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LEGAL REGULATION OF ORGANIZATIONAL AND FINANCIAL SUPPORT OF MEGA-SCIENCE PROJECTS[1]

Abstract

The article looks at organizational and financial regulation of construction and operation of large-scale research plants. It analyzes and describes general provisions and peculiarities of mega-science projects, and their definitions. It also studies organizational forms of their cooperation both at the national and

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international levels and looks at financial mechanisms applied to the funding of research facilities on the territory of Russia and abroad. While working on the article the authors have established that financial and legal norms are applied to social relations targeted at financing mega-science projects. Social relations include the issues of financing from state budget and tax relief applied to the organizations that construct and operate large research plants. The article also looks at financial control, which is put in place during the implementation of mega-science projects. As a result of the conducted research a conclusion has been made about the efficiency of joint projects by both international government organizations and Russian organizations where research facilities will be located. The article also draws attention to a misplaced approach, when mega-science projects are implemented on the premises of research institutions funded from state budget.

Key words: mega-science, science, funding, research facilities, large-scale research facilities, international cooperation, international collaboration, budget, budget funds, funding of research

JEL Classification: K33

1. Introduction

The term ‘mega-science’ was introduced in the 1960s when researchers started discussing interstate scientific cooperation aimed at collaborative implementation of highly complex scientific projects significant for the future of the whole humankind. However, at the moment there is no single approach to the definition of the concept.

Many researchers of the legal phenomenon of mega-science apply material approach when giving legal definition of ‘mega-science’ or ‘mega-science caliber’ [Gorlova, Tkachenko 2019: 207].

Professor A.O. Chetverikov demonstrates that term ‘mega-science’ is generally applicable to ‘facilities, devices and other infrastructure’, which form the basis of large-scale scientific projects ‘meant to make breakthrough discoveries’. Having studied widely used legal terms related to ‘mega-science’ in overseas official documents the author provides their synonyms: ‘large-scale research facilities’, ‘large-scale scientific facilities’, ‘extremely large and significant research facilities’. The author highlights two main criteria applied to research facilities to qualify them as mega-science projects: their considerable scale (also from the point of view of labour input in their construction, operation and necessary investments) and their focus on considerable scientific advancements, which makes mega-science especially important for the society [Chetverikov 2018: 14–15].

Using existing legal terminology, some authors define 'mega-science' as 'unique research plant of mega-science caliber'. Researchers provide its following characteristics: 1) these are unique research complexes; 2) they are unequalled in any country in the world; 3) their operation is aimed at achieving breakthrough innovations and technologies; 4) their construction and operation is subject to international cooperation; 5) their construction and operation requires considerable financial and human resources [Moshkova, Lozovsky 2019: 37].

Other researchers suppose that the concept of unique mega-science research plant is identical to the term 'global research facility'. Global research facilities are 'large, expensive complexes of equipment with unique characteristics meant for long-term research aimed at gaining new breakthrough knowledge, which considerably contributes to existing concept of reality or alters it, which are constructed and operated as part of international collaboration of countries, international organizations and other participants that are not international legal entities (state agencies, research institutes, financial institutions) [Kozheurov, Teimurov 2019: 140]. It should be noted that this definition makes an important emphasis on the participants of international collaboration in construction and operation of mega-science plants, whose organizational legal form depends on the status of the participants.

There are also opinions of researchers of legal doctrine who apply the so-called 'process' approach when giving the definition of 'mega-science' as the activity of authorized entities conducted as part of international cooperation between the countries involved. In this context the term 'mega-science' is used as applied to 'mega-science projects', which are 'international scientific projects aimed at constructing and operating mega-science plants and achieving scientific breakthrough and innovative results of global importance' [Tkachenko 2019: 46]. Mega-science projects are of obvious public and even global importance as their main goal is to discover new opportunities that could be beneficial for the whole world community. Capital intensity is a key characteristic of such projects; therefore, their implementation is only possible with the help of state budget funding. The main goal of mega-science plants construction is obviously their operation to conduct research, gain new advanced knowledge and develop innovative technologies.

However, the work of entities involved in mega-projects implementation as part of international collaboration starts long before the first scientific results are obtained and does not finish after they are achieved and tested. Implementation of mega-science projects is impossible without considerable financial, human and intellectual resources. At all stages of mega-science projects the entities of various legal status involved perform organizational,

financial, controlling, labour and other activities, besides conducting the research. All the above-mentioned participating entities have to be properly institutionalized.

Therefore, 'legal' approach could be applied to defining the term 'mega-science'. In this context 'mega-science' means public relations settled by legal provisions, which arise between various entities during the implementation of mega-science projects as part of international cooperation, including relations on construction and operation of global infrastructural facilities (mega-science research plants) and their financing.

