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Lobova, Svetlana Vladislavlevna; Bogoviz, Aleksei Valentinovich; Ragulina, Yulia Vyacheslavovna et al.

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Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/econis-archiv/>

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The Fuel and Energy Complex of Russia: Analyzing Energy Efficiency Policies at the Federal Level

Svetlana Vladislavlevna Lobova¹, Aleksei Valentinovich Bogoviz^{2*}, Yulia Vyacheslavovna Ragulina², Alexander Nikolaevich Alekseev³

¹Altai State University, Barnaul, Russia, ²Federal Research Center of Agrarian Economy and Social Development of Rural Areas- All Russian Research Institute of Agricultural Economics, Moscow, Russia, ³Plekhanov Russian University of Economics, Moscow, Russia. *Email: aleksei.bogoviz@gmail.com

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ABSTRACT

The paper critically reviews Russia's energy efficiency policies in the fuel and energy complex, one of the most important parts of the economy of Russia, since 2012 till 2016. Since Russia's economy is very energy intensive and has a great potential of increasing its energy efficiency, the role of such policies in the fuel and energy complex is of the highest importance. The paper, first of all, comprehensively reviews overall goals and priorities of energy efficiency in the fuel and energy complex of Russia, devoting special attention to the government management system, technological regulations, financial incentives and funding, as well as supporting mechanisms. Second, the paper analyzes energy efficiency performance in the fuel and energy complex of Russia on the basis of the official methodology used by the Ministry of Energy of Russia. Third, the paper critically reviews both the legal and strategic framework of energy efficiency policies in Russia and the methodology used by the Ministry of Energy to evaluate energy efficiency performance, with the purpose of providing valuable recommendations that would further develop energy efficiency policies in the fuel and energy complex of Russia.

Keywords: Energy Efficiency, Fuel and Energy Complex, Russia

JEL Classifications: Q43, Q48, E60, E65, O10

1. INTRODUCTION

The fuel and energy complex of Russia is one of the most important structural component of the Russian economy, one of the key factors in the growth of labor productivity, the operation of production systems and the life of Russian society. More than two million people work in the fuel and energy sector, which forms more than 20% of Russia's gross domestic product, accounts for 50% of Russia's exports and more than 40% of the country's budget (Rutland, 2017; Naoyuki and Alekhina, 2016; Sabitova and Shavaleyeva, 2015; Akhmetshin et al., 2018).

Despite having abundant energy resources and being one of the main suppliers of energy resources to the world market (which

also determines the importance of the fuel and energy complex in the economy of the country), Russia has one of the most energy intensive economies among the industrialized countries (Cui et al., 2014; Voigt et al., 2014). More than that, Russia has very high energy saving potential, according to the International Energy Agency (IEA, 2011) and the World Bank (IFC and World Bank, 2014).

Given the role played by the fuel and energy complex of Russia and the challenge of reducing energy intensity of the economy, numerous studies have addressed the issues of energy efficiency in Russia, focusing either on general aspects (Asif and Muneer, 2007; Bashmakov, 2009; Camiato et al., 2016; Kreydenko et al., 2018; Malmendier, 2011; Orlov et al., 2013; Strakhova and Lebedinsky,

2012) or on particular sectors (Lezier et al., 2017; Orlov, 2017; Overland, 2013; Tyutikov et al., 2016; IFC and World Bank, 2014). Some papers focus primarily on energy efficiency policies conducted in the fuel and energy complex of Russia (Chaika, 2018; Sokolov et al., 2017; Simonova et al., 2016). Despite the presence of a large amount of research in this area, none of those papers comprehensively review goals and priorities of energy efficiency policies in the fuel and energy complex of Russia, critically analyze the methodological framework used by Russia's federal authorities to evaluate energy efficiency performance in this sector of the economy, or closely focus on drawbacks of such policies and methodological approaches with the help of the latest quantitative and qualitative data. The presented research addresses all the issues listed above as part of our large research project that focuses on energy efficiency of the Russian economy (Bogoviz et al., 2018a) and its energy security (Bogoviz et al., 2017; Bogoviz et al., 2018b). As a result, our paper significantly contributes to the body of scholarly literature and fills the gap by critically reviewing Russia's energy efficiency policies in the fuel and energy complex.

