MARKET DEVELOPMENT STRATEGIES FOR ROSATOM STATE CORPORATION

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Abstract

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Abstract

In the current state of the world economy when the electricity consumptions rise, there are growing needs to increase its production from alternative sources to meet the demands. As a result, nuclear energy is gradually conquering the market and fills in the formed niche. The competition is very high but Rosatom State Corporation stands out against the background of all as it uses successful market entry strategies and demonstrates a continuous growth due to its unique experience gained across the entire spectrum of nuclear market. Therefore, the question is which exact methods does it use?

The research is done through deductive methods, alongside the qualitative and quantitative research. The thesis includes both primary and secondary data. The primary data is collected through personal communication with the actual employees, whereas the secondary data comes from electronic materials, articles and books. All the sources of information are referenced.

The thesis aims to observe what methods of market development Rosatom uses for its internationalisation which leads to order book replenishment. Furthermore, as there are uncertainties with the future of the state financing of Rosatom construction projects and possible reductions in the number of jobs in existing industries, alternative development directions are also studied. There are descriptions of different competitive advantages and exclusivities of Rosatom alongside deep information about each cooperation from every partner country of the corporation.

Keywords

Rosatom, Nuclear, Cooperation, Nuclear Power Plant, Atomic

CONTENTS

1 INTRODUCTION

The introduction part will acquaint the reader with an information concerning the background, aims and questions of this thesis, as well as why the research is important. The research methodology and data collection process will also be described. To summarise all information, the reader will be familiarised with the overview of the structure of the thesis.

1.1 Research Background

The thesis work reveals the concept of market development for Rosatom State Corporation and the trends in international cooperation.

In recent decades, the term “soft power” has been increasingly used in foreign policy concepts of various countries of the world. Soft power is a persuasive approach to international relations that includes the use of cultural and economic influence. Such strategy was chosen by Russia in the recent years and was intensified to improve its image on the international arena. As noted by Russian Prime Minister Dmitry Medvedev, this goal setting is primarily connected with the fact that “because of Russia’s wary perception, the country’s investment potential is seriously suffering in the world and major international projects are being hampered”.

According to the forecasts of researchers, in the XXI century, only those national economies (and accordingly sovereign states) that can withstand intellectual and technological competition will be able to keep its independence. Even though Russia is currently lagging behind many countries in economic development, its preserved educational, scientific and technical potential can overcome the current decline, bring the state to a decent level and increase its attractiveness in the world. One of the possible forms than can be viewed as a marketing campaign can be the export of Russian technologies associated with the use of the peaceful atom, abroad. There is an understanding that nuclear power represents a rather serious test of Russia’s ability to protect its interests on a global scale.

“Rosatom” State Corporation is one of the world leaders and key players on the global arena in the field of nuclear energy. It is a unique Russian international company

headquarted in Moscow that is leading the way in the construction industry in terms of number of Nuclear Power Plant (NPU) units being built (39 in 12 countries) and has a global share of 40% of world nuclear market. It is composed of more than 360 enterprises including many research organisations, nuclear icebreaker fleet and weapons complex. Furthermore, it is involved in the following aspects: uranium enrichment services and its export, international scientific activities, cooperation with the International Atomic Energy Agency (IAEA). Thanks to expansion to the international market, “Rosatom” State Corporation (Rosatom further on) has become a significant player on the global arena. It is the only atomic company in the world that has competencies in all areas of atomic energy use at all stages of the life cycle of nuclear facilities. (Rosatom 2019.)

1.2 Thesis Research Questions, Aims and Limitations

The aim of the thesis is to ascertain by which strategies and methods does Rosatom take the leading positions of the world energy market and what contributes to such high growth rate? Henceforth, the research question and sub-question are:

Research question: “What strategies and methods does Rosatom use for its order book replenishment?”

Sub-question: “Are there any alternative atomic directions for future development of Rosatom?”

This thesis can be useful as a guideline for the marketing experts in the energy field and for different Energy Departments of both developed and developing countries. Rosatom was chosen as a case-company for its successful market entry strategies and continuous growth due to unique experience gained across the entire spectrum of nuclear fuel cycle technologies and construction of nuclear power plants. In the current state of the world economy, the topic is relevant, as in the conditions of increasing electricity consumption in different countries, there is a growing need to create sources of this energy. Nuclear power is designed to fill the electricity market. The thesis reveals the concepts of methods, strategies for entering foreign markets, trends in international cooperation and possible alternative uses of nuclear energy. The novelty of this thesis work is that various ways of entering the international markets and various areas of activity on the global scale for a Russian state corporation are considered. Rosatom has to make enough efforts to not only cope with it but also retain its leading

position in the world. The limitation of the thesis work is that political agenda can change at any time and can influence the future alternative development strategies for Rosatom.

1.3 Research Methodology and Data Collection

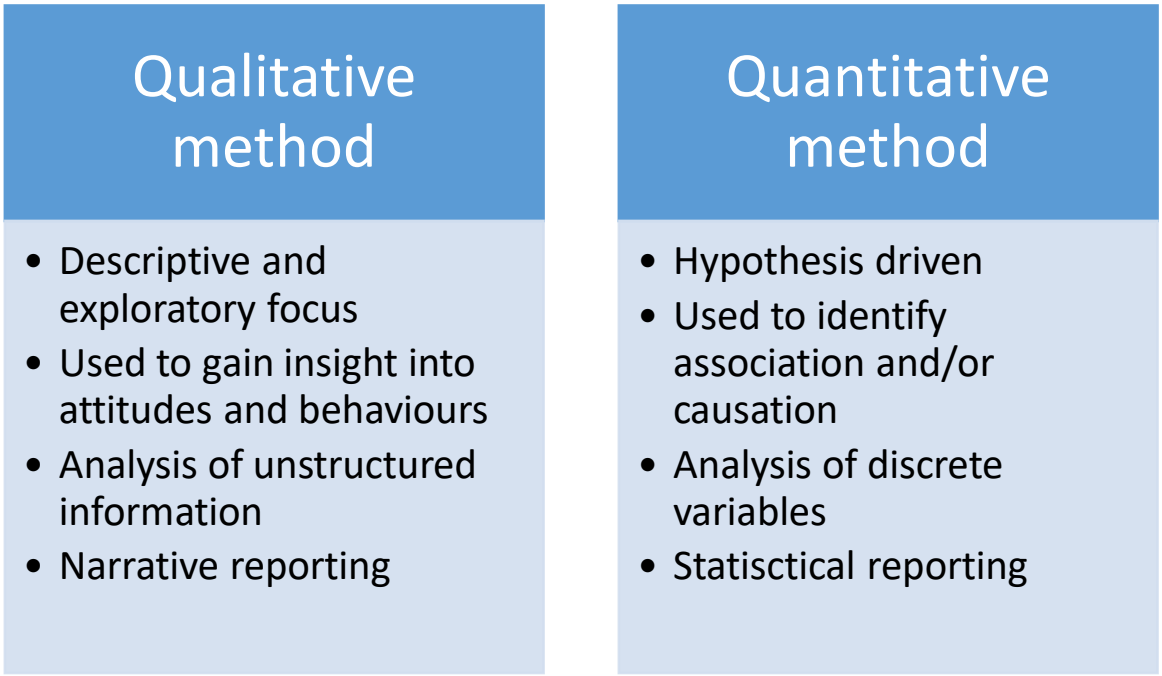
Primary and Secondary Data

Primary data is any data that has been collected for a special purpose from the original source first hand. Primary data has not been published yet and is more reliable, authentic and objective. It has been collected by the author. Primary data has not been changed or altered by human being, therefore its validity is greater than secondary data (Bykov 2015, 14.)

Secondary data is gathered and recorded by someone else prior to and not for a current project but another. It involves less cost, time and effort. Secondary data is data that is being reduced in different contexts. (Bykov 2015, 14.)

Qualitative and Quantitative Research

Qualitative method is a term denoting that information obtained during the study cannot be quantified or analysed. It helps to reveal the hidden motives of the client and people's behaviour, allows to identify some characteristics that may be hidden during the quantitative analysis (Bykov 2015, 14.)



Quantitative method is a term meaning that information was obtained through surveys or interviews with observations. There are structured questions which are answered by a large number of respondents. It is driven on a hypothesis. The numerical data is then transformed into statistics (Bykov 2015, 14.)

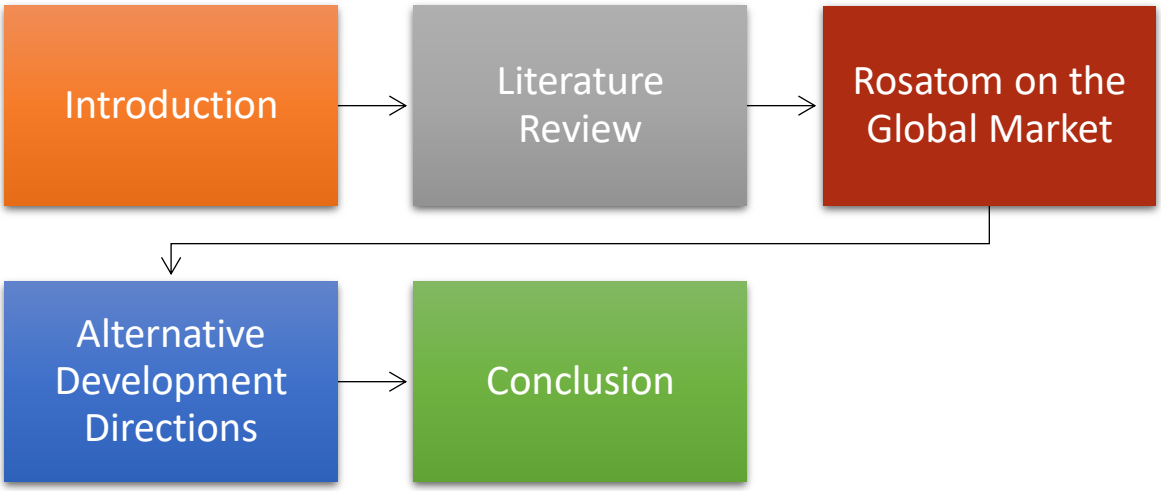
Inductive Research and Deductive Research

Inductive Research begins with a research question and the collection of empirical data, which are used to generate hypotheses and theory. Whereas, Deductive Research approaches usually begin with a theory driven hypothesis, which guide data collection and analysis. (Bykov 2015, 14.)

