Formation of the fuel and energy complex of Eastern Siberia in the 1960s–2010s: construction of energy enterprises

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Abstract. The article discusses the formation experience of the fuel and energy complex of Eastern Siberia. Based on the analysis of a large number of archival materials, it is shown how enterprises of oil and gas production, coal industry, and hydropower were built under the conditions of the controlled and planned economy. The geography of Eastern Siberia contemplated the construction of powerful industries, which became natural monopolies under the new economic conditions. The coal industry was mostly privatized. Today, the enterprises producing and processing oil, gas, and hydropower operate in the frame of private-public partnership. Siberia has never experienced a shortage of electricity. Its cost was low; therefore, the enterprises were highly profitable. The market economy identified new trends: strengthening of the export-orientedness of the enterprises in the energy sector; attraction of foreign investment into organizing the construction of the newest enterprises; rapid introduction of new technologies; and increase in the uneven development of the region. Summary of historical experience can serve as a source of understanding of modern economic realities.

1. Introduction

The article discusses the formation experience of the fuel and energy complex of Eastern Siberia. Based on the analysis of a large number of archival materials, it is shown how enterprises of oil and gas production, coal industry, and hydropower were built under the conditions of the controlled and planned economy. The geography of Eastern Siberia contemplated the construction of powerful industries, which became natural monopolies under the new economic conditions. The coal industry was mostly privatized. Today, the enterprises producing and processing oil, gas, and hydropower operate in the frame of private-public partnership. Siberia has never experienced a shortage of electricity. Its cost was low; therefore, the enterprises were highly profitable. The market economy identified new trends: strengthening of the export-orientedness of the enterprises in the energy sector; attraction of foreign investment into organizing the construction of the newest enterprises; rapid introduction of new technologies; and increase in the uneven development of the region. Summary of historical experience can serve as a source of understanding of modern economic realities.

2. Problem Statement

By the early 2020s, it became apparent that the Western model of globalization, relying on the strength and dominance of one center in the world, had become tarnished. Gradually, regional centers of “installation” of a new economic reality began to form. Russia became one of such centers. Its past Soviet experience in industrialization, including the experience in the formation of the fuel and energy complex, is used today by China. The growing economies of Asian countries suffer a shortage of energy;
therefore, they need it. To some extent, they push the development of new technologies in Russia. The political stability of our country, development trend, lack of desire to weaken our neighbors, and equal partnership attract more and more Asian economies to cooperate with Russia. In this case, studying the economic experience of the past is always relevant. That will contribute both to a new understanding of the economic realities of our country and to the formation of prospects for its development (international, too). This fact determines the relevance of new research on this issue.

3. **Purpose of the Study**

The studies on the development of the energy sector in Eastern Siberia were mainly completed quite a long time ago, and they concerned the Soviet period. One of the first studies was the book by Ya.A. Mazover [3], where he briefly dealt with Eastern Siberia as well. Of great interest are the parallel studies of V.V. Alekseev [4] and A.N. Zykov [5]. They describe the initial period of large-scale electrification of Siberia. Cheap electricity allowed building large enterprises of heavy industry in tens. Siberia developed very dynamically in the 1960s–1970s. Therefore, such material was reflected in I.I. Komogortsev, G.N. Harin, V.S. Balakin, G.S. Prazdnov, V.V. Chernyh and others. The development of the national republics of Siberia, including Buryatia, was especially closely studied [6]. However, there were some blank gaps even in avalanche publications. With the collapse of the USSR and the destruction of the Soviet economic system, many enterprises disappeared. However, this hardly affected the energy sector, especially large enterprises. Enterprises were updated, sales markets were optimized, and innovations began to be actively introduced. Scientific research was also adjusted by the formation of market mechanisms: lots of publications of narrowly focused economic content appeared; the authors used one or several enterprises of a similar profile as a factual base. That did not allow evaluating the development of industries as a whole. The purpose of this article is to summarize the historical experience of the formation of the fuel and energy complex of Eastern Siberia over the past half century using the more comprehensive systematic approach. An attempt was made to determine trends in the energy sector development, as well as changes in the configuration of its sub-sectors. The study is based on the wide use of data from state archives, many of which are first-ever to be introduced into scientific field. That will close some gaps in the history of the region.

4. **Research Methods**

The study used both general scientific methods (comparison, description, induction, deduction, generalization, etc.) and methods of historical research (chronological, historical genetic, and comparative historical). A large array of analyzed data entailed the use of statistical and historical sociological methods. The whole set of possibilities, classification, and the systemic method allowed recreating an objective scientific picture of the issue under consideration.

