51	0.00	4.29	26.34				8.94	9.95	95.03
Non-Ferrous Metals	0.13	0.00	3.79	2.46				11.98	5.95	24.31
Chemical and Petrochemical Feedstocks	0.01	0.00	5.18	4.46				8.50	39.91	58.07
Machinery	0.32	0.00	3.23	6.10				11.41	31.92	52.98
Wood, Paper, Pulp & Printing	0.10	0.54	2.21	0.37				3.01	16.03	22.26
Constructive Materials	3.23	0.10	6.57	15.62				3.65	12.28	41.45
Construction	0.43			3.75				2.31	5.96	12.45
Textile & Leather	0.02	0.00	0.05	0.05				1.82	5.78	7.72
Food and Tobacco	0.81	0.14	5.18	1.63				1.82	12.05	21.63
TRANSPORT TOTAL	0.31	0.011	108.48	0.50				7.63	5.43	122.37
OTHER SECTORS TOTAL	43.68	12.69	52.24	38.02				36.36	130.28	313.26
Agriculture	2.28	0.97	23.99	1.40				8.28	10.93	47.84
Comm. & Public Services	22.94	6.30	8.36	13.59				10.84	32.86	94.89
Residential	16.62	4.67	9.73	18.86				10.54	66.37	126.79
Non-specified sectors	1.84	0.75	10.16	4.16				6.70	20.12	43.74
NON-ENERGY USE	1.62	6.14	64.51	33.02						105.29

Source: CENEf, "Energy Efficiency in Russia" draft

Table 2.7. Fuel and Energy Production and Export, 1992

Parameter	Unit	Production	Export excluding FSU
Electricity	bln. kWt-h	989	n.a.
of which			
- hydro	bln. kWt-h	172	
- nuclear	bln. kWt-h	119	
Heat	mln. GCal	827	
Coal	mln. t	337	n.a.
of which			
- coking	mln. t	71.1	n.a.
Crude Oil	mln. t	393	66.2
Petroleum Products	mln. t	n.a.	25.2
of which			
- gasoline	mln. t	35.1	n.a.
- diesel fuel	mln. t	65	n.a.
- mazut	mln. t	88	n.a.
Natural Gas	bln. m3	640	88.9

Source: Social-Economic Situation in Russian Federation in 1992. Volume 1 GOSKOMSTAT of Russia, Moscow, 1993, pp.104,112

Table 2.8. Oil and Gas Condensate Production

mln. t

	1990	1991	1992
Oil and Gas Condensate Productic	516.3	461.1	398.8
Refining	298.4	289.2	256
Import	16.8	12.6	10.2
Export to FSU Republics	136.6	117.72	75.5
Export to other countries	82.2	55.7	64.3
Consumption	15.9	11.08	13.2

Source: VNIIKTEP

Table 2.9. Natural Gas Production

bln.m3

	1990	1991	1992
Natural Gas Production	640.6	643	640.4
Import	25.2	20.9	23.8
Export to FSU Republics	112	92.2	106.6
Export to other countries	100	105.3	99.1

Source: VNIIKTEP

Table 2.10. Electricity Consumption in Russia

bln.kWt-hours

	1990	1991	1992
INDUSTRY TOTAL	553.7	531.5	487.8
Fuel	83.4	79.5	75
Iron & Steel	72.7	69.1	64
Non-Ferrous Metals	97.4	96	94
Chemical and Petrochemical	69.1	73.3	70
Machinery	92.8	89.5	82
Wood, Paper, Pulp & Printing	29.7	28.3	26.7
Constructive Materials	24.5	23.8	21.5
Textile & Leather	14.8	14.2	13
Food and Tobacco	14.8	14.6	13.5
Others	54.5	43.2	28.1
TRANSPORT TOTAL	103.8	96.7	92.2
OTHER SECTORS TOTAL	259.9	270.3	270
Agriculture	67.3	70.5	67
Construction	18.8	16.8	15
Residential/Commercial	173.8	183	188
Subtotal	917.4	898.5	850
Own Use	72.2	73.7	70
Losses	84.2	83.9	80
Total	1073.8	1056.1	1000

Source: VNIIKTEP
(All-Russian Scientific Research Institute for Complex Fuel & Energy Problems)

Table 2.11.

Heat Consumption in Russia

mln.GCal

	1990	1991	1992
INDUSTRY TOTAL	1059.9	1035.6	993.4
Fuel	100.3	96.6	96
Iron & Steel	69.6	65.5	61
Non-Ferrous Metals	41.6	41	40.4
Chemical and Petrochemical	279.1	282	270
Machinery	223.2	220	218
Wood, Paper, Pulp & Printing	112.1	106	100
Constructive Materials	85.9	83.5	76
Textile & Leather	40.4	38	37
Food and Tobacco	84.3	83	77
Others	23.4	20	18
TRANSPORT TOTAL	38	37	36.3
OTHER SECTORS TOTAL	929.3	917.4	905.5
Agriculture	76.4	72	72
Construction	41.7	37.5	33.5
Residential/Commercial	693.9	700	705
Non-specified	117.3	107.9	95
Subtotal	2027.2	1990	1935.2
Losses	40.5	39.6	38.5
Total	2067.7	2029.6	1973.7

Source: VNIIKTEP

Table 2.12. Boiler and Furnace Fuel* Consumption in Russia

mln. tce

	1990	1991	1992
INDUSTRY TOTAL	166.9	160	150.5
Fuel	30.2	29	28.5
Iron & Steel	75.7	73	68
Non-Ferrous Metals	5	4.7	4.2
Chemical and Petrochemical	11.3	11	10.2
Machinery	9.7	8.7	8.2
Wood, Paper, Pulp & Printing	1.8	1.6	1.3
Constructive Materials	24.6	23.6	22
Textile & Leather	0.1	0.1	0.1
Food and Tobacco	4.5	4.5	4.4
Others	4	3.8	3.6
TRANSPORT TOTAL	70.3	70.2	70.5
OTHER SECTORS TOTAL	167.5	164.3	164
Agriculture	7.53	7	7.2
Construction	1.67	1.5	1.4
Residential/Commercial	95.1	96	98
Feedstocks and Non-energy use	48.2	45.8	44
Non-specified	15	14	13.4
Subtotal	404.7	394.5	385
Losses	14.01	13.5	13
Heat & Electricity Generation	392.4	388.8	375
District Heating	177.4	170.4	169
Total	988.51	967.2	942

*including coal, gas, mazut, other residual fuels

Source: VNIIKTEP

Chapter 3. PRESENT ENERGY EFFICIENCY STRATEGY IN RUSSIA

3.1. Energy Policy

The Russian government recently debated and approved of an energy policy called "The Concept of Russian Energy Policy in the New Economic Situation."[1] Among its main goals are:

- Developing reasonable energy demand and promoting energy conservation;
- Ensuring reliable energy supply;
- Creating an interregional energy supply system;
- Emphasizing electrification and upgrading fuel quality; and
- Maintaining Russia's energy export potential.

Among the most urgent measures for 1993 are: improving the reliability of energy supply; reducing energy intensity; improving financial conditions of energy producers; and attracting foreign investments for energy exports. To achieve these goals, it is necessary to further liberalize energy prices (excluding natural monopolies) and replace or partially substitute income and profit taxes by energy rent. For medium and long-term energy policy, energy efficiency is a top priority.

3.2. Present Energy Conservation Policy

Energy conservation policy more and more often became a subject of consideration by the Russian government. As recent as June 18, 1993 the Presidium of Council of Ministers of the Russian Federation (Cabinet) considered "Energy Conservation Program for Russia" submitted by the Ministry of Fuel and Energy (see Appendix 3). The program was presented by the Minister of Fuel and Energy Yuri Shafranik, went through a storm debate, and was approved in general with request for significant changes (personal communication with Yu. Shafranic).

The main reason for developing the program is the growth of energy intensity of Russian GDP. According to July 12 TV interview with Shafranic, energy intensity of the GDP grew by 34 percent since 1990.

He said that potential to improve energy efficiency in Russia is estimated equal to 450-500 mln tce. This estimate is slightly more conservative than that in the Program text. He also mentioned that energy costs in overall production costs grew from 3-5 percent in industry up to 8-10 percent. For some reasons he thinks that it is still a small number.

The conservation program calls for a freeze in industrial energy consumption at 1992 levels, and any electricity consumed over and above that level would be triple the price.

The plan also calls for across-the-board energy price hikes, including raising the price of coal two and a half times to raise money to pay overdue money salaries for miners and fund restructuring of coal industry, including the closure of unprofitable mines.

In a business Russian newspaper" Commersant Daily" the publication about this Cabinet sitting appeared under the title "Energy Conservation will be Promoted Administratively".[2] Yu. Shafranik believes that it is possible to force consumers to save energy by combination of price shocks and strict administrative measures to limit energy consumption.

Recognizing the limited effectiveness of energy pricing policy as a means to direct consumers to the effective energy use, experts from the Ministry of Fuel and Energy proposed to authorize regional authorities to establish quotas for energy consumption and to charge triple price for energy consumption growth if it is not followed by production growth.

3.2.1. "Energy Conservation Program for Russia"

Innovation Investment Program **"ENERGY CONSERVATION IN RUSSIA": (Strategy and Priorities)** was prepared based on decrees of the Russian Government No.318issued on May 18, 1992, No.371 issued on June 1, 1992, order of the Russian Government No.5695 of May 21, 1992 prepared by the Ministry of Fuel and Energy of the Russian Federation, the Ministry of Science and Technical Policy of the Russian Federation, the Ministry of Economics of the Russian Federation, and the Engineering Academy of the Russian Federation.[3] Below we present abstracts from the text of this program with our comments.

3.2.1.1. Basic Provisions of the Program "Energy Conservation in Russia"

The Concept of Energy Policy in Russia in the new economic situation approved by the Russian Government sets the task of achieving in 2000 savings of primary energy resources (as compared to those in 1990) by 200-250 mln tce, and in 2010 - by 500-600 mln tce. About half of all the savings must be achieved by way of improving the structure of economy and the rest - by technological improvements and undertaking a complex of organizational measures.

If successful, these energy savings would mean that by 2010 energy intensity of Russia's GDP will be reduced by 22-24%, as compared to that in 1990.

CENEf's comments.[4]

The goals of the program are formulated in a very general manner, as well as mechanisms for their realization. The target is to reduce energy intensity of GDP only by 22-24% during the coming 20 years. But lots of countries managed to reduce it much quicker starting with much more efficient use of energy. It is not clear, what this rate has to do with the Program. Is it

the program task or not? If energy consumption can be reduced 1.4-1.7 fold, or by 30-40%, as it was mentioned at the page 7 of Program text, why the task is to reduce it just by 22-24%?

3.2.1.2. Stages of the Program Implementation

Energy Conservation Program in Russia should be implemented in 3 stages.

First stage will take 12-18 months. This period coincides with a complex of anti-crisis measures in the economy in general and in energy sector in particular. The major directions for energy conservation activities on the federal level must be as following:

- Improving prices system for primary energy resources and energy carriers produced from them;
- Developing and adopting legislative acts and regulations in the area of production, rational utilization and savings of fuels and energy;
- Establishing a structure of federal and regional authorities for energy consumption and energy conservation management (standardization, inspection, information, assistance to energy consumers in improving energy efficiency);
- Establishing a federal and regional non-budgetary energy efficiency funds to initiate and financially support most important and energy efficient projects;
- Further improving the system of tariffs for electricity and heat and developing methods of charging for energy savings (????????????);
- Training leaders and engineers for energy conservation.

Second stage will last up to 1996-1997. This will be, basically, time to overcome energy crisis and establish a developed energy market in Russia. Legislative acts in the field of energy consumption and energy conservation, as well as organizational and economic mechanisms must come into effect.

Large-scale support in transferring Russia's economy to an energy efficiency development on this second stage must be provided by conversion enterprises, especially by way of equipping energy consumers with fuels and energy meters. In the transition period an important role in improving efficiency, environmental friendliness and reliability might be played by, for example, small- and medium-size thermal power stations with gas-turbine drives and other energy installations manufactured for ships, submarines and aircrafts.

At the third stage energy efficiency policy must be further developed. It must include both measures on improving the structure of economy to increase in Russia's GDP the share of science-intense and low energy intensive industries, and measures on developing and introducing absolutely new low energy intensity technologies, energy efficient equipment and materials.

CENEf's comments.

Basically, all the proposed measures for the first stage of the program implementation - called anti-crisis measures - establish an institutional and normative base for implementing energy conservation policy. Their impact will be delayed. For some reason, the list of these measures lacks a number of subprograms which are considered in the Program. The third stage is described very vaguely.

3.2.1.3. Energy Conservation Mechanisms

These stages are supposed to be carried out based on the state's implementation of active energy efficiency policy by way of simultaneous solving a complex of interconnected tasks, namely:

- development of a legislative base for energy conservation;
- development of standards for energy consumption, certification of energy intense products;
- creation of a favorable economic environment including commercialization of work; development of an energy conservation mechanism corresponding to the market economy; development of a price policy;
- financial support provided by the state of the investment policy, legislative base, standardization of energy consumption;
- implementation of scientific and technical energy efficiency policy and of energy efficiency projects;
- production of the necessary energy efficient equipment and organization of delivering it to consumers through the market infrastructure;
- distribution of powers and responsibility between federal and regional authorities;
- international cooperation;
- economic sanctions to consumers guilty of energy losses and irrational energy consumption.

3.2.1.4. Energy Conservation Fund

To reduce the load on industries of the fuels and energy complex, it is necessary to take on the federal level a number of urgent financial, economic and administrative measures (sanctions for irrational energy consumption).

The amount of funding for federal financial support of energy efficiency projects for the period of 1993-1995 is estimated at 365-370 bln rubles (prices of 1993) for top priority projects. This will save 35-40 mln tce in 1995, as compared to 1990, and set perspectives for a number of projects to be implemented in the coming two or three years that will save 70-80 mln tce.

This money will be collected in the federal and regional non-budgetary energy conservation funds. It makes sense to estimate deductions to the funds for a certain period of time with further on indexation. After energy consumption standards are developed (in 1995), the mechanism for collecting money in the funds can be changed based on fining enterprises for inefficient and irrational energy use.

The Russian Non-Budgetary Inter-Industry Energy Conservation Fund was established on the federal and regional levels by the decree No.371 of the Russian Government issued on June 1, 1993.

This decree will allow to direct up to 25 bln rubles annually (prices of 1993) to the needs of energy efficiency. Among these 16-18 bln rubles will be directed to the regional energy conservation funds.

CENEf's comments

The description of the Fund proposed functions is presented in the Appendix 4. It is clear that the information presented does not provide enough details on the future fund activities, but if a more detailed version exists, it is not available. The following information is a result of a personal communication with Mr. Vitaly Bushuyev.

Activities of the Fund are under supervision of Supervisory Council.
The Chairman of this Council is a representative of Fuel and Energy Ministry.

The Chairman of the Directors Council of the FESF Executive Board is Mr. Anatoly Lutenko. His deputy is Mr. Valery Vasiliev. The head of the International Relations department of the RESF is Dr. Victor Shakhin.
The staff of the Fund is supposed to consist of 15 people.
The fund activities shouldn't be based on revenues from sanctions! It will never do.

What does the phrase about accounting expenses for economic motivation mean? Won't these expenses be justified? 370 bln rubles from federal funds are needed to save 30-40 mln tce and to lay a basis for saving another 70-80 mln tce. Total is 105-120 mln tce.

Taking into consideration the task for the year 2000 (savings equal 200-250 mln tce) and the structural factor's contribution (about 50%), it seems like the whole (technical) energy conservation program is financed exclusively by federal funds. But what about separate enterprises? Will they be kept aside?

Who will direct money to the regional funds and how will it be done?

3.2.1.5. Energy Consumption Standards. Certification of Products

Recently energy consumption indexes have been introduced in 314 GOST (government standards) regulations. The total amount of documents to be developed in 1993-1995 is estimated at 120-150, and the funds needed for their development is 50 mln rubles. The program of priorities includes a list of these documents.

An important direction in energy efficiency policy is certification of newly manufactured products for correspondence to energy standards. Expenses for establishing certification standards on the first stage are estimated at 100 mln rubles.

CENEf's comments.

Presently the Center for Energy Efficiency Standardization is under creation in the State Standardization Committee.

Will there be a complete standards system in 1995? There haven't been such rates of its development in the world practice. But if this system is not established, it means that it's impossible to change the fund creation mechanism.

The cost of establishing a network of authorized centers cannot possibly be as low as only 100 mln rubles.

3.2.1.6. The Structure of the "Energy Conservation Program in Russia"

Economic mechanism on the first stage will focus on grants and subsidies to enterprises consuming and manufacturing energy efficiency equipment to promote revealing economic potential; equipping energy sector with control devices; recycling energy resources; as well as local and renewable energy sources.

After the Law on energy conservation is adopted, means of economic and administrative influence will be enlarged by tax benefits and sanctions, fines for irrational energy consumption, and improving price and depreciation policies. The economic mechanism will include methods of price forming; relations between energy suppliers and energy consumers; financing energy conservation; standardization of energy consumption; and control over efficient utilization of fuels and energy. Economic mechanism should also include levers and stimuli to make the necessary structural changes in energy production and consumption. In long-term perspective structural economy will reduce energy intensity of GDP by 20-25%.

Financial mechanism implies federal support of energy efficiency projects by federal and local budgets, privileged loans for 3-4 years with covering the bank interest from the budget funds. The Russian Non-Budgetary Inter-Industry Energy Conservation Fund established by the Russian Government must promote energy efficiency. Budgetary and non-budgetary money must provide motivation for attracting the funds of enterprises and organizations to finance energy efficiency on a commercial basis. This must become the main source of funding.

Legislative Base for Energy Conservation has been launched by a draft energy conservation law developed by order of the Russian Government. It has been sent to the subjects of the Federation, ministries and departments of the Russian Federation. This draft aims, in the first place, at setting legal norms for implementation of the federal energy efficiency policy. It establishes financial and economic mechanisms promoting energy conservation, for example, tax, loans and depreciation benefits; creation of energy conservation investment funds; subsidies; economic sanctions for inefficient energy use.

CENEf's comments.

What is the system of grants and subsidies like? Will it work? And how? What tax benefits are suggested? What fines are proposed and for what?
It is absolutely unclear, how the Program suggests to motivate enterprises positively to save energy. It points that the fund's money will be utilized to attract enterprises' funds on a commercial basis. It is unclear what it means. It is also stated that each ruble of the fund will attract 3-4 rubles of enterprises' money. But not a single table reflecting financial sources of the Program keeps this ratio.

3.2.1.7. Top Priorities in Energy Conservation

The Program includes about 230 top priority projects. Most important of these are 78 projects which are combined into a program of primary measures on meeting the needs of Russian industries for energy and water control and regulation devices. This program will be implemented in 1993-1995. Expenses are estimated at 6.5 bln rubles, including 2.7 bln rubles for scientific-research and design projects (prices of 1993).The program of primary measures includes:

- 23 projects on heat control and regulation devices (expenses estimated at 1.973 bln rubles);
- 17 projects on natural gas (expenses estimated at 1.42 bln rubles);
- 15 projects on electricity (expenses estimated at 1.839 bln rubles);
- 18 projects on water consumption control (expenses estimated at 0.772 bln rubles);
- 5 projects on developing energy consumption automatic management systems (expenses estimated at 0.539 bln rubles).

Implementation of the Program will ensure annual manufacturing of 1-1.2 mln devices related to heating and therefore energy savings up to 25% of the present heat consumption. Production of gas meters will be increased up to 0.2 mln pieces a year for industrial use and up to 1 mln pieces for residential use. The need for electric meters will be met in 1996.

The Program of top priorities includes 156 energy efficiency projects which will ensure in 1993-1995-1997 savings of 75-85 mln tce annually (as compared to 1990) in gas, oil, oil refining, chemistry and oil-and-chemistry industries, as well as in ferrous and non-ferrous metallurgy, substitution of scarce motor fuels in transport, agriculture, construction and machine-building sectors. Total expenses for their implementation are estimated at 258 bln rubles (prices of 1993).

Payback period will not exceed 2-4 years. Cost effectiveness (the cost of saved fuels) will be 1.5-1.7 trillion rubles annually.

On the order of the Russian Government (decree No.371 issued on June 1, 1992) the program of top priorities includes projects on improving energy efficiency in extraction, refining, transportation and utilization of oil, gas and petroleum products.

The program of reducing oil and gas consumption after technical re-equipment of oil refining plants can be implemented in 1993-2000 achieving fuel efficiency of up to 6 mln tce. The expenses are estimated at 22 bln rubles (prices of 1993).

The program of reconstructing systems of preparation, transportation and storage of oil and petroleum products, which will ensure reducing losses of hydrocarbons, will allow to save 2.5 mln tce. The necessary investments will be 30 bln rubles.

The program of improving fuel efficiency of compressor stations of gas mains can ensure fuel efficiency of 16 mln tce in 1993-1996. The necessary investments will be about 63 bln rubles. Payback period of these projects will not exceed 1-2.5 years.

Direct oil losses during extraction, transportation and storage are 12.5 mln tons. It is possible to reduce these losses by 45-50% with assessed savings of 5.6-6 mln tons annually, investments of 6-6.5 bln rubles and cost efficiency of 4.7 bln rubles.

The potential of reducing losses during extraction, transportation and storage of motor fuels is 11-12 mln tons of coal equivalent. Investments needed to reveal this potential are estimated at 6-7 bln rubles and the cost efficiency - at 16-18 bln rubles.

The total amount of electricity for electric drives in oil extraction is estimated at 45 bln KWh or 57 mln tons of oil equivalent. Creation and large-scale use of autonomous mini-thermal power stations utilizing associated gas will allow to improve electricity and fuel efficiency of heat supply for extraction industries.

Gas savings potential just during its transportation along the gas mains is estimated at minimum 32-34 bln m^3 annually. Possible directions of revealing this potential, which is equal to construction of a gas pipe-line from Jamal Peninsula with the crossing of 1400 mm, can be improving utilization equipment at compressor stations; equipping these stations with steam-and-gas systems with additional electricity production; and using secondary energy resources.

CENEf's comments.

There are 156 projects among top priorities. The program should have concentrated on their implementation and sources of funding.

It is also unclear, who and by what means will implement the programs listed in the Table 3.1.

Table 3.1.

Top Energy Conservation Priorities

(developed in the accordance with the Decree No.371 of the Russian Government issued on June 1, 1993, prices of 01.04.1993)

Programs	Necessary capital investments, bln rubles	Period of the programs implementation	Fuel efficiency, mln tce	Cost efficiency, bln rubles	Payback period for capital investments, years
1. Reduction of oil and gas consumption after re-equipping oil-refinery plants	21.6	1993-2000	6.0	14.5	2-3
2. Reconstruction of oil and petroleum products preparation, transportation and storage to reduce hydrocarbons losses	29.3	1993-2000	2.5	11.9	5
3. Improvement of fuel efficiency of compressor stations of gas mains for utilization of secondary energy resources	63.0	1993-1996	16.8	22.5	4
4. Reduction of motor fuel consumption by increasing the number of cars and buses working on diesel fuel; reduction of specific utilization of fuel by cars and agricultural vehicles and substitution of scarce fuels	178.0	1993-2000	12.0	95.0	5
5. Manufacturing energy control devices and testing equipment	6.5	1993-1995	5.0	10.0	2.5-3
6. Substitution of motor fuels by compressed or liquefied gas and other fuels	1.0	1993-1995	2.5	70-90	2-3
Total	299.4		44.8	220-240	3.5

The mentioned six programs were developed in accordance with government decree No.371 issued on June 1, 1992. It took the Ministry of Fuel and Energy about one additional year, comparing with decree schedule, to develop these programs.

1. Program of Reducing Losses of Oil, Natural Gas, and Petroleum Products in Extraction, Refining and Transportation: 1993-2000.

2. Program of Reduction of Fuels Consumption by Motor Vehicles: 1993-2000.

3. Program of Improving Energy Efficiency of Natural Gas Compressor Stations at Natural Gas Transmission Pipelines: 1993-2000.

4. Program of Substitution of Gasoline and Diesel Fuels by Compressed and Liquefied Natural Gas: 1993-1995.

   Leader: Mr.Kashirov, General Director of "Avtogas". Key participants are: Gasprom, Ministry of Fuel and Energy, Roscommash. Program cost - 1 billion rubles. State of realization: at the beginning of June financing of the program wasn't started yet.

5 Program of Reduction of Oil and Natural Gas Consumption through the Renovation and Retrofitting of the Petroleum Refinery Plants: 1993-2000. The Program contains a plan for each refinery renovation. Supervisor - Committee of Petroleum Refining.

6. Program of Devices and Systems for Energy Metering and Auditing Devices Production Development: 1993-2000.
   Leader of the Program: V.M.Vasiliev, Ministry of Fuel and Energy.
   Investments - 6.5 billion rubles.
   Source of finance - 3.5 billion rubles credit of Central Bank at annual interest 15% for metering devices production.
   State of realization: at the beginning of June the credit line wasn't open yet.

The objectives of the listed Programs are described in the Appendix 5. The budget for those programs is shown in Table 3.1.

3.2.1.8. The Structure of the Program Management

Board of directors of the Russian Non-Budgetary Inter-Industry Energy Conservation Fund and corresponding industry and regional funds are the chief implementors of the Program.

Money of the Russian Non-Budgetary Inter-Industry Energy Conservation Fund, as well as of non-budgetary funds for scientific-research and design activities of the Ministry of Fuel and Energy, according to the decree No.371 issued on June 1, 1992, is attracted to support the Program.

Management of regional energy conservation funds is exercised by the local authorities.

Control over the course of the Program implementation and efficiency of the funds utilization is exercised by the Supervisor Council formed by the Ministry of Fuel and Energy of the Russian Federation in accordance with the Statement on the Russian Non-Budgetary Inter-Industry Energy Conservation Fund. All the money directed for the Program implementation by any of the above mentioned sources is collected in the Russian Non-Budgetary Inter-Industry Energy Conservation Fund which alone is responsible for implementing the Program.

CENEf's comments.

It is not clear from the tables, how the programs will be financed by the federal and regional funds.

Much of the data in the tables is not very understandable. For example, in the table with primary programs expenses exceed the effect. It may be that the latter is presented in the annual amount and expenses are generalized, but one can't understand it from the context.

3.2.2. Energy Efficiency Demonstration Zones

There are 7 demonstration zones in Russia today under the Program "Energy Efficiency 2000": Istra, Reutov, Voronovo, Tushino, Severnoye, Zhavoronki, VNIIGAS.

Eleven more zones are under consideration now by the Ministry of Fuel and Energy. Among them are zones in Karelia, Buriatia, Tverskaya Oblast. Ministry of Science and Technology used to be responsible for developing the demonstration zones. But presently this responsibility is shifted to the Ministry of Fuel and Energy.

Hard currency financing is going to come from the European Energy Commission of UN, but this Commission hasn't yet spent a cent for hardware part of the project. The only expenses up to now came to cover business travels of Russian officials to Europe to participate in meetings organized under the supervision of "EE2000".

Ruble financing is expected to come from the RESF. But since this Fund doesn't have money yet, this is not a case. Money for the feasibility study came from the Ministry of Science and Technology.

Among the active foreign firms involved in Russian part of "EE2000" are British companies "Sathwell, "East Midlands", "March", a Hungarian company "Nitrokema", a German firm "Transsonic".

3.3. Energy Saving Program for Moscow in the period to 1995

English text of this program is presented in the Appendix 6. Here is a brief description of the program.

Legal Foundations for Energy Saving are expected to be provided by a special federal law on energy saving that would grant the local authorities a right to set up regional energy saving funds; specify the sources for replenishing the latter; permit to use a part of the saved fuel for mutual payments; state the structure of bodies supervising energy saving. The law shall provide for a system of financial incentives for energy saving.

Federal regulations shall provide for developing procedures for determining, whether indigenous equipment meets the international standards for energy consumption. New building codes shall be developed.

The foundations of the economic mechanisms for energy saving suggest multirate tariffs for electricity and heat for industrial users with a fixed annual payment for the specified capacity and variable monthly payments for the energy resources consumed and differential-scale penalty tariff for overconsumption. For residents payments will be based on quotas for energy consumption depending on the size of family and the actual living space. Also differential time-of-day electricity tariffs are introduced, as well as differential surcharges on tariffs for inefficient use of energy resources. Decision to apply such a surcharge should be made by the Moscow Regional Energy Commission.

An economic mechanism is being launched to promote heat saving, provided users will be equipped with commercial heat meters.

Administrative measures call for establishing a special body responsible for efficient use of energy resources - Energy Saving Agency - for managing and supervising the energy saving policy with the following main objectives:

- energy saving policy;
- setting consumption quotas and rating payments and penalties;
- determining potentialities for further saving of fuel and energy resources;

and rights:

- mandatory energy auditing;
- checking the compliance of users with the quotas for fuel and energy consumption;
- checking the state of accounting of fuel and energy resources;
- collecting penalties;
- free access to all Moscow power, electric and heat using installations.

Mandatory regular inspections of users shall be carried out every 3-5 years at the users' expenses. Also mandatory infra-red (IR) examination of buildings being commissioned is introduced. If heat losses do not meet the design values, the construction organizations shall be subjected to financial penalties.

DEVELOPMENT AND INTRODUCTION OF THE MEANS FOR METERING AND CHECKING DISTRIBUTION OF FUEL AND ENERGY RESOURCES plans to launch an energy saving mechanism, which requires wide introduction of meters as an essential means for commercial payments between energy vendors and users with possibility of remote reading for large and wholesale users and multirate electricity meters for individual household users.

Supervision of losses and determination of reserves for further energy saving, should be based on regular IR inspections using aerophotography or mobile ground laboratories.

RESEARCH AND DEVELOPMENT PROGRAM IN ENERGY SAVING plans:

- to develop advanced heat meters and arrange their commercial production in the city,
- to introduce automatic process control systems for heat supply and individual indoor temperature controllers;
- to develop and launch the production of IR imagers;
- to develop and introduce the technology for warmth-keeping of structures of existing buildings;
- to launch the production of higher heat resistant panels for house building;
- to study and introduce a process of "cold" welding for pipings;
- to introduce pipelines with foamed polyuretane insulation in polyethylene sheathing;
- to develop and introduce thermal pumping plants (TPP) for utilizing waste heat;
- to develop and introduce different heat accumulators;
- to start using heat energy due to waste incineration city refuse for heat supply;
- to introduce means for recording, transmitting and processing information on electricity consumption;
- to develop, manufacture and introduce adjustible electric drives;
- to launch production and installation of sodium lamps;
- to develop and introduce efficient electric luminaries with gaseous-discharge and filament lamps.