During the collection of data for the thesis, Qualitative method and Quantitative method were used. Also, the research is done through deductive methods. The thesis includes both primary and secondary data. The primary data is collected through personal communication with the actual employees, whereas the secondary data comes from electronic materials, articles and books. The author had worked at Rosatom for a period of five months in 2018 and collected a significant part of information through collaboration and coordination with two other higher ranked employees. First employee, Sergey Kalinovksy works in the Marketing sector of Rosatom Corporation, whereas Tihon Verstovseli works at the Hungarian direction of Rosatom. All obtained primary data was

written down and saved during the practical traineeship. All the sources of information are referenced.

1.4 Thesis Structure



The first chapter includes an introductory part which handles an information concerning the research background, justifications for choice of Rosatom, thesis research questions, aims and limitations with the research methodology of the data collection being described. The second chapter considered the main reasons for globalisation existing and theories around strategies of internationalisation in the market. The reader will understand the concepts for market development

Chapter three gives a full glance over Rosatom's areas of operation in the world and describes its history, competitive advantages, current projects concerning NPPs and scientific cooperation. Also, it gives concrete examples of market development with deep analysis conducted over cooperation with significant NPPs. Possible risk factors for Rosatom are described.

Chapter four answers the sub-question in terms of possible alternative development strategies. The final chapters conclude the thesis.

2 LITERATURE REVIEW

In order to reach the aims of the thesis, reasons for globalisation existing and theories around strategies of internationalisation in the market must be studied.

2.1 Strategies of Internationalisation

Globalisation can be defined as an integration of national economies through trade, investment, capital flow, labour migration and technology (Merriam-Webster 2019).

This process in the global economy took over the world in the 1950's. In terms of seeking for more profit, attracting new clients, establishing long-term prospects different companies started to enter new foreign markets. It progressed to such state when in the current context of globalisation any significant merchants cannot function alone without coming into contact with other members of the international market. The cooperation may occur in different kinds of sectors including economical, social, political, cultural and many other areas. The international cooperation in the economical sector stands out especially. In modern life, success is not only measured in terms of amount of production and number of goods manufactured but also by presence of market infrastructure, use of up-to-date or innovative technologies and materials. (Vladimirova 2011, 63.)

All these factors determine the success of certain company on the global market. It functions if country is in possession of capital and ability of different institutes to work on establishment of international economic relations that help to hold strong positions worldwide (Vladimirova 2011, 67).

During globalisation capital begins to move more freely from one country to another and focuses where the conditions for business are better. As a result, it brings more profit. Capital investment becomes not only a national matter yet international as well. However, in the modern conditions it is not enough to invest a certain amount of money into the company to let it be successful. Furthermore, investor should have abilities to attract high technologies, the presence economic ties and provide information that will enhance the competitiveness. (Vladimirova 2011, 68.)

It is possible to see the shift of the world economy towards developing countries due to rise of consumers in such countries. There are two fundamental processes of internationalisation. Development of communication technologies that empowers faster and better exchange of information, and the labour market. The younger population in the developing countries provides fullness of labour market with the qualified workers that

makes such countries perspective for new companies and engages them into the process of globalisation. (Lin-Chan 2011, 7.)

In addition, companies enter the international market to confirm the position of a leader in a particular industry. Big role is played by the concept of core competency. With core competency, the company is more competitive not only on the domestic market but also on the external market. This term was introduced by C.K.Prahalad and Gary Hamel. It refers to a specific set of skills, technologies and experience that only this certain company possesses. This set provides a competitive advantage for the organisation. Core competency comes from long work, accumulation of experience and high-quality work of the staff. (Prahalad 1990, 4-5.)

Another reason for entering the international market becomes a risk factor. Work on different foreign markets can reduce a country risk. By diversifying the production and marketing of goods, companies can avoid the losses that arise, for example, due to economic downturn or political instability in one country, and make profit in another. (Kovaleva 2017, 20.)

There are many ways, models and different principles for entering new foreign markets and they are all called by one concept “Internationalisation strategies”. These strategies make up a whole scheme and can be divided into three different blocks, each of which is subdivided into certain types. (Kovaleva 2017, 21.)

- Trade strategies
- Cooperative strategies
- Investment strategies

2.1.1 Trade Strategies

Trade strategies include trading of certain goods and services. Accordingly, there is an import and export in goods, licensing, franchising, subcontracting, engineering, leasing, insurance and banking services etc. in service trading. (Krylov 2012, 57.)

Export refers to trade of goods and services abroad with the aim of their implementation on the foreign market and generating profit. Such method of entering the international market is considered one of the least risky. The export of products does not require a significant adjustment in the domestic sales market and the existing range. The organisational structure of the enterprise does not change and the least amount of

resources is used. However, there are certain risks in the field of legislation, export mechanisms and the solvency of the host country. There are two types of exports: direct and indirect. During the direct export supply and sale of goods happens directly abroad through its own resources and personnel. This method can be easily implemented when there is no need to look for customers, and they search for the seller themselves. (Krylov 2012 58.)

According to Krylov (2012, 58-59), the company may resort to the following export tools illustrated in the Table 1:

Table 1 Export tools (Krylov 2012, 58-59)

Export tools		
• Export department (deals with all matters related to the supply and promotion of goods on the foreign market).	• Own sales representatives abroad.	• A team of foreign experts (they can assist in the development of the foreign market, support and stimulate the sales of the products).

During the indirect export, a company sells its products to intermediaries on the domestic market who then sell the products to the foreign market. These intermediaries have their own channels and ways of entering the external markets and operating on them. It reduces the costs in terms of remuneration of labour of the representatives abroad, the transportation costs and costs of acquiring new knowledge of conditions of the foreign market. Mostly, the enterprises that offer indirect export services have very qualified staff, whose work is targeted at studying and mastering the external market. These specialists already are aware of what, in which the regions and countries of the world sells better. Such cooperation allows to not only lower down the costs but also increase the efficiency of the product promotion on the external market.

Another type of trading strategy is licensing. “Licensing is used when a foreign company (licensor) transfers the possession rights of an object to a local company (licensee), which

must perform certain work or make payment according to the licensing agreement concluded." In such way, a company gets access to the external market with the least risks and the licensee gets an opportunity to use ready-made technologies, to use brand and produce an already well-known brand. There are many examples of companies that resort to licensing as a model of work on foreign markets. One of the famous ones is Coca-Cola that sells licenses and concentrate for the production of its drinks to other manufacturers in different countries of the world. It is worth pointing out that there are certain disadvantages of such internationalisation. The licensor has less control over the licensee's production than if the company had managed the production on its own. Furthermore, when the license agreement ends, there is a risk that instead of the licensee, there would be a new competitor. (Moiseeva 2013, 271.)

One more trade strategy of internationalisation is called franchising. "Franchising is a special form of licensing where the franchisor does not only sell an intangible asset (e.g. trademark) to the franchisee but also obliges the franchisee to follow certain rules on how to conduct business." Rules and procedures for the use of franchise are written in the contract signed the franchisor and the franchisee. In most cases, the contract determines the amount of deductions for the usage of the franchisee that can be fixed, one-time for a certain period or calculated as a certain percentage of sales. However, if the requirement for deductions for the use of franchisee is not present, the franchisee should purchase a certain number of goods, works and/or services from the franchisor. (Machina 2012, 49.)

In the separate clause of the contract, the terms of use of the trademark might be highlighted. It all depends if the franchisee may use a trademark in a certain area or the franchisee is required to strictly follow the requirements of the franchisor while disposing the equipment in the store. It considers the size and color of the shelves and finishing off with the mandatory uniform of working clothes for personnel". Just like other ways, franchising has its own advantages. (Machina 2012, 50.)

By entering a new foreign market through franchising, the company has more control over the sales of its products, remains its own unique style as well image and brand. If there are any arising disagreements in terms of the work of franchisee, the franchisor has rights at any time to easily terminate the cooperation without experiencing significant financial losses. (Machina 2012, 50.)

2.1.2 Cooperative Strategies

Such type of strategy includes the implementation of joint programs where the parties are co-owners of certain results of joint activities. There is a separation and distribution of resources and risks. The cooperative strategies can be divided into following:

- Joint ventures
- Co-production and/or marketing
- Affiliated companies
- Strategic alliances without equity
- Mutual exchange of shares

Strategic alliance is a special cooperative agreement between two or more companies that combines key competences, capabilities and abilities of companies to get better results and achieve new heights. They are divided into two main types: non-share wise strategic alliances and share wise strategic alliances. Alliances operate in three areas of activity: joint work in entering new markets, work on R&D projects and joint production. (Hromova 2011, 156.)

There are numbers of features inherent in strategic alliances:

- Such form of cooperation allows companies to work effectively together but it does not bring to the merger of companies;
- It is aimed for a medium or long term perspective;
- Independently, the alliance cannot be a legal entity;
- Alliance makes companies more competitive by working together against common competitors;
- The same company can be in several alliances;
- Alliances are created between those companies that can complement each other's activities by own experience, skills, technologies, resources and by ability to enter certain markets that already exist in virtue of one of the members of alliance;
- Enterprises become more competitive and stable in their industry as the risks are reduced;

- It becomes possible to use the missing production capacity at the expense of the alliance partner.

An example of a strong alliance includes IBM, Motorola and Apple in 1991 when they combined to challenge a dominant Intel computing platform on the market by creating a more advanced next generation operating system. In addition, there are many examples of companies located in developed countries signing agreements on strategic alliance with a company from developing countries. Sometimes it is done to not only start exporting to a certain country but to an entire continent. (Hromova 2011, 158.)

2.1.3 Investment Strategies

Investing strategies represent the ownership and control strategies, ownership of property abroad, both partial and full (Lin Chan 2011, 31).

Such strategy is divided into the following types:

- Construction of a new enterprise;
- Absorption;
- Branches and representatives office;
- Creation and acquisition of a company abroad;
- Mergers.

Foreign Direct Investment (FDI) is defined as “an investment reflecting a lasting interest and control by a foreign direct investor, resident in one economy, in an enterprise resident in another economy. Such investments are targeted at achieving certain goals: generating profit in the long term and having an ability to partially manage this foreign company. (Tyutyunnik 2013, 14.)

The merging process includes a unity of several equal economic units because of which a new entity and taxpayer appears as autonomous legal entities are liquidated. All assets and liabilities from companies included in the merger process start to belong to the new entity. All participants may transfer the rights of control over their organisations to the authorised capital but at the same time, they will keep the organisational and legal form of the participating enterprise. Absorption process is an act of acquiring the authorised capital of any company in the amount no less than 30% where the legal independence of the company remains. (Tyutyunnik 2013, 15.)

3 ROSATOM ON THE GLOBAL MARKET

This part familiarises with the case company. The key goal is to give an overall idea about the company's industry, services, ways of operation, location, and its customers.