The paper is structured in the following way. In the next part, we describe the data and methodology used in our research. Then, we review the existing energy efficiency policies in the energy and fuel complex of Russia and apply the methodology used by the Ministry of Energy to evaluate energy efficiency performance in this sector of the economy. After that, we identify drawbacks in both Russia's energy efficiency policies in the fuel and energy complex and the methodology used by the Ministry of Energy, as well as provide relevant policy recommendations. Lastly, we conclude with final remarks.

2. DATA AND METHODOLOGY

In order to review current energy efficiency policies in the fuel and energy complex of Russia, we collect and analyze relevant federal legislation and government programs from open sources. The main source of information is the official websites and electronic databases of the Government of the Russian Federation and the Federal Assembly of Russia covering the entire period of our analysis, starting in 2008 and ending in 2017. The focus on federal legislation and programs is determined by the overwhelming importance of the federal legislation and government strategic planning in Russia, which is to be followed by all other regions of Russia. Thus, by focusing on the federal agenda, we may analyze the general framework for increasing energy efficiency in the fuel and energy complex of Russia. Particularly, we focus on the following aspects while reviewing energy efficiency policies: (i) Overall goals and priorities in Russia's energy efficiency policies in the fuel and energy complex; (ii) a government management system; (iii) technological regulations; (iv) financial incentives and funding; (v) and supporting mechanisms.

With the aim of reviewing the methodology used by the Ministry of Energy of Russia, we rely on the data coming from the Russian State Statistical Service, also known as Rosstat (Russian Federal State Statistics Service [RFSSS], 2018). Particularly, we rely on those indicators that are used by the Ministry of Energy of Russia in order to evaluate energy efficiency performance in the fuel and

energy complex. Our analysis of the indicators is limited by the availability of data, because the Ministry of Energy and Rosstat have been collecting data for these indicators only since 2012. We apply the methodological framework used by the Ministry of Energy to monitor energy efficiency performance in the fuel and energy complex, point out its limitations, and then discuss how energy efficiency policies in the fuel and energy complex might be further developed.

3. RESULTS

3.1. Energy Saving and Energy Efficiency in the Fuel and Energy Complex

In this section of the paper, we summarize the key federal policies of Russia in energy efficiency of the fuel and energy complex, conducting a general review and then going specifically into the policies that exclusively address the fuel and energy complex. The methodological framework briefly outlined above is used to analyze the documents and policies being adopted and implemented by the federal Government of Russia. In particular, we overview such dimensions of energy efficiency policies in the energy and fuel complex as (i) overall goals and priorities, (ii) issues of government management, (iii) technological regulations, (iv) financial incentives and funding, and (v) supporting mechanisms. Then we devote our attention to the methodology used by the Ministry of Energy to evaluate energy efficiency performance in the fuel and energy complex of Russia, focusing on the following: (i) Oil and natural gas processing; (ii) oil and natural gas production; (iii) oil transportation; (iv) generation of electricity and thermal energy; and (v) transmission of energy.

3.1.1. The government management system

The state program "energy efficiency and energy development" includes the following indicators that are intended to help the Government of the Russian Federation (and the Ministry of Energy, in particular) to more efficiently manage the processes of increasing the energy efficiency of the Russian economy: (a) "The depth of processing of crude oil, %;" "electric power losses in electric grids from the total volume of electricity supply;" (b) "the specific consumption of fuel equivalent for the supply of electricity on the sources of combined production of electric and thermal energy with an installed capacity of 25 MW and more (proportional fuel separation method);" (c) "the specific consumption of conventional fuel for the release of thermal energy from the collectors on the sources of combined production of electric and thermal energy with an installed capacity of 25 MW and more (proportional fuel separation method);" (d) "specific electricity consumption for oil transportation (thousand tons km) under comparable conditions;" (e) "specific consumption of electricity for transportation of petroleum products (thousand tons of km) in comparable conditions;" (f) "the total specific consumption of fuel and energy resources per ton of coal production." The Ministry of Energy collects data on the indicator and processes them with the help of Rosstat (RFSSS, 2018). These indicators are used by federal authorities in the development of energy efficiency policies and approaches in the field of fuel and energy complex, while being strongly embedded into the government management system.

