The Second U.S. – Russian Nuclear Non-Proliferation Conference

Nuclear Threat Initiative (NTI) and Russian Academy of Sciences (RAS)
Moscow, Russia
March 18-20, 2009

Conference Chairmen:
Siegfried S. Hecker – Co-Director of Center for International Security and Cooperation and Professor (Research), Stanford University

David Holloway – Spruance Professor of International History and Freeman Spogli Institute for International Studies Senior Fellow, Stanford University

Nikolay P. Laverov – Vice-President of the Russian Academy of Sciences
Preface

Siegfried S. Hecker,¹ David Holloway² and Nikolay P. Laverov³  
Co-chairmen of the 2nd U.S. – Russian Nuclear Non-Proliferation Conference

The second nuclear nonproliferation conference sponsored by the Nuclear Threat Initiative and the Russian Academy of Sciences was held in Moscow, on March 18 to 20, 2009. The first was held on October 23-25, 2002, only one year after the 9/11 attacks. Much of the global security focus at that time was understandably on terrorism. In fact, the tragic Dubrovka Theater siege took place during the conference. A principal message of the first conference was not to forget the dangers of nuclear proliferation while we scale up our preparedness for the potential of nuclear terrorism. The proceedings of that conference are available on request from aedawson@stanford.edu.

Since 2002, the Libyan nuclear program and the A.Q. Khan network were exposed, the Iranian covert uranium enrichment program was discovered and found to have made significant technical progress in the past two years, North Korea withdrew from the NPT and tested a nuclear device, and Syria was discovered to have built a plutonium-producing reactor. March 2009 was a propitious time to hold the second conference. US-Russian relations had deteriorated in recent years, reaching their nadir in August of 2008 at the time of the war in Georgia. Now we have a new American administration that is determined to “reset” relations between our two countries. There are some reasons for cautious optimism: we may be at a turning point in US-Russian relations. Cooperation in nuclear matters is crucial in this context and the events of the past seven years have demonstrated that such cooperation is necessary to make the world a safer place.

¹ Siegfried S. Hecker – Co-Director of CISAC and Professor (Research), Stanford University; Co-Chair of the Conference (USA).
² David Holloway – Spruance Professor of International History and FSI Senior Fellow, Stanford University; Co-Chair of the Conference (USA).
³ Nikolay P. Laverov – Vice-President of the Russian Academy of Sciences (RAS); Co-Chair of the Conference (Russia).
Acknowledgments.........................................................................................................................8

Conference Summary and Recommendations.....................................................................................9
Nikolay P. Laverov – Vice President of the Russian Academy of Sciences; Conference Co-Chair

Siegfried S. Hecker – Co-Director of the Center for International Security and Cooperation and Professor (Research), Stanford University; Conference Co-Chair

David Holloway – Spruance Professor of International History and Senior Fellow at the Freeman Spogli Institute for International Studies, Stanford University

Opening Remarks (No written remarks available)...................................................................................

Nikolay P. Laverov, Siegfried S. Hecker and David Holloway (No written remarks available)

Welcome Addresses (No written remarks available) ............................................................................

Vladimir P. Nazarov.................................................................................................................................
Deputy Secretary of the Security Council of the Russian Federation

John Beyrle...........................................................................................................................................
Ambassador of the United States of America to the Russian Federation

Andrey A. Kokoshin...............................................................................................................................First Deputy Chairman of the Committee on Science and High Technology, State Duma, Federal Assembly, Russian Parliament

Sam Nunn................................................................................................................................................Former United States Senator and Chairman and Chief Executive Officer, Nuclear Threat Initiative

Anatoliy Antonov.....................................................................................................................................Director of the Department for Security and Arms Control, Ministry of Foreign Affairs of the Russian Federation

Session I ..................................................................................................................................................14
Chairman: Boris Myasoedov, Academician and Advisor to the Russian Academy of Sciences

NPT Regime: New Challenges and Threats ................................................................. 15
Alexey Arbatov – Head of the Center for International Security, Institute of World Economy and International Relations (IMEMO), Russian Academy of Sciences

Strengthening the US-Russian Partnership for Nuclear Nonproliferation ............... 37
Charles B. Curtis – President and Chief Operating Officer, Nuclear Threat Initiative

The Nuclear Disarmament and NPT ................................................................. 41
Anatoliy Antonov – Director of the Department for Security and Arms Control, Ministry of Foreign Affairs of the Russian Federation

The Vision of a Nuclear Weapons Free World .................................................. 46
David Holloway – Spruance Professor of International History and Senior Fellow at the Freeman Spogli Institute for International Studies, Stanford University

Session II ..................................................................................................................... 48
Chairman: David Holloway – Spruance Professor of International History and Senior Fellow at the Freeman Spogli Institute for International Studies, Stanford University

Development of the IAEA’s Future Verification Regime ........................................... 49
Olli Heinonen – Deputy Director General and Head of the Department of Safeguards, International Atomic Energy Agency

U.S. – Russian Strategic Arms Reduction Talks (START, ABM, INF), Militarization of Outer Space Concerns ................................................................. 52
Vladimir Dvorkin – Chief Researcher at the Institute of World Economy and International Relations (IMEMO) of the Russian Academy of Sciences; Major-General (ret.)

Trust and Transparency: Foundation for a Good Relationship .............................. 58

Technical Cooperation in a Nuclear Area: Background and Prospects ......................... 60
Rady Ilkaev – Scientific Director of the Russian Federal Nuclear Center, the All-Russian Research Institute of Experimental Physics

Anticipated Nuclear Power Renaissance and Need for a New System Analysis of Factors Affecting Proliferation of Nuclear Materials and Technologies ................................ 86
Nikolay Ponomarev-Stepnoy – Deputy President Emeritus, “Kurchatov Institute” Russian Scientific Center

Back to the Table of Contents
Session III
Chairman: Nikolay Laverov – Vice President of the Russian Academy of Sciences; Conference Co-Chairman

Non-Proliferation and Physical Protection Challenges Posed by Global Nuclear Power Development
Scott Sagan – Co-Director, Center for International Security and Cooperation, Stanford University

Threats to the Nonproliferation Regime from Global Nuclear Power
Evgeniy Avrorin – Scientific Leader of the Russian Federal Nuclear Centre, the All-Russian Research Institute of Technical Physics

Strengthening the NPT Regime: Nuclear Weapons-Free Zones, Comprehensive Safeguards, etc
William C. Potter – Director of the James Martin Center for Non-Proliferation Studies, Monterey Institute of International Studies

The Importance of the NPT Article VI Realization for Strengthening the NPT Regime
Roland Timerbayev – Chairman of the Board, PIR Center

Concerning Support of Nonproliferation Regime in the Conditions of World Nuclear Energy Renaissance: About Creation under the IAEA Aegis of an International Corporation for Industrial Mass Production of Small and Middle Nuclear Power Plants
Evgeniy Velikhov – President of the Russian Scientific Center “Kurchatov Institute”

Session IV
Chairman: Frederick Iseman – Chairman and Chief Executive Officer of the CI Capital Partners; Advisor to the Board of Directors, Nuclear Threat Initiative

Strategic Imperatives for U.S.-Russian Nuclear Cooperation
William J. Perry – 19th U.S. Secretary of Defense; Co-Director, Preventive Defense Project

Russian View of the Iranian Nuclear Problem
Vladimir Evseev – Senior Associate at the Institute of World Economy and International Relations (IMEMO), Russian Academy of Sciences

An American View of the Iranian Nuclear Problem
Mark Fitzpatrick – Director of the Non-Proliferation and Disarmament Program, the International Institute for Strategic Studies
Iran and UN Security Council Resolutions ...............................................................................226
Yuli Kvitsinsky – First Deputy Chairman, Committee on International Affairs of
the State Duma, Russian Federation Federal Assembly

Session V ..........................................................................................................................................230
Chairman: Gennadiy Chufrin – Advisor to the Russian Academy of Sciences; Member of the
Board of Directors, Institute of World Economy and International Relations (IMEMO) at the
Russian Academy of Sciences

Non-Proliferation and the American-Indian Civil Nuclear Initiative (CNCI) ...............231
Ashley J. Tellis – Senior Associate, Carnegie Endowment for International Peace

Pakistan and Problems of Nuclear Nonproliferation .........................................................233
Vladimir Moskalenko – Chief Researcher, Institute for Oriental Studies at the
Russian Academy of Sciences

Middle East Nuclear Proliferation .........................................................................................243
Anton Khlopkov – Executive Director, PIR Center (Center for Policy Studies in
Russia)

Session VI ........................................................................................................................................246
Chairman: Adam Scheinman – Assistant Deputy Administrator for Nonproliferation and
International Security, National Nuclear Security Administration (NNSA), U.S. Department of
Energy

Management of the Korean Nuclear Crisis ..........................................................................247
Siegfried S. Hecker – Co-Director, Center for International Security and
Cooperation, and Professor (Research), Stanford University; Conference Co-
Chairman

Russian-Korean Cooperation and its Impact on the Nuclear Problem of the Korean
Peninsula .........................................................................................................................................270
Alexander Vorontsov – Director, the Department for Korean and Mongolian
Studies at the Institute for Oriental Studies, Russian Academy of Sciences

Prospects for Establishment of a Nuclear-Free Zone on the Korean
Peninsula ........................................................................................................................................277
Vladimir E. Novikov – Senior Researcher at the Russian Institute of Strategic
Research

Session VII ......................................................................................................................................281
Chairman: Anatoly Zrodnikov – Director General of the State Scientific Center of Russian
Federation – Institute of Physics and Power Engineering

Fuel Assurances: Comparison of Current Proposals and Future Prospects ..................288

Back to the Table of Contents
Laura S.H. Holgate – Vice President for Russia/New Independent States Programs, the Nuclear Threat Initiative

The Nuclear Renaissance and Prevention of Proliferation of Technologies for Uranium Enrichment and Spent Fuel Reprocessing

Anatoliy Diakov – Director of the Center for Arms Control, Energy and Environmental Studies, Moscow Institute of Physics and Technology

U.S. – Russian Nuclear Technical Cooperation: Past and Future

Arian L. Pregenzer – Senior Scientist of the Cooperative Monitoring Center, Sandia National Laboratories

Nuclear Fuel Cycle Protection: Russian Option

Valentin B. Ivanov – Chief Researcher at the Institute of Ore Deposits, Geology, Petrography, Mineralogy and Geochemistry; Russian Academy of Sciences

Session VIII

Chairman: Siegfried S. Hecker – Co-Director of the Center for International Security and Cooperation and Professor (Research), Stanford University; Conference Co-Chair

Counter-Proliferation and the Role of the UN Security Council, Proliferation Security Initiative

Alexander N. Kalyadin – Chief Researcher, Institute of World Economy and International Relations (IMEMO) at the Russian Academy of Sciences

Dealing with the Threat of Nuclear Terrorism


First Line of Defense: Legislative Base of Physical Protection, Accounting and Control of Nuclear Materials (NMPC&A) and Russian National System of Export Control

Elina Kirichenko – Director, Center for North American Research, Institute of World Economy and International Relations (IMEMO) at the Russian Academy of Sciences

Model Guidelines for Nuclear Detection Architectures

Mark Mullen – Assistant Director of the Domestic Nuclear Detection Office, U.S. Department of Homeland Security

Session IX

Chairman: Vladimir Evseev – Senior Associate, Institute of World Economy and International Relations (IMEMO) of the Russian Academy of Sciences

Status and Challenges for Nuclear Power Plant Security

Richard A. Meserve – President, Carnegie Institution of Washington
Experience of Ensuring Nuclear Material Transportation Safety in Projects Involving Repatriation to the Russian Federation
Mikhail Barishnikov – Deputy Director of the Scientific and Production Company “Sosny”

U.S. – Russian Cooperation in the Field of Nuclear Materials Safety

Elimination of Highly Enriched Uranium (HEU) in Reactor Fuel and Targets
Kevin Crowley – Director of the Council on Nuclear and Radiation Studies Board, U.S. National Academies

Session X
Chairmen: Siegfried S. Hecker, David Holloway, Nikolay P. Laverov

General Discussion, Overview, Recommendations

Appendix I-III

Appendix I: The Second U.S. – Russian Nuclear Non-Proliferation Conference Agenda

Appendix II: The Second U.S. – Russian Nuclear Non-Proliferation Conference Participants List

Appendix III: The Second U.S. – Russian Nuclear Non-Proliferation Conference Conference Photos
Acknowledgements

Organizing and holding the Second U.S.-Russian Nuclear Non-Proliferation Conference would not have been possible without the assistance and generosity of many people from both the United States and the Russian Federation. The chairmen of the conference would like to thank the Nuclear Threat Initiative and the Russian Academy of Sciences for sponsoring the conference. We further thank the Russian Academy of Sciences for hosting and providing the venue for the conference at their headquarters in Moscow. The conference would not have been possible without the generous financial support of Frederick J. Iseman, Chairman and Managing Partner of the CI Capital Partners, and Advisor to the Board of Directors, Nuclear Threat Initiative. We also thank former Senator Sam Nunn, who made a surprise appearance at the conference, and Charles Curtis and Ms. Laura Holgate of NTI for their support. We are indebted to all those who participated in the conference as presenters and observers.

Organizing and facilitating the conference was accomplished by a professional and dedicated support staff. Their tireless efforts ensured that every aspect of the conference ran smoothly. We would like to thank Dr. Yuri Shiyan, Head of Desk on Cooperation with North and Latin American Countries of the Foreign Relations Department of the Russian Academy of Sciences, and his staff for arranging logistics in Moscow. He made certain that all logistics were taken care of once the conference participants arrived at the RAS headquarters. Dr. Robert Berls of NTI took care of the logistics for the U.S. participants. With Dr. Berls’ help, the American delegation had a productive and enjoyable trip to Moscow. We would also like to acknowledge Ms. Alla Kassianova for her excellent job in translating the Russian papers and presentations into English, and Dr. Pavel Podvig for doing a technical check of the translations. We give special thanks to Ms. Alistair Dawson, executive assistant to Dr. Hecker, who provided professional and courteous assistance in coordinating the pre- and post-conference planning. The successful planning for the conference, as well as the release of this final conference report, is tribute to Ms. Dawson’s dedication to this project. We would also like to thank Mr. Niko Milonopoulos, research assistant to Dr. Hecker, for his assistance during the conference and with the conference proceedings. His hard work contributed to the successful execution of the conference.
Conference Summary and Recommendations
Siegfried S. Hecker,1 David Holloway2 and Nikolay P. Laverov3
Co-chairmen of the 2nd U.S.– Russian Nuclear Non-Proliferation Conference
April 30, 2009

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

Russian and American specialists discussed cooperation on the crucial issues of nuclear nonproliferation and arms control and disarmament. This was a propitious time to discuss these issues because the deterioration in US-Russian relations in recent years has limited cooperation in nuclear matters. The United States and Russia are still the two greatest nuclear powers, and they must use their considerable experience in nuclear cooperation to address urgent global security issues. The nonproliferation regime is under great strain and arms control and disarmament could take another step backward when the START Treaty expires in December 2009. The Obama administration is determined to “reset” relations between our two countries and the D. Medvedev government has welcomed the US overtures. The environment at the conference reflected cautious optimism that we may be at a turning point in US-Russian relations. However, participants from both countries reiterated their governments’ security grievances accumulated during the past decade.

The list of Russian grievances includes concerns about NATO expansion eastward, the abrogation of the ABM Treaty and US plans for ballistic missile defense system in Poland and the Czech Republic, lack of US interest in a follow up to the START I treaty, and other concerns. The primary grievance expressed by US participants was inadequate cooperation by Russia to halt Iran’s drive to expand its nuclear capabilities. The continuing stark differences in security concerns between Russia and the United States were highlighted by Alexey Arbatov, who listed the following Russian security concern priorities:

- NATO expansion to post-Soviet space
- US BMD in Central Europe
- US strategic conventional precision guided munitions
- US strategic up-loading superiority
- US military space superiority
- International terrorism (North Caucasus, Central Asia)
- Nuclear and missile proliferation

1 Siegfried S. Hecker – Co-Director of CISAC and Professor (Research), Stanford University; Co-Chair of the Conference (USA).
2 David Holloway – Spruance Professor of International History and FSI Senior Fellow, Stanford University; Co-Chair of the Conference (USA).
3 Nikolay P. Laverov – Vice-President of the Russian Academy of Sciences (RAS); Co-Chair of the Conference (Russia).
• Nuclear terrorism

US participants consider the bottom two as their highest priority concerns. The Russian participants insisted that Russia’s high-level security concerns – particularly the issues of NATO expansion and BMD deployments in Central Europe -- must be addressed before significant cooperation can be achieved on nonproliferation and disarmament issues. The issues of conventional forces, uploading, and space superiority will be important for the Russians as moves to reduce nuclear forces to much lower levels get under way.

The conference featured presentations and discussions by both sides on a wide range of issues from challenges to the nonproliferation regime; to nuclear disarmament and the nonproliferation regime; imperatives for strategic Russian-US cooperation; nonproliferation challenges posed by the growth and expansion of global nuclear power; regional proliferation challenges with a focus on Iran, North Korea, South Asia and the Middle East; prospects for enhanced Russian-US nuclear technical collaboration; nuclear security and safeguards; and countering nuclear terrorism.

In contrast to the October 2002 conference also co-sponsored by the Russian Academy of Sciences and NTI, we found a convergence of concerns between most Russian and US participants on the serious threats posed by nuclear proliferation. Since 2002, the Libyan nuclear program and the A.Q. Khan network were exposed, the Iranian covert uranium enrichment program was discovered and found to have made significant technical progress in the past two years, North Korea withdrew from the NPT and tested a nuclear device, and Syria was discovered to have built a plutonium-producing reactor. UN Security Council resolutions and sanctions against North Korea and Iran have done little to curtail their progress. Iran has made substantial progress in its missile program and North Korea continues to attempt to upgrade its missile capabilities in defiance of international sanctions. The 2005 NPT Review Conference ended in total disarray. In addition, a significant increase in the expansion of global nuclear power, particularly in the developing world, will pose new nonproliferation challenges. The grave threat posed by proliferation challenges are now better appreciated, although there is still little agreement on how the international community should respond to this threat. These were the issues that framed most of the discussions at the conference.

To deal with these proliferation challenges the participants stressed that progress in nuclear nonproliferation is inextricably linked to progress in nuclear disarmament. Concurrently with this conference, the four American statesmen (George Shultz, William Perry, Henry Kissinger, and Sam Nunn) who reenergized the global debate to eliminate nuclear weapons met with former Prime Minister Evgeny Primakov and President D. Medvedev to discuss their initiative. Senator Nunn and Secretary Perry also spoke at the conference. Conference participants and Russian government officials have publicly shown strong support for this initiative, although serious reservations have been expressed in private discussion both on the Russian and American sides. At the conference, it was agreed that the United States and Russia must lead the five recognized nuclear weapons states in taking concrete steps toward nuclear disarmament as part of their Article VI obligations before the NPT Review Conference convenes in 2010. Conference participants agreed that the technical community represented at the conference can help to catalyze some of the steps suggested by the four statesmen.
Conference participants reviewed the rich history of technical cooperation between Russian nuclear institutes and American nuclear laboratories. The collaborations established in the early 1990s were essential in helping to reduce the danger of nuclear materials and nuclear expertise leaking from the Russian nuclear complex during the transition from the well-secured Soviet times to those of economic and political hardship and uncertainty. Both Russian and American specialists lauded the scientific collaborations – particularly the lab-to-lab and ISTC programs. However, they lamented the fact that for numerous reasons this cooperation has weakened dramatically in the past few years. Both sides believe that support from the highest level of both governments will be required to rejuvenate nuclear cooperation and collaborative programs, and adjust to new domestic and international environments. We believe it is imperative to consummate the US-Russian civilian nuclear agreement (the 123 agreement) that fell victim to the Georgian crisis last August. We also believe that technical cooperation should now focus not only on the Russian and US nuclear complexes, but more broadly on how Russian-US cooperation can help solve global nuclear problems.

We heard both about the benefits of a global expansion of nuclear power and the additional risks posed, especially by the spread of nuclear power to politically volatile and unstable regions. Innovative proposals comprising technical, organizational and institutional approaches were presented to control the risks resulting from increased global nuclear fuel cycle requirements. The Nuclear Threat Initiative and the IAEA have been leaders in this area. IAEA Deputy Director General, Olli Heinonen, and others presented specific ideas on strengthening the future verification regime. Russian specialists presented some novel ideas to promote more proliferation-resistant nuclear reactors and fuel cycle concepts.

Preventing nuclear terrorism remains at the top of the American agenda and is also considered a serious threat by the Russian participants. Although carrying out a nuclear terrorist attack is not simple and requires overcoming many obstacles, it was agreed that an entire spectrum of actions need attention – from preventing, to detecting, interdicting, managing the consequences and attribution. Ongoing cooperation between Russia and the United States has yielded significant enhancements in nuclear materials security and transportation security, yet more needs to be done to meet the current threat. Significant enhancements have also been made in the safety and security of nuclear power plants. More cooperation in all of these areas was judged to benefit both countries, but it has been challenging to move forward in the current political environment.

**We make the following recommendations to our respective governments:**

1) **It is imperative to resolve the high-level political obstacles that inhibit increased nuclear cooperation.**

It is important for our governments to resolve political disagreements that impede crucial cooperation in nuclear matters. Russian participants listed the following at the top of their list:
- NATO expansion eastward.
- Ballistic missile system deployment in Poland and Czech Republic.
- Keeping the INF Treaty in force.
- Preventing weaponizing of space.
- Addressing the imbalance of capabilities in conventional forces.
US participants focused primarily on the need to work cooperatively to address Iran’s nuclear ambitions.

We offer our technical and professional support to assist the governments in overcoming these obstacles. For example, such activities could include analysis to support verification protocols for a START I follow-on treaty, joint examination of the Iranian nuclear and missile threat, and jointly exploring various missile defense scenarios to counter the Iranian threat.

2) Nonproliferation and disarmament are inextricably linked. It is imperative for Russia and the United States to make progress toward disarmament in order to further the nonproliferation agenda and to increase the prospects for a successful 2010 Nonproliferation Review Conference.

Continued reduction in the nuclear arsenals of Russia and the United States is important, but so are additional steps that demonstrate significant progress toward Article VI. For example, ratification of the CTBT, implementing a Fissile Materials Cutoff Treaty, securing all nuclear materials to the highest international standards, and the question of stability at low number of nuclear weapons all pose significant technical as well as political challenges. We recommend that joint technical collaborations between US and Russian specialists be initiated quickly so as to achieve substantive progress by the 2010 NPT Review Conference. To cite just one example, prospects for ratification of the CTBT could be enhanced by technical collaboration at each other’s test sites to increase our confidence in compliance with and verification of a test ban.

