

## **Nuclear power – important component of the sustainable economic development and factor of climate preservation**

Dear Colleagues,

I would like to start my presentation by the quote from the report by the IAEA Director General “Nuclear Technology Review - 2015”, which is submitted to the forthcoming session of the IAEA Board of Governors - “Growth of population and demand for electricity in the developing world, recognition of the role nuclear power plays in reducing greenhouse gas emission, the importance of security of energy supply and the volatility of fossil fuel prices point to nuclear energy playing an important role in the energy mix in the long run”. Russia fully concurs with this conclusion of the report.

The Russian Federation is a firm and zealous proponent of peaceful uses of nuclear energy, what has been repeatedly confirmed by the political leadership of our country over the recent decades. Development of the nuclear industry is seen as a top national priority. It is perceived to be a key sector of the Russian economy, essential for national energy security. The Government has a plan to increase nuclear share in the state energy mix from 16 % to 25 % by 2030. It means that 28 new power units have to be built by that time in Russia.

The Russian nuclear industry nowadays is mainly combined in the State Atomic Energy Corporation “Rosatom”, former Ministry on Atomic Energy. It is a world leader in advanced nuclear technologies, providing innovative engineering and construction solutions for nuclear reactors and production of nuclear fuel. Since 1954, when the world’s first nuclear power plant was launched in Obninsk, Rosatom has amassed a wealth of experience and acquired extensive competencies in large-scale nuclear projects. Russia possesses the most sophisticated nuclear enrichment and reactor engineering technologies – pressurized water reactors of VVER type designed by Russian engineers have proved their reliability through thousands of reactor years of accident-free operation. 71 VVER reactors were built around the world, 56 are under operation, including 38 units outside Russia.

Today the Russian nuclear industry comprises 350 companies with over 255,000 employees operating in the nuclear fuel cycle, power generation, and R&D sectors. 34 operating power units in 10 nuclear power plants have 25.2 GW installed capacity.. Recent achievements in this area include construction of new nuclear plants: Novovoronezh NPP-2, Leningrad NPP-2, Baltic NPP, the world's first floating NPP, an additional fourth power unit at Beloyarsk NPP.

Rosatom operates the world's only nuclear icebreaker fleet, which allows Russia to develop the Northern Sea Route and provide access to regions of Arctic shelf. It comprises 6 nuclear icebreakers, 1 container vessel and 4 ships of technological support. Construction of a new nuclear icebreaker flagship started in 2013 at the Baltic shipyard in Saint Petersburg. Its commissioning will mark a new era in exploration of the Arctic region.

At the forefront of Rosatom activities is international nuclear power cooperation. It is now engaged in the construction of nuclear power plants in Kudankulam (India), Bushehr (Iran), Akkuyu (Turkey), Belarus and China. All these NPPs are based on VVER technology, which is one of the most referenced facilities. Rosatom is gradually increasing a stock of foreign orders. By the end of 2014 it signed legal documents concerning cooperation in construction of 29 nuclear power units with countries in Europe and Asia-Pacific Region. Besides Rosatom negotiates and takes part in tenders for construction of another 50 units. On estimations sum of its contracts is coming up to \$100 bln. US dollars for next 10 years.

Advantage of Rosatom is that today it is the only company in the world able to offer a full line of nuclear technological chain production, from uranium extraction to plants' decommissioning. It is clear that to build a plant is not enough, one also has to ensure its stable work and good economic performance. For this one should not only supply a facility, but to transfer operating technologies, to assist in training relevant personnel, to make sure there is sound regulatory system. At the same time a whole bunch of other issues are to be solved: what to do with spent nuclear fuel and radioactive wastes, how to ensure fuel supply. A client has

to know where the fuel is going to come from within the next 60 years, which is the minimal life-term of the NPP. Russia today is ready to offer solutions which will completely satisfy all clients' needs, including the problem of funding. Here, of course, Rosatom relies on strong support of the Government, which helps both in intergovernmental financing and also in more complicated tasks, such as build – own –operate projects, where we build a station, at the same time being its owner and operator.

As for nuclear safety I would like to quote again the report by IAEA Director General - “ Safety improvements continued to be made at NPP throughout the world. These have included identifying and applying lessons learned from Fukushima Daiichi accident, improving the effectiveness of defense in depth, strengthening emergency preparedness and response capabilities, enhancing capacity building and protecting people and the environment from ionization radiation”. The Russian Federation is not an exception in this regard. VVER reactors, which are constructed now meet all current Russian and international safety standards and the IAEA requirements. They successfully undergone stress-tests, along with the 18 VVER units in 5 EU countries. In our new designs we use innovative combination of active and passive safety systems, which allow to provide maximum level of safety in case of all contingencies at NPP.

One of the main advantages of nuclear power recognized by world community is the fact that it does not produce green gases and hence has minimal effect, if any, on climate change.

Global warming is a gradual rise in the average temperature of Earth's atmosphere and oceans caused, among other factors, by a greenhouse effect that is an increase in concentrations of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF<sub>6</sub>) resulting in warmer temperatures near the surface of the Earth. From 1906 to 2005, Earth's average temperature rose by 0.74°C, which triggered climatic disturbances, with dangerous natural disasters growing in number and scale, more frequent and intense rainfall and growing threats to ecosystems and

biodiversity. The combination of these factors hurts the economy, jeopardizes the stability of ecosystems, and threatens the life and health of ordinary people. If global warming continues and average global temperature rises merely by 2°C, the sea level may rise by 1 meter by 2100 – which would submerge most of the Southeast Asian coast, including Calcutta, Bangkok and Shanghai. Scientific findings confirm that continuing climate change may have more dramatic consequences unless prevented by appropriate measures. In particular, scientists have proved that permafrost thawing may multiply production and emission of nitrous oxide (N<sub>2</sub>O) which is known to be a greenhouse gas.

According to the International Energy Agency, carbon dioxide emissions reached their historical maximum of 30.6 Gt in 2010. Coal is the leading source of CO<sub>2</sub> emissions, whereas oil and gas occupy second and third place, respectively. To fight against climate change, 159 countries adopted the Kyoto Protocol in 1997 to cut their greenhouse gas emissions. Use of carbon-free and renewable energy sources, including nuclear power, is recognized as a solution to global warming. Russian nuclear power plants make a significant contribution to a fight against global warming, as their operations lower CO<sub>2</sub> emissions by 210 million tonnes every year. The world nuclear power industry accounts for reduction in CO<sub>2</sub> emissions by 3.4 billion tonnes annually.

Speaking about advantages of nuclear energy we should not forget that nuclear industry drives demand for other products and services and therefore stimulates engineering, steel making, geology, construction and other sectors of the national economy.

Taking all these into account we look with confidence into the future of nuclear energy and nuclear power in particular.