3.1.2. *Issues of technological regulation*

One of the most important aspects of technological regulations in the fuel and energy complex of Russia with respect to energy efficiency policies is an interindustry reference book for the best available technologies in the field of energy conservation and energy efficiency, which was developed by the Ministry of Energy of the Russian Federation (Rosstandard, 2017). Also, technical requirements for the rules of access to the wholesale electricity and power market (WEPM) were approved (Government of Russia, 2017). When accessing WEPM, participants must comply with the technical requirements for generating equipment.

It is also worth mentioning that the Ministry of Energy of Russia uses the refinery modernization agreements to stimulate the transition to fuel production of elevated ecological classes (Ministry of Energy, 2017). Normalization of losses of electric energy during transmission in distribution networks through the mechanism of benchmarking is carried out. Work is underway to update the requirements for internal and external coverage of budget sector organizations.

The Federal Law No. 279-FZ “On Amendments to the Federal Law on Heat Supply and Certain Legislative Acts of the Russian Federation on Improving the System of Relations in the Sphere of Heat Supply” came into force on July 31, 2017 (ConsultantPlus, 2017a). The document was prepared by the Ministry of Energy of Russia and was aimed at improving the efficiency of heating systems and stimulating their development. This federal law changes the system of regulation in the field of tariff formation with the transition from state regulation of all tariffs in the sphere of heat supply to the establishment of the maximum price level for thermal energy for the end user - the level of the so-called “alternative boiler house.” The price will be calculated on the basis of how much heat energy could be consumed by consumers in the case of the construction of their own boiler house.

One more important aspect of technological regulation is devoted to heat supply organizations (HSO). Price zones are going to be formed, within which the unified HSOs are to be responsible for heat supply (IA Regnum, 2017). HSO are required to implement measures for the construction, reconstruction, and modernization of heat supply facilities, which is specified in the heat supply scheme. HSOs are also responsible for the quality of service they provide and setting the maximum permissible interruptions in providing thermal energy. However, in this case, the transition to a new model of the heat market will be voluntary.

3.1.3. *Financial incentives and funding*

In the electric power industry, one of the main measures of financial incentives is the model of the wholesale electricity and capacity market (MWECM) operating in accordance with the Rules for the MWECM approved by the Resolution No. 1172 of the Government of the Russian Federation on December 27, 2010 (ConsultantPlus, 2018). The Ministry of Energy of Russia has implemented and been maintaining the current model of the electric energy market, as well as developing a model of the heat energy market. At the same time, when forming the price for MWECM, the parameters of the technical condition of the generating equipment are taken into account.

In the oil industry, the Ministry of Energy of Russia uses measures to stimulate the utilization of associated petroleum gas (APG) (Vedomosti, 2012). As a result of measures taken, the APG utilization rate in the industry increased in the period of 2012–2016 from 76.2% to 87.1% (at 14.3%).

The Ministry of Energy and the Ministry of Industry and Trade of the Russian Federation have developed a list of facilities and technologies that relate to objects and technologies of high energy efficiency. The specified list was approved by the Resolution of the Government of the Russian Federation No. 600 of June 17, 2015, and in accordance with it privileges are provided in the framework of tax legislation (ConsultantPlus, 2017b).

