

The Project:

Nuclear Renaissance: Risks versus Benefits

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Benchmark III

In Benchmark III our task is to demonstrate an understanding of one of the challenges related to nuclear energy. The project can be addressed this challenge through one of the CIF domains. They are scientific and environmental, socio- cultural, economic, political and geopolitical. We have chosen the political and geopolitical domain.

In Benchmark III we have synthesize and evaluated the information we have already gained in Benchmark I and II. Here we present you our own interpretation about world events and concerns. We also present our judgments according to the knowledge we have already gained.

First of all we would like to give our conclusions and share our opinions on the information gained in Benchmark I and II.

The creation of nuclear power is an unprecedented step in the scientific and technical development of the human civilization. However, the energy got out of the atom and its safe usage in various spheres of human life simultaneously make great demands to the experts of a nuclear complex. Some radical contradictions and problems of the modern world are based on the tendency of all actively developing countries to possess a nuclear energy, and also on the extreme non-uniformity of the distribution of power opportunities on the planet. The problem is global, so for its decision it is necessary to unite efforts of all the international community. The basic directions which it is necessary to concentrate efforts on are connected with the search of new ecological friendly sources. The sources providing base power today are fossil fuels and energy of the atom. Other, so-called alternative sources can give only some percents of the general power balance of our planet and because of this fact do not influence providing of energy to the population of the Earth.

Nowadays resources of fossil fuels are close to their exhaustion, and, except for that fact the prices for them are unreasonably high and there are no reasons which would affect their decrease.

When we talk about alternative energy sources, we usually mean any sources, except hydro carbonic fuel such as coal, oil and gas which is considered to reach the limits in XXI-XXII centuries.

Listing the variety of different kinds of alternative energy (they are hydro energy, wind energy, the energy of tide, biomass energy, solar energy, geothermal energy of the ground, nuclear energy), it is necessary to note that there is a problem of providing of energy by the end of the XX1. This urgent question is on the agenda of the world civilization. Insufficient providing of energy tends to decrease the quality standards of a life. Our consumer civilization cannot allow it. The urbanization of the population dictates the development of energy with huge capacities; and only nuclear energy can replaced energy of huge capacities got out of hydro carbonic fuel.

For last three decades the research in the field of energy has been developing with enormous steps as in the field of increasing of efficiency of use of traditional kinds of fuel, as in the sphere of expanding of technologies of new generation which could change the existing energy sector. The satisfaction of perspective needs for ecological energy all around the world will demand switching on the newest technologies and simultaneously the continuation of putting investments into increase of efficiency of the energy, the renewable kinds of energy, that are alternative to fossil fuel, and also into purer, more ecological non- renewable alternative energy sources.

Nowadays the nuclear technology is the most concentrated energy source and because of this fact it is the most progressive, but among the operating power technologies, the nuclear energy is the youngest.

The atomic engineering (in its today's condition, state) has the obvious and essential lacks interfering its mission of power supply of a society in the future.

Disadvantages of using nuclear energy are

- ✓ huge quantity of extraction of uranium,
- ✓ dependence on the place of deposits,
- ✓ great and expensive works of the enrichment and division of isotopes,
- ✓ a plenty of radioactive wastes and the fulfilled fuel,
- ✓ a small share of using the fuel,
- ✓ expensiveness of providing safety and security,
- ✓ a high level of thermal environmental contamination,

- ✓ expensiveness of stopping the operation,
- ✓ uncombined parts of the fuel cycle,
- ✓ increasing prices for fuel, etc.

The objective value of nuclear power and prospects of its development in the whole are defined by its contribution to the world production of energy and the potential opportunities to increase this contribution. The basic contribution (about 80 %) in producing of energy is given by three kinds of fuel (oil, gas and coal) and oil has the key role in the world production of energy as it was before. The reasons of it are explained with the sphere of its usage in our Benchmark 1.1.

The contribution of a nuclear energy is rather insignificant; it is about 6 % of the world production of primary, main energy sources. This basic parameter shows that the role of nuclear power is insignificant in the universal scale of producing energy and it is quite possible that the world could do without this energy source with some structural reorganization.

The nuclear power has been developed in 31 states that produce 82,5 % of world electric power. Thus, the contribution of nuclear power to production of the electric power is more than 20 % in 20 states and - more than 30 % in 15 states. Such countries as South Korea, China, India, Russia, have extensive programs of development of nuclear-power capacities. Recently the nuclear power of Slovakia has essentially increased, the expansion of nuclear power is planned by Finland. Iran joins the number of the nuclear-power countries. The nuclear energy is the important factor in providing the electric power in France, Belgium and Sweden.

