The problems and prospects of the public–private partnership in the Russian fuel and energy sector

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Abstract. This article highlights some opportunities for shifting the paradigm for the development of natural resources in the Russian fuel and energy sector using public-private partnership instruments. It shows three main directions for developing public-private partnerships in the area of subsoil use and emphasizes the role of innovations in implementing the most promising projects in the fuel and energy sector of Russia.

1. Introduction

The fuel and energy sector (FES) plays a significant role in the development of Russia, with its substantial resources able to meet the country needs and ensure reasonable exports. According to the \textit{BP Statistical Review of World Energy} of June 2016, Russia is ranked second in the world’s natural gas reserves, sixth in oil and seventh in coal reserves at the end of 2015. Table 1 shows Russia’s share in the world’s energy resources in 2015, namely 17% of gas, 6% of oil and 6% of coal [1].

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Rank in world} & \textbf{Type of fossil fuel} & \textbf{Total proved reserves} & \textbf{Reserves-to-production (R/P) ratio} \\
\hline
2 & Gas (trillion metres cubic\textsuperscript{***}, trillion feet cubic\textsuperscript{***}) & 32.3\textsuperscript{***} & 56.3 \\
6 & Oil (thousand million barrels */ thousand million tones**) & 102.4* & 25.5 \\
7 & Coal (anthracite and bituminous****/ sub-bituminous and lignite*****, million tones) & 101.5**** & 89.8 \\
\hline
\end{tabular}
\caption{Russia’s share in the world fossil fuel reserves at end 2015 [1].}
\end{table}

Russia is the largest producer and exporter of fossil fuel in the world market. In 2012–2014, Russia ranked first/second in oil production (including gas condensate), sharing the place with Saudi Arabia (12.7–12.9% of world production in 2014), and was the world’s second largest oil exporter. It was the second largest natural gas producer (19.6% in 2013, 16.7% in 2014) after the USA (21.4% of world...
production in 2014) but consistently the largest gas exporter. Russia ranked sixth in coal mining (4.3%) and third in coal exports [2]. According to the Energy Research Institute of the Russian Academy of Sciences, Russia’s FES accounted for about 30% of the country’s GDP and consolidated budget in 2015. The share of energy resources in total export proceeds amounted to 56% in 2015 [3]. Table 2 indicates that according to the Forecast of Energy Production in Russia and the World, the FES will continue to drive the Russian economy up to 2040.

Table 2. Fuel and energy sector in Russian economy [3].

| Indicators                                          | 2015 | 2040 |
|-----------------------------------------------------|------|------|
| Share of fuel and energy sector in gross domestic product (%) | 31   | 15   |
| Share of prime energy in export (%)                 | 56   | 26   |
| Share of prime energy export in gross domestic product (%) | 16   | 6    |
| Share of fuel and energy sector in consolidated budget (%) | 30   | 14   |

With its largest resource base, Russia also has a high energy saving potential reaching a third of the current energy consumption, as well as a possibility of significantly increasing the cost-effectiveness of energy projects. However, the exaggerated role of the FES in Russia and its predominantly extensive development has a negative impact on the economy, holding back its development.

The exaggeration of the FES role in Russia has resulted in the formation of a “dual enclave economy,” which is most commonly studied in the context of the “resource abundance” and “resource curse” theories. These terms were used by Sachs, Warner, Gelb and Auty to explain the reasons for the lag in the development of countries with considerable natural resources [4–7]. Later on, Stiglitz linked the problems of “resource-based economies” with the presence of certain enclaves that are quite isolated from each other and use different mechanisms of reproduction [8]. Modern Russian and international studies tend to describe the Russian economy as a “resource-based economy” or a “dual enclave economy” with the features as follows:

- the presence of two or more sectors (enclaves) isolated from each other;
- a high proportion of high-yielding, extensively developing, export-oriented industries involved in the extraction of natural resources;
- a small share of manufacturing industries represented by mainly simple process-based production;
- poor development of industries in the domestic market;
- incomplete processes of market transformation manifested in the underdeveloped domestic market and infrastructure;
- strong dependence on global markets and global, vertically integrated companies;
- low receptiveness to innovative development;
- fusion of business and authorities and their rent-seeking behaviour; and
- the presence of inefficient institutions (rules of the game) preserving the current situation [9-12].