3.1.4. *Supporting mechanisms*

One of the main supporting mechanism for implementing state policy in the field of energy conservation and improving energy efficiency is popularization, which, in the fuel and energy sector, is expressed primarily in the organization of events with the participation of major representatives of the fuel and energy complex. In Russia, there is a successful experience of holding such events. In particular, the International Forum on Energy Efficiency and Energy Development “ENES,” which was held for the sixth time in 2017 and regularly supported by the leading organizations of the fuel and energy complex and industrial sector of Russia. This forum is an international platform for discussing world trends in energy saving and sustainable development, as well as directions of the state energy policy. Within the ENES Forum, participants are given the opportunity for constructive dialogue in an international format on the introduction of energy-efficient technologies and sustainable development, as well as the opportunity to promote the most advanced ideas and initiatives on energy saving.

The Ministry of Energy of Russia organizes the All-Russian competition for mass media, press services of organizations of the fuel and energy complex, and regional administrations entitled the “MediaTEK,” which in 2017 was held for the 3rd time. One of the main objectives of the contest is to stimulate the growth of professionalism of energy organizations in the field of information coverage of their activities, informing the public about the projects aimed at the development of the fuel and energy complex, stimulating projects related to the popularization of the professions of the fuel and energy complex, and increasing the importance of the work of power engineers, oil workers, and gas workers.

With regard to the development of the area of information support, the Ministry of Energy of Russia coordinates the work on the implementation of the mechanism of energy declarations in the budget sector. A detailed analysis of the implementation of this mechanism in the budget sector is presented in the relevant section. At present, about 160,000 state and municipal institutions are registered in the GIS “Energy Efficiency,” which is about 90% of the total number according to the register of organizations of the Federal Treasury. The draft law was developed by the Ministry of Energy of Russia jointly with the Ministry of Economic Development of Russia, according to which there would be the mandatory introduction of an energy declaration for public

authorities and local self-government bodies, state, and municipal institutions (autonomous, budgetary, state).

In 2013–2014, within the framework of the state program of the Russian Federation “Energy Efficiency and Energy Development,” the Ministry of Energy of Russia trained more than 32,000 managers and specialists in the budget sector. The training was based on an approach that was maximally oriented toward practice. Within the framework of the course, each student not only received the current knowledge, but also solved practical tasks in the field of energy conservation directly within the framework of his/her field of activity. The implementation of the program was aimed at the wide involvement of managers and specialists of the executive branch bodies of the constituent entities of the Russian Federation and made it possible to give serious impetus to the work on the transition to the sectoral management model. However, the program was terminated in 2015 due to lack of funding.

3.2. Monitoring Energy Efficiency Performance in the Fuel and Energy Complex of Russia

3.2.1. Oil and natural gas production

To analyze the general state of energy conservation and increase energy efficiency in oil and gas production, the Ministry of Energy uses the following specific indicator of energy consumption, calculated on the basis of the form No 11-TER (which was included in the form No 4-TER in 2016): “Specific consumption of fuel and energy resources for oil production, including gas condensate, kg. c.f./t.” The data collected by us from (RFSSS, 2018) is presented in Figure 1.

The indicators of specific consumption of fuel and energy resources for oil production tend to increase in most federal districts of the Russian Federation. In many ways, this is due to the systematic complication of oil production conditions, in our opinion. The gradual depletion of relatively easily accessible deposits leads, among other things, to a systematic increase in the share of hard-to-recover reserves. Therefore, the specific indicators of consumption of fuel and energy resources will tend to increase. Accordingly, in the sectors under consideration, measures to improve energy efficiency are primarily aimed at curbing the growth rates of unit costs in physical terms. Specific consumption of fuel and energy resources for the period from 2012 to 2016 increased from 19.5 to 22.7 kg c.f./t. (by 16.4%). At the same time, growth rates significantly slowed in 2015 and 2016. If in 2013 and 2014, the increase to the level of the previous year was 4.4% and 4.7%, respectively, then it was only 2.6% and 3.5% in 2015 and 2016.