3.1 Past, Present and Future

As the world population and standard of living in different countries are growing, there is an increase in the demand for energy. Therefore, in order to satisfy all needs, as well as conserving fossil fuels with environment, there is a need to find alternative sources of energy. Nuclear energy is designed to be one of the solutions and one of the tools of soft power for different countries in the world. Also, it is considered to be the safest energy in terms of fatalities per terawatt (TW) consumed in the world which is clearly shown in Figure 1 where it equals to 0.01 TW.

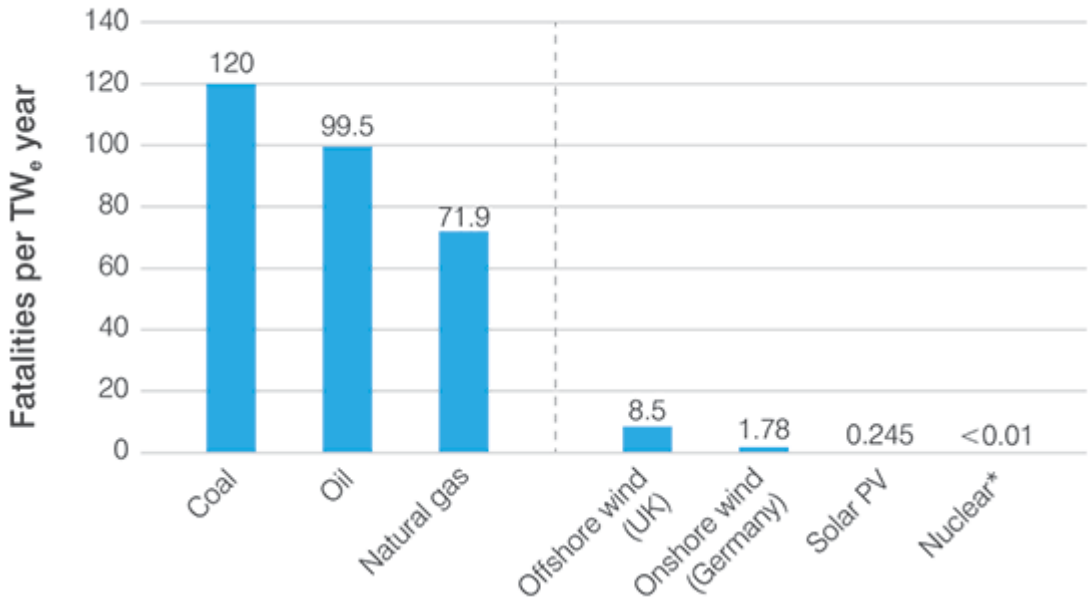


Figure 1 Energy accident fatalities per TW a year (Paul Scherrer Insitut 2015)

The USSR has been working on the construction of nuclear power plants in other countries since the 1960's starting from participation in building Rheinsberg NPP in GDR (German Democratic Republic). The focus was mainly on the Communist countries but there were a few exceptions. The only governmental corporation responsible for it was "AtomEnergoExport", which was a monopolist in USSR. In 1970's and 1980's, it conducted the construction of NPPs in Bulgaria, Czechoslovakia, Hungary, Cuba and even Finland. (Rosatom 2017.)

With the break of USSR in 1991, Russian Government established the Ministry for Atomic Energy which was a successor to its Soviet equivalent. In the next years, nuclear industry in Russia started to experience problems and lack of financial support from the government as there were big economical difficulties in the country. Many other industries fell into disrepair but atomic managed to survive thanks to the United States-Russia post-Cold war nuclear disarmament process and MMP (Megatons to Megawatts Program). It was a largest nuclear cooperation project between Russia and USA. According to an intergovernmental agreement between two countries signed in 1993, Russian high enriched uranium, weighing 500 tons of many destroyed warheads, was diluted to low enriched uranium and sold to America for real money which lacked it and used to manufacture nuclear fuel for its NPPs. Russia received a total revenue of 17 billion dollars and could give vital support to its own atomic industry. Today, every tenth light bulb in the USA burns thanks to Russian uranium. (Rosatom 2019.)

Thus, Rosatom slowly emerged from the economic shock in the country better than other industries and managed to incorporate the best practices and enterprises of the nuclear sector of the entire post-USSR countries. However, during the recovery period in the 1990's, Russia suffered two painful fiasco on the external market. It lost the tender for the construction of the third power unit of the Finnish NPP Olkiluoto (won by the Franco-German consortium) and the tender for the supply of nuclear fuel for reactors to another Finnish NPP Loviisa which was built with the participation of Soviet Union. Year by year, the corporation was gradually able to restore its volume of orders in the world and situation in the nuclear sector began to improve in the early 2000's. In 2004, The Ministry for Atomic Energy transformed into Federal Agency on Atomic Energy and later, in 2007, Russian President Vladimir Putin has signed a law under which its assets and powers transferred to newly established Rosatom State Corporation that continued to represent domestically and abroad. (Rosatom 2019.)

The industry of Russian nuclear power has two different directions of development on the foreign markets. First direction focuses on the emerging (developing) markets where the main target is on financing projects from the Russian side. Even though these emerging countries prefer to work in accordance with international requirements set by IAEA (International Atomic Energy Agency), the main focus of cooperation is not on the excessive safety. Instead, it is on the actual ability to receive funding for support and construction of nuclear facilities.

Second direction is targeted on already developed energy markets where a deep study of the projects concerning safety and competitiveness is done by the Russian side prior to

the possible agreement to cooperate. In advance, the risks with supply of equipment, fuel and installations are carefully considered. The reasons for Rosatom's internationalisation are very straightforward. Rosatom must confirm its leadership in the global nuclear sector.

The domestic market is saturated and it is needed to attract new customers in other countries to make long-term profits. The risk factor is also reduced when working with many different and dissimilar countries, as with diversification Rosatom can avoid losses due to the economic recession and political instability in one of the countries and continue to make profits in the other. Rosatom is expanding its order book by providing loans to countries where it sells its nuclear projects. In total, many states have already received more than $100 billion at 3% per annum. (Kalinovsky 2018.)

There are many current projects that are aimed at international activity and cooperation with Rosatom. Alexey Likhachev, the CEO of corporation, gave an interview to "RUSSIA 24" TV channel in January 2019 where the main points of previous successful years were summed up. He stated that the main accents are once again on the internationalisation and on the domestic market that can attract certain interest from abroad. The order book exceeds $133 billion. Last 5 years have confirmed the growing worldwide interest in Russian nuclear technologies. For comparison, if in 2013, Russia conducted or planned a construction of 28 NPP power units worldwide, the data for 2018 suggests that the number of such power units rose to 39 in 12 countries. Rosatom remains an absolute leader in the number of NPP power units being built abroad. (Likhachev 2019.)

2018 marked itself as the final stage of construction of the FNPP (Floating Nuclear Power Plant) "Academic Lomonosov". This is a unique atomic object which, for the first time in the history of mankind, can be moved anywhere and placed at any place on the water. In this case, it will be located in the waters of the Arctic. The main goal is to provide energy for geographically remote areas and its industrial enterprises, port cities, as well as gas and oil platforms located in the open sea. FNPP has been designed with a large margin of safety that exceeds all possible threats and makes nuclear reactors immune from tsunamis and other natural disasters. Rosatom is negotiating with potential buyers from the countries of the Persian Gulf, Southeast Asia and South America. There are 15 countries including Algeria, Indonesia, Argentina, China and Malaysia that show interest. The most potential cooperation concerning this development is planned with Argentina. Rosatom is the only company in the world that has abilities to construct such objects at the moment and it has a significant competitive advantage on the market. (Likhachev 2019.)

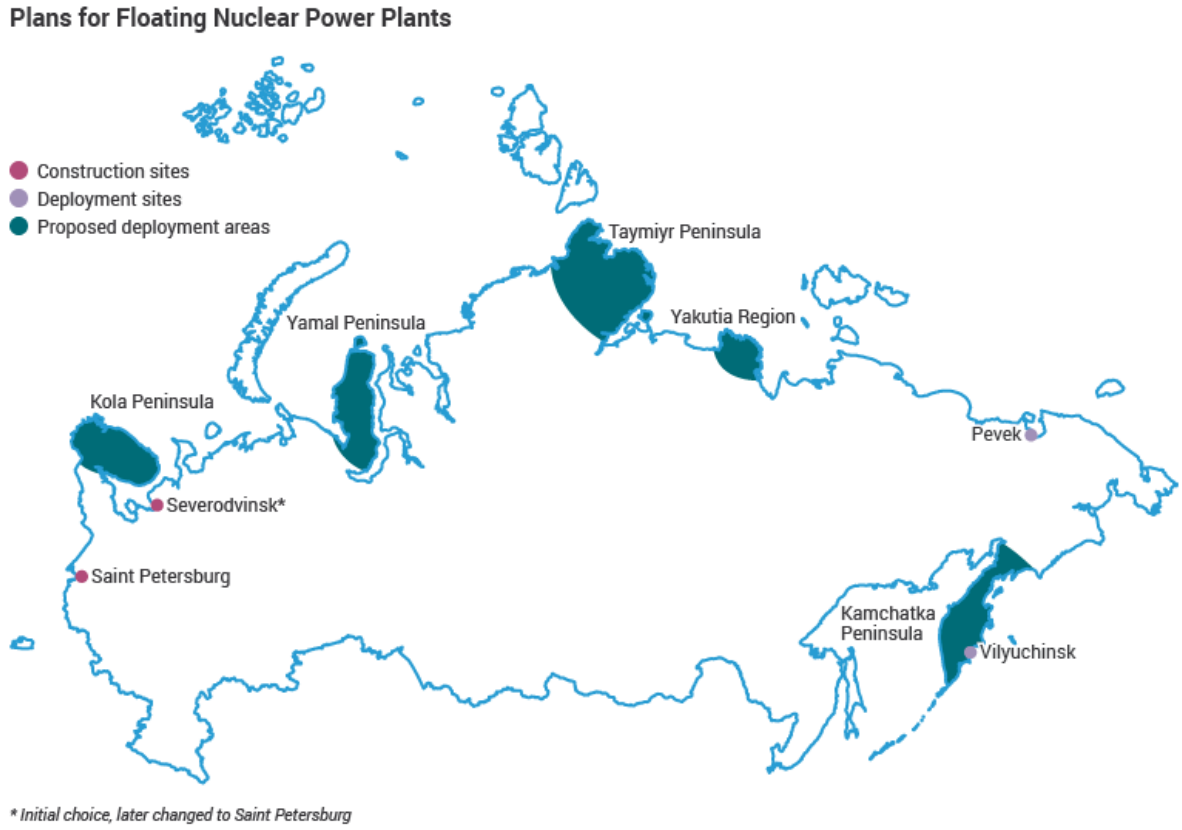


Figure 2 Plans for deployment of floating NPP (World Nuclear Association 2018)

Map of Russia on Figure 2 clearly shows the gradual geographical steps concerning the FNPP. Out of all proposed northern and eastern deployment areas, the choice was made in favor of the small city of Pevek. Construction process was initially planned in Severodvinsk but due to the military workload had to be moved to St Petersburg where the shipyards had an experience of building nuclear icebreakers. Completed vessel made its first leg of journey to Pevek in May 2018.