3) Scientific cooperation and collaboration between Russia and the United States is crucial to deal with nonproliferation threats. It is imperative that this cooperation be rejuvenated and strengthened.

Joint technical cooperation and collaboration in the nuclear arena has been and continues to be critical to deal with global nonproliferation challenges and to build confidence in US-Russian arms control and disarmament measures. Moreover, enhanced collaboration in civilian nuclear energy and across a broader front of fundamental science will benefit both countries. Unfortunately, strained high-level governmental relations have severely curtailed the successful nonproliferation and defense collaborations initiated nearly two decades ago. In addition, they have prevented the development of increased civilian cooperation. We strongly urge finalizing the civilian nuclear energy 123 agreement and reinvigorating programs such as the lab-to-lab and ISTC programs. The current gridlock in these programs requires support and specific approval at the highest level of our governments.

The Russian participants made it clear that cooperation on the issues spelled out above would be possible only if the political leaders on both sides took a firm public stand in support of such cooperation. The Russian participants, for the most part, are clearly interested in cooperation and believe that the United States and Russia can build on their past experience of collaboration and that in the future we can work together in support of nonproliferation and disarmament in the future.
1 Center for International Security and Cooperation at the Freeman Spogli Institute for International Studies, Stanford University

2 Vice President, Russian Academy of Sciences
Session I

Chairman:
Boris Myasoedov

Speakers:
Alexey Arbatov, NPT Regime: New Challenges and Threats

Charles B. Curtis, Nuclear Non-Proliferation Challenges for the New U.S. Administration

Anatoliy Antonov, Status of Nuclear Disarmament and NPT Regime

David Holloway, The Vision of a Nuclear Weapons Free World
As a result of the end of the Cold War, the nuclear weapons nonproliferation process achieved significant progress during the 90s. About 40 new states joined the Nuclear Nonproliferation Treaty (NPT), among them two nuclear states: France and People’s Republic of China. In 1995, the treaty was extended for an indefinite term. In the course of this decade, four states closed their nuclear programs and either renounced nuclear weapons or were forced to give them up (Brazil, Argentina, South African Republic, and Iraq). Three states that had nuclear weapons stationed on their territory agreed, following two-year-long negotiations, to forego them and in 1994 signed the Lisbon Protocol as non-nuclear states (Ukraine, Belorussia, and Kazakhstan).

The Nonproliferation Treaty became the most universal international treaty with 189 member states and only four outside (Israel, India, Pakistan, and North Korea).

Nonetheless, in the first decade of the 21st century, nonproliferation prospects raise a growing concern of the international community and policy-makers in most states. A report on international security written by a panel of distinguished experts and public figures from fifteen countries commissioned by the UN Secretary General Kofi Anan in 2004 noted: “the nuclear non-proliferation regime is now at risk because of lack of compliance with existing commitments, withdrawal or threats of withdrawal from the Treaty on the Non-Proliferation of Nuclear Weapons to escape those commitments, a changing international security environment and the diffusion of technology. We are approaching a point at which the erosion of the non-proliferation regime could become irreversible and result in a cascade of proliferation”.4

The reasons of this alarming situation can be listed in the following order:

First, all of the states that have not yet joined the NPT are located in the world’s least stable regions. They are involved in conflicts fraught by wars with a very high likelihood of combat use of NW – unseen since August 1945 and laden with immensurable and unpredictable consequences for the entire global politics.

Second, the examples of Iraq, Iran, Libya, and some other states have revealed insufficient effectiveness of international control over transfers of nuclear materials and technologies in the NPT framework (Article III), and above all, International Atomic Energy Agency (IAEA) safeguards. As surprising as it is, after more than 30 years of the NPT existence, 42 out of 189 NPT member parties have not yet signed comprehensive safeguards agreement with IAEA. The 1997 Additional Protocol has not yet been signed or ratified by more than 40 states some of which run substantial nuclear programs. The NPT nuclear member states and the

---

nuclear trio outside the NPT only have agreements with IAEA on selective inspections on individual sites.

Third, the world learned about the existence of the “black market” in nuclear materials, technologies, and expertise which has involved a range of NPT states (in particular, Libya, Iran, Iraq, Saudi Arabia, Egypt, Indonesia) as well as individuals and organizations from the states not bound either by the Treaty or related export restrictions and control mechanisms (Pakistan).

Fourth, the world market of nuclear materials and technologies, potentially promising billion-dollar profits, became an arena of tight competition among exporters rather than importers. In their struggle for markets, supplier states (above all, USA, USSR/Russia, Canada, France, China, Brazil, Argentina, Portugal, Germany, Italy, Belgium, Norway, and others) are not disposed to be overly scrupulous about compliance with IAEA safeguards, weakness thereof, and even the fact of customer’s NPT non-membership (Israel, India, Pakistan). Even information on military applications underway in some states failed to stop exporters from signing deals. The existing non-formal export control mechanisms in this and related areas (the Zangger Committee, Nuclear Supplier Group (NSG), Wassenaar Agreements, etc.) are by far inadequate to tackle this problem.

Fifth, the international terrorism factor has come to the forefront of security issues due to a series of terrorists acts with massive civil casualties, starting with the US 11 September 2001 tragedy, and open intent of terrorist organizations to gain access to NW and other types of weapons of mass destruction (WMD). In this view, there is not enough confidence about the appropriate safety of states’ stockpiles of nuclear materials and in some cases, even nuclear warheads to rule out their getting into the hands of terrorists by theft, bribery, or as a result of political destabilization or civil war. Especially dangerous as a source of nuclear materials, technologies, or expertise for terrorists is the growing “black market”, by definition illegal and not subject to the control of IAEA or national laws and mechanisms.

Sixth, as shown by the experience of the North Korea, the almost complete NPT universality – a realized dream of its founders of the late 1960s – does not in fact provide guarantees against further nuclear proliferation. The North Korean precedent, which may be copied by other states, has revealed a new threat: a state, as an NPT member, may reap the fruit of international cooperation in peaceful nuclear energy and research (in accordance with Article IV), and then openly leave the NPT with the required advance notice of three months (Article X) to build its own nuclear weapons. First of all, Iran, but also Algeria, Egypt, Brazil, Turkey, South Korea and even Japan came under suspicion as potential NPT “refuseniks”.

Finally, seventh, is the current policy of the nuclear NPT state members and primarily the US and Russia. The problem lies in their course on upgrading their nuclear forces, their relations in this sphere, and their stand on nonproliferation issues in respect to the states outside of the “Big Five” as well as nuclear export problems. While reducing their huge overstocks of NW inherited from the Cold War, these powers have long-term plans for the development of their nuclear forces, keep in place the strategy of nuclear deterrence, and thus in fact breach the spirit of the NPT (Article VI) which commits the nuclear states to work towards nuclear disarmament in exchange of the other states’ forgoing the NW.

This factor is seventh in order but not last in significance. In a certain sense, if we regard the “Big Five” powers as subjects, or initiators, of the nonproliferation policy which are most interested in its success, then the nuclear states outside of the NPT, “threshold” states, and all other Treaty state parties as well as non-state actors all together are, to an extent, objects acted upon by the nonproliferation regimes and policy. Given this consideration as well as enormous
military might, technological and economic potential, and political weight of the five nuclear powers, the prospects of NW nonproliferation depend predominantly on them.

That is why problems, mistakes, and shortcomings in the policy of these powers can be justifiably considered as a major, though not the only, cause of today’s universal concern about the nuclear nonproliferation prospects, even though actions of other countries or non-governmental organizations often steal the spotlight of public attention.

An adjustment, in some cases a considerable one, of the leading states’ policy line on these issues could become a decisive prerequisite for strengthening the nonproliferation regimes and system. But this of course would be not enough. Strengthening the NPT requires additional effort and measures directly in this sphere. A good deal would also depend on other states and their readiness to respond to positive and negative stimuli on the part of the leading powers.

At the same time, another point is true: continuation of the present policy of the main countries and, moreover, committing yet new mistakes in essence would be a guarantee of the failure of nuclear nonproliferation, and that in a short term.

Analysis of critical problems and perspectives of the nuclear nonproliferation policy and nuclear deterrence strategy in today’s international relations leads to a number of conclusions and practical recommendations.

First, after the end of the Cold War, the nuclear confrontation between the two great powers moved to the backstage of their everyday foreign policies and official rhetoric. The forefront became occupied by new security problems, above all those of WMD proliferation and international terrorism seeking access to these weapons. However, it should be admitted that over recent years, attempts to solve or just control these problems increasingly have been falling behind the unfolding of dangerous processes and events.

Having initially started in a bipolar format (US-USSR), nuclear deterrence brought about the NW proliferation, and the latter, in full compliance with the classical laws of the Hegelian dialectic, created a threat of deterrence failure in a multipolar nuclear world through combat use of nuclear weapons as a result of political or strategic miscalculation, technical glitch, action of an adventurous regime or terrorist act.

Second, an effective resolution of nonproliferation problems is impeded not only by their inherent complexity but also by an incompatibility of military and political relations between leading powers with today’s imperatives of interest coordination, improvement of legal norms, and multilateral political and military cooperation.

In this way, the recent one-and-half decade has shown that mutual deterrence based on reciprocal capability of inflicting a devastating nuclear missile strike fairly easily survived the demise of the global rivalry between the US and USSR/Russia with which is was closely bound during the preceding decades. Mutual nuclear deterrence continues to reproduce itself up to present, and its dynamic produces an effect of negative reverse impact on the powers’ political relations to say nothing of substantial economic losses. This military-and-strategic relationship, despite declarations of a “strategic partnership”, tacitly preserves historically established mutual distrust and suspicions of secret combat plans of the opposite side and fear of a possible nuclear strike (predetermined or accidental) however absurd from the political viewpoint.

Third, though nuclear states continue to stress the deterrence strategy, due to vulnerability or, in contrast, a superiority complex, deterrence remains effective only against the least probable threats which include a nuclear aggression or large-scale conventional attack of great powers against one another. However, it does not work against new and quite real threats of the present – in particular, it cannot stop further NW proliferation, and probably even instigates the expansion
of the “nuclear club”. Even less is the nuclear deterrence capable of conquering the international terrorism or preventing it from gaining access to WMD or actual use thereof.

Fourth, the relations of mutual nuclear deterrence quietly but quite tangibly set constraints on great powers’ capability for genuine cooperation in responding to new threats and challenges. The extent of their cooperation characteristic for the Cold War period, which witnessed the conclusion of most arms control agreements including the NPT, is not sufficient for the new era.

A qualitatively higher level of trust and cooperation between the powers is required for interaction between secret services and special-purpose forces, joint policies of WMD counter-proliferation (e.g. PSI), more rigorous nuclear and missile export control, verifiable termination of weapon-grade materials production, realization of the “Global Partnership” projects involving access to each other’s classified sites, development of joint missile launch warning systems, and others.

It will be impossible to attain this high level of cooperation while the US and Russia are still planning (even in the shadow of public attention) strikes of thousands of warheads against each other, keeps their missiles in the state of high launch readiness and modernize their strategic nuclear forces to maintain the guaranteed capability of response strike. Other nuclear powers follow this example to the extent of their own capabilities.

Fifth, this archaic and absurd system of strategic relationship will not change by itself, without deliberate and consistent action and agreements of leading states. That said, in the foreseeable future, we of course won’t see a full nuclear disarmament – it would have required a fundamental re-arrangement of international relations to which neither the states nor peoples of the world are ready yet. Rather, we speak of the transition to a new strategic relationship which can be defined as “nuclear partnership”, “mutual guaranteed nuclear security” or “the strategy of mutual nuclear guarantees”. In one way or another, the main problem is not choosing the terms but in the substance of the concept.

Sixth, in the years of the Cold War, global confrontation, and intense arms race, in the center of the international security, understandably, stood agreements on limitations and reductions of the nuclear forces of two most powerful states, while the nuclear nonproliferation played a secondary side role. With the end of the Cold War, the primary security threats swapped their places, and, correspondingly, global and regional issues of nonproliferation came to the forefront. But this does not mean that the great-power nuclear confrontation can now be ignored. Rather, the present imperatives and possibilities of cooperation, which have opened with the departure of the Cold War, demand qualitatively new agreements.

More so, if methodologically the study of the pressing issues of nuclear nonproliferation can be divided into “central” nuclear deterrence (vertical proliferation), global nuclear proliferation (horizontal), and regional problems of proliferation, in the practical policies the issues belonging to different categories often “get caught” by one another and require comprehensive solutions.

For example, the interaction of the US and Russia in retiring the confrontational nuclear deterrence raises issues of nuclear potentials of third powers, India and Pakistan, as well as missile and nuclear ambitions of North Korea and Iran. The regional problem of Iran poses sharp-edged problems of the global nonproliferation: states’ right to a full nuclear fuel cycle, setting up of multi-party cartels for guaranteed supply of nuclear fuel for nuclear power plants, the right of the leading powers to resort to counter-proliferation measures including coercive ones. The North Korea nuclear problem, besides all that, opens up the issue of a state’s right to
leaving the NPT and building nuclear weapons, which entails the global problems of great powers’ compliance with the NPT Art. VI obligations and their attitudes towards other key treaties in this sphere (ABM Treaty, CTBT, FMCT).

Seventh, with this in mind, many proposals should be considered in packages as some of them are not realizable without measures at other levels of the present nuclear issue area which are logically connected across themselves. E.g., the proposal of “co-opting” India and Pakistan into the nonproliferation order by having them join the 1997 Additional Protocol as well as CTBC and FMCT, would of course require a prior ratification of this Protocol and CTBT by the US and other great powers as well as signing the FMCT.

In the format of the US-Russian relations and in the Big Five framework, the proposed main steps embrace the following measures or agreements:

- Conceptual downgrading of the priority status of nuclear weapons in strategy of the US, Russia, Great Britain, France, and China reflected in their respective doctrines. Unqualified committing by all nuclear powers to no first use of nuclear weapons against any NPT state party.

- Ratification by the US and China of the Comprehensive Test Ban Treaty (CTBT) is the key link between the “vertical” and “horizontal” nuclear disarmament. This could prompt joining the CTBT also by India, Pakistan, Israel, and North Korea and set a material limit to perfecting of the nuclear weapons by the states that had created them. This would have also set a strong barrier against building of their nuclear weapons by open or secret “threshold” states.

- Transition to a stage-by-stage dismantling of the mutual nuclear deterrence between Russia and the US. The first stage – controlled retiring of concepts of launch-on-warning strikes, i.e. missile launches based on information of the early warning systems. The second stage - ongoing increase of the launch preparation time for the growing numbers of strategic nuclear weapons by coordinated organizational and technical measures under reliable joint control.

- Reaching an agreement between the US and Russia on warhead accounting rules and other practical arrangements in the process of implementing the SORT treaty of 2002. Extending the term of control systems and trust-building measures of START-1 treaty at least until 2012. The immediate start of talks on SORT-2 to the end of reducing the strategic nuclear forces to a level of 1000-1500 warheads.

- Broadening of the objectives and technologies of joint response to missile threats. Unfreezing for this purpose the Moscow Joint Data Exchange Center and expanding its missions.

- Signing of a US-Russian comprehensive treaty on cooperation in development, deployment, and use of data and fire control systems of the missile defense, which would delineate joint and unilateral operations in this sphere and provide guarantees that respective missile defense systems would not be designed against each other.

- Beginning a dialogue between the US and Russia on limiting and reducing the tactical nuclear weapons including their non-deployment in the Central and Eastern Europe as well as
subsequent removal of these weapons to centralized storage sites located exclusively on national territories.

- Setting up consultations on multilateral nuclear dialog aimed at involving the Great Britain, France, and China into the system of strategic nuclear weapons limitations and adoption of certain verification and confidence-building measures.

Eighth, the steps outlined above could remove major blocks to powers’ cooperation in fighting the proliferation, but of course, on their own, would not be able to stop or reverse it. To achieve this, we need special measures of a multilateral nature and focused on this particular sphere – universalization and strengthening of the NPT and its regimes, norms, and mechanisms. It is only on this foundation that the counter-proliferation and targeted approach to the “problem” states can produce a positive effect – with the condition of unity of the great powers and lawful character of their actions, especially coercive ones.

Specifically for the strengthening of the NPT and the entire regime and mechanisms of nonproliferation, the following measures should be proposed:

- Banning (through Zangger Committee and Nuclear Supplier Group) any shipments of nuclear materials and technologies to the states which have not yet signed the 1997 Additional Protocol. Banning supplies of nuclear fuel cycle technologies to states outside of NPT. New supplies of nuclear fuel cycle technologies to NPT member states should not be possible unless they accept the condition to return or destroy the acquired materials and technologies should they leave the NPT. Otherwise, there should be a stipulation for IAEA report and imposing of sanctions mandated by the UNSC. Dismantling of already existing installations if they had been built in breach of the NPT and IAEA safeguards, as a condition for any further cooperation with the NPT member states.

- Supplies of LEU to the states which had opted out of the full nuclear cycle at lowest market price and subsequent re-export of spent nuclear fuel by supplier states or international consortia set up for this purpose under the IAEA aegis.

- Development of mandatory and verifiable international standards of accounting, physical protection, safe transport and storage of nuclear materials. Financial and technical support of these measures is needed with special attention to physical protection, control and accounting at nuclear weapons and weapon-grade nuclear materials storage sites.

- Immediate conclusion of the first, “narrow” treaty to ban the production of fissile materials (first of all, weapon-grade uranium) for military purposes (FMCT). Its subsequent gradual extension with pertinent mechanisms of control for all nuclear and non-nuclear NPT member states, and bringing into its fold the “unaligned” trio (Israel, India, Pakistan) as well as North Korea. In addition to CTBT, this could become another binding link between the “vertical” and “horizontal” nuclear disarmament.

- Establishment of an international legal foundation for the Proliferation Security Initiative (PSI) in respect of norms and means of lawful interdictions and inspections of maritime, land, and air transport under suspicion of illicit shipping of nuclear materials and technologies. Coordination between PSI and UNSC prerogatives and procedures.
- Energizing the existing nuclear export control groups (Zangger Committee, Nuclear Supplier Group) and placing their activity onto a legal framework with new and more effective decision-making mechanisms, system of control and sanctions for offenses determined by IAEA investigation and imposed by the UNSC.

- Adoption of uniform world-wide norms for disciplining private companies and individuals liable for illegal actions constituting threat of nuclear proliferation (as a crime against humanity) and appropriate adjustment of national legal codes in accordance with the UNSC Res. 1540. Coordination of norms and mechanisms of investigation of illegal activities of public officials, with possible forwarding of the case to the International Criminal Tribunal.

- Intensification of joint programs by the US, Russia, and other technologically advanced states in development of nuclear energy reactors of the new generation, with higher operation security and minimal content of weapon-grade materials in the spent nuclear fuel.

- Tightening of the Missile Technologies Control Regime (MTCR), especially in respect of dual technologies supplies, and exerting concerted pressure by the great powers towards getting non-member states join the regime. Converting the MTCR to an international treaty (convention) with clear-cut definition of its subjects and objects, measures of verification and transparency, obligations by member states of appropriate changes in their domestic laws and setting up of export control mechanisms compliant with the common standard.

- Broadening of international cooperation in commercial and scientific use of outer space and organization of a world space consortium on the basis of potentials of the US, Russia, and European Space Agency to offer discounted services to MTCR member states by the states possessing their own space launchers and orbital systems.

- Substantial increase in funding for IAEA, increasing its staff as well as its prerogatives in investigating breaches of the NPT with forwarding the matter to the UNSC for undertaking enforcement measures.

Ninth, the resolution of regional nuclear nonproliferation problems depends on the strengthening of the NPT regime and mechanisms but in each case requires a customized approach in accordance with specific features of individual states and proliferation instances.

In the South Asia, such an approach could be oriented at an indirect legitimization of the nuclear status of India and Pakistan in exchange to measures limiting their nuclear programs and preventing nuclear conflict with a prospect of eventual joining the CTBT, FMCT, 1997 Additional Protocol (on non-military nuclear sites), MTCR and all nuclear and dual-technologies materials and technologies export control regimes. In particular, the following measures can be envisioned:

- Include into the military doctrines of India and Pakistan the principle of no first use of nuclear weapons in order to stabilize the entire military and strategic sub-system (India-China-Pakistan) in terms of reducing the possibility of a nuclear war even in the next crisis event.
- Achieve an agreement between India and Pakistan on reciprocal removal of nuclear-capable tactical missiles from the border zone and notification of any movements of forces. Adoption of mutual obligations of non-deployment of nuclear weapons in Kashmir (both in the Indian state of Jammu and Kashmir, and in the areas controlled by Pakistan). Control capabilities can be arranged on a bilateral basis, and if necessary, with technical means provided by great powers.

- Conclude a treaty on keeping the missile-and-nuclear forces in the state of low combat readiness (i.e., codify the existing practice) with performing control on a bilateral basis, with a possible assistance from great powers.

- Develop measures which should be adopted in the event of domestic political destabilization in Pakistan to downscale the nuclear danger. Pakistani authorities must increase measures of safety and control over nuclear weapons and nuclear materials storage sites, with possible assistance of great powers (in particular, the US and China).

The precipitous dynamic of processes in the Middle East makes the situation increasingly explosive and hard to predict. With that in mind, the proliferation threat in this region, more than anywhere else, arises not only from states but also from terrorist organizations seeking to get hold of NW. This leads to an extreme gravity of problems of nuclear materials and technologies safety as well as a growing number of specialists involved in the work on nuclear programs.

A comprehensive solution of the regional problems could lie in the following:

- Ratification by Iran of the 1997 Additional Protocol.

- Admission of Iran to WTO and EU investments into Iran’s gas industry, granting negative security guarantees by the US and restoration of diplomatic relations between the two states.

- In a more distant perspective – extension to Israel of bilateral security guarantees by the US or multilateral obligations by NATO in exchange of Israel’s giving up its nuclear weapons and joining the NPT.

With this development, all states of the regions must join the 1997 Additional Protocol, CTBT, FMCT, MTCR, and all norms and mechanisms of export-import control.

In the Far East, the probability of South Korea and Japan joining the nuclear club, growth of China’s nuclear forces and, to a large extent, the future of the NPT regime and mechanisms on the global scale all depend on the outcome of the North Korean nuclear program saga. The same factor affects the magnitude of danger in the event of an armed conflict in the region and possibility of international terrorists getting access to the nuclear weapons.