The main problems that influence the decision of the future atomic engineering are

- ✓ a safe operation of the operating power units, (reactors),
- ✓ a safe and expedient prolongation of the period of operation of the power units which have developed a procedural resource,
- ✓ a gradual replacement of operating power units with installations of a new generation.

Latest decades are characterized with the comprehension of an acuteness and a variety of environmental problems. Especially it concerns a fuel power complex providing specified development and simultaneously bringing the significant contribution to the environmental contamination. Nowadays the atomic engineering is the most ecologically pure branch of electric power industry if we compare parameters of influence on the environment.

Moreover, the transition to the closed nuclear fuel cycle predetermines its perspective for the next century. Despite of the discrepancy in estimations of ecological safety of the nuclear technologies, existing in public consciousness and in the mass media, the gained experience and all set of scientific data give the basis for the optimistic answer to the question of the level of their ecological compatibility. First of all, it concerns a normal operation of objects of atomic engineering and a nuclear fuel cycle. Mastered nuclear "know-how" of the electric power with the use of nuclear technologies on the level of radiating influence on the personnel, the population and the environment provide a most small contribution in radiating the person and the change of the radiating balance of the environment.

More than 20 years have passed from the date of the largest world atomic energy catastrophe in the history – the failure of Chernobyl nuclear power plant. First of all, the consequences of Chernobyl accident have influenced the huge quantity of people, 116 thousand people in 640 settlements, it has reduced a life for most of them. The country has had the enormous economic damage and the huge impact has been put to atomic engineering. Chernobyl failure became the event of the big political value both for the USSR and for the entire world. The radioactive cloud from it has passed above the European part of the USSR, the East Europe, Scandinavia, the Great Britain and the east part of the USA. Approximately 60 % of radioactive deposits have dropped out on the territory of Belarus. The wave on prohibition of a construction both the begun nuclear blocks, and nuclear stations rose under the movement of "green", it was practically in all the country. The accident in Chernobyl has put worldwide exclusively strong impact on the public reputation of a nuclear energy. Plans and completion of the atomic power stations have sharply changed. Only 3 power units have been completed in the USSR till 1989, the construction has also stopped in the Europe, except France. Since 1979 till now no block of the atomic power station is constructed in the USA. The research works in new

directions of development of the atomic power stations were sharply reduced; the basic efforts have been directed to increasing of a safety of nuclear blocks.

Tragical lessons of Three Mile Island in the USA, Chernobyl in the USSR have learned many professionals: corresponding conclusions and developments have been drawn, they are used in applied devices and technologies, culture of production and psychology of the usage. By present time significant and insignificant nuclear failures are analyzed by the international commission of experts.

In Russia nuclear and radiating failures are in the sphere of the responsibility of the state corporation Rosatom as the state body of using of an atomic energy in the peaceful and military purposes, as the state competent body on the maintenance of nuclear and radiating safety and physical protection at transportation of sharing materials and radioactive substances. Rosatom carries out functions of carrying out the state policy and legal regulation, functions of the management of the state property in the sphere of using of an atomic energy, the development and safe functioning of atomic engineering, a nuclear weapon complex, a nuclear fuel cycle, a nuclear science and techniques, nuclear and radiating safety, non-proliferation of nuclear materials and technologies, and also the international cooperation in this sphere. So according to the situation in our country, the absence of nuclear accidents and proliferation of nuclear materials we consider that this sphere of industry has a positive tendency. Rosatom actively cooperates with the IAEA. We think every country developing nuclear energy should cooperate with international organizations, sign and ratify international agreements and treaties, have international controls, allow international safeguards to check its nuclear industry. This question is global, it should be under the international control. We consider that representatives of every nuclear state must be in the international organizations controlling this sphere.