It should also be noted that one of the key characteristics of mega-science projects is their extremely high cost. Due to this objective reason such projects are mostly financed by the government. For example, in the Russian Federation 'the state bears a greater part of costs related to the development of mega-science. The funds are allocated from the federal budget under special-purpose programmes, the so-called result-based budgeting'[Arzumanova, Boltinova 2019: 41].

Therefore, legal relations in the financial cooperation of the countries involved in mega-science projects are of primary importance within the whole system of public relations arising in the course of implementation of mega-science projects. Financial reactions in this field are not limited to government funding or making use of other sources to construct unique research plants and infrastructure. They also include the relations related to gaining revenue from the operation of mega-science plants, tax relief and special tax treatment for research organizations and other entities involved in the construction and operation of such global research facilities.

Legal mechanism of dealing with financial relations in mega-science sphere at the national level is based on budget and tax legislation and is further elaborated in special government target-oriented programmes and national projects. At the interstate level financial and legal relations are regulated depending on the legal forms of international integration to implement particular mega-science projects.

2. Organizational and legal forms of international cooperation in mega-science projects implementation

Presently, there are a lot of mega-science projects under implementation in the world, which include:

International Thermonuclear Experimental Reactor (ITER);

European x-ray free electron laser (European XFEL);

Facility for Antiproton and Ion Research in Europe (FAIR);

European Synchrotron Radiation Facility (ESRF).

The Large Hadron Collider (LHC).

Currently, the following mega-science projects are under implementation in the Russian Federation:

International Centre for Neutron Research based on high-flux research reactor PIK;

Nuclotron-based Ion Collider fAcility (NICA);

4th Generation Synchrotron Radiation Source (SSRS-4)

Siberian Synchrotron and Terahertz Radiation Centre (SSTRC);

New-generation electron-positron collider 'Super Charm-Tau Factory.'

Each of the above-mentioned projects is unique. Nevertheless, their implementation requires considerable material, financial, scientific and other resources, proper planning and control over designing, construction and operation of mega-science plants. This in its turn preconditions proper organization of the activities.

Establishing International Intergovernmental Organization following the agreement between participant countries is one of the organizational and legal forms of such international cooperation. There are two types of such organizations - project type and framework type [Chetverikov 2018: 19–20].

For example, to implement ITER mega-science project following the Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project and the Agreement on the Privileges and Immunities of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, signed in Paris on November 21, 2006, a special-purpose design international intergovernmental organization – ITER International Fusion Energy Organization has been established.

European Organization for Nuclear Research (CERN) operating under framework Convention for the establishment of a European organization for nuclear research as of July 1, 1953 is an

example of international intergovernmental framework organization. Russia conducts joint research on the premises of CERN laboratories following the agreement between the Russian Federation Government and CERN on further development of scientific and technological cooperation in high-energy physics as of 1996. In 2019 the Russian Government approved the signing of another agreement, which envisages extension of collaboration using CERN equipment [Directive of the Government of the Russian Federation No 751-r dated April 15, 2019 'On signing the Agreement between the Russian Federation Government and the European Organization for Nuclear Research (CERN) on scientific and technological collaboration in high energy physics and other areas of common interest and relevant Protocol', Paragraph 1].

Establishing a national legal entity incorporated on the territory of the country where global research facility is going to be constructed is another option for mega-science projects implementation. In such a case research organizations representing participant countries that are parties to international agreements become members of such legal entities and direct participants of mega-science projects. As a rule, the countries involved draw articles of incorporation of the established legal entity by signing an international treaty, which is the main instrument of its international legal institutionalization [Chetverikov 2018: 22]. Such principle is applied to German limited liability legal entities - European XFEL-GmbH ('European X-ray Free-Electron Laser' XFEL [Convention Concerning the Construction and Operation of a European X-Ray Free-Electron Laser Facility, Art. 2]), FAIR GmbH ('Facility for Antiproton and Ion Research' [Convention concerning the Construction and Operation of a Facility for Antiproton and Ion Research in Europe, Art. 2]) and French civil company (Société civile) – European Synchrotron Radiation Facility (ESRF) [Convention Concerning the Construction and Operation of a European Synchrotron Radiation Facility, Art. 1]).

International treaties and agreements establish the norms regulating general and financial liabilities of the parties. General norms are further elaborated in local acts of international intergovernmental organizations and legal entities that implement certain parts of mega-science projects. However, it seems reasonable to deal with large-scale research infrastructural facilities constructed as part of mega-science projects in Russia and abroad separately to take a closer look at the peculiarities of financial relations that take place during the construction and operation phases of such projects.

3 Participation of Russia in financing international mega-science projects

International Thermonuclear Experimental Reactor (ITER). As has been mentioned above, to implement ITER project under the international agreement dated October 24, 2007 a

special intergovernmental organization - ITER Organization was established. Currently, it employs over 900 in-house specialists from the countries that are parties to the agreement - the Russian Federation, the EU countries (represented by the European Atomic Energy Community), China, the USA, India, Japan, the Republic of Korea.