The FES itself is experiencing some negative effects of the enclave economy such as a deteriorated resource base due to the depletion of existing fields, reduced size and quality of new geological discoveries, and increased costs of developing complex and distant provinces. Today, Russia’s FES has highly depreciated production assets and outdated technologies, and is too dependent on imported equipment, materials and services, as well as on unstable external energy markets. These problems were exacerbated by a steadily decreasing demand for energy and its prices in the world market, as well as an outbreak of a geopolitical crisis in 2014 leading to the introduction of sanctions against Russia and making it impossible for the country to continue its development by mainly producing natural energy resources and selling them in the external market. There arose an urgent need for seeking a new model of the FES development. The solution seems to lie in a shift from the extensive use of natural resources to an integrated exploitation of natural resources, with sustainable socio-
economic development of the regions and mutually beneficial partnership relations between science, authorities and business on the principles of public-private partnership (PPP) [13]. All these factors give rise to a pressing need for seeking potentially productive directions for, and forms of, PPPs aimed at finding a new paradigm for developing the Russian FES.

The purpose of this paper is to identify possible directions for PPPs involving science, authorities and business in the fuel and energy sector that have good prospects in the specific Russian conditions.

2. The problem discussion

PPPs are still quite rare in the Russian FES, although the country’s leadership and the Energy Strategy of Russia for the Period until 2035 emphasise the plans to use PPPs as an effective tool for import substitution and cross-sectoral cooperation that should help to attract investment and “form a domestic scientific, technological and industrial base for designing and producing high-quality power equipment and providing services in the key technological areas to ensure the FES sustainable operation and development” [13]. There are three main reasons for that, namely: (1) Russia does not have a clear conceptual approach to PPPs, (2) the national PPP model is still in its infancy in Russia, with no clear PPP laws, standards and project models, and (3) Russian legislation has a number of serious limitations on using PPP projects in the energy sector.

Among the most authoritative studies of PPPs are those by Osborne, Steven, Klijn, Teisman, Hodge, Greve and Yescombe et al. [14–18]. A few conceptual approaches can be found in the foreign and Russian theoretical studies, differing in their understanding of the PPP role and place in the modern market economy. The first approach takes a broad view of a PPP defining it as any form of cooperation between business and authorities, including joint ventures, corporate social responsibility, charity, even government subsidies, and financial and organizational support for business [19]. This broad approach can show the role of PPPs in the public sector, as well as offer possible directions for joint participation of business and government in the FES development. However, it seems unable to identify PPP features, mechanisms and forms, or their benefits and risks. The main drawback of this approach lies in its inability to clearly define priorities and boundaries for the use of PPPs in the fuel and energy sector.

The second approach is based on the concept of “New Public Management” (van Ham, Koppenjan, Gerrard, Savas, Delmone, Varnavskiy, Deryabina and Kholodnaya) [20–24]. This approach defines PPP as a way of introducing the instruments of commercial project management into the traditional branches of the public sector (medicine, healthcare, protection of public order, public utilities) and of strengthening public property management in the infrastructure sectors, for example, in transport. In other words, PPP is conceptualized as an instrument of state regulation and an alternative to privatization. This approach focuses on adopting foreign organizational schemes and ways of financing projects used in developed countries. Its main advantage is in a detailed analysis of PPPs as a form of interaction between business and authorities, while its main drawback is its focus on the experience of developed countries only. Most followers of this approach do not analyze country-specific PPP models; nor do they consider a possibility of using PPPs in the fuel and energy sector. With some reservations, we can say that this approach is most prevalent in the Russian and foreign literature.