Due to the fact that the sub-sector of gas production is characterized by a high concentration of production capacities, for the analysis of this sub-sector, the indicators of the program for increasing the energy efficiency of PJSC Gazprom can be used (“Specific fuel consumption for own technical needs to the volume of gas production,” t.c.f./t.c.f., Figure 2). The indicator of the specific consumption of fuel and energy resources for own technical needs for the volume of gas production tends to decrease. This indicator decreased by 8% from 2012, reaching 0.093 t.c.f./t.c.f. in 2016. The results of the international comparative analysis (benchmarking) show that the PJSC Gazprom is part of the group

of leading companies in terms of the specific consumption of fuel and energy resources for their own technical needs to the volume of gas production.

3.2.2. Oil and natural gas processing

In order to analyze the general state of energy conservation and increase energy efficiency in the oil and gas processing industry, the Ministry of Energy uses the following specific energy consumption indicators calculated on the basis of the No 11-TER form: (i) The specific consumption of fuel and energy resources for oil processing, including in the gas condensate, kg. c.f./tons; (ii) specific consumption of fuel and energy resources for gas processing, kg c.f./thous. m³. The used the data (RFSSS, 2018) are presented in Figures 3–5.

The indicators of the specific consumption of fuel and energy resources for the production in the field of oil processing

Figure 1: Specific consumption of fuel and energy resources for oil production, including gas condensate, kg c.f./t

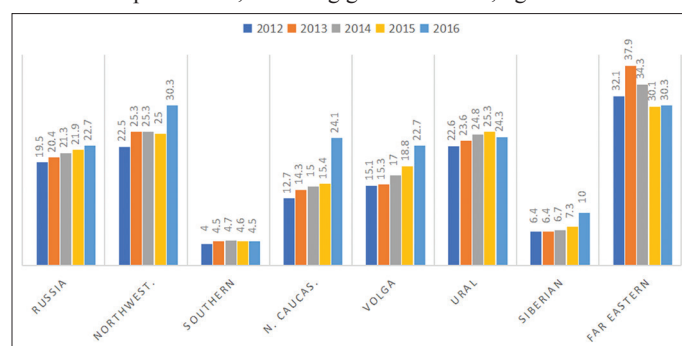


Figure 2: Specific fuel consumption for own technical needs to the volume of gas production, t.c.f./t.c.f., according to PJSC gazprom

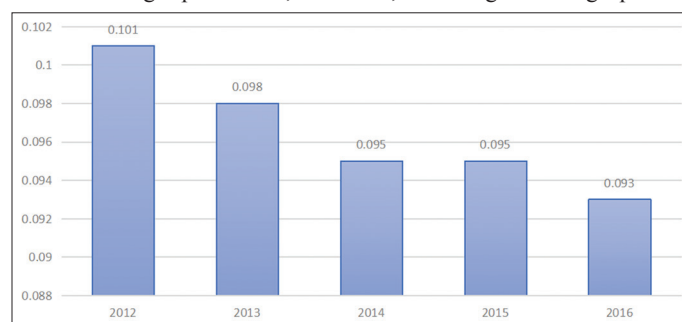


Figure 3: Specific indicators of consumption of fuel and energy resources for oil refining, including gas condensate, according to Rosstat, kg c.f./tonnes