These countries finance ITER both with financial and material contributions. According to financial statement of ITER Organization as of 2018, the funding had the following structure.

Table 1. On joint contributions of ITER member countries as of December 31, 2018
[ITER Organization 2018 Financial Report]

Country	Money contribution		Natural contribution		TOTAL:	
	thousand euros	%	thousand euros	%	thousand euros	%
European Atomic Energy Community	1,047,279	45.59%	617,829	35.90%	1,665,109	41.44%
China	208,370	9.07%	215,664	2.53%	424,034	10.55%
India	208,370	9.07%	87,039	5.06%	295,409	7.35%
Japan	208,370	9.07%	400,067	23.25%	608,437	5.14%
Republic of Korea	208,370	9.07%	129,780	7.54%	338,150	8.42%
Russian Federation	208,370	9.07%	156,503	9.09%	364,873	9.08%
USA	207,956	9.05%	113,951	6.62%	321,907	8.01%

After the construction of all ITER facilities all expenses related to their maintenance and operation will be covered by participating countries and the above-mentioned duties will be performed by France as the 'host country'.

As part of non-monetary contribution, the Russian Federation is providing superconductors, parts of evacuation chamber, power supply systems and reactor diagnostic systems for the ITER. Manufacture of such parts is funded from the federal budget via 'Rosatom' State Atomic Energy Corporation which is responsible for the funds allocated from the state budget. In this case 'Rosatom' acts as an authority entity entitled by the state to form, distribute (re-distribute), use and control state finances for public benefit.

ITER funds reserved on bank accounts and deposits are made up of inputs of participant countries and other contributions (e.g. interests on bank deposits, difference in currency rates which arises out of currencies exchange by participant countries, etc.). Free funds can be invested. At the same time, provided that ITER is mostly funded by state budgets of the countries involved only low-risk financial investments can be used.

Facility for Antiproton and Ion Research in Europe (FAIR). Limited Liability Organization – FAIR GmbH was established to perform the construction and operation of FAIR in 2010 following German legislation and the Convention concerning the Construction and Operation

of a Facility for Antiproton and Ion Research in Europe to construct and operate FAIR. The shares are held by nine FAIR project participant countries: Germany (70.23%), India (3.53%), Poland (2.33%), Russia (17.45%), Romania (1.16%), Slovenia (1.18%), Finland (0.49%), France (2.65%), Sweden (0.98%) [First research under mega-science FAIR project will be conducted in 2018, July 12, 2018].

The initial estimated cost of the project was 1.262 bln euros (based on 2005 year prices). However, later the figure was reviewed. The session of the expert group that took place in April, 2019 resulted in the decision to allocate additional 850 mln euros [Report of the FAIR Progress and Cost Review Board: Detailed Review of Progress and Financial Status of the FAIR Project, 29 April, 2019].

Russia is a key FAIR project participant and makes a considerable monetary and scientific contribution. According to Scientific Director of FAIR, an academic of the Russian Academy of Sciences B.Y. Sharkov, 'monetary contribution which Russia makes to the project in most cases returns to Russia in the form of contracts for manufacturing high-tech equipment' [Russian physicists will manufacture unique equipment for FAIR, 13 December, 2016]. Russia's non-monetary contribution is high-tech equipment, namely electromagnets.

According to FAIR GmbH Articles of Incorporation, Annexed to the Convention concerning the Construction and Operation of a Facility for Antiproton and Ion Research in Europe, rules of the Trade Code (HGB) of the Federative Republic of Germany related to the preparation and audit of annual financial report and statement of affairs of large companies are applied to the above-mentioned company [FAIR GmbH Articles of Incorporation, ART 21]. Its annual accounting statements will be checked by an independent certified auditor.

European x-ray free electron laser (European XFEL). Limited Liability Company European XFEL-GmbH established and operating under German legislation is responsible for the construction and operation of the European XFEL. The company was established in the Federative Republic of Germany on September 28, 2009. Later, following the Convention concerning the Construction and Operation of the European XFEL signed on November 30, 2009 in Hamburg (hereinafter - the Convention) the project participant countries (the UK, Hungary, Germany, Denmark, Spain, Italy, Poland, Russia, Slovakia, France, Switzerland, Sweden) undertook to contribute to the construction. All contributions are made in monetary and natural form.

Germany made the largest contribution to the project - besides 580 mln. euros (in year 2005 prices) to cover the construction expenses it prepared and provided construction sites in

Hamburg and Schenefeld for free. Russia's initial contribution amounted to 250 mln euros (in the prices as of year 2005) and was the second largest one. In general Germany covers 58% of total expenses, Russia - 27% and other countries - from 1 to 3%.

According to the official website of G.I. Budker Institute of Nuclear Physics, 'greater part of the funds contributed by Russia returned in the form of contracts for research equipment development and production' [The operation of European XFEL starts, September 1, 2017]. Thus, Russian specialists created the power supply systems for the correcting electromagnets for the linear accelerator and beam transport channels for the European XFEL.