In this light, the six-party talks provide the main chance of achieving a political resolution of the problem. This would require a steep rise in their effectiveness and speed of moving towards an agreement. Of first importance is the task of working out a common strategy, priorities, and tactics of the five parties, non-existent as of now.

In general terms, the package of agreements and mutual compromises may consist of the following main elements:
-Granting, in the six-party negotiations framework, the negative security guarantees on the part of the US and other great powers to both Korean states, and signing the peace treaty to replace the Truce Agreement of 1953.

-Re-start of the KEDO project with participation of Russia and PRC, economic assistance (including fuel) to the KPDR, and its involvement into international economic projects (pipelines, railroads, etc.).

-On its part, North Korea must return to NPT, join the 1997 Additional Protocol as well as CTBT, MCTR, Fissile Material Cutoff Treaty, and all regimes of export control. North Korea must agree to a controlled destruction of all components of its military nuclear program and dismantling of all nuclear sites except nuclear power plants within the KEDO project.

-The North Korean missile program should be limited by the MTCR framework, and the remaining elements must be destroyed under international observation using the experience of the Intermediate-range Nuclear Forces treaty. Launches of Korean civilian satellites can be performed by the launchers of great powers for a minimal payment rate.

As one of the aspects of the settlement, it would be expedient to agree on measures of reduction of the armed forces and armaments of the two Korean states in the separation zone using the experience of CFE and SCO Treaty.

This package of measures may quite likely remove the problem of the “nuclear choice” of South Korea and Japan for a mid-term perspective. In a broader format, this could be assisted by steps on strengthening the security on the regional scale. In this connection, the six-party talks should be turned into a standing forum for discussion and resolution of Northeast Asian problems.

And, finally, tenth: The recommendations proposed above at the first glance may look like a wish list rather than a feasible action program. But if we regard the new threats to international security which came forward a decade-and-half after the end of the Cold War in a serious way rather than just use them as a subject for political declarations, then for their resolution we need a qualitatively new policy both in the sphere of nuclear nonproliferation and nuclear deterrence. In this situation, traditional approaches or minor course adjustments, as well as unilateral or arbitrary solutions, are of no avail.

We need new carefully developed broad and comprehensive bilateral and multilateral measures of legal, political, economic, military, technical, and information character. The proposals above stand on the firm ground of strategic and technological reality. The main obstacles to them are, more than anything else, of a subjective nature: lack of political will and realization of crucial problems among state leaders, policy-makers, the military, media and public, as well as the inertia of accustomed thinking and resistance of group interests invested in old theories and practices. Overcoming these obstacles is the main prerequisite to the solution of today’s international security problems.
THE NUCLEAR NON-POLIFARATION REGIME: NEW THREATS AND CHALLENGES

A. Arbatov. Corresponding member, Russian Academy of Sciences. Head of the Center on International Security, IMEMO, Russian Academy of Science
Nuclear non-proliferation Treaty and regime (NPT)

- During the 1990’s about 40 new member-states (including France and China).
- 7 states agreed or forced to de-nuclearise
- Out of 192 UN member states, 188 – NPT members
- 4 non-member states: Israel, India, Pakistan, North Korea. All have nuclear weapons
- 5 NPT nuclear member states: Russia, the United States, Britain, France, China (January 1, 1967. Art. IX).
- 183 – non-nuclear member states.
- 1995 - Indefinite prolongation of NPT
- 1997 - Additional Protocol to IAEA safeguards
New threats and challenges

- Since 1998 3 states went nuclear
- North Korea and Iran – scary precedents
- 4 outsiders in conflict regions
- Nuclear fuel cycle – “gray zone”
- 12 or 13 states have uranium enrichment facilities (including 5 nuclear NPT member states, 1 or 2 nuclear non-NPT states, 6 non-nuclear NPT member states)
- 14 states have nuclear fuel reprocessing facilities (5 nuclear NPT member states, 3 nuclear non-NPT states, 6 non-nuclear NPT member states)
- Nuclear renaissance (30 new states, 43 in construction, 108 planned)
- IAEA insufficient safeguards (Iraq, PDRK, Iran, Libya, Syria)
- Nuclear terrorism
- Lack of P-5 cooperation
Lack of P-5 cooperation

- Different security priorities
- Other foreign interests ahead of non-proliferation (US - Israel, Pakistan, India. Russia – Iran, India. China – North Korea, Iran)
- Nuclear exports competition
- Lack of systemic and comprehensive strategy
Russia within reach of ballistic missiles beside those of the US, Britain, France, China
Russian security concerns priorities

- NATO expansion to post-Soviet space
- US BMD in Eastern Europe
- US strategic conventional PGMs
- US strategic up-loading superiority
- US military space superiority
- International terrorism (North Caucasus, Central Asia)
- Nuclear and missile proliferation
- Nuclear terrorism
The items of nuclear proliferation

- Peaceful nuclear materials used in power plants and research reactors. Irradiated nuclear fuel. May be used for further enrichment and reprocessing. Located in reactors, in storages and in transit.
- Uranium enrichment and plutonium separation technologies.
- Weapon grade nuclear materials (about 1860 tons of civilian and military Plutonium, 1900 tons of HEU). Located in storages of nuclear materials and in weapons.
- Nuclear munitions. Located in deployed weapons, in storages and depots.
- Radioactive materials ("dirty bomb")
- Intellectual expertise.
ACTORS OF NUCLEAR PROLIFERATION

- States
- Non-state extremist organizations (international terrorists)
- “Black market”
The routes of proliferation among states

- Tacit violation of IAEA safeguards
- Open withdrawal from NPT (Art. X, “supreme national interests”, 3 months notice to NPT member states and UN Security Council).
- The danger of Fuel Cycle Technologies (8 non-nuclear NPT member states have it including Iran)
Prevention of nuclear proliferation among states

- Tacit violation – enhancing IAEA safeguards
  - Universalization of Additional Protocol of 1997
    - 5 NPT nuclear weapon states and AP-97
    - Nuclear suppliers group
    - Export control regime
  - Increasing IAEA funding, personnel, technical capabilities

- Open withdrawal (Art. X). Cannot be prohibited. But cannot be permitted to cover tacit violations, or to use the fruits of NPT peaceful nuclear cooperation for military purposes
  - Extraordinary NPT Conference
  - Intensive IAEA inspections
    - Transfer of the case to the UN Security Council (Article VII of the UN Charter)
    - Preservation of IAEA safeguards
    - Dismantling and withdrawal of critical materials and technologies
Preventing proliferation among extremist organizations

- Non-proliferation to other states
- UN CS Resolution N 1540 of 2004
- Convention for the suppression of acts of nuclear terrorism (UN GA 2005)
- Physical protection, accounting and control of nuclear materials
- Proliferation security initiative
- Suppression of international terrorism and of their state-sponsors
Nuclear disarmament and non-proliferation, 1980-1990:

- 1990’s: 40 new NPT member states (two nuclear weapon states),
- 1995 NPT indefinite extension
- 1997 Additional Protocol
- 1987 INF Treaty,
- 1990 CFE Treaty,
- 1991/1994 START-1,
- 1991/1992 TNW Initiatives,
- 1992 CWC,
- 1993 START-2,
- 1996 CTBT,
- 1997 START-3 framework and ABM delineation,
- 1999 CFE Adaptation
Comprehensive non-proliferation strategy

- Enhancement of NPT, its mechanisms and regimes
  - IAEA safeguards, AP-97 (FMCT), role of NSG
  - strict rules of withdrawal from NPT
  - strengthening of IAEA
  Export control:
  - Guiding principles of NSG (2004)
  - UN SC Resolution 1540
  - Export Control Convention (?)

- Nuclear disarmament (Art. VI of NPT)
  - follow-on to START-1 (1500 warheads)
    * - CTBT
    - next START treaty (1000 warheads), strategic conventional precision guided weapons
  - TNW (CFE)
  - cancel or limit BMD in Europe, cooperative global BMD
  - prohibition of all types of ASAT and space-based BMD
  - 3 NPT and 3 non-NPT nuclear weapon states limits
    * - FMCT/FMT

- “Sticks and carrots”:
  Threshold states (Iran, North Korea)
  International fuel cycle centers (Angarsk), NTI fuel bank
  PSI
  Suppression of nuclear terrorist organizations and black market
  CTR (Nunn-Lugar), Global Partnership
  123 Agreement, GNEP
It’s an honor to be here again in Moscow at the Russian Academy of Sciences – which has been home for nearly three centuries to distinguished scientists.

Six and a half years ago, we were here in this very hall, called together by the same purpose that brings us here today – to reaffirm the common security interests of Russia and the United States; and to emphasize the special role that scientists play in highlighting nuclear dangers and promoting cooperation.

As everyone in this hall will acknowledge – over the last six years, we did not accomplish all of what we had hoped. We made significant advances in some areas. But in others, we did not do all we set out to do. In the tone of our relations, our two nations ended in a worse place than we began – with a rise in suspicion and a drop in trust.

Today, once again we have two new Presidents.

President Obama is coming off a campaign in which he declared a striking new vision on nuclear weapons – and a different, more collaborative approach to engaging the world. President Medvedev has answered with equally challenging words.

The new nuclear agenda

Here is what President Obama has said.

1. This is the moment to begin the work of seeking the peace of a world without nuclear weapons.

2. We'll work with Russia to take U.S. and Russian ballistic missiles off Cold War prompt launch alert postures, and we will work to dramatically reduce the stockpiles of our nuclear weapons and materials and increase warning and decision time to reduce pressure on the nuclear triggers.

3. We will work to negotiate a verifiable global ban on the production of new nuclear weapons material.

4. We'll set a goal to expand the U.S.-Russian ban on intermediate-range missiles so that the agreement is global.

5. We will lead a global effort to secure all nuclear weapons and material at vulnerable sites within four years.

To match these words with deeds, progress on each of these matters will require the active cooperation of the Russian Federation.
Importantly, this call for a new nuclear agenda is not coming just from the American side.

**Russia’s Comments**

A few weeks ago, President Medvedev declared, “Today we face an urgent necessity to move on the way to nuclear disarmament. In accordance with its obligations under the Treaty on the Nonproliferation of Nuclear Weapons, Russia is fully committed to the goal of a world free of these most deadly weapons.”

President Medvedev went on to say:

“…I fully share the commitment of the U.S. President Barack H. Obama to the noble goal of saving the world from the nuclear threat and see here a fertile ground for…joint work. I believe that constructive interaction in this field will contribute to general improvement of…Russian-U.S. relations.”

We should all take President Obama and President Medvedev’s words to heart, and we should all recognize the urgency and importance of the task that lies before us.

The stage is set for a “reset” of the U.S.-Russian relationship. A change in direction on nuclear security policy lies at the center of that change. We have a good foundation from which to begin.

**Global Initiative and WINS**

In 2002, NTI Co-Chairman and former Senator Sam Nunn and Senator Richard Lugar met with Russian officials in the aftermath of the Putin-Bush Summit here in Moscow and proposed a Global Coalition Against Catastrophic Terrorism. Later that year, the G8 created the Global Partnership Against Weapons and Materials of Mass Destruction followed later by the Proliferation Security Initiative and the creation of the Global Initiative to Combat Nuclear Terrorism co-chaired by Russia and the U.S. with over 70 participant states. When the Global Initiative was established in 2006, it called for the sharing of best practices in securing nuclear materials.

The institution that can do that work is called the World Institute for Nuclear Security, or WINS, and it was founded this past fall in Vienna.

As *The Economist* wrote last October: “WINS is a place where for the first time those with the practical responsibility for looking after nuclear materials – governments, power plant operators, laboratories, universities – can meet to swap ideas and develop best practices.”

We hope that every organization and institution with responsibilities for nuclear materials protection will become a member. If so, WINS can help bring us to the day where the best security practices anywhere are put in practice everywhere. I hope very much that WINS will have the support of the people in this room, and the benefit of enthusiastic Russian involvement. Other initiatives have been taken. But much of our work to reduce nuclear dangers remains to be done.

**The Big Opportunity – and the New Politics of Nuclear Security**

As everyone in the audience knows, in the first few days of 2007, an opinion piece published in the Wall Street Journal written by former Secretaries of State George Shultz and
Henry Kissinger, former defense secretary William Perry, and former Senate Armed Services chairman Sam Nunn noted that “the world is now on a precipice of a new and dangerous nuclear era” and that nuclear deterrence is becoming “increasingly hazardous and decreasingly effective.”

This message, and most importantly, these authors, changed the political debate in the United States, and made it politically possible to talk again of working toward the ultimate goal of a world free of nuclear weapons.

These four individuals – George Shultz, Henry Kissinger, Bill Perry and Sam Nunn – are in Moscow right now, delivering the same message that has dominated their public statements for the last two years: Each of the four has concluded that if we are going to get the cooperation from other states we need to reduce today’s urgent nuclear dangers, we have to re-assert the vision of the world free of nuclear weapons and take the steps that will build trust, reduce nuclear dangers and help develop the foundation for – in President Medvedev’s words – a world free of these most deadly weapons. Russia and the U.S. must lead this step-by-step journey.

Undoubtedly, this subject will be prominently on the agenda when Kissinger, Shultz, Perry and Nunn meet with President Medvedev on Friday of this week. I want to emphasize step-by-step the characteristics of this journey.

As we meet here today, we could be on the verge of momentous change. I am fully expecting that our presidents will chart a new course for our two nations when they meet on April 1st on the borders of the G-20 group of states. I believe each president will give instructions on how they wish to “reset” the relationship and change direction. At the same time, the world will be watching and listening to us to see if both sides are prepared to forthrightly recognize and deal constructively with the challenges that “hold us by the sleeve” and impair our bilateral relationship. The major challenges to our bilateral relationship must be addressed if we are to rebuild trust between our two nations and make progress of a new nuclear security agenda. These three are:

**Challenges**

- Will the commitment to negotiations bring into effect a START replacement – before December
- Will our two nations find a path to resolve differences on European Missile Defense
- Will we be able to develop a new European Security Architecture and find a path to resolve differences on NATO Expansion

There can be no coherent, effective security strategy to reduce nuclear dangers that does not take into account Russia – its strengths, weaknesses, aims and ambitions. So, it is remarkable – and dangerous – that the United States, Russia and NATO have not developed an answer to one of the most fundamental security questions we face: What is the long-term role for Russia in the EuroAtlantic arc? Whether caused by the absence of vision, a lack of political will, or nostalgia for the Cold War, the failure of both sides to forge a mutually beneficial and durable security relationship marks a collective failure of leadership in Washington, European capitals and Moscow. From his first day in office, President Medvedev has spoken about the need for a new architecture. Now may be the time to begin to give shape to that vision.
To make progress on any of these challenges, we must restore a process of communication and engagement. There can be and will be no progress unless it can pass this test – is it in the collective security interest of both states?

Call to Action/Conclusion

In conclusion, let me say that I am very optimistic about what our two countries can accomplish together in the next few years to reduce nuclear dangers around the world. I am optimistic, in great part, because of the confidence that I have in the ability of Russian and U.S. scientists to be agents and advocates for change.

This confidence dates back to my service as Undersecretary and Deputy Secretary of Energy in the 1990s. One of the highlights of my time there was seeing the success of the lab-to-lab cooperation between Russian and U.S. scientists, in particular their joint work in the success of the Material Protection, Control and Accounting program (MPC&A).

I have never known work of such significance to go forward more quickly or more harmoniously. In this room are many authors of that successful program. The contracts that launched this cooperation were concluded in six weeks time – and technology, developed jointly by U.S. and Russian scientists, is now protecting HEU and plutonium in facilities across Russia, including at the Kurchatov Institute. Both sides have learned from each other in this experience.

As we have all read, the terrorists that took over the Dubrovka Theater in 2002 when last we met had targeted the Kurchatov Institute before choosing instead to seize hostages at the Theater. Whatever their reasons might have been for avoiding Kurchatov, the fact is, the HEU in the Kurchatov Institute was more secure, and far harder for any terrorist to seize, because of the MPC&A and the cooperation of Russian and U.S. scientists.

The book Dismantling the Cold War explained the MPC&A success this way, and I quote: “Once conceptualized at the lower levels, lab-to-lab programs are then "sold" by each side's scientists to their respective governments. Instead of a U.S. official advocating a program to the Russian government, the recommendation comes from a Russian scientist or Minatom official.”

Clearly, when the trust that the scientists command because of their knowledge is combined with the trust they enjoy because of their patriotism, they have tremendous influence as advisors.

To me, there couldn’t be a better example of the crucial role that scientists can play in advancing our common security. It is more important than ever for our scientists to use the stature they have in the eyes of their country to promote cooperation in reducing nuclear threats.

There have been many periods over the past 60 years of U.S.-Russia relations where time was not ripe for change. This is not one of those times. Many issues are converging – greater danger, a greater sense of urgency, new leadership, the chance of greater trust – and every one of these trends tells us that the moment to push for change is NOW.

As President Obama and President Medvedev have said, Russia and the U.S. should lead the way. But Russia and the U.S. are more likely to lead if Russian and U.S. scientists are pushing from behind. Thank you.
The indefinite-term NPT is a time-proven instrument that lies at the foundation of the international security system. In its 40 years of existence, the treaty has demonstrated high viability and withstood tough tests. It continues as a critical instrument for prevention of the nuclear proliferation and serves as a basis for advancement along the road of irreversible nuclear disarmament, as well as ensures international cooperation in the peaceful use of nuclear energy.

It should be admitted that over the recent years, the architecture of the nuclear Nonproliferation Treaty has sustained shocks from some long-standing and new challenges. The end of the cold war has not made the world much safer. Relations between certain countries still retain a high measure of distrust, and some states regard the nuclear option as the most effective means of providing national security and an instrument of achieving a greater political weight in the world. As a result, the noble aspirations to rid the world of the nuclear weapons remain unrealized, and the heavy luggage of the past combined with new threats is pulling us backwards, blocking our way to tangible achievements in building a safer and more predictable world.

The current 5-year NPT review process that will result in the 2010 NPT Review Conference must bring forth a package of specific actions by the international community in strengthening the nuclear disarmament and nonproliferation regime. The coming May session of the Review Conference Preparatory Committee which should lay the foundation of future decisions is going to be critical for the preparation process.

Given the disappointing results of the previous Review Conference, is this a feasible objective?

My answer is: With the political will, respectful attitude towards parties’ concerns and readiness to compromise, a positive result is within reach.

What are the present problems of the NPT? Let me start with a cornerstone of the treaty – the problem of nuclear disarmament.

Is everything good in this sphere? It would of course be unfair to deny some substantial achievements in this area. As far is Russia is concerned, we keep observing our international obligations in full and considerably ahead of the schedule. Back in 2001, we reached the "ceilings" in reductions of strategic carriers and accountable nuclear warheads set by the START. The indefinite-term INF Treaty that resulted in complete elimination of two classes of land-based nuclear weapons remains a critical contribution to the cause of nuclear disarmament. The SORT treaty is being successfully implemented.

We believe that the time is right for new steps in the area of nuclear disarmament. However, in this sphere the process proceeds in a difficult fashion.

The problem is that many nuclear disarmament plans of the 2000 NPT Review Conference (and this was the last conference to adopt concrete decisions on nuclear nonproliferation and
disarmament) have not been realized. The ABM treaty does not exist today. START-2 has never entered into force. We are still far from CTBT entering into force. Talks on fissile materials ban have not yet started, let alone completed as planned by the 2000 Review Conference.

The gravity of the situation is fully appreciated in every corner of the world. It is not accidental that more and more initiatives in complete nuclear disarmament are recently being put forth: ‘The Hoover Initiative”, “A Global Zero” initiative, Evans-Kawaguchi Commission, the Luxemburg Forum, or plan of the UK Prime Minister Gordon Brown.

We welcome any constructive steps capable of guiding the disarmament process out of the protracted crisis. In our understanding, of greatest importance is establishment of an international environment conducive to complete rejection of nuclear weapons under the condition of strengthening the international stability and respecting the principle of equal security.

We are convinced that this is a task not only for the nuclear states but also for every NPT member party without exception. An objective as big as the attainment of a “nuclear zero” may only be considered in unbreakable connection with the resolution of other international problems, including settlement of regional conflicts, reliable guarantees for the viability of key disarmament and nonproliferation instruments, return of all nuclear weapons back to the territory of states that possess them, refusal of unilateral deployment of global missile defenses, prevention of deployment of weapons in space, as well as a controlled wind-down of the conventional arms race.

It is very important that these initiatives don’t stay on paper or inside the walls of international conference halls. It is necessary to think how we can turn an appealing idea into practical agreements. Let me be frank. Sometimes, the international community makes plans or sets objectives that are very distant from real life. As a result, public commissions, nongovernmental organizations and representatives of civil society would operate in one dimension, and official national delegations or government officials – in another. I believe that under the present conditions, it should be critical to prevent the emergence of mutually opposed dynamics. We should seek to harmonize the efforts of nongovernmental and academic communities with the work of government experts.

In the complex environment of the present nuclear disarmament situation, a recent statement of support to the noble idea of freeing the world from the nuclear danger made by RF President Medvedev, has proved well-timed and much-needed. It sent a call to the US to conclude a legally binding agreement on further limitations and reductions of strategic nuclear weapons. This statement, along with Russia’s principal approaches to the issues of nuclear disarmament and nonproliferation, was made public at the Conference on Disarmament on March 7th this year by Foreign Minister Lavrov (the full text is available for the participants of our conference).

I have just returned from a small conference in the French town of Annecy where heads of delegations of the NPT review process member parties and representatives of leading NGOs came together to discuss the problems of the Treaty. My colleagues gave a favorable response to the approach spelled out in the statement of President Medvedev. In their view, Russia has once again demonstrated good will and assumed initiative in the area of nuclear disarmament.

Without any doubt, the pivotal part in the process of missile and nuclear disarmament belongs to the Russian-American agreements on limitations and reductions of strategic offensive weapons. The foundational treaty in this area, the 1991 START treaty between the USSR and USA, expires on December 5 of this year. Its goals have been fully accomplished. Discussing the option of its extension would be illogical only because it would have been a serious step
backwards in the actual disarmament process. (Incidentally, this is also the view of the United States). Why so? It is because the commitment to reduce the strategic forces down to the level of 1600 strategic carriers and 6000 nuclear warheads associated with them had long been fulfilled by Russia and the US, and de-jure, the sides may now begin to increase their pertinent forces.

This is why at present, we put the main emphasis on the need to reach a new legally binding agreement on lowering the permitted strategic nuclear weapon “caps” which could incorporate the most valuable and practicable aspects of the existing treaty. We advanced this proposal to the American side back in September 2005. However, the talks that followed revealed lack of readiness of the former US administration for serious work.