The IAEA is a leading world international governmental forum of scientific and technical cooperation in the field of peaceful use of nuclear technology. The IAEA created within the limits of the United Nations in 1957 as the independent organization, represents the culmination of the international efforts on the embodiment in the reality of the offer which the president of the USA Eisenhower has stated in the speech «Atoms for Peace» at the session of

the general assembly of the United Nations in 1953. He predicted the creation of the international body under the control and development of using of an atomic energy. Today the wide spectrum of services, programs and different kinds of activity of the agency is based on needs of 130 states-members. The agency aspires to raise a role of a nuclear science and technology in the business of rendering of support to the steady development of the mankind. It concerns both increasing of a level of knowledge, and their uses for overcoming essential problems facing to the world, such as illnesses, the change of the climate, the environmental contamination, etc. The significant part of the activity of the agency is connected with nuclear power, including such aspects as safety and nuclear wastes, and also the maintenance of using of nuclear technology exclusively in the peaceful purposes.

There are some ways of getting or using of the nuclear weapon by terrorists or the terrorist organizations. It is an access to radioactive materials, a diversion on a nuclear object, an access to weapon nuclear materials and an abduction of nuclear ammunition from arsenals of the nuclear states. The preliminary analysis which experts spend on these questions now, shows that the threat of using of weapons increases. Radiological weapons and radioactive isotopes have been already used as a means of an infection of a district and people. It is easier to get an access to them; they are widespread in the huge quantities because they are used in research, medical, chemical and other purposes.

The theft of nuclear materials is really the greatest danger. The huge quantity of weapon nuclear materials is in the world. The huge quantity of the information is accessible through the Internet; it is possible to receive further data there on how to create the primitive nuclear device. Terrorists do not need to create rockets of reaching the primitive nuclear device, it is not necessary to find special ammunition which would answer special technical requirements, dimensions and others. This all can be made in the lorry, in the underground, in a supermarket, in any place of the greatest congestion of people.

We think that complete transparency in nuclear programs and their expansion undermines the autonomy and security of a nation; especially it concerns acts of terrorism. The complete transparency in nuclear programs can be used not only by terrorists but other states that want to have nuclear industry

for peaceful or military purposes. Other states can use this information for attacking nuclear objects during hostilities. So all this can help proliferation of nuclear weapons. These facts undermine not only the autonomy and security of a nation but security of the world.

The capture of nuclear weapon is the most terrible prospect. Certainly, if the nuclear warhead or nuclear charge will be in hands of terrorists it is possible to consider that day as a "doomsday". But on the other hand, it is the most difficult to get an access to nuclear charges. Strategic nuclear charges are stored together with carriers in special places and nuclear charges are reliably protected, they are also created in such a way that they have a double- triple system of protection.

The attack of a nuclear object is a rather vulnerable purpose. There is a huge quantity of power and research nuclear reactors, warehouses of spent nuclear fuel, factories of uranium enrichment, chemical plants on processing the spent nuclear fuel in the world. A lot of nuclear materials are in transit.

The recent events of February, 2007 in the Israeli city of Dimon are the acknowledgement of the big vulnerability of nuclear objects. The terrorist-condemned man in the shopping center of the Israeli city accomplished the act of terrorism. The city of the Demon is located in the desert Negev, it is the center of nuclear researches which are done by the Israeli government. The Israeli special services managed to stop the plot which purpose was an act of terrorism on a nuclear reactor in Dimon.

The atomic engineering is one of the most developed branches in scientific, technical and technological attitude; it is used by a modern mankind for its life-support. The occurrence and development of a nuclear branch is obliged to the development of a high science, deep penetration into secrets of a substance, carrying out of comprehensive investigations on the basis of the advanced scientific theories and instrument complexes. As stocks of hydrocarbons are reduced, the world demand for them is steadily growing. The consumption of hydro carbonic raw materials increases in industrially developed states, it also increases in promptly growing economic countries of Asia and Latin America. More and more coal, oil and gas are required in China, India and Brazil where the industrial production is developing in huge scales.

The development of atomic engineering for many countries is a life-buoy for the decision of a problem of a disbalance of the fuel baskets focused, for example on coal and black oil (the countries of Southern Asia and Asia-Pacific region), gas (the countries of the Middle East and Northern Africa) or hydro resources (South America). As for us we don't think that any country is entitled to pursue the development of nuclear energy under current international agreements. It depends on the political situation in a country, a level of its development, purposes of it, the policy of a country on the international arena. Signing and ratifying international agreements are essential but the IAEA should decide if a country is entitled to pursue the development of nuclear energy or not. The development of nuclear energy promises great benefits, but it is interfaced to a high degree of a danger of uncontrollable nuclear processes, it demands not simply the greatest qualification of the staff, but also the culture of manufacture, the responsibility and care.