It should be noted that when signing the Convention, the Russian Federation Government pre-agreed that Russia's contribution to the project should be proportionate to the amount of time of the use of the plant by Russian research organizations.

Large Hadron Collider (LHC). LHC construction is conducted under the auspices of the European Nuclear Research Council and the project cost was estimated as 4,332 mln Swiss francs (hereinafter – CHF). LHC operation costs make about 80% of CERN annual turnover [Facts and figures about the LHC].

Presently, 23 countries participate in CERN (Austria, Belgium, Bulgaria, UK, Hungary, Germany, Greece, Denmark, Israel, Spain, Italy, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Finland, France, Czech Republic, Switzerland, Sweden), 8 more have the status of associated members (India, Lithuania, Pakistan, Turkey, Ukraine, Croatia. Cyprus and Slovenia are associated members that are in the process of joining CERN project). Being CERN non-member Russia has the status of a supervisor (like the USA, Japan, the EU, UNESCO and Joint Institute for Nuclear Research). Supervisors undertake to finance, draft projects, make developments and conduct experiments within the framework of the projects they participate in.

Close ties between the scientists of CERN and Soviet research organizations have existed since the very establishment of the European Nuclear Research Council in 1954. Later on October 30, 1993 the Russian Federation Government and CERN signed an agreement on further development of scientific and technical cooperation in high-energy physics [Directive of the Government of the Russian Federation No 1040 dated October 12, 1993 'On signing the Agreement between the Russian Federation Government and the European Organization for Nuclear Research on further development of scientific and technological collaboration in high energy physics', Paragraph 1], which lay the corner stone in the cooperation in elementary-particle physics and related fields. The Agreement emphasized that 'the Russian Federation

and its research and development institutes and centres undertake to make considerable contribution to the construction and operation of the LHC'. After 3 years on June 14, 1996 'Protocol on the participation in the Large Hadron Collider Project' (hereinafter - the Protocol) was signed, which is an integral part of the Agreement.

Following the Protocol, the Russian Federation undertook to make an input in the form of equipment for the total value of 100 mln CHF (the prices as of year 1996) within 10 years after signing the Protocol in order to ensure the participation of Russian research organizations in LHC development. Two funds were established for that purpose:

'Russian fund LHC-1' (RF LHC-1) – the fund established by CERN amounting to one third of the cost of equipment supplied by Russian organizations to CERN. The funds were to be spent on purchasing materials and equipment from manufacturers located in CERN participant countries upon the requests of Russian R&D organizations. Later acquired materials and equipment were to be transferred to Russian research organizations. However, in 2001 it was decided to forward one third of the funds to Russian research organizations directly to enable them to 'resolve their financial issues' [Transfer from the Russian Fund (LHC-I), June 5, 2001];

'Russian fund LHC-2' (RF LHC-2) - the fund was established by the Ministry of Science and Technical Policy of the Russian Federation. Its amount also made up one third of the cost of equipment supplied by CERN. Its funds were to cover operational costs of Russian research organizations and enterprises related to the development and manufacture of equipment supplied to CERN [Protocol on the participation in the Large Hadron Collider Project, Art. 5].

'RF LHC-1' fund was managed under the control of CERN upon mutual agreement with the Russian party and 'RF LHC-2' - the Russian Ministry of Science (and later its legal successors) upon the pre-agreement with CERN.

It should be noted that on April 16, 2019 the Russian Federation Government and CERN signed a new Agreement on scientific and technical cooperation in high-energy physics and other areas of mutual interest in order to 'update the cooperation format', which superseded the Agreement of 1993. According to the new Agreement the areas of activity of the Russian research organizations in CERN include: conducting experiments and modernization of ATLAS, CMS, ALICE and LHCb detectors on the LHC; research and development for future high-energy colliders - Compact Linear Collider (CLIC) and Future Circular Collider (FCC); research in neutrino physics, etc. It should be noted that in 2018 4.85 mln dollars were allocated for the participation of Russian scientists in CERN programmes [Dmitry Medvedev's meeting with the Russian scientists working at CERN, June 10, 2019].

The Agreement also provides for the participation of Russian scientists in the LHC upgrade programme in order to achieve the High-Luminosity LHC. Presently the estimated cost of the program is 1.5 bln. CHF [CERN expected to announce one-year delay to Large Hadron Collider upgrade, November 25, 2019]. Russia is supposed to contribute almost 1.1 bln roubles (over 1.6 mln. CHF) [The cost of Russia's participation in LHC upgrade was named, June 11, 2019].