During their first meeting on March 6 in Geneva, Foreign Minister Lavrov and the US State Secretary Hillary Clinton had an open exchange of opinions on key problems of the strategic stability, including the disarmament issues. The two ministers pressed the button which symbolized a “reload” of relations between the countries. They agreed to start the talks on working out a new agreement to replace the START treaty in the immediate future.

At present, we are waiting for the end of the formation process of the Washington “disarmament team”. We closely follow statements by Barack Obama and his administration regarding the plans of the new US leadership on restarting the dialog with Russia on reductions of the nuclear arsenals. At the same time, let no one entertain illusions – forging an agreement on reductions and limitations of nuclear strategic forces will take substantial effort. Besides, documents of such importance can not be agreed on overnight.

I would like to stress that in the future negotiations, the principal importance without a doubt will belong to the interconnection between defensive and offensive weapons. A real progress in nuclear disarmament is not possible while it is being simultaneously undermined by unilateral deployment of global missile defenses. Such developments could beget an erosion of strategic stability and unsettle the global system of checks and balances.

In the spirit of openness, as a constructive alternative to unilateral missile defense designs, we propose to join the efforts of all states interested in countering the potential missile threats. Our “package proposal” on building strategic cooperation between all interested parties remains on the table.

We need specific agreements on non-deployment of weapons in outer space, on banning the conventional refitting of nuclear warheads, and on halting the growth of conventional forces. Without a breakthrough on these issues, it will be hard to expect a positive and steady progress in the nuclear disarmament process.

As important as the Russian-American relations in the strategic sphere are, it would be an oversimplification to reduce the entire process of nuclear disarmament to them alone. We believe that the NPT Review Conference of 2010 will be a place of frank discussion on what additional contribution to the process could be made by other nuclear state parties. We believe that as soon as in the short-term perspective, they will be able to gradually join in the efforts of Russia and the US.

Not too far away is the time when we should be thinking about getting nuclear countries other than the “nuclear five” involved in the disarmament process. It would be impossible to imagine a situation when the nuclear NPT member states will be disarming while other countries not bound by legal obligations will continue to increase their nuclear arsenals. Equally unacceptable, in our mind, would be attempts to use the NPT membership for realization of national nuclear military programs.
Without doubt, an agenda also exists for the Conference on Disarmament where we could continue a common discussion on the prospects for nuclear disarmament. Russia supports the organization of a dedicated conference auxiliary body to tackle these problems.

Besides, we call for an immediate start of talks on Fissile Material Cut-off Treaty (FMCT). We believe that all conditions for this are in place. At the 2010 NPT Review Conference we will seek endorsement of the importance of this Geneva agenda item as a next step in the process of nuclear disarmament and strengthening of the nuclear nonproliferation regime.

One more critical factor in the progress towards the global nuclear “zero” is an expeditious entering into force of the CTBT. Russia ratified this treaty as far back as 2000 and has applied consistent efforts to accelerate its entering into force. Observing the nuclear test moratorium, as important as it may be, can not substitute legal obligations arising from the NPT. We expect that all countries whose participation is required for the CTBT to enter into force will sign and ratify it as soon as possible. It is obvious that a lot depends on the position of the US. As mentioned in the March 7th statement of Foreign Minister Lavrov, Russia has noted some positive signals from Washington on a possibility of a revised approach to CTBT. We trust that it will be implemented into concrete decisions of the Obama administration.

A key factor in the steady progress of the disarmament process is strengthening the nuclear nonproliferation regime. It is this area that has traditionally remained the subject of constructive multilateral as well as bilateral Russian-American cooperation. We call for the continuation of this cooperation.

Much has been done to create an effective international “safety net” preventing nuclear weapons and materials from falling into the hands of non-state actors and, above all, terrorists. I am talking of UNSC resolution 1540, the launch of the Russian-American initiative to combat the acts of nuclear terrorism (Global Initiative to Combat Nuclear Terrorism), collaboration in strengthening of export control regimes and the controlling functions of IAEA. But there’s much more to be done. This is evident from the results of work of the UNSC Res. 1450 Committee: many states don’t cooperate in an active way and provide required information about national nuclear materials monitoring systems. Today, 75 states are the Global Initiative members. What about the rest?

Still unresolved are the problems with Iranian and North Korean nuclear programs. We are worried that so far it has been difficult to set up some provisional benchmarks which would create a framework for political and diplomatic settlement of these problems.

It is too early to speak about effective operation of the nonproliferation regime at the regional level. Nuclear-free zones which are established to this effect (today they comprise about 110 states) do not function at their full potential. In the Middle East, the 1995 NPT Review Conference decision on the establishment of a zone free of nuclear and all types of WMD and delivery systems still remains unrealized.

Still on agenda is improvement of the controlling activity of IAEA. It may be interesting to mention that the entire financing available today to IAEA is lower than the combined contract fees of “Manchester United” soccer players. We regard the Additional Protocol to the safeguard agreements as an effective instrument for enhancing the Agency’s capacity in this respect. In perspective, the Additional Protocol, which Russia ratified in 2007, should become a universal yardstick for verification of states’ compliance with their nonproliferation obligations under NPT, as well as provide an important new standard in the area of nuclear export control.

The close connection between nonproliferation and peaceful use of the nuclear energy is apparent. I am not going to speak today on the nuclear energy “renaissance”. This should be a
subject for a dedicated discussion. I would only suggest that using the benefits of the peaceful atom should not be blocking solutions for managing the risks inherent in proliferation of sensitive technologies. A few years ago Russia proposed its own recipe for the solution of this problem – creation of a global nuclear energy infrastructure based on multilateral approach to nuclear fuel cycle.

This initiative offers an economically and practically feasible alternative to developing components of nuclear fuel cycle at the national level. It has been implemented in the Uranium Enrichment International Center (IUEC) at the Angarsk Electrolytic Chemical Plant created jointly with Kazakhstan. Armenia and Ukraine have already joined the Center while a number of other states expressed interest. At the Center and under the supervision of IAEA we also plan to set up a so-called “buffer stock” of low-enriched uranium to ensure the guaranteed fuel supply to interested states in case of market disruptions.

This does not exhaust the issues to be discussed and resolved at the coming NPT Review Conference. We are confident that in spite of existing difficulties, all problems of nuclear disarmament and nonproliferation should and can be resolved collectively on the basis of NPT provisions.

I would like to assure the participants of this conference that the Russian side is prepared for productive cooperation with all government delegations, NGOs and academic circles in delivering effective results of the Review Conference which, in our mind, will permit to make a new step towards a nuclear-free world. Making our planet safer is our common task.
We are discussing many specific and important aspects of nuclear nonproliferation at this conference. I want to relate these to the issue of disarmament, which has been injected into the nuclear debate in the United States – and around the world too – by the so-called Hoover/NTI Initiative. The Quartet of former secretaries of state George Shultz and Henry Kissinger, former Secretary of Defense William Perry, and former senator Sam Nunn published two articles in the Wall Street Journal in January 2007 and January 2008 calling for a world free of nuclear weapons and laying out the steps to such a world. These articles (especially the first) elicited a widespread and favorable response, to judge by the letters received, and editorials published in newspapers, from all around the world. This response was as gratifying as it was surprising to the authors of the articles. The response was certainly more favorable than it had been in 1986, when President Ronald Reagan and General Secretary Mikhail Gorbachev raised the possibility of eliminating nuclear weapons at their meeting in Reykjavik.

The two articles in the Wall Street Journal were the product of two conferences held at the Hoover Institution at Stanford University. Detailed studies have been done to provide analytical support for the steps to a nuclear-free world set out in the articles. Two thirds of former U.S. secretaries of state, secretaries of defense, and national security advisors have given their support to the Quartet’s Initiative. British, Italian, and German counterparts have published articles of their own in support of the Initiative. Most importantly, Barack Obama gave his support in September 2008, before he was elected president. He fully supported the goal of eliminating all nuclear weapons as well as the specific steps in that direction proposed by George Shultz and his colleagues.

Why has the Initiative had such an impact? Many eminent men make appeals that are ignored; and many people have been calling for years for the elimination of nuclear weapons. It was, I think, some combination of the men and the moment that explains the impact. These are four men “not known for their utopian thinking,” as Gorbachev put it; they are also men with vast experience in international affairs. They have spoken up at a time when the nuclear nonproliferation regime is under great strain. (The North Korean nuclear test took place a few days before the first Hoover conference in October 2006.) The status quo was tending to deteriorate into a proliferated world. Ultimately the Initiative is based on the perception that a discriminatory nuclear regime in which some states hold on to nuclear weapons while the rest are denied access to them will not work. In other words, nonproliferation and disarmament are intimately linked.

The Initiative can also be read as a rejection of the Bush Doctrine enunciated in the 2002 National Strategy of the United States of America. It accepts the Bush Doctrine’s contention that the main nuclear threat now comes from “rogue” states and terrorist groups, but it rejects the Doctrine’s emphasis on preventive force and unilateralism in favor of diplomacy and
international cooperation. The impact of the Initiative on the nuclear debate in the United States has been considerable. “Nuclear disarmament” has become a respectable concept, and there is – in the public debate at least, and perhaps in policy too – a very important shift away from merely telling other states not to acquire nuclear weapons to a focus on creating a new nuclear order in which the obligations by the nuclear weapons states to move toward disarmament will play a key role.

The Hoover Initiative set out a number of steps on the path to a nuclear-free world. We are discussing many of them at this conference: strategic arms reductions; the interface between nuclear weapons and nuclear power; the safety and security of nuclear materials, etc.

No one knows what a nuclear-weapons-free world would be like, beyond its three main characteristics:

1. Zero nuclear weapons.
2. Guaranteed and controlled access to nuclear fuel for power reactors.
3. An assured basis for dealing with the danger of breakout.

It is not clear how these conditions would be secured; but no one would want to delay taking the first steps until we have worked out exactly what a nuclear-weapons-free world would look like. That is a question that will have to be thought through carefully as we move toward disarmament.

The vision of a nuclear-weapons-free world and the steps proposed for moving in that direction stand in a dialectical relation to each other. As the second Wall Street Journal article put it, “without the bold vision, the actions will not be perceived as fair or urgent. Without the actions, the vision will not be perceived as realistic or possible.” The vision provides the compass. The aim is disarmament, not merely arms control. “Strategic stability” remains a key concept, but it has to be counterbalanced by the goal of moving to zero.

There have been earlier attempts to eliminate nuclear weapons, most notably the negotiations under the auspices of the United Nations on the international control of atomic energy in which the United States and the Soviet Union (along with other countries) engaged beginning in 1946. Among the lessons that can be drawn from that failure are:

- The vital role of the political context; we need a vision of a shared future that we can live with, without nuclear weapons.
- Progress has to be based on a sense of ownership of the disarmament process by all the nuclear weapon states.

The United States and Russia have of course a crucial role to play. They possess between them about 90 per cent of all the nuclear weapons in the world. It is encouraging, therefore, that the two countries have agreed to negotiate a binding treaty to succeed START. The issue is an urgent one because START expires in December of this year, and because it is important that the United States and Russia be able to show some progress by the time of the NPT Review Conference in 2010.

The other nuclear states need also to be brought into the disarmament process. They can argue that the United States and Russia must make the first reductions before they join in. In the meantime, however, there are things that they could do to make it easier for the United States and Russia to cut their nuclear forces. Among the helpful steps would be: a commitment not to increase the size of their nuclear forces; greater transparency about their nuclear forces and military doctrine; and maintaining their forces on a low state of alert.
Session II

Chairman:
David Holloway

Speakers:
Olli Heinonen, Development of the IAEA’s Future Verification Regime

Vladimir Dvorkin, Russian-American Talks on Strategic Arms Reductions (START-1, ABM, INF) Prevention of Minimization of Outer Space

William Fallon, Trust and Transparency: Foundation for a Good Relationship

Randy Ilkaev, Technical Cooperation in a Nuclear Area: Background and Prospects

Nikolay Ponomarev-Stepnoy, Anticipated Nuclear Power Renaissance and Need for a New System Analysis of Factors Affecting Proliferation of Nuclear Materials and Technologies
The IAEA’s verification system plays a critical role in the global nuclear nonproliferation regime. It serves as the sole international mechanism to monitor nuclear activities under the Nuclear Non-Proliferation Treaty (NPT). It is also the primary vehicle for verifying compliance with peaceful uses of nuclear energy and it provides assurances of State’s nuclear non-proliferation undertakings. The Agency’s authority is derived from its Statute, the NPT, and the various Safeguards Agreements concluded with States.

The pursuit of nuclear energy

Energy security concerns and fears of climate change are prompting many countries to revisit the nuclear power option as part of its national energy mix. Recently published IAEA updates show that the nuclear electricity generation may grow by 15 to 45% by 2020 and by 25 to 95% by 2030. The acquisition and utilisation of nuclear technology is also seen as a matter of economic, scientific, and technological advancement.

We are going to live a nuclear renaissance. To ensure a supply of reactor fuel for its nuclear power plants, some countries have shown interest in mastering the nuclear fuel cycle – which brings with it proliferation risks. We have all also witnessed the emergence of covert nuclear trade networks, whose activities span the globe.

To date nuclear power has been mainly used in industrialized countries. However, much of the future growth is expected to take place in the developing world: 16 out of the 35 new reactors currently under construction are in developing countries, particularly in Asia.

Many of the new nuclear facilities to be established will be in States which have limited or sometimes no previous nuclear experience. Many of these States have also yet to establish or enhance their nuclear regulatory bodies and appropriate legislation and resources for effective State System for Accountancy and Control (SSAC). The Agency’s role of national capacity building through its technical cooperation, together with a resilient safeguards verification system are necessary ingredients that contribute to public acceptance of nuclear energy.

Changes in the IAEA verification regime

The Agency’s task of carrying out responsible safeguards verification to ensure the peaceful use of nuclear energy entails that timely and early detection in verifying compliance is necessary. With a changing landscape of nuclear proliferation challenges, and cases where the letter or spirit of the NPT has been threatened, a strengthened system of safeguards has been instituted that incorporates the Additional Protocol as well as state level approaches to safeguards.

Other areas have been identified to adapt safeguards to the changing environment – ranging from moving towards an information-driven safeguards approach, to reviewing the
IAEA’s authorities, technologies, personnel and resources. The Agency can also be part of a solution to a multinational approach to the nuclear fuel cycle (MNA) that addresses the issue of proliferation of the sensitive aspects of the nuclear fuel cycle.

To carry out its verification activities effectively, the IAEA needs to have adequate inspection authority and access to all relevant information and locations. The Agency’s two main types of legal instruments are the comprehensive safeguards agreements (CSAs) and the additional protocols (APs). Together, the two instruments enable the Agency to conclude that States are not diverting nuclear material to nuclear weapons.

The Agency will also need to move with the times when it comes to its technical capabilities. Having state-of-the-art verification technology will remain an important requirement, particularly for the detection of clandestine nuclear activities. The IAEA would benefit greatly from having the capacity to commission R&D in safeguards technology, be it in cooperation with Member States or the commercial market. It will need to strengthen existing detection capabilities, especially with regard to environmental sampling, satellite imagery and information analysis. For example, the increasing number of environmental samples taken will require the IAEA to improve its own laboratory capabilities as well as to expand its network of analytical laboratories in Member States.

In addition, new types of nuclear reactors and associated nuclear fuel cycle technologies will emerge, requiring the IAEA to begin designing dedicated safeguards approaches and techniques well in advance. The IAEA will also work with States and facility providers and operators to design and operate ‘safeguards friendly’ nuclear installations to facilitate efficient and effective verification. In this verification scheme, mechanistic facility level safeguards criteria play a lesser role.

Nuclear Fuel Supply – The Need for a New Framework

Following expectations of a surge in nuclear power, the question arises on fuel supply assurances – notably on where will the nuclear fuel come from. Will it remain in the hands of the few existing suppliers? Or will additional states develop their own national enrichment and reprocessing capabilities. It is possible, and essential, to create a new mechanism, an MNA, that provides countries with the option of nuclear fuel assurances and the economic benefits in not pursuing enrichment. If it is left open, we could end up with a potential cascade of states mastering sensitive parts of the nuclear fuel cycle. This would be a dangerous setback to regional and international security.

Since such a mechanism was raised by Mr ElBaradei in 2003, a number of concrete proposals have emerged from various quarters. They cover a broad spectrum, from establishing an IAEA-controlled last resort reserve of low enriched uranium, to providing backup assurances of supply and setting up international uranium enrichment centres. At the most advanced stage is the proposal of the Russian Federation to set up an international uranium enrichment centre at Angarsk housing a low enriched uranium reserve which the Agency can draw upon. With regard to the NTI proposed fuel bank, the monetary goal is now complete. The next step is to develop a proposed framework for the fuel reserve for the consideration of the Board likely this coming June 2009.

IAEA Verification and Disarmament

While the Agency’s primary role in verification is in the context of States’ non-proliferation commitments, the IAEA Statute also accommodates a possible role in assisting
States in the verification of nuclear disarmament. Article III.B.1. of the IAEA Statutes stipulates that in carrying out its function:

“The Agency shall conduct its activities in accordance with the purposes and principles of the United Nations to promote peace and international co-operation, and in conformity with policies of the United Nations furthering establishment of safeguarded worldwide disarmament and in conformity with any international agreements entered into pursuant to such policies; ......”.

In the past, the IAEA have been called upon to disarm and verify Iraq’s nuclear weapons program, to verify the dismantlement of South Africa’s nuclear weapons program and ensure that all nuclear materials were placed under IAEA safeguards, and to verify Libya’s abandonment of its weapons of mass destruction efforts.

Another aspect related to disarmament that the Agency is involved in is the verification of nuclear materials released from Nuclear Weapon States (NWS) military programs. To this end, the Agency has been verifying the down-blending of High Enriched Uranium (HEU) and safeguarding of some plutonium in the US. This placement of excess materials from military programs can be seen as a partial fulfillment of NWS meeting their obligations under Article VI of the NPT.

These are some examples of the fundamental issues the IAEA’s future verification regime will need to address.
Strategic Nuclear Arms Reductions

One of the key questions in the problem of the strengthening of the nuclear nonproliferation regime is the issue of compliance by the nuclear club member states (and primarily the US and Russia) with their Article VI obligations under the NPT in conducting talks on the reduction of their nuclear arsenals. Precisely because of lack of progress in this area, despite the actual realization of strategic nuclear weapon reductions by these two states, the two last NPT review conferences of 2000 and 2005 effectively resulted in failure.

Ahead of the next review conference of 2010, of critical importance is the prospect of conclusion of a new Treaty on the reduction of strategic nuclear forces between Russia and the US before the end of this year. This treaty must replace the START-1 that expires on December 5th 2009.

This goal is discussed on every official and non-official level as well as in media, so I will touch upon it only briefly. The need for this treaty had been mentioned during the US election campaign by both presidential candidates and also by the new American administration. The same has been recently stated by Russian Foreign Minister. There exists a common understanding that the new treaty should be legally binding and contain appropriate verification measures. Also, that the warhead limit should be made lower than that of the Moscow Treaty, that is lower than 1700 warheads – at least 1500 warheads.

At the same time, there are a number of pre-existing and well-known stumbling blocks and disagreements standing in the way of concluding the treaty by the required deadline. These stumbling blocks are mainly related to the contention around the US Missile Defense system in Eastern Europe, the size of the so-called “upload potential” (возвратного потенциала) and related rules of warhead count, carrier limitations, accounting of non-nuclear warheads on strategic carriers and some other problems, including a range of issues on a mutually acceptable system of control.

To an extent, disagreements about the missile defenses in Poland and Czech Republic can be assuaged by the decision of the new US administration to revisit this plan on the cost-effectiveness criteria, which in combination with the economic crisis will probably move the scheduled deployment time (2013) back by at least three or four years. But because the US does not plan to completely drop the missile defense deployment in Poland and Czech Republic, the conflict potential remains. Moreover, the conflict around the US missile defense may get stronger in connection with the US potential plans for unilateral global deployment of land-, sea-, air-, and possibly, space-based missile defense.

Still critical is the question about the size of the upload potential, i.e. US ability of a relatively quick increase of the number of warheads on the missiles that will be subject to
dismantling of a certain share of warheads under the new treaty. The US will certainly not agree to destroy or radically rebuild a certain number of their 14 submarine carriers for the sake of reducing the upload potential. Still, there exist some options whereupon, for example, a number of launch tubes on “Ohio” submarines could be disabled, so they cannot contain missiles. Likewise, options may include the replacement of the warhead bus on Trident-2 missiles or other variants, though the probability of such solutions being accepted is not very high.

A compromise regarding the US plans of refitting the sea-based Trident-2 missiles with conventional warheads could be reached in the event when the US does not plan to deploy more than say 100 or 200 of them. Then they could as well be counted together with the nuclear ones. This will not really affect the strategic triad potential of the US. There may be other disagreements on the accounting rules for deployed warheads and carriers.

It is likely that some long time could be needed to agree on an acceptable system of inspection and advance notification procedures that may be selected from those provided for by the START-1. This treaty stipulates 15 types of inspection and about 170 kinds of advance notifications, demonstrations, exchanges of data etc. All of these had been agreed on in the end of the Cold War when the level of mutual distrust still remained high. Hence the volume of inspections that included up to 15 annual nuclear site visits by different categories of inspection. Such volume of inspections and notifications is doubtless seen as excessive and too costly. Analysis shows that under the new treaty, the number of inspections may not exceed 5 or 6 and the annual inspection quotas could be sharply reduced. The advance notification volume can be reduced at least by 3 times. For example, exchange of missile launch telemetry data on magnetic tapes and decoding equipment was to an extent justified by the control provisions of START-1 which limited missile throw weight. Because now these limitations are not being planned, a similar exchange would not make sense.

Thus, there is a number of hurdles standing in the way to agreement on a draft new Treaty, and their list can be extended if one wishes to obstruct the conclusion of the treaty before the end of the year. The ultimate success of the negotiation process which can start following the April 2009 meeting between presidents of Russia and the US will depend on political decisions of the leadership of the two countries. The past experience shows the influence of such decisions. In the initial stage of the START-1 negotiations, every article of this voluminous document was speckled with parentheses containing the divergent positions of each side, and elimination of those parentheses progressed very slowly for the course of 7 years. But as soon as impulses came from above, many of them dropped like fall leaves under the wind.

It would be quite acceptable to make do with signing the new treaty by the end of 2009, and getting it ratified later on. In practice, signed agreements in this area have been observed even prior to their ratification.