FUNDING THE PROGRAM will be provided through Moscow Energy Saving Fund which was set up to accumulate funds to:

- finance regional energy saving programs;
- give preferential credits;
- share funding of federal energy saving programs.

PUBLIC EDUCATION IN ENERGY SAVING is supposed to address direct financial beneficiaries of energy saving, provide them with possibilities for making dwellings and working places more comfortable and reduce impacts on environment.

PROVIDING CONDITIONS FOR FOREIGN INVESTMENTS IN ENERGY SAVING should be covered by a future Russian law on energy saving and solve the problems of lack of

hard currency for import purchases, lack of paying-off mechanism for Western partners and lack of legislative basis for energy saving.

NEAR-TERM RESULTS OF PROGRAM IMPLEMENTATION will permit to reach annual cost saving of 1600 mln rubles by 1995 at investments of 2170 mln rubles.

Many other regions are presently at the edge of developing their energy efficiency programs. Moscow took a lead in this process.

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Chapter 4. WHAT ELSE SHOULD BE DONE IN ENERGY EFFICIENCY

Knowledge of the energy efficiency potential and even willingness to promote some technologies through government programs would have limited usefulness unless new market-based mechanisms allowing to realize this potential would not be developed. The problem is not simply very inefficient equipment but also very inefficient practices and policies which discourage improvements. This problem should be addressed wider including not just equipment and technologies, but also management and planning tools, education and training, institutional needs, and data and informational needs.[1]

Review of market-based mechanisms to ascertain "what works" presently in Russia to promote energy efficiency; and introduction of policy tools such as consumer information programs and utility integrated resource planning which can promote efficiency will laid the solid basis for the development of the energy efficiency policy.

Absence of experience in the field of energy efficiency policy implementation in a transition economy makes it important to investigate options and expected impacts of alternative policies directed to promote energy efficiency in Russia. A major emphasis should be made on developing proper institutional infrastructure, estimation of efficiency of regulatory and financial incentives and dependence of their efficiency on the general economic and political situation in Russia. That will allow to find the most flexible and robust policies for the transition period.

4.1. Energy Efficiency Policy

4.1.1. Institutional Infrastructure

The technical potential of energy efficiency improvements cannot be considered separately from institutional structures. In large degree it will determine how this potential be translated into practice?

Analysis of present institutional infrastructure's efficiency -- Russian and local parliament commissions, central and local governments, academic institutions, utilities, large enterprises, NGOs, and others -- in developing and implementing energy efficiency policy should receive first priority.

Development of the most effective and flexible (on the background of very fast evolving government institutions) institutional structures which will be responsible for the development and implementation of energy efficiency policy should constitute a core of this policy. Special attention should be devoted to the creation of local energy efficiency authorities. Based on this analysis and on worldwide experience, proposals to improve institutional infrastructure at different levels of policy-making should be made and incorporated in corresponding legislation.

Efficiency of many presently proposed and newly created institutions are still disputable even at a government level. For example, deputy head of energy department of the Ministry of Economy Mr.G.P.Kutovoi asks why the RESF is created under umbrella of Fuel and Energy Ministry, which is interested in growth of consumption for getting more profits? Why this Ministry is coordinator of energy conservation policy? He thinks that it should be done differently: as an independent agency or committee.[2] Similar opinion was expressed in the draft law developed by CENEf.

A very new organization -- RESF -- is going to be responsible for Energy Conservation Program implementation. It is not clear, if this institution, which is going to have about 15 permanent staff people, would be able to do this job efficiently. Their cooperation and subordination with energy conservation department of the Ministry, as well as with local authorities is not clear enough.

Table 4.1.

Actions plan for institutional issues

	1993	1994-1995	1996-1998
International level			
- Support of "EE2000" demonstration zones	+	+	+
- Inter-governmental agreements on developing and implementation of energy efficiency policy	+	+	+
- Soft credits from the international monetary agencies for providing financial resources to the federal programs on improving energy efficiency		+	+
- Establishment of direct foreign regions to Russian regions joint programs on energy efficiency		+	+
- Implementation of inter-governmental projects on implementation of energy efficiency policy		+	+
- Support of Western-Russian NGOs in energy efficiency field	+	+	+
Federal			
- Creation of powerful and experienced Federal Energy Efficiency Agency	+		
Regional			
- Creation of Regional Agencies for Energy Efficiency	+		
Enterprise			
- Privatization and clear division of the responsibility for financial health of the enterprise	+	+	+
- Demonopolization	+	+	+

4.1.2. Laws on the Federal and Regional Levels

Pressing institutional need concerns legislation and policy. Governments at federal and local levels have little experience creating effective policies for improving energy efficiency. Many

of the legislators were elected "off the street" with little legislative experience. Thus policy makers need to learn how to develop and pass effective legislation to promote energy efficiency.

Presently there are two drafts law prepared. The first one was developed by the VNIIKTEP on the request of the Fuel and Energy Ministry (see Appendix). This draft was distributed.

There is a tradition in Russia to pass laws without describing mechanisms for their implementation. Such laws even have a specific name -- laws of general action. This approach leaves mechanisms development up to the corresponding government agencies --in our case the Fuel and Energy Ministry, -- which "knows energy better than we do". That was exactly the case with the Ministry draft.

CENEf wrote comments on the Ministry draft. The comments appeared to be longer than the draft itself. Finally, CENEf suggested writing its own draft on its own expense. But the Ministry gave CENEf only one month to do that, comparing with at least one year taken by the VNIIKTEP. Finally, CENEf's draft was developed (see Appendix). Since then two competing drafts were at the table.

There are many differences in these two drafts. CENEf's draft law on "Energy Efficiency Improvements" is a so-called law of direct action. At the meeting in the Supreme Soviet of March 4, 1993, deputy of Industrial and Energy Committee Mr.G.S.Kallistratov said: "CENEf draft is logically constructed and is ready to be approved even today. But we are not used to approve such laws. If we are going in this direction, I would greet it, but with this language we could encounter some problems passing this law in the Supreme Soviet".

Several meetings were devoted to prepare a single draft to present to the Supreme Soviet and to distribute to the regions. As a result, Ministry final draft incorporated some CENEf's approaches, even the title of their draft law changed. But the main spirit of a general law describing in detail what is important for the Ministry to fix in this law and missing many mechanisms important for other players is still there. Many industrial energy managers do not support this approach.

Passing the law "On Improving Energy Efficiency" is still on the agenda.

According to the Russian experts' assessment[3], if conservation measures are realized in the coming 5 years on the stages of design, construction and maintenance of residential and commercial buildings they can reduce energy demand by 25 percent.

The key to achieve this belongs to building codes and regulations in accordance with which buildings are designed, and National Standards ensure the quality of construction.[4]

Such standards are being developed both on the federal and municipal levels. For example, at present new Moscow buildings codes are under development. They include requirements for heat protection, heat-, water-, and electricity supply.

Table 4.2.

Actions Plan for Legislation Issues

	1993	1994-1995	1996-1998
International level			
- International expertise of the law "On Improving Energy Efficiency"	+		
- International assistance in training experts from federal and local Energy Efficiency Agencies and local energy commissions on utility regulation		+	+
Federal			
- Passing the Law "On Improvement in Energy Efficiency"	+	+	+
- Development and implementation of federal energy efficiency programs	+	+	+
Regional			
- Development of regional regulations on energy efficiency	+		
- Development and implementation of regional energy efficiency programs	+	+	+
Enterprise			
- Prescription of the responsibility for supervising the energy efficiency projects at a factory level	+	+	+

4.1.3. Regulatory Incentives

For some unclear reasons many items listed below weren't touched upon in the Program text, which is, as in former Soviet documents is too technical. But for successful implementation of energy efficiency strategy activities shown in those items are extremely important and very urgent.

Energy consumption data collection process. The Soviet energy statistics was substantially different from the OECD energy balances structure. The more detailed data were available only for supply side, and statistical descriptions of demand side activities were severely limited, as well as the number of experts which had an access to these data.

Energy statistics at the regional level was never published. Therefore, this information was and still is unavailable to many experts and general public. There is one additional problem that presents an acute barrier to improving energy use in Russia: the lack of information about how energy is used.[5]

To get reliable data on the structure of energy consumption the clarification of procedures of metering and reporting data on consumption by different groups of consumers, as well as their

surveys should be done. Identification of the most useful formats for mandatory energy consumption data collection and reporting should be followed by presentation of proposals to introduce new regulation on metering and reporting energy consumption data according to new formats by the Central Statistics Agency and Fuel and Energy Ministry.

Better quality statistical data openly available are necessary also for making more solid basis for procedure of energy programs discussion and for calculating costs and benefits of various investments both for individual enterprises and for federal or local strategies.

As chapters 1 and 2 show, even government programs do not contain enough reliable information. Without having reliable statistics on energy consumption it would be impossible to estimate efficiency of any government program directed for the improvement of energy efficiency.

Energy Labelling. Analysis of potential efficiency of energy efficiency labelling programs by sectors and type of equipment should be implemented including: identification of types of equipment appropriate to start energy efficiency labelling program; proposals for institutional process for energy efficient labelling.

Development of marketing tools to sell efficient equipment is no less important than production of this equipment. Russian decision-makers mainly concentrate their attention on the production end without looking for tools promoting market penetration of new technologies.

Energy Efficiency Standards. First, analysis of most promising areas and mechanisms to introduce or enforce energy conservation standards will be implemented. This analysis will answer questions: what are most promising areas for energy efficiency standards? What is the best scheme to introduce new standards? How to develop efficient system to supervise them? What is the best control mechanism? What sanctions and incentives should be provided?

Building Codes and Regulations. Building standards generally are updated every five years. Historically, building standards had focused on safe structural design, proper sanitary and hygienic conditions, minimizing the cost of construction, etc. with the objective of minimizing risks to health and life.

The new concept of the building standards takes into account energy efficiency. The Building Codes and Regulations (SNIPs) on heat engineering is the main document to be followed in thermal design of newly built and renovated buildings for various purposes with rated temperature or temperature and humidity of the indoor air throughout Russia.

The present standards for insulation of buildings do not aim at energy efficiency. That is why GOSSTROY of Russia decided to develop and implement methods for thermotechnical standardization and design of energy efficient buildings and to develop thermotechnical energy efficiency standards to reduce energy consumption of new and reconstructed buildings by at least 25 percent.

The new draft Code[6] has been developed in NIISF with a view to create buildings with efficient energy use. Standardization of thermal properties of buildings with efficient energy use under the assumption that the building presents a single energy system, makes it possible to design the

building with balanced thermal properties and to reduce heat losses maintaining the same comfort conditions. In this connection an energy concept of the Code has been evolved.

The implementation of the Code will permit by 1995 a quarter reduction of energy consumption in operation of newly built and reconstructed buildings or throughout the country, as compared to existing ones.

Development of databases on technological and policy options to improve energy efficiency in Russia. Selection of proper formats and software for the development of data ses on technological options to improve energy efficiency in Russia will allow to disseminate technological information. Those formats should be friendly for databases users.

Assessment of the potential for energy savings with the use of western energy efficiency technologies and practices will allow to get most advanced and sophisticated estimate of energy efficiency improvement potential.

Collection of information for the database should include costs, economic and other environmental benefits, technical, economic and environmental performance of technologies, factors important for their market penetration and other parameters.

Development of those databases will significantly help to identify opportunities to improve energy efficiency.

Consumer information programs for energy efficiency. It is necessary to examine United States of America and European consumer information programs for energy efficiency in household appliances and examine their applicability to the Russian consumer market. Based on that it would be possible to propose a consumer information programs for key energy efficiency consumer products which can serve as models for industry or industry association to adopt.

Energy efficiency education and training. Education and training of those working "on the ground" - factory managers and engineers, local utility officials, ministry planners, local government officials, or building managers, should be a high priority.[7]

Training courses should include material on energy efficient and waste-reducing technologies as well as the issues, logistics and methodologies of setting up industrial energy audit programs and in general economic management and decision-making which would significantly impact energy managers' ability to launch and implement energy efficiency projects. New generation of management must be trained in cost minimization, in which energy efficiency is a component.

A personnel infrastructure in each local region is important. Local people "on the ground" in each region must be able to address problems themselves without relying on foreign advisers or experts from Moscow.

Energy efficiency demonstration projects could be also used for education and training. The purpose of such projects should be not to demonstrate technical potentials, but to provide concrete examples of how energy efficiency can be implemented. They are probably even more important as visible vehicles to educate policy-makers and planners and to promote efficiency in general.[8]

This activity should also investigate possibilities to introduce a special chapter on efficient energy use in some school textbooks.

Energy efficiency research and development. In previous years many energy efficiency innovations were developed in Russia. Support of scientific activity in energy efficiency improvement area through existing scientific facilities and through process of conversion of scientific units previously specialized on military research would allow to increase energy efficient technologies potential. Development of new tools for providing government financial support of energy efficiency R&D and transferring technological knowledge from the scientists and engineers to industry and other energy consuming sectors should form a core of this activity.

Table 4.3.

Actions plan for regulation issues

	1993	1994-1995	1996-1998
International level			
- Training of Russian statistical experts on methodologies and procedures for collection energy consumption statistics	+	+	
- Garmonization of energy efficiency standards and certification procedures		+	+
- Exchange of data on energy efficient technologies available in Russia and abroad		+	+
- Joint international energy efficiency R&D	+	+	+
Federal			
- Development of statistical formats for reporting energy consumption data by different sectors of the economy. Publication of a number of statistical databooks on energy consumption.	+	+	
- Development of energy efficiency standards and building codes, as well as certification procedures for energy efficient equipment.	+	+	+
- Development of consumer information programs.	+	+	+
- Support of energy efficiency research and development	+	+	+
Regional			
- Publication of regional statistical databooks on energy consumption.		+	
- Development of regional building codes, as well as certification centers.	+	+	+
- Development of consumer information programs.		+	+
- Development of training programs for factory managers and engineers	+	+	+
- Support of regional energy efficiency research and development	+	+	+

Enterprise			
- Preparation of internal regulations and rules for energy efficiency groups activities and for energy conservation reporting systems.	+	+	+
- Utilization of databases on energy efficient technologies		+	+

4.1.4. Financial Incentives

Future work should be concentrated on the analysis of institutional feasibility and financial efficiency of different economic incentives to promote energy efficiency. It will let identify proper incentives without wasting time on trying not efficient ones.

Pricing mechanism recommendation. Energy pricing is a key determinant of Russia's future energy system evolution. Policy recommendation on energy pricing will help policy makers determine the best action plan in the transition to market economy. These recommendations are to be based on cost allocation methodologies, and evaluation of sensitivity of different energy consumption sectors reaction to price changes. Identification of barriers on the way of price signals impacts on final energy consumers' behavior will allow develop a policy to remote these barriers.

Russia is struggling to introduce market-oriented pricing policies for energy and other goods and services, and promote a market orientation within decision-making circles. This means collaboration among former rival ministries or factories, complete information about energy use and conservation opportunities, and computer programs and other aids commonly used in the West to optimize energy use in buildings and factories, among other things. But the Russians also must learn how to choose energy efficiency options. Western firms, energy authorities or experts, and consultants all have ample experience using the software of energy management and energy planning. They should be prepared to share this experience with their emerging Russian counterparts, but they should be prepared for a long process. The goal, after all, is to let Russians (or those in other republics) understand how Westerners think about energy use, not simply to set up computer programs for Russian use with Russian numbers.

Energy taxes. The former USSR had no experience with special energy taxes. Recently coal prices were subsidized and there practically were no tax component in prices of other energy carries especially for industrial consumers. Energy taxes should be considered in the framework of general pricing mechanism recommendations. Potential impact of energy taxes on energy consumption should be estimated. Based on these recommendations an energy tax policy at the federal and regional levels should be proposed and implemented.

Energy efficiency tax credits. Two possible versions of tax credits for investments in energy efficiency should be tested: technology based tax credits and performance based tax credits with different levels of tax credits for each of them. Financial and institutional efficiency of such policy should be evaluated.

Tax exemptions for energy efficient equipment producers. Due to this measure purchase prices for energy efficient equipment could be reduced at least by the value added tax (20%).

Favorable depreciation methods and terms. The influence of the depreciation methods and terms on projects' internal rate of return should be estimated and corresponding policy proposals will be developed. Those methods of the depreciation could be applied first of all to control and metering devices.

Tax deductions. This financial incentive is based on modified notion of taxable income. Institutional feasibility and financial efficiency of this incentives will be evaluated.

Presently anyone purchasing equipment to improve energy efficiency with, say, one year payback will pay 20% value added tax and 32% profit tax, without mentioning many other taxes. It means that government's share in revenues (more than 50 percent) is definitely too high to discourage many from starting projects to improve energy efficiency. If an enterprise spends 1 million rubles to buy equipment and saves 1 million rubles of energy costs, it must pay 200,000 rubles VAT for the equipment and 320,000 rubles as a profit tax, and keep not more than 480,000 rubles as additional profit.

Hard currency earning on energy efficiency. Before the problem of ruble convertability is resolved, participation of enterprises in hard currency value of saved energy could become very powerful economic motivation to fulfill energy efficiency projects not only for domestic firms but also it will motivate technology transfer form abroad. This policy should be tested against difficult institutional and energy conservation verification issues. If proper solution found corresponding draft of legislation should be developed. Presently there is a decision signed by the Prime Minister Chernomirdin allowing this mechanism for Demonstration Zones (see Appendix). Precise mechanism is still needed to be developed.

All financial incentives efficiency should be tested against general economic environment evolution -- growth of demand, inflation rates, interest rates, equipment and energy prices trends etc. -- to identify the policies which will provide the best results in any foreseeable general economic situation or flexible policies easily adaptable to fluctuation of economic situation.

Methodologies of calculations of external social gains from the realization of energy efficiency projects, including indirect additional energy conservation, reduction of capital intensity of the economy, growth of energy export potential, and ecological effects, should be developed to conduct cost/benefit analysis of different energy efficiency policies from the society standpoint.

Table 4.4.

Actions plan for developing financial incentives

	1993	1994-1995	1996-1998
International level			
- Recommendations for energy pricing policy;	+	+	
- Sharing experience on regional energy commissions activities;	+	+	
- Training on costs/benefits analysis for cost reduction projects;	+	+	
- Training for the development of proposals for international financial institutions.	+	+	
Federal			
- Developing the RESF abilities to efficiently finance energy efficient projects;	+	+	
- Development and implementation of energy pricing policy promoting energy efficiency;	+	+	+
- Development of procedures for getting hard currency for foreign investments in energy efficiency;	+	+	
- Development of a set of financial incentives for improving energy efficiency.	+	+	+
Regional			
- Development of pricing policy for electric and gas utilities;	+	+	+
- Development of the system of regional incentives promoting energy efficient projects.	+	+	+
Enterprise			
- Developing personal incentive system for stimulation of plant staff to implement energy efficiency projects level	+	+	+

4.2. Integrated Resources Planning[9]

Integrated resource planning aims at finding the lowest cost way for an energy utilities to provide energy services to their customers considering on the equal basis both supply- and demand- side options. This approach has never been taken in Russia.

This system of planning differs substantially from traditional ones used previously in Russia because it necessitates taking into account both supply-side and demand-side opportunities. Specialized methods and alternative scenarios allow system planners to consider uncertainty in

the search for solutions and means of adapting to changing conditions of energy supply and demand, including the use of economically justified energy conservation.

The practical application of IRP suggests that new laws and regulations should be developed for managing energy utilities. These measures, naturally, will affect the institutional structure of the industry and legal framework of its operation.

The energy sector of Russia today has no system of planning suitable for market conditions. The former system developed for a centralized economy will not satisfy the requirements of a society in transition. The resulting vacuum has created an urgent need to create new planning approaches.

Traditional energy sector planning did not consistently consider opportunities on the demand side. Formerly, it neither permitted broad public participation nor relevant treatment of ecological impacts of power generation. The old planning system in Russia itself helped cause low efficiency in energy use and high cost of energy services.

The underdevelopment of private property and market pricing signals resulted in low priority for reducing energy service costs. Energy efficiency measures, including demand side management, heat supply controls, industrial process improvement, have long been ignored by the responsible authorities and planning bodies. This fact has widened the gap between energy supply and demand, caused huge mis-allocation of investment in supply facilities, and has permitted environmentally destructive energy development.

Rationalizing energy use will become even more important in the future due to the uncertain rate of economic recovery, major shortage of hard currency and investment capital, and severe ecological problems.

Preparation of legislation and regulation, and institutional transformation. A number of steps should be taken to create the legislation and regulations necessary to implementing IRP in Russian conditions, including consideration of special powers for regional energy commissions and requirements of utilities. Draft legislation and regulations will facilitate implementation of the IRP approach in Russia by providing models for national and governmental authorities to consider.

Development of pilot programs. This step is necessary to complete the preliminary effort and initiate a regular procedure for developing and implementing integrated resource plans. Program delivery is the specific feature being addressed, implying start-up activities such as development, implementation of pilot programs, and market testing. For program at mature phase it requires conducting quality assurance inspections, monitoring and replacing equipment, maintaining communication with customers, evaluating and modifying the program as needed.

Table 4.5.

Actions plan for integrated resource planning

	1993	1994-1995	1996-1998
International level			
- Training of Russian energy experts on methodology of IRP	+	+	+
- Sharing the experience on legislative and regulatory status of IRP	+	+	
- Sharing the experience of introduction of IRP to utilities' business in different countries	+	+	
- Assistance in manufacturing the necessary energy efficient equipment and hardware for demand side management		+	+
Federal			
- Passing the legislation requiring the necessity of integrated resource plans for utilities' development and prescribing procedures of its consideration and approvement	+	+	
- Creation of legislative base for regional energy commissions to regulate the process of utilities development	+	+	
Regional			
- Creation of regional regulation to incorporate integrated resource planning to the process of utilities' development	+	+	
- Development of necessary conditions to make demand side management financially attractive for utilities	+	+	
Enterprise			
- Creation of offices in utilities responsible for development and realization of DSM programs	+	+	+
- Implementation of pilot DSM programs, markets testing		+	+

4.3. Energy Auditing and Performance Contracting

(2) Access to off-the-shelf products, including advertising, technical assistance, and accurate information about energy-saving potentials of various products;

(3) Access to credit for energy investments and/or shared-savings investment programs.

Lack of necessary energy efficient equipment and underdevelopment of energy consumption reporting system is one of the important reasons why statistical data are very poor and energy is wasted in Russia. Aggressive energy auditing is necessary not only to estimate but to identify and measure the potential of energy efficiency improvement. Unfortunately, Russia possesses insufficient experience in energy auditing or in the production and use of energy efficient equipment including metering tools and devices to satisfy the needs of IRP.

Recent and anticipated energy price increases have created favorable conditions for energy conservation activities. Many private and state firms now are looking for help to find a possibility to reduce their energy bills. Energy efficiency service companies, if created, could help to satisfy this demand.

Energy audits could bring about significant energy conservation in Russia due to several reasons:

- Previously energy consumption was very poorly metered;
- Low energy prices and government subsidies for unprofitable enterprises provided no awareness of energy losses by plant managers;
- Energy rationing forced plant managers to hide energy efficiency potential to prevent planning authorities from reducing their quota.

Experience in western, developing, and east european countries shows that energy audits and following performance contracting could help capture cheap and rapid energy efficiency improvements. In Russia, the main potential for energy efficiency improvements is in the industrial sector. Industrial energy audits could significantly reduce energy consumption and costs.

Energy audits and performance contracting would also provide extremely valuable information for further development and introduction in Russia the concepts of Demand Side Management and Integrated Resources Planning.

Russia has many well-trained engineers, some of whom are now on the eve of unemployment. Many universities and other teaching institutes could also participate in this activity.

It is important to identify and collect equipment sets for energy audits from devices produced in Russia and abroad. Monitoring energy audit results and comparison of costs and benefits of using these sets would then be made. Based on this information, equipment which could be produced locally by Russian firms, including possible participation of defense/conversion plants, should be identified, as well as the possibility of creating Russian-US joint ventures to produce such equipment.

Based on the first results of energy audits, it is necessary to
carry out information dissemination, attracting the attention of the mass media, and the general public to economic, social, and environmental benefits of energy auditing. Barriers on the way of efficient implementation of energy audits would be clarified and corresponding legislation to remove these barriers should be drafted and presented to the legislature. Guidelines to create new energy efficiency services companies working on the base of performance contracting would be developed.

It is necessary to clarify market perspectives for domestic production of energy efficient equipment and auditing equipment. Perspectives for attracting American producers to the Russian market should be investigated.

Table 4.6.

Actions plan for issues on energy auditing

	1993	1994-1995	1996-1998
International level			
- Sharing experience in energy audits and performance contracting;	+	+	
- Assistance in starting ESCO companies;	+	+	
- Investment grantees for joint-ventures producing equipment for energy audits and JV ESCOs	+	+	
Federal			
- Development of a federal program for promoting energy auditing		+	
- Development of a legal basis for ESCOs activities.		+	
Regional			
- Development of regional programs for identification of energy efficiency opportunities;	+	+	+
- Courses for training energy auditors.	+	+	+
Enterprise			
- Carrying energy audits to identify energy efficiency improvement potential;	+	+	+
- Production of equipment for energy audits and energy efficient equipment.			

4.4. Most Promising Technologies

L.Shipper correctly pointed that in all sectors in the medium term there are some very practical equipment and technology requirements which when integrated with market-oriented economic management and policies will allow feedback of the correct economic signals and control of energy consumption: metering and energy control equipment; process controls that regulate the flow of materials and energy within factories; thermostates, valves, and shunts for controlling heat use in buildings; and dimmers and other equipment for controlling lighting. Characteristic of these systems is that they cost very little relative to the value of the energy flow they control over a short period, even a few months. Without this equipment, few managers or individuals will be able to respond to market signals including energy prices.[10]

Gas turbines. The application of modern gas turbine technologies allow significantly improve efficiency of natural gas utilization by:[11]

- retrofitting existing steam-turbine units by means of topping gas and steam-gas turbines with the additional power production efficiency up to 80 percent at low capital costs: creation of new highly efficient steam-gas plants with an efficiency more than 505 at reduced capital costs.

This option allows:

- reduction of the capital costs per unit of additional power capacity by 20-50 percent;
- savings of 25-50 billion m^3 of natural gas annually;
- significant reduction of emission from power sector.

Conversion of the existing Russian military jet industry to stationary power plant production could lead to production of 20 gigawatts of power capacity addition over the next few years.

Variable speed AC drives. In 1990 electric drives used 60 percent of total electric energy consumed in Russia. Currently less than 1 percent of installed drives are efficient, controlled speed models.

Industrial furnaces. Poor construction leads to excessively high energy use several times the energy-per-ton of output figures in western countries. Potential savings total of annually with application of control equipment, insulation materials, and furnaces retrofit.

Industrial secondary process heat recovery. Western ventures in energy intensive industries (pulp and paper, chemicals, steel) could take advantage of the former Soviet republics' enormous resources while proving that these can be used effectively.

Improving efficiency of the district heating sector. There are a number of very promising technologies:

- improving detection and control of district heating distribution system leaks and losses;
- energy flow regulation measures and systems in individual buildings for improving system control of heat supplied by the district systems.

Energy efficiency technologies in construction. Real reduction of energy consumption in apartment buildings can be achieved by introducing several new energy efficiency technologies, improving heat protection of non-transparent, applying window insulation glazing, reducing air permeability of sashes and doors, optimizing dimensions of windows, building dimensions and orientation, introducing control devices, and improving heating system.

As a result of international cooperation, with the USA, for example, (NRDC, BATTELLE POWER ADMINISTRATION), five western energy efficiency technologies were selected which, if introduced in Russia, can have the quickest and greatest energy conservation impact with relatively low capital cost[12]. All these technologies were approved in the NIISF and very promising results were achieved. Each technology is very competitive on the Russian market and can be used by both private and federal business.

The outdoor insulation of buildings. The equipment and raw materials for installation of this insulation is produced by DRYVIT and SENERGY in the USA and LOBO in West Germany.

A number of Russian companies can manufacture separate components for this type of insulation from domestic raw materials. Moscow City Administration (with participation of Energy Department) is going to fund work on installation of additional heat protection in 400 buildings. With installation of additional outdoor coating 50 mm thick in 20 nine-store apartment buildings with the total square of walls surface of 100 thousand m^2, heat savings will reach 717 tons of coal equivalent annually. Long-time laboratory tests in Russian conditions of the above mentioned companies' products proved their reliability. The best insulation in our conditions is that from mineral wool with normal orientation of fibres to the surface. This is produced by ROCKWOOL in Denmark, and a simplified version is produced in Russia. Production of separate components for this type of heat emissivity protection and installation work can be performed by small business.

Window insulation glazing with little heat losses. It can be used in ordinary casements with any frame type. Most prominent glass manufacturers, for example SUNGATE 200, SUNGLAS HR'P, COMFORT E in the USA and LEYBOLD-HERAEUS in West Germany produce this type of glass. STEKLO Association in Russia is ready to start manufacturing this glass. Application of this glass on the inside of two panes glazing is equivalent, from insulation point of view, to three panes glazing in cold period of the year. Application of insulation glazing on the outside of two panes glazing considerably reduces sun heat in areas with hot climate. This technology can also be a field for medium business.

Elastic stripping for windows and balcony doors. Application of these materials reduce air permeability of windows two or more times and therefore it makes sense on the whole territory of Russia. Application of these in a five-room single family house with useful floorspace of 112 m^2 reduces specific energy consumption for heating by 30 percent. Production of these can be a field for small business.

Individual temperature regulators (thermostats) for heating devices. They automatically regulate the work of radiators so that to keep the inside air temperature constant. Tests showed that application of thermostats saves at least 15% of energy. The greatest energy savings are achieved in spring and autumn with active sun radiation, as well as with intense non-regular internal residential heat production. These thermostats are manufactured by HONEYWELL in the USA and DANFOSS in Denmark. Organization of production of such thermostats can be done by medium business.