According to CERN budget for 2020 the total revenue in the current fiscal year will make up 1,355.9 mln CHF, including 1,168.9 mln CHF as contributions by participant countries and 28 mln CHF as contributions by associated countries. CERN expenses in its turn in 2020 must make up 1,341.8 mln CHF including 531 mln CHF on research programmes funding (including accelerator programme), 495.2 mln CHF - on infrastructure and services, and 314.7 mln CHF – on research projects (243.1 mln CHF of them – on the LHC upgrade).

It should be noted that the Agreement between the Russian Federation Government and CERN as of April 16, 2019 lists the areas of joint activities of the European Organization for Nuclear Research in Russian mega-science projects. These are divided into two groups - 'those conducted on the territory of the Russian Federation' (experiments on electron-positron collider, study of radioactive isotopes with the help of neutron plant (IRINA on PIK reactor) and those conducted 'at Joint Institute for Nuclear Research' (putting NICA into operation). Therefore, we can conclude that both Russia and CERN are interested in scientific cooperation in the field of mega-science projects.

4. Overseas funding of mega-science projects on the territory of the Russian Federation

Unlike the above-mentioned projects whose construction and operation are performed by inter-governmental organizations (CERN, ITER Organization) or specially established legal entities whose shares are distributed between participant countries, in Russia mega-science projects are as a rule implemented on the premises of existing research institutions:

Super Charm Tau Factory and Siberian Synchrotron and Terahertz Radiation Centre (SSTRC) – on the premises of State Budget Scientific Institution G.I. Budker Institute of Nuclear Physics of Siberian Division of the Russian Academy of Sciences;

IGNITOR magnetic confined fusion reactor – on the premises of Federal State Budget Institution 'Kurchatov Institute' Research Centre;

PIK reactor – on the premises of Federal Budget Institution P.B. Konstantinov Petersburg Nuclear Physics Institute of 'Kurchatov Institute' National Research Centre;

4th Generation Synchrotron Radiation Source (SSRS-4) – on the premises of Federal Budget Institution 'A.A. Logunov Institute of High Energy Physics of 'Kurchatov Institute' National Research Centre.

Only NICA project is implemented by international inter-governmental organization Joint Institute for Nuclear Research (JINR).

Therefore, we can see crucial difference in the organizational approach to development, construction and operation of European and Russian mega-science facilities, which also impacts their funding. Thus, ITER, FAIR, XFEL, LHC were initially viewed as international projects with multiple sources of financial support. Distribution of duties on financial, scientific and technical support of mega-science projects between different countries appears to be pre-requisite to successful and efficient accomplishment of tasks and goals.

Despite their international importance Russian mega-science projects are first and foremost viewed as national projects since mostly Russian resources (financial, human and technical) are used. Funds from the federal budget are the main source of funding for national mega-science projects. On the one hand, such approach allows centralized allocation of national resources and reserving intellectual property rights for the results of the work, which is also important and helps to sustain the importance of Russian science for the international community. At the same time dependence on single financial source has certain risks as shortage of funds may lead to extension of deadlines or put the whole project under threat.

International experience indicates the necessity of accurate planning of results and workflow during the implementation of mega-science projects, which on the one hand allows to involve larger number of participants, who need to be convinced in the feasibility and practicability of the projects, and on the other hand, distribute work load, assign tasks and develop work flow to ensure certainty within the project framework. Meanwhile the report of the Accounts Chamber of the Russian Federation on the result of expert study 'Defining the main reasons that restrain scientific development of the Russian Federation: assessment of research infrastructure, sufficiency of motivation, improving the appealingness of the work of leading scientists' mentions that as of the day of its publication (February 7, 2020) the Russian Federation Government had not yet approved the Federal Scientific and Technical Research Programme of Synchrotron and Neutron

Research and Infrastructure Development for 2019–2027 and 'the Council to implement the federal scientific research programme had not elaborated the characteristics of mega-science facilities under construction or modernization. This means the need in financing unique mega-science plants had not been specified [Report of the Accounts Chamber of the Russian Federation on the result of expert study 'Defining the main reasons that restrain scientific development of the Russian Federation: assessment of research infrastructure, sufficiency of motivation, improving the appealingness of the work of leading scientists', 42]. Meanwhile, Russian mega-science projects have been implemented more or less intensively for over ten years.

Assigning the functions of the operator of mega-science projects to an international inter-governmental organization or a specially established organization, where the shares are distributed between participating countries, allows for greater transparency of the course of the project implementation in general and its funding in particular. Such organizations publish annual financial reports, which are checked by independent auditors. Russian approach does not allow such openness as relevant information is not available in public domain, and financial control is performed by state bodies. According to the Accounts Chamber of the Russian Federation this might open the door to malversation also mentioned in the report – about the current problem of 'toxicity' of state funding of research projects in Russia.

As has been mentioned above, implementation model of NICA mega-science project controlled by Joint Institute for Nuclear Research (JINR) is the closest to the international model.