The third approach, most suited for a possibility of using PPPs in the fuel and energy sector, defines PPP projects as an instrument of national, international, regional and municipal economic and social development, and as a way of overcoming the economic crisis in some countries and sectors (Brinkerhoff, Brinkerhoff, Agere, Kontorovich, Nikitenko, Goosen et al.) [25–27]. It clearly defines such PPP features as a project form (a PPP is a long-term project with a clearly defined timeframe), a voluntary and mutually beneficial co-operation between partners, a formal nature of this co-operation based on contracts and agreements with a clear structure of interaction and division of risks and benefits, and a joint participation of business and authorities in the financing, management and/or implementation of the project [12]. At the same time, this approach admits a possibility of PPPs taking the form of a project but not possessing all the PPP features described above. The term “quasi-PPP”
(“almost” PPP) has been offered to distinguish such projects from the “classic” PPPs [27]. We believe that it is the third approach that can identify potentially productive areas and specific features of PPP development in the Russian fuel and energy sector.

Let us take a closer look at the Russian experience of PPP development. The Russian market of PPP projects began to formally develop following the Federal Law N 115-FZ “On Concession Agreements” of 21.07.2005. The period of 2005-2015 saw a rapid increase in the number of projects and investment volumes. By the middle of 2016, 1339 projects had been approved for implementation, of which 873 are already underway, according to the Unified Information System of Public-Private Partnerships in the Russian Federation (PPP-info). Table 3 shows a tenfold increase in the number of projects in 2014-2016. It is noteworthy that the Siberian and Far Eastern Federal Districts, where the main resource companies are based, were among those which saw the greatest growth in the number of projects [28].

**Table 3. The quantity of PPP projects in Russia as per PPP Information Portal, 2013-2015 [28].**

| District                        | Number of PPP projects by year | Growth from 2014 to 2015 (times) |
|--------------------------------|--------------------------------|----------------------------------|
| Central Federal District        | 59                             | 14                               |
| North-western Federal District  | 46                             | 5                                |
| Volga Federal District          | 36                             | 10                               |
| Southern Federal District       | 14                             | 6                                |
| North Caucasian Federal District| 9                              | 7                                |
| Ural Federal District           | 25                             | 4.5                              |
| Siberian Federal District       | 103                            | 11                               |
| Far Eastern Federal District    | 19                             | 36                               |
| Russian Federation (total)      | 311                            | 9.8                              |

The sectoral analysis shows that most Russian PPPs are based on concession agreements in the infrastructure and social sectors, with very few PPPs set up in the energy sector. In 2015, for example, only five PPP projects out of 1285 belonged to the area of subsoil use, according to the PPP-info database.

All FES-related PPP projects can be divided into three groups. The first group is made up of projects aimed at creating sector-specific mineral productions on the basis of concession agreements and production sharing agreements. Examples of this type of Russian PPPs include development projects in the Elga coal deposit (Republic of Sakha, Neryungri district) and oil and gas fields of Evenkia (Yurubchensko-Tokhomskoye, Kuyumbinskoye, Nizhneangarsk group, and Sobinsko-Teterinskaya group). With some reservations, this group can also include a number of raw hydrocarbons development projects with a share of foreign investment, based on production sharing agreements, namely: Sakhalin-2 Project, including the Piltun–Astokhskoe oil and gas condensate field, and the Lunskoe gas condensate field; the Sakhalin-1 project, including the Chayvo, Odoptu and Arkutun–Dagi oil and gas fields; the Khariyaga project; and the development of the Samotlor oil and gas field. It is noteworthy that such PPPs do not really change the paradigm of subsoil use, retaining the predominantly extensive nature of the FES development and reinforcing the dependency of “host regions” on the extraction of resources and the dual enclave development. However, abandoning such projects at this stage would be unreasonable as they attract foreign investment and can mitigate the effects of the economic crisis, supporting the current state of the FES [31].

The second group of PPP projects focuses on the development of industrial and social infrastructure in the resource extraction regions, creating conditions for a sustainable use of natural resources, deep processing and beneficiation of the extracted minerals.