5. **Research Questions**

The fuel and energy complex includes industries related to the extraction and production of energy resources, their processing into other types of fuel, conversion to other types of energy, as well as industries related to the transportation of this energy to consumers. Its formation in the USSR was an urgent need in the harsh climate and vast territory. Siberia played a special role with its rich and various natural resources: brown and fossil coal, water, and hydrocarbons. The country's government relied on a scientific approach and state planning. As far back as 1947, a conference was held to study the productive forces of the Irkutsk region. In the report of academician A.V. Vinter, Eastern Siberia was noted to be unique in terms of energy resources: 37% of potential reserves of water energy, high-quality coals of various grades. The necessity for the construction of the cascade of hydroelectric power stations on the Angara River was expressed in the report. Energy-intensive industries on local raw materials were to become the main energy consumers [7]. Six hydropower plants were planned to be built;
however, there were only four to be eventually built. The Irkutsk Hydroelectric Power Station became the first of the 4 built stations. Many pilot solutions were tested in it [8]. Then the Bratsk Hydroelectric Power Station (main construction 1954–1961, and then until 1966) and the Ust-Ilimsk Hydroelectric Power Plant (main construction 1962–1974, and then until 1979) were built and launched. They constituted a powerful core around which territorial-industrial complexes began to form [9].

The Krasnoyarsk Hydroelectric Station on the Yenisei River (main construction 1956–1967, and then until 1971) remained the most powerful in the country for a long time. To meet the demand for electricity in the north of the Krasnoyarsk Territory, the Ust-Khantai Hydroelectric Power Station was built (1970–1972). That made it possible to increase the electric power generation in the Krasnoyarsk Territory from 33.8 billion kWh in 1970 to 44.7 billion kWh in 1974 [10]. It amounted to 57 billion kWh in 1980 [11].

The eighth and ninth five-year plans were periods of powerful investments in the energy sector of the Krasnoyarsk Territory. They amounted to 361.1 and 928.6 million rubles in the eighth and ninth five-year plans, respectively [12]. This allowed not only expanding a number of thermal power plants, but also directing money to reconstruction of facilities and equipment modernization. Sayano-Shushenskaya Hydroelectric Power Station on the Yenisei River was gradually being built. It is unique in many respects. However, eliminating design errors took a lot of time and money. Its construction entered its most active phase in 1978 and was finally completed in 2014 with the liquidation of the consequences of the 2009 accident.

The change in the economic structure and forms of ownership intensified the construction of the fourth hydroelectric power station on the Angara (the Boguchanskaya hydroelectric power station). The first preparatory work started in 1974. However, its construction completed only in 2012–2014 due to the lobbying of the project by Oleg Deripaska, RUSAL (Russian Aluminum). The share of hydropower in Siberia has always been high, and in 2017 it reached 46% [13]. In Russia, only the Volga and Angara Rivers have cascades of large hydroelectric power stations, the first five most powerful ones of which are located in Eastern Siberia. Thus, it became possible to preserve and build new energy-intensive industries in the region. The development of older enterprises is carried out in line with the equipment modernization and the production reconstruction. Newer enterprises expand and introduce new hydraulic units.

As compared to hydropower enterprises which were located in the Irkutsk Region and the Krasnoyarsk Territory, coal mining was carried out in all the four regions of Eastern Siberia. This is the most traditional form of natural resources, and its active (albeit small) development was carried out since the beginning of the twentieth century. Large-scale post-war development plans for the eastern regions of the country (especially since the early 1960s) gave a new impetus to the development of the coal industry. In the Irkutsk Region, coal mining is conducted by Vostsibugol, a company established by the state in 1945 as a regional coal mining enterprise. The peak of its development occurred in the 1970s [14]. During Perestroika, it changed its ownership several times and found Irkutskenergo as a parent company. Today, work is carried out at seven open-pit mines (mines have died), including the Cheremkhovsky and Tulunsky ones.

In the Krasnoyarsk Territory in the 1970s, coal was taken both by mines (mines of Abakan, Yenisei, Kotuy) and by open-pit mining. From the 1970s, huge deposits of brown coal were actively developed at the Berezovsky, Nazarovsky, Irsha-Borodinsky open-pit mines. The equipment modernization, introduction of new machines, use of inventions and efficiency proposals, as well as environmental events became permanent [15]. Brown coals became the basis for the heat generation of several areas. The Berezovskaya state district power station became the largest enterprise in the Krasnoyarsk Territory. In February 2016, the billionth ton of coal from the date of launching was mined at the Borodinsky open-pit mine. Today it is a huge field measuring seven by two kilometers, where the square of stripping operations is more than two thousand hectares. Two most powerful excavators in Russia (ERP-2500) work at this open-pit mine. In 2013, the open-pit mine was named after the legendary USSR Minister of Coal Industry M.I. Shchadov.