Joint Institute for Nuclear Research is an international inter-governmental organization established under the Agreement on Establishment of Joint Institute for Nuclear Research as of March 26, 1956 and operates following the guiding principle of openness to all countries and their mutually beneficial cooperation. JINR is located in Dubna, the Moscow Region of Russia and 18 countries are its members [Articles of Association of Joint Institute for Nuclear Research, Art 1] (Republic of Azerbaijan, Republic of Armenia, Republic of Belarus, Republic of Bulgaria, Socialist Republic of Vietnam, Georgia, Republic of Kazakhstan, Democratic People's Republic of Korea, Republic of Cuba, Republic of Moldova, Mongolia, Republic of Poland, Russian Federation, Romania, Slovak Republic, Republic of Uzbekistan, Ukraine, Czech Republic. Besides, Cooperation agreements between the Institute and Hungary, Germany, Egypt, Italy, Serbia and South-African Republic have been made).

The list of funding sources of JINR includes:

a) Institute member fees;

b) special-purpose funding of research projects;

c) funds received under agreements and protocols on scientific and technical cooperation;

d) revenue from the business of the Institute;

e) revenue from the use of intellectual property;

f) bank loans and borrowings;

g) other sources [Articles of Association of Joint Institute for Nuclear Research, Art 12].

In general, NICA project is funded by JINR, the Russian Federation and other participants. With this in view in 2016 the Russian Federation Government and International inter-governmental research organization Joint Institute for Nuclear Research entered into Agreement on Construction and Operation of NICA. The document allows its parties to unite their material, technical and financial resources to create NICA complex [Agreement on Construction and Operation of NICA, Art 1].

As of the day of signing the Agreement the estimated project value was 17,500 mln. roubles (in 2013 year prices), 8,800 mln. roubles – from the Russian Federation and 8,700 mln. roubles – from Joint Institute for Nuclear Research and other project participants [Agreement on Construction and Operation of NICA, Art 4]. When new participants join, the cost of the project is increased by the amount of their input, and the breakout of other participants' shares except for that of Russia is recalculated accordingly.

As part of international scientific cooperation Russian organizations involved in mega-science projects also get funding from the European Union. Presently, innovative research program Horizon 2020 is effective in the EU. It envisages allocation of funds of almost 80 bln euros during 2014–2020 for EU research programmes.

As part of it CREMLIN (Connecting Russian and European Measures for Large-scale Research Infrastructures) project aimed at facilitation of scientific cooperation between Russia and the EU in the field of scientific operation of large-scale research facilities was launched. The project was effective from September 1, 2015 till August 31, 2018 and presupposed allocation of 1,696,250 euros to support scientific cooperation.

The largest German research centre for physics of electronic particles (Deutsches Elektronen-Synchrotron (DESY), the European coordinator of the project, provided the following recommendations following the results of the project:

a) special recommendations on the Russian-European collaboration regarding five Russian mega-science projects;

b) general guidelines on further actions related to continuing Russian-European mega-science collaboration [First CREMLIN Recommendations for the European-Russian Mega-science Collaboration, June 5, 2018].

In general, the cooperation was declared successful and European partners decided to launch CREMLINplus project. It will be effective from February 1, 2020 till January 31, 2024 and envisages the funding amounting to 24,946,362.50 euros. Thus, the amount of funding has been increased by over 14 times, which undoubtedly testifies to the interest of the European party in developing mega-science collaboration with Russia.

The goals of CREMLINplus include:

1. active promotion of five Russian mega-science projects: NICA, PIK, SSRS-4, International Centre for Extreme Light Studies (XCELS) and Super Charm-Tau Factory. In the opinion of the European party, collaboration in this field will allow to develop and provide the best and the newest technologies both for Russian and European mega-science projects;

2. creating a large base of theoretical and practical knowledge for the managerial staff and scientists by preparing Russian research facilities located in 11 laboratories both for Russian and international scientists [Connecting Russian and European Measures for Large-scale Research Infrastructures – plus, March 18, 2020].

35 organizations from Russia, Germany, Belgium, Hungary, Italy and some other European countries participate in the program. After the implementation of the program 9 mln euros will be provided to 11 Russian research and educational organizations.

5. Conclusions

The following conclusions can be made from the conducted study of legal regulation of financing mega-science research facilities:

1. Mega-science is a multi-dimensional phenomenon, which can be viewed from various angles. On the one hand, mega-science projects are large-scale research infrastructures with unique research equipment of global calibre. On the other

hand, they envisage some activity of the authorized entities as part of international cooperation between countries in designing, constructing and operating large research plants. From the legal point of view, mega-science projects are a system of public relations settled by legal provisions, which arise between various entities during the implementation of mega-science projects as part of international cooperation, including relations on creation and operation of global infrastructural facilities (mega-science research plants) and their funding.

2. Mega-science projects are implemented for public benefit - their main goal is to conduct complex scientific research and gain new breakthrough knowledge and develop innovative technologies for the benefit of all humankind. Such research is not commercially attractive for business, because as a rule it solves fundamental scientific tasks and cannot be applied for making profit. Thus, mega-science projects require high-priority state funding.