A good example of such projects is the construction of a complex of refineries and petrochemical plants in Nizhnekamsk initiated by the government of Tatarstan and PAO Tatneft, the main private partner, investor and project coordinator. The project aimed to set up facilities for processing Tatarstan
oil near the site of its production; replace oil exports with the realization of high-quality oil products on the domestic and foreign markets, which is in line with Russia’s strategic objective; improve the environment by producing environmentally friendly fuels and complying with stringent emission requirements at the design stage; and apply the advanced world technologies. This integration of refineries and petrochemical plants in a single production facility will give impetus to intra- and interregional integration of companies in the region. The first stage of this PPP project has already created over 3,000 new jobs, with new housing, a kindergarten and a sanatorium built for its workers [22, 26]. The distribution of “duties” between the partners is also noteworthy. As a private partner, PAO Tatneft contributed its own funds to the construction of production facilities, while the government of Tatarstan used the Investment Fund (Investfond) to upgrade the external infrastructure such as access tracks, an oil pipeline with a pumping station and a pipeline for the finished products. About 16.5 billion roubles of budget investments was allocated for this project from the Investment Fund, its total cost amounting to over 200 billion roubles. The construction started in 2006 and is now in its final stage [26]. The PPPs of the second type generally have a significant social component. They involve large-scale upgrades in the transport, energy and social infrastructure and aim to improve the social and economic environment by raising employment, living standards, etc. And although they do not produce any fundamental changes in the paradigm of subsoil use, they are much more oriented towards its shift than the first group.

The second PPP group also includes those projects which are components of such mega-projects as Ural Industrial-Ural Polar, the Comprehensive Development of the Lower Angara Area, the Comprehensive Development of South Yakutia, etc. These are long-term multisectoral projects aimed at a large-scale development of new territories. Their implementation involves development institutions and major vertically-integrated companies operating in the energy and mineral resources sectors. All these projects were thoroughly assessed and approved by the RF government. Trans Urals accounted for 62% of total investment in the mega-projects exceeding 150 billion USD, i.e. over 10% of Russia's GDP. They focus on sustainable, balanced and competitive development of problem areas. Table 4 shows some examples of such projects.

Table 4. Russian PPP projects in the fuel and energy sector [29].

| No. | Project name                                                                 | Duration      | Industry classification                                                                 | Project status |
|-----|------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------|----------------|
| 1   | Elaboration of project documentation for the investment project, “The Comprehensive Development of South Yakutia” | 2008-2013     | coal mining, enrichment, energy                                                         | federal        |
| 2   | Building the transport infrastructure for the development of mineral resources in the southeast of the Trans-Baikal Territory | 2007-2016     | enrichment, transportation                                                              | federal        |
| 3   | A complex of refineries and petrochemical plants in Nizhnekamsk              | 2006-2012     | petroleum refining                                                                      | federal        |
| 4   | Ural Industrial–Ural Polar                                                   | 2005-2015     | extraction of natural resources, transportation, energy                                 | federal        |
| 5   | The Comprehensive Development of the Lower Angara Region                     | 2006-2015     | transportation, energy, nonferrous metallurgy                                          | regional       |
| 6   | A complex for processing Northern Caspian gas into ethylene, polyethylene and polypropylene (step I) | 2011-2015     | gas processing, energy and transport infrastructure                                    | regional       |
| 7   | Construction of the Kyzyl–Kuragino railway line for the development of mineral resources in the Republic of Tyva | 2008-2016     | transportation                                                                         | regional       |
The Comprehensive Development of South Yakutia project was approved in 2007 under the Scheme for Comprehensive Development of Production, Transport and Energy in the Republic of Sakha (Yakutia) until 2020. This PPP project aimed to create a new large industrial zone in the Far East of Russia based on the region hydropower and mineral resources such as natural gas, apatite, coal, iron and uranium ores, etc. It was planned that 25% of its total cost would come from the public funds (Investment Fund) and 75%, from private investors.

The project intended to design and build the following facilities: the Kankunskaya hydropower plant (HPP), the Elkon mining and metallurgical combine (MMC), the South Yakutia mining and metallurgical association, the Inaglinsky coal complex and the Yakutia gas production centre, as well as build roads (Tomмот–Elkon MMC, Maly Nimyr–Kankunskaya HPP), railways (Tomмот–Elkon MMC, Taezhnaya–Taezhny mining and beneficiation combine (MBC), Chulbass–Inaglinsky coal complex, Ikabekan–Tarynnakhsky MBC, Kosarevsky–Selidarsky mining and chemical complex (MCC)), and an electrical grid infrastructure (the Kankunskaya HPP–Neryungri high-voltage line and the Neryungri substation, the Kankunskaya HPP–Aldan high-voltage line and the Aldan substation, and power supplies for the Elkon MMC, the Tarynnakhsky and Taezhny MBCs, the Inaglinsky coal complex and the Selidarsky MCC).