New small-size gas furnaces with 85-90% efficiency. Ordinary gas furnaces are 60-65% efficient. These new ones are based on low-temperature infrared combustion. They are characterized by complete combustion, but they need additional precautions for environmental protection. Lots of US companies manufacture this equipment and can provide assistance in selecting the best equipment and promote organizing of joint production. This might be an area for medium business.

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Draft

Law of the Russian Federation

ON IMPROVING ENERGY EFFICIENCY

The Draft was Developed by
the Center for Energy Efficiency
(CENEf)

Moscow

January, 1993

90

This draft of the Law "On Energy Efficiency Improvement" of the Russian Federation was prepared by the Center for Energy Efficiency on the request of V.Bushuyev, Chairman of the Committee for Energy and Resources Conservation and Renewables of the Ministry of Fuels and Energy of the Russian Federation during the period December 20, 1992 - January 20, 1993.

In preparing this draft, the following documents were used:

- Draft Russian Federation law on energy conservation prepared by a group of specialists of the Scientific Research Institute for Complex Fuel and Energy Problems and other organizations on the order of the Committee for Energy and Resources Conservation;
- Draft Russian Federation law on energy conservation (the 2nd variant) prepared by the staff of the Krzhizhanovsky Energy Institute;
- Comments on the "Draft of the Law of the Russian Federation on Energy Conservation" prepared by the CENEf staff (copies were sent to the authors of the draft and to V.Bushuyev);
- Laws of foreign countries on energy conservation (the USA, Denmark, etc.)

The work on the draft Law of the Russian Federation "On Energy Efficiency Improvement" was carried out under the guidance of

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CENEf is grateful for their ideas and proposals on the draft development, but has exclusive responsibility for the final editing of the draft.

Tight time limits did not allow a wide discussion of the draft.

CENEf will be very grateful to anyone who will present his comments on the draft Law in oral or written form.

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Center for Energy Efficiency (CENEf)

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Center for Energy Efficiency (CENEF)

This Law sets the legal norms for developing the federal policy for improving energy efficiency, as well as the legal norms for developing institutional, economic and informational mechanisms for implementation of this policy and its operation.
The priority of improving energy efficiency rather than increasing energy production must become an important guideline of economic policy of the Russian Federation and the key point of its energy policy.

During the last 20 years, the energy intensity of Russia's economy has been increasing, especially over the last two years, while many developed countries have been successful in improving energy efficiency. At present, the energy intensity of the Russian Federation is 2-3 times higher than that of highly developed industrial countries. For one unit of consumer goods and services produced in the Russian Federation, the outlay of energy is 3-4 times higher and the emissions of harmful substances are 6-10 times higher than those in highly developed countries.

Maintaining or especially increasing energy production detracts significant economic resources from acheiving the purpose of well-being and improving ecological conditions of the population of the Russian Federation. Energy carrier price hikes combined with continued high energy intensity of the economy will lead to deepening of the economic recession and decline of competitiveness of Russian products on external markets.

Implementation of a strong federal energy efficiency policy focusing on a flexible combination of state regulation and market mechanisms will:

- Reduce to a large degree national expenses for ensuring reliable energy supply, since energy efficiency projects are, on average, 5 times less capital intensive than energy production projects;
- Set significant investment resources and export profits free which may be directed to improving the well-being of the population;
- Reduce production costs and consumer expenses for energy carriers, and thus soften the financial crisis and the inflationary effect of energy carrier price hikes;
- Increase the competitiveness of Russian products and services on external markets;
- Prolong the period of utilization of non-renewable energy resources of the Russian Federation;
- Significantly reduce the negative effect of the energy industry on the environment without additional expenses for supply enterprises, manufacturing and consuming energy with equipment for environmental pollution reduction;
- Increase the export potential of the country without increasing fuels extraction;
- Increase employment, since every ruble invested in energy efficient equipment creates eight times more jobs than a ruble invested in energy production.

The terms used in the text of the Law are defined as follows:

Energy efficiency - ratio of useful products and services provided by the equipment or technology to the energy used by this equipment or technology, determined by special methods of measurement;

Energy intensity - value inverse to energy efficiency;

Energy efficiency measure - any change in equipment or technology intended primarily to improve its efficiency;

Energy - electric power, heat and organic fuels;

Energy consumption (utilization) - the amount of energy directly consumed by the equipment or technology while operating, determined by specific procedures;

Expenses for energy efficiency measures - expenses for designing and purchasing the necessary products and services for implementing energy efficiency improvements;

Energy conservation - a set of measures designed to reduce energy intensity of manufacturing products and services using equipment or technological processes.

Cost-effective energy conservation potential - the amount of energy which can be saved as a result of implementating a set of energy efficiency measures where the value of the energy saved exceeds the cost of their implementation.

The Federal Agency - the Federal Energy Efficiency Agency of the Russian Federation.

The Regional Agency - any energy efficiency agency in republics, regions, districts, autonomous regions of the Russian Federation, and the cities of Moscow and St.Petersburg;

Energy supply company - any legal entity selling electric power, heat, natural gas to the final consumer.

Final energy consumer - any legal entity purchasing electric power, heat, or natural gas without the purpose of reselling it.

Energy facility - any institution for energy production, refinement, transportation, storage and distribution.

Energy audit - identifying energy consumption characteristics which determine:

a) the energy efficiency of the inspected enterprises;
b) measures for improving energy efficiency;
c) the conformity of the products, services and technologies to the standards regulating energy efficiency;

Preliminary energy inspection - identifying efficiency of energy use at the inspected enterprise.

Federal building - building or construction with a heating system, air conditioning or ventilation, which is an asset of the federal authorities.

A medical service building - building or construction with a heating system, air conditioning or ventilation used by government medical institutions.

An educational building - building or construction with a heating system, air conditioning or ventilation used by government educational institutions.

Energy efficiency standard - a requirement regulated by the standard of a product or technology which

a) regulates the minimal level of energy efficiency determined by specific procedures or
b) regulates the maximum possible amount of energy consumption.

Covered product - equipment or technology for which there are energy efficiency standards.

Title I. State Energy Conservation Management System.

Article 1. Federal Energy Efficiency Agency.

1. A complete set of measures for improving energy efficiency has become the top priority of the Russian national energy strategy. At present, however, responsibility for carrying out this strategy is shared by too many state enterprises.

In order to establish a state management system for energy efficiency it is necessary to create a Federal Energy Efficiency Agency of the Russian Federation (FEEA).

2. The FEEA of the Russian Federation shall be created on the decision of the Supreme Soviet. The Federal Energy Efficiency Agency of the Russian Federation shall be one of the central bodies of the state management system of the Russian Federation and shall be subordinate to the President and the Government of the Russian Federation.

3. The Proposal on the Federal Energy Efficiency Agency of the Russian Federation (FEEA) shall be developed by the Government of the Russian Federation and ratified by the Supreme Soviet.

4. The FEEA Director and his first deputy shall be appointed by the Head of the Government of the Russian Federation. The Director is responsible for the FEEA activities.

5. The FEEA will perform the following functions:

- Develop state energy efficiency policy in all spheres of the economy by improving federal legislation and elaborating federal energy efficiency programs;
- Prepare sections on improving energy efficiency in all state energy development programs of the Russian Federation;
- Organize, fund and control implementation of federal energy efficiency programs;
- Identify the cost-effective energy conservation potential of the economy and elaborate recommendations for keen exploitation of this potential;
- Develop and improve an institutional mechanism for implementing energy efficiency policy;
- Develop and improve an economic mechanism to encourage implementation of energy efficiency programs and projects;
- Coordinate efforts of federal, regional and local governments in developing and implementating energy efficiency policy;
- Plan, organize and coordinate scientific-research and design activities to improve energy efficiency;

- Develop and improve the system of collecting objective information on the scale and structure of energy consumption, publish this information, and develop a system of providing information according to the needs of implementation of the energy efficiency policy;
- Promote business competition for meeting energy demand between energy supply companies and organizations focusing on improving energy efficiency;
- Involve independent experts, energy consumers, manufacturers, and the public in developing national energy efficiency policy and federal energy efficiency programs;
- Involve private enterprises in implementation of energy efficiency programs;
- In cooperation with the Federal Committee for Standards and Certification and the Federal Committee for Energy Inspection develop an energy efficiency document base and informational infrastructure for distribution of normative and technical documentation and data-bases;
- Develop and implement information and education programs on opportunities for and advantages of taking energy efficiency measures.

Article 2. Funding of the Federal Agency Activities.

1. The Federal Agency of the Russian Federation and its funds shall be the property of the Russian Federation. The Federal Agency funds shall not be part of the budget or other funds, have a particular purpose, and are not subject to seizure.

2. On the territory of the Russian Federation, expenses for energy efficiency projects shall be paid from non-budget funds collected:

- In the energy efficiency fund of the Federal Energy Efficiency Agency of the Russian Federation;
- In energy efficiency funds of Regional Energy Efficiency Agencies located in the republics, regions, districts, autonomous regions of the Russian Federation, and the cities of Moscow and St.Petersburg.

3. The non-budget funds are formed by:

- money received through taxation for purchasing fuels and energy;
- voluntary contributions of legal and private persons;
- other contributions not contradicting the legislation.

4. Money received through the federal tax for purchasing fuels and energy shall be directed to the non-budget energy efficiency fund of the Federal Energy Efficiency Agency.

5. The non-budget funds of the FEEA shall be used for:

- Funding federal energy efficiency improvement programs in the way identified in these programs;
- Partially compensation of the expenses of enterprises and organizations for carrying out energy efficiency improvement projects, scientific-research and design projects, creating prototypes and large-scale production of equipment, energy efficiency characteristics of which surpass federal standards and norms by more than 20 percent.

6. Partial compensation of the expenses of the enterprises shall be made from the fu exclusively in the following ways:

- Up to 50 percent compensation of the main part of the loan taken by the enterprise fr a financial institution for carrying out an energy efficiency project;
- Preliminary payment to the financial institution of the loan interest (providing th payment does not exceed the loan itself) if the loan was taken by the enterprise for th purpose of carrying out an energy efficiency project.

7. Partial compensation of an enterprise's expenses is provided only on the condition that:

- The expenses for an energy efficiency project are incurred after this Law had come in effect;
- The loan for implementation of an energy efficiency project was taken after this Law h come into effect;
- The enterprise has never before received any financial or tax priviledges for this projec
- The financial institution which has provided the loan, agrees to give back the interest pa in advance by the energy efficiency fund for utilization of the loan, or a part of the loa in case the enterprise does not follow its obligations;
- The enterprise provides a confirmation from the financial institution for using the loa with the particular purpose of carrying out an energy efficiency project;
- The enterprise which implements the project guarantees that the project will function n less than 1 year;
- The enterprise presents documents containing the results of an energy inspection of th enterprise or a standard of the enterprise for equipment or technology which are subjec to modification in the course of an energy efficiency project implementation.

8. Not less than 30 percent of the funds used for partial compensation of enterprises' expense for carrying out energy efficiency projects shall be directed to small business.

9. Under the aegis of the FEEA there will be the Consulting Counsel which unite representatives of the Fuel and Energy Department, Finance Department, Ecology and Natura Resources Department, Industry Department, Science, Higher Education and Technical Polic Department, Press and Information Department, as well as representatives of Regional Agencies enterprises, scientific institutions and non-government organizations.

10. The tasks of the Consulting Counsel include holding public seminars on drafts of federa budgets, ratifying the federal budget, and also ratifying the annual report of the Federal Agency to the Head of the Government.

11. The FEEA shall annually present to the Head of the Government of the Russian Federation a report of its activities which must include:

- Assessment of energy efficiency improvement achieved with the help of federal programs and projects financed by the non-budget Fund;
- The number and characteristics of programs and project participants which were financed by the non-budget Fund;
- Financial report describing use of funds throughout the year;
- Recommendations for further improvement of the Fund's activities.

The annual report of the Fund shall be available to the public.

Article 3. The Federal Energy Commission.

1. Under the aegis of the Supreme Soviet (or the Government) there will be the Federal Energy Commission (FEC).

2. The FEC Chairman and members shall be appointed by the Supreme Soviet (or by the Head of the Government). The Chairman exercises control over the everyday activities of the Commission and is responsible for the results.

3. The FEC consists of six people and the Chairman. The FEC members are nominated for four years and can only be relieved by the Supreme Soviet (or the Head of the Government).

A person who is receiving or has received any income from energy supply companies during the last two years cannot be appointed Chairman or a member of the Commission. Nor can a person be appointed who has close relatives working for or profiting from energy supply companies. For carrying out the everyday activities of the Commission, an administrative body will be formed, the structure, personnel and estimate of operational expenses for which will be ratified by the Supreme Soviet.

4. The FEC activities are funded from the state budget.

5. The functions of the FEC are to:

- Develop, improve and control compliance with the rules governing consumers connected to sources of electricity-, heat- and natural gas supplies;
- Provide licenses for construction of energy facilities that are likely to change the water balance of more than one region of the Russian Federation;
- Provide licenses for construction of transmission grids that cross more than one region of the Russian Federation;
- Provide licenses for construction of natural gas and oil pipelines that cross more than one region of the Russian Federation;
- Identify rates and payments for interregional delivery of electric power, heat and natural gas;
- Determine the procedures and rules for providing licenses for construction of energy facilities on the territories of regions;
- Develop rules and recommendations for identifying rates and payments for energy, heat and natural gas consumption for the regional energy commissions including elaboration of the rates and payments system for encouraging implementation of energy efficiency programs by energy supply companies;
- Develop recommendations for the regional energy commissions on procedures for preparing, considering and ratifying regional energy supply companies' development plans, when the state does not possess the controlling block of shares in these companies;
- Develop obligatory procedures to include in regional energy supply companies' development plans, when the state possesses the controlling block of shares, both energy efficiency projects and energy facilities construction projects on an equal basis; criteria for projects selection which allow coverage of the additional energy needs with minimal expenses; economic methods for encouraging energy supply companies to invest in energy efficiency projects.

6. The FEC Chairman must organize public seminars and examinations by experts with participation of all interested parties before ratification of any normative documents or licenses developed or put out by the FEC.

7. The FEC Chairman has a right to obtain all the necessary information from any authorities, as well as from any energy supply company free of charge. Independent energy supply companies may provide free information for only two inquiries made by the FEC Chairman per calendar year.

Title II. Regional State Energy Efficiency Management Bodies.

Article 4. Regional Energy Efficiency Agencies.

1. There are Regional Energy Efficiency Agencies (REEA) in the state management bodies of republics of the Russian Federation, regions, districts, autonomous regions, and the cities of Moscow and St.Petersburg.

2. The funds of REEA are not part of the budget or other funds, have a particular purpose and are not subject to seizure.

3. The functions of Regional Energy Efficiency Agencies are to:

- Participate in development and implementation of regional elements of federal energy efficiency improvement programs;
- Develop regional energy efficiency improvement policy in all spheres of the economy by improving regional legislation and developing regional programs;
- Implement, fund and control implementation of regional energy efficiency programs;
- Identify the cost-effective energy conservation potential in the region and develop recommendations for maximal achievement of this potential;
- Develop and improve an institutional mechanism for effective implementation of energy efficiency policy;
- Develop within its jurisdiction and improve an economic mechanism to encourage programs and projects for improving energy efficiency in the region;
- Coordinate regional and local authorities efforts to develop and pursue energy efficiency policy;
- Plan, organize and coordinate scientific-research and design activities on energy efficiency improvement;
- Develop and improve a system of collecting objective information on energy consumption.

Article 5. Funding the Regional Agency Activities.

The regional tax for fuels and energy purchasing is directed to the non-budget energy conservation fund of the Regional Agency.

Article 6. Regional Energy Commissions.

1. Each Regional Energy Commission (REC) must include at least one representative of the Regional Agency.

2. Regional Energy Commissions, guided by the FEC recommendations, will identify the rates and payments for electric energy, heat and natural gas use. Regional Energy Commissions have a right to make alterations in the FEC recommendations if the rates include the expenses of energy supply companies for implementation of energy efficiency improvement projects, and possible losses caused by sale reduction are compensated.

3. REC will develop the documents for energy supply companies' presentation of their development plans and the procedure of review and ratification of these plans on the base of methodical recommendations of FEC. Within a year after this Law comes into effect, any such plan must include a demand management program with a section on increasing energy efficiency by the consumers of an energy supply company. Plans of meeting energy demand on the territory served by the company by both demand management and energy efficiency improving on the one hand and energy facilities construction on the other, are necessarily followed by expense assessments obtained using methods developed by REC.

4. In order to reflect the ecological cost of increasing electricity production, heat and natural gas supply, assessments of expenses for projects involving energy resourse production, REC can increase by 10-30 percent for projects that improve energy efficiency.

5. The main criterion for an energy supply company's final development plan is the lowest cost combination of demand management programs and energy production projects needed to meet energy demand.

6. The REC Chairman must hold an examination by experts and public seminars on energy supply company development plans with participation of all interested parties.

7. REC will not provide licenses for construction of energy facilities if they are not included in an energy supply company's development plan that has been ratified by the REC.

8. The REC Chairman has a right to promptly receive all necessary information from any regional authorities and energy supply companies free of charge. Non-governmental energy supply companies must provide free information for only two inquiries from the REC Chairman per calendar year.

Title III. Federal Energy Efficiency Programs.

Article 7. General Principles of Development, Ratification and Implementation of Federal Programs for Energy Efficiency Improvement.

1. Basic cooperation among the Federal Agency and Regional Agencies is implemented in the process of developing, implementing and monitoring federal energy efficiency programs.

2. Federal programs can be initiated by the Supreme Soviet, the Federal Government and regional authorities.

3. The Federal Agency develops: methods for developing regional sections of programs; conducting energy inspections; financial analysis of programs included in the project; criteria for

selecting these projects; procedures for review and ratification of regional sections of the programs; and conditions for funding.

4. Each regional section of the federal program is financed in the proportions agreed upon befor from the funds of the Federal Agency and the Regional Agency which has prepared the plan. Th share of the Federal Agency should be not less than 50 and not more than 80 percent.

5. The Federal Agency provides assistance to the Regional Agencies in preparing projects fo regional sections of the program, developing normative and legal documentation necessary to implementation of the federal program, and annual reports on the status of the federal program

6. The Federal Agency can provide subsidies to the Regional Agency for training a certification of the people making energy inspections in an amount not exceeding 5 percent o the federal funding of program's regional section.

7. The FEC Director shall not consider an application for funding the regional section of program if it lacks :

- The necessary information identified in the recommended methodology for developing th regional section of the program;
- Assent to follow the recommended methodology developed by the Federal Agency fo implementing the program and requirements for bookkeeping;
- An inventory of organizations to be involved in implementing the regional section of th federal program;
- Assessment of the expected cost effectiveness of the utilization of the funds provided by the Federal Agency.

8. The Regional Agency must keep separate registration of the funds received from the Federa Agency for implementating regional sections of the federal programs and make the record available to representatives of the Federal Agency.

9. The Federal Agency can not directly implement projects on federal programs in the region which it has financed for implementation of the regional sections of federal programs. It only has such a right in case the regional authorities refuse to participate in the federal program.

10. The Regional Agency shall provide annual reports to the Federal Agency Director on the results of implementation of the regional section of the federal program in a format determined by the Federal Agency.

11. The Federal Agency Director shall provide annual reports to the Supreme Soviet and the Head of the Government on the status of the federal program implementation in a format determined by them.

Article 8. The Federal Energy Efficiency Improving Program in Educational and Medical Institutions.

1. The Supreme Soviet considers that:

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- Educational and medical institutions are large energy consumers;
- Cost growth for supplying them with energy is a great burden on federal and regional budgets, limiting possibilities for funding main activities;
- There is significant energy efficiency potential in educational and medical institutions;
- In order to realize this potential, the state must provide financial assistance.

2. The goal of this section of the Law is to identify the procedures for development, review, and implementation of Federal energy efficiency programs in educational and medical institutions through cooperation between the Federal and Regional Energy Efficiency Agencies.

3. Within 180 days of its formation, the Federal Agency must develop and present to the Consulting Counsel methods of developing regional sections of this Program which must include: factors to be considered when identifying project priorities; criteria for selection of medical and educational institutions; descriptions of typical energy efficiency improving measures; criteria for selection of institutions to be involved in implementation of the projects; and methods of energy inspections.

These methods should be ratified by the Consulting Counsel, after which they should be sent to the regional authorities to develop the regional sections of the Program.

4. Within 90 days of receiving the methodology for developing the regional sections of the Program, the Head of the regional authorities should present a draft of the regional section of the Program to the Federal Agency Director which must include:

a) The results of the preliminary energy spot check identifying the region's energy efficiency potential in accordance with the methods developed by the Federal Agency;
b) Recommendations for energy efficiency improving project types with an assessment of implementation expenses;
c) A program for providing educational and medical institutions with devices for energy consumption control and regulation;
d) A list of organizations to be involved in implementation of the projects;
e) Guarantees for selection on an equal basis of projects to be included in the regional section of the Program;
f) Identification of funds for the regional programs to be directed from the Federal Agency funds;
g) Guarantees for the projects' implementation and effective utilization of federal funds.

5. The Federal Agency must arrange examination of each regional section of the Program by independent experts within 60 days after its presentation. If the regional section meets the requirements of Article 4, it is ratified. If not, within 90 days, the Head of the regional authorities should present a new version of the regional section of the Program.

6. Applications for funding the regional sections of the Program can be made once a year. They should be followed by an information inventory, identified by the Federal Agency in "Methods...". A report on the follow-up of examination by independent experts and public seminars on the regional section of the Program held by Regional Agencies should be attached to each application.

7. No region can recieve more than 10 percent of the total funds provided by the Federal Agency

for financing this program. The share of the federal funds for financing the regional section of the Program must not exceed 60 percent of the total regional section cost. When distributing the Federal Agency funds among the regions, 80 percent is distributed depending on the number of the population and climate; 10 percent depending on the supply of energy carrier in the region and prices for it; and 10 percent depending on the regional budgets.

8. Federal financing of a regional section of the Program will be terminated if the Federal Agency finds that utilization of the funds does not correspond to the purposes and tasks identified in the application for the Program financing. If any violation appears, the Federal Agency Director shall inform the Head of the Regional Agency that funding may be cut off and then holds seminars to single out reasons for violations. When it is done, funding is terminated and may only begin again after the violations are eliminated.

9. Each recipient of this Program's funds should keep separate cost accounting, present annual reports on implementation of the Program projects, and make the ledgers and financial documents available in accordance with the rules determined by the Federal Agency.

10. The Federal Agency Director shall annually present a report to the Supreme Soviet and the Government that must include:

- An assessment of the energy saved due to the Program;
- An assessment of the estimated energy savings in the course of further implementation of the Program;
- An assessment of the Program's cost effectiveness;
- Guidelines for Program improvement.

Article 9. Federal Program "Top Ten Industrial Projects".

1. The Supreme Soviet has stated that:

- Energy efficiency in Russian industry is much lower than that in developed industrial countries in the West;
- Energy inefficiency, along with price hikes for energy, deepens the economic crisis and limits competitiveness of Russian goods on the world markets;
- There is a significant energy efficiency potential in the Russian industrial sector;
- Practical realization of a significant part of this potential is possible with minimal expenses;
- Demonstrating possibilities, economic, social, ecological and other advantages of improving energy efficiency requires federal support.

2. The objectives of the "Top Ten Industrial Projects" are:

- To demonstrate that energy efficiency measures can result in significant economic, social and ecological benefits in a short time period with minimal cost to consumers;
- To demonstrate that improving energy efficiency is much cheaper than expanding capacity;
- To attract the attention of regional decision-makers and industry, as well as the public to the favorable economic, ecological and social consequences of improving energy efficiency; and

- To encourage industrial enterprises to implement energy efficiency projects.

3. Within 180 days after this Law comes into effect, the Federal Agency should develop and present for ratification by the Consulting Counsel methodological recommendations for developing regional sections of this Program. These recommendations shall identify:

- The procedure for informing industrial enterprises of the competition for the ten best energy efficiency projects;
- The procedure for presenting applications for participation in the competition;
- Criteria for selecting judges for the competition;
- Methods of financial analysis for the projects;
- Criteria for selecting projects for funding;
- Conditions of the projects' funding;
- Conditions for using the results of the implemented projects in information and education programs.

4. Within 30 days after the ratification of the methodological recommendations by the Consulting Counsel, Regional Agencies should organize a competition of industrial projects. Within 90 days after the competition begins, the competition jury starts working, considers the presented projects and chooses the top ten projects.

5. Regional Agencies present applications to the Federal Agency for funding the regional section of the program based on the jury's decision. A report on the decision of the jury shall be attached to this application.

6. The Federal Agency can refuse an application if the economic effectiveness of the projects submitted are significantly lower than that of projects in other regions. If the application is refused (with a suitable explanation) the region has a right to hold another competition on its own account.

7. The selected projects must be funded with 50 percent federal funds, 20 percent Regional Agency funds and 25 percent the enterprise which has initiated the project.

8. Not more than 20 percent Federal Agency funds for federal programs and not more than 20 percent of the yearly budget of the Regional Agency can be granted any one. No region can receive more than 10 percent of the funds provided by the Federal Agency for funding this program.

9. Funding of any regional section of the program will be terminated if the Federal Agency finds that utilization of the funds does not correspond to the purposes and provisions identified in the Program funding application. If any violations are found the Director of the Federal Agency informs the Head of the Regional Agency that funding may be halted, holds seminars to examine the reasons for the violations and identifies the means of bringing them in compliance. After it is done, the funding is cut and can only begin again when all violations have been eliminated.

10. Each recipient of federal funding for a particular program shall keep separate accounting of the expenditures and make the ledgers and financial documents available in accordance with the rules determined by the Federal Agency.

11. The Federal Agency determines the form in which Regional Agencies annually present to it reports on the results of the Program's implementation.

12. The Federal Agency Director annually presents a report to the Supreme Soviet and the Government that shall include: an assessment of the energy saved in the course of the Program; an assessment of the cost effectiveness of the implemented projects; a list of announcements in the central and regional mass media (including those on TV and radio) containing the experience gained through the projects; a list of educational programs and seminars that used the information obtained in the course of the projects; and the guidelines of improving the program "Ten Top Industrial Projects".

Article 10. The Federal Buildings Energy Efficiency Program.

1. The Supreme Soviet has stated that:

- The federal government is one of the biggest energy consumers;
- Federal buildings' energy supply expenses are quite large and continue to increase;
- There are good opportunities for revealing energy efficiency potential in these buildings at minimal expense;
- Improving energy efficiency in these buildings will have a good effect on the federal budget by reducing federal government maintenance expenses and demonstrating the advantages of energy efficiency in Russia.

2. The purpose of this section of the Law is to define the preparation procedures and mechanisms for implementing energy efficiency improving Program in buildings belonging to the Federal Government.

3. All the departments of the federal government are required to reduce energy consumption by not less than 15 percent per square metre in federal buildings in the period 1993-2000.

4. Within 90 days after this Law comes into effect, the Federal Agency must determine the methodology each separate department must use for developing energy efficiency-improving programs for their buildings.

5. The head of each department shall, within six months after this Law comes into effect, develop and present to the Federal Agency a program for realization of this goal. This program shall include:

- Holding energy inspections in federal buildings;
- Identifying a list of basic measures for fulfilling this mandate at minimum cost;
- Identifying a list of organizations to be involved in energy efficiency programs in the buildings belonging to the federal government;
- Identifying a schedule for supplying federal buildings with energy consumption control and regulation devices and the time for complete transition to payments for heating based on heat meters' indications;
- Application for funding the program from the Federal Agency funds.

6. For providing consulting assistance in implementing this program, the Federal Agency shall organize a working group. The working group will provide methodological recommendations for

developing the departmental sections of the program, for carrying out energy inspections and for giving the conclusions for projects presented by the federal departments and for reports on implementation of these programs.

7. Within 30 days after a federal department presents an energy efficiency program for the buildings in its possession, the Federal Agency must give a decision on it. If the decision is positive, funding of the program may begin. If the decision is negative, the Head of the Federal department must present a revised version of the program to the Federal Agency within 60 days after receiving this decision.

8. The amount of money directed to the federal buildings energy efficiency improving Program cannot exceed 10 percent of the funds directed by the Federal Agency to financing the federal programs. No Federal department can get more than 10 percent of the funds directed by the Federal Agency for a particular program.

9. Savings of the budget funds provided to a federal department in a financial year that are equal to the cost of the energy saved due to implementation of this Program remain in possession of this department and will be distributed in the following proportions: 60 percent for financing primary activities, 10 percent for providing bonuses to the staff of the department which has participated in implementation of the Program; and 30 percent for funding additional energy efficiency projects in the buildings belonging to the department.

10. Federal departments must annually present written reports to the Federal Agency describing results achieved in the course of the Program. These reports should contain: an assessment of the energy saved with the help of the energy efficiency Program; an assessment of how well the measures acheive the Program targets; an assessment of the cost effectiveness of the Program; and guidelines for Program improvement.

11. The Federal Agency Director annually presents a report on the status of Program implementation to the Supreme Soviet and the Head of the Government. The report should reflect the degree to which the Program target was achieved, a comparison of the cost for implementation of energy efficiency projects in different departments, and an analysis of and proposals on guidelines for improving the programs and improving methods of expanding and implementing the programs.

Article 11. The Federal Program for Improving Energy Efficiency in Transport.

Within a year after this Law comes into effect, the Federal Agency, in cooperation with other interested departments, must develop and present to the Government of the Russian Federation a Federal program for improving energy efficiency in transport.

Article 12. The Federal Program for Recycled Resources and Waste of Energy Intensive Production Utilization Improving.

Within a year after this Law comes into effect, the Ministry of Industry, in cooperation with the Federal Agency, must develop and present to the Government of the Russian Federation a Federal Program for improving utilization of recycled resources.

Article 13. The Federal Program for Scientific Research and Design Activities on Energy Efficiency.

Within a year after this Law comes into effect, the Federal Agency, in cooperation with other interested departments, shall develop and present to the Government of the Russian Federation the Federal program for scientific, research and design activities concerning energy efficiency. A three year Program shall be developed consisting of the tasks for the first year and prognosis for the two years to follow.