   Mega-science projects solve particular tasks, therefore, there is no need to construct many of such facilities, and their high cost makes international cooperation economically feasible.

3. Legal relations in the financial cooperation of participant countries in mega-science projects are crucial in the system of public relations, which arise in the process of construction and operation of large-scale research facilities. Norms of financial law regulate the system of public relations connected with financial activity in the field including budget funding and involving other sources to create large-scale research facilities, receiving tax relief for research organizations involved in the construction and operation of global research facilities, financial control in the process of mega-science projects implementation.

4. In order to fulfill their obligations participant countries make monetary and non-monetary input. Monetary input can return to the country's economy in the form of manufacture orders for mega-science plants components, as well as conducting research and development by research organizations.

5. In order to resolve organizational issues of mega-science projects the parties traditionally establish international inter-governmental organizations (project or framework types) or national legal entities incorporated on the territories of the country where global research facility is going to be constructed. At the same time in Russia such projects are as a rule implemented on the premises of existing state-

funded research institutions (except NICA). The first approach seems to be more effective as it ensures a higher level of certainty and transparency for the project participants, allows to reallocate financial burden at the stage of its planning and relies on multiple financial sources.

A conclusion has been made that the approach based on establishing international government organizations or national legal entities incorporated on the territories of the country where global research plant will be located is more efficient than the Russian approach when mega-science projects in most cases are implemented on the premises of existing state-funded research institutions.

References

Arzumanova, L., Boltinova, O.: Pravovoe regulirovanie megasajens-proektov v Rossii [Legal regulation of mega-science projects in Russia], Aktualnye Problemy Rossiyskogo Prava [Actual Problems of the Russian Law], No. 7, 2019.

Chetverikov, A.: Organizacionno-pravovye formy bol'shoj nauki (megasajens) v usloviyah mezhdunarodnoj integracii: sravnitel'noe issledovanie [Organizational and legal forms of big science (mega-science) in international integration: comparative study], Yuridicheskaya Nauka [Law science], No. 1, 2018.

Gorlova, E., Tkachenko, R.: Ponyatie proektov klassa «megasajens» na primere ustanovok ITER i FAIR [The Concept of mega-science projects with research plants ITER and FAIR taken as an example], Aktualnye Problemy Rossiyskogo Prava [Actual Problems of the Russian Law], No. 5, 2019.

Kozheurov Y., Teimurov, E.: Ponyatie, priznaki i pravovaya priroda global'noj issledovatel'skoj infrastruktury [Concept, characteristics and legal nature of global research facilities], Aktualnye Problemy Rossiyskogo Prava [Actual Problems of the Russian Law], No. 9, 2019.

Moshkova, D., Lozovsky, D.: Pravovye aspekty realizacii megasajens-proektov [Legal aspects of implementation of mega-science projects], Vestnik of O.E. Kutafina Moscow State Law University [Courier of the Kutafin Moscow State Law University (MSAL)], No. 7, 2019.

Nurakhov, N., Kravchuk, V., Petrov, A., Grigoryev, S., Kozlov, Yu, Maksimov, V., Snitser, M., Gulyaeva, T., Zaplatina, T.: Primenenie kriteriev otnesenie nauchno-tekhnicheskogo proekta k proektam «megasajens» na primere MCNI PIK [Application of the criteria for classifying a scientific and technical project as a mega-science project using the example of ICSTI PIK], in: Konstituciya Rossijskoj Federacii i sovremennyj pravoporyadok: Moskovskaya yuridicheskaya nedelya. Materialy XV Mezhdunarodnoj nauchno-prakticheskoj konferencii: v 5-ti chastyah. CH. 4. [Constitution of the Russian Federation and the modern rule of law: Moscow Law Week. Materials of the XV International scientific-practical conference: in 5 parts. Part 4.], Moscow, Prospect, 2019

Tkachenko, R.: Proekty klassa «megasajens» kak odno iz osnovnyh napravlenij realizacii byudzhetnoj politiki Rossii [Mega-science projects as one of the focus areas of the Russian budget policy implementation], Vestnik of O.E. Kutafina Moscow State Law University [Courier of the Kutafin Moscow State Law University (MSAL)], No. 7, 2019.

Alexy, R.: A Theory of Legal Argumentation: The Theory of Rational Discourse as Theory of Legal Justification, Oxford: Oxford University Press, 2010.

Legal Acts:

Agreement between the Russian Federation Government and the European Organization for Nuclear Research (CERN) on scientific and technological collaboration in high-energy physics and other areas of mutual interest' (ICA-RU-0144, April 16, 2019).