The project was to remove infrastructure constraints and facilitate the socio-economic development of the region; ensure high rates of economic growth; contribute to an increase in the economically active population in Yakutia, one of the least populated regions in Russia; provide income growth and improved living standards; and increase revenues in the budgets of all levels. It also intended to create conditions for the development of new deep processing facilities, diversify Russian exports, etc. The project had a federal status and, apart from the federal and regional funds, involved such private investors as the Almazredmetzoloto uranium holding, RusHydro, AK ALROSA, EVRAZ, Gazprom, UK Kolmar and other large, national, vertically-integrated companies. A total of 24.8 billion roubles, including over 7.4 billion roubles from the RF Investment Fund, was spent on the Comprehensive Development of South Yakutia, mainly on the design works.

However, despite the enormous investments, the project has not been implemented in full for various reasons, including international economic sanctions, the changes on the world markets of raw materials leading to a sharp drop in the prices for uranium, coal and oil, etc. Yet, the problem seems to lie much deeper. This PPP model—a large investment project involving big companies and development institutions—has been unable to break the inertia of Russia's mineral resource base focused on the extensive use of natural resources. Its experience showed that both businesses and public authorities were most willing to get involved in those parts of the project which were related to the development of new deposits. The private companies built the Inaglinsky coal complex, whereas the government developed its infrastructure.

On the whole, the government contributed 3.2 billion roubles to the Comprehensive Development of South Yakutia invested in the construction of the Chulbass–Inagl railway line, a transmission line and a 110 kV substation. By 2016, the Eastern Siberia–Pacific Ocean (ESPO) oil pipeline had been laid across the south of the republic and the Berkakit–Aldan–Tomмот railway had been built. The ongoing projects include the construction of the Power of Siberia gas pipeline and the renovation of Lena Highway. Among the completed facilities are new power lines and a connection to the power grid of the Far East. Much less “lucky” were energy, deep processing and social infrastructure facilities. The issue of expanding the reproduction of the regional resources was also left unaddressed [29].

Even less successful was the Ural Industrial-Ural Polar project launched in 2005. This project was supposed to be able to solve such problems as inadequate investment in the engineering sector, power shortages, underdeveloped energy and transport infrastructure, and the dependence on imported raw materials. A significant part of the investments was assumed to come from the commodity sector through active government policies. The total investment in the project amounted to 543.8 billion roubles in 2006 prices, namely 105 billion roubles from the RF Investment Fund, 79.1 billion roubles from the Ural Federal District, and 359.7 billion roubles from private investors.
The project was supposed to create a unique industrial and infrastructural complex based on the integrated development of natural resources in the Subpolar and Polar Urals, and to construct the key components of the basic transport and energy infrastructure. Its aims were to radically improve the industrial raw materials base, upgrade the transport and energy infrastructure in Russia and the Urals in particular, accelerate the development of regional economies through their large-scale innovative diversification, develop social infrastructure in the new industrial areas, and raise the standard of living and the quality of life for people in the Ural Federal District. The Ural Industrial-Ural Polar project was planned as a model for a new integrated approach to developing mineral resources and territories. It contained three main components—transport, energy, and natural resources. In the core of the transport component was a project to build a Polunochnoye–Obskaya railway line along the eastern slope of the Urals which, together with the Obskaya–Bovanenkovo and Obskaya–Salekhard–Nadyrn lines and the Salekhard–Agirish–Urai–Tyumen road, was to provide the shortest link between the industrial Urals and the mineral deposits in the Polar Urals and the oil and gas area, ensuring access to the Northern Sea Route to Norilsk. The energy component involved the construction of power lines and four power plants with a total capacity of 2544 MW to run on local raw materials. Its objective was to provide reliable power supplies for the existing and future customers in the new economic zone. The natural resources component envisaged opening 18 to 60 mining, processing and woodworking enterprises. The area under development exceeded 390 thousand sq. km. The project implementation involved over 100 companies and a specially set up management company, OAO Urals Industrial-Urals Polar Corporation, later renamed to AO Development Corporation. The company’s shareholders were such regions in the Ural Federal District as Khanty–Mansiysk Autonomous Okrug—Yugra, Yamalo–Nenets Autonomous Okrug, Tyumen Oblast, Chelyabinsk Oblast, Sverdlovsk Oblast, and the German company DB International GMBH. AO Development Corporation prioritized cost-effective investment projects based on PPP principles and capable of increasing the competitiveness of the regional economies, encouraging their diversification and investment activities, removing infrastructure constraints and cultivating new points of economic growth in the Ural Federal District. Its Board of Trustees, consisting of the RF President's plenipotentiary to the Ural Federal District and the governors of Khanty–Mansiysk Autonomous Okrug—Yugra, Yamalo–Nenets Autonomous Okrug and Tyumen Oblast, is responsible for the development strategy of both the corporation and the project [30, 31].