Title IV. Energy Efficiency Standards and Certification.

Article 14. Energy Efficiency Standards System.

1. The Supreme Soviet considers that one of the most promising guidelines for energy efficiency is standardization and certification of energy indexes for equipment and technologies to bring them into line with state requirements for energy efficiency.

2. The goal of energy efficiency standardization and certification is to improve the organizational, methodological, normative and technical base, as well as organizational, normative and technical infrastructure for energy efficiency standardization.

3. The energy efficiency standardization system is a part of the Federal Standardization System of the Russian Federation. The Standardization System includes the federal, departmental, republic and regional standards; and construction norms and rules ratified by the Federal Committee for Standards and Certification and the Federal Committee for Construction of the Russian Federation; and standards of enterprises and of scientific, technical and engineering entities, which are directly or indirectly connected with energy consumption and energy efficiency.

Energy efficiency standards and normative documents set norms, rules, propositions, requirements, a mandatory certification system while designing, manufacturing, constructing, reconstructing and expanding, and technical retrofitting energy consuming equipment and technologies.

Energy efficiency certification is carried out with the purpose of bringing energy indexes of the equipment into line with regulatory requirements identified in the standards and normative documents.

The certification system ratified by the Federal Committee for Standards and Certification and the Federal Committee for Construction of the Russian Federation identifies the rules for the testing procedure necessary to carry out estimation of the conformity of the energy consuming equipment and technologies indexes to the norms. This results in the release of a document /energy certificate, license/ on registering and future compliance.

4. The objects of energy efficiency standardization are indexes of energy consumption by equipment, transport and technologies, heating, cooling, air conditioning and ventilation, appliances, as well as insulation indexes of buildings and constructions and heat pipings, and methods of controlling these norms.

5. Funding of energy efficiency standardization on application of the Federal Agency is carried out from the funds of the Federal Agency, if there are no other sources set out in the application.

Article 15. Procedure for Standards Development.

1. The Federal Agency Director must annually present to the Chairman of the Federal Committee for Standards and Certification of the Russian Federation and the Chairman of the Federal Committee for Construction of the Russian Federation an application for inclusion in the federal standardization plan, containing:

- an inventory of the equipment for which state energy efficiency standards should be developed;
- an inventory of the equipment for which the present federal standards regulating energy efficiency requirements should be modified;
- an inventory of technologies for which federal standards regulating energy efficiency requirements should be developed;
- an inventory of technologies for which the present federal standards regulating energy efficiency requirements should be modified;
- an inventory of organizational and methodological state standards projects including improvement of energy efficiency terminology, methods of testing and calculating indexes characterizing energy efficiency; ways of including energy efficiency indexes in the project, operation, and maintenance documentation; proposals on normative documentation classification; requirements for the composition and contents of the normative documentation.

2. These inventories should be followed by grounds for developing state standards including grounds for scheduling and conditions for their implementation, as well as grounds for the expected energy saving and economic effects for their implementation.

Each inventory should be followed by a project of corresponding standards, prepared at the initiative of the Federal Agency, as well as protocols for the examination by experts and seminars held by the Federal Agency on these inventories and standards projects.

The present normative documents on technologies,insulation of buildings, constructions, equipment, heat pipings are subject to revision within three years after this Law comes into effect in the direction of increasing the level of insulation and heating, ventilation and cooling efficiency, first of all, by implementation of an energy concept according to which insulation and energy characteristics of an object as a unique energy system are standardized.

3. Within 90 days before presenting the inventories to the Federal Committee for Standards and Certification and the Federal Committee for Construction of the Russian Federation, the Federal Agency Director must provide an opportunity to all interested parties to get acquainted with these inventories and projects of the corresponding state standards, suggested methods of calculating and carrying out tests, ways of reflecting energy efficiency indexes in the expected, operation and maintenance documentation, means of labelling, and present comments on the standardization projects in written form.

4. 45 days before presenting the inventories to the Federal Committee for Standards and Certification and the Federal Committee for Construction of the Russian Federation, the Federal

Agency Director must organize public seminars and provide an opportunity for participation in them to all interested parties.

5. The Federal Committee for Standards and Certification and the Federal Committee for Construction of the Russian Federation develops and ratifies the normative documentation regulating:

- The nomenclatura and levels of energy efficiency indexes;
- Norms, rules, propositions and requirements for calculating energy efficiency indexes;
- Normative, technical and measure base of the energy indexes control and methods of carrying out tests for stating the conformity of the equipment or technology characteristics to the normative energy requirements;
- Requirements for the organization, order, rules, procedures and methods of the information service and providing normative documentation on the standards regulating energy efficiency ;
- Rules for incorporating energy efficiency indexes in the project, operation and maintenance documentation;
- rules for incorporating the requirements regulated in the standards in products labelling.

6. Federal standards regulating energy efficiency ratified by the Federal Committee for Standards and Certification and the Federal Committee for Construction of the Russian Federation are obligatory for all kinds of covered products and technologies manufactured or used on the territory of the Russian Federation including those obtained through import.

7. Standards and norms adopted in departmental and regional normative and technical documents can be obligatory or voluntary. In any case, they must not contradict the federal standards.

Article 16. Federal Control of Compliance with Standards.

1. Federal control compliance with the energy efficiency norms identified in state standards is given to the Federal Committee for Standards and Certification, the Federal Committee for Construction, and the Federal Committee for Energy Inspection. In order to carry out this function, the Federal Committee for Standards and Certification and the Federal Committee for Construction will undertake certification test centers. A test center can receive a certificate for testing products and technologies for compliance with state energy efficiency standards if:

- it has the normative and technical base necessary for carrying out tests;
- it pledges to carry out tests strictly in accordance with organizational and methodological standards;
- it pledges in written form to provide representatives of the Federal Committee for Standards and Certification, Federal Committee for Energy Inspection, Federal Agency and a Regional Agency the opportunity to participate in the tests (in the region in which the center is located) on their first application;
- it pledges in written form to make tests for compliance of the equipment or technologies to the standards identified by the Federal Committee for Standards and Certification, Federal Committee for Energy Inspection, Federal Agency or Regional Agency within 30 days;
- the Regional Agency has held public seminars on providing the center with a test certificate and the follow-up of the seminars has been presented to the Federal Committee

for Standards and Certification.

2. A Regional Agency, regional branches of the Federal Committee for Standards and Certification, and the Federal Committee for Energy Inspection have a right to test any product or technology for which there are federal energy efficiency standards for conformity of their indexes to the norms identified by the standards.

3. The Federal Committee for Standards and Certification must regularly test compliance of products for which there are federal standards regulating energy efficiency. This must include honoring requests of the consumers for testing.

4. Nobody has a right to test the same type and size product manufactured, repaired or sold by the same legal person more often than twice in a calendar year.

Article 17. Energy Efficiency Standards for Enterprises.

1. With the purpose of encouraging energy efficiency improvement, there are requirements regulating energy efficiency in the standards of enterprises.

2. The Federal Agency, in cooperation with the Federal Committee for Standards and Certification, must issue methodological recommendations for developing energy efficiency requirements in the standards of enterprises within 180 days after this Law comes into effect. These methods should be sent to all Regional Agencies. These methods must become an obligatory amendment to any set of documents sent to enterprises and organizations to involve them into federal and regional energy efficiency programs.

3. An enterprise must use these methods to prepare proposals concerning a company energy efficiency standard. This proposal is coordinated with the Regional Agency and the regional branch of the Federal Committee for Energy Inspection and is registered in the regional branch of the Federal Committee for Standards and Certification.

4. The energy efficiency standard of an enterprise is valid for three years, after which it is subject to revision. Energy efficiency requirements identified in the standards of enterprises are a basis for an assessment of the effectiveness of the measures on improving energy efficiency.

Article 18. Certification of Energy Efficiency Indexes.

1. Each product or construction object subject to federal standards and normative documents must have a certificate of compliance proving that its energy consumption indexes meet the norms and standards, taking into consideration the region of operation and other factors affecting energy consumption. The nomenclatura of products and construction objects which are subject to obligatory certification must be stated in the standards.

2. On the federal level, energy consumption certification is regulated by the legislation, controlled by the Federal Agency, and carried out by Regional Agencies.

3. The Regional Agency organizes testing of construction models or objects by certification centers, estimates and confirms correspondence to the standards and normative documents, and

issues a certificate of compliance or a license for manufacture of a product. If a product or a construction object does not meet the standards, no license may be issued.

4. Certification of the equipment or technologies for which there are voluntary standards is carried out on a voluntary basis. These certificates may be used in advertising manufactured products or obtaining obligatory licenses for production of new equipment, implementation of new technologies, and manufacturing of new products or economic benefits from management bodies (ministries, local authorities).

Title V. Economic Mechanisms for Encouraging Energy Efficiency.

Article 19. Federal and Territorial Taxes for Purchasing Fuels and Energy.

1. With the purpose of encouraging energy efficiency, there are federal and territorial taxes for purchasing fuels and energy which are paid by enterprises, organizations and institutions regardless of property type, departmental possession and organizational and legal forms, as well as private persons purchasing fuels and energy. The tax is identified in percentage of the fuels and energy price:

federal tax	-	0.3
territorial tax	-	0.7

2. The exact amount of the taxes shall be identified by the Government of the Russian Federation and the governments (authorities) of the republics, regions, districts, autonoumous districts of the Russian Federation, and the cities of Moscow and St.Petersburg.

3. The tax is included in the retail price of fuels and energy and is separately recorded by energy supply companies.

4. Enterprises and organizations exporting fuels and energy from the Russian Federation must make deductions from the hard currency received for selling fuels and energy to the non-budget fund of the Federal Agency in the amount stated by the Government of the Russian Federation according to the tax rates for selling fuels and energy.

5. Every three months energy supply companies must transfer the money received from taxes for purchasing fuels and energy from the consumers in the region to the non-budget funds of the Federal and Regional Agencies.

6. The money received from taxes for purchasing fuels and energy are only to be used for goals identified in Article 2.

7. The Federal Taxation Committee of the Russian Federation exercises control over payment of the tax for purchasing fuels and energy and the time limits for payment to the energy efficiency fund.

Article 20. Depreciation Benefits.

For energy consumption control and regulation devices, the depreciation period is shorter. Therefore, the Government of the Russian Federation submitted by the Energy Efficiency Agency, within 180 days after the Federal Agency is created, ratifies the inventory of devices for energy consumption control and regulation, the norm of depreciation deductions identified with consideration of the lifetime of these devices equal to one year, and also the inventory of energy efficient equipment types and devices with a short depreciation period.

Article 21. Federal Financial Support for Energy Efficiency Projects.

Federal financial support for energy efficiency measures is provided by the Federal Agency and regional agencies from their non-budget funds in accordance with the provisions of this Law. The funds thus obtained by legal and private persons are not subject to taxation.

Article 22. Value-added Tax Benefits.

The value-added tax rates are 50 percent lower for products with energy efficiency characteristics exceeding the federal energy efficiency requirements by 20 percent. This benefit is provided by the Government of the Russian Federation upon presentation of a federal standard certificate, providing the certificate was issued or confirmed not earlier than a year before the application.

Article 23. Customs Benefits.

The Federal Agency shall annually present to the Government of the Russian Federation an inventory of products and services which can significantly improve energy efficiency and, therefore, may enjoy customs benefits, and an inventory of products completely free of customs duties. To these inventories shall be attached assessments of cost effectiveness of customs benefits and methods of calculating these assessments.

Article 24. Encouraging Foreign Investments in Energy Efficiency Projects in the Russian Federation.

1. Foreign investors implementing energy efficiency projects on the territory of the Russian Federation have a right, according to the obtained savings of a certain energy carrier, to:

a) buy an equal amount of the same energy carrier for internal prices;
b) receive a license for exportation of this amount of the same energy carrier without export duties.

2. This license can be sold by the legal person which has implemented the project to any other legal person.

3. Within 60 days after its formation, the Federal Agency will develop and coordinate the order of realization of this right. Then it will present the draft decree for ratification by the Government of the Russian Federation.

4. To identify the amount of energy saved, a legal or private person having a Federal Agency certification must carry out an energy inspection before and after the project implementation, or to ratify standards of enterprises for energy efficiency technologies for all elements of the implemented project in the central bodies of the Federal Committee for Standards and

Certification of the Russian Federation before and after project implementation.

Protocols for energy inspections or ratified copies of the standards of enterprises for energy efficiency of technologies should be presented to the Federal Agency which must consider them within 10 days. If the decision is positive, the Federal Agency issues a certificate confirming the energy savings of the project implemented by a foreign investor.

Title VI. Energy Inspections and Energy Consumption Registration.

Article 25. Energy Consumption Registration.

1. Regional energy commissions in cooperation with Regional Agencies within six months after this Law comes into effect, must consider and ratify a plan of providing all legal persons who are energy buyers with energy consumption registration devices and identify a date from which the amount of purchased energy is identified as indicated by registration devices.

2. The required minimum for registration devices for different categories and groups of consumers is identified by the central and local branches of the Federal Committee for Energy Inspection.

3. The rules of installation of registration devices, certification, the commercial discount and reading the indications are developed by energy supply companies and ratified by the Federal Committee for Energy Inspection and the Federal Committee for Standards and Certification of the Russian Federation.

4. Each Regional Agency within a year after its formation, must develop and implement a program for identifying possibilities for and the cost effectiveness of registration devices and heating consumption regulation devices, and also methods of payment for heating supply for:

a) individual houses;
b) multi-story houses.

5. It is forbidden to collect payments for heating by indications of registration devices in case the residential consumer is not equipped with a heating energy consumption regulation devices.

Article 26. Energy Inspections.

1. Within six months after this Law comes into effect, the Federal Committee for Energy Inspection shall develop the inspection form and methods of evaluating energy efficiency at the inspected object.

2. During regular inspections by the Federal Committee for Energy Efficiency its auditors must fill in this protocol. It can contain recommendations for eliminating the violations of the standards for energy efficiency, and also imposing fines in accordance with the procedures determined in these standards and other normative documents.

3. The director of the enterprise signs the protocol together with the inspector of the Federal Committee for Energy Inspection and has a right, if he does not agree with the recommendations, to write down a special opinion. If the director of the enterprise refuses to

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sign the protocol, it is signed by the inspector alone and an explanation of the refusal is attached.

4. The inspector of the Federal Committee for Energy Inspection must leave one copy of the protocol at the enterprise. Another copy must be given to the Head of the Regional Agency.

5. Inspections must not interrupt the normal technological regime of the enterprise.

6. A year after this Law comes into effect, legal persons interested in revealing and implementing measures for improving energy efficiency can make an order for energy inspection which can only be carried out by legal or private persons which have received certificates from the Regional or Federal Agencies.

Article 27. Federal Examination by Experts of the Energy Efficiency Projects.

1. Preliminary, pre-project and project documents on the objects to be constructed on the territory of the Russian Federation are subject to obligatory federal examination by experts.

2. Under the aegis of regional Agencies there are groups of federal energy efficiency experts. Tasks, functions and powers of separate sections of the examination are identified by the Provision on the federal energy efficiency examination by experts developed by the Federal Agency and ratified by the Russian Government.

3. Experts must review federal examinations for all legal and private persons. A negative conclusion of the federal energy efficiency examination by experts provides grounds for re-developing projects in accordance with the review of the examination by experts.

Implementation of projects on construction and reconstruction of objects without a positive conclusion of the federal energy efficiency examination by experts is forbidden.

Title VII. Education and Personnel Training.

Article 28. Compulsory Teaching of the Basics of Energy Efficiency.

1. To ensure the minimal knowledge necessary for the formation of energy efficiency skills, in all secondary and high schools, regardless of their specialization, it is necessary to introduce obligatory teaching of the basics of energy efficiency as a part of the course "Basic Ecological Knowledge and Culture".

2. The Federal Agency, Ministry of Education and Ministry of Science, High School and Technical Policy must develop educational programs and text-books and organize personnel training within a year after this Law comes into effect.

Article 29. Regional Educational Programs and Programs for Increasing the Level of Professional Knowledge.

1. For implementation of educational programs and programs for improving professional skills of the leading workers and specialists in the field of providing enterprises and organizations with energy and holding seminars and conferences, each regional Agency, within a year after its

formation, forms a department with the following functions:

a) developing and implementing regional education programs and programs for improving professional skills of the leading workers and specialists in the field of providing enterprises and organizations with energy;
b) organizing demonstrations of energy efficient technologies and equipment;
c) organizing information services on energy efficiency for energy consumers in the region.

Within a year after this Law comes into effect, Regional Agencies must develop a plan for certifying people responsible for providing energy to enterprises and organizations for knowledge of the basics of energy efficiency. Such certification is made every three years.

Title VIII. International Cooperation in Improving Energy Efficiency.

Article 30. Participation in International Cooperation.

The Russian Federation takes measures for developing and strengthening mutually profitable complex international cooperation in improving energy efficiency both in relations to individual countries and by taking part in the activities of international organizations. The Government of the Russian Federation creates most favorable conditions for mutually profitable exchange of energy efficient technologies, as well as participation of Russian specialists in international projects of developing such technologies.

Article 31. Foreign Investments Insurance.

To attract foreign material and financial resources, advanced foreign techniques and technologies, and management experience to the objects connected with energy efficiency on the territory of the Russian Federation, along with the current federal guarantees the following order of the above-mentioned foreign investments insurance is set.

Foreign investors, whose material or intellectual investments allowed to improve energy efficiency on the territory of the Russian Federation and who signed an insurance agreement with the Multilateral Agency for foreign investments, have a right to apply to the Federal Energy Efficiency Agency of the Russian Federation for compensation of the insurance contribution value in accordance with the above-mentioned agreement. The foreign investors must present all the necessary documentation to prove the improvement in energy efficiency that they claim.

Within 90 days after the application of the foreign investor, the Federal Agency must either compensate the investor the value of his insurance contribution, or give a motivated explanation why such compensation is impossible. The amount of the compensation must not exceed the actual cost savings received from the energy conservation measures. The insurance contribution compensation is made in the currency paid by the investor. The insurance contribution compensation is free of charge and does not bring out any changes in property rights on the insured investments.

Article 32. International Cooperation in the Field of Standartization.

Within a year after this Law comes into effect, the Federal Committee for Standards and Certification must develop a program for harmonizating the federal system of energy efficiency indexes standardization with progressive international, national and regional standartization system of other countries, and also develop procedures of mutual ratification of the certification results.

Article 33. Analysis of International Cooperation Effectiveness.

The Federal Agency shall annually present to the Government of the Russian Federation an analysis of the effectiveness of international cooperation and proposals for improving it.

Title IX. Final Provisions.

Article 34. Observation of Commercial Secrecy by Officials of the Federal and Regional Agencies and Inspectors of the Federal Committee for Energy Inspection.

Officials of the Federal and Regional Agencies and Inspectors of the Federal Committee for Energy Inspection may not use to their own benefit or make known the data which constitute commercial secrets of a legal person who takes part in implementing energy efficiency programs or carries out energy audits.

Article 35. Settling Controversies.

Controversies connected with energy efficiency improving activities shall be settled by the court or arbitration in compliance with their jurisdiction.

Article 36. International Treaties.

If international treaties of the Russian Federation or the former USSR contain other rules than those stated in the Law on Energy Efficiency of the Russian Federation, the rules stated in international treaties take precedence.

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МИНИСТЕРСТВО ТОПЛИВА И ЭНЕРГЕТИКИ
РОССИЙСКОЙ ФЕДЕРАЦИИ

ПРОЕКТ

ЗАКОН

РОССИЙСКОЙ ФЕДЕРАЦИИ ОБ ЭНЕРГОСБЕРЕЖЕНИИ

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МОСКВА - 1992

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ПРОЕКТ

ЗАКОН РОССИЙСКОЙ ФЕДЕРАЦИИ ОБ ЭНЕРГОСБЕРЕЖЕНИИ

Настоящий Закон устанавливает правовые нормы в области управления и регулирования отношений между государством, юридическими и физическими лицами по поводу рационального использования и экономного расходования топлива и энергии. Он регламентирует права и функции федеральных и местных органов власти, права, ответственность и обязанности энергопотребляющих организаций и потребителей топлива и энергии с позиции их рационального использования и экономного расходования. Он направлен на превращение энергосбережения в решающий фактор удовлетворения ожидаемого прироста потребности отраслей экономики и населения страны в топливно-энергетических ресурсах и решения экологических проблем в период становления и устойчивого функционирования рыночных отношений в экономике и ее энергетическом секторе.

По мере развития рыночной экономики, включая рынок топлива и энергии, отдельные положения и статьи настоящего Закона подлежат уточнению и дополнению.

РАЗДЕЛ I. ОБЩИЕ ПОЛОЖЕНИЯ

Статья I. Область применения Закона Российской Федерации об энергосбережении

Настоящий Закон действует на территории республик (в составе Российской Федерации), краев, областей России, г.Москвы и Санкт-Петербурга.

Закон распространяется на все виды деятельности, связанные с потреблением топливно-энергетических ресурсов, и нацелен на рациональное использование и экономное расходование топлива и энергии.

Закон направлен на:

осуществление энергосберегающей политики во всех сферах экономики: в промышленности, на транспорте, в жилищно-коммунальном и сельском хозяйстве, в строительстве, в прочих отраслях материального производства, в сфере услуг, а также в области международного и научно-технического сотрудничества в сфере энергопотребления и энергосбережения;

стандартизацию и нормативное обеспечение энергоиспользования в основных энергоемких технологических процессах, оборудовании и

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промышленной продукции, бытовых энергоиспользующих приборов;

производство и применение энергосберегающего оборудования, машин, механизмов, приборов учета и регулирования расхода энергоресурсов и другой наукоемкой продукции, а также производство энергосберегающих конструкционных и строительных материалов;

разработку приоритетных направлений экологически чистой энергетики, новых источников энергии и видов топлива и новых более эффективных методов их преобразования и использования;

создание эффективных систем управления и контроля за энергопользованием;

информационное обеспечение реализации федеральной и региональных программ энергосбережения, разъяснительную и рекламную работу в народном хозяйстве и среди населения по проблемам энергосбережения и использования новых источников энергии и видов топлива;

создание учебной базы и материалов по подготовке менеджеров в области энергосбережения.

Статья 2. Основные принципы государственной политики в области энергосбережения

Основными принципами государственной политики в области энергосбережения являются:

а) правовое обеспечение перевода экономики страны на энерг регающий путь развития;

б) осуществление государственного регулирования деятельнос предприятий, организаций всех форм собственности и населения с I рационального использования и экономного расходования топлива и энергии;

в) приоритетность требований энергосбережения при проведении энергетической политики, необходимость соблюдения энергетических стандартов и нормативов при осуществлении хозяйственной, управленческой или иной деятельности;

г) предоставление максимальной самостоятельности регионам I проведении государственной энергосберегающей политики.

Статья 3. Объекты правового регулирования отношений в области энергосбережения

Объектами правового регулирования в области энергосбережени являются отношения в сфере производства, потребления, распределения топлива и энергии, проектирования, создания и внедрения научных,

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[illegible] структурных и технологических разработок, связанных с повышением эффективности топливно- и энергопользования, информационного обеспечения народного хозяйства и населения по вопросам энергосбережения, а также в области управления и контроля за использованием топлива и энергии.

Статья 4. Субъекты правового регулирования отношений в области энергосбережения

Субъектами правового регулирования отношений в области энергосбережения являются юридические и физические лица, в результате непосредственной деятельности которых осуществляется проведение государственной энергосберегающей политики, реализация энергосберегающих проектов и программ во всех отраслях экономики.

Раздел II. УЧЕТ ИСПОЛЬЗОВАНИЯ ТОПЛИВНО-ЭНЕРГЕТИЧЕСКИХ РЕСУРСОВ

Статья 5. Требования к учету энергопотребления

Объемы экономии топливно-энергетических ресурсов определяются на основании достоверного учета их расхода. При этом приборный учет топлива и энергии является обязательным. Ответственность за обеспечение достоверного приборного учета расхода энергоресурсов на предприятиях и в организациях народного хозяйства возлагается на руководителей этих предприятий и организаций или иных должностных лиц, которые должны выполнять эти обязанности согласно приказу.

Системы такого учета должны соответствовать проектной документации на производство промышленной и другой продукции, объекты строительства, реконструкции и реставрации или разрабатываться по специальным проектам. Применяемые приборы учета и контроля за расходованием топливно-энергетических ресурсов должны отвечать требованиям соответствующих стандартов.

Учет энергопотребления осуществляется в соответствии с установленными стандартами и нормами точности измерений и техническими требованиями к средствам и методам измерений. При необеспечении потребителями необходимого учета энергоресурсов, соответствующего действующим нормам и правилам, следует принимать при взаиморасчетах количество топлива и энергии по данным поставщика.

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Статья 5. Обязательность учета и контроля за расходованием энергоресурсов для новых объектов строительства

В проектах строительства предприятий всех форм собственности, в жилищной сфере и иных энергопотребляющих объектов, утвержденных с 1 июля 1994 г., должна предусматриваться установка счетчиков расхода электроэнергии, горячей и холодной воды, газа, топлива. В проектах должны предусматриваться условия для организации внутридомового учета расхода газа, воды, электро- и теплоэнергии.

В проектах жилых домов, утверждаемых с 1 июля 1994 г., должна быть предусмотрена установка наряду с электросчетчиками поквартирных счетчиков расхода горячей и холодной воды, газа и теплоэнергии в отопительной системе с установкой соответствующих регуляторов тепла. Без этих счетчиков ввод в эксплуатацию новых объектов строительства, в том числе жилых зданий, по проектам, утвержденным с июля 1994 г., запрещается.

В том случае, если проект, не предусматривающий установку вышеназванных счетчиков, но утвержденный после 1 июля 1994 года, принят к производству строительной организацией, то с момента ввода объекта в эксплуатацию строительная организация оплачивает потребление газа, воды, электро- и теплоэнергии по тарифам, увеличенным вдвое, вплоть до приведения объекта строительства в соответствие с требованиями настоящего Закона по учету и контролю за расходом воды и энергоресурсов. При этом расход этих ресурсов определяется по данным снабжающих организаций.

После ввода объекта в эксплуатацию при неустановке вышеуказанных счетчиков заказчик оплачивает расход неучитываемых видов топливно-энергетических ресурсов, а также воды по тарифам, увеличенным вдвое по сравнению с условиями договора о поставке ресурсов.

Во всех случаях половина уплаченной суммы перечисляется в фонд энергосбережения, причем 30% этой суммы – в федеральный фонд, и 70% – в региональный фонд энергосбережения.

В эксплуатируемых зданиях, на действующих предприятиях и в организациях, где нет приборного учета топливно-энергетических ресурсов (а также воды), но он возможен по условиям эксплуатации, предусматриваемые стандартами приборы должны быть установлены в течение трех лет со дня принятия данного закона. Ответственность

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за установку приборов в указанный период возлагается на юридических и физических лиц, в чьей собственности или в чьем ведении находятся эти объекты.

Контроль за своевременностью и правильностью установки приборов осуществляют федеральные органы управления экономикой, энергосбережением и единая служба России по энергетическому надзору.

При неустановке этих приборов в указанный срок с собственников (владельцев) зданий, предприятий и т.п. органами госэнергонадзора ежегодно взимается штраф в размере не менее 10% стоимости годового объема потребляемых ресурсов, который перечисляется в региональный фонд энергосбережения.

Дальнейшее совершенствование управления энергоснабжением потребителей (телекоммуникационное оборудование и др.) и применение более энергоэкономичных средств энергоиспользования на основе новейших достижений научно-технического прогресса регулируется постановлениями Правительства.

Контроль за соблюдением условий данной статьи осуществляют федеральные и региональные органы управления энергосбережением и единая служба России по энергетическому надзору.

РАЗДЕЛ III. ЭКОНОМИЧЕСКИЙ МЕХАНИЗМ ЭНЕРГОСБЕРЕЖЕНИЯ

Статья 7. Основные принципы экономического механизма энергосбережения

Экономический механизм энергосбережения в условиях регулируемого рынка должен способствовать заинтересованности производителей и потребителей топливно-энергетических ресурсов в их экономном и рациональном потреблении, в использовании местных, экологически чистых видов топлива и энергии, вторичных энергоресурсов, нетрадиционных, возобновляемых источников энергии, а изготовителей машиностроительной продукции и материалов – в выпуске энергетически эффективной техники. Особенностью этого механизма является в целом поощрительная направленность применяемых экономических рычагов и стимулов.

Внедрение экономических методов управления энергосбережением в хозяйственную практику направлено на снижение потребности экономики России в топливе и энергии с одновременным ростом производственных, экономических, социальных, научно-технических и экологи-

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гических задач; развитие материальной базы энергосбережения, рынк энергосберегающей техники; расширение использования энергетическ эффективных и экологически чистых технологий.

Статья 8. Финансирование энергосберегающих проектов

Источниками финансирования энергосберегающих проектов и осуществления мер по рациональному использованию и экономии топливно энергетических ресурсов являются государственные бюджеты России и республик в составе Российской Федерации, внебюджетные фонды министерств, местные бюджеты, Российский внебюджетный межотраслев фонд энергосбережения на федеральном и региональном уровнях, собственные и заемные средства предприятий, учреждений и организаций а также другие источники.

Статья 9. Условия функционирования Российского внебюджетного межотраслевого фонда энергосбережения

В целях финансовой поддержки проводимой государством энергосберегающей политики, стимулирования внедрения научно-технических и организационно-экономических мероприятий по энергосбереж нию, а также сдерживания темпов инфляции, создается Российский внебюджетный межотраслевой фонд энергосбережения, функционирующий на федеральном и региональном уровнях. Статус, порядок образовани и использования средств федерального и регионального фондов энергосбережения определяется Положением о Российском внебюджетном межотраслевом фонде энергосбережения, утверждаемым федеральными органами управления экономикой Российской Федерации.