Agreement on Construction and Operation of NICA (Russian Federation Government Directive dated 27.04.2016 No 783-r 'On Signing the Agreement between the Russian Federation Government and International inter-governmental research organization Joint Institute for Nuclear Research on Construction and Operation of NICA')

Agreement on Establishment of Joint Institute for Nuclear Research (Moscow, March 26, 1956)

Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project (Paris, November 21, 2006)

Agreement on the Privileges and Immunities of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, signed in Paris on November 21, 2006 (Paris, November 21, 2006)

Convention Concerning the Construction and Operation of a European X-Ray Free-Electron Laser Facility (Berlin, September 23, 2004)

Convention Concerning the Construction and Operation of a European Synchrotron Radiation Facility (Paris, Dezember 16, 1988)

Convention concerning the Construction and Operation of a Facility for Antiproton and Ion Research in Europe (Wiesbaden, October 4, 2010)

Convention for the establishment of a European organization for nuclear research (Paris, July 1, 1953)

Directive of the Government of the Russian Federation No 1040 dated October 12, 1993 'On signing the Agreement between the Russian Federation Government and the European Organization for Nuclear Research on further development of scientific and technological collaboration in high energy physics' (The Agreement lost effect)

Directive of the Government of the Russian Federation No 751-r dated April 15, 2019 'On signing the Agreement between the Russian Federation Government and the European Organization for Nuclear Research (CERN) on scientific and technological collaboration in high energy physics and other areas of common interest and relevant Protocol'.

Act of 27 August, 2009 on Public Finance (consolidated text Journal of Laws 2017, item 2077, as amended).

Other Official Documents:

Otchet o rezul'tatah ekspertno-analiticheskogo meropriyatiya «Opredelenie osnovnyh prichin, sderzhivayushchih nauchnoe razvitie v Rossijskoj Federacii: ocenka nauchnoj infrastruktury, dostatochnost' motivacionnyh mer, obespechenie privlekatel'nosti raboty vedushchih uchenyh» [Report of the Accounts Chamber of the Russian Federation on the result of expert study 'Defining the main reasons that restrain scientific development of the Russian Federation: assessment of research infrastructure, sufficiency of motivation, improving the appealingness of the work of leading scientists']. Available at: http://fgosvo.ru/uploadfiles/Work_materials_disscusion/sp.pdf

Internet Resources (other than official documents or scientific articles):

CERN expected to announce one-year delay to Large Hadron Collider upgrade, November 25, 2019. Available at: https://physicsworld.com/a/cern-expected-to-announce-one-year-delay-to-large-hadron-collider-upgrade/

Connecting Russian and European Measures for Large-scale Research Infrastructures – plus, March 18, 2020. Available at: https://cordis.europa.eu/project/id/871072

Evropejskij rentgenovskij lazer XFEL nachinaet svoyu rabotu [The operation of European XFEL starts], September 1, 2017. Available at: http://www.inp.nsk.su/press/novosti/1504-evropejskij-rentgenovskij-lazer-xfel-nachinaet-svoyu-rabotu

Facts and figures about the LHC. Available at: https://home.cern/resources/faqs/facts-and-figures-about-lhc

First CREMLIN Recommendations for the European-Russian Megascience Collaboration, June 5, 2018. Available at: https://indico.desy.de/indico/event/20397/material/7/0.pdf

ITER Organization 2018 Financial Report. Available at: https://www.iter.org/doc/www/content/com/Lists/list_items/Attachments/857/2018_ITER_Financial_Report.pdf

Nazvana stoimost' uchastiya Rossii v modernizacii kollajdera [The cost of Russia's participation in LHC upgrade was named], June 11, 2019. Available at: https://ria.ru/20190611/1555487336.html

Pervye issledovaniya v ramkah mirovogo megasajens proekta FAIR projdut v 2018 godu [First research under mega-science FAIR project will be conducted in 2018], July 12, 2018. Available at: https://www.rosatom.ru/journalist/smi-about-industry/ervye-issledovaniya-v-ramkakh-mirovogo-megasayens-proekta-fair-proydut-v-2018-godu/

Rossijskie fiziki izgotovyat unikal'noe oborudovanie dlya uskoritelya FAIR [Russian physicists will manufacture unique equipment for FAIR], 13 December, 2016. Available at: https://ria.ru/20161213/1483445974.html

Report of the FAIR Progress and Cost Review Board: Detailed Review of Progress and Financial Status of the FAIR Project, 29 April, 2019. Available at: https://www.gsi.de/fileadmin/oeffentlichkeitsarbeit/fair/RevBoardReport_190429_ Public.pdf

Transfer from the Russian Fund (LHC-I), June 5, 2001. Available at: http://cds.cern.ch/record/35674/files/CM-P00078916-e.pdf

Vstrecha Dmitriya Medvedeva s rossijskimi uchyonymi, rabotayushchimi v CERN [Dmitry Medvedev's meeting with the Russian scientists working at CERN], June 10, 2019. Available at: http://government.ru/news/36968/