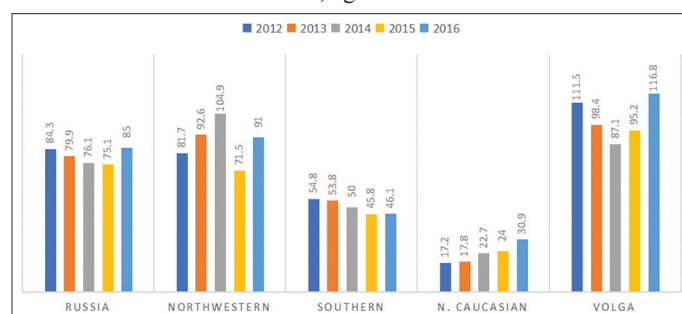
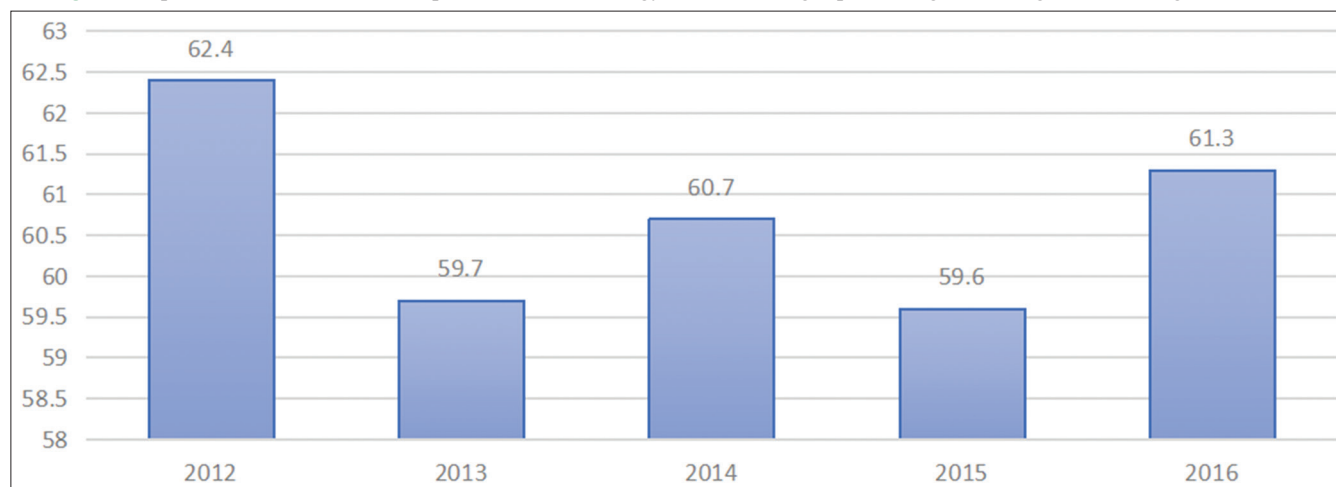
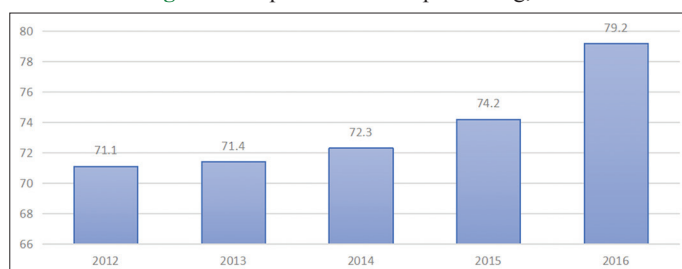


Figure 4: Specific indicators of consumption of fuel and energy resources for gas processing, according to Rosstat, kg c.f./thous.m³**Figure 5:** Depth of crude oil processing, %

(according to the data coming from (RFSSS, 2018), namely the forms No 11-TER and No 4-TER) indicate their growth in the Urals Federal District from 17.2 to 30.9 kg.c.f./tons (79.6%), in the Far Eastern Federal District - from 41.5 to 58.5 kg c.f./tons (by 41.0%). In many respects, this is connected, as we believe, with the commissioning of new primary and secondary oil refineries at the Antipinsky Refinery and the Surgut Stabilization Plant Condensate in the Urals Federal District, as well as the Khabarovsk Refinery and the Komsomolsk Refinery in the Far Eastern Federal District.

Nevertheless, the specific consumption of fuel and energy resources for gas processing in the Russian Federation as a whole is gradually decreasing. From 2012 to 2016, this indicator decreased by 1.8%, amounting to 61.3 kg c.f./thous. m³ in 2016.