Статья 10. Источники средств для формирования Российского внебюджетного межотраслевого фонда энергосбережения на федеральном и региональном уровнях

1. Основным источником формирования Российского внебюджетного межотраслевого фонда энергосбережения являются отчисления предприятиями и организациями-потребителями топливно-энергетических ресурсов (природного газа, мазута, моторных топлив, электричес-

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ной и тепловой энергии от 1% до 5% стоимости нерационально потребленных топлива и энергии (за исключением предприятий и организаций бюджетной сферы, коммунально-бытового и социального назначения и сельского хозяйства) с отнесением затрат на себестоимость продукции предприятия-производителя продукции (услуг). В случае нерационального использования и неэкономного расходования энергоресурсов предприятия и организации-потребители на территории единой энергосистемы России по энергетическому надзору осуществляют отчисления в Российский внебюджетный межотраслевой фонд энергосбережения из прибыли. Диапазон изменения отчислений на текущий год определяется Правительством Российской Федерации. Местные органы управления устанавливают конкретные уровни отчислений для регионов в пределах действующих ставок.

2. Другими источниками формирования Российского внебюджетного межотраслевого фонда энергосбережения являются:

а) отчисления в размере от 1% до 5% от поступлений во внебюджетные инвестиционные фонды министерств и ведомств;

б) платежи предприятий, осуществляемые в виде предусмотренных данным законом и нормативными актами санкции за нерациональное использование топливно-энергетических ресурсов;

в) целевые отчисления предприятий и организаций разового характера для разработки и изготовления энергосберегающего оборудования;

г) добровольные взносы юридических и физических лиц, не облагаемые налогами;

д) прибыль (доход), получаемая в результате деятельности структур управления энергосбережением.

3. Администрации республик (в составе Российской Федерации), краев и областей России, г.Москвы и Санкт-Петербурга предоставляется право по согласованию с местными органами управления природопользованием использовать для формирования региональных фондов энергосбережения часть средств своих столоичических фондов.

4. При перечислении средств в Российский внебюджетный межотраслевой фонд энергосбережения в региональные фонды по месту нахождения предприятия, организации направляется 70%, в федеральный фонд энергосбережения - 30%.

5. Основные направления использования Российского внебюджетного межотраслевого фонда энергосбережения приведены в Положении о Российском внебюджетном межотраслевом фонде энергосбережения.

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Статья 11. Контроль за использованием государственного внебюджетного фонда энергосбережения

Контроль за целевым использованием средств государственного внебюджетного межотраслевого фонда энергосбережения осуществляют Наблюдательный совет, образованный Правительством России, государственные финансово-банковские и другие контролирующие государственные органы в соответствии с возложенными на них законодательством функциями.

Статья 12. Льготное налогообложение предприятий, осуществляющих мероприятия по энергосбережению и производящих энергосберегающую продукцию

1. Для предприятий-производителей и потребителей энергосберегающего оборудования устанавливаются следующие льготы в налогообложении:

а) подлежащая налогообложению прибыль предприятия-производителя энергосберегающего оборудования и приборов уменьшается на полную сумму затрат предприятия по подготовке и освоению производства новых энергосберегающих видов продукции (удельные расходы энергоресурсов на ее производство соответствуют перспективным стандартам или ниже установленных стандартов при сохранении или улучшении потребительских свойств), а также на освоение новой техники и технологии, если они обеспечивают годовой энергетический эффект в экономике не менее двукратного размера налоговой льготы. Полученный фактический эффект должен подтверждаться документально предприятиями-потребителями энергосберегающей техники при подтверждении органами единой службы России по энергетическому надзору;

б) подлежащая налогообложению прибыль предприятия-потребителя энергосберегающего оборудования и приборов уменьшается на сумму затрат на освоение новой техники и технологии на период нормативного срока освоения, если они обеспечивают энергетический эффект в экономике не менее двукратного размера налоговой льготы. Полученный эффект должен подтверждаться документально по учетным данным предприятия;

в) прибыль предприятия, полученная от реализации высокоэффективного энергосберегающего оборудования для использования энергии нетрадиционных источников, местных видов топлива и энергетических отходов, а

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также высокоэффективных автоматических инженерных систем, отличной арматуры и приборов новых типов, дифференцирующих и регулирующих потребление энергии, а также систем учета расхода топливно-энергетических ресурсов, по представлению федерального или регионального органов управления энергосбережением в качестве единой служ- ба России по энергетическому надзору не облагается налогом в течение двух лет с начала освоения выпуска;

г) не облагается налогом прибыль, направленная предприятиями и организациями на учредительную и организационную деятельность по созданию предприятий, выпускающих новейшее опытное энергосберегающее оборудование, включая соответствующие затраты на научные исследования;

д) прибыль предприятий, выполняющих строительно-монтажные работы (в том числе при капитальном ремонте зданий) по повышению тепловой защиты существующих зданий относительно нормируемого уровня не менее, чем на 50%, при улучшении их архитектурно-эстетических качеств на основе применения эффективных технологий безотселения или прекращения эксплуатации зданий, облагается налогом по льготной ставке, пониженной до 50% от действующей ставки налога на прибыль;

е) не облагается налогом и остается в распоряжении предприятия прибыль, полученная от экономии топливно-энергетических ресурсов по сравнению с установленными стандартами и нормативами.

4. Правительству России, правительствам республик (в составе Российской Федерации) и местным органам государственной власти в рамках их компетенции предоставляется право полностью или частично освобождать от налогообложения прибыль, целевым образом направляемую предприятиями на мероприятия по энергосбережению и развитию производства энергосберегающей продукции. Эти льготы распространяются на любого участника процесса энергосбережения, в т.ч. на производителей и потребителей топлива и энергии, на организации, целевым образом финансирующие мероприятия по энергосбережению и развитие производства энергосберегающей продукции. В последнем случае кредиты и дотации (субсидии) полностью или частично могут исключаться из сумм, облагаемых налогом. Сумма предоставленных предприятию финансовых льгот выделяется из средств действующего на акционерной основе предприятия при региональном органе управления энергосбережением с последующим возмещением этих сумм предприятием.

5. Величина предоставляемых налоговых льгот и контроль за их эффективностью определяется и обеспечивается распорядительными средств фондов энергосбережения;

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на федеральном уровне – Правлением Российского внебюджетного межотраслевого фонда энергосбережения, на региональном уровне – государственными энергетическими комиссиями при республиканских (для республик в составе Российской Федерации) и при местных исполнительных органах соответствующих Советов народных депутатов по представлению потребителями энергосберегающей продукции обоснования эффективности энергосберегающих мероприятий и продукции. В случае недостижения ожидаемых результатов от энергосбережения органы, предоставляющие льготы, могут частично или полностью отменить эти льготы и взыскать у получателей льгот средства на величину недополученной суммы, скорректированной на оценивавшийся темп инфляции.

Статья 13. Льготное кредитование проектов и программ по энергосбережению и предприятий, производящих энергосберегающую продукцию (технику)

1. Льготные кредиты при проведении работ по энергосбережению предоставляются предприятиям и организациям для:

а) выполнения мероприятий по заключениям государственной энергетической экспертизы, направленных на мобилизацию резервов экономии;

б) использования высокоэффективных энергосберегающих технологий и оборудования, включая НИОКР и изготовление опытных образцов и демонстрационных установок;

в) применения предприятиями установок на базе использования нетрадиционных и возобновляемых источников энергии;

г) приобретения оборудования, материалов и приборов, обеспечивающих экономию энергоресурсов;

д) выполнения научно-исследовательских и опытно-конструкторских работ в области энергосбережения;

е) изготовления опытных образцов и экспериментальных установок;

ж) освоения производства новых энергетически эффективных технологических процессов.

Предоставление льготных кредитов осуществляется за счет средств Российского внебюджетного межотраслевого фонда энергосбережения на федеральном и региональном уровнях.

2. Процентная ставка кредита, предоставляемого на льготных

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условия для финансирования мероприятий по энергосбережению, может быть снижена до 50% средней банковской ставки в данном районе по соответствующему виду кредита в период его предоставления.

5. Сроки возврата кредитов и величину [illegible] ставки на федеральном уровне определяет правление Российского внебюджетного фонда энергосбережения, на региональном уровне – региональные энергетические комиссии при исполнительных органах Советов народных депутатов. Кредиты выдаются в соответствии с положением о Российском внебюджетном фонде энергосбережения и по предоставлению потребителям топлива и энергии и производителям энергоэкономичной продукции, прошедшей экспертизу, обоснования эффективности предполагаемых к осуществлению за счет кредитов энергосберегающих мероприятий и видов продукции.

6. Контроль за эффективностью использования кредитов возлагается на кредиторов. В случае неэффективного использования кредитов или получения ожидаемых результатов правление Российского внебюджетного энергосберегающего фонда энергосбережения или государственные энергетические комиссии имеют право изменить условия кредитования, обязать предприятия и организации, взявшие кредиты, вернуть кредитные суммы и наложить на них штрафные санкции.

Статья 11. Направления и условия финансирования экспертизы и разработок нормативно-методических материалов в области энергосбережения

1. Федеральные и местные органы управления, а также заинтересованные предприятия и организации могут оказывать организациям, предприятиям-потребителям топливно-энергетических ресурсов и производителям энергоэкономичной продукции финансовую поддержку в виде дотации, субвенций и других форм финансовой помощи на реализацию мер, способствующих экономии топлива и энергии. Между заинтересованными сторонами заключается договор, в котором оговаривается сумма дотации, субвенций или субсидий, направление и сроки осуществления энергосберегающих мероприятий и выпуска продукции, ожидаемые результаты и эффективность от их внедрения.

2. Местные и федеральные органы управления, а также предприятия и организации, оказывающие финансовую поддержку при осуществлении энергосберегающих мероприятий, имеют право контролировать эффективность использования дотации, субвенции, субсидии и других форм

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[illegible], по представлению федерального органа управления энергосбережением или федеральной и региональных энергетических комиссий, потребовать в случае их бесспорного полного выявления частичного или полного возврата предоставленных средств.

3. Суммы сверх изъятой прибыли предприятия, осуществляющего энергосберегающие мероприятия, освобождаются от налога на прибыль и добавленную стоимость.

Статья 17. Амортизационная политика в области энергосбережения

1. Федеральные органы управления [illegible] по предложению федерального органа управления энергосбережением устанавливают повышенные нормы амортизационных [illegible] для энергосберегающего и энергосберегающего оборудования.

2. Подготовка предложений по номенклатуре [illegible], для которого устанавливаются ускоренная амортизация, а также повышение норм амортизации возлагается на федеральный орган управления энергосбережением с участием потребителей и производителей топлива и энергии.

Статья 18. Валютная выручка от экономии энергоресурсов

1. Предприятия и организации, осуществляющие мероприятия по энергосбережению, по решению федерального органа управления энергосбережением предоставляется право экспорта до 50% сэкономленных топливно-энергетических ресурсов (жидких и твердых топлив), приобретаемых у государства по регулируемым ценам, при этом экономия определяется как абсолютное сокращение потребления топлива и энергии, полученное без уменьшения (в натуральном, условно-натуральном выражении или в сопоставимых ценах) выпуска продукции (или в большем объеме, чем снижение объемов производства продукции, услуг), для которой приобретались энергоресурсы в соответствии с действующими стандартами на ее производство.

2. Валютная выручка от экспорта сэкономленных топливно-энергетических ресурсов направляется: в федеральный бюджет — в размере не менее 40%; не более 3% выручки передаются в ведение администраций соответствующих регионов, а оставшаяся часть — в равных долях: 1) предприятиям, сэкономившим энергоресурсы, на приобре-

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[illegible] общего потребления топлива и энергии [illegible] тыс. тонн условного топлива в год подлежат регулярным обследованиям не реже одного раза за [illegible] со времени [illegible] закона. В коммунально-бытовом секторе таким обследованиям подлежат не реже одного раза в 3 года отдельные котельные мощностью свыше 10 Гкал/час, тепловые пункты, магистральные и распределительные тепловые сети, а также многоквартирные жилые здания и культурно-бытовые помещения в составе [illegible], на транспорте обследованиям подлежат не реже одного раза в 3 года [illegible] энергопотребления и проверяется эффективность использования моторных топлив в соответствии с нормами, утвержденными правительством России и применяемыми регионами в составе Российской Федерации.

[illegible] обследование указанных предприятий [illegible] не проведено или не подтверждены [illegible] энергетическом паспорте о ранее проведенном обследовании, органами [illegible] служб России по энергетическому надзору к предприятию применяются экономические санкции, предусмотренные настоящим законом.

По усмотрению региональных энергетических комиссий сроки проведения обследований и уровни потребления энергоресурсов для предприятий, подлежащих обследованию, могут быть уменьшены.

Статья 19. Экономические санкции за расточительное и нерациональное использование энергоресурсов

1. Экономические санкции налагаются на предприятия всех форм собственности, потребляющие топливно-энергетические ресурсы:

а) за перерасход по сравнению с установленными стандартами и нормативами (на основе результатов приборного учета) в размере 5-кратной стоимости потерь;

б) за несвоевременное проведение обследования своего энергетического хозяйства в размере 10% годовой стоимости энергопотребления;

в) за неисполнение или несвоевременное выполнение предписаний органов государственного энергетического надзора по устранению фактов расточительного и нерационального расходования топлива и энергии (устранение прямых потерь);

г) за производство машин и оборудования, строительство зданий и сооружений, энергетические характеристики которых хуже

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[illegible] экспертизы.

5. За нерациональный расход энергоресурсов и несвоевременное устранение выявленных по причинам несвоевременное выполнение согласованных с экспертизой мероприятий) по представлению органов государственной энергетической экспертизы на предприятие накладываются экономические санкции в виде повышения в [illegible] раза цены на указанные энергоресурсы. Суммы полученных санкций перечисляются в региональный фонд энергосбережения. При этом решение спорных вопросов о наложении экономических санкций производится региональными энергетическими комиссиями и арбитражному суду.

6. Организации, осуществляющие транспортировку топливно-энергетических ресурсов, несут материальную ответственность за сохранность транспортируемого топлива. Недопоставка топлива получателю, связанная с потерями топлива при транспортировке и хранении, превышающими установленные стандарты и нормативы потерь, должна возмещаться получателю за счет транспортной организации в соответствии с ценой приобретения на топливо и сверх того транспортная организация уплачивает штраф в доход федерального бюджета в размере стоимости недопоставленного топлива.

7. На период до разработки стандартов региональным энергетическим комиссиям предоставляется право утверждать для предприятий нормативы энергопотребления на основную энергоемкую продукцию. Эти нормативы служат базой для применения экономических санкций.

8. Региональные энергетические комиссии устанавливают для поставщиков и потребителей порядок преддоговорных санкций, соответствующих предоставлению минимума услуг по энергоснабжению (в части косинуса "фи", возврата конденсата, отклонения мощности, объема энергопотребления и качества поставляемых топливно-энергетических ресурсов от величин, предусмотренных в договоре). Раз в год (в IV квартале) региональные энергетические комиссии устанавливают предельные уровни санкций.

9. Порядок взимания и размер экономических санкций за отклонение уровней энергопотребления от установленных стандартов и нормативов утверждается федеральным органом управления энергосбережением по согласованию с федеральными органами управления экономикой Российской Федерации.

10. Спорные вопросы между предприятиями, не согласными с

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[illegible] связанные с рациональным и [illegible] использованием энергоресурсов, [illegible] решаются посредством федеральной энергетической комиссии и в арбитражном суде.

Статья 20. Стимулирование использования вторичных энергоресурсов, нетрадиционных и возобновляемых источников энергии

1. Стимулирование заинтересованности организаций в использовании вторичных энергоресурсов, нетрадиционных и возобновляемых источников энергии осуществляется с помощью налоговых и финансово-кредитных льгот, предусмотренных в настоящем законе.

Для этих целей при федеральном и региональных органах управления энергосбережением создается и используется банк данных по вторичным энергоресурсам (тепловым и горючим), оптовым и др. отходам и т.п., нетрадиционным и возобновляемым источникам энергии, по энергоэкономичным технологиям, по стандартам на энергопотребление.

2. За счет средств Российского внебюджетного межотраслевого фонда энергосбережения по решению его правления представляются субсидии в связи с использованием вторичных и местных энергоресурсов, нетрадиционных и возобновляемых источников энергии в размере до 50% стоимости строительно-монтажных работ и оборудования (тепловые насосы, биоэнергетические и гелиоустановки, утилизационное оборудование и др.).

3. Региональные энергетические комиссии имеют право возмещать из региональных фондов энергосбережения (на возвратной основе) до 20% затрат, связанных с использованием вторичных энергоресурсов и производством энергии за счет нетрадиционных и возобновляемых источников в течение первых двух лет освоения.

Раздел IV. Стандартизация и сертификация в области энергосбережения

Статья 21. Задачи стандартизации и сертификации в области энергосбережения

Задачей стандартизации в области энергосбережения является

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создание комплекса нормативов, правил и требований (обязательных или рекомендательных) по рациональному использованию и экономному расходованию топливно-энергетических ресурсов на всех стадиях жизненного цикла изделий, технологических процессов и производства работ.

Сертификация в области энергосбережения устанавливает процедуры выявления и подтверждения соответствия показателей экономичности энергопотребления изделий, реализуемых потребителям, с показателями, установленными в стандартах или других нормативно-технических документах на эти изделия.

Статья 22. Предметы и объекты стандартизации, организация контроля

1. Объектом стандартизации являются все виды энергопотребляющего оборудования и технологий, автотранспортных средств, строительных и сельскохозяйственных машин и механизмов, товаров народного потребления, потребляющих электрическую и (или) тепловую энергию или органическое топливо, или преобразующих один вид энергии в другой, а также теплоизоляционные конструкции.

Предметом стандартизации являются нормативы энергопотребления, удельные характеристики использования энергоносителей при определенных условиях функционирования, экономических, экологических и других ограничениях.

Нормативы расхода топлива и (или) энергии могут устанавливаться либо в стандартах на машины, оборудование, механизмы, теплоизоляционные материалы и строительные конструкции наряду с другими показателями, либо в специальных "стандартах нормативов", или в нормативно-технических документах (рекомендациях) на технологические процессы и производство работ в различных отраслях народного хозяйства.

Нормативы энергопотребления, устанавливаемые в стандартах и других нормативно-технологических документах, должны обосновываться расчетами или экспериментами в соответствии с методическими материалами по согласованию с федеральными органами управления энергосбережением.

Номенклатура показателей экономичности энергопотребления определяется разработчиком или производителем изделия, конструк-

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ции, технологического процесса, производителем работ и утверждается органом стандартизации России по согласованию с органами управления энергосбережением и Госэнергонадзором.

Нормативы энергопотребления устанавливаются разработчиком документа и утверждаются либо органом стандартизации России, либо ведомством (министерством) по согласованию с органами управления энергосбережением и Госэнергонадзором.

На некоторые изделия массового спроса нормативы расхода топлива и энергии могут устанавливаться специальными постановлениями Правительства России по представлению федерального органа управления энергосбережением.

2. Нормативы энергопотребления, устанавливаемые в стандартах и других нормативно-технических документах, являются базой для оценки эффективности использования топлива и (или) энергии и последующего применения экономических рычагов для управления энергосбережением.

Наряду с нормативами энергопотребления в стандартах и нормативно-технических документах оговариваются методы, приборы и условия их определения.

3. Контроль за соблюдением нормативов энергопотребления, установленных в государственных стандартах и постановлениях Правительства России, возлагается на территориальные органы стандартизации России. Контроль за соблюдением нормативов, установленных в других нормативно-технических документах, возлагается на министерства и ведомства Российской Федерации согласно ведомственной принадлежности и органы Госэнергонадзора.

4. Федеральный орган управления энергосбережением организует работу по оценке эффективности использования топливно-энергетических ресурсов и проведению государственной энергосберегающей политики совместно с федеральным органом стандартизации России, Государственным энергетическим надзором, координирует работу региональных энергетических комиссий в части энергосбережения.

По всем спорным вопросам по оценке эффективности использования энергоресурсов в качестве арбитра выступает федеральный орган управления энергосбережением, действующий на межотраслевом уровне. Его заключения по спорным вопросам являются

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окончательными.

Статья 28. Создание нормативной базы энергосбережения

1. Федеральный орган управления энергосбережением совместно с федеральным органом стандартизации России по согласованию с заинтересованными ведомствами:

а) ежегодно разрабатывает и утверждает перечень видов энергоемкого энергопотребляющего оборудования, бытовой техники массового использования, теплоизоляционных материалов и строительных конструкций, на которые необходимо разработать нормативы энергопотребления и установить их в государственных стандартах. Финансирование этих работ осуществляется через госбюджет, а также Российский внебюджетный межотраслевой фонд энергосбережения; непосредственную разработку стандартов осуществляет федеральный орган по стандартизации России;

б) ежегодно разрабатывает рекомендации отраслям, ассоциациям, концернам, фирмам и другим организациям для установления нормативов энергопотребления в ведомственных нормативно-технических документах на оборудование, технологические процессы, производимые работы. Финансирование этих работ должно осуществляться за счет средств отраслей и организаций;

в) устанавливает перечень энергоемких технологических процессов, работ и услуг, энергопотребляющего оборудования и установок, на которые должны быть разработаны перспективные нормативы энергопотребления, утвержденные и реализованные в определенные сроки;

г) разрабатывает проекты постановлений Правительства России по установлению нормативов энергопотребления на особо важные технологические процессы и оборудование;

д) организует создание и ведение банка данных по энергосберегающим технологиям и оборудованию и банка данных по стандартам и нормативно-техническим документам на такие технологии и оборудование.

2. Нормативы, устанавливаемые в государственных стандартах и постановлениях Правительства России, являются обязательными. Несоблюдение этих нормативов влечет санкции в соответствии со

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статьями данного Закона и нормативными актами.
Нормативы, устанавливаемые в других нормативно-технических документах, носят рекомендательный характер. Санкции за их невыполнение устанавливаются региональными энергетическими комиссиями. Они не должны превышать санкции за нарушение государственных стандартов.

Нормативы расхода топлива и энергии в обязательном порядке включаются в энергетические паспорта оборудования, ремонтные карты, технологические инструкции по эксплуатации, а также технические паспорта на все виды продукции, потребляющей топливо и (или) энергию. Нормативные расходы теплоты на отопление зданий и сооружений устанавливаются в строительных нормах и правилах.

3. Через каждые 3-5 лет нормативы энергопотребления, установленные в стандартах, подлежат проверке органами Госстандарта. При этом определяется соответствие норматива уровню, достигнутому в передовых технологиях, и устанавливаются, при необходимости, его новые значения и срок очередной проверки.

Статья 24. Сопоставительная оценка энергетических затрат и результатов при добыче топлива

Федеральный орган управления энергосбережением совместно с топливодобывающими ассоциациями, корпорациями и компаниями в 1993-1994 гг. разрабатывает методику и проводит энергетическую оценку нефтяных и газовых месторождений, шахт и разрезов с целью сравнения энергии, заключенной в объеме добываемого топлива с количеством энергии, затраченной на его добычу и транспортировку, включая энергию, затраченную на производство оборудования и материалов.

Процессы добычи топлива, в которых энергия, заключенная в добываемом топливе, равна или меньше энергии, затраченной на ее добычу, подлежат остановке. Вопрос о их дальнейшей судьбе решается местными органами в трехмесячный срок.

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Статья 25. Сертификация показателей экономичности энергопотребления

1. Основные виды машин, оборудования, бытовых приборов, сырья и материалов должны иметь сертификат, указывающий соответствие показателей энергопотребления выпускаемой продукции установленным стандартам.

2. Работа по сертификации продукции организуется федеральным органам стандартизации России. В финансировании этих мероприятий принимает участие Российский внебюджетный межотраслевой фонд энергосбережения.

Федеральный орган стандартизации России:

а) устанавливает номенклатуру (перечни) продукции, подлежащей сертификации по согласованию с федеральным органом управления энергосбережением;

б) устанавливает перечень сертификационных требований и разрабатывает рекомендации по введению их в нормативно-техническую документацию на конкретные виды продукции;

в) организует присоединение к международным системам или заключение региональных соглашений о проведении сертификации продукции;

г) разрабатывает стандарты и правила проведения сертификации конкретных видов продукции и проводит аттестации производства сертифицируемой продукции на предприятиях-изготовителях;

д) проводит аккредитацию испытательных организаций (центров, лабораторий, подразделений и т.п.), назначенных ответственными и правомочными за проведение сертификационных испытаний продукции.
При аккредитации оценивает техническую компетентность и независимость испытательной организации от изготовителя и потребителя продукции;

е) организует проведение испытаний продукции, подлежащей сертификации;

ж) выдает сертификаты и (или) удостоверения "Знаков соответствия" специальной маркировки;

з) осуществляет надзор за качеством сертифицируемой продук-

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ции, правильностью проведения сертификации;

и) обеспечивает информационное обеспечение работ по сертификации.

3. При поставке продукции на экспорт ее сертификация обязательна.

4. Для продукции, показатель экономичности энергопотребления которой превосходит норматив, установленный в государственном стандарте, устанавливается "Знак энергетической эффективности". Предприятия, выпускающие такую продукцию, получают право на льготы по отчислениям в фонд энергосбережения. Предел снижения отчислений устанавливается федеральным органом управления энергосбережением, а их уровень-региональными энергетическими комиссиями.

При выявлении потребителем худших показателей фактического энергопотребления по сравнению с указанными в технической документации для соответствующих условий эксплуатации изделие подлежит возврату предприятию-изготовителю для замены с возмещением потребителю всех убытков. При невозможности такой замены предприятие-изготовитель возмещает потребителю все расходы, связанные с приобретением и возвратом изготовителю некачественного изделия.

Порядок возмещения расходов потребителю устанавливается федеральным органом управления энергосбережением по представлению федерального органа стандартизации и единой службы России по энергетическому надзору.

РАЗДЕЛ V. ПОЛНОМОЧИЯ ОРГАНОВ ВЛАСТИ В ОБЛАСТИ ЭНЕРГОСБЕРЕЖЕНИЯ НА ФЕДЕРАЛЬНОМ И РЕГИОНАЛЬНОМ УРОВНЯХ

Статья 38. Компетенция Российской Федерации в области энергосбережения

Ведению Российской Федерации в области регулирования отношений в энергосбережении относится:

а) принятие Концепции энергосберегающей политики на перспективу;

б) установление правовых основ регулирования отношений в области энергосбережения на территории России и их корректировка

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в процессе законодательной деятельности;

в) принятие в составе законодательных актов положений, позволяющих разработать и ввести в действие отвечающий рынку финансово-экономический механизм энергосбережения;

г) утверждение порядка образования внебюджетных фондов энергосбережения.

В соответствии с Конституцией Российской Федерации Верховный Совет Российской Федерации полномочен принимать к своему рассмотрению и другие вопросы, относящиеся к государственному регулированию в области энергосбережения и входящие в компетенцию органов власти Российской Федерации.

Статья 27. Компетенция республик в составе Российской Федерации в области энергосбережения

Ведению республик в составе Российской Федерации в области регулирования отношений, связанных с энергосбережением, подлежат:

а) реализация энергосберегающей политики России с учетом региональных условий;

б) определение порядка организации и деятельности органов управления энергосбережением на уровне соответствующей республики;

в) определение полномочий местных органов власти и управления в части рационального использования и экономного расходования энергетических ресурсов;

г) формирование экономического механизма в области энергосбережения в пределах, предусмотренных Верховным Советом Российской Федерации;

д) определение административных и экономических санкций за нерациональное использование и неэкономное расходование топлива и энергии и порядок их применения.

Верховные Советы республик в составе Российской Федерации в рамках своих полномочий осуществляют и другие функции в области энергосбережения на территории своих республик.

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Статья 28. Компетенция Советов народных депутатов краев, областей и других административно-территориальных единиц в области энергосбережения

Ведению Советов народных депутатов краев (областей) и других административно-территориальных единиц в области энергосбережения подлежат:

а) координация и контроль деятельности предприятий и организаций, направленные на обеспечение рационального использования и экономного расходования энергетических ресурсов в крае (области) и других административно-территориальных единицах;

б) организация разработки и утверждение программы энергосбережения;

в) формирование местных фондов энергосбережения и определение порядка финансирования целевых программ по рациональному использованию и экономному расходованию энергетических ресурсов;

г) направление деятельности предприятий, расположенных на территории конкретного Совета народных депутатов, вне зависимости от их подчиненности, по развитию материально-технической базы энергосбережения, выявлению и реализации их потенциала;

д) рассмотрение возможности снижения энергоемкости продукции (работ, услуг) и привлечения нетрадиционных возобновляемых и местных, недефицитных видов топлива и энергии при рассмотрении проектов социального и экономического развития региона;

е) формирование структуры управления энергосбережением в регионе;

ж) рассмотрение возможности и определение порядка введения платы за право использования дефицитных топливно-энергетических ресурсов (нефти и нефтепродуктов, газа и других, дефицитность которых для данного региона определяется региональными энергетическими комиссиями);

з) определение дополнительных условий по порядку применения административных и экономических санкций за нерациональное использование и неэкономное расходование топлива и энергии, исходя из Российского законодательства.

Местные Советы народных депутатов в рамках своих полномочий могут осуществлять и иные функции в области энергосбережения, не противоречащие Российскому законодательству.

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Статья 29. Функции исполнительных органов управления в области энергосбережения

I. Функции исполнительных органов Российской Федерации, республик, входящих в ее состав, республиканских министерств и ведомств, администраций краев, областей (округов) России, г. Моск и Санкт-Петербурга в области энергосбережения приведены в Полож о системе управления энергосбережением на федеральном и региона ном уровнях.

2. Для реализации положений настоящего Закона и проведения государственной энергосберегающей политики создаются федеральны орган управления энергосбережением и региональные энергетически комиссии. Их полномочия устанавливаются нормативными актами, ут рждаемыми соответственно Правительством России, республик в ее ставе и местными органами управления.

РАЗДЕЛ VI. НАДЗОР ЗА РАЦИОНАЛЬНЫМ ИСПОЛЬЗОВАНИЕМ И ЭКОНОМНЫМ РАСХОДОВАНИЕМ ТОПЛИВА И ЭНЕРГИИ

Статья 30. Государственный энергетический надзор

I. Надзор за рациональным использованием и экономным расхо дованием топливно-энергетических ресурсов в стране, включая все виды топлива, продукты их переработки, электрическую и тепловую энергию и вторичные энергоресурсы, осуществляется созданным при Правительстве России органом - государственным энергетическим надзором, или единой службой России по энергетическому надзору.