Fossil coal is mined at the Izykhsky and Chernogorsky open-pit mines in Khakassia (the Krasnoyarsk Territory). The Chernogorsky open-pit mine dates back to coal works of 1907 but it began to develop
actively in the 1960s and 1970s. The staff of the enterprise worked tirelessly to increase production efficiency and introduce best practices. During the tenth five-year plan, more than 10 million tons of coal was mined. The average monthly labor productivity per worker reached 308 tons. The prime cost of one ton of high-quality coal was 6.09 rubles [16]. Today, the open-pit mine is part of the Siberian Coal Energy Company (SUEK) and is actively being developed. Records are still setting at this open-pit mine. In January 2016, the team of V. Yarosh set a world record for the shipment of stripping soils over the month (1075 thousand cubic meters) [17].

The coal industry of Transbaikalia developed in the 1970s at a more modest pace. The Gusinozerskaya mine in Buryatia and the Vostochnaya mine in the Chita region experienced some difficulties. They were connected with roadways in coal seams. The Bukachacha mine was considered more successful. But it also could not be called trouble-free. In the 1970s, the party committee regularly reviewed issues related to the elimination of accidents and fires in the mine, whereas the issues of scientific and technological progress were never discussed (!). Despite the reconstruction, the share of manual labor was 40% in 1985 [18]. Due to its unprofitability, the mine was closed in 1998.

Since the late 1970s, the government relied on open-pit coal mining as cheaper and safer one. In 1978, the Holboldzhinsky open-pit mine was launched. The Kharanorsky open-pit mine (launched in 1970) began to work more actively. Its design capacity is 5 million tons of brown coal per year [19]. After technical re-equipment in 1990, 9 million tons of coal was mined. At the turn of the century, in 2002, in the course of industry optimization, the open-pit mine became part of SUEK (Siberian Coal Energy Company). Serious investments and competent management have made the enterprise performance sustainable and profitable. Old traditions are supported and filled with new content at this open-pit mine. In Soviet times, there was a “club of millionaires” at the Kharanorsky open-pit mine. It was a competition between teams for the extraction of one million tons of coal. Nowadays, the financial side has added to moral incentives: such a team receives a prestigious car and one million rubles for all team members.

In the 1970s, the rich Tugnuisky coal-bearing area on the border of Buryatia and the Chita region was considered promising. It began to be developed in 1989. But almost immediately, the Tugnuisky open-pit mine fell into a zone of instability along with the country and survived due to barter for several years. In 2001, he became part of SUEK. Sustainable development of this open-pit mine is associated with the appointment of Valery Kuletsky as the Director General in 2008. In recent years, coal mining has tripled and amounted to 14 million tons in 2018 (totally, 439.3 million tons of coal was mined in Russia in 2018) [20].

Considering energy in general, we mean first of all traditional energy based on coal, hydrocarbons, water. For Eastern Siberia, there was no need to build nuclear power plants and develop unconventional sources of energy using the sun and wind. Another peculiarity of Eastern Siberia was due to the vast territory and underpopulation. Industrial enterprises are grouped in a very limited area and are always tied to powerful energy sources. Territorial-production complexes arose and developed this way. Energy enterprises are almost always very large. That is why almost all of them survived the difficult perestroika period. Over the past thirty years, private property has developed and strengthened in Russia. There are public-private partnerships in the hydropower field. Almost all coal enterprises have become private and are part of large holdings. Thus, almost 60% of the coal mined in 2018 accounted for seven companies. The leader is SUEK, which accounts for a quarter of Russian coal mining. The enlargement allowed reducing costs, increasing profitability, and implementing investment projects. The industry is developing dynamically. Russia is on trend since over the past forty years, coal in the world’s electricity production has permanently been 38–39% [21]. In the 21st century, Russia became a reliable exporter of coal.