In 2018, Russian parliament vested Rosatom with powers of the operator of Northern Sea Route (NSR) and in terms of development and operation of the adjacent territories in the Arctic. NSR is the main shipping artery of Russia in that region. It passes through the seas of the Arctic Ocean and Russia's exclusive economic zone, connecting European and Far Eastern ports. Its length from Kara Gates to Provideniya Bay is 5,600 km or 3,023.76 nautical miles. (Likhachev 2019.)

The Northern Sea Route serves the ports of the Arctic and major rivers. Using NSR fuel, equipment and foodstuffs are delivered to this area. The partners in this region are China, Japan, South Korea and many European countries in terms of cargo transportation. All infrastructure created in the Arctic is designed to be eco-friendly and fully corresponds to the sustainable development and urbanisation norms set by Rosatom which has its own SEM (System of Ecological Management) that all corporation employees have to follow. (Likhachev 2019.)

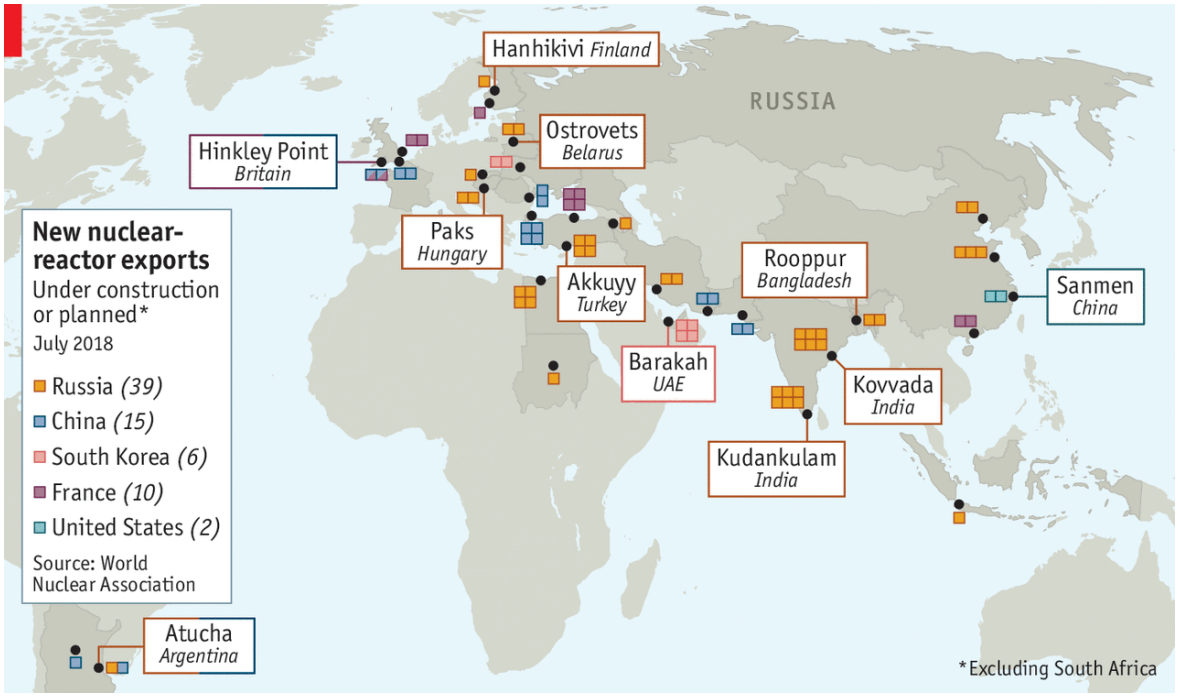


Figure 3 Map of global presence on the nuclear market (The Economist 2018)

A confirmation of successful activity is the number of contracts signed for the construction of nuclear power plants on a foreign market which is shown in Figure 3. Rosatom is in progress of building four unit blocks of the Akkuyu NPP IN Turkey, two unit blocks of the Paks-2 NPP in Hungary, one unit block of the Hanhikivi-2 in Finland, two unit blocks of the Tianwan NPP in China, two unit blocks of the Ostrovets NPP in Belarus, four unit blocks of the El Dabaa NPP in Egypt, four unit blocks of the Bushehr NPP in Iran, two unit blocks of the Rooppur NPP in Bangladesh, two blocks of the Kundankulam NPP in India and modernisation of the current existing unit block of the Metsamor NPP in Armenia. Negotiations were signed or underway for another 18 unit blocks in other different countries of the world, including Argentina, Sudan, Indonesia, Uzbekistan, Nigeria, Jordan and many other countries. Not a single atomic energy company in the world has such

significant order book which is clearly shown in Figure 3. The amount of nuclear reactors under construction or planned (39) exceeds its closest competitor China (15) by 2.6 times. Such factor represents high competitive ability of Rosatom. (Likhachev 2019.)

Big perspectives of the development of nuclear market are predicted. According to the forecasts of strategy calculations of nuclear industry analysts, the global nuclear energy market is expected to grow by 2030 in all its segments.

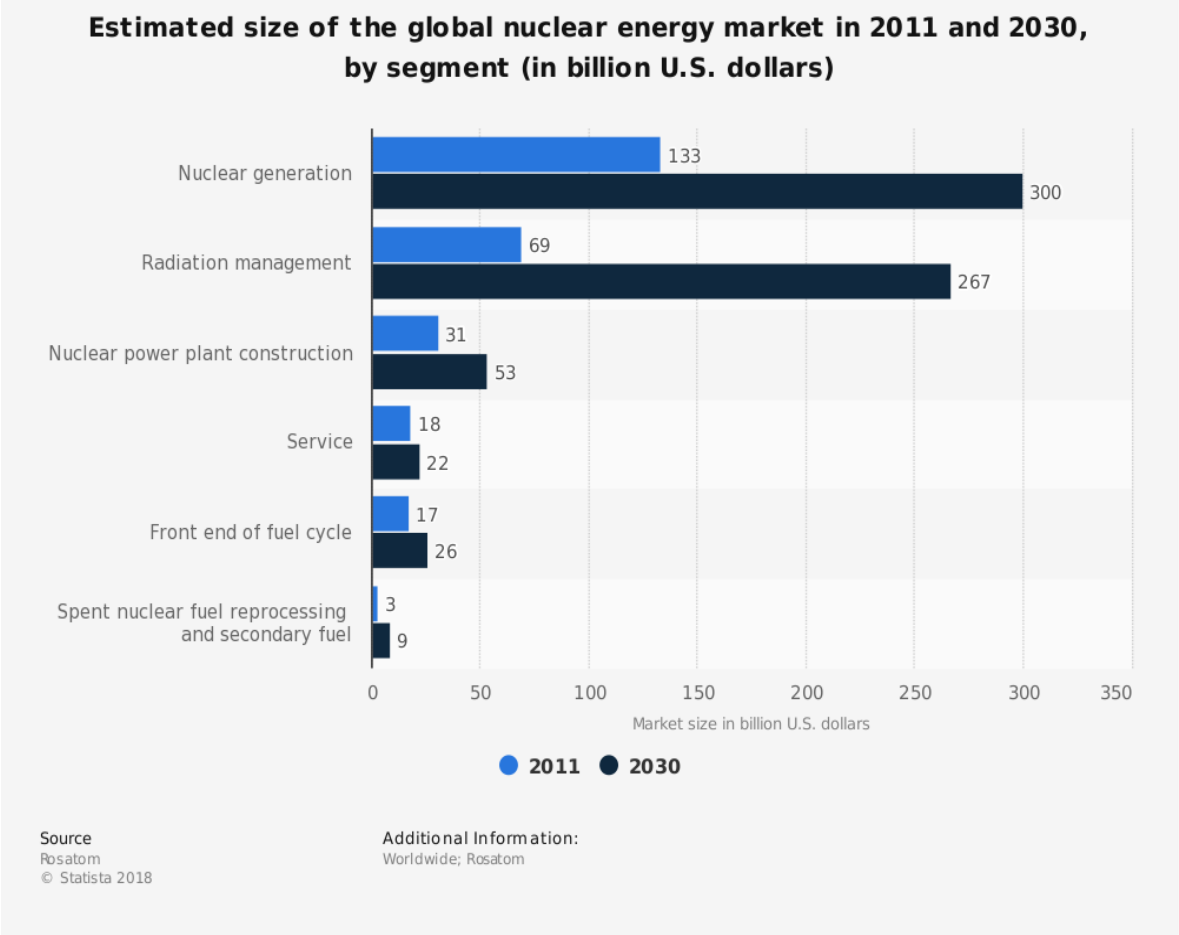


Figure 4 Estimated size of the global nuclear energy market in 2011 and 2030 by segment (Rosatom 2018)

According to Figure 4, segment of radiation management ($69 billion in 2011 and $267 billion in 2030) will sufficiently increase the volumes on the market and will approach the indices of nuclear generation ($133 billion in 2011 and $300 billion in 2030) segment. Nuclear Power plant will continue to demonstrate growth ($31 billion in 2011 and $53 billion in 2030). Front end of fuel cycle segment ($17 billion in 2011 and $26 billion in 2030) is expected to overtake service segment ($18 billion in 2011 and $22 billion in 2030) which would still grow in size. The lowest segment in terms of finances spent, nuclear fuel reprocessing and secondary fuel ($3 billion in 2011 and $9 billion in 2030) will rise as well, like others.

Concerning other achievements in terms of global cooperation, more key theses were voiced by Likhachev in the interview. The construction of the first NPP in Turkey “Akkuyu” continued, which is implemented on the basis of the Intergovernmental Agreement signed between Russian and Turkey in May 2010. Power plants VVER-1200 of the Akkuyu NPP are among the most advanced developments of generation 3+ with enhanced security systems that meet all existing requirements and are more powerful than its predecessors. The model of cooperation between two countries is slightly different from others. Due to the lack of resources and qualified personnel, Turkish government proposed Russia to build, own, and operate (BOO) this NPP for the entire period of its operation, i.e. 60-80 years. This is a big program in which the cost of construction is $22 billion. This project suggests that Russia, with its atomic program, comes to Turkey for an estimate of 100 years. (Likhachev 2019.)