**Missile defense and nuclear nonproliferation**

The impact of programs of missile defense systems creation, prototype testing, and deployment on the nuclear weapons proliferation became apparent as early as the late 1950s when the nuclear armaments race between the USSR and US was already in place. Efforts to contain this race resulted in the signing of the ABM Treaty (which entered in force in 1972) and the 1974 Protocol to the Treaty.

Before the end of the Cold War, missile defense affected the so-called vertical proliferation, i.e. the growth of nuclear weapons stockpiles of the nuclear states. Now missile defense program are affecting the horizontal proliferation, i.e. attempts of the threshold states to
acquire nuclear weapons. Here, a lot will depend on which format the future missile defense systems will be assuming: unilateral, block-based, or multilateral.

On the one hand, it may be suggested that the deployment of defense systems for missile interception on different stages of trajectory can affect political decisions of threshold states on freezing their programs of development and deployment of middle-range and intercontinental missiles with nuclear warheads. At the same time, if this containment is achieved by deployment of missile defenses in unilateral or block-based format and triggers vertical proliferation, its value will prove minimal. As an example, we can expect that facing the strengthening of missile defenses of the US and Israel, Iran will be increasing the number of its intermediate-range missiles to overcome the missile defense layers and fit its missiles with missile defense countermeasures.

On the other hand, if the missile defenses of a region can be potential targets of an effective missile attack, the state that had been planning such an attack may seek to develop other technical and tactical capabilities to inflict nuclear damage on its victim. These could include cruise missiles, kamikaze-piloted aircraft, sea vessels of various classes, commando groups armed with a nuclear device or other means. In other words, proliferation of these weapons may get a new momentum.

The dramatically different set of conditions for containing the processes of nuclear materials, nuclear weapons and missiles proliferation can be brought about by a multilateral approach to development and deployment of missile defense systems. Of course, this does not rule out attempts to use alternative means of nuclear weapons delivery. But a completely new stage of strategic cooperation between the developed states in countering common threats to security allows making, on a consolidated basis, significantly more effective decisions on resolution of the existing nuclear crises, strengthening nonproliferation regimes, turning the missile technologies control regime (MTCR) into a legally binding international agreement, bolstering counter-proliferation measures, and achieving a lot more.

To sum up, after the end of the Cold War, the relationship between programs of development and deployment of strategic and nonstrategic missile defenses and proliferation of nuclear weapons and delivery systems have undergone a significant transformation. In this process, unilateral or block-based missile defense programs will continue to negatively affect the vertical proliferation of nuclear weapons. The scale of their stockpile growth will depend on the 'density' of the missile defenses and absence or presence of treaty limitations on the parties’ strategic nuclear forces. An extreme scenario would include Russia’s abrogation of the Intermediate-range Nuclear Forces Treaty (INF) and a buildup of mainly mobile elements of nuclear and missile forces by China, India, and Pakistan. As the US missile defense system would be getting progressively more effective with activation of land-, sea-, air-, and space-based layers of defenses, vertical nuclear proliferation would be getting new impulses. This will lead to yet another crisis of the nonproliferation regime and reinforce the incentives for acquiring nuclear weapons, i.e. horizontal proliferation, for the threshold states. At the same time, an effective multi-layered missile defense system with a high probability of intercepting individual and multiple missile launches will be stimulating the quest for alternative methods of delivery of nuclear weapons.

At the same time, if the development and deployment of strategic and nonstrategic missile defenses is carried out in the US-Russia-NATO format with participation of other nuclear and non-nuclear states, this could signify a beginning of a cardinally new stage of the global strategic partnership. The way to this partnership lies through overcoming of the most serious
disagreements in this sphere between Moscow and Washington and does not appear to be an easy one. Nonetheless, the existing situation still leaves an opening for mutually acceptable solutions.

In a paradoxical way, the present-day missile defense crisis, in the case of its resolution, could provide a unique opportunity for development of strategic cooperation which could lead to a radical transformation of the still existing state of mutual deterrence between the US and Russia. It could render confrontation between them practically impossible and put the vertical proliferation on the reverse track. No less important would have been a possibility of a consolidated position on leveraging the policies of threshold states towards strict compliance with all requirements of the nonproliferation regime and UNSC resolutions on limitation of their missile programs, rejection of full nuclear cycle etc.

**Threats of militarization of outer space**

The process of the outer space militarization is understood not as a use of military-purpose intelligence, navigation, communication and control of space systems but the deployment in outer space of anti-satellite and anti-missile systems, weapons for attacking targets in other spheres as well as deployment of anti-satellite systems on earth, at sea and in the air.

At present, it is primarily the US who possesses a diverse arsenal of newest space technologies and scientific and designs blueprints for development and possible deployment after 2010 of specific prototypes of land- and sea-based anti-satellite systems.

The deployment of these weapons is backed by doctrines and concepts of the American outer space policy. For instance, the strategic plan for the US Space Command “Vision 2020” determines the following main directions of action:

- Development of means and capabilities of full control of space

- Identification of new forms and methods of global engagement (including potential capability of space force application in any region of the Earth) and achievement of full war-fighting integration of land, sea, air and space forces

Specific steps in this direction are spelled out in the report of the Commission to Assess United States National Security Space Management and Organization. In the view of the US leadership, the main rationales of the new initiatives for space militarization and building of missile defenses are:

- Possibility of proliferation of nuclear, and above all, ballistic missiles and nuclear weapons;

- Persistent trend of dissolving the boundary between military and civilian space activities;

- Technological affinity between missile defense and anti-satellite systems;

- Decreasing level of space activities in Russia and rise of space programs in countries hostile or potentially hostile to the US.
In January 2001, the US Congress-mandated Commission on issues of space proposed a strong recommendation that the US preserve the option of deployment of weapons in space and identified three potential objectives of the space-based weapons:

- Defend existing US space assets
- Prevent uses of space hostile to US interests
- Project force from space to strike any land, sea, or air target.

In a short-term perspective, Russia and China are also capable of utilizing their potential of space militarization. But, as I said earlier, the US is an undisputable leader in this area. Over the last 50 years we have accumulated substantial experience of negotiations on preventing the militarization of outer space. This experience includes the 1963 Partial Test Ban Treaty, the Outer Space Treaty of 1967, and the ABM Treaty of 1972 which banned creation, testing, and deployment of missile defenses or their components in space.

One can remember the experience of space and defense talks. Developed in 1983-1984 and presented at the Reykjavik summit, the Soviet proposal put forward a “package” that assumed that the USSR and US would reject, on a reciprocal basis, design, testing, and deployment of anti-missile and anti-satellite systems as well as other means based on conventional or other physical principles and capable of striking targets in space, atmosphere, or on earth. Then, the Soviet Union was ready to commit to most strict control including opening to inspection its relevant labs. The work of the Geneva group lead to advances in defining some critical terms, consideration of on-site control procedures and exchange of data on research, design, testing, deployment and modernization of missile defense systems and components. These normative and legal assets can be used in future talks.

Attempts to establish international legal norms to prevent the arms race in space that took place in the last few years have not been successful. Apart from the US negative attitude, this was also due to the complexity of the issue. This also relates to the Russian-Chinese draft treaty proposed at the Conference on Disarmament in spring 2008 whose outline followed the Treaty for Outer Space of 1967 and extended its ban of WMD to “all types of weapons”.

The dead ends that manifested in the resolution of this problem encouraged the world expert community to search for alternative ways. One of these ways were attempts to agree on a less formalized, compared to a treaty, code or rules of conduct in outer space. They include Model Code of Conduct for Responsible Space-Faring Nations of the Stimson Center (US), draft of Framework for Space Security of the Eisenhower Institute, and draft for a Code of Conduct for outer space activities proposed on the official international level by the EU Council.

These initiatives spring from the assumption that agreement on the principles of a code of conduct would introduce voluntary limitations and extend the consensus on fundamental principles of the use of outer space. While reaching a legally binding treaty remains complicated, the politically binding codes not burdened with difficult definitions, count and accounting rules or methods of control and data exchange may come to the forefront.

As a valuable contribution, a space conduct code could shape political preconditions for moving ahead with talks on comprehensive and legally binding treaties banning or limiting space weapons. It is important that US President Obama during the election campaign for the first time

Back to the Table of Contents
spoke in favor of signing a code of conduct including conclusion of a global ban on anti-satellite
weapons and ant-satellite weapons tests.

Tremendous part in the success of practical talks on these issues depends on a possibility of a clear agreement on the definition of the subject and working out realistic and reliable measures for control and transparency. The initial treaty could be concluded for a limited term (say 10 years with a possibility of extension). In the first stage, it could include the US, Russia, and, possibly, People’s Republic of China, and be open to other powers to join.

Now, the US economic and technological space superiority is obvious and undisputable, but if it starts, the race of space armaments will inevitably draw in other countries, first of all China, Russia, India, Brazil, Japan, and further on, possibly Iran, Pakistan, and others. As a result, and despite its space superiority, the US stands most to lose because of its greater dependence on the security of space assets in its military and civilian activities. This is what historically happened to the nuclear and missile weapons in which the US initially enjoyed the monopoly or superiority but now regard their proliferation as a principal security threat.

In the long term, the growing threat of space arms race and even more, of space conflicts, will inevitably lead to vertical and horizontal nuclear and missile proliferation and irreversible crisis of the entire nuclear disarmament and nonproliferation regime.
Trust and Transparency: Foundation for a Good Relationship

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

During more than four decades of service at sea, I have had the chance to participate in many conflicts.
I have seen the pain and anguish war has inflicted on people. I have seen many battlefields. I can speak with some authority on the mayhem and pain.
Last visit to Moscow was 1992 and 17 years ago.
Upon the visit I was wondering around the city, it was May 9th. Saw many celebrations and came up on a street corner. Number of older people who were veterans of the great war. They were decked out at there uniforms. One had old camera and asked to take a picture of him and others. Fallon took picture of the people. Both the man Fallon met and Fallon were soldiers and they embraced.
I tell you that because my impression after visit to Russia because it shows that even though we had many difficulties we had in the past, it gave me a lot of hope we were going to have a different future.
Went out to my duties. As a sailor, thought it would be easier to interact at sea.
Have not seen border in sea.
Have been disappointed in what has happened since 1992. We have missed opportunities to improve relations to do good throughout the world.
There are not a lot of differences between people throughout the world. People what the same things, security and stability and the expectation of a better life for the future.
We are at a point now that is offering us an opportunity.
A good relationship depends on trust. If not trust, the relationship is not good. How doe you get trust? You have to build confidence.
If we are going to make progress we are going to need to have dialogue and engagement.
If you don’t have firsthand knowledge, then you have assumptions. When you make assumption you are wrong about have the time b/c we don’t know.
Today there is a tendency among young people to be wishy-washy. If you are wrong then the framework is wrong. I like to make a minimal amount of assumptions.
It has been obvious that there are many states that have made assumptions.
I sense there is too much hedging. There is too much cold war influence. It has been 20 year; maybe that is not enough time.
Do you think there is going to be war among Russian and the US? I don’t, and that should elevate our discussion.
How do we deter a place like Iran?
The potential use of conventional warheads on ballistic missiles. When I heard this proposal I was torn. I knew it was to get away from using nuclear weapons.

Back to the Table of Contents
• The other side said it was going to be a serious problem because it could cause anxiety between Russia and US.
• Another issue is what about all these weapons? What are we doing with them? Why do we have them?
• These talks should focus on improving our security in the world. If we can get the Russian federation and the United State to agree, that would be a huge deterrence in countries getting nuclear weapons.
• The issue is to assume a position of leadership. You play an absolutely key role. We have responsibility to play that role. Not to say that it is a political issue and belongs to someone else.
• Together we can do anything. The collective imperative of having this group leading in this area the minor will have little choice but
• It is all about relationship. We can learn from history. They key thing for us is to take advantage of opportunity.
• I know how difficult it is to change, but we need to think critically about these issues.
Technical Cooperation in a Nuclear Area: Background and Prospects
Randy I. Ilkaev, Scientific Director of the Russian Federal Nuclear Center, the All-Russian Research Institute of Experimental Physics

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
TECHNICAL COOPERATION IN THE NUCLEAR FIELD: BACKGROUND AND PERSPECTIVES

Radi I. Ilkaev
Russian Federal Nuclear Center – VNIIEF

2nd Russian-American Conference on Nonproliferation of Nuclear Weapons
(Moscow, 18-20 March 2009)
TECHNICAL ASPECTS OF NONPROLIFERATION

- ensuring physical protection and technological security
- technical support of anti-terror activity
- development of security culture
Presidential initiatives of autumn 1991 formed the basis for cooperation between the Russian and US nuclear laboratories. Decisions made at high governmental level enabled to make productive the first phase of cooperation January 1992 onset of a dialogue, meeting in Arzamas-16
First joint RFNC-VNIIEF – LANL experiments demonstrated the mutual advantage of cooperation

1993
PROGRAMS OF SCIENTIFIC AND TECHNICAL COOPERATION IN THE FIELD OF NONPROLIFERATION

- MPC&A
- ISTC
- Global Initiative program (GIPP):
  - IPP
  - NCI
- WSSX
- REU-HEU Program
JOINT PULSED POWER EXPERIMENTS

• **New models for turbulent mixing (TM)**
  As a result of joint experiments it is expected to acquire data for calibration and enhancement of TM models in practically important space of parameters

• **Dynamics and stability of liners**
  It is expected to develop a technology of stable plasma liners formed from solid shells to carry out physical research

**Pulsed power generation technology**

It is expected to develop a draft design of a facility having current over 50MA and rise time 100ns
IMPROVEMENT OF COMPUTATIONAL APPROACHES AND DEVELOPMENT OF HIGH-PERFORMANCE COMPUTER SYSTEMS

• Development and updating of models and codes for solving problems of continuum mechanics and high energy density physics
  Efforts are performed in the interests of fundamental research, directed towards perfection of knowledge and improvement of reliability of mathematical and computational modeling

• Development of high-performance networks
  Development of parallel software and assessment of scalability of parallel algorithms of numerical calculations are performed to enhance stability and operating efficiency of parallel computer
LASER TECHNOLOGIES

• Generation of ultrahigh quasi-stationary electromagnetic fields with strength of 10⁹-10¹¹V/cm by phase conjugation effect
• Measurements of the gains of stimulated scatterings in large-aperture nonlinear crystals
• Demonstration of high-energy explosive pumped iodine laser
• Development of diagnostic equipment for laser research
NONPROLIFERATION THROUGH SCIENTIFIC COOPERATION – COLLABORATION WITH THE ISTC

• Facilitate solution of nonproliferation problems, provide scientists with an opportunity of re-directing their efforts towards civil-related activities
• Support fundamental and applied research
• Promote integration of scientists and engineers into the international scientific and technical community
• Contribute into creation of market-oriented economy
COOPERATION IN THE INTERESTS OF THE IAEA

• Participation of weapons specialists as experts in the international meetings and conferences addressing issues of the IAEA safeguards
• Development of up-to-date methods and hardware to meet the goals of the IAEA safeguards
• Defining criteria and assessment of technologies relative to the risk of proliferation
• Testing of devices and methods used in the IAEA Safeguards Department
Threats of nuclear and radiological terror are regarded at the beginning of the XXI century among major threats to international stability and national security. Russia was the initiator of the International Convention on Nuclear Terror Acts Prevention.

V.V. Putin signs the Convention on Nuclear Terror Acts Prevention at a UNO Summit
RFNC-VNIIEF SCIENTIFIC AND TECHNICAL BASE IN PREVENTING THE THREATS

- Long-term (within decades) RFNC-VNIIEF work in the fields outlined below has formed a substantial base for counteracting the threats of nuclear terror:
  - ensuring nuclear weapons safety,
  - research of emergencies,
  - research of casual effects on nuclear explosion
  - identifying areas of radiation contamination,
  - determining background response characteristics of nuclear charges and materials,
  - development of special types of radiation diagnostic equipment,
  - development of the means of elimination of nuclear charges and weapons.
Radioprospecting vehicle “Viza” at location of emergency detecting nuclear explosive devices (NED) and radiological devices (RD)
Robot-manipulator MF-4 with gamma-radar carried to location of nuclear explosive and radiological devices search
Search under water. Submersion of a deep-water radiometer-type spectrometer GAR-01M into the well

Survives at pressure levels up to 400 atm

Погружение гамма-спектрометров в колодец
2 сентября 2005 года
Determining accurate isotopic composition of the material of NED imitator. According to the results of gamma-spectrum processing, content of uranium isotopes is $^{238}\text{U} - 99.77\%$, $^{235}\text{U} - 0.23\%$. Depleted uranium used as the material of NED imitator.
Comparison of recorded gamma-lines with available library of radionuclides showed that Cm-244 nuclide was used as RD imitator. The Figure indicates energies of gamma-lines used for identification.
Field spectrometer “Inspector-2000” used as a part of RD imitator identified Cs-137.
METHODS OF NED ELIMINATION

- Major advantages of explosive techniques in elimination/dismantling of NED are:
  - possibility of rapid dismantling in the absence of stationary energy sources at any region;
  - remotability of operations and personnel safety;
  - short time of personnel presence near contaminated structures.
- Levels of such effects are strictly limited and aimed at avoidance of NED HE detonation.
METHODS OF NED ELIMINATION

Special wedges inside HE parts create conditions for nucleation of initial cracks whose spontaneous propagation results in failure of HE parts.
METHODS OF NED ELIMINATION

Extended shaped charges used for cutting the housing components during dismantling of ammunition.
MAIN FACTORS THAT DETERMINE POSSIBILITIES FOR COOPERATION

- Transition of terrorism to a “nuclear” stage means drastic increase of its scientific and technical level.
- Exceptional complexity and importance of the problem opens up possibilities for international collaboration between key nuclear centers under relevant intergovernmental agreements and at appropriate level confidence.
PROMISING AREAS OF COOPERATION

• Identification of priorities of cooperation in settling problems of nuclear nonproliferation and counteracting nuclear terrorism;
• Scientific programs in the interests of settling problems of nuclear nonproliferation and counteracting the threats of nuclear terrorism;
• Development of technologies and hardware to enhance nuclear materials physical protection, control and accountability;
• Development of technologies and hardware to detect, identify and eliminate nuclear explosive devices;
• Working out of proposals and regulatory documents for international cooperation in the fields of handling excess nuclear weapon materials, power-grade fissile materials, tritium.
THANK YOU!
Anticipated Nuclear Power Renaissance and Need for a New System Analysis of Factors Affecting Proliferation of Nuclear Materials and Technologies

Nikolay Ponomarev-Stepnoy, Deputy President Emeritus, Kurchatov Institute Russian Scientific Center

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

Growing pressure on energy markets calls for introducing new resources into the sphere of power production. Among them, an increasing number of states turn towards intensive expansion of the nuclear power industry.

Relief of demand for energy requires radical change in the volume of nuclear power utilization which should lead to significant growth of the role and weight of nuclear power in the energy balance of many states of the world. It is expected that:

- By mid-21st century, world’s net volume of effective nuclear power capacity will grow by more than five times;

- The group of states and regions using nuclear power will be enlarged; what is more essential, it will include states without a prior experience of nuclear technologies and thus lacking established nuclear security rules and skills in implementing safeguards to prevent nuclear weapons proliferation;

- The composition of the nuclear power industry will change: fast breeder reactors which provide the industry with nuclear fuel by means of its expanded production will be common. The nuclear fuel cycle will include reprocessing of spent nuclear fuel (SNF) and recycling of fissile materials, i.e. it will be a closed fuel cycle. Nuclear reactors will be used not only for generating electricity on power plants but also as power sources in industrial technological processes, in particular in hydrogen production. Alongside large-capacity reactors connected to the general power grid, there will be demand for local nuclear plants of small and medium capacity to provide heating and electricity for local customers. The number of such reactors in many regions of the world may be quite big.

These changes in the evolving nuclear power industry may of course lead to greater availability of nuclear materials and heightened risk of proliferation of nuclear materials, technologies, and finally nuclear weapons. The goal of containing proliferation risks unavoidably is international in scope and should be approached in tandem with the goal of maintaining energy security.

Today, we have to keep in mind that with the growth of world’s nuclear power industry concurrent with increased traffic and availability of nuclear materials, technologies and related expertise, special attention must be given to the nuclear dimension of international and sub-national terrorism. While considering the nuclear terrorism threat, it should be noted that in this case, just one or a few minimally complicated nuclear devices will suffice. Efforts of terrorist groups can be also directed at building a so-called “dirty” bomb or striking a potentially

86

Back to the Table of Contents
radioactive installation with conventional weapons. In this connection, along with ongoing improvement of systems for accounting, control, and protection of nuclear materials, there arises a task of radical improvement in the practice of accounting, control, and protection of radioactive substances and materials. In the first place, this requires setting up computer-based systems of accounting for radioactive substances similar to ones for nuclear materials.

So that measures and activities being taken towards containing proliferation risks were not random or reactive, we need to study the existing and potential threats to the nonproliferation regime associated with large-scale development of nuclear power industry. These studies should be based on system analysis of nuclear power production with identification and assessment of risk factors. These factors first of all include:

- Increase in the volume of nuclear power production capacity;
- Growing number of states using nuclear energy;
- Growing number of nuclear power plants, including small-capacity ones;
- Increase in number and types of nuclear fuel cycle facilities;
- Increase in transfers of nuclear materials;
- Increase in number of storage facilities and amounts of stored nuclear materials with varying (location- and time-dependent) degree of proliferation risks;
- Greater variance in nuclear reactor type, and use of breeder reactors;
- Expansion of technological areas of nuclear reactor use;
- Introduction of reprocessing and recycling of fissile materials into the nuclear fuel cycle;
- Increase in the volume of radioactive waste.

This system analysis should provide a foundation for recommendations on specific measures for strengthening the nonproliferation regime.

To increase effectiveness of recommendations arrived at by analyzing the problem “energy-security – proliferation risks”, it is expedient to have an instrument for comparative quantitative assessment of proliferation risks inherent in a specific solution. The relative proliferation danger (extent of risk) of different nuclear technologies and even types of nuclear materials should be constantly monitored and assessed by international experts, and recommendations on counter-proliferation measures should be continuously upgraded. It would be advisable to organize a project provisionally entitled “Methodology of quantitative analysis of proliferation risks for nuclear materials, radioactive substances, and nuclear energy technologies arising from expanded geography, applications, and pool of customers and with a view to introduction of innovative reactor and fuel cycle technologies”. As a result, such project could identify promising concepts for developing large-scale nuclear power industry and propose political, institutional, and technical solutions to reduce proliferation risks.
Tasks for institutional solutions to strengthen the nonproliferation regime

Assessment and optimization of institutional solutions proposed for the next stage of large-scale nuclear industry development require a series of activities with application of quantitative risk analysis. These activities could include:

- Developing the concept for International Nuclear Fuel Cycle Centers designed to reduce proliferation risks by introducing international control over technological operations in proliferation-sensitive stages of nuclear fuel cycle: uranium enrichment, LEU banks, fuel manufacturing and shipping, storage and reprocessing of SNF and fuel recycling.