To conduct a general assessment of the overall state of energy conservation and energy efficiency in the oil refining industry, the Ministry of Energy also uses the target indicator of the Energy Efficiency and Energy Development State Program of the Russian Federation entitled the “depth of crude oil processing, %.” The depth of crude oil processing for the period from 2012 to 2016 increased by 11%, amounting to 79.2% in 2016. The achieved increase was planned, as the value of this indicator grew according to the results of each year.

3.2.3. Oil transportation

The main indicator for this sector is the specific indicator of consumption of fuel and energy resources for oil transportation in comparable conditions using power ratios according to the data of Transneft PJSC, which differs from the Rosstat’s indicator. The

use of this indicator is primarily due to the non-linear dependence of energy consumption on the volume of pumped oil, which makes the use of a direct specific indicator uninformative.

The specific consumption of fuel and energy resources for the transportation of oil through the main pipelines of the Russian Federation as a whole tends to decrease. For the period from 2012 to 2016, it decreased by 10% and amounted to 1.62 kg c.f./thous. t.km. by the end of 2016. At the same time, in the Central, North-Western, Volga, Siberian, and Far Eastern Federal Districts, the growth of this indicator was observed in 2016 (Table 1).

The main factor affecting the indicators of energy efficiency of oil transportation through main pipelines is the change in the volume of pumped oil (change in turnover). In 2016, there was a significant increase in the volumes of pumped oil in the Far Eastern and Siberian federal districts, in which the lowest specific consumption rates were observed. In our opinion, in many respects, the observed dynamics is due to the planned work of the Transneft PJSC to improve energy efficiency.

3.2.4. Natural gas transportation

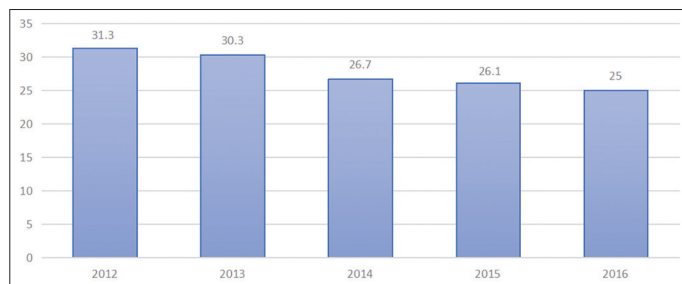
Due to the fact that the sub-sector of gas transportation has a high concentration of production capacities, the indicator of the energy efficiency program of the Gazprom PJSC, “Specific consumption of fuel and energy resources and process losses,” kg c.f./million m³ km, is used by the Ministry of Energy to analyze this sub-sector. Consequently, as the data shows (RFSSS, 2018), specific consumption of fuel and energy resources and technological losses in the gas transportation industry in the Russian Federation is gradually decreasing (Figure 6). For the period from 2012 to 2016, this indicator decreased by 20% and was 25.0 kg c.f./million m³ km in 2016.

4. DISCUSSION

Our review clearly demonstrates that Russia lacks effective energy efficiency policies in energy and fuel complex, because current policies are too fragmented and limited. In our opinion,

Table 1: Oil transportation by main pipelines, kg c.f./thous. tons

| Russia | | | | | Central | | | | | Northwestern | | | | |
|----------|------|------|------|------|----------------|------|------|------|------|--------------|------|------|------|------|
| 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 |
| 1.81 | 1.79 | 1.78 | 1.78 | 1.62 | 1.33 | 1.29 | 1.24 | 1.21 | 1.59 | 2.43 | 2.18 | 2.08 | 2.06 | 2.33 |
| Southern | | | | | North-caucasus | | | | | Ural | | | | |
| 2.79 | 2.43 | 2.31 | 2.24 | 1.94 | 2.75 | 2.73 | 2.73 | 2.72 | 2.59 | 1.84 | 1.79 | 1.69 | 1.65 | 1.52 |
| Volga | | | | | Siberian | | | | | Far Eastern | | | | |
| 1.91 | 1.89 | 1.83 | 1.68 | 1.78 | 1.18 | 1.09 | 1.07 | 1.01 | 1.24 | - | 0.95 | 0.80 | 0.63 | 1.45 |