Государственный энергетический надзор имеет своей задачей обеспечить соблюдение всеми предприятиями (объединениями), орга низациями, учреждениями и гражданами устанавливаемого порядка и правил потребления топливно-энергетических ресурсов при их прои водстве, транспортировке, переработке, преобразовании, хранении и потреблении, а также требований к их рациональному использова нию и экономному расходованию с обязательным обезвреживанием и утилизацией отходов.

2. Объекты, функции и права единой службы России по энерге тическому надзору на федеральном и региональном уровнях определ ны в Положении о государственном энергетическом надзоре, утвержденном Правительством России.

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3. Решения, принятые органами единой службы России по энергетическому надзору в рамках своих полномочий, определенных этим Положением, являются обязательными для исполнения всеми владельцами энергопроизводящего и энергоиспользующего оборудования в республиках в составе Российской Федерации, краях и областях, г. Москве и Санкт-Петербурге.

4. При органах государственного энергетического надзора действует энергетическая экспертиза, работающая по контрактной системе. В ее функции входит проведение экспертизы энергопотребления во всех сферах экономики силами специальных экспертных организаций на федеральном и региональном уровнях. Энергетическая экспертиза осуществляется экспертными подразделениями.

Статья 31. Обязательность государственной энергетической экспертизы

Проведение государственной энергетической экспертизы в части энергосбережения является обязательным в процессе инвестиционной, управленческой, хозяйственной и другой деятельности, связанной с добычей, переработкой, транспортировкой, хранением, производством и использованием топливно-энергетических ресурсов в материальном производстве и сфере услуг.

Порядок проведения энергетической экспертизы и ее объекты определяются органами управления энергосбережением на федеральном и региональном уровнях.

Представители государственной энергетической экспертизы имеют право беспрепятственного доступа на объекты, где проводится экспертиза.

Статья 32. Обязательность исполнения предписаний и заключений государственной энергетической экспертизы

Заключение государственной энергетической экспертизы после утверждения региональными энергетическими комиссиями является обязательным для исполнения на предприятиях и в организациях региона.

Отрицательное заключение энергетической экспертизы является основанием для изменения программ и проектов в соответствии с вы-

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водами экспертизы.

Положительное заключение экспертизы является основанием для удовлетворения ходатайств потребителя энергоресурсов о предоставлении ему субсидий, налоговых и финансово-кредитных льгот за счет средств фонда энергосбережения.

Реализация программ, проектов и решений по внедрению энергоемких процессов без положительного заключения энергетической экспертизы и аудиторской проверки на соответствие государственным стандартам и установленным нормативам по расходу энергоресурсов запрещается.

Решение государственной энергетической экспертизы может быть обжаловано в региональных энергетических комиссиях, в федеральной энергетической комиссии, в Арбитражном суде.

РАЗДЕЛ УП. ОТВЕТСТВЕННОСТЬ ЗА НАРУШЕНИЕ ЗАКОНОДАТЕЛЬСТВА ОБ ЭНЕРГОСБЕРЕЖЕНИИ

Статья 33. Ответственность за нарушение законодательства об энергосбережении

Нарушение законодательства России об энергосбережении влечет за собой установленную этим законом, другими законодательными актами России и республик в ее составе дисциплинарную, гражданскую, административную или уголовную ответственность.

Ответственность за нарушение законодательства об энергосбережении несут лица, виновные в :

а) невыполнении установленных требований по поддержанию и повышению технического уровня энергоиспользующего оборудования и систем энергоснабжения, обеспечивающего соответствие показателей энергопотребления установленным стандартам;

б) отказе от предоставления федеральным и региональным органам управления энергосбережением, в том числе энергетическим комиссиям, государственному энергетическому надзору, Правлению Российского внебюджетного межотраслевого фонда энергосбережения и их подразделениям современной и полной информации, а также искажении сведений учета и государственной отчетности по энергопотреблению;

в) невыполнении требований единого государственного энергетического надзора по вопросам, относящимся к его компетенции;

г) нарушении требований законодательства России при проведе

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нии энергетической экспертизы, в том числе в предоставлении неверной информации и материалов экспертизы;

д) подготовке проектов строительства новых предприятий и зданий, выполненных с нарушением стандартов энергетической эффективности;

е) финансировании, строительстве и внедрении в производство новой технологии и оборудования, выпуске продукции, не отвечающих требованиям стандартов в области потребления топливно-энергетических ресурсов и не имеющих положительного заключения государственной энергетической экспертизы;

ж) нарушении установленных требований к энергопотреблению при проектировании, строительстве, реконструкции и эксплуатации сооружений, транспортных средств и других объектов, предприятий;

з) нерациональном использовании топлива и энергии, выражающемся в систематическом превышении установленных стандартов на потребление энергоресурсов, и нарушении других существующих требований к экономному использованию топлива и энергии;

и) нарушении сроков внесения платежей за нерациональное использование топливно-энергетических ресурсов;

к) невыполнении распоряжений органов, осуществляющих государственный надзор в целях энергосбережения, а также создании препятствий для нормальной работы представителей этих органов;

л) унижении чести и достоинства работников, осуществляющих надзор за рациональным использованием топливно-энергетических ресурсов, посягательстве на их жизнь и здоровье.

Законодательстом России может быть установлена ответственность и за другие нарушения законодательства об энергосбережении.

Статья 34. Ответственность юридических и физических лиц

1. Юридические и физические лица обязаны возместить ущерб, причиненный ими в результате нарушения законодательства об энергосбережении, в порядке и размерах, установленных законодательством России, независимо от размера налагаемых санкций.

2. Применение мер дисциплинарной, административной или уголовной ответственности не освобождает виновных от возмещения ущерба, причиненного ими в результате нарушения законодательства об энергосбережении.

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3. Должностные лица и специалисты, виновные в невыполнении требований эффективного использования топливно-энергетических ре сурсов, обязанностей по поддержанию и повышению технического уро вня энергоиспользующего оборудования и систем энергоснабжения, искажении сведений учета и отчетности по энергопотреблению, несу гражданскую, административную или уголовную ответственность в со ответствии с законодательством России и входящих в ее состав республик.

4. Предприятия (объединения), учреждения, организации обязаны возместить ущерб, причиненный ими в результате нарушения за конодательства об энергосбережении.

По представлению федеральных органов управления и надзора в области энергосбережения могут накладываться экономические санкции в соответствии с действующим законодательством России о нанесении ущерба юридическим и физическим лицам.

5. Определение состава административных правонарушений и пр ступлений в области энергосбережения, порядок привлечения виновных к административной и уголовной ответственности за их соверше ние устанавливаются административным и уголовным законодательством России.

Статья 35. Ответственность государственных органов местного самоуправления

При нарушении законодательства об энергосбережении ущерб, причиненный в результате неправомерных решений, действий или без действия государственных органов местного самоуправления, возмещается ими в полном объеме предприятиям, учреждениям, организациям и гражданам за счет собственных средств.

РАЗДЕЛ УШ. ВНЕШНЕЭКОНОМИЧЕСКАЯ ДЕЯТЕЛЬНОСТЬ В ОБЛАСТИ ЭНЕРГОСБЕРЕЖЕНИЯ

Статья 36. Участие России в международном сотрудничестве в области энергосбережения

I. Россия принимает участие в международном сотрудничестве в области энергосбережения на государственном и общественном уровнях в соответствии с законодательством России и международным правом.

2. Россия осуществляет меры по развитию и укреплению международного сотрудничества в области энергосбережения с другими государствами, а также в рамках деятельности по развитию энергетики и энергосбережения ООН и организаций, входящих в ее систему, других правительственных и неправительственных международных организаций с учетом основных положений Европейской энергетической хартии.

Статья 37. Стимулирование иностранных инвесторов

Иностранным юридическим и физическим лицам, участникам совместных предприятий, осуществляющим производственную деятельность и вкладывающим свои средства на территории России для импорта и внедрения энергетически эффективных технологий, предоставляются налоговые льготы, предусмотренные данным Законом.

Статья 38. Гарантии для иностранных инвестиций в энергосбережение

Для обеспечения гарантий для иностранных инвестиций в энергосбережение до 50% их объема при наступлении форс-мажорных обстоятельств Российскому внебюджетному межотраслевому фонду энергосбережения предоставляется право создавать на акционерной основе страховой валютный фонд.

Статья 39. Обязанность иностранных юридических лиц и лиц без гражданства по соблюдению законодательства России об энергосбережении

Иностранные юридические лица и граждане, а также лица без гражданства обязаны на территории России соблюдать требования настоящего Закона, иных законодательных и нормативных актов, регулирующих отношения в области энергопотребления и энергосбережения, и несут ответственность за их нарушение в соответствии с законодательством России.

APPENDIX I

Inventory of Energy Efficiency Improvements Potential for the Former USSR

Source: Prepared for the Climate Change Division U.S. Environmental Protection Agency under a Related Services Agreement with the U.S. Department of Energy Contract DE-AC06-76RLO 1830

Table AI.1

Energy Conservation Measures in Electric Power Generation

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Total, mln tce	Energy savings in 2005 with respect to 1990	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Implementation of the program for commissioning steam-gas and gas-turbine plants	0	0	84.5					84.5
Utilization of flue gases heat from boilers at natural gas-fired cogeneration plants	72	22 / 14.8	1.7					1.7
Manufacture of energy economizing equipment	75	23.2 / 15.7	26.2					26.2
Improving efficiency of existing steam-power stations	80	24.8 / 16.8	6.3					6.3
Employing controlled electric drives in production processes	75	25.9 / 18.4	1.9		6			
Increasing the share of cogeneration blocks in centralized heat supply	110	34.1 / 23.1	10					10
Equipping large energy consumers with meters that account and monitor energy consumption in material production	110	36 / 25	0.8		1.1	2.9		

Table AI.1

Energy Conservation Measures in Electric Power Generation

Measure	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings investments, roubles per t C	specific fixed capital
Implementation of the program for commissioning steam-gas and gas-turbine plants	72.2				0.8	0.3	37.5	0.02
Utilization of flue gases heat from boilers at natural gas-fired cogeneration plants	1.4				122.4	37.3 / 25.1	0.73	168.0
Manufacture of energy economizing equipment	15.2			8.5	1965	609.1 / 412.6	14.3	137.4
Improving efficiency of existing steam-power stations	5.4				504	156.2 / 105.8	2.8	180.0
Employing controlled electric drives in production processes					142.5	49.3 / 35.1	0.8-1.4	102-178
Increasing the share of cogeneration blocks in centralized heat supply					1100	341 / 231	4.4	250
Equipping large energy consumers with meters that account and monitor energy consumption in material production					88	28.8 / 20	0.4-0.6	147-220

Table A1.1

Energy Conservation Measures in Electric Power Generation

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Total, mln tce	Energy savings in 2005 with respect to 1990	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Application of reactive power compensating apparatus	165	46.9 / 30.4	0.6		1.7			
Increasing the cross-section of conductors on newly commissioned 35-330 kV transmission lines	225	57.4 / 34.9	4.2		13.2			
Utilization of economical sources of light	240	76.3 / 52.3	0.9		2.6			
Changes in the compression ratio and number of compressor stations on gas pipe-lines			4.5					4.5
TOTAL	1152		141.6	0	24.6	2.9		133.2

14

Table AI.1

Energy Conservation Measures in Electric Power Generation

Mesaure	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Application of reactive power compensating apparatus					95.7	27.2 / 17.6	0.2-0.4	239-399
Increasing the cross-section of conductors on newly commissioned 35-330 kV transmission lines					945	241 / 146.5	1.9-3.2	295-497
Utilization of economical sources of light					206,4	65.6 / 45.0	0.4-0.6	344-516
Changes in the compression ratio and number of compressor stations on gas pipe-lines	3.9							
TOTAL	106.6	0	0	8.5	5169.8		63-33	78-82

Table A1.2

Energy Conservation Measures in Fuel/Energy Complex

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Reducing coal losses from blow-off in railway transport	0.5	0.1 / 0.1	7				7
Improving the efficiency of heating furnaces in oil refinery from 60-70% to 88-92%	36	12.7 / 9.1	1.4	-0.3			1.5
Optimizing schemes for heating oil so as to increase the heating temperature by 40-50 ^{0}C	40	14.1 / 10.1	1.1				1.1
Improvement of gas pumping units	80	25.6 / 17.6	14				14
Using controlled electric drives in industrial processes	75	25.9 / 18.4	7.6	23.6			
Using mine-extracted methane for electricity and heat production	91	29.1 / 20.0	2.5	7.8			
Equipping large energy consumers with meters that account and monitor energy resource expenditure in material production	110	36 / 25	3	3.9	4.6		
Application of reactive power compensating apparatus	165	46.9 / 30.4	2.3	7.4			
Installation of large boilers with a fluidized bed	200	61 / 41	5				5
Introduction of new technologies for the main energy-intensive processes in oil refining	190	67.1 / 48.1	7.1	2	10.4		4.7

Table AI.2

Energy Conservation Measures in Fuel/Energy Complex

Measure	Energy savings in 2005 with respect to 1990						
	Natural gas, bln m^3	fuel oil, mln tons	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Reducing coal losses from blow-off in railway transport			7	3.5	0.8 / 0.5	5.3	0.7
Improving the efficiency of heating furnaces in oil refinery from 60-70% to 88-92%		1		50.4	17.8 / 12.8	0.8	63
Optimizing schemes for heating oil so as to increase the heating temperature by 40-50 ^{0}C		0.8		44	15.5 / 11.1	0.7	63
Improvement of gas pumping units	11.9			1120	358.4 / 246.4	6.2	181
Using controlled electric drives in industrial processes				570	197.2 / 140.2	3.4-5.7	100-168
Using mine-extracted methane for electricity and heat production				227.5	72.8 / 50	1.1-1.9	120-207
Equipping large energy consumers with meters that account and monitor energy resource expenditure in material production				330	107.9 / 74.9	0.9-1.5	220-367
Application of reactive power compensating apparatus				382.8	108.7 / 70.4	1.1-1.8	213-348
Installation of large boilers with a fluidized bed			5	1000	305 / 205	3.8	263
Introduction of new technologies for the main energy-intensive processes in oil refining		3.2		1349	476.2 / 341.3	3.8-4.5	300-355

Table A1.2

Energy Conservation Measures in Fuel/Energy Complex

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Manufacture of efficient sources of light	240	76.3 52.3	3.4	10.8			
Installation of new transformer capacities with reduced no-load losses in 35-330 KV networks	310	88 57	0.7	2.3			
Boilers with utilization under pressure	250	92.5 67.5	0.8				0.8
Improving quality of designs, reducing losses in new and reconstructed district heating systems	353	130.6 95.3	35		205.9		
Installation of natural gas-fired boilers with intensive cooling of the flue gases	470	173.9 126.9	5.5				5.5
Improving the organization of work at stationary mine and shaft installations			0.1	0.3			
Increasing the volume of poen coal mining			2.7	8.4			
TOTAL	2610.5		99.2	66.2	220.9		39.6

Table AI.2

Energy Conservation Measures in Fuel/Energy Complex

Measure	Energy savings in 2005 with respect to 1990						
	Natural gas, bln m^3	fuel oil, mln tons	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Manufacture of efficient sources of light				825.6	262.5 / 180	1.5-2.6	318-550
Installation of new transformer capacities with no-load losses in 35-330 KV networks				232.5	66 / 42.8	0.3-0.6	378-775
Boilers with utilization under pressure	0.7			200	74 / 54	0.4	500
Improving quality of designs, reducing losses in new and reconstructed district heating systems				12355	4571.3 / 3335.8	15.4-26.4	468-802
Installation of natural gas-fired boilers with intensive cooling of the flue gases	4.7			2585	956.4 / 697.9	2.4	1077.1
Improving the organization of work at stationary mine and shaft installations						0.1	-
Increasing the volume of poen coal mining						1.2-2.0	-
TOTAL	17.3	5	12	21275.3	7590.5 / 5463.1	48-67	317-443

Table AI.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Increasing utilization of scrap metal in steel-making	0	0 / 0	13.2	4.1	2.8		11.5
Rolling metal without heating slabs in continuous furnaces	0	0 / 0	0.3				0.3
Improving the heat shield of enclosures at new and reconstructed industrial buildings	0	0 / 0	2.3		13.6		
Improving the heat shield of enclosures at new and reconstructed industrial buildings	0	0 / 0	4.4		25.5		
Introduction of progressive standards for thermal-physics parameters of enclosures for new and reconstructed buildings (thickness of heat insulation layer, dimensions of fenestrations, number of glazing layers)	0	0 / 0	7		41.2		
Increasing utilization of waste energy resources in ferrous metallurgy	0	0 / 0	0.7				0.7
Increasing the production of aluminium and other secondary alloys by utilizing scrap metal and waste	0	0 / 0	4.2	9.9	3.2		0.5

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles, E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Increasing utilization of scrap metal in steel-making	2.8	0.7	5.9		0.1	0 / 0	7.3-7.8	0.01
Rolling metal without heating slabs in continuous furnaces	0.3				0	0 / 0	0.1	0
Improving the heat shield of enclosures at new and reconstructed industrial buildings					0	0 / 0	1.0-1.7	0
Improving the heat shield of enclosures at new and reconstructed industrial buildings					0	0 / 0	1.9-3.3	0
Introduction of progressive standards for thermal-physics parameters of enclosures for new and reconstructed buildings (thickness of heat insulation layer, dimensions of fenestrations, number of glazing layers)					0	0 / 0	3.1-5.3	0
Increasing utilization of waste energy resources in ferrous metallurgy	0.6				0	0 / 0	0.3	0
Increasing the production of aluminium and other secondary alloys by utilizing scrap metal and waste		0.3			0	0 / 0	1.9-3.0	0

Table AI.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Increasing the share of gas-fired furnaces for heat-treating, and simultaneously reducing the share of electric furnaces	0	0 / 0	5.2	30.9			- 4.7
Reducing direct losses in heating installations for producing concrete; organization of accounting and automatized monitoring of energy consumption	0	0 / 0	0.4	0.7	0.8		
Increasing the output of cellular concrete blocks	0	0 / 0	3.7	0.6	- 1.6		3.8
Increasing the chemicalization of concrete with different kinds of chemical admixtures, in particular with superplasticizing agents	2.1	0.9 / 0.7	0.8		4.6		
Introduction of technological lubricating systems at sheet and strip mills	5	1.1 / 0.6	0.2	0.6			0.2
Introduction of installations utilizing the heat of distillory liquid in the production of soda ash	3.2	1.3 / 1.0	0.4				0.4
Intensification of clinker calcination using technogenic products	6.5	2.3 / 1.7	0.1				0.1
Introduction of autogenous smelting of copper sulphide concentrates	10	3.7 / 2.7	0.6	- 0.2	0		0.7

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Increasing the share of gas-fired furnaces for heat-treating, and simultaneously reducing the share of electric furnaces	- 4.1				0.1	0 / 0	2.2 - 5.3	0.02 - 0.05
Reducing direct losses in heating installations for producing concrete; organization of accounting and automatized monitoring of energy consumption					0	0 / 0	0.2 - 0.3	0
Increasing the output of cellular concrete bloks	2.7			0.7	0	0 / 0	1.9	0
Increasing the chemicalization of concrete with different kinds of chemical admixtures, in particular with superplasticizing agents					1.7	0.7 / 0.6	0.3 - 0.6	2.8 - 5.7
Introduction of technological lubricating systems at sheet and strip mills	0.1				1	0.2 / 0.1	0.1 - 0.2	5 - 10
Introduction of installations utilizing the heat of distillory liquid in the production of soda ash	0.3				1.3	0.5 / 0.4	0.2	6.5
Intensification of clinker calcination using technogenic products	0.1				0.6	0.2 / 0.2	0.1	6
Introduction of autogenous smelting of copper sulphide concentrates	0.6				6	2.2 / 1.6	0.3	20

Table AI.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Improvement of the technology for producing iron ore concentrates (concentration of tailings, application of automatic process control, etc.)	10	3.9 / 2.9	0.9	2.8			
Using sulphide and sulphate products, bark and timber waste as fuel	10	4 / 30	7.7		45		
Introduction of methanol production of type M-400 units having a capacity of 400 thousand tons annually	14	4.2 / 2.8	0.7	0.1	3.8		
Using the heat of the flue gases in air heaters at blast furnaces for heating the components of combustion; reconstruction of air heaters	13.5	4.3 / 3.0	1.3				1.3
Improvement of the structure of concrete aggregates, including artificially porous aggregates; using secondary resources for light-weight concretes	12	5.7 / 4.5	5.2				5.2
Improving the efficiency of electrical heat-treating furnaces in machinery	40	8.8 / 4.8	2.5	7			
Going over from combine to stationary thrashing of grain	27	10.3 / 7.6	7	4.9			

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Improvement of the technology for producing iron ore concentrates (concentration of tailings, application of automatic process control, etc.)					9	3.5 / 26	0.4 - 0.7	13 - 23
Using sulphide and sulphate products, bark and timber waste as fuel					77	31 / 23.3	3.4 - 5.8	13 - 23
Introduction of methanol production of type M-400 units having a capacity of 400 thousand tons annually					9.8	2.9 / 1.9	0.3 - 0.6	16 - 33
Using the heat of the flue gases in air heaters at blast furnaces for heating the components of combustion; reconstruction of air heaters	1.1				17.5	5.6 / 3.9	0.6	29
Improvement of the structure of concrete aggregates, including artificially porous aggregates; using secondary resources for light-weight concretes	3.1	1			62.4	29.5 / 23.3	2.5	25
Improving the efficiency of electrical heat-treating furnaces in machinery					100	22 / 12	1.0 - 1.7	59 - 100
Going over from combine to stationary thrashing of grain					189	72 / 53.1	3.9	48

Table AI.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Introduction of the membrane method for caustic soda production (installation of a production line)	35	10.3 / 6.8	0.7	0.5	3.1		
Using secondary material resources and waste from other industries as the raw material component in calcinating clinker and as the admixture in producing cement and ceramic bricks	50	11 / 6	3.6				3.6
Organizing hot metal setting in a heating furnace	30	11.6 / 8.6	1.2				1.2
Producing high- and extra-high-strength reinforcements that reduce the specific expenditure of steel in making reinforced concrete from 64.8 kg/m^3 by the year 2005	25	11.8 / 9.3	3.2	2.6	0.7		2.2
Improvement of the technology for making prefabricated reinforced concrete constructions and elements	25	11.8 / 9.3	7.7	-6.7	57.9		
Using lighter-weight machines and tractors	35	13.6 / 10.1	7	4.9			

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Introduction of the membrane method for caustic soda production (installation of a production line)					24.5	7.2 / 4.8	0.3-0.5	49-82
Using secondary material resources and waste from other industries as the raw material component in calcinating clinker and as the admixture in producing cement and ceramic bricks	3.1				180	39.6 / 21.6	1.6	113
Organizing hot metal setting in a heating furnace	1.1				36	13.9 / 10.3	0.6	60
Producing high- and extra-high-strength reinforcements that reduce the specific expenditure of steel in making reinforced concrete from 64.8 kg/m^3 by the year 2005	1	0.1	0.8		80	37.8 / 29.8	1.6-1.9	42-50
Improvement of the technology for making prefabricated reinforced concrete constructions and elements					192.5	91.1 / 71.8	3.4-5.8	33-57
Using lighter-weight machines and tractors					245	95.5 / 71.0	3.9	63

Table A1.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Production of less energy intensive and high-strength cements reducing their specific expenditure in making concrete from 315.8 kg/m^3 in 1990 to 303.2 kg/m^3 by the year 2005	38.4	13.8 / 10.0	1.2	0.9	0.2		0.8
Improving the heat shield characteristics of premises for live stock	52	13.9 / 8.7	5.6		2.7		5.1
Improvement of the technology of melting in blast furnaces	50	16 / 11.1	3.6				3.6
Additional applications for waste energy resources in ferrous metallurgy	54	16.5 / 11.1	3.7		20.4		
Additional applications of gas-utilizing compressorless turbines using the surplus pressure of blast furnace gas	52	16.6 / 11.4	0.8	2.5			
Improvement of heat-treatment furnaces in ferrous metallurgy	50	20.4 / 15.4	4.4	3.3			3
Improving the technical level and efficiency of energy	71.7	21.9 / 14.7	4				4

Table A1.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Production of less energy intensive and high-strength cements reducing their specific expenditure in making concrete from 315.8 kg/m^3 in 1990 to 303.2 kg/m^3 by the year 2005	0.6	0.2			46.1	16.6 / 12.0	0.6-0.7	66-77
Improving the heat shield characteristics of premises for live stock	2.3	0.2		2.2	291.2	77.8 / 48.6	3.2-3.3	88-91
Improvement of the technology of melting in blast furnaces	-3.2	0.1	7.6		180	57.8 / 39.8	4.1	44
Additional applications for waste energy resources in ferrous metallurgy					199.8	60.9 / 41.0	1.5-2.6	77-133
Additional applications of gas-utilizing compressorless turbines using the surplus pressure of blast furnace gas					41.6	13.3 / 9.2	0.4-0.6	69-104
Improvement of heat-treatment furnaces in ferrous metallurgy	2.6				220	89.8 / 67.8	1.8-2.1	105-122
Improving the technical level and efficiency of energy	2.7	0.3		0.5	286.8	87.5 / 58.8	2.0	143

Table AI.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Improvement of energy supply and energy utilization in ferrous metallurgy plants with complete and complex use of waste energy resources	80	23.2 / 15.2	7	8.4			4.3
Improvement of the technology of sintering (increasing the area of sintering, using highpressure blowers, using the heat from cooling the sinter cake, partial substitution of coke by coal)	75	24 / 16.5	0.6				0.6
Application of controlled electric drives in production processes	75	25.9 / 18.4	21.0	65.2			
Modernizing heating schemes for bauxite pressure-leaching batteries and desiliconization batteries in processing nephol	100	31.1 / 21.1	1.2		7.3		
Additional utilization of heat in waste gases in chemistry	80	32.2 / 24.2	0.2				0.2
Organization of the centralized manufacture and complete supply of furnaces for heating and thermal treatment	80	32.6 / 24.6	11.4				11.4

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Improvement of energy supply and energy utilization in ferrous metallurgy plants with complete and complex use of waste energy resources	3.7				560	162.4 / 106.4	3.1-3.9	144-181
Improvement of the technology of sintering (increasing the area of sintering, using highpressure blowers, using the heat from cooling the sinter cake, partial substitution of coke by coal)	0.5				45	14.4 / 9.9	0.3	150
Application of controlled electric drives in production processes					1579.5	544 / 387.5	9.3-15.6	101-169
Modernizing heating schemes for bauxite pressure-leaching batteries and desiliconization batteries in processing nephol					120	37.3 / 25.3	0.5-0.9	133-240
Additional utilization of heat in waste gases in chemistry	0.2				16	6.4 / 4.8	0.1	160
Organization of the centralized manufacture and complete supply of furnaces for heating and thermal treatment	9.1	0.5			912	372.1 / 280.9	5.2	175

Table AI.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Improvement of the technology and equipment for electrical steel melting	98.2	34.9 / 25.0	1.2	3.7			
Equipping large energy consumers with meters that account and monitor energy resource expenditures in material production	110	36 / 25	6.2	15.3	14.3		
Using non-traditional renewable sources of energy with autonomous and decentralized consumers	143.5	43.8 / 29.4	4.8				4.8
Application of reactive power compensating apparatus	165	46.9 / 30.4	3.3	10.3			
Improvement of technologies for producing ferrous alloys	123	49 / 36.7	0.3	0.9			
Application of reactive power compensating apparatus	165	46.9 / 30.4	3.3	10.3			
Improvement of technologies for producing ferrous alloys	123	49 / 36.7	0.3	0.9			
Improvement of furnaces for the production of rolled stock, piping and refractories	140	54 / 40	1.5	0.5			1.3
Installation of boilers for burning electrolytic hydrogen in the production of caustic soda	87.5	60.3 / 51.5	0.2				0.2

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Improvement of the technology and equipment for electrical steel melting					117.8	41.8 / 424	0.5-0.9	131-236
Equipping large energy consumers with meters that account and monitor energy resource expenditures in material production					682	223 / 154.8	3.2-5.5	124-213
Using non-traditional renewable sources of energy with autonomous and decentralized consumers	0.4	2.1		1.4	688.8	210.1 / 141.2	3.0	230
Application of reactive power compensating apparatus					546	155 / 100.5	1.5-2.5	218-364
Improvement of technologies for producing ferrous alloys					36.9	14.7 / 11.0	0.1-0.2	185-369
Improvement of furnaces for the production of rolled stock, piping and refractories	1.1				210	81.1 / 60.1	0.6-0.7	300-350
Installation of boilers for burning electrolytic hydrogen in the production of caustic soda	0.2				17.5	12.1 / 10.3	0.1	175

Table A1.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Production of butadiene by oxidizing dehydrogenation of butanes	218	65 / 43.2	1.2	0.5	2.7		0.6
Application of advanced equipment in the production of ethylene	220	65.6 / 43.6	5	1.3	2.9		4
Introduction of coneless filling apparatus and mobile plates of the furnace top for regulating gas flow in blast furnaces	220	70.6 / 48.6	0.9				0.9
Making bricks in automatic production lines by rigid forming with utilization of coal enrichment waste	154	72.8 / 57.4	0.8				0.8
Utilization of efficient sources of light	240	76.3 / 52.3	9.4	29.4			
Modernization of heating schemes for roasting machines in the production of pellets; technical reequipment of pelletizing factories; introduction of automatic control systems	200	82.8 / 62.8	0.6	0.5			0.4
Growth of clinker production by a dry technology	240	86.4 / 62.4	5.5	-3.5			6.6
Introduction of new automatized electrolyzers with burnt anodes for 175 and 225 kA	180	89.1 / 71.1	1.5	4.8			