- In perspective, this idea can bring about establishment of international nuclear energy-technological centers for fuel reproduction and actinide burning, and possibly, hydrogen production using nuclear reactors and supplying it to states which are not yet ready for nuclear power industry.

- Leasing of nuclear fuel and nuclear energy reactors.

- Control and regulation by innovative approaches and new methods of direct remote monitoring of nuclear materials, radioactive substances, reactors, and fuel cycle technologies.

- Automated systems of real-time accounting and control of nuclear and radioactive materials in all spheres of declared nuclear activities.

- Developing of requirements for:
  - Reducing volumes and circulation of dangerous nuclear materials in all stages of the fuel cycle
  - Reducing the amounts of fissile materials, whether bound or separated

- Grouping of nuclear materials and fuel cycle technologies based on degree of their attractiveness.

- Regulation of proliferation-sensitive technologies

- Assessment of threat from the “dirty” bomb and controlling transfers of radioactive fission products and actinides.

- Introducing the rule of incorporating nonproliferation systems (accounting and control physical protection, etc.) at the design stage and that of equipment supplies.

- Controlling dissemination of sensitive knowledge in the area of nuclear technologies.

- Nuclear export control analysis based on quantitative proliferation risks assessment.

- Concept development for joint nonproliferation regime based on IAEA safeguards and multilateral approaches to NFC organization.
Special attention must be paid to states just beginning their use of peaceful nuclear energy. In this case, additional requirements to nuclear suppliers would be advisable:
- Supplies of nuclear power blocks with comprehensive nuclear service bundle (fresh fuel supply, irradiated fuel repatriation, decommissioning and dismantling of the plant).
- Instruments of physical protection and ongoing control should be mandatory component of the supply contract (standardized computer systems for accounting and control of nuclear materials, radioactive substances, and radioactive waste, real-time remote monitoring and detection thereof).

Tasks in the area of new nuclear technologies

Quantitative risk analysis is a good instrument for development of technical solutions to reduce proliferation risks. It must be also used for analysis of tasks in the sphere of innovative designs for nuclear reactors and fuel cycle technologies and producing recommendations on nuclear technologies assessment criteria in reducing proliferation risks. The following tasks can be named:
- Proliferation risk analysis of nuclear power industry and fuel cycle structure and elements.
- Expert assessment of proliferation risks of innovative designs and nontraditional technologies for nuclear industry. Requirements for innovative nuclear technologies: reactors with higher fuel reproduction, closed fuel cycle technologies (processing, separation, recycling, and disposal of nuclear waste); smaller nuclear power installations.
- Methods for minimization of radionuclide content and radioactive waste volume in nuclear energy system
- Proliferation risk analysis for SNF storage, operations with radioactive fission products and actinides, and radioactive waste disposal.
- Conditions and requirements for final disposal of radioactive waste.
- Development of technologies and designs providing for internal protection of dangerous nuclear materials, in particular, proliferation-resistant fuel.
- Comprehensive system for physical protection, accounting, control, and remote monitoring for nuclear power plants and other nuclear fuel cycle facilities.
- Development of innovative monitoring means for nuclear materials, reactors, and closed fuel cycle technologies.
- Computer-based system for accounting and control of nuclear materials based on monitoring and detection of nuclear materials.

Even this early stage of risk assessment can produce some recommendations related to specific features of innovative proliferation-resistant nuclear fuel cycles. For example:
- Reducing production and consumption of LEU by increasing fuel burn-up performance, raising reactor efficiency through higher energy conversion ratio e.g. when using very high temperature reactors;

- Reprocessing of irradiated fuel to utilize mixed oxide fuel without separating plutonium and uranium in the fuel reprocessing and fabrication chain;

- Use of thorium as nuclear fuel because thorium is proliferation resistant in its natural state;

- Making fresh nuclear fuel inherently protected by regulating its radioactive composition.

Examples of proposed approaches
Example 1: Nuclear risk proliferation analysis for risks related to use of different nuclear technologies and materials

Method of quantitative analysis for nuclear and radioactive materials and nuclear energy technologies risks arising from expanded geography, applications, and customer pool as well as introduction of innovative reactor and nuclear fuel cycle technologies may prove quite useful for comparative assessment of different tracks of nuclear power industry development, comparison between various nuclear technologies, and suggestion of institutional solutions. One of important and relatively little studied problems here is assessment of terrorism-related proliferation risks linked to activities of criminal, among them, international criminal groups. We believe that we should strive to create a methodology of probabilistic risk assessment similar to one offered by expert group headed by Norman Rasmussen in 70-80s of the past century and applied to assessment of nuclear and radiation safety of nuclear installations. As a result of their work, quantitative risk assessment today is an effective instrument of comparative assessment of nuclear installation technical safety.

Methods for statistical analysis of limited or so-called “grey” knowledge based on quantified assessment of high-entropy logarithmic distributions and developed by the Kurchatov Institute Russian Scientific Center can be used for quantitative risk assessment in nuclear weapons proliferation and nuclear terrorism related to activities of criminal groups.

Comparative assessment of proliferation risks for different source materials has been performed. The materials include: low-enriched uranium (LEU), weapon-grade highly-enriched uranium (HEU), reactor-grade plutonium from spent nuclear fuel (Pu-F), and weapon-grade plutonium (Pu-W). It was suggested that the proliferation risk can be determined as a function of the following unmeasurable parameters characterizing main components of a probable proliferation scenario: duration of time needed for building an arsenal of nuclear explosive devices – T; costs of the arsenal creation including investment in all links of the technological chain of creating nuclear explosive devices from source materials and the cost of the source material – F; secrecy of the process – S; technological safety of related activities – D; accessibility of the source material – A; efficiency of the source material – E. The proliferation risk \( R \) is determined by the equation of \( R=(S*D*A*E)/(T*F) \).

Analysis of results of comparative risk assessments lead to a conclusion that the greatest proliferation risk is linked to the use of LEU. A relative risk involved in use of LEU is higher than risks involved in use of HEU and Pu-F by more than 50 times and is statistically significant.
Obtained results to a large extent depend on different levels of source material accessibility. A higher proliferation risk linked to the use of LEU is explained by its greater accessibility compared for example to fuel-grade plutonium if it derived from SNF. The situation changes though if the PU-F accessibility is same as that of LEU. Expert assessments were made to determine proliferation risks in the case if the source material was low-enriched uranium (LEU) in the form of traditional uranium oxide fuel and MOX fuel with plutonium recovered from reactor. It was assumed that both material types are equally accessible in the form of fresh fuel, and the material can be obtained by unauthorized removal from the fresh fuel storage facility at a nuclear power plant.

In the case when the criminal group had in advance covertly set up appropriate production capacities for reprocessing of illegally obtained materials into the material for nuclear explosive device, i.e. facility for enrichment of uranium extracted from LEU assemblies or facility for chemical extraction of plutonium from MOX fuel, relative proliferation risk associated with unauthorized access to MOX fuel comes out five times higher than for LEU fuel. The relative risk level for MOX fuel may be even higher given higher labor capacity of setting up an enrichment line and longer time needed for LEU enrichment compared to chemical extraction of plutonium from MOX fuel.

These assessments point to special significance of maintaining the fresh fuel safety regime at nuclear power plants. In this connection, we stress the need for new approaches to real-time systems of accounting, control, protection, and constant monitoring of nuclear materials at every stage of declared nuclear activities.

Example 2: Increasing protection of low-enriched uranium

The findings outlined above raise a question about possible creation of proliferation-resistant LEU fuel. High proliferation risk associated with use of LEU containing 4 percent of uranium 235 is due to the fact that the cost of uranium-235 further enrichment into weapon-grade condition is approximately three times lower than the cost of natural uranium enrichment. One of possible ways to increase protection can be using LEU derived from regenerated uranium, which contains not only a traditional for LEU set of U 234, U 235, and U 238 isotopes but also U 232 and U 236 isotopes. Fuel fabricated through regeneration may prove a much less practical material for conversion because of presence in its composition of U 232 isotope. Enrichment by U 235 isotope of LEU manufactured from regenerated fuel will simultaneously produce enrichment by U 232 isotope, and correspondingly, worsen the radiation situation. With certain critical content of U 232 it may lead to radiation barrier and contamination of enrichment equipment. Besides, presence of U 232 and U 236 isotopes in low-enriched uranium serves as identificator for each individual fuel shipment which enables tracking the nuclear material along its entire path up to getting loaded into reactor.

Example 3: Remote monitoring of nuclear materials and installations

Methods considerably increasing control effectiveness and reducing control costs include computer- and TV-aided remote monitoring. In 1994, Remote Monitoring Program was implemented in Kurchatov Institute in the framework of lab-to-lab cooperation between the Sandia National Laboratories and KI. Storage facilities of highly enriched uranium for the Remote Monitoring project were provided by Argonne National Laboratory-West (USA) and the Kurchatov Institute.
Demonstration of the remote monitoring system as compared to the existing approach of inspections confirmed certain advantages of the former. Among them:

- Low cost of control;
- Continuous and non-interrupting mode of control;
- System records both unauthorized activity and the perpetrator;
- Control system does not interfere with personnel activity.

From the technical point of view, high potential value of remote monitoring aimed at transparency and nuclear materials proliferation control is beyond doubt. However, special work should be done so that governments, when making decisions, were assured that the implementation of these systems does not compromise national security. It is necessary to develop specific bilateral (multilateral) procedures for these systems implementation.

Under the growing proliferation threat, we can assert with confidence the necessity of introducing nuclear materials remote monitoring at all stages of declared nuclear activities into the practice of international regulation. Obligatory use of this instrument not only for monitoring but also for quantitative control of volumes and transfers of fissile and radioactive materials at all stages of the fuel cycle should be aimed at preventing obtaining and unauthorized use of nuclear materials, including their possible theft during transportation.

**Example 4: Computer system for accounting and control**

Specialists of the Kurchatov Institute in collaboration with Los Alamos National Laboratory developed and implemented a standardized computer system for accounting and control of nuclear materials “KIMAKS”. The system can be adapted to needs of nuclear facilities of all complexity levels. Besides Kurchatov Institute, it is also implemented in the Russian Navy and will be implemented at Krasnoyarsk-26 Mining and Chemical Plant of RosAtom and in Murmansk Shipping Company. The KIMAX system went through state certification in information protection and offers the capability of information processing at various secrecy levels.

**Conclusions and recommendations**

Based on the above presentation, we can propose the following conclusions and recommendations on activities towards reducing proliferation risks associated with anticipated renaissance of nuclear power industry.

Growing pressure on energy markets calls for introducing new resources into the sphere of energy production. Among them, an increasing number of states turn towards intensive expansion of nuclear power industry.

It is expected that the development of nuclear power industry at the new stage will be marked by an expanded group of states willing to use nuclear power, steep growth in number of nuclear power installations in various regions of the world, increase in reprocessing of spent nuclear fuel and introduction of recycling, growing volumes and traffic flows of nuclear fuel and radioactive materials. These factors contribute to greater proliferation risk. To counterbalance these trends, it is expedient to develop and implement additional measures to strengthen the nonproliferation
regime in all spheres of activities responsible for nonproliferation safeguards: political, institutional, and technical.

To make these measures maximally effective, it is necessary to develop and implement system analysis of nuclear power industry with identification and quantitative assessment of proliferation risk factors.

In the framework of the Russian-US cooperation, it is recommended to undertake a study project entitled:

“Research and development aimed at reduction of proliferation risks and strengthening nuclear safety in the view of nuclear power renaissance”. This study can include the following projects:

- System analysis of nuclear power industry with identification and quantitative assessment of proliferation risk factors and recommendations on risk reduction.

- Development of improved real-time systems for accounting and control of nuclear and radioactive materials in all spheres of declared nuclear activities.

- Development of technologies, hardware and procedures for remote monitoring to provide for continuous on-line inspection of nuclear materials, radioactive substances, and nuclear installations.

- Development of recommendations to nuclear suppliers on obligatory inclusion of computer systems for accounting and control of nuclear materials, radioactive substances, and radioactive waste in combination with remote monitoring and detection systems into nuclear supplies contracts.

It would be useful to establish a standing Russian-American work group for coordination of collaborative work in this direction. Noting the positive results of the Russian-US cooperation in accounting, control, and physical protection of nuclear materials at earlier stages, we can hope for success of the next stage of cooperation with the coming renaissance of nuclear power industry.

Growing pressure on energy markets calls for introducing new resources into the sphere of power production. Among them, an increasing number of states turn towards intensive expansion of nuclear power industry.

It is expected that the development of nuclear power industry at the new stage will be marked by an expanded group of states willing to use nuclear power, steep growth in number of nuclear power installations in various regions of the world, increase in reprocessing of spent nuclear fuel and introduction of recycling, growing volumes and traffic flows of nuclear fuel and radioactive materials. These factors contribute to greater proliferation risk. To counterbalance these trends, it is expedient to develop and implement additional measures to strengthen the nonproliferation regime in all spheres of activities responsible for nonproliferation safeguards: political, institutional, and technical.

To make these measures maximally effective, it is necessary to develop and implement system analysis of nuclear power industry with identification and quantitative assessment of proliferation risk factors.

In the framework of the Russian-US cooperation, it is recommended to undertake a study project entitled:

“Research and development aimed at reduction of proliferation risks and strengthening nuclear safety in the view of nuclear power renaissance”.

This study can include the following projects:

- System analysis of nuclear power industry with identification and quantitative assessment of proliferation risk factors and recommendations on risk reduction.

- Development of improved real-time systems for accounting and control of nuclear and radioactive materials in all spheres of declared nuclear activities.

- Development of technologies, hardware and procedures for remote monitoring to provide for continuous on-line inspection of nuclear materials, radioactive substances, and nuclear installations.

- Development of recommendations to nuclear suppliers on obligatory inclusion of computer systems for accounting and control of nuclear materials, radioactive substances, and radioactive waste in combination with remote monitoring and detection systems into nuclear supplies contracts.
The Conference recommends establishing a standing Russian-American working group for the coordination of collaborative work in this direction.

The Conference notes the positive results of the Russian-US cooperation in accounting, control, and physical protection of nuclear materials at earlier stages which builds a hope for success of further cooperation in the area of nonproliferation in the course of renaissance of nuclear power industry.
Anticipated nuclear power renaissance and need for a new system analysis of factors affecting proliferation of nuclear materials and technologies

Nikolai Ponomarev-Stepnoy
Vice-President Emeritus
Kurchatov Institute Russian Scientific Center

2nd Russian-American Conference on nonproliferation of nuclear weapons, materials, and technologies

Russian Academy of Sciences and Nuclear Threat Reduction Initiative, USA
Moscow, 18-20 March, 2009
Energy and Crisis

Share of primary energy in GDP, %

Area of crises

2008 year. Share of primary energy in GDP

Área de crise

Back to the Table of Contents
Energy Challenges of 21 Century

- Growth of per-capita energy consumption in developing countries:
- energy consumption in developing countries approaching that of developed states
- Increase in global energy consumption: growth by 3 times by mid-century
- Price hike for organic fuel: extreme prices, crisis
- Harmful impact on climate of energy emissions
What is to be done?

To solve the problem of unsatisfied energy demand:

• Expand and develop all available energy sources
• Create in the world economy a “core zone” less vulnerable to destabilizing impacts of economic and political situation
• Among advanced power technologies, nuclear energy combined with hydrogen economics meets these criteria to greatest extent
Resolution of energy security problem in the 21st century requires changes in the scale and structure of nuclear power industry

- **growth in size and share of nuclear power capacity in power industry of many states:**
  - Nuclear power total capacity by mid-21st century will increase by more than five times
  - Number of states and regions drawing on nuclear power industry will grow

- **Structural transformation of nuclear power industrial complex:**
  - Expanded fuel reproduction (fast breeder reactors) and closed fuel cycle
  - Use of nuclear power in industrial technology processes (high temperature reactors)
  - Autonomous nuclear power plants of low and medium capacity.
Nuclear power industry based on TR and FR reactors
(including low- and medium capacity reactors)
Factors affecting risk of proliferation

• **Growing scale of nuclear power industry**
  - Growing number of nuclear power plants, among them local low-capacity nuclear power plants,
  - Growing number and typology of enterprises involved in nuclear fuel cycle,
  - Growth in volumes and transfers of nuclear materials,
  - Growth in volume of radioactive waste.

• **Structural transformation of nuclear power industrial complex**
  - Expanded fuel reproduction, use of fast breeder reactors,
  - Reprocessing of spent nuclear fuel (SNF), nuclear fuel recycling, closed fuel cycle.

• **Increasing number of states using nuclear power but historically unprepared for managing nuclear technologies (nuclear safety and nonproliferation safeguards)**
Tasks for strengthening the nonproliferation regime

• Changes in the developing nuclear power industry may lead to greater accessibility of nuclear materials and technologies and greater proliferation risks.
• We need new approaches and additional measures to ensure at least a containment of the risks at present level.
• These measures are necessary in all spheres embraced by the nonproliferation regime:
  ➢ political
  ➢ institutional
  ➢ technical
• We need to use system analysis with quantitative assessment of proliferation risks as an instrument for addressing these problems.
Quantitative analysis of proliferation risks

Goal

• Offering institutional solutions aimed at resolving nonproliferation problems arising at the new stage of nuclear power industry development
• Comparison and selection of proliferation-resistant innovative nuclear technologies (nuclear reactors and fuel cycle).
Institutional Tasks

- International Nuclear Fuel Cycle centers
- Real-time automated systems for accounting and control of nuclear materials in all spheres of declared nuclear activities
- Global remote monitoring of nuclear and radioactive materials
- Assigning of nuclear materials and technologies to specific risk groups
- Quantitative assessment of proliferation risks in nuclear export control
- Requirements to
  - Reducing the volume and transfers of dangerous nuclear materials at all stages of nuclear fuel cycle
  - Reducing amounts of fissile materials deposited at storage facilities in extracted or bound state
- Accounting, control, and management of radioactive materials with a view to threat of the “dirty bomb”
Goal: assist developing countries in peaceful use of nuclear energy by resolving problems of safety, efficiency, and nonproliferation

Functions:
- Fuel bank and nuclear fuel production
- Storage and reprocessing of SNF
- Nuclear energy technological centers for fuel reproduction, actinides burn, hydrogen production
- Leasing of nuclear fuel and nuclear power blocks
Nuclear power industry in novice states

• **Supplying nuclear power plants in complex with full nuclear services**
  - Supplies of fresh fuel,
  - Repatriation of irradiated fuel,
  - Removal of radioactive waste,
  - Decommissioning.

• **International control as delivery precondition**
  such control should be imposed at all stages of nuclear fuel cycle, including on nuclear materials, radioactive substances and radioactive waste in exporter and importer states.

• **Instruments of physical protection and ongoing control as mandatory element of delivery**
  - Standardized compute systems for accounting and control of nuclear and radioactive materials and radioactive waste combined with
  - Ongoing remote monitoring and detection of nuclear and radioactive materials and radioactive waste.
Tasks in the sphere of nuclear technologies

• Analysis of structure and technologies of nuclear power industry by factors of proliferation risk
  ➢ Open or closed fuel cycle,
  ➢ Minimization of radionuclide amounts and transfers in the nuclear energy system,
  ➢ Analysis of proliferation risks and requirements for SNF storage, management and disposal of radioactive waste.

• Proliferation-resistant innovative nuclear technologies
  ➢ Self-resistant technologies and designs,
  ➢ Proliferation-resistant fuels.

• Comprehensive system of physical protection, control, accounting, and remote monitoring for nuclear facilities
  ➢ Computer-based system for control and accounting of nuclear materials involving monitoring and detection of nuclear materials,
  ➢ Innovative methods of monitoring of nuclear materials, reactors and technologies
Assessment of proliferation risks for different source materials

<table>
<thead>
<tr>
<th>Source material</th>
<th>Time Tl-Th To</th>
<th>Cost Fl-Fh Fo</th>
<th>Secrecy Sl-Sh So</th>
<th>Safety DI-Dh Do</th>
<th>Accessibility Al-Ah Ao</th>
<th>Proliferation risk Ro5-R95 Ro</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEU</td>
<td>1.5-3 2.1</td>
<td>3-15 6.1</td>
<td>10-50 24</td>
<td>0.5-1 0.7</td>
<td>10-100 39</td>
<td>8.16 – 185 53.3</td>
</tr>
<tr>
<td>HEU</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rpu</td>
<td>3-10 5.2</td>
<td>8-60 19</td>
<td>0.2-0.9 0.46</td>
<td>0.2-0.9 0.46</td>
<td>0.1-5 1.25</td>
<td>0.00014 – 0.0139 0.0028</td>
</tr>
<tr>
<td>Wpu</td>
<td>1.5-4 2.4</td>
<td>2-20 5.1</td>
<td>0.2-0.9 0.46</td>
<td>0.5-0.9 0.68</td>
<td>0.1-0.5 0.24</td>
<td>0.00095 – 0.0217 0.0062</td>
</tr>
</tbody>
</table>

T- duration, F-cost, S – secrecy, D – technological safety, A – accessibility, o-mathematical expectation, I and H – low and high boundaries of the interval
LEU – low-enriched uranium, HEU – highly-enriched uranium, Rpu – reactor plutonium, Wpu- weapon-grade plutonium
Proliferation risk R is determined as multiplication Ri: R=(1/T)x(1/F)xSxDxA
Increasing fuel protection

• Risk of illicit fuel enrichment

Volume of separation work and source material for producing 1 kg of 90% enriched uranium

natural uranium 170 SWU ; source material 288 kg, 4% enriched uranium 60 SWU ; source material 25 kg.