However, just as the mega-project described above, Ural Industrial-Ural Polar has not been implemented in full. Experts believe the reasons for the failure of both mega-projects include their long duration, high risks and complexity, overestimated mineral resources, design flaws in assessing the demand for the transport infrastructure, the economic crisis, sanctions and others. But even if all these negative factors had not come into play and the mega-projects had been fully implemented, they would have been unable to overcome the resource “curse” of Russia and its constituent resource extraction regions [31].

The transition to an integrated, PPP-based subsoil development is only possible if these PPPs aim to set up new production facilities creating innovative development centres, innovative markets and clusters. There are still very few projects like that in the world. According to IPP Journal, there are 168 innovative PPP projects in the world in 2016, including 45 in the USA, 10 in Indonesia, and 7 in Bangladesh. Most of the projects are being implemented in the energy sector, constructing modern power plants, with fewer in the oil and coal chemistry. It is noteworthy that private investment for these projects comes from major engineering companies which, together with research organizations and public authorities, establish innovative development centres, technological platforms, etc. [32].

The third group of PPP projects in the Russian FES can be exemplified by three technological platforms involved in the extraction of natural resources and the processing of oil and gas. These three platforms (No. 22, No. 23 and No. 24) were selected from the list of 28 platforms and approved by the Government Commission on High Technology and Innovation in 2011. Platform No. 22 focuses on deep processing of solid minerals and upgrading domestic processing facilities with high technologies. Platform No. 23 aims to develop and implement new technologies for hydrocarbon production,
preparation, processing and transportation, including well drilling, etc. Platform No. 24 deals with deep processing of hydrocarbon resources and intends to create conditions for upgrading technologies and increasing the competitiveness of oil and gas processing and petrochemical and organic synthesis, using foresight procedures. The primary goal of these technological platforms is to select fundamental research ideas, do prospecting works and research, and develop innovative business concepts. [26]

The main difference from the first two groups is that the recipients of investments in the third group of PPPs are not producing or processing companies, but those companies which work for the fuel and energy sector, creating internal and external markets, and developing its mineral and human resources, its industrial and scientific base. This limits the possibility for large, vertically integrated energy companies to accumulate all the resources and leads to a synergistic effect, i.e. a large number of highly specialized and competitive small and medium-sized innovative companies setting up around the core PPP project and encouraging the development of scientific and social infrastructure. This ultimately creates conditions for a transition of the FES companies to a rational model of subsoil use, for changing the vector of resource regions development and breaking the vicious circle of the “resource curse.”

3. Conclusion
Our analysis shows that the PPP projects in the Russian fuel and energy sector are still developing very slowly. However, PPPs focusing on the innovative model for integrated development of natural resources have potentially great prospects. It is this kind of PPPs that can fundamentally solve the problems of the FES and resource extraction regions through a transition to a new paradigm of subsoil use based on the ideas of integrated use of natural resources and sustainable socio-economic development by adopting new technologies and developing the domestic market.

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