In the context of entering new directions on the European market, there have been significant advances. The European Union (EU) approved construction of Paks-2 NPP in Hungary and gave a “green light” as all formal procedures were completed. Construction is scheduled to begin at the end of 2019 or in 2020 and start of operation of the completed NPP to occur in 2026. In January 2014, Russia and Hungary signed an intergovernmental agreement on cooperation in the area of atomic energy use which implies a construction of fifth and sixth power units of Paks-2 NPP. The contract for actual construction was signed in December 2014 by Rosatom and Hungarian energy company MVM. The cost of the Paks-2 project is estimated at €12.5 billion and Russia provides a loan of €10 billion to Hungary. (Verstovseli 2018.)

Rosatom has concluded the first commercial contract for the supply of nuclear fuel for NPP of Western type. Starting from 2021, Rosatom will supply fuel for the Swedish Ringhals nuclear power plant, dividing the contract by $ 130 million with its competitors, the French Areva and the American Westinghouse. (Rosatomnewsletter 2017.)

Russia and China signed a general contract for the construction of units 7 and 8 of the Tianwan NPP. It is the largest facility for the Russian-Chinese economic cooperation. The first and second power units were launched back in 2007, the third in December 2017 and power start of the forth unit took place in October 2018. (Kalinovsky 2018.)

The project of construction of the first NPP in Egypt “El-Dabaa” is going according to the schedule which will last for 12 years. It entered the licensing and preparation stage for the start of construction work at the site of the future nuclear power plant. In accordance with the signed documents, Rosatom will build four nuclear power units on the Mediterranean coast meeting the highest, safety standards. It is planned that the first block of “El-Dabaa”

NPP will be commissioned in 2026 and the whole construction of the station will be finished by 2028-2029. (Kalinovsky 2018.)

With respect to the construction of the Hanhikivi-1 atomic power plant in Finland, there are additional preparations to obtain a construction permit. In 2015, Fennovoima submitted an application to the Finnish authorities to obtain a license for the construction of Hanhikivi-1. It fulfilled one of the main conditions of the contract – the share of Finnish ownership of the future NPP to exceed 60%. However, the process of obtaining the license is still delayed due to the fact that the provision of documentation required is proceeding more slowly than planned. Finnish experts, together with Russian colleagues take into account any remarks from the regulator and work on solutions in accordance with the comments. Actual obtaining of the license is planned for 2021 and start of station operation for 2028. (Neimagazine 2019.)

The peculiarity of this project is that the requirements of the Finnish nuclear regulator STUK (Säteilyturvakeskus) for detailing and document processing at the licensing stage are higher than those of other countries. Likewise, Hanhikivi-1 nuclear power plant was the primary project to which STUK moderated requirements applied. It was updated after the construction of the Olkiluoto-3 nuclear power plant in Finland according to the German-French project and after the disaster occurred at Fukushuma-1 in Japan as a result of the earthquake and tsunami in March 2011. (Kalinovksy 2018.)

Therefore, numerous processes in Hanhikivi-1 project are new to all its participants. In the meantime, extra time devoted to the design phase and the preparation of licensing documents will help the project to avoid delays amid construction. As “Fennovoima” (construction customer) is included in the NPP construction project for the first time in its history, the technical and administrative competencies were proposed to be improved by Rosatom. After the Fukushima-1 accident, Finland became the first country in the world to announce the construction of a new nuclear power plant. (Verstovseli 2018.)

The preliminary cost of building such station is €6.5 billion, of which Fennovoima spends €1.5 billion and Rosatom incurs the remaining expenses in terms of providing a loan of €5 billion. (Verstovseli 2018.)

The fact of providing a loan is a big competitive advantage of Rosatom. Another prominent fact is that Rosatom can extend the life of a nuclear unit by high-temperature heating of the reactor body with special stages of temperature control. The integrity of the metal destroyed by prolonged radiation exposure inside the reactor body is restored and as any reactor is an expensive facility, it is a very useful feature. (Kalinovsky 2018.)

Even though all described construction processes could be called ordinary by atomic measures, an example of the Bushehr NPP in Iran, displayed on Figure 5, became very special and nothing similar has ever happened. After signing a treaty between Iran and

Figure 5 Completed Bushehr NPP in Iran

Russia, Rosatom undertook to complete the construction of a station, abandoned by builders from Germany to wound in 1979, by inscribing Russian equipment into the construction part that was made according to the German project. The West put political pressure on Russia in order to force it to abandon the process. However, no matter what, Russia showed the will to defend its interests and fulfil its obligations to its partners. Unit 1 of the Bushehr NPP was completed and launched in 2013 Thanks to this, Rosatom earned a brilliant worldwide reputation of a company that “can do anything”. (Rosatom 2017.)

Russian government had determined certain goals and objectives for Rosatom Corporation to become a world technological leader by entering more foreign markets, using innovative scientific developments and as a result entering the top three companies in terms of revenue in Russia. A planned implementation term is by the year 2030. The scale of work until 2030 is expressed in the number of NPPs which are built in the world according to the Russian technologies which should set the global standards. (Rosatom 2017.)

After the Chernobyl disaster on April 26, 1986 when routine test at the power plant went wrong and two enormous explosions blew a thousand ton roof off one of the plant's reactors, releasing 400 times more radiation than the atomic bomb dropped on Hiroshima, the world nuclear standards required changes drastically. Especially, concerning the environmental harm caused. As the accident occurred in the area of Rosatom's area of responsibility, it needed to reconsider its approach to nuclear safety and rehabilitate itself in the eyes of the world atomic society as fast as possible. In result, the environmental norms were tightened during the construction of new nuclear units and these standards became the strictest in the world. Year by year, Rosatom managed to return the lost ground and advanced very far in terms of technological progress. At the same time, Rosatom successfully overcame the negative impact on the market from the consequences of the accident at Fukushima in 2011. It proposed nuclear power units with new safety systems which exclude what happened at the Japanese station. Moreover, Rosatom became the only company in the world that managed to bring the construction of stations that meet all the post-Fukushima requirements to the industrial level. (Baltnews 2019.)

Nonetheless, incidents at Chernobyl and Fukushima can be considered as exceptions to the rule, as statistics clearly show that nuclear power sector has the lowest energy accident fatalities a year. (Figure 1.)

One of latest main innovations is set to be a fourth generation NPP reactor which is a complete new step in the nuclear industry and Russian corporation Rosatom was the first one in the world to actually impellent this technique. Fourth generation of NPP includes fast-neutron reactors which are different compared to usual thermal-neutron reactors. They are much safer as they do not have high pressure and the risk of coolant lose due to boiling-out is impossible. Any exothermic chemical reactions under high temperature inside the atomic reactor cannot happen which was the cause for Fukushima explosion in March 2011. (Kalinovsky 2018.)

Another positive factor is that using such reactors, it became possible to use certain elements in the fuel cycle that previously were not used and remained in the waste. That is the "firewood" for fast-neutron reactors which does not require any mining and will be enough for humanity to use for thousands of years. It is claimed a ten-fold advantage over thermal-neutron reactors. All what is needed is just to extract the spent nuclear fuel on other nuclear power plants out of the storage. It will be reprocessed and its component will serve as fuel for fast reactors. At the same time, fast reactors themselves are capable of producing new components when operating. The emergence of such innovative reactors

created a closed nuclear fuel cycle. There are no emissions of carbon dioxide into the atmosphere during its operation. According to Rosatom experts, this reactor will be able to operate continuously on a single fuel load for up to 15 years. As a result, they do not only provide energy but also make a significant contribution to the environment. Other countries have not come to anything like this yet which creates a significant competitive advantage.

Furthermore, technological innovations include a third (3+) generation NPP reactor where the latest developments and achievements were implemented that, once again, meet all post-Fukushima requirements. The most powerful reactor today VVER-1200, has three key advantages: it is highly productive, durable and safe.

- The capacity of the reactor has increased by 20% compared with previous generation
- As wide automation and centralization of functions with processes were used, amount of personnel compared with previous generation units was reduced by 30-40%
- The entire period of operation of the main equipment has been increased by two times compared with previous generation units, making it 60 years
- Certain project solutions optimize capital costs. According to the plan, one evaporative cooling tower is being built instead of two, as it was on previous NPPs earlier. Such way of approach allows to significantly reduce energy consumption, the territory of the NPP and capital costs while maintaining all technology and safety requirements.

In terms of safety procedures, the unit is equipped with two protective shells with a ventilated space between them. The outer shell can withstand any natural (earthquakes, floods, hurricanes), or anthropogenic (explosions) effects on the NPP which became especially important after the Fukushima event. The security systems of the station will function even if complete loss of power supply would occur and can perform all its safety functions without any activation. (Kalinovsky 2018.)

However, the main innovative factor is in the lower part of the containment station where there is a core catcher. It is a device designated to catch the molten core material of a nuclear reactor and cool it down because if it falls through, it would be released as a radioactive product into the soil during a severe accident. As a result, it prevents an ecological disaster. (Kalinovsky 2018.)

3.2 International Scientific Cooperation

The technological advancements do not keep unnoticed and are well respected widely. In order to integrate such ideas into masses, those countries that are interested in them and in the construction of NPP, sign a contract with Rosatom for the construction of CNST (Center of Nuclear Science and Technology) in those states. It is built for preparation of the local high-level personnel who would be able to work on the development of nuclear energy in their countries. Last contracts for establishment of the centers were signed with Zambia and Bolivia. It is another highly efficient method of entering a country's nuclear power industry which is multidimensional and can be integrated into a large number of areas of human activity. The center is aimed not only a research work – it assumes a widespread use of radiation technologies in agriculture, medicine and industry. (Atomic Expert 2018.)

***-"We offer Bolivia not only the construction of the highest nuclear research center in the world (4100 m above sea level) but the highest technologies as well. The implementation of this project will allow Bolivia to become a regional leader in the field of nuclear research" – said the CEO of Rosatom, Alexei Likhachev*. (Likhachev 2018.)**

Rosatom is ready to fully support the project implementation from scratch, including training specialists, building nuclear infrastructure in accordance with the requirements of the IAEA, listening to the public opinion, designing and building of the actual center, supplying fuel and services, upgrading and decommissioning. At the request of the customer, Rosatom can setup anything from nuclear medicine departments to irradiation facilities for agricultural products. Local science and vocational school will receive accelerated development. A new educational and information program will be created for the local population and will be possible to change the situation in terms of improving the quality of life, preserving the health of the citizens. Also, the services of the center will be available for residents of other countries which can strengthen Bolivia's relation with its neighbours. (Kalinovsky 2018.)

