

Interview

**VICTOR MOUROGOV ON THE
PROSPECTS
OF NUCLEAR ENERGY
DEVELOPMENT**

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Professor Victor Mourogov, IAEA Deputy Director General, Doctor of Technical Science, is interviewed by Yaderny Kontrol Editor-in-Chief Vladimir Orlov.

YADERNY KONTROL: Victor Mikhailovich, a continuing discussion on the IAEA's role and objectives is underway. You have been working in this organization for the last 3 years. In your opinion, what is the role of the IAEA and what role could it play in nuclear energy and nuclear security matters?

MOUROGOV: Today I have no doubt that the Agency is a unique international organization which works to facilitate the peaceful applications of nuclear energy, and nuclear technologies in different spheres of activity in order to promote sustainable development of human society. At the same time it is a unique international mechanism contributing to both global nuclear safety and international security.

The Agency serves as a global store of nuclear knowledge and its everyday activities are aimed at extracting and disseminating this information around the world for practical use.

Q.: Will you tell us more about the main promotional functions of the IAEA at the moment? What is your view of these functions?

A.: The main function or, I would say, mission of the Agency lies in encouraging in

every possible way the support of the peaceful application of nuclear technologies.

The range of technologies in use and yet to be used is impressive. In this connection, one can't help mentioning the example of Russia. Russia has achieved considerable results in developing ultramodern technology in the field of nuclear power for space engineering. Sometimes it seems to me, as an expert in this sphere, that it is a kind of magic, a sort of miracle. IAEA Director General ElBaradei has recently visited the IPPE State Research Center in Obninsk. He witnessed the work of the nuclear-pumped laser and highly praised the device. Now Russian scientists are figuring out how to utilize the device and discuss ways to move satellites from one orbit to another, to destroy space garbage, to transmit information at unlimited distances, to maintain communication with submarines, to sterilize volumes... And this is only one of the many recent examples.

If we speak about the role of nuclear energy, nowadays the nuclear power sector accounts for 7% of the world's energy balance. Some would say, '7%, so much!' I will say, 'Just 7%.' It is not much in comparison with an immense and practically inexhaustible potential for nuclear technologies that, in particular, could provide for sustainable energy development.

We should not run to extremes. At the time, when nuclear energy was born, people spoke about a 100% share of the energy balance, considering NP as the key technology for solving the principal problems facing humanity. To my mind, it is ridiculous to speak about the monopoly of any source of energy. We should think about an optimum combination of different sources, including nuclear power.

At present, with privatization underway in some countries, and with the coordinating role of governmental institutions diminishing, the significance of international coordination and cooperation in the field of defining an optimal energy strategy for sustainable development is growing. A vivid example was the Kyoto Conference on

preventing global climate changes (reducing carbon dioxide emission).

What should we do? If nuclear energy is to make qualitative leaps, we will need new engineering solutions and technologies. We should radically change our attitude towards the design and planning of nuclear reactors. These should be reactors with a deterministic level of safety. Second, we have to review the technology of an external fuel cycle which should provide for not only smaller volumes of radioactive wastes (there exists such *dry* technology at the laboratory level), but should also comply with nonproliferation principles or, in other words, be resistant-to-proliferation.

Q.: Are the main functions of the Agency limited to control-regulation and promotion?

A.: Not only. There could be a new mission connected with the unique, potential role and place of the Agency in the system of international security, originating from the reduction of nuclear arms and the process of nuclear disarmament.

As you know, after the end of the Cold War we inherited hundreds of tons of plutonium and highly-enriched uranium. How should we treat it: as a lethal, dangerously explosive heritage to be got rid of as soon as possible and a nightmare to forget? Or is it an invaluable wealth, an important source of energy? That's the dilemma. Or how should we use the knowledge and experience of those specialists who worked with nuclear power in the defense industry on both sides of the ocean? Taking into account its experience, the technologies concerned and its special place in the system of international relations, the Agency could answer this question for today and for the future. The answer should be practical, aimed not at a simple *good* or *bad* but at the rational utilization of this legacy.

It is the IAEA that could play a key role in reducing the nuclear threat, verifying and supervising the cutting down and elimination of the stockpiles of nuclear materials, for instance, through their use as

fuel for nuclear power reactors, and through the application of nuclear expert knowledge solely for peaceful purposes.

The Agency could contribute its knowledge and experience to the cause of nuclear disarmament, using its advantages. These include the above-mentioned experience in promoting modern technologies; problems associated with the utilization of nuclear technologies (safety, nonproliferation, economic efficiency, environmentally friendly application); broad membership of the organization (now comprising 128 member states). The IAEA can provide for and maintain real transparency and irreversibility of disarmament.

Q.: How much time is left? How long is it possible to put off the idea of the IAEA participation in the process of nuclear disarmament?

A.: Obviously the sooner the nuclear weapon states concerned can agree on a role for the IAEA, the better. I sincerely hope that the IAEA Board of Governors will agree to a suitable formula in 1999, because the issue is before us.

The IAEA is the best rostrum to show the world how the problems of nuclear disarmament are being solved in a transparent way. What should be the degree of transparency? How can we obtain it? All these and many other corresponding questions should be answered within the framework of the IAEA's activities. Discussing these matters, answering these questions could lead us to the solution of the problem of a strategy for nuclear energy development. For when we say '*the future of plutonium withdrawal from military use*' the next words will inevitably be '*the future of nuclear energy*'.

Q.: What is your opinion on the future role of nuclear energy in Europe?

A.: It is difficult to speak about Europe as a whole. That is like defining an average temperature for hospital patients.