• Increasing fuel protection by using regenerated uranium

Enrichment of regenerated uranium fuel increases content of uranium 232 and uranium 236, which deteriorates the radiation situation and reduces neutron characteristics of the material
Comparative proliferation risks related to use of MOX and UOX fuel

<table>
<thead>
<tr>
<th>Source material</th>
<th>‘M_U’ и ‘M_{Pu}’</th>
<th>‘M_{EU}’ и ‘M_{EPu}’</th>
<th>“S_{U}”</th>
<th>“S_{Pu}”;</th>
<th>“Proliferation risk” R (Ro5; R95) Ro</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEU (UOX)</td>
<td>5.6-20</td>
<td>14-25</td>
<td>20-100</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20-150</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20-100</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>R_{Pu} (MOX)</td>
<td>5.0-19</td>
<td>6-10</td>
<td>1</td>
<td>10-30</td>
<td>6.12 (2.12; 12.85)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>10-30</td>
<td>7.94 (2.21; 18.40)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>10-50</td>
<td>4.48 (1.26; 10.33)</td>
</tr>
</tbody>
</table>

‘M_U’ and ‘M_{Pu}’- Mass of fissile uranium and plutonium isotopes in one fuel assembly
‘M_{EU}’ and ‘M_{EPu}’ – mass of HEU or reactor plutonium needed for building one nuclear explosive device,
“S_{Pu}” – relative costs of building one plutonium device in relation to costs of building a uranium device
“S_{U}” – relative enrichment costs for uranium extracted from assemblies of LEU fuel in relation to costs of chemical extraction of reactor plutonium from MOX fuel

Relative proliferation risk \( R = \frac{(S_{U} * M_{EU} * M_{Pu})}{(S_{Pu} * M_{EPu} * M_{U})} \)
Remote monitoring work

• **The Sandia/Argonne – KI RRC remote monitoring system** is the first experience of a practical application of such technology in the area of controlling the use of nuclear materials in Russia.

• **It is the first time when two leading nuclear powers subjected their direct-use nuclear materials to the mutual control.**
BILATERAL MUTUAL SYSTEM OF FACILITIES TRACKING AND MONITORING

USA, Sandia National Laboratories, Monitoring Center

USA Network

"Iskra" network

International communication channels

INMARSAT “GORIZONT”

Russia, "Kurchatov Institute" RRC, main site Building 139, Monitoring Center

"Kurchatov Institute" RRC
Complex of research reactors and critical assemblies, nuclear material storage facility equipped with RMS

Existing bilateral mutual monitoring system of nuclear materials

Argonne National Laboratory
Nuclear material storage facility equipped with RMS

Ponomarev-Stepnoy
Conclusions and Recommendations

• Large-scale development of nuclear power industry is the demand of time dictated by necessity to alleviate the growing pressures on fuel markets and provide for energy security world-wide.

• Growing scale and state number as well as structural transformation of the nuclear power industry may lead to growing proliferation risks. So it is necessary to develop and implement additional measures in all spheres of nonproliferation regime: political, institutional, and technical.

• To make these measures optimal, it is necessary to apply system analysis to identify and assess factors of proliferation risks in the development of nuclear power industry.

• Russian–US cooperation in nuclear power industry must include a project on “Resolution of nonproliferation problems and nuclear security under nuclear energy renaissance” that could include
  – System analysis of nuclear power industry and quantitative assessment of proliferation risks
  – Real-time automated systems for accounting and control of nuclear and radioactive materials in all spheres of declared nuclear activity
  – Global remote monitoring of nuclear and radioactive materials

• Experience of Russian-US cooperation in accounting, control and physical protection of nuclear materials offers assurance for positive resolution of the problem.
Нераспространение и атомная энергетика

Физико-технические проблемы ядерной энергетики

Н.Н. Пономарев-Степной
Академик РАН, почётный вице-президент РАН, "Курчатовский институт"
Session III

Chairman:
Nikolay Laverov – Vice President of the Russian Academy of Sciences; Conference Co-Chairman

Speakers:
Scott Sagan, Non-Proliferation and Physical Protection Challenges Posed by Global Nuclear Power Development

Evgeniy Avrorin, Threats to the Nonproliferation Regime from Global Nuclear Power

William C. Potter, Strengthening the NPT Regime: Nuclear Weapons-Free Zones, Comprehensive Safeguards, etc

Roland Timerbayev, The Importance of the NPT Article VI Realization for Strengthening the NPT Regime

Evgeniy Velikhov, On a Question of Non-Proliferation Regime Approval in Context of the Renaissance in Nuclear Energy Sector: Creating International Corporation under IAEA Aegis for Industrial Serial Production of Small- and Medium-Power Nuclear Plants
Non-Proliferation and Physical Protection Challenges Posed by Global Nuclear Power Development
Scott D. Sagan, Co-Director, Center for International Security and Cooperation, Stanford University

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
Non-proliferation and Physical Protection Challenges Posed by Global Nuclear Power Development

Scott D. Sagan
Stanford University
US-Russia Nuclear Non-Proliferation Conference
March 18, 2009
Outline

- Weapons states, weapons program states, and reactor states
- “Expansion” vs. “spread” of nuclear power
- Physical protection challenges
- Non-proliferation challenges
- Conclusions
Belarus, Kazakhstan, Ukraine not included since inherited weapons from USSR. No independent “exploration” dates.

Main source: Singh and Way dataset


Nuclear exploration – when countries “seriously consider building nuclear weapons, as demonstrated by political authorization to explore the option or by linking research to defense agencies that would oversee any potential weapons development.”

Changes to Singh and Way dataset for this graph:


Syria – the Dair Alzour (aka Al Kibar) site that was bombed in 2007 was estimated by the IAEA to have begun construction in 2001. See http://www.isis-online.org/publications/syria/IAEA_Report_Syria_19Nov2008.pdf. The latest IAEA report claims the agency needs more information to assess whether the facility was used for nuclear weapons, but says there is a “low probability” that uranium particles found at the site came from Israeli missiles, as Syria had claimed. See http://isis-online.org/publications/syria/IAEA_Report_Syria_Feb_2009.pdf.

Yugoslavia – nuclear program ended in 1987 and civilian energy shortly thereafter.


Taiwan – Singh and Way code “no interest” in 1978 and “explore” in 1987. Taiwan had a secret program throughout the 80’s, but activity stopped in 1988 following U.S. pressure


Libya – Bent to U.S. pressure in 2003, abandoned program, let in inspectors.


Iraq – By 1994, *International Atomic Energy Agency (IAEA)* inspectors believed they had destroyed, disabled, or removed all nuclear weapons related technology and materials from Iraq. Source: nti.org

Romania – Ended in 1989 with Ceausescu’s downfall

South Africa–Acceded to the *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)* as a non-nuclear weapon state in 1991, and *International Atomic Energy Agency (IAEA)* inspectors subsequently verified the completeness of its nuclear dismantlement. Source: nti.org

Germany-Signed an agreement with France and Italy to build nuclear weapons(1957), Charles de Gaulle came to power and stopped the deal (1958)

Italy-Signed an agreement with France and Germany to build nuclear weapons (1957), Charles de Gaulle came to power and stopped the deal (1958)

Federation of American Scientists

Federation of American Scientists

Sagan

Back to the Table of Contents
Pink line shows the dates when states had their first research reactor critical and the total number of states with nuclear power activities across time.

White label signifies those states that are currently nuclear weapons states.

Red label signifies those states with enrichment/reprocessing capabilities.

Green label signifies those states that currently have power reactors.

(3 states – Slovakia, Armenia, Lithuania have power reactors, but do not have research reactors – date on graph shows when they got power reactors)

Black label signifies those states that have only research reactors.

A (-) before a country label means that the state shut down all research reactors (and also does not have power reactors)


Blue line shows estimated dates that states acquired nuclear weapons and the total number of states with nw at that time. Countries coded as possessing on the following dates: US (1945), Russia (1949), UK (1952), France (1960), China (1964), India (1973), South Africa (1979-94), Pakistan (1990), Kazakhstan (1991-95), Ukraine and Belarus (1991-96), North Korea (2006)

60 total states with research/power/enrich/NWS. 9 with NW. Difference of 51.

According to 2008 study by Charles Forsberg, Director of the MIT Nuclear Fuel Cycle Study, 33 countries currently have nuclear reactors, and over 40 additional countries have announced an interest in building nuclear power plants.
Expansion vs. Spread

Nuclear power reactors in the world at the end of 2007:

<table>
<thead>
<tr>
<th>Group and Country</th>
<th>In Operation</th>
<th>Group and Country</th>
<th>In Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Units</td>
<td>Total WW(e)</td>
<td>Number of Units</td>
</tr>
<tr>
<td>North America</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>18</td>
<td>12610</td>
<td>Lithuania</td>
</tr>
<tr>
<td>United States of America</td>
<td>104</td>
<td>1000582</td>
<td>Romania</td>
</tr>
<tr>
<td>Latin America</td>
<td></td>
<td></td>
<td>Russian Federation</td>
</tr>
<tr>
<td>Argentina</td>
<td>2</td>
<td>915</td>
<td>Slovakia</td>
</tr>
<tr>
<td>Brazil</td>
<td>2</td>
<td>1799</td>
<td>Slovenia</td>
</tr>
<tr>
<td>Mexico</td>
<td>2</td>
<td>1360</td>
<td>Ukraine</td>
</tr>
<tr>
<td>Western Europe</td>
<td></td>
<td></td>
<td>Middle East and South Asia</td>
</tr>
<tr>
<td>Belgium</td>
<td>7</td>
<td>5814</td>
<td>India</td>
</tr>
<tr>
<td>Finland</td>
<td>4</td>
<td>2946</td>
<td>Iran, Islamic Republic of</td>
</tr>
<tr>
<td>France</td>
<td>29</td>
<td>65260</td>
<td>Pakistan</td>
</tr>
<tr>
<td>Germany</td>
<td>17</td>
<td>20430</td>
<td>Far East</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
<td>482</td>
<td>China</td>
</tr>
<tr>
<td>Spain</td>
<td>8</td>
<td>7460</td>
<td>Japan</td>
</tr>
<tr>
<td>Sweden</td>
<td>10</td>
<td>9354</td>
<td>Korea, Republic of</td>
</tr>
<tr>
<td>Switzerland</td>
<td>5</td>
<td>3222</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>19</td>
<td>10222</td>
<td></td>
</tr>
<tr>
<td>Eastern Europe</td>
<td></td>
<td></td>
<td>World Total (e)</td>
</tr>
<tr>
<td>Armenia</td>
<td>1</td>
<td>376</td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>2</td>
<td>1996</td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>6</td>
<td>3619</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>4</td>
<td>1829</td>
<td></td>
</tr>
</tbody>
</table>

Expansion vs. Spread

States with nuclear power and states (in red) now considering embarking on nuclear power programs:

<table>
<thead>
<tr>
<th>North America</th>
<th>Western Europe</th>
<th>Eastern Europe</th>
<th>Central/South Asia</th>
<th>Middle East</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>Belgium</td>
<td>Armenia</td>
<td>India</td>
<td>Iran</td>
</tr>
<tr>
<td>United States</td>
<td>Finland</td>
<td>Bulgaria</td>
<td>Pakistan</td>
<td>Egypt</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>Czech Republic</td>
<td>Azerbaijan</td>
<td>Gulf States (UAE)</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>Hungary</td>
<td>Georgia</td>
<td>Israel</td>
</tr>
<tr>
<td></td>
<td>Netherlands</td>
<td>Lithuania</td>
<td>Kazakhstan</td>
<td>Jordan</td>
</tr>
<tr>
<td></td>
<td>Spain</td>
<td>Romania</td>
<td>Mongolia</td>
<td>Syria</td>
</tr>
<tr>
<td></td>
<td>Sweden</td>
<td>Russia</td>
<td>Bangladesh</td>
<td>Turkey</td>
</tr>
<tr>
<td></td>
<td>Switzerland</td>
<td>Slovakia</td>
<td></td>
<td>Yemen</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
<td>Slovenia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ireland</td>
<td>Ukraine</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>Albania</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norway</td>
<td>Belarus</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Portugal</td>
<td>Estonia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Latvia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poland</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\*Source: World Nuclear Association, March 2009*

Despite the large number of these emerging countries, they are not expected to contribute very much to the expansion of nuclear capacity in the foreseeable future - the main growth will come in countries where the technology is already well established.

WNA 03/2009:

- **China**: 11 power reactors operating; 7 under construction; 10 about to start construction
- **Japan**: 53 power reactors operating; 3 under construction; 13 more planned
- **India**: 17 power reactors operating, 6 under construction; unspecified number planned
- **ROK**: 20 reactors operating; 5 under construction; 3 on order; 2 planned by 2030

Existing nuclear power states are where increased # of reactors will take place; new nuclear power states, however, are where much of the security concerns lie.
Physical Protection Challenges

- Growth of nuclear power coincides with growth of terrorist threat
- IAEA encouraging DBT: movement from compliance-based to performance-based system
- Current shortcomings:
  - Inadequate threat assessment coordination
  - “Single Point” DBT dangers
  - Organizations seek compliance, not creativity
  - Complacency in many new nuclear power states
- IAEA only recommends – no required minimum DBT
Non-proliferation Challenges

• Safeguards and fuel cycle
• NPT misinterpretations
  – Article IV: contingent rights
  – Article VI: “shared responsibilities”
  – Article VI/Article IV connection
• Article X “return to sender” reforms
  – UNSC or NPT Review Conference
  – NSG and Industry

Fuel Cycle – Not much to say
  Fuel Bank – reduce incentives/Intl. or regional fuel repositories

NPT – Article VI – all states work in good faith at low #s

Article X
  - 3 months → 6 months or 12 months/return to sender
  - NSG or industry: return to sender clause
  - Automatic referral to UNSC under Chapter 7 as “threat to international peace and security”
Threats to the Nonproliferation Regime from Global Nuclear Power
Evgeniy Avrorin, *Scientific Director Emeritus of the Russian Federal Nuclear Centre, The All-Russian Research Institute of Technical Physics*

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
Threats to the Nonproliferation Regime from Global Nuclear Power

E.N. Avrorin
Scientific Director Emeritus
Zababakhin RFNC-VNIITF
Presentation at the Second Russia-US Conference on Nuclear Weapons Nonproliferation
Moscow, 18-20 March 2009
In the near decades, considerable qualitative and quantitative changes should be expected to occur in nuclear power. The global financial crisis is likely to slow down, but not stop the process.
A considerable increase is expected both in the number of reactor units and in the number of nuclear-power countries. Reactors of new types will be constructed: several types of fast neutron reactors, high-temperature technological reactors, and low and medium power reactors.
Drastic changes should be expected to occur in “off-reactor” nuclear technology: many countries will start uranium enrichment, nuclear fuel fabrication, spent fuel recycling with different technologies, and waste handling.

So, nuclear power is likely not only to expand, but also to diversify. Its geographical distribution will change, too.
This issues new challenges in the sphere of nuclear weapons nonproliferation. It will be necessary to develop a number of measures – technical, legal, organizational and economic – to enhance the nonproliferation regime.
Of two main types of nonproliferation verification measures within the scope of IAEA safeguards – inspections and monitoring, the emphasis should be put on the means of real-time monitoring. Already in the near future, the required number, variety and degree of detail of inspections and their cost will exceed the really achievable level. At the same time, technological advance in sensors based on different physical principles and in the means of communication makes it possible to develop a comprehensive and reliable verification system.
Needless to say that this will require considerable international effort. A legal agreement is needed, stating that subject to verification are all potentially hazardous nuclear facilities in all countries regardless of their nuclear status, form of government and geographical setting.

The double-standard policy must fall into disuse.
It is necessary to identify the key points that are not proliferation resistant and the key parameters subject to control.

It will be necessary to develop and construct an optimal system of sensors for the control of nuclear materials (their position, amount and composition) and basic technological parameters.
This should be done with the maximal use of experience gained in the development of the MPC&A systems now in use at many Russian and US enterprises (including those ones developed with the help of Nuclear Threat Reduction Initiative).
It will be necessary to develop an international network for data transfer to an international data center (presumably, IAEA-based).
For this purpose (of course, with account for differences in tasks and scales), we can use the structure of the nuclear test ban treaty verification system: the network of control stations of different types, the real-time data transfer system, the international data center, data mining and exploitation etc.
It goes without saying that such a control system will require operating personnel (international, national or mixed), well trained and certified.
The question of payment for the control does not seem easy to decide. It would hardly be appropriate to include these charges in the cost of produced energy. Since all the world community is interested in nonproliferation, the charges should be compensated, in one way or another, from international funds.
What should become an important component of the nonproliferation system is a complex of positive stimuli to observe nonproliferation principles: conscientiously participate in the control system and voluntarily refuse the most hazardous technologies (uranium enrichment, spent fuel recovery). These positive stimuli must supersede sanctions and intimidation.
Different approaches to nuclear power internationalization would seem useful in the context of nonproliferation, including the establishment of international centers for nuclear fuel enrichment, fabrication and post-processing, guaranteed nuclear material funds, or international waste disposal centers.
All these challenges cannot be met without a broad international cooperation, the bilateral Russia-US cooperation first.
Strengthening the Nuclear Non-Proliferation Treaty Regime: Nuclear Weapons-Free Zones, Comprehensive Safeguards, etc.
William C. Potter, Director, James Martin Center for Nonproliferation Studies, Monterey Institute of International Studies

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

Introduction:
I am very pleased to participate in this important conference and I would like to express my thanks to both the organizers and our hosts. I also am grateful to them for asking me to speak on the topic of “Strengthening the NPT Regime” with the interesting subtitle “NWFZs, Comprehensive Safeguards, etc.” I am not quite sure how to interpret the “etc.” portion of the subtitle, but I am inclined to treat it as giving me considerable flexibility in terms of what I cover in my prepared remarks.

I am known to many of you as a professor and director of a large U.S. research center. However, most of my remarks this evening will reflect less my scholarly perspective and more my first-hand experiences as a delegate to every NPT Review Conference and PrepCom since 1995. That being said, I should emphasize that I am speaking very much in my personal capacity.

The State of the Regime
Coming from a part of California where Clint Eastwood also resides, I am tempted to re-title my talk “The State of the Nonproliferation Regime: the Good, the Bad, and the Ugly.” Were I to follow that motif, I would begin by noting several of the more positive but often neglected features of the NPT:

The Good
Most widely subscribed to treaty in the world—only 3 (or depending how you count the DPRK, 4) outliers. To be sure these non-parties are important and populous, but nevertheless almost the entire community of nations has voluntarily chosen to sign and ratify a treaty of indefinite duration that precludes them from acquiring nuclear weapons or assisting other countries to do so.

Despite the tendency for pundits today to forecast doom and gloom and to rely on frightening metaphors about proliferation cascades and waves and dominoes, in fact the pace of proliferation remains much less than anticipated and is unlikely to change significantly, at least in the near term.

Only one nation – The Democratic People’s Republic of Korea – has defected in the past defection in past.

Proliferation is not a one way street (witness South Africa, Belarus, Kazakhstan, and Ukraine)

Much of the world is covered by Nuclear Weapons Free Zones—indeed nearly the entire Southern Hemisphere is governed by a NWFZ. In deference to the conference organizers who
asked me to touch on the issue of NWFZs, I also would emphasize that NWFZs are among the few disarmament and nonproliferation approaches that has shown considerable success in recent years. The most recent NWFZ to enter into force is the Central Asian NWFZ, the last ratification of which was obtained this past December. One of the unusual features of the CA NWFZ—which has been ignored by most observers, including the IAEA—is the requirement for all parties to the zone to put in place the Additional Protocol. Momentum also has resumed this past year for the Pelindaba Treaty—the African NWFZ. Although more than a decade has passed since the zone was negotiated, thanks to several recent ratifications, only two more states must ratify the treaty for it to enter into force—a development that is expected to occur in advance of the 2010 Rev Con.

**Progress with respect to the AP.** Most observers would cite the growing adoption internationally of the Model Additional Protocol as a very positive development as it expands the declaration a state must make to the IAEA of activities that might contribute to the development of nuclear weapons and broadens the agencies right of access to verify the declaration. Under the AP, for example, IAEA inspectors have access to all parts of a State’s nuclear fuel cycle, as well as to any other locations where nuclear material is or may be present. The IAEA also is entitled to collect environmental samples at locations beyond declared locations when deemed necessary. As of the end of mid-February 2009, the AP was in force for 90 states. If the good news is that more than half of the states with safeguards agreements with the IAEA now also have APs in force, the bad news is that 30 NNWS parties to the NPT still do not have even comprehensive safeguards in place (i.e., INFCIRC 153). Moreover, the AP is not in force in much of the Middle East, and a number of key countries in that region have not even signed the accord (including countries such as Egypt, Iraq, Israel, Saudi Arabia, and Syria). Although Iran signed the AP in December 2003, it is not currently implementing the AP. Other countries outside of the ME that do not yet have the AP in place include Argentina, Brazil, India, Mexico, and Pakistan.

In assessing the nonproliferation promise and the prospects for the AP, once must address at least four key questions:

1) Does the AP provide adequate authority and verification means to the IAEA?
2) Will that authority and the verification means at the IAEA’s disposal under the AP be utilized with sufficient vigor and purpose?
3) Is the AP likely to enter into force for those states of major proliferation concern?
4) Will the AP be recognized globally as the standard or condition for nuclear supply?

At this moment, there are not clear-cut answers to most of these questions. While most experts believe the AP represents a major step forward in strengthening the nonproliferation tools available to the IAEA, it is more difficult to ascertain if the IAEA DG and member states will have the political will to act on the information these new tools provide.

In addition to uncertainties regarding political will, the IAEA will also faces, a challenge in terms of a reliable flow of resources necessary to perform its additional safeguards responsibilities. Also, as previously noted, it remains uncertain if a number of key states—some of which are considered prime proliferation candidates—can be persuaded to adopt the AP. The U.S-India deal has not been helpful in this regard (or, in most other nonproliferation respects), as it is widely perceived as providing benefits to a nuclear weapons possessor that is not even a party to the NPT. In addition, one could argue that the collective amnesia on the part of most NPT States Parties (including Russia and the United States) about the safeguards obligations they undertook as part of the Decision on Principles and Objectives for Nuclear Non-
Proliferation and Disarmament at the historic 1995 NPT Review and Extension Conference erodes the moral authority of those states who typically are leaders in promoting strengthened safeguards. Finally, with respect to the issue of the AP, I would note that a potential challenge for the IAEA and the current safeguards system is the projected surge in global nuclear energy use, often referred to as a “nuclear renaissance.” Although a nice-sounding phrase, it is not at all clear how the renaissance, if it materializes, will impact on the Agency’s already overstretched and under-funded safeguards system. What new safeguards resources, for example, will be needed if the Agency is to monitor effectively greatly expanded nuclear activities of its member states?