Rosatom also plans to build the same CNST in Zambia. It will contribute to the growth of the level of education and science in the country by training highly qualified specialists in different specialisations. Radioisotopes that will be produced at the Center's facilities can be used to diagnose and treat oncological and cardiac diseases which will generally increase the availability of high-tech nuclear medicine for Zambians. The use if irradiation

for food processing can improve its preservation for safety purposes and will create conditions for growth in export of Zambian agricultural products. Such processes will have a positive influence on the quality of life in the country. Furthermore, Rosatom offers a breakthrough project using the latest technologies in water treatment. In future, it can provide invaluable help to Zambia and countries around it which face a growing number of diseases due to the use of dirty water by the local population. (Rosatom 2018.)

Until recently, NPP construction projects prevailed in Rosatom's order book. Experts estimate the amount of investment into the creation of CNST in Bolivia at €300 million. The construction of a two-unit NPP would cost no less than $6 billion and would last much longer. (Kalinovsky 2018.)

However, in Europe all the construction projects only include NPPs at the moment and just two are built in the EU. As stated before, Hanhikivi-1 is located in Finland and Paks-2 is located in Hungary and one deserves an attention as a stronghold of tight cooperation.

3.3 Paks-2 Nuclear Power Plant in Hungary

The construction project of Paks-2 NPP with the participation of Russia, which in Budapest is called the flagship of the Russian-Hungarian cooperation, has moved to the stage of active preparation for construction that is set to begin in 2019.

Paks-2 NPP exploits four nuclear power units built in 1974-187 with the participation of the USSR and they account for more than 40% of the total electricity generated in Hungary. The station is one of the safest and most reliable nuclear power plants in the world. (RIA 2017).

At the end of 2014, Russia and Hungary signed a contract that considers a construction of the fifth and sixth units of the Paks NPP. Russia gave Hungary a state loan of up to €12.5 billion for the Paks-2 project. Hungary highly values the importance of the construction project for the development of national economy and cooperation with Russia in various areas. (RIA 2017).

-"It is no exaggeration to say that it is one of the most significant business transactions of the century and is a huge incentive for our economy" – said Péter Szijjártó, the Hungarian Foreign Minister (RIA 2017).

As a result of this cooperation, about ten thousand new jobs will be created in Hungary which will give a strong support to fight unemployment. Figure 6 fully illustrates all other positive direct and indirect socio-economic factors from building an NPP for any region.

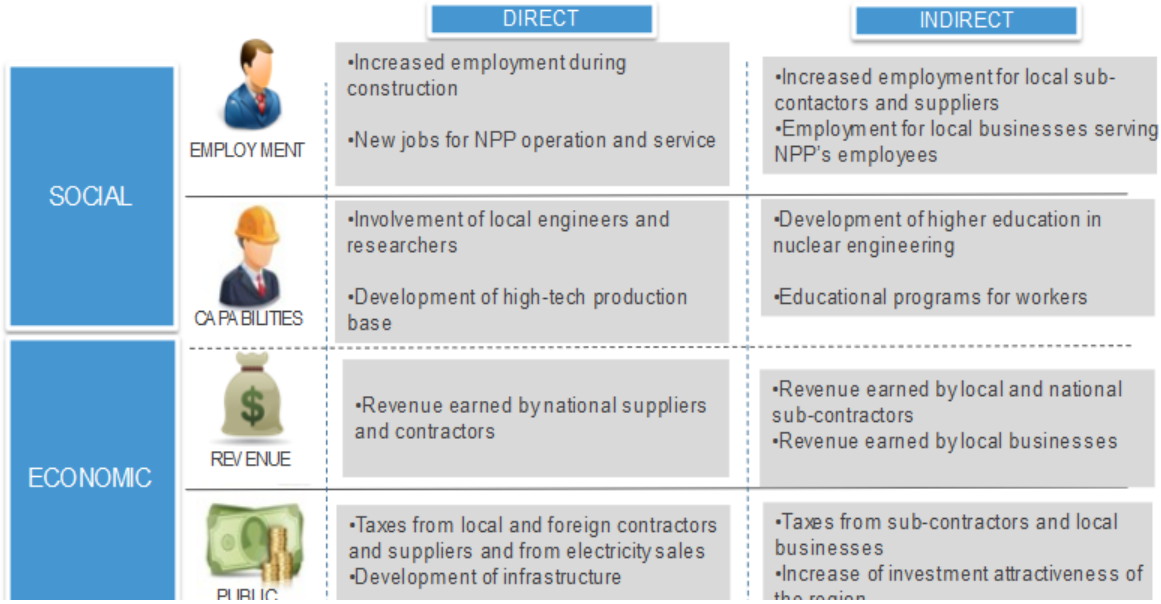


Figure 6 Positive direct and indirect socio-economic factors from constructing an NPP

Hungary intends, over time to increase the share of nuclear generation in its energy system up to 70% of the total energy mix (RIA 2017.)

The choice for Russian technologies for new Paks-2 NPP power units was obvious as for 40 years of exploitation of current four NPP power units, the supply with energy is rated as one of the most efficient in the world (Verstovseli 2018).

The European Commission (EC) initially notified the Hungarian government in September 2015 that the project meets all the EC requirements, including technical and environmental. However, later it launched an investigation concerning possible state subsidies, implementation of public access and government procurement form. All investigations were stopped in March 2017 with a statement of absence of any violations. (Verstovseli 2018.)

Another important event was the fact that the general contractor of the project, the engineering company ASE (AtomStroyExport), part of Rosatom State Corporation, managed to pass the nuclear qualification audit which made it possible to proceed to the active phase of the project. Rosatom only needs to provide Hungary with the necessary project documentation and work can on the site can start. (Energybase 2017.)

The intergovernmental agreement between two countries ensures a localisation of equipment production on the level of 40% and Rosatom is counting on the active participation of Hungarian companies in the project (Verstovseli 2018).

An impressive fact is that according to the survey conducted by the project company MVM Paks II, majority of the Hungarian population supports the completion of the Paks-2 NPP with 54% supporting, 36% against and 10% with no opinion. For reference, 50% support level in terms of NPP is considered to be extremely high. (Verstovseli 2018.)

Furthermore, one of the most unique projects in world atomic history was a multi-year joint project of Hungarian and Russian nuclear power engineers to eliminate the consequences of the accident at the second power unit of Paks NPP. In 2003, Russian Ministry of Atomic Energy promptly responded to the request of the Hungary to assist in the extraction and processing of the destroyed fuel assemblies which collapsed during its washing. The event was assigned a “serouis incident level” according to the international rating scale for nuclear events. Russian side finished all the restorations in 2007 and Hungary resumed the operation of Paks NPP. A number of employees in the Russian nuclear industry were honored with Hungarian state awards. In other time, Rosatom does not only help to maintain the existing power units of Paks NPP but also modernises them. (Verstovseli 2018.)

3.4 Cooperation with Turkey

The first step in cooperation between Russian and Turkey was carried out in 2010. The then Russian President Dmitry Medvedev signed a Federal Law of “Ratification of the Agreement between the Government of the Russian Federation and the Government of the Republic of Turkey in the field of peaceful use of nuclear energy for peaceful purposes” (RIA 2010).

The agreement is aimed at forming the legal framework which would facilitate greater cooperation between Turkey and Russia in terms of peaceful use of nuclear energy in certain areas which are of mutual interest in both countries. Those areas are joint scientific activities, researches, design, construction and modernisation of reactors for NPP, joint security operations and improvement over the use of nuclear fusion technology. Also, this agreement defines the principles of cooperation including the exchange of scientific information, technologies, innovations, and specialists, organisation of joint scientific conferences and training of high-qualified staff. (Akkunpp 2019.)

The agreement itself has twelve points in the use of which both Parties shall cooperate:

1. Research and development in the area of peaceful use of atomic energy
2. Controlled thermonuclear fusion
3. Design, construction, commissioning, operation, modernisation, testing, maintenance and decommissioning of power reactors
4. Supply of nuclear materials and equipment for power reactors, as well as provision of nuclear fuel cycle services
5. Exploration and development of uranium deposits
6. Development, design and construction of nuclear materials, necessary for use in power reactors, including regulatory activities in terms of radiation safety
7. Development of improved and innovative reactor & nuclear fuel technologies
8. Nuclear safety, radiation protection, environmental protection
9. Control over nuclear and radioactive materials, facilities and radiation sources
10. Production and use of radioisotopes
11. Development of contingency plan and radioactive waste management
12. Other areas of cooperation that may be agreed between Parties in written form

Currently, the practice shows that cooperation is actively developing and Rosatom operates successfully on the Turkish market of nuclear energy. For example, in March 2018 there was a first graduation of 35 Turkish nuclear specialists, the number of which grows every year. Such people are separately taught for working at Akkuyu NPP at the National Nuclear Research University (NNRU) in Russia which is funded by the Russian budget. All students were recruited. The global competitive advantage of the export oriented programs of the NNRU is the creation of resource centers for practical traineeships (local Russian NPPs) which foreign students and specialists can go through. It will be very useful on their full time jobs. The training program includes studies of Russian language and all nuclear connected activities. For the opportunity to be among those students, there is a big competition between different pupils of mathematical and physical universities. It offers tremendous opportunities for such future specialists as studying in Russia and the diploma of graduation from such program guarantee a recruitment on the Akkuyu NPP construction of which began in April 2018. As there is a

lack of qualified specialists in this area, Turkey is really counting on this program and specialists that it is able to prepare. (Akkynpp 2019.)

The process for the arrival of atomic energy to Turkey was excessively delayed. There were plans to use it since 1955 when there was a supply of equipment for NPP construction to the bordering country of Iran from American “Atoms for Peace” agreement signed by USA President David Eisenhower. Turkey was very interested in the development of the Nuclear Power Plant and there was some certain work carried out that was aimed at the implementation of such idea. In particular, feasibility studies for the construction of the reactors. However, it led to nothing and was all over with no further actions. It happened for several reasons. Firstly, there were no guarantees from the government in terms of financing the construction projects. Secondly, as Turkey is on the seismic zone and the building technologies were not as earthquake resistant, there was a risk towards country’s security and the Chernobyl disaster, especially, did not add confidence. (Akkunpp 2019.)