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Production of butadiene by oxidizing dehydrogenation of butanes	0.5				261.6	78 / 51.8	0.5-0.7	374-523
Application of advanced equipment in the production of ethylene	3.4				1100	327.8 / 217.8	2.2-2.5	440-500
Introduction of coneless filling apparatus and mobile plates of the furnace top for regulating gas flow in blast furnaces			0.9		198	63.6 / 43.8	0.7	283
Making bricks in automatic production lines by rigid forming with utilization of coal enrichment waste	0.4			0.4	123.2	58.3 / 46	0.5	246
Utilization of efficient sources of light					2250	718 / 491.8	4.2-7.1	317-536
Modernization of heating schemes for roasting machines in the production of pellets; technical reequipment of pelletizing factories; introduction of automatic control systems	0.4				120	49.7 / 37.7	0.3	400
Growth of clinker production by a dry technology	4.5	0.7		1.4	1320	475.2 / 343.2	3.1-3.5	377-426
Introduction of new automatized electrolyzers with burnt anodes for 175 and 225 kA					270	133.6 / 106.6	0.7-1.2	225-386

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Table AI.3

Energy conservation measures in industry

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Making brick with 50% hollowness in production lines for 75 mln equivalent bricks annually	236.5	94.4 / 70.7	3.8				3.8
Introduction of large units for producing ammonia, type AM-85 and AM-90 with an annual capacity of 500 thousand tons	500	149 / 99	4.5	9	9.1		
Improvement of the structure of the stock of machinery equipment (more press-forging and special equipment, grinding and buffing machines)	500	171 / 121	2.8	8.7			
Saving metal by improving technological processes in machine building			9.3	14.3	2.6		4.3
Development and introduction of technologies for bleaching sulphate cellulose using oxidizing additives			0.2	0	0.5		
Increasing the output of thermomechanical (TM) and chemical thermomechanical (CTM) puep in paper production			0.1	0.3			
Savings of timber and increasing the use of waste paper, TM and CTM			1.2	0.6			0.4

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Making brick with 50% hollowness in production lines for 75 mln equivalent bricks annually	1.9	0.42		1.0	898.7	358.6 / 268.7	1.0	899
Introduction of large units for producing ammonia, type AM-85 and AM-90 with an annual capacity of 500 thousand tons					2250	670.5 / 445.5	2.0-3.3	682-1125
Improvement of the structure of the stock of machinery equipment (more press-forging and special equipment, grinding and buffing machines)					1400	478.8 / 338.8	1.2-2.1	667-1167
Saving metal by improving technological processes in machine building	3.5	0.1					4.1-5.7	0
Development and introduction of technologies for bleaching sulphate cellulose using oxidizing additives								
Increasing the output of thermomechanical (TM) and chemical thermomechanical (CTM) puep in paper production							0.04-0.07	0
Savings of timber and increasing the use of waste paper, TM and CTM	0.1	0.1					0.6	0

Table AI.3

Energy conservation measures in industry

			Energy savings in 2005 with respect to 1990				
Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, roubles per tce, E=0.5 E=0.12	Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Motor fuel, mln tons	Boiler/ furnace fuel, mln tons
Savings due to the production of thinner paper			0.2		1.2		
Greater application of continuous casting of steel			6	8.7	1.4		4.1
Improvement of steelmaking processes structure			4.7	-10.3	2.3		7.6
TOTAL	6242.1		232	227.3	267		99.8

Table AI.3

Energy conservation measures in industry

Measure	Energy savings in 2005 with respect to 1990							
	Natural gas, bln m^3	fuel oil, mln tons	coke, mln tce	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Savings due to the production of thinner paper								
Greater application of continuous casting of steel	2.1	0.2	0.2				2.8-3.7	0
Improvement of steelmaking processes structure	4.4	1.8	-0.1				1.5-2.4	0
TOTAL	54.2	8.4	15.3	6.6	18223.6		111-150	121-164

Table AI.4

Energy Conservation Measures in Commercial and Residential Sector

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, rou-bles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Boiler/ furnace fuel, mln tons
Using panels with improved heat shield properties in new construction of apartment and public buildings	-38.9	-20.2 / -5.4	5.5		32.4	
Using heat shields for outside walls	-20	-10.6 / -3	0.9		5.2	
Improving insulation of the pipe lines in district heating systems	21	11.5 / 3.5	17.4		102	
Improvement of window and door balcony blocks in apartment houses and public buildings (more glass panes in casements, individual casements, selective glass panes, glazed loggia)	28	15.3 / 4.7	3.5		20.4	
Transfer of heat generators and boilers on burning quality fuel (gas, high-grade coals, briquettes) instead of low-grade fuel	45	26 / 8.7	14.8			14.8
Introduction of accumulator heating systems in private houses	26	14.9 / 5	0.4	1.3		
Using newest designs for electric ranges	60	34.4 / 11.6	1.9	5.9		
Automation at central and individual heating places	35	25.2 / 11.9	6.6		38.8	

Table AI.4

Energy Conservation Measures in Commercial and Residential Sector

Measure	Energy savings in 2005 with respect to 1990						
	Natural gas, bln m^3	fuel oil, mln tons	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Using panels with improved heat shield properties in new construction of apartment and public buildings				-213.9	-111.3 / -30	2.4-4.1	-89-52
Using heat shields for outside walls				-18	-9.6 / -2.7	0.4-0.7	-4.5-26
Improving insulation of the pipe lines in district heating systems				365.4	200.2 / 61.4	7.7-13.1	29-47
Improvement of window and door balcony blocks in apartment houses and public buildings (more glass panes in casements, individual casements, selective glass panes, glazed loggia)				98	53.6 / 16.4	1.5-2.6	38-65
Transfer of heat generators and boilers on burning quality fuel (gas, high-grade coals, briquettes) instead of low-grade fuel			14.8	295	382.2 / 128.7	11.1	27
Introduction of accumulator heating systems in private houses				10.4	6 / 2	0.2-0.3	35-52
Using newest designs for electric ranges				114	65.3 / 22	0.8-1.4	81-143
Automation at central and individual heating places				231	166.3 / 78.5	2.9-5.0	46-119

Table AI.4

Energy Conservation Measures in Commercial and Residential Sector

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, rou-bles per tce, E=0.5 / E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Boiler/ furnace fuel, mln tons
Decommissioning of inefficient boilers (having capacities up to 20 GCal/hour) and concentration of heat production at large boilers	65	37.2 / 12.5	7.5	5.4		7.5
Using new designs of refrigerators and freezers	70	40.1 / 13.5	3.7	11.7		
Using biogas from sewage and household garbage in public utilities	90	48.7 / 14.5	1.5	1.3	1.5	
Application of adjustible electric drives in production processes	75	46.9 / 18.4	1.9	5.9		
Application of accumulating electric water heaters with heat pumps	135	77.4 / 26.1	1	3.1		
Production and installation of automatized and mechanized boilers	132	77.2 / 27.1	25	15		25
Introduction of effective heat generators	200	114.6 / 38.6	4.6			4.6
Application of adjustible drives in household electrical appliances	170	106.4 / 41.8	5.8	18		
Utilization of economical sources of light	240	143.5 / 52.3	21.6	67.5		

Table AI.4

Energy Conservation Measures in Commercial and Residential Sector

Measure	Energy savings in 2005 with respect to 1990						
	Natural gas, bln m_3	fuel oil, mln tons	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Decommissioning of inefficient boilers (having capacities up to 20 GCal/hour) and concentration of heat production at large boilers	5.4		1.2	487.5	279.3 / 94.1	3.7	132
Using new designs of refrigerators and freezers				259	148.4 / 50	1.7-2.8	93-152
Using biogas from sewage and household garbage in public utilities	1.3			135	73 / 21.7	0.7	193
Application of adjustible electric drives in production processes				142.5	89.2 / 35.1	0.8-1.4	102-178
Application of accumulating electric water heaters with heat pumps				135	77.4 / 26.1	0.4-0.7	193-338
Production and installation of automatized and mechanized boilers	15	1	6.2	3300	1930.5 / 676.5	13.3	248
Introduction of effective heat generators			4.6	920	527.2 / 177.6		
Application of adjustible drives in household electrical appliances				986	617.2 / 242.6	2.6-4.3	229-379
Utilization of economical sources of light				5184	3100 / 1130.1	9.6-16.2	320-540

Table A1.4

Energy Conservation Measures in Commercial and Residential Sector

Measure	Specific fixed capital investments, roubles per tce	Specific levelized costs, rou-bles per tce, E=0.5 E=0.12	Energy savings in 2005 with respect to 1990: Total, mln tce	Electricity, bln kWH	Heat, mln Gcal	Boiler/ furnace fuel, mln tons
Improving heat shields at existing apartment bredings (cement-sand stucco 2 cm thick for outdoors; cement-perlite plaster 3 cm thick for indoors; stucco outdoors; foam plastics indoors)	578	306.9 87.3	0.5		2.9	
Savings of gas by using electric ranges						
Using new generation of TV sets and video tape recorders			2.2		6.9	
TOTAL	2015		126.3	53.4	120.3	201.7

Table AI.4

Energy Conservation Measures in Commercial and Residential Sector

Measure	Energy savings in 2005 with respect to 1990						
	Natural gas, bln m^3	fuel oil, mln tons	coal, mln tce	capital investments, mln roubles	levelized costs, mln roubles E=0.5 / E=0.12	carbon savings	specific fixed capital investments, roubles per t C
Improving heat shields at existing apartment bredings (cement-sand stucco 2 cm thick for outdoors; cement-perlite plaster 3 cm thick for indoors; stucco outdoors; foam plastics indoors)				289	153.5 / 43.6	0.2-0.4	722-1445
Savings of gas by using electric ranges							
Using new generation of TV sets and video tape recorders						1.0-1.7	0
TOTAL	21.7	1	22.4	13091.9		58-84	156-226

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APPENDIX II

Inventory of Energy Efficiency Improvements Potential for Russia

Source: V.P. Chupyatov Editor. Background Materials for Energy Conservation Program in Russia. June 1992, Produced by ENECO under contract with CENEf. p.1-87

* a/b - capital specific costs/discounted specific costs
** x-y - minimum-maximum values

Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)*	Electricity bln kWh **	Boiler and furnace fuel, mln tce **	Gas, bln m^3 **	Coal, mln tce **	Potential 1990, mln tce **	Possible savings in 1997, mln tce **	Possible savings in 2000, mln tce **
Coal industry								
Utilization of recovered coalbed methane in electricity and heat production	2275 / 500	8.0 - 10.0				2.6 - 3.3		0.5 - 1.0
SUBTOTAL:	2275 / 500	8.0 - 10.0				2.6 - 3.3		0.5 - 1.0
Gas transportation								
Improving efficiency of gas pumping units	2000 / 400		5.8 - 6.9	5.0-6.0		5.8 - 6.9	2.0 - 2.5	4.0 - 5.0
Changes in the compression ratio and number of compression stations on gas pipe-lines			2.6 - 2.1	2.3-1.8		2.6 - 2.1		
Improving technologies for gas transportation			1.4 - 1.6	1.2-1.4		1.4 - 1.6		
SUBTOTAL:	2000 / 400		9.8 - 10.6	8.5-9.2		9.8 - 10.6	2.0 - 2.5	4.0 - 5.0
Coal transportation								
Reducing coal losses from blow-off in railway transport	13 / 3		7.0 - 8.0		7.0 - 8.0	7.0 - 8.0	2.5 - 3.0	5.0 - 6.0
SUBTOTAL:	13 / 3		7.0 - 8.0		7.0 - 8.0	7.0 - 8.0	2.5 - 3.0	5.0 - 6.0
Electricity transportation								
Installation of new transformer capacities with reduced no-load losses in 35-350 kV networks	7750 / 1425	4.5 - 5.0				1.5 - 1.6		0.5 - 0.6
Reactive compensation	4125 / 760	15.0-18.0				4.9 - 5.9	0.5 - 0.5	1.5 - 1.7
Increasing the cross-section of conductors on newly commissioned 35-330 kV transmission lines	5625 / 873	10.7-13.0				3.5 - 4.2		0.5 - 0.7
SUBTOTAL:	17500/3058	30.2-36.0				9.9 - 11.7	0.5 - 0.5	2.5 - 3.0

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Heat transportation										
Improving quality of designs, reducing losses in district heating systems	8825/2383		150.0-170.0					25.5-28.9	8.0-10.0	12.0-15.0
SUBTOTAL:	8825/2383		150.0-170.0					25.5-28.9	8.0-10.0	12.0-15.0
Electricity and heat energy										
Commissioning efficient steam-turbine equipment	1875/395			11.8-13.8	5.0-6.0	1.4-1.7	4.0-4.5	11.8-13.8	3.0-4.0	7.0-9.0
Improving cost-effectiveness of district heating in place	2000/420			4.6-5.6	2.1-2.6	0.5-0.6	1.5-1.8	4.6-5.6	1.0-1.2	1.5-3.0
Implementation of the program for commissioning steam-gas and gas-turbine plants with more efficient electricity production				57.8-68.7	25.0-30.0	7.0-8.5	19.0-22.0	57.8-68.7	6.0-8.0	15.0-17.0
Commissioning of large boiler-stations equipped by boilers with a fluidized bed	5000/1025			5.9-8.0	2.5-3.5	0.7-0.9	2.0-2.7	5.9-8.0		1.5-2.0
SUBTOTAL:	8875/1840			80.1-96.1	34.6-42.1	9.6-11.7	26.5-31.0	80.1-96.1	10.0-13.2	25.0-31.0

Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Oil refining										
Increasing the efficiency of heating furnaces in oil refinery from 60-70% to 88-92%	900/228	-0.8 - -1.0		4.6-4.9		3.2-3.4		4.3-4.6		1.5-2.0
Introduction of new technologies for the main energy-intensive processes in oil refining	4750/1203	0.8-0.9	9.0-10.5	2.1-2.4		1.5-1.7		3.9-4.5		0.5-0.6
SUBTOTAL:	5650/1431	- -0.1	9.0-10.5	6.7-7.3		4.7-5.1		8.2-9.1		2.0-2.6
Residential and Commercial Sector										
Production and installation of automatized and mechanized boilers	3300/678			17.8-20.1	8.5-9.5	0.6-0.8	7.2-8.0	17.8-20.1	5.0-7.0	8.0-11.0
Utilization of efficient sources of light (for all consumers)	6000/1308	35.0-42.0						11.4-13.7	2.0-3.0	5.0-7.0

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Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Using panels with improved heat shield properties and panels of cellular concrete in new construction of apartment and public buildings			25.0-35.0				4.3-6.0	1.5-2.0	3.0-4.0
Improvement of window and door balcony blocks in apartment houses and public buildings (more glass panes in casements, selective glass panes, glazed loggia)	700 / 118		23.0-26.0				3.9-4.4	1.5-1.8	2.0-2.5
Improving heat shields at existing apartment bredings	14450/2183		8.0-10.0				1.4-1.7	0.4-0.5	0.8-1.0
Using stationary electric cookers of the newest design	1500/290	8.0-9.0					2.6-2.9	0.4-0.5	1.0-1.5
Using new designs of refrigerators and freezers	1750/338	9.0-11.0					2.9-3.6	0.5-0.6	1.5-1.8
Using new generation of TV sets and video tape recorders		6.0-7.0					2.0-2.3	0.6-0.9	1.3-1.5
Improving quality and increasing variety of sanitary and technical armatura for efficient hot and cold water utilization	1625/313	30.0-35.0	35.0-40.0	2.3		2.3	18.0-18.2	4.0-6.0	8.0-10.0

Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Transfer of heat generators and boilers on quality fuel combustion (gas, high-grade coal, briquettes) instead of low-grade fuels	5000/965			12.0-15.0			12.0-15.0	12.0-15.0	3.0-4.0	5.0-7.0
Automation at central and individual heating places	875/298		30.0-32.0					5.1-5.4	0.4-0.6	0.5-1.0
Using biogas from sewage and household garbage in public utilties	2250/363			2.0-2.0	1.7-1.7			2.0-2.0		0.2-0.3
SUBTOTAL:	37450/6854	88.0-104.0	121.0-143.0	34.1-37.1	10.2-10.2	0.6-0.8	21.5-23.0	83.4-95.3	19.3-26.9	36.3-48.6
Agriculture			**Motor fuel, mln tons**							
Reducing losses by speed-up harvesting, improving technologies for harvesting including going over from combine to stationary thrashing of grain and developing new technologies			14.0-17.0					20.6-25.0	7.0-8.0	12.0-15.0
Using lighter-weight machines and tractors	875 / 255		3.5-4.0					5.1-5.9	0.8-1.2	2.0-2.5

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Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Motor fuel, mln tons	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Improving the heat shield characteristics of premises for livestock	1300 / 218			1.5-2.0	0.5-0.6	0.3-0.4	0.5-0.7	1.5-2.0		0.5-1.0
Application of agricultural techonologies improving harvests and production in livestock breeding			14.0-17.0					20.6-25.0	5.0-6.0	8.0-10.0
Using non-traditional renewable sources of energy with autonomous and decentralized consumers	3588 / 735			6.2-6.2	0.9-0.9	2.9-2.9	1.0-1.0	6.2-6.2	0.3-0.5	1.0-2.0
SUBTOTAL:	5763 / 1208		31.5-38.0	7.7-8.2	1.4-1.5	3.2-3.3	1.5-1.7	54.0-64.1	13.1-15.7	23.5-30.5
Transport										
Going over from obsolete types of aircrafts to more efficient ones			1.7-2.4					2.5-3.5	0.8-0.9	1.5-1.7
Improving trucks and buses population structure to provide more rational passenger and cargo transportation			7.6-9.0					11.2-13.2	1.0-1.5	3.0-5.0

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Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Motor fuel, mln tons	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Improvement of fuel efficiency for motor vehicles			9.7-11.0					14.3-16.2	1.5-2.0	4.0-5.0
Improving fuel efficiency for railroad transport		0.3-0.4	1.9-2.1					2.9-3.2	0.3-0.4	0.8-1.0
Increasing the share of diesel cars in car population structure			1.7-2.0					2.5-2.9	0.2-0.4	0.5-1.0
Construction and reconstruction of roads and highways			2.8-3.1					4.1-4.6	0.6-0.9	1.0-1.5
Electrification of railroads			0.7-1.0					1.0-1.5		0.2-0.3
Improving the quality of railroads (increasing the share of non-juncture railroads, removing rotten wooden ties and old rails, increasing the railroad capacity			1.4-1.7					2.1-2.5		0.2-0.4
Improving the structure of plane population by way of supplying more efficient wide-bodied planes of IL-86, A-300, Boing-747 type			1.2-1.4					1.8-2.1	0.5-0.6	0.8-1.0
SUBTOTAL:		0.3-0.4	28.7-33.7					42.4-49.7	4.9-6.7	12.0-16.9

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
General measures for industries	2750 / 625	14.0-18.0	45.0-60.0	3.5-4.6	3.0-4.0			15.7-20.7	4.0-5.0	7.0-9.0
Demand-side control in material production	1875 / 463	100.0-120.0						32.5-39.0	3.0-4.0	6.0-8.0
Improving thermal insulation of envelope of new and reconstructed inductrial building			25.0-35.0					4.3-6.0	0.5-0.5	1.5-2.0
Improving building materials (range of rolled products, increasing plastics production, etc.)		28.0-36.0	5.0-6.0	8.9-10.4	7.0-9.0	0.6-0.7		18.9-23.1	4.0-5.0	8.0-11.0
SUBTOTAL:	4625 / 1088	142.0-174.0	75.0-101.0	12.4-15.0	10.0-13.0	0.6-0.7		71.4-88.8	11.5-14.5	22.5-30.0
Ferrous metallurgy										
Improving energy supply and energy consumption of ferrous metallurgy plants with full and complex utilization of waste energy	2000 / 380	16.0-19.0	4.0-5.0	4.8-5.8	4.2-5.0			10.7-12.8	0.5-1.0	1.5-2.0
Greater application of continuous casting of steel		2.5-3.0		0.7-0.9	0.6-0.8			1.5-1.9		0.8-1.0

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Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Improving the structure of steel-melting industry		-7.0 - -9.0	0.8-0.9	5.2-6.0	3.0-3.5	1.2-1.4		3.1-3.2	0.5-1.0	1.5-2.0
Increasing utilization of scrap metal in steel-melting		2.4-3.0	0.3-0.4	8.1-9.2	1.8-2.2	0.4-0.5	5.5-6.0	8.9-10.2	2.0-3.0	3.0-4.0
Improving furnaces for production of rolled stock, pipe-line and refractories, and heat-treatment furnaces in ferrous metallurgy	3500 / 1000	2.4-2.9		2.2-2.5	1.9-2.2			3.0-3.4	0.5-0.7	1.0-1.2
Measures in rolling industry (organization of hot metal feed in heat-treating furnaces, direct rolling, technological lubrication, etc.)	750 / 215	0.2-0.3		0.7-0.9	0.6-0.8			0.8-1.0		0.2-0.3
Improving technology and equipment for iron ore concentrates, pellets and sinter production	250 / 73	1.4-1.7		0.8-0.9	0.7-0.8			1.3-1.5		0.4-0.6
Improving technologies for melting in blast furnaces, utilization of flue gases of space-heaters	1250 / 278			3.8-4.2	-0.7- -0.8	0.1-0.1	4.5-5.0	3.8-4.2	0.7-1.0	1.5-2.0

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Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Improvement of the technology and equipment for electrical steel melting and ferrous alloys production	2455 / 625	2.5-3.0						0.8-1.0		0.3-0.4
SUBTOTAL:	10205/2571	20.4-23.9	5.1-6.3	26.3-30.4	12.1-14.5	1.7-2.0	10.0-11.0	33.9-39.2	4.2-6.7	10.2-13.5
Non-ferrous metallurgy										
Increasing production of aluminium and other made of secondary raw material alloys by utilizing scrap metal and waste		8.0-10.0	3.0-3.5	0.3-0.3		0.2-0.2		3.4-3.8	1.0-1.5	2.0-2.5
Introduction of new automatized electrolyzers with burnt anodes for 175 and 225 kA	4500/1778	2.0-2.2						0.7-0.7		0.3-0.4
Modernizing heating schemes for bauxite pressure-leaching batteries and desiliconization batteries in processing nephelits	2500/528		4.0-4.5					0.7-0.8		0.3-0.4
SUBTOTAL:	7000/2306	10.0-12.2	7.0-8.0	0.3-0.3		0.2-0.2		4.8-5.3	1.0-1.5	2.6-3.3

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Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Machine-building										
Organization of the centralized manufacture and complete supply of furnaces for heating and thermal treatment in machine-building industry	2000/615			5.5-7.1	4.2-5.4	0.5-0.6		5.5-7.1	2.0-2.5	3.0-3.5
Increasing the efficiency of electrical heat-treating furnaces in machinery	1000/120	4.5-6.0						1.5-2.0	0.4-0.6	0.7-1.0
Increasing the share of gas-fired furnaces for heat-treating and simultaneously reducing the share of electric furnaces		40.0-45.0		-9.2- -10.4	-8.0- -9.0			3.8-4.2	0.5-0.7	1.7-2.0
Improving the structure of the fleet of machinining equipment for more press-forging and special equipment, grinding and buffing machines	12500/3025	9.0-10.5						2.9-3.4	0.6-0.8	1.5-2.0
SUBTOTAL:	15500/3760	53.5-61.5		-3.7- -3.3	-3.8- -3.6	0.5-0.6		13.7- 16.7	3.5-4.6	6.9-8.5

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Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Building materials industry										
Growth of clinker production by a dry technology	6000/1560	-7.0--8.0		6.3-7.2	4.0-4.5	0.6-0.7	0.8-1.0	4.0-4.6	0.8-1.0	1.5-2.0
Making brick with 50% hollowness in utilities lines for 75 mln equivalent bricks annually; recycling coal refinery waste	5913/1768			3.7-4.6	2.0-2.5	0.4-0.5	0.8-1.0	3.7-4.6	0.6-0.9	1.0-1.2
Using secondary material resources and waste from other industries as the raw material component in calcinating clinker and as an admixture in producing cement and ceramic bricks	1250/150			1.7-2.0	1.5-1.7			1.7-2.0	0.8-1.0	1.2-1.5
Producing high- and extra-high-strength reinforcements that reduce the specific expenditure of steel in making reinforced concrete from 64.8 kg/m^3 in 1990 to 61.4 kg/m^3 by the year 2005	625/233	1.0-1.2	0.3-0.4	0.9-1.1	0.4-0.5		0.4-0.5	1.3-1.6		0.2-0.4

Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Enlarging utilization of porous aggregates and secondary resources for light-weight concretes	300 / 113			3.3-3.7	2.0-2.2	0.7-0.8		3.3-3.7	1.5-1.8	2.0-2.5
Improvement of the technology for production of prefabricated reinforced concrete constructions and elements and adding different chemical admixtures in concrete	625 / 233	-2.5- -3.0	40.0- 45.0					6.0-6.7	1.5-2.0	2.5-3.0
SUBTOTAL:	14713/4057	-8.5- -9.8	40.3- 45.4	15.9- 18.6	9.9- 11.4	1.7-2.0	2.0- 2.5	20.0- 23.2	5.2-6.7	8.4-10.6
Chemistry and Oil Chemistry										
Application of advanced equipment in the production of ethylene and butadiene	5500/1090	1.0-1.2	4.5-5.6	2.5-3.2	2.2-2.8			3.6-4.5	1.0-1.5	2.5-3.0
Introduction of large units for production of ammonia, type AM-85 and AM-90 with an annual capacity of 500 thousand tons	12500/2475	3.5-3.8	3.5-4.0	2.5-2.8	2.2-2.4			4.2-4.7	1.0-1.5	2.0-2.5

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Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Motor fuel, mln tons	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
Introduction in methanol synthesis of aggregates, type M-400 with an annual capacity of 400 thousands tons	350 / 70	-0.5- -0.6	4.0- 5.0	0.5-0.6	0.4-0.5			1.0-1.3	0.2-0.3	0.5-0.7
SUBTOTAL:	18350/3635	4.0-4.4	12.0- 14.6	5.5-6.6	4.8-5.7			8.8-10.5	2.2-3.3	5.0-6.2
Timber and paper industry										
Using sulphite and sulphate products, bark and timber waste as fuel	250 / 75		35.0- 40.0					6.0-6.8	2.0-2.5	3.0-4.0
Savings of timber by increasing the use of waste paper, thermomechanical and thermomechanicochemical products				0.8-1.8	0.3-0.7	0.3-0.7	0.9- 1.0	2.1-3.3	0.3-0.4	0.5-0.7
SUBTOTAL:	250 / 75		35.0- 40.0	0.8-1.8	0.3-0.7	0.3-0.7	0.9- 1.0	8.1-10.1	2.3-2.9	3.5-4.7

Table AII.

Potential Energy Savings in Russia Industries

Measure	Specific costs, ruble/tce (prices of 1992)	Electricity bln kWh	Heat, mln GCal	Motor fuel, mln tons	Boiler and furnace fuel, mln tce	Gas, bln m^3	Residual oil	Coal, mln tce	Potential 1990, mln tce	Possible savings in 1997, mln tce	Possible savings in 2000, mln tce
TOTAL	158994/ 35209	347.9-416.5	454.4-538.8	61.1-72.7	202.9-234.4	88.0-104.0	23.1-26.2	68.5-77.2	483.6-568.6	90.2-118.7	181.9-236.4

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APPENDIX III.

INNOVATION INVESTMENT PROGRAM

"ENERGY CONSERVATION IN RUSSIA"
(Strategy and Priorities)

Decrees of the Russian Federation Government No. 318 of May 18,1992, No. 371 of June 1,1992. Order of the Russian Federation Government No. 5695 of May 21, 1992.

Ministry of Fuel and Energy
of the Russian Federation

Ministry of Science And Technical Policy
of the Russian Federation

Ministry of Economics
of the Russian Federation

Engineering Academy
of the Russian Federation

PASSPORT OF THE PROGRAM "ENERGY CONSERVATION IN RUSSIA"
(prices of April 1, 1993)

1. Period of the Program implementation: 1993-2000.
   First stage: 1993-1995.
   Implementation period of the Top Priority Projects: 1993-1995-1997.

2. 1995-prospective energy savings (as compared to those of 1990): 30-40 M tons of coal equivalent.
   2000-prospective energy savings (as compared to those of 1990): 200-220 M tons of coal equivalent.

3. Innovation part of the Program.
   - Cost: 20 M rubles.
   - Development period: January-June, 1993.
   - Financing:
   - Budget: 12 M rubles.
   - Scientific-Research And Design Fund of the Russian Federation Ministry of Fuel and Energy: 6 M rubles.
   - Scientific-Research And Design Fund of the Russian Federation Ministry of Science and Technical Policy: 2 M rubles.

4. Investment part of the Program.
   - Implementation period: 1993-2000.
   - Financing:
   - Total: 1300 B rubles.
   - First stage (1993-1995): 365-370 B rubles, including capital investments: 290 B rubles.

5. Financial resources for the first stage.
   - Budget (federal and local): 120 B rubles.
   - Russian Non-Budgetary Inter-Industry Fund Of Energy Conservation and other Funds: 79 B rubles.
   - Other non-budgetary funds: 168 B rubles, including bank loans: 53 B rubles.

Client:
Ministry of Fuel and Energy of the Russian Federation (Management body of the Russian Non-Budgetary Inter-Industry Fund Of Energy Conservation).

Consulting Engineer: Engineering Academy of Russia, Russian Academy of Science Institute for Energy Research, including subcontractors.

Contractors: Ministries and agencies of the Russian Federation, areal, regional, republican (within the Federation) management bodies, enterprises, organizations, associations, concerns, corporations.

GENERAL PROPOSITIONS OF THE PROGRAM "ENERGY CONSERVATION IN RUSSIA"

1. SUBSTANTIATION OF THE PROGRAM

Low energy efficiency of Russian economy keeps being one of the predominant reasons for the intense situation in fuel and energy sector of the country. The expenditure of primary energy resources per unit of gross domestic product (GDP) in Russian federation is 1.3 times higher than in the USA and 2 times as large as compared to that of the developed Western European countries and Japan.

The continuing industrial recession in Russian federation has not practically affected energy consumption.

While the annual 1992 gross domestic product declined by 20%, the consumption of primary energy resources diminished by only 4%. Since the production of energy resources has dropped for the most recent two years by 12%, the lack of appreciation of energy conservation decreased the reliability of the national economy down to a critical level. It also caused the 25% reduction of energy export to the CIS and other countries. During the above mentioned time period the energy intensity[1] of primary industries has increased by 30-34%. If urgent steps are not taken, one can expect the further growth of energy intensity for the 1993-94 GDP, which in turn will have serious negative consequences for the economy as a whole.