The development of oil and gas production concentrated in Western Siberia for a long time. However, geological exploration yielded positive results both in the Irkutsk region and the Krasnoyarsk Territory. Thus, in the Krasnoyarsk Territory, by the mid-1970s, the Nordvik oil deposit and such gas deposits as Pelyatkinskoye, Kazantsevskoye, Nizhne-Khetskoye, Sukhotungusskoye, and Kuyumbinskoye were explored [22]. The exploitation of the Messoyakha and Soloninsky gas deposits was launched. However,
the region economy could not be called energy-deficient; therefore, there was no special economic sense
to develop oil and gas deposits.

Everything changed with the advent of a new economic reality, shift or change in world development
trends, gradual acquisition of strength and new opportunities by Russia. Having surveyed its Siberian
resources [23], in the 2000s, Russia started its turn to the East, to Asia. China met this turn positively
since economic interests of both countries coincided [24]. The Eastern Siberia-Pacific Ocean oil pipeline
(ESPO) was the first major interstate initiative implemented. Oil from Western and Eastern Siberia
began to be destined for Japan and China. In 2019, the Power of Siberia gas pipeline was launched. Gas
from the Kovyktinskoe and Chayandinskoe fields of the Irkutsk region went to China. This project
confirmed the farsightedness of China, which, in the context of the unfolding trade war with the United
States, relied on Russia [25]. The game on foreign oil trade markets, building positive relations and
equal partnership with Asian neighbors open up new prospects for our country. The construction of the
second stage of the ESPO and the Power of Siberia-2 gas pipeline is planned. Thus, Russia is actively
involved in Eurasian integration processes [26].

The development of the North is very important today. In 2009, the commercial operation of the
Vankorsky oil and gas field was launched. It was opened in 1988, 140 kilometers far from Igarka (the
Krasnoyarsk Territory). Together with the Lodochny, Tagulsy, and Suzunsky deposits, it forms the so-
called Vankorsky block. Today, Russia attracts foreign investment (in particular Indian) to further
develop this cluster. To develop the natural resources of the Arctic [27], Russia attracts China since it
will also get preferences from the development of Siberian hydrocarbons [28]. The new century has
opened up new opportunities in the development of hydrocarbon production in Eastern Siberia. On the
one hand, the rapid development of Asia has helped diversify markets towards the Asia-Pacific region
(APR). On the other hand, with the increase in foreign trade and the growth of Russian own economy,
it has become possible to invest heavily in the construction of ultramodern industries. To some extent,
investor interest has shifted to the rapidly growing oil and gas industry. The development of the energy
sector leads to the development of infrastructure and electric power industry. All that serves as a stable
basis for economic growth. It can be stated that the adaptation to new realities and the formation of new
development trends have occurred.

6. Conclusion
The authors can summarize all the foregoing as follows:

1. For more than half a century, Eastern Siberia has been and remains a place where traditional
types of energy based on the rich natural resources available are developed. Large enterprises
remain stable and have the potential for their further development in case of high and modern
managerial competence.

2. According to the past experience, private, joint-stock form of ownership is more effective in a
number of cases: when the value of the enterprise is not prohibitively high and when the capital
stock is available both financially and technologically. This conclusion is confirmed by the rapid
development of the coal industry in the 21st century.

3. More complex and high priced hydropower and hydrocarbon industries require public-private
partnerships since neither large investment nor interstate initiatives are possible without the
organizing role of the state. The market economy stimulates the exploration of the new but does
not impede the development of the old, economically sound and cost-effective.

4. Restructuring of the economy under the new economic and old geographical conditions in
Siberia led to the formation of natural monopolies. Under the state supervision, such companies
as SUEK, Gazprom, and others serve as a driver of economic growth and territorial
development. Large enterprises are trying to support traditions, develop the social component,
and take care of the environment.
5. Strengthening of the export-orientedness has become a new trend in the 21st century. In conditions of relative overproduction, enterprises trade and cooperate with foreign partners successfully.

6. In our opinion, there has been some reconfiguration of the subsectors. The share of coal remains stable, the share of hydropower decreased slightly, and the share of oil and gas increased. Moreover, the course towards deeper hydrocarbon processing is well-established.

7. Under the conditions of the controlled Soviet economy, the government tried to develop territories more or less evenly. Under the conditions of several decades of the market economy, the gap widened between the Krasnoyarsk Territory and the Irkutsk Region on the one hand, and Transbaikalia on the other hand. In the first case, we have a complete set of energy resources and a complete set of enterprises, accordingly. In the second case, the lack of oil and gas leads to a “downfall” of the economy, as evidenced by numerous indicators.

It is possible to assume that some generalization of historical experience allows us not to get lost in the present. The power economy development can be assumed to serve as an indicator of the development of the economy as a whole.

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