Western Europe has succeeded in obtaining a high degree of energy independence. This process was stimulated by the past oil crisis and following establishment of the OPEC. Western Europe has managed to change entirely the role of the coal industry. The social picture of many regions has changed; a large percentage of the labor force moved from the raw material industry into manufacturing; the transportation system was modified to move people and products of the engineering industry instead of raw materials. I hope that one day, Russia will be able to make such a transition.

The countries of Western Europe, a number of which obtain from 30 to 70% of electricity from the nuclear power sector, have reached the level of sustainable development. Some of them, for instance France, now have an energy output surplus.

At the same time, they actively introduce power-saving technologies. Energy sufficiency or even surplus makes them think in terms of maintaining rather than increasing the current level of nuclear power engineering, about improving safety and the economy of nuclear power stations. At the moment, in the field of nuclear energy these countries have everything: design, technology, engineering solutions, infrastructure, educational system, personnel... Absent, however, is a long-term program for nuclear energy development.

The situation is different in Central and Eastern Europe. Last summer I attended an international conference in Dubrovnik and had the opportunity to ascertain that many countries of this region do not envisage their development without the use of nuclear power. Sometimes nuclear energy accounts for half of their energy generation. They have dozens of reactors, manufactured in the Soviet Union. In fact, what we have in Central and Eastern Europe are the fragments of the former Soviet nuclear system. The system has collapsed but the fragments work. Russia continues to supply them with fuel, to take back the fuel, there are some agreements in effect... But inevitably pops up the question: what is their

future? What is the optimal energy development strategy for the region?

Q.: This is true for Europe but in Asia the situation is different.

A.: Quite right. At the same time, Asia is becoming the center of world nuclear power. I mean China, India, Pakistan, South East Asia... 4 billion people, 2/3 of the world population... And such people through their governments have already made their choice in favor of future nuclear energy development.

In general, the developing countries use only 4% of the nuclear power produced in the world. There is no boom yet; it is in the process of ripening. In China the share of nuclear power in the whole energy production, per capita, is 100 times lower than in France. As an example: to reach the average level of Western Europe in annual nuclear energy production, per capita, China would have to build every year about ten 1000-megawatt reactors over the next 50 years.

Most of the Asian states counting on nuclear power development (mainly South East Asia, where this process may be impeded by the recent financial crisis), yet possess neither an advanced industrial infrastructure, nor a comprehensive higher educational system, nor a technological or engineering basis for handling wastes, not to mention the actual construction of nuclear power stations. However, they have the willingness a real need. Some of these states have already worked out or are elaborating long-term programs for nuclear energy development.

Coming back to the problem of nuclear energy in the developing countries, we can say that there exist several groups of states. Some of them have acquired advanced nuclear technologies and possess a well-developed nuclear power sector. However, they do not have a desire to develop it further. Others (Asia, North Africa and Latin America) are ready to start a new development of an energy sector. These groups should *be bridged* for exchange of

information. The *bridges* should be *built* by the IAEA.

Q.: But even the composition of these groups of countries in Africa and Asia is different.

A.: The capabilities of each country should be treated differently. For instance, it would be reasonable to explain to some sub-Saharan states the advantages of developing the renewable sources of energy, solar and thermal energy in particular. Other countries, for example, those of North Africa, which face the problem of seawater desalination, have difficulties in finding alternatives preferable to nuclear energy. I would like to point out that the problems of acute fresh water shortages or desalination are relevant for territories inhabited by 2.5 billion people worldwide. Nowadays, the lack of fresh potable water causes more deaths than armed conflicts. In some cases only nuclear energy can help to save maybe millions of lives.

The problem could be solved in the following way. 50-100 MW reactors could be constructed in a black box manner: serial manufacturing in developed countries as the product of the machine-building industry, and then delivered to developing countries on 20-year leasing terms. After that time they could be returned and replaced by new ones. Without refueling, reloading! Thus, we solve the problems of safety, operation, handling of wastes and nonproliferation. In fact, it would be a small-sized passive safety reactor. The proliferation and financing risks are both minimal in such projects: if they don't pay, dismantle the reactor and take it back.

Probably, at the beginning these reactors will be more expensive but, as you know, the most expensive position to be in is *no energy at all*. Transportable or floating small and medium-sized reactors can be moved from island to island, from region to region.

These and other projects alike are a good testing ground for international cooperation.

I suppose that international cooperation in the nuclear energy sphere is the key to

determining its development, and it has bright prospects.

Q.: When you speak about the prospects of nuclear energy development, does it mean that the Agency studies this matter in detail and makes the prognoses?

A.: Yes, this trend is of top priority. At the moment, the Agency pays more and more attention to the future of nuclear energy, to the problems of strategy. The Agency starts by carrying out its principal tasks envisaged in its founding documents. The forecasts you are asking about do not require much money but their role cannot be underestimated. For some countries they serve as support in elaborating their energy development strategies, providing for the use of nuclear power; for other states they give reasonable grounds for concentrating their efforts on traditional non-nuclear sources of energy.

The Agency maintains new programs on the basis of international cooperation. These programs are endorsed by member states and include the comparative analysis of different sources of energy, taking into account their economic efficiency, safety, environmentally friendly application and risk to public health. Thus, as the only body in the UN family with an energy mandate, we study the role of different sources of energy (nuclear, coal, gas, petroleum, renewable sources, etc.) with the aim of providing sustainable development of the human society.

From 1970 to 1989 Mr. Mourogov worked as Senior Scientist at IPPE in Obninsk. Then until 1992 he was Scientific Secretary of IPPE and Head of the Division on Organization, Planning of Research and Development and Advanced Investigations. From 1992 to the end of 1995 Mr. Mourogov was Director of the IPPE State Research Center of the Russian Federation, Chairman of the IPPE Scientific Council and Member of the Scientific and Technical Council of the Ministry of Atomic Energy of the Russian Federation.