Finally, new attempts were made again in 2010 to revive the nuclear industry. Turkey understood the importance of such energy sector and announced a tender for construction of NPP on its territory. A few countries including South Korea, China, Canada and Japan were striving to sign contract and start the supply of equipment to the new NPP. However, Russia was chosen as it stood out in terms of offering new innovative program for the formation and development of the nuclear industry in the new foreign market. Turkey signed an agreement on financing from the Russian side, which made it possible to start building reactors at the Akkuyu site. It was hampered by foreign policy tensions of both countries. However, no matter what, everything led to an agreement as

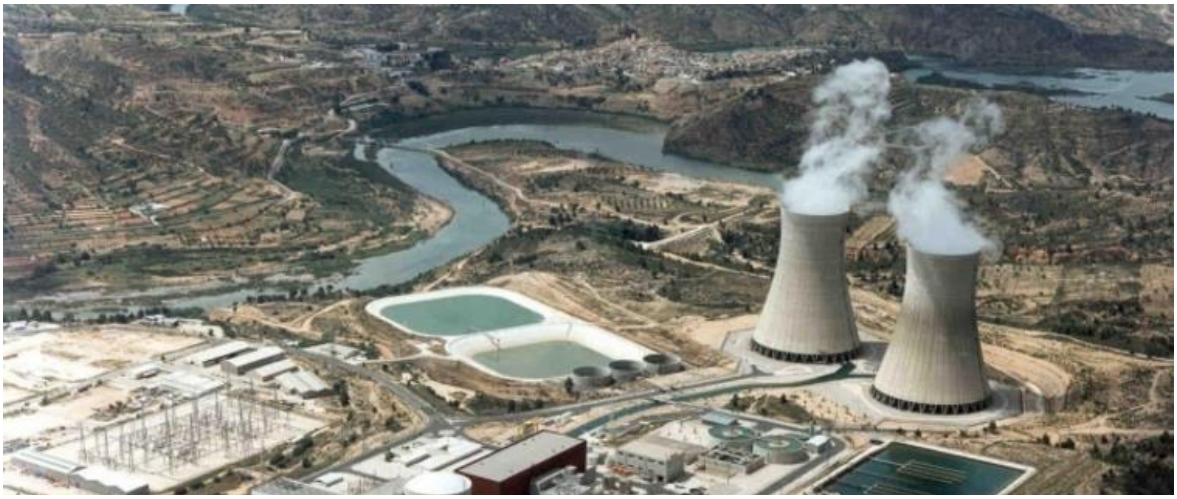


Figure 7 Future Akkuyu NPP (Emlak 2018)

everyone understood the benefits of such cooperation. Rosatom plans to actively involve Turkish small and medium business in the construction process. The Turkish Atomic Energy Agency issued a license to build the first Akkuyu block only a night before the ceremonial start of construction. Russian President Vladimir Putin and his Turkish colleague Recep Tayyip Erdogan attended this event on 3rd of April, 2018 and set off the process. Rosatom estimates a total investment of $22 billion into the project. (Akkuyu 2019.)

Figure 7 displays the look of the future NPP in Turkey.

A special model offered by Russian Rosatom is called “Build-Own-Operate”. It implies the construction, operation and ownership of the nuclear power plant. The essence of the model is quite simple. Russian Federation is building reactors in Turkey for Russian money and after the construction has all the rights to own and operate this station. Rosatom is the main investor and can cover its expenses with the revenues from the subsequent sale of electricity to Turkey. Such business model is a popular practice in other industries. It can be observed in telecommunications technologies but in the nuclear sector it happened for the first time ever. (Akkunpp 2019.)

The Turkish market looks very perspective as at the moment there are no more NPPs in the country. Turkey needs to search for new sources of energy as the demand for electricity among the population is rising. According to the World Bank Group, the Electric power consumption (kWh per capita) for Turkey in 2005 accounted for 2,013.89 kWh, whereas in 2014 it rocketed to 2,854.56 kWh. Within 9 years, the energy consumption demonstrated a 41% growth and it continues to demonstrate it in the next years. Such volumes can bring to enormous shortages of electricity in Turkey, so there is an urgent need to build an NPP which is currently undergoing. It can cover the needs of the population and save the country from the sudden risks. Also, as demonstrated earlier, the electricity generated at NPP will cost less. (World Bank Group 2014.)

Within ten years, Turkey may become one of the most profitable countries in the field of atomic energy as it plans to reduce the import of fossil fuels from abroad and increase the number of renewable energy sources up to 30% and the share of atomic energy up to 10%.

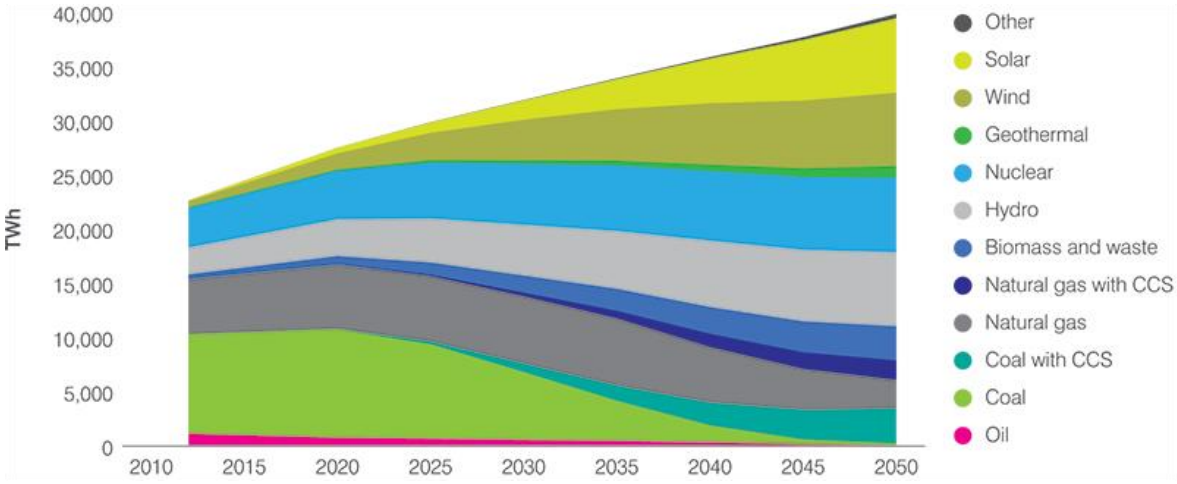


Figure 8 Predicted energy consumption levels and energy mix (Paul Scherrer Insitut 2015)

This factor is especially important for Turkey. According to predictions of the analysts shown in Figure 8, energy consumptions in the world per year will rise from 27,000 TWh (terawatt hours) in 2018 to 40,000 TWh in 2050 and share of nuclear energy in the energy mix will expand which would provide a significant contribution to global electricity. Therefore Turkey makes right steps for its successful future.

Despite the ambition of the Turkish Government and the desire to have its own energy resources, the Turkish population is concerned about the scale and number of planned Nuclear Power units. Turkey has no experience in the field of nuclear facilities, so it is uknown if the Turkish regulatory authority would be able to track and control the construction of Akkuyu NPP by Russian specialists. A lot of criticism also appears towards the use of atomic energy precisely for peaceful purposes, since Turkey supports Iran's policy on atomic energy issues which is of concern to the world. (Verstovseli 2018.)

Nevertheless, Russia continues to be active on the Turkish nuclear market. To overcome such vigilance in the society, Rosatom should actively pursue an information policy to the Turkish society showing that all processes are under control, transparent and show all positive factors orientation on the nuclear energy. According to Figure 9, in relation to other energy sources, the price range of nuclear fuel is lower than the rest and is the cheapest in terms of MWh (Megawatt an hour). It will lead to a decrease in electricity

prices for the population. For example, the price for nuclear energy ranges from $40/MWh to $100/MWh, whereas coal energy ranges from $70 MW/h to 140 MW/h.

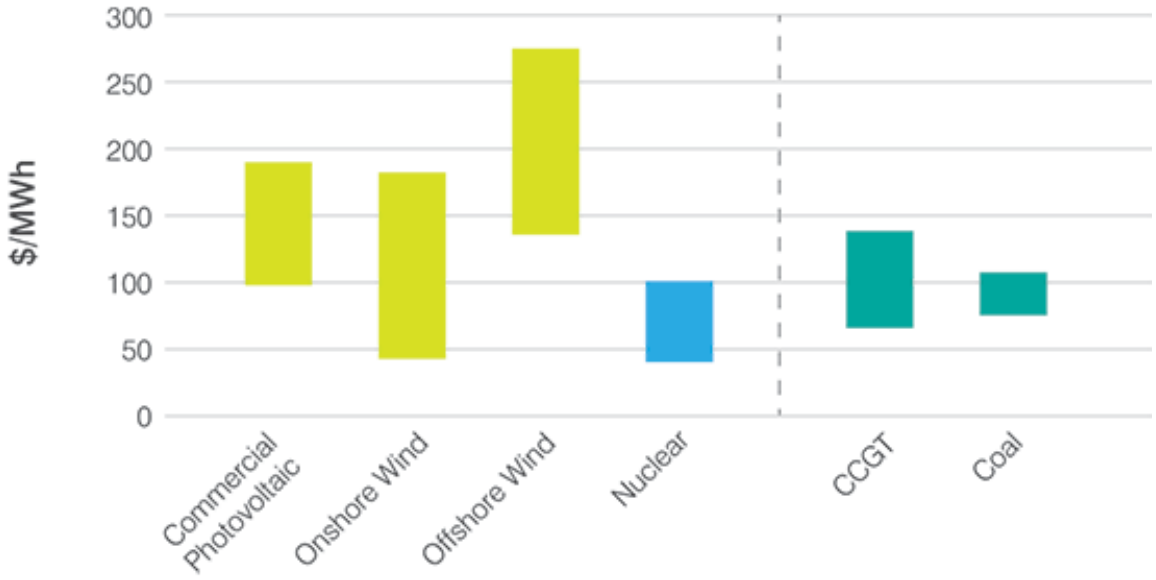


Figure 9 Levelised cost of electricity (International Energy Agency 2015)

3.5 Risk Factors

In terms of future perspective, there is a big number of tenders held in which Rosatom actively participates without any fear of strong competition. Its technologies and innovations give Rosatom a competitive advantage, so everything looks promising but Rosatom should be careful about potential partners. It should base on its own experience as there were examples of indecorous cooperation, like with Bulgaria, which led to risks for Rosatom and large financial losses.

Belene NPP is located in Bulgaria, the construction of which began in 1987 but is still not completed and was suspended in the early 1990's due to insufficient funding. All equipment for the first and second power units was already imported. Due to suspension of construction, Russia incurred sufficient financial losses. In 2000's, Bulgaria decided to resume the project but already required the future NPP to correspond to European standards. In 2006, an international construction tender was announced for the same two power units which eventually was won by Rosatom and a French company "Areva" which both signed a new contract with Bulgaria. The contract was worth €4 billion. (KP 2016.)