Figure 6: Specific consumption of fuel and energy resources and process losses, kg c.f./million m³ km

they do not address a number of very important issues with respect to energy efficiency the fuel and energy complex faces systemically. More than that, the indicators used by the Ministry of Energy are not suitable to measure any substantial progress in reducing energy intensity and increasing energy efficiency, since they do not provide a comprehensive picture of the processes unfolding in this very important sector of the Russian economy. For instance, the Government of Russia relies on the values of energy intensity when tracking the progress made by the country in energy efficiency. However, this indicator may be considered useful and misleading, because this indicator is influenced by many factors not directly related to energy efficiency. Consequently, we may state that Russia has no effective mechanism of improving energy efficiency in the fuel and energy complex and no effective evaluation mechanism for tracing performance in this area and providing policy-makers with relevant and accurate information.

The government management system also does not provide any real opportunity, in our opinion, to substantially change the current level of energy efficiency in the fuel and energy complex. More than that, it does not focus on strengthening coordination between the federal center and the regions, including the key players of this sector. There is some success observed in the introduction of new technological standard that would increase energy efficiency in the fuel and energy complex of Russia. However, they came into force only in 2017, which was too late if one takes into account the development of energy efficiency policies in Russia since 2008.

With regard to financial incentives and funding, the measures proposed are too narrow and cover only the electricity market, absolutely ignoring the vast sub-sectors of the fuel and energy complex. Also, the federal Government of Russia does not provide subsidies or loans that would increase energy efficiency in the complex, which leads to one more missed opportunity. The Government of the Russian Federation, in our perspective, should much more actively participate in the development of investment schemes to finance energy efficiency in the fuel and energy

complex, especially in light of its importance for the economy of the country.

Since there is no clear evaluation mechanism that would trace energy efficiency performance, it is highly necessary to (i) conduct an in-depth assessment of the energy efficiency potential of this sector of the economy and (ii) develop an effective evaluation mechanism with appropriate indicators. In our perspective, there are also no clear casual mechanisms between the policies being adopted and the actual energy efficiency trends; therefore, the data and methodology that the Ministry of Energy relies on is so weak and, honestly, almost useless for conducting a reliable analysis. In other words, the methodology is not sensitive to actual energy efficiency trends in the industries under analysis.

In sum, despite some progress made in the field of increasing energy efficiency in the fuel and energy complex of Russia, especially in creating a legal and institutional framework, there is still a lot to be done. With the current data, it is not possible to effectively analyze past trends in energy efficiency of the country, to understand current developments, or to make any solid recommendations on how energy efficiency policies in the fuel and energy complex might be improved. Russia strongly needs a mechanism that would provide a better understanding of the factors affecting energy efficiency of the country, including the influence of the energy efficiency policies developed and conducted by the Government of Russia.

5. CONCLUSION

Being one of the most important sectors of the national economy, the fuel and energy complex of Russia has very high potential in the field of increasing energy efficiency. Our review of the energy efficiency policies in Russia's fuel and energy sector clearly shows that they are too limited and fragmented, not being able to capture the whole potential of the sector. More than that, the methodology used by the Ministry of Energy to evaluate energy efficiency performance in the fuel and energy complex of Russia is very weak and, frankly speaking, useless for making any solid conclusions and recommendations.

Consequently, we propose to conduct an in-depth study of the potential the fuel and energy complex has in terms of increasing energy efficiency in order to develop appropriate policies at the federal level. Also, our research team concludes that the evaluation mechanism should be developed in a way to be able to capture real trends and tendencies in the complex and evaluate how effective the energy efficiency policies are. Russia has a very large energy

efficiency potential, and it should use every chance to develop better policies, including in the fuel and energy complex.

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