This unpleasant situation in Russia's economy is explained by the low prices for energy resources and products (as compared to world standards). As a result, no levels of social structure (ranging from management agencies to factory workers and civilian population) are interested in rational usage and economical expenditure of fuel and energy. The quick and effective solution in this area is hardly possible due to the combination of the following reasons :

- lack of the energy consumption registration devices;
- large percentage of outworn capital equipment, causing immense energy expenditure;
- lack of the competent administrative and engineering personnel in the sphere of energy conservation.

Another influential deterrent is the unreadiness of industry to rapidly expand the production of energy conservation equipment and control/measurement devices necessary for the rational use and economical expenditure of fuel and energy.

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[1]ratio of energy used by the equipment or technology to useful products and services, provided by this equipment or technology - V.K.

2. ENERGY CONSERVATION POTENTIAL

The general Russian need for primary energy resources will amount to 1.2 B tons of coal equivalent[2] (tce) or 35.5 10^{15} Btu in 1993. By 2010 it will reach the level of 1.7-1.8 B tce. There is, therefore, a 450-500 M tce potential for energy conservation. Saving this volume of primary energy resources may be accomplished through the implementation of a consequent and comprehensive federal energy conservation program, rather than by the additional energy production.

The concept of energy policy in Russia in the new economic situation, approved by the Russian government, sets the task of achieving in 2000 savings of primary energy resources (as compared to those in 1990) by 200-250 M tce, and in 2010 -- by 500-600 M tce. Only half of total savings is supposed to be achieved by way of improving economical structure. The other, greater part must be accomplished as a result of technological and organizational improvements.

By the year of 2010 the energy intensity of GDP will have been reduced by 22-24% (in comparison with 1990), provided that the mentioned amounts of energy savings are achieved.

Western countries, which experienced energy crisis in 1973-74, had to toughen federal standards for energy characteristics in industry and for heat characteristics of buildings. They also had to develop and implement federal energy conservation programs. This experience proves that Russia can realistically reach the above indicated amounts of energy resources savings.

3. STAGES OF THE PROGRAM IMPLEMENTATION

The strategy of Russia's energy conservation program supposes 3 periods.

<u>The first 12-18 month period</u>, which is according to "Russia's Energy Policy Program" associated with anti-crisis measures both in energy sector and in the economy in general, suggests that the major directions for energy conservation activities on the federal level should be as follows.

- To improve the system of prices for primary energy resources and energy carriers produced from them. Internal cost for fuel and energy must correspond to the expenses of its production and delivery to a consumer. In this case the cost would approach the world level and the current asymmetry of prices for other industrial goods would be eliminated. According to the domestic and foreign experience, no other legislative, administrative or technological measures will be productive enough.

- To develop and adopt legislative acts and regulations in the sphere of production, rational utilization and economical expenditure of fuel and energy in Russia.

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[2] 1 ton of coal equivalent = 29.43 10^6 Btu.

- To establish a structure of federal and regional management bodies, supervising energy consumption and conservation process (standardization, inspection, information, assistance to energy consumers in improving their local energy sectors).

- To form federal and regional non-budgetary energy conservation funds for initiating and financial support of the most important and energy efficient projects.

- To further improve the tariff system for electrical and heat energy and to develop the methods of charging for energy savings.

- To provide administrative and engineering personnel, specially trained in energy conservation techniques.

The second term will last until 1996-1997 and will have the objective to overcome energy crisis and to establish a developed energy market in Russia. The energy consuming/conservation legislative acts along with the respective organizational and economic mechanisms are supposed to become effective during this period. In particular, it is necessary to financially encourage energy producers and consumers for them to effectuate energy conservation measures. This process must be functioning at both federal and regional levels. Control of compliance with energy efficiency standards and norms in industry, agriculture and commerce should also be organized. It will be especially important to start mass production of measurement and control devices (preferably automated) for fuel and energy expenditure purposes and supply all categories of customers with them. Establishing accurate measurement and control in the field of energy consumption is indispensable condition to achieve large volumes of saved fuel and energy for a short period of time.

Significant practical assistance in transferring Russia's economy to energy efficiency way of development must be provided by military enterprises which are currently being conversed. They can particularly be helpful in equipping energy consumers with measurement / control devices. With the country moving towards market economy, considerable role in terms of improving efficiency, environmental friendliness and reliability of power and heat supply will be played by medium- and small-size thermal power stations. They are supposed to employ gas turbine engines and other power equipment, manufactured by military plants for submarines, jets etc.

Defence complex enterprises must also take care of mass production of multipurpose mobile diagnostic laboratories, designed by Russian scientists. Energy inspection institutions and consulting firms, equipped with such laboratories will then be able to discover additional energy conservation possibilities, especially among the numerous newly created private businesses in industry, agriculture and commerce.

During the third time period energy conservation policy is supposed to be further developed. It must include both measures on improving the structure of economy to increase the share of the science-intense and low energy intensive industries in Russia's GDP, and measures on developing and introducing new low energy intensity technologies, efficient equipment and materials.

4. ENERGY CONSERVATION MECHANISMS

The implementation of active federal policy in energy conservation is supposed to be a basis for consequent realization of the described stages by way of simultaneous resolution of the following co-related tasks:

- to establish a legislative base for energy conservation;
- to develop the standards for energy consumption and certification of energy intense products;
- to establish an auspicious economic environment, including commercialization of work; to develop an energy conservation mechanism and a price policy, corresponding to market economy;
- to federally finance current investment policy, to provide a legislative base, to establish standardization of energy consumption;
- to effectuate scientific and technical energy efficiency policy and implement energy conservation projects;
- to produce the necessary energy conservation equipment and organize its delivery to consumers through the market infrastructure;
- to share the power and responsibilities between the federal and regional management bodies;
- to develop international cooperation;
- to apply economic sanctions to consumers, guilty of energy looses and irrational energy consumption;

5. DEVELOPMENT OF ENERGY CONSERVATION EQUIPMENT

Energy consumption can be reduced by a factor of 1.4-1.7 through the improvement of energy efficiency for a new fleet of machines and equipment. The production of energy conservation equipment as well as energy meters should become at least 10 times higher and annually amount to an equivalent of 30-40 B rubles within the next 3-5 years. Presently, the needs of energy consuming industries in certain types of energy conservation equipment are only met by 4-55%.

60% of industrial facilities are morally and physically wornout, and only 20-30% of installations correspond to world standards. Energy standardization covers only 4% of machines, which are presently manufactured and maintained.

Production of energy meters and energy control systems satisfies 30% of generally required amounts and the needs in heat meters are met by only 3-6%. Automated systems are not manufactured at all.

6. ENERGY CONSERVATION FUND

Social factors do not allow to considerably increase the cost of fuel. Nor do they let to essentially change the correlation between the prices for energy resources and processing industries production. That is why, in order to reduce the load on fuel and energy sector

industries, it is necessary to take on the federal level a number of urgent financial, economic and administrative measures (such as sanctions for irrational energy consumption).

The required amount of funding for federal financial support of energy conservation projects for the period of 1993-95 is estimated at 365-370 B rubles[3] for top priority projects. This will save 35-40 M tce in 1995, as compared to 1990, and set perspectives for a number of projects to be realized in the coming 2-3 years which will save 70-80 M tce. The above indicated sum equals to 0.8-1% of the cost of fuel, which is annually consumed by various branches of national economy. Together with the expenses for economic motivation, the annual financial needs for energy conservation purposes will amount to 4-4.8% of the cost of the fuel consumed.

These financial resources must be collected in the federal and regional non-budgetary energy conservation funds. It is reasonable to estimate deductions to the funds for a definite period of time with further indexation. After energy consumption standards are developed (1995), the mechanism for collecting money in the funds can be changed, based on penalizing enterprises for inefficient and irrational energy use.

The Russian Non-Budgetary Inter-Industry Energy Conservation Fund was established on the federal and regional levels by the decree of the Russian Government No. 371 of June 1, 1993.

According to the Government order, the Ministry of Fuel and Energy, the Ministry of Economics, and the Ministry of Finances developed the provisions of the Energy Conservation Fund. These include mechanisms of the Fund formation as well as the directions and inspection of the Fund's consumption. However, the provisions in question can not become effective until the Government or the Supreme Soviet makes a decision to include the expenses directed to the Fund (in the amount of 0.5-1% of expended resources) into the cost price of production.

Russia's Ministry of Finances together with the Ministry of Economics and the Ministry of Fuel and Energy developed the draft decree which establishes the order of deductions to the federal and regional Energy Conservation Funds, made by industrial, construction and transport organizations in the proportion of 70% and 30%, respectively. This draft, in conformity with the Government decree No. 552 of August 5, 1992, denotes to include directed to the Fund deductions into the cost price of goods, works or services, provided by the involved organizations and enterprises. For all that, the expected rise of the cost price will not exceed 0.02-0.1% and, therefore, will not practically affect the final price of products. The draft decree is currently under consideration of the Russian Federation Government.

If adopted, the decree will allow to annually direct up to 25 B rubles to the needs of energy conservation. Among these 16-18 B rubles will be sent to the regional energy conservation funds.

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[3] here and further prices of 1993.

7. ENERGY CONSUMPTION STANDARDS. CERTIFICATION OF PRODUCTS

Present system of energy consumption standards does not correspond to the market economy requirements. More than 1000 federal standards, including energy consumption indexes are currently in force.

These indexes do not, however, cover all the sphere of the most power consuming production and can not be used as a technical basis for energy consumption canons.

According to the western experience, all standards, as well as construction norms and rules, should have mandatory and discretional levels.

The mandatory level should enclose the standards, regulating energy consumption efficiency for buildings and constructions along with the indexes of minimal energy consumption for the most power consuming equipment and mass production facilities. Recently energy consumption indexes have been introduced in 314 federal standards. The total amount of the documents to be developed in 1993-95 is estimated at 120-150, the funds needed for their development being 50 M rubles. The program of top priorities includes the list of these documents.

An important direction in energy conservation policy is the certification of newly manufactured products for compliance with energy standards. The objects of certification should, first of all, include goods of mass production, heat isolating materials, energy meters, regulating apparatus, electrical motors, auto- and moto vehicles. Expenses for establishing certification standards on the first stage are estimated at 100 M rubles.

8. THE STRUCTURE OF THE PROGRAM "ENERGY CONSERVATION IN RUSSIA"

The major parts of the Program are as follows:
- analysis of the energy conservation potential and main directions of its realization;
- legal, organizational and financial mechanisms of energy conservation;
- science and technology policy in energy conservation; substantiation of the primary directions and top priority projects;
- improvement of energy conservation structure at regional and federal levels;
- federal financial support of energy conservation policy;
- international cooperation;
- top priority projects in energy conservation.

<u>Economic mechanism</u> on the first stage will be represented through grands and subsidies to enterprises consuming and manufacturing energy conservation equipment to promote revealing economic potential. These enterprises must be encouraged to equip their local energy sectors with measurement devices, to use secondary energy resources as well as local and renewable energy sources.

After the law on energy conservation comes into force, measures of economic and administrative influence will be enlarged by tax benefits and sanctions, fines for irrational energy consumption, and improving price and depreciation policies. The economic mechanism will include methods

of price formation; relationship between energy suppliers and energy consumers; financing energy conservation; standardization of energy consumption and control over efficient utilization of fuel and energy. Economic mechanism should also provide levers and motivation to make the necessary structural changes in energy production and consumption. In long-term perspective structural economy will reduce energy intensity of GDP by 20-25%.

Financial mechanism implies federal support of energy conservation projects by federal and local budgets, privileged loans for 3-4 years with covering the bank interest from the budget funds. The Russian Non-Budgetary Inter-Industry Energy Conservation Fund established by the Russian Government must promote energy conservation. Budgetary and non-budgetary money must provide motivation for attracting the funds of enterprises and organizations to finance energy conservation on commercial basis. This must become the main source of funding.

Legislative base for energy conservation has been launched by a draft energy conservation law developed by order of the Russian Government. It has been sent to the subjects of the Federation, ministries and agencies of the Russian Federation. This draft aims, in the first place, at setting legal norms for implementation of the federal energy efficiency policy. It establishes financial and economic mechanisms promoting energy conservation (by way of tax, loans and depreciation benefits; creation of energy conservation investment funds; subsidies; punitive sanctions for inefficient energy use.

The draft determines provisions on energy consumption standards and certification of the maintained equipment at the level of federal standards. It also suggests to orginase the system of energy consumption registration at the level of federal statistics and to create federal and regional management bodies on energy conservation.

9. TOP PRIORITIES IN ENERGY CONSERVATION

The program includes about 230 top priority projects. Most important of these are 78 projects which are combined into a program of primary measures on meeting the needs of Russian industries for energy and water control and regulation devices. This program will be implemented in 1993-95. Expenses are estimated at 6.5 B rubles, including 2.7 B rubles for scientific-research and design projects.

The Program Of Primary Measures

Sphere	Number of projects	Total cost, B rubles
Registration, control and regulation of heat energy consumption	23	1,973
Natural gas	17	1,420
Electrical energy	15	1,839
Water consumption registration (meters)	18	0,772
Automated systems for energy consumption control	5	0,539

Implementation of the program will ensure annual manufacturing of 1-2 M devices related to heating and respective energy savings up to 25% of the present heat consumption. Production of gas meters will be increased up to 0.2 M pieces a year for industrial use and up to 1 M pieces for household use. The need for electric meters will be met in 1996.

The program of top priorities includes 156 energy efficiency projects which will ensure in 1993-1995-1997 annual savings of 75-85 M tce (as compared to those of 1990) in gas, oil, oil refining and oil-and-chemistry industries, as well as ferrous and non-ferrous metallurgy. They will also provide substitution of scare motor fuels in transport, agriculture, construction and machine building sectors. Total expenses for their implementation are estimated at 258 B rubles. The detailed information about these project is appended.

Payback period, including investment cycle will not exceed 2-4 years. Annual cost effectiveness (i.e. cost of saved fuels) will amount to 1.5-1.7 trillion rubles.

On the order of Russian Government (decree No. 371 of June 1, 1992) the program of top priorities includes projects on improving energy efficiency in extraction, refining, transportation and utilization of oil, gas and petroleum products.

The program of reducing oil and gas consumption after technical re-equipment of oil refining plants can be implemented in 1993-2000 achieving fuel efficiency of up to 6 M tce. The expenses are estimated at 22 B rubles.

The program of reconstructing system of preparation, transportation and storage of oil and petroleum products, which will ensure reducing looses of hydrocarbons and will allow to save 2.5 M tce. The necessary investments will amount to 30 B rubles.

The program of improving fuel efficiency of compressor stations of gas mains can provide fuel efficiency of 16 M tce in 1993-1996. The necessary investments will be about 63 B rubles. Pay back period of these projects will not exceed 1-2.5 years.

Direct oil losses during extraction, transportation and storage are 12.5 M tons. It is possible to reduce these losses by 45-50% with assessed savings of 6-6.5 B rubles and cost efficiency of 4.7 B rubles.

The potential of reducing losses during extraction, transportation and storage of motor fuels is 11-12 m tons of coal equivalent. Investments needed to reveal this potential are estimated at 6-7 B rubles and the cost efficiency - at 16-18 B rubles.

The total amount of electricity for electric drives in oil extraction is estimated at 45 B KWH or 57 M tons of oil equivalent. Creation and large-scale use of autonomous mini-thermal power stations utilizing associated gas will allow to improve electricity and fuel efficiency of heat supply for extraction industries.

Gas savings potential just during its transportation along the gas mains is estimated at minimum 32-34 B m^3 annually. Possible directions of revealing this potential, which is equal to

construction of a gas pipe-line from Jamal Peninsula with the crossing of 1400 mm, can be improving utilization equipment at compressor stations; equipping these stations with steam-and-gas systems with additional electricity production; and using secondary energy resources.

10. NON-CONVENTIONAL ENERGY RESOURCES

The draft program suggests substituting energy of organic origin by that from non-conventional sources. The perspective saving potential is expected to reach 5.5 B tce during 1993-95 and 0.6 B tce in 1993.

Between 1993 and 1994 it is supposed to design and manufacture 4.3 KW and 60 KW wind power stations. Development of special hot water installations for rural areas will make it possible to use solar energy. These installations will be manufactured in form of plastic and stainless collectors and solar concentrators.

It is also expected to begin mass production of bio-digesters for solid waste processing, "Biosolar" installations for growing water-plants and processing them into hydrocarbons as well as 16 KW gas-generators for timber waste processing.

A power/heat supply installation will be designed to utilize the natural heat of the Earth. This installation will be capable of developing 3 MW of electric power and 12 MW of heat power.

In the year of 1993 it is planned to carry out 20 research and design projects, the associated expenses are estimated at 224 M rubles. 117 B rubles are supposed to be covered by the Ministry of Fuel and Energy, and 107 M rubles -- by the Ministry of Science and Technical Policy.

11. THE STRUCTURE OF THE PROGRAM MANAGEMENT

Board of directors of the Russian Non-Budgetary Inter-Industry Energy Conservation Fund and corresponding industry and regional funds are the chief implementors of the Program.

Money of the Russian Non-Budgetary Inter-Industry Energy Conservation Fund, as well as of non-budgetary funds for scientific-research and design activities of the Ministry of Fuel and Energy, according to the decree No. 371 issued on June 1, 1992, is attracted to support the Program.

Management of regional energy conservation funds is exercised by the local authorities.

Financial resources of the Russian Energy Conservation Fund will be used to stimulate concerned enterprises to invest 3-4 rubles for every ruble, received from the Fund.

Control over the course of the program implementation and efficiency of the funds utilization is exercised by the Supervisor Council formed by the Ministry of Fuel and Energy of the Russian

Federation in accordance with the Statement on the Russian Non-Budgetary Inter-Industry Energy Conservation Fund. All the money directed for the program implementation by any of the above mentioned sources is collected in the Russian Non-Budgetary Inter-Industry Energy Conservation Fund which alone is responsible for implementing the Program.

Potential Of Energy Conservation (by 2010)

	Natural gas, B m^3	Oil products, millions metric tons	Coal, Coal coke, million metric tons	Electric energy, B KWH	Heat energy, B Cal	Total, million tons of coal equiva-lent
Fuel and Energy Complex:	45-60	15-17	33-39	40	160-180	150-180
Oil production	5-10					6-12
Coal production	3-4			10		3.5-4.5
Energy transportation	8-10		7-8	30	150-170	52-59
Power and Heat engineering	32-42	10-12	26-31			80-96
Oil refining		4.7-5			9-10	8-9
Household	10	0.6-0.8	21-23	90-105	120-145	85-95
Agriculture	1.4-1.5	35-41	1.5-1.7	8-10	4	54-64
Transport		29-34				42-50
Industry:	34-42	6-7	12			
General industrial measures	10-13	0.5		140-175	75-100	71-89
Metallurgy	12-15	2	10-11	20-24	5-6	34-39
Machine building	3-4	0.5		55-60		14-17
Building materials	10-11.5	1.7-2	2-2.5	8.5-10	40-45	20-23
Chemistry and oil-and-chemistry	5-6			4-5	12-15	9-10
Timber and paper industry	0.3-0.7	1-2			35-40	8-10
Total	90-100	85-100	70-80	350-420	450-540	480-570

Efficiency Of The Top Priority Energy Conservation Projects, presented in the program "Energy Conservation In Russia" (prices of April 1, 1993)

Branches of national economy and inter-industrial projects	Number of projects	Expenses for research and preparation for mass production, B rubles	Implementation period, years	Energy savings, M tce	Economic efficiency (cost of the saved fuel), B rubles	Payback period for capital investments, years
Manufacturing energy consumption registration and control devices	78	6.5	1993-1995	5	75	2-3
Natural gas industry	50	120	1993-1997	11	180	3-4
Oil industry	5	1.2	1993-1997	12-16	480-640	3-4
Oil refining industry	5	2.6	1993-1997	2-2.5	50-60	3-4
Chemistry and oil-and-chemistry	5	2.9	1993-1997	2.5	30	3-4
Ferrous metallurgy	15	5.4	1993-1997	4.5	70	3-4
Non-ferrous metallurgy	8	3.0	1993-1997	2-2.5	30-40	3-4
Transport	11	5.6	1993-1997	4	200	3-4
Alternative motor fuels	7	1.0	1993-1995	2.5-3	70-90	2-3
Agriculture	29	4.1	1993-1997	20-25	100-120	3-4
Construction	6	4.9	1993-1995	5	75	
Machine building	14	115	1993-1997	9	130	3-4
Total	234	270		80-90	1500-1700	2-3

Distribution of resources for the program "Energy Conservation in Russia"

	Financial expenses (prices of 1993), B rubles					Expected outcome of subprogram (program) implementation
	Financial sources and directions of investments	For the implementation period	to wit			
			1993	1994	1995	
1	2	3	4	5	6	7

Subprogram objectives: Establishing legal and economical mechanisms to provide implementation of energy conservation policy. Creating scientific and industrial basis for energy conservation technologies and equipment. Designing and manufacturing energy consumption measurement and control devices. Utilization of new and renewable sources of energy. Level of readiness The subprogram is being developed. Client: Ministry of Fuel and Energy of the Russian Federation	Sources of financing Total to wit: Republican budget Investment loan ways of support: tax benefits coal donations Local budgets Non-budgetary sources, including: enterprises funds bank loans special funds other	367.99 54.75 65.55 247.69 115.35 52.95 78.9	80.62 1.59 9 70.03 26.95 18 25.95	129.6 13.98 28.59 87 42.48 18 26.37	132.6 13.98 27.96 90.66 46.92 16.95 26.58	The subprogram will cover general directions of implementation of "Russian energy conservation policy the new economic situation". It will determine energy conservation potential, social and economic efficiency of the energy conservation program as well as basic directions of improving energy efficiency in different branches of Russia's national economy for the period till the year of 2000. As a result of

<u>Capital investments</u>					resources
Total	288.0	63.0	100.8	124.2	will
to wit:					amount to
					an
Republican budget	46.8		10.8	10.8	equivalent
					of 3 M
Investment loan					rubles in
ways of support:					1993, and
tax benefits					of 35 M
coal donations					rubles -- in
					1995.
Local budgets	57.6	9	27	21.6	
Non-budgetary					
sources,	183.6	54	63	81	
including:					
enterprises funds	75.6	18	23.4	34.2	
bank loans	45	18	18	9	
special funds	63	18	21.6	23.6	
Besides:					
Own hard currency resources					
Foreign investments, M Am. dollars	24	6	8	10	
Foreign credit, M Am. dollars	60	18	20	22	

1	2	3	4	5	6	7
	Current expenses					
	Total	79.99	17.62	28.77	33.6	
	to wit:					
	Research and design projects,	13.94	4.1	4.92	4.92	
	including					
	Republican budget	7.95	1.59	3.18	3.18	
	Non-budget sources	5.99	2.51	1.74	1.74	
	Other needs,	66.05	13.52	23.85	28.68	
	including					
	Republican budget	7.95	1.59	3.18	3.18	
	Non-budget sources	58.1	13.52	22.26	22.32	
	Local budgets	7.95		1.59	6.36	

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Appendix IV.

RUSSIAN NON-BUDGETARY INTER-INDUSTRY ENERGY SAVING FUND

MINISTRY OF FUEL AND ENERGY OF RUSSIA

The policy of energy conservation conducted by Russian Government is based on:

- applying market-oriented mechanisms of energy saving stimulation;
- creating a favorable economic atmosphere for producers and consumers of the energy saving equipment;
- providing financial support for development, production and implementation energy saving technologies, devices and materials;
- setting up territorial and federal non-budgetary financial funds of energy saving promotion;
- liberalizing energy pricing;
- energy consumption standardization;
- implementation of large-scale projects and programmes of promotion of efficient environmentally clean techlogiens;
- improving scientific, industrial and commercial mutually-beneficial cooperation in the field of energy conservation with foreign partners.

For providing financial support of implementation this policy of energy conservation has been created in accordance with the resolution of the government of the Russian Federation the Russian Non Budgetary Inter Industry Energy Saving Fund (RESF).

The managment of the federal part of the RESF (where accumulated 80% means) has been carried out by the Executive Board within the Ministry of Fuel and Energy of the Russian Federation.

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Activities of the Executive Board are under the purview of the Supervisory Council (Board) included officials, top scientists and businessmen of different branches of industry and science.

The Executive Board of the RESF has already embarked on setting up a network of regional Energy Saving Centres as a basis for implementing the conceived energy saving policy.

It is supposed in 1993 to establish and equip with necessary technical means such Centres in Moscow, Istra, Kemerovo, Republic of Buryatia, Novosibirsk, Irkutsk, Novgorod, Tula, Nizhniy Novgorod.

The Executive Board of the RESF will provide general methodical guidance and auspices of the regional Energy Saving Centres.

Means of the RESF are being formed through: extra-payments for consumpted energy by the enterprises (exept budget organisations, collective and individual farms, housing and municipal administrative buildings); payments of the enterprises as sanctions for irrational using of fuel-and-energy resources; incomes as result of research, consulting advisory, informational and commercial activities of the Executive Board or regional Energy Saving Centres; dividents and percentage by reimbursements of the favourable loans.

Means of the RESF (federal part) are directed by the Executive Board to solve large-scale urgent inter-industry and inter-regional problems in the field of energy conservation and energy efficiency on the principles of share holding and favourable loaning.

The main directions of the RESF using:

- to finance the measures on scientific, standard-and-juridical provision of the energy conservation and on standardization of the energy consumption;
- to provide the implementation of the energy consumption on the principles of share holding of enterprises-consumers concernd;
- to support financially the manufacturing of the techni-

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cally complicated energy saving and energy efficient equipment;

- to provide financial support of the creating a market infrastructure of the energy saving equipment, devices, materials and technologies and promote its penetration both in russian market and in world market;
- to encourage technical energy renovation of the most energy-intensive industries; to stimulate utilization of secondary energy resources (favourable loans, grants, supsidies, compensation part of the expenditures).

Means of the RESF are being used for:

formation data bases and data bank of energy efficient technologies, provision juridical consulting and advisory services of creating management system, training personnel both in Russia and abroad, insurance in the field of energy conservation investments of foreign and russian enterprises and firms.

The Executive Board of the RESF express its readiness to establish and develop mutually beneficial cooperation (scientific-technological, industrial and commercial) with foreign partners on all above mentioned problems in the field of energy saving and energy efficiency.

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Appendix V.

KEY ISSUES OF THE PROGRAMME FOR 1993-2000 ON REDUCING LOSSES OF OIL, NATURAL GAS AND PETROL DURING ITS EXTRACTION, REFINING AND TRANSPORTATION.

The Programme has been developped in addition to the major "Energy Conservation Pogramme for Russia" and in accordance with the decree N371 issued on June 1, 1992 by the government of Russian Federation: "Urgent measures on energy conservation in the field of oil and natural gas extraction, transportation and refining"

The objectives of the programme are the following:

-To set the priorities for the technical energy saving policy in the field of oil and natural gas extraction transportation and storing.

-To carry out research and development projects.

-To introduce modern energy efficient technology and know-how in the field in question.

-To organise the industrial production of new energy efficient equipment and ensure future development of existing industrial facilities to meet the demands of oil and gas industry.

-To develop the economic mechanism which would stimulate, during transient period, the introduction of modern energy efficient technology and equipment and provide government support for energy conservation projects.

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KEY ISSUES OF THE PROGRAMME ON ENERGY CONSERVATION MEASURES TO BE TAKEN FOR THE RENOVATION AND RETROFITTING OF THE OIL REFINING PLANTS.

The Programme has been developped in addition to the major "Energy Conservation Pogramme for Russia" and in accordance with the decree N371 issued on June 1, 1992 by the government of Russian Federation: "Urgent measures on energy conservation in the field of oil and natural gas extraction, transportation and refining"

The objectives of the programme are the following:

-to carry out R & D in the field of energy conservation in oil and petrol industry.

-to stimulate the development of the industries manufacturing energy efficient equipment to meet the demand of oil refining plants in 1993 - 1997.

-to develop and put into practice economic and legislative mechanism which would stimulate, during transient period, the introduction of modern energy efficient technologies and equipment and ensure government support for energy conservation projects.

-to enhance international cooperation in the field of energy conservation.

KEY ISSUES OF THE PROGRAMME FOR THE YEARS 1993 - 1996 ON SUBSTITUTION OF PETROL AND DIESEL FUELS BY COMPRESSED AND LIQUEFIED GASOIL.

The Programme has been developped in addition to the major "Energy Conservation Pogramme for Russia" and in accordance with the decree N 371 issued on June 1, 1992 by the government of Russian Federation: "Urgent measures on energy conservation in the field of oil and natural gas extraction, transportation and refining"

The objectives of the programme are the following:

-to work out measures which would facilitate the establishment of more attractive business and economic environment to enchance further development and retrofitting of existing gasoil compressor service stations (GCSS) and to encrease the fleet of vehicles which use as a fuel bottled liquefied gas.

-to carry out R & D with a view to develop efficient and environmentaly sound vehicles which run on bottled liquefied gas.

-to stimulate the development of branches of industry which are related to manufacturing or maintenance of GCSS and vehicles.

-to develop and introduce automatisation and control equipment for GCSS.

-to develop the mechanism for implementation of GCSS retrofitting programme.

-to introduce new materials, technology and know-how.

KEY ISSUES OF THE PROGRAMME ON REDUCTION OF FUEL CONSUMPTION BY AUTOCAR AND TRACTOR FLEET.

The Programme has been developped in addition to the major "Energy Conservation Pogramme for Russia" and in accordance with the decree N 371 issued on June 1, 1992 by the government of Russian Federation: "Urgent measures on energy conservation in the field of oil and natural gas extraction, transportation and refining"

The objectives of the programme are the following:

-to define the priorities for the implementation of technical policy for modernisation of the autocars, tractors and agricultural vehicles manufacturing industry with the view to encrease vehicles fuel efficiency.

-to improve technical maintenance system for existing autocar and tractor fleet to reduce its fuel consumption.

-to develop a set of regulations concerning fuel efficiency of types of vehicles, including those imported.

-to carry out research and development projects.

-to develop and put into practice new economic and legislative mechanism which would stimulate, during transient period, manufacturing of efficient equipment and provide financial support for related industries development through the use of innovation and investment funds.

-to enhance the international cooperation in the field of fuel efficiency.

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