Rosatom stated that it will fully finance the construction project at the expense of the Russian state budget. In 2010, Rosatom announced an increase in the costs from €4

billion to €6.3 billion and explained such big difference due to the fact that the contract did not clearly spell out the formula for the effect of inflation on the cost of the project. Therefore, all investments were set to increase. Bulgaria did not accept such changes and decided to suspend the contract for the second time and completely severed it in 2012. Even though, all long-awaited certificates from the European Commission were already received by then. Rosatom, again, suffered billions in losses, took long time and effort to negotiate but due to the fault of the Bulgarian side, it lead to nothing. (KP 2016.)

However, Bulgaria did realise their mistakes and now asks for cooperation again as they understood the exclusivity and innovativeness of Russian technologies. Nonetheless, there are risks of repeated misunderstandings (RIA 2018).

It is advisable to switch towards Czech Republic which is seen as a potential market for expansion, which in 2014, only because of certain EU policies, canceled the project with Rosatom. It was still a bona fide partner during the construction of a nuclear power plant back in Czechoslovakia during 1980's with the support of the USSR. Now, the Czech Republic has announced a new tender for the construction of nuclear power units at Temelin NPP and the Czech government did let Rosatom to be allowed to participate in the tender. It is likely that Rosatom will win the tender. Its advantage on the Czech market is involvement in the construction of the previous power units at the NPPs at the times of Czechoslovakia, since with the construction of additional units, it is better to resort to the services of those who built the first units for safety purposes. (RIA 2019.)

In order to generate profit from a Nuclear Power Plant, Rosatom has to wait for the whole long life cycle because the term of construction of one NPP today is at least seven years and most often it is ten years. At the same time, there are certain scale limitations in the traditional nuclear market and possible risks from it.

Therefore, Rosatom has to generate a steady income and use any time intervals correctly. To ensure such target, it needs to develop towards its own alternative atomic directions.

4 ALTERNATIVE DEVELOPMENT DIRECTIONS FOR ROSATOM

There are certain factors that speak in favour of the development of alternative areas of activity for Rosatom. For example, due to the growth of the state budget deficit, the possibilities for state financing of Rosatom construction projects can decrease. Also, there is an increase in labour productivity and level of automation of different processes, there will be reductions in the number of jobs in existing industries. In order to be prepared and compensate for these trends, further diversification should be set up and intensive growth in its production volumes needs to be done. (Kalinovsky 2018.)

Since the early 1990's there was a governmental task to maximise the use of the scientific, technological and production potential. It was done by extracting uranium from disarmed nuclear complex in order to reorient it to the civilian sector and to use it in the production of peaceful atom products, thus retaining highly skilled personnel and technology. Many Nuclear Defense Complex enterprises had to adapt to the new realities and started to produce molybdenum, gold, beryllium, lithium, many earth metals and their compounds for the needs of civilian industries and for export to other countries. Also, production facilities for mass consumption, including milk processing equipment and car trailers were established. (Expert 2018.)

It continued until the 2000s when the "nuclear renaissance" took place. Atomic industry development programs were adopted again. The need to maintain conversion production programs disappeared and gradually they began to curtail. Many organisations of the industry perceived relief with return to traditional profile activities. Samples of conversion products were placed into the museums of those enterprises as a reminder of the difficult historical period that they managed to go through and survive. However, Rosatom has not curtailed all diversification processes and eventually has begun to realise its strong potential for increasing revenues and order book. Certain priority areas from the point of view of global technological trends were identified and are orientated by the profile of Rosatom itself. (Expert 2018.)

4.1 Additive Technology

Additive technology (3D printing) is a very big competitive advantage in the modern world. Until recently, in the metal printing segment, Russian developers had virtually no own competencies. On the domestic market of 3D printing equipment, only imported manufacturers were present. Each of those manufacturers guarantees the quality of the final product only under the condition of using a certain initial, usually its own raw material, so metal powders also had an import origin. (Stranarosatom 2016).

The economic sanctions of 2015 and the further weakening of the national currency Ruble. It all led to a rise in the cost of imported 3D equipment itself and the maintenance of an existing one which was accompanied by problems with the supply of raw materials, titanium alloy powder. This prompted Russian manufacturers, Rosatom in this case, to set up the production of the actual printers in Russia. (Stranarosatom 2016).

In the perspective, supply of manufactured printer can be made both to domestic market in order to fill a niche, and to foreign markets. This will allow Rosatom to create a new import-substituting production with high-tech jobs, comply technologically with the world level and possibly start to set the standards.

4.2 Clean Energy

Another direction for development can be the concept of “clean” energy. It is capable of providing a support for transition to a model of environmentally sustainable development. Until Recently, Russia had no technology and production facilities for the creation and commercialisation of the final product of such type. Accordingly, the implementation of such project requires not only substantial investment but transfer of the necessary technologies as well.

According to the annual report of Rosatom for 2016, Rosatom approved a wind energy strategy. The decision to start a new business in wind energy is an important strategic step which means that there will be a diversification of low-carbon technologies. The assessment of the Russian wind power market is as follows: by 2024, its volume is plans to be 3.6 GW with an annual turnover of €2.7 billion. Achieving of such indicators will be accompanied on the domestic market by steady demand for wind power and as a result for production of wind turbines, wind farms and any necessary infrastructure which will amount to €5.4 billion by 2024. (Rosatom 2018.)

Rosatom made certain significant further steps in terms of advancing on this matter and chose a Dutch company “Lagerwey Wind” as a technological partner. It has four years of experience in the design and manufacture of wind turbines and it transferred all necessary skills and technologies for the Russian side in order to set up the production in Russia (Lagerwey 2017).

For the manufacture of the necessary equipment, Rosatom’s machine-building capacities can be maximally used which will ensure the required level of localisation of wind turbine production.

4.3 Peaceful Atom

All over the world, new technologies of environmentally friendly agricultural economy are actively are introduced as methods for ensuring plant protection, storage, processing, creating high-quality and safe food conduction. However, they do not always help.

Despite the development of methods of phytosanitary processing of food products, sterilisation of medical products, a number of unsolved problems is still remaining in the world practice. According to the expert organisations, the share of product losses in the global food industry is 30% of the production volume. Another important problem is hospital-acquired infection. According to World Health Organisation, every tenth patient in the world suffers from infections caused by a violation of sterility of medical devices. (FAO 2015.)

Therefore, the use of innovative technologies for processing (gamma processing and electron beam) can ensure the sterilisation of medical products and help to solve this significant problem. The safety and security of food products can also be ensured by such method. It is known that microbiological contamination of products leads to a decrease in the period of their preservation and increases risks to human health. Processing with accelerated electrons or gamma beam can help to neutralize any dangerous pathogens which are in the structure of food while any other methods are ineffective. Such technologies can be studied and implemented with the CNSTs that have actively started to be built by Rosatom in different parts of the world. Especially, it can be useful for Zambia where CNST is being built, due to its big food problems. (OBOB 2018).

4.4 Nuclear Medicine

Today, Nuclear medicine technologies are increasingly used in the diagnosis of cancer, cardio and neurological diseases and play a significant role in the treatment of cancer. In developed countries of the world, the share of cancer patients receiving treatment using nuclear medicine methods reaches 70% which allows to significantly increase the effectiveness of treatment. Whereas, in Russia, the proportion of such patients does not exceed 23%. (PROR 2019.)

Rosatom can use the opportunity for its expansion on the market of nuclear medicine and consolidate its resources to assist in providing citizens with affordable nuclear medicine services. It can be equipped with needed infrastructure diagnostic and therapeutic centers

and radiopharmaceuticals. This is difficult to estimate how profitable for Rosatom such kind of business can be. Much will depend on the government policies, support mechanisms and the level of medical insurance. Creation of a full-fledged center of nuclear medicine would cost millions of euros. To ensure the effectiveness of its work, close cooperation with medical institutions, the formation of patient flow and the inclusion of these services in the compulsory health insurance for residents of the region is required. Such practices can also be potentially viewed to be exported to other countries in terms of its success in Russia.

Rosatom is an export-orientated corporation. Therefore, the general approach should be to first create a reference sample in Russia and only then export the product or certain practices to foreign markets. Everything should be focused to suit the international standards from the beginning. If Rosatom would stick to such conditions, then it has a big potential to further replenish its order book and increase its presence in other segments of the nuclear industry.

5. CONCLUSION

Rosatom has a strong desire for internationalisation and business diversification of its activities. It proposed an innovative model for entering a new market with its Build-Own-Operate model, which implies the construction, equipment and operation of the Akkuyu NPP in Turkey throughout its operation.

Rosatom State Corporation is rightfully considered to be the largest and most influential energy company in the global nuclear market. It achieved such positions as a result of construction and exploitation of new nuclear plants in various countries, signing of new construction contract, export of enriched uranium and ability to take into account all of the interests of its new customers.

However, the most important feature is that it meets the quality and safety requirements of nuclear power plants. Despite the successful operation in different countries, it has all abilities to search for more potential markets and strengthen its leading position in the nuclear market. Possible further researches could include the areas where Rosatom can develop in terms of peaceful atom use during space investigation processes.

The thesis answered the question of what successful methods of market development does Rosatom use for its internationalisation which leads to order book replenishment. Furthermore, as there are uncertainties with the future of the state financing of Rosatom construction projects and possible reductions in the number of jobs in existing industries, alternative development directions were studied which included additive technology, clean energy, peaceful atom and nuclear medicine.

The first chapter gave an information concerning the research background, justification for choice of Rosatom for the research, thesis research questions, aims and limitations with the research methodology of the data collection described. The thesis structure was clearly illustrated as well. The second chapter considered the main reasons for globalisation existing and theories around strategies of internationalisation in the market.

Chapter three gave a full glance over Rosatom’s areas of operation in the world and described its history, competitive advantages, current projects concerning NPPs and scientific cooperation and gave concrete examples of market development. Deep analysis was conducted over cooperation with Paks-2 NPP and Akkuyu NPP with consideration of possible risk factors for Rosatom.

Chapter four answered the sub-question in terms of possible alternative development strategies describing additive technology, clean energy, peaceful atom and nuclear

medicine. The final chapters expounded the answers to the research questions with the sub-question and gave a brief information concerning each chapter of the thesis.

During the process of data collection, author used Qualitative method and Quantitative method. Also, the research was done through deductive methods. The thesis included both primary and secondary data. The primary data was collected through personal communication with the actual employees, whereas the secondary data came from electronic materials, articles and books. The author had worked at Rosatom for a period of five months in 2018 and collected a significant part of information through collaboration and coordination with two other higher ranked employees. First employee, Sergey Kalinovksy works in the Marketing sector of Rosatom Corporation, whereas Tihon Verstovseli works at the Hungarian direction of Rosatom. All obtained primary data was written down and saved during the practical traineeship. All the sources of information are referenced using which the validity and reliability of the results can be checked.

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APPENDICES