The last point I will make under the heading of “Good” developments from the standpoint of the nonproliferation regime is the greater political space today for progress on nuclear disarmament --the result of a number of factors including the “Road to Zero” Initiative launched by George Schultz, Bill Perry, Sam Nunn, and Henry Kissinger, and the new political leadership in the United States. However, although the door is now open on the nuclear disarmament front, it is less apparent if anyone wants to walk through the doorway. This reticence is especially evident outside of the United States where it is difficult to discern the impact of the Shultz et al. initiative on other NWS (with the possible exception of the UK) or, for that matter, on most NNWS who either remain silent or express skepticism about the Road to Zero approach. In this regard, it is worth posing the question: “How much U.S. action on the disarmament front would be enough to persuade key NNWS --and especially those within NAM—that they should also begin to show more flexibility on various nonproliferation measures s the Additional Protocol, HEU minimization in the civilian nuclear sector, and multinational fuel assurances?

The Bad

Turning now to my category of “the Bad,” I would note first: The negative impact on the NPT of the increasingly uncompromising national positions on the part of both some NWS and NNWS, usually defended on the basis of commitments to principle, but too often applied irresponsibly and without apparent regard for the damage done to disarmament and nonproliferation. I would include as examples of this phenomenon, the misuse of the rules of procedure to prevent time for debate on substantive matters in the NPT review process and the disavowal or selective inattention by many States Parties to previous commitments to the package of decisions taken at the 1995 NPT Review and Extension Conference and the 2000 NPT Review Conference. Second, there is an absence of a viable group of like-minded states that can serve as a bridge between many of the NWS and NNWS on disarmament and nonproliferation issues. The New Agenda Coalition (NAC) previously performed this function well, but it increasingly appears to be divided about its priorities and means to achieve them. While the 7 Nation Initiative led by Norway has attempted to assume a similar bridging function outside of the NPT context, its impact on NPT issues remains to be seen, and it is unclear if that group or an alternative once can emerge to perform a useful bridging function.

There has been a rise in the danger of non-state actors as suppliers, middlemen, and end-users. The bad news here is not only the growing nuclear terrorism threats posed by non-state actors, but the tendency on the part of most states to say the right things but to do very little from the standpoint of implementing new policies. Stated somewhat differently, although most countries support efforts to combat nuclear terrorism in the abstract, in practice they tend to see the issue as someone else’s problem.” Also contributing to the problem, I would argue, are
misguided efforts to minimize or exaggerate the threat. In other words, although Michael Levy is absolutely correct in pointing out the danger of treating terrorists as 10 feet tall and immune to Murphy’s Law—that is, what can go wrong (from a terrorist’s perspective) will go wrong-- it is as dangerous to assume that obtaining fissile material and using it to make crude but real nuclear explosives is beyond the reach on non-state actors. As HEU is particularly attractive from the standpoint of an Improvised Nuclear Device, it is important for the United States and Russia to take the lead in minimizing the use of HEU in the civilian nuclear sector.

It also is crucial for states not only to put in place rules and regulations related to MPC &A as called for by UN Security Resolution 1540, but to enforce violations of those regulations. Regrettably, in most countries in the world today, there is little prosecution and even less punishment for violations involving lax nuclear security and exports. Indeed, it is not an exaggeration to say that most states have greater penalties for DUI than for driving with illicit nuclear material—and this situation applies equally to states from the developing and developed world.

The Ugly

Having discussed the “good” and the “bad,” let me turn to the “Ugly.” A visitor from Mars who attended NPT sessions during the last review cycle prior to 2005 could reasonably conclude that based on the amount of time and debate devoted to issues the most pressing proliferation challenges were: (1) What language to speak when the interpreters leave the conference room at 6 PM (this is a favorite topic for French-speaking African delegates who only engage on this issue)? (2) Should NGOs be given access to conference documents? And (3) Should ABBAC and the CTBTO be seated as observers to the meetings? Unlike these vital issues, there was no debate about the DPRK nuclear issue (or even if the DPRK should be treated as a non-NPT party), no discussion about serious nuclear trafficking incidents, and practically no mention by states outside of the Middle East of the failure to make any headway in implementing one of the 1995 Resolution on the Middle East—one of the four key elements of the 1995 NPT Rev Con package. This surreal environment must change if the NPT review process is to serve a useful function in strengthening the nonproliferation regime.

Where Do We Go From Here?

First, we must revitalize US-Russian cooperation. Note my contrarian view that in some respects, more routine and meaningful cooperation in the nuclear nonproliferation sphere took place between the Soviet Union and the United States during the Cold War. As Ambassador Timerbaev can testify, from the mid-1970s until the mid-1980s, you had regular high-level bi-laterals every six months, which covered the entire gamut of nuclear proliferation issues. Although the revival of such consultations would not ensure cooperation in dealing with difficult proliferation problems, the absence of a regular forum hinders the exchange of information and the coordination of policy across the entire spectrum of nuclear proliferation. It also probably makes sense to make greater use of the P-5 mechanism to pursue parallel and coordinated action on nonproliferation policy, especially since the most contentious issue for that body—U.S. opposition to anything related to the CTBT—no longer should be a major obstacle.

Second, we must undertake joint efforts to enhance IAEA safeguards. Both countries routinely have endorsed the Additional Protocol as the international safeguards standard, but were slow to put the AP in place for themselves. Although, as I mentioned earlier, the NSG exemption for India is not helpful in this regard as it promotes the concept of an exceptionalist
approach to nonproliferation rules, it still should be possible for the United States and Russia to expand cooperation in the area of strengthening IAEA safeguards, especially if Russia expands its miniscule contribution to the IAEA safeguards budget (I believe Russia only contributes about 1.1% of the budget in contrast to the U.S. contribution of 25% and the Japanese contribution of 19%).

Third, our nations must strengthen our collaboration in the safeguarding of sensitive fuel cycle technologies through the promotion of regional nuclear fuel centers. The United States and Russia both recognize the proliferation risks posed by the spread of sensitive fuel technologies. What remains to be seen is the relative degree to which nonproliferation or economic considerations will drive each country’s approach to regional nuclear fuel centers and the potential for centers such as the Angarsk facility to offer meaningful assurances to countries of proliferation concern. Although the currently is little interest in the multinational fuel centers on the part of those states for whom fuel assurances are designed, the approach has merit and is deserving of joint support. That being said, it is important not to retain the nonproliferation requirements initially insisted upon by Russia for participation in the fuel centers. Were one to waive even minimal requirements such as adherence to the NPT, the initiative could become a proliferation problem rather than a nonproliferation solution.

We should Share information regarding illicit nuclear trafficking. Regrettably, and notwithstanding repeated presidential summit statements to the contrary, little headway has been made in the area of sharing intelligence information regarding illicit nuclear trafficking. For that matter, neither the United States nor Russia has been forthcoming in providing the Office of Nuclear Security at the IAEA with timely forensics information about known illicit nuclear trafficking incidents. If Washington and Moscow take seriously their pronouncements about combating nuclear terrorism, they need to fashion greater cooperation in sharing sensitive but vital information in the trafficking sphere.

Fifth, the United States and Russia must come to a mutual understanding on NATO enlargement. Although not technically a nonproliferation issue, the prospect of further NATO enlargement probably is the greatest irritant in U.S.-Russian relations and the issue most likely to lead to a dangerous confrontation. To the extent that this irritant can be reduced, both the nonproliferation and broader U.S.-Russian political agenda can be greatly improved.

Finally, the U.S. and other states must give attention to the NPT Review Conference PrepCom that it deserves. My impression is that we have an unusual opportunity at the forthcoming PrepCom and the 2010 Rev Con to repair much of the damage that was done during the last review process cycle, including disavowal of inconvenient, prior NPT RevCon commitments. This revival or restoration, however, will not happen automatically, and will require great energy, planning, and the commitment of human resources—not all of which are in much display to date. Indeed, one of my concerns is that the new U.S. administration, while inclined to do many of what I regard to be the right things on the nonproliferation front, has been reluctant to give preparations for the 2009 PrepCon the attention it deserves, adopting the stance that it is only the Review Conference that deserves much attention. In my view, this is a shortsighted approach that is apt to produce more problems in 2010 than is necessary.
Conclusion

U.S. and Soviet leaders during the Cold War learned the value of nuclear cooperation the hard way after both sides contributed to the global spread of nuclear weapons and came frighteningly close to their use. It would be tragic for contemporary leaders of the United States and Russia to forget this lesson or their common stake in preventing a nuclear catastrophe. To the extent that this conference helps to reduce the likelihood of this occurrence and provides practical recommendations for cooperation it will be a success.
The Importance of the NPT Article VI Realization for Strengthening the NPT Regime
Roland Timerbayev, Chairman of the Board, PIR Center

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

[NO WRITTEN PAPER PROVIDED]
Concerning Support of Non-Proliferation Regime in the Conditions of World Nuclear Energy Renaissance: About Creation under IAEA Aegis for Industrial Mass Production of Small and Middle Nuclear Power Plants

Evgeniy Velikhov, President of the Russian Scientific Center “Kurchatov Institute”

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
CONCERNING SUPPORT of NONPROLIFERATION REGIME in the CONDITIONS of WORLD NUCLEAR ENERGY RENAISSANCE: ABOUT CREATION under the IAEA AEGIS of an INTERNATIONAL CORPORATION for INDUSTRIAL MASS PRODUCTION of SMALL and MIDDLE NUCLEAR POWER PLANTS

Evgeny P. Velikhov
Secretary of the Public Chamber of the Russian Federation,
President of the RRC “Kurchatov Institute”, academician

2-d Russian American Conference on nonproliferation of nuclear weapon, materials and technologies
Moscow, March 18-20, 2009
RUSSIA

Back to the Table of Contents
Table of contents

Proposal
Organization
Scenarios
Non-Proliferation and Security
International Legal Support
Proposal (1)

At present, the growth of energy demand is surpassing the capacity of the energy sector in using the primary energy sources and in producing an universal energy product electricity. Wider use of nuclear energy for electricity production in a significant degree represents a solution of this task.
Proposal (2)

Enlarging the world nuclear energy production will require strengthening control over the reliability and safety of the nuclear energy sector, taking additional decisions in the sphere of non-proliferation and raising the level of nuclear energy acceptability for the society and the environment.
Proposal (3)

The major share of the world’s electricity is produced by power plants having capacities below 600 GW(e). Small and medium nuclear power plants (SM NPP) require considerably smaller capital construction expenses, they facilitate solution of reliability and safety issues, and they are suitable for industrial mass, - that is - commercial - manufacturing.
Proposal (4)

According to the IAEA data, today the leading world companies have over 50 SM NPP designs.

Several recent international projects and programs provide for the use of SM NPP in countries having moderate energy programs.

Russia is now constructing the world’s first floating NPP of 70 MW(e) capacity based on two icebreaker’s reactors (Fig. 1).
Floating Nuclear Power Facility

Fig. 1

Velikhov
Proposal (5)

Considerable experience of mass industrial production of nuclear power facilities intended for on-surface and submarine ships and vessels is currently available, which forms a good basis for deployment of civil SM NPP (Fig. 2).
# Nuclear Icebreaker “Rossiya”

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>First nuclear icebreaker “Lenin”</td>
<td>1959</td>
</tr>
<tr>
<td>Total nuclear icebreakers built</td>
<td>8 (9)</td>
</tr>
<tr>
<td>Total nuclear ships built</td>
<td>1</td>
</tr>
<tr>
<td>Icebreaker reactor types developed</td>
<td>20</td>
</tr>
<tr>
<td>Total operating resource of nuclear ship reactors, reactor years</td>
<td>200</td>
</tr>
<tr>
<td>Total reactor types for nuclear icebreakers and ships developed</td>
<td>5</td>
</tr>
</tbody>
</table>

Fig. 2

Velikhov
Proposal (6)

For the intensification of the global nuclear energy production under conditions non-proliferation it is proposed the creation under the auspices of the IAEA of the international nuclear energy Corporation.
Proposal (7)

Such Corporation would have to:
• Unite Holders and Users of the nuclear energy services in one organization
• Organize mass industrial SM NPP production
• Use the best nuclear energy technologies, developed in the World
• Provide for the most high requirements and standards of SM NPP reliability and safety

Interaction of nuclear energy services Holders and Users within a common project would provide Users’ access to high nuclear energy technologies and promote non-proliferation in the conditions of the global nuclear energy renaissance.
Proposal (7)

The proposal on International nuclear energy Corporation creation is reflected in the Report of the Eminent Persons Commission formed by IAEA Director General M. ElBaradei for defining the IAEA development landmarks up to 2030. The Report was presented to the Board of Governors and IAEA General Conference-2008 (Fig. 3). It is planned to form a special expert group to study the questions posed in the Commission’s Report.
Fig. 3. 
Report of the Eminent Persons Commission
Organization (1)

Organization of the project may be performed similarly to the international project AIRBAS INDUSTRIES.

In 1970 the Airbus Industries was formally established as the European Group of Economic Interests (EGEI), when France, Germany, Great Britain, Spain agreed on creation of a unified structure, which would allow their national aero-companies to work together on the project of the wide body civil aircraft A300 while remaining independent enterprises (Fig. 4).
Airbus A300

Fig. 4.
EGEI are a new legal form assisting in development of cooperation inside of Europe. The EGEI gives to the European enterprises the possibility to establish ties in other countries without losing their own individuality and independence. The aim of groups is to assist in development of economic activities of the members.

Creation and activities of the EGEI are regulated by Decision № 2137/85 of the EU Council.
The proposed project could be initiated by the IAEA. The Agency already has a practical experience of successfully initiating in 1978 the international thermonuclear megaproject - ITER - based on the agreement between the USA, the EU, Russia, Japan, China, South Korea and India, which together represent over a half of the world population (Fig. 5).
ITER

Fig. 5.
Scenarios (1)

Acting inside Corporation:

- Holders would encompass the complete nuclear energy production cycle from uranium production up to radioactive waste disposal.

- Users having no intention of large-scale development of their own nuclear energy technologies would use the nuclear energy services, pay for electricity, heat or desalinated seawater supplied to them and gain access to high nuclear energy technologies.
Sustainable operation of the Corporation would be guaranteed by International Fuel Cycle Centers (IFCCs) to be created under the IAEA auspices. The first IFCC is being currently created in Russia following the initiative of the president Vladimir Putin.
Scenarios (3)

Fig. 6 shows the nuclear energy life cycle under the above scenario, when the Holder of nuclear energy services is responsible for all life cycle stages, while the User just pays for services provided to him (electricity, heat or desalinated seawater).
SM NPP’ Life Cycle

Fig. 6. International Script “Holder is Responsible for All”
Scenarios (4)

Many other options of relations between nuclear energy service Holders and Users within the Corporation can also take place:

- The User becomes owner of the NPP, operates it and assures its nuclear fuel cycle;
- The User starts operating the NPP on leasing terms, and becomes its owner later;
- The User becomes owner of the NPP, but the provider assures its operation and nuclear fuel cycle.

Other optional relationships within the Corporation to be determined by real life are also possible.
Scenarios (5)

Economic factors would be the incentive for developing countries to use the proposed nuclear energy supply pattern, because it would be able to provide the cheapest energy services. Mass industrial fabrication of moderate-capacity nuclear power plants, including block-type and mobile ones, would contribute to reduction of related capital expenses.
Establishment of a multinational nuclear Corporation, in case of its proper organization, could substitute the chaotic competitive competition with the more acceptable cooperative competition, when benefits from decisions would be received not by a single member, but by all members of the Corporation.
Non-Proliferation and Security (2)

As a result, the Corporation would on the whole become the most reliable provider of the cheapest SM NPP. Nobody would be able to compete with it by means of producing cheaper and less reliable goods.
Non-Proliferation and Security (3)

Establishment and operation of the proposed and coordinated with the IAEA international nuclear energy Corporation would become a reliable barrier on the way of critical materials’ and technologies’ proliferation. Development and adoption of dedicated international standards and regulations would be possible in this connection.
The very Corporation’ existence and activities would strengthen non-proliferation, because of mutual control taking place within the Corporation, and because countries beyond the Corporation would be unable to compete with it on the project as a whole.
The international project of a transnational Corporation for industrial fabrication and operation of serial SM NPP and assurance of their fuel cycles could be implemented in accordance with Article 3 of the IAEA’ Statute.
For international legal support of the Corporation’s establishment and operation, it would be necessary to develop:

• Draft Declaration on strategic partnership in the field of development and mass production of SM NPP;

• Draft intergovernmental agreement defining the rights and duties of participants, as well as obligations connected with the goals of the international project;

• Draft general international legislation defining the legal status of the international (transnational) Corporation, the order of its establishment and operation, basic areas and forms of its activities during all SM NPP life cycle phases;
International Legal Support (2) finish

- Draft Statute of the transnational inter-state Corporation for industrial fabrication and operation of SM NPP and assurance of their fuel cycles;
- Draft program of activities; list of participants; work description and schedule; required financing, etc.;
- Contribution standards determining participation in the Corporation’s activities.

It seems that the development of these documents should start upon receipt of potential participants’ consent to fulfill the supposed scope of work with meeting all the respective schedules, conditions and requirements associated with it.
The END

THANKS for your ATTENTION!
Session IV

Chairman:
Frederick Iseman

Speakers:
William J. Perry, Strategic Imperatives for U.S.-Russian Nuclear Cooperation
Vladimir Evseev, Russian View of the Iranian Nuclear Problem
Mark Fitzpatrick, An American View of the Iranian Nuclear Problem
Yuli Kvitsinsky, Iran and UN Security Council Resolutions

Back to the Table of Contents
P 1---THE IMPERATIVE OF A RUSSIAN-AMERICAN STRATEGIC DIALOGUE

During the Cold War, the world faced every day the possibility of a nuclear exchange that could have resulted in the end of civilization.

Today, with the Cold war behind us, the danger of a nuclear holocaust seems remote. But the end of the Cold War did not bring about the “End of History.”

History is being written every day in the streets of Baghdad, in the nuclear test ranges of North Korea, and in the nuclear labs of Iran.

So while we no longer live under the threat of a nuclear holocaust, we do live in dangerous times. The Taliban is resurging in Afghanistan; NK has tested a nuclear bomb; Iran is not far behind; Russia’s relations with the United States have become strained, with the strain reaching dangerous levels during last year’s crisis in Georgia.

The first decade after the Cold War ended was a decade of euphoria; but that has faded. All of these daunting security challenges, which have manifested themselves this past decade, are confronting the Obama administration today. In particular, three related security challenges will require priority action by the Obama administration;

P 2---THREE SECURITY CHALLENGES

1) Reducing the danger of nuclear proliferation;
2) Reducing the danger that a terror group will get and use a nuclear weapon; and
3) Reducing the danger that the US and Russia will drift into a hostile relationship with some of the dangers of the Cold War.

The first two dangers are closely related in the sense that the first line of defense against nuclear terrorism is stopping nuclear proliferation. The third danger is related to the first two in the sense that dealing effectively with either of these problems requires, first of all, close cooperation between the US and Russia, which will be impossible to achieve with the hostile relations that developed between our two countries last year.

Let me consider first the related dangers of proliferation and nuclear terrorism. There are still tens of thousands of nuclear weapons in the world; the move to nuclear disarmament has stalled; and additional nations are striving to become new nuclear powers. If one of these thousands of weapons would fall into the hands of terrorists, they could detonate it in one of our cities, with catastrophic results.

During the Cold War, the danger was a massive nuclear exchange between nuclear powers. Today the primary danger is a few nuclear detonations set off by a terror group in Moscow or Washington or Delhi or London. The danger of nuclear terrorism is all too real, and as more nations acquire nuclear weapons or the fissile material needed for nuclear weapons, that danger will increase. To add to the danger, today the proliferation of nuclear weapons and fissile materials is dangerously close to a “tipping point.”
Of course, the detonation of a relatively primitive nuclear bomb in one of our cities would not be equivalent to a nuclear exchange during the Cold War. But the results would be catastrophic, with the catastrophe extending well beyond the staggering fatalities. The direct economic losses from such a detonation would be many hundreds of billions of dollars, but the indirect economic impact would be even greater. And the social and political effects are incalculable, especially if the nuclear bomb were to be detonated in one of our capitols, disabling a significant part of our government. It is all too easy to imagine that after the first bomb had been detonated, a terror group would claim responsibility, and announce that they had more bombs already placed in, say, five other cities, and that they would detonate them unless certain of their demands were met. Even if this threat were not true, the terror and disruption it would cause would be beyond imagination. So our highest priority should be accorded to programs that could prevent such a catastrophe; that is:

P 3---PRIORITY PREVENTIVE ACTIONS

1) Programs that reduce and protect existing nuclear arsenals; and
2) Programs that keep new arsenals from being created.

All of these preventive programs, by their nature, have international dimensions, and their success depends most notably on the two largest nuclear powers, Russia and the US, being able to work cooperatively with each other. That such cooperation can be successful is illustrated by the application of the Nunn-Lugar program in the 90s. At the time, Ukraine was the third largest nuclear power in the world. Today Ukraine is nuclear weapons-free, and its deadly missile field has become a productive sunflower field. American efforts on the Nunn-Lugar program, done cooperatively with the Russian government, led to the dismantlement of thousands of nuclear weapons and their launchers, and made us all safer.

P 4---US/RUSSIAN COOPERATION IN DISMANTLEMENT

Those efforts also resulted in the first ever reduction in the number of nuclear states since the dawn of the nuclear age.

P 5---PROLIFERATION HISTORY

But unless US-Russian relations can be improved, it is hard to imagine our two governments cooperating on future programs that require such a high level of mutual trust.

While nuclear terrorism is the most likely threat today to Russia and the US, the threat of a nuclear conflict is not totally removed. Russia and the US still retain the capability to pose an existential threat to each other. However, since the ending of the CW, neither nation has showed an intent to use or even threatened to use this capability against each other. Indeed, for much of this period the US and Russia have cooperated closely on reducing nuclear arms and curbing nuclear proliferation. But in recent years, Russian rhetoric has become increasingly anti-American, stimulated in part by American moves to add Ukraine and Georgia to NATO and to deploy a missile defense system in Poland and the Czech Republic. Additionally, Russia has begun to rebuild their nuclear forces.

These developments are not remotely equivalent to the dangerous hostility between our two nations during the Cold War, but ignoring such problems could allow US and Russia to drift into a hostile relationship with some of the dangers of the Cold War. And certainly they are an impediment to the kind of cooperation we need to deal effectively with the twin dangers of proliferation and nuclear terrorism.
The Obama administration, understanding the importance of this issue, has begun a major effort to restart a strategic dialogue with Russia. In a speech in Munich, just a few weeks after inauguration, Vice-President Biden proposed to “press the reset button” on US-Russian relations.

Russia has responded positively to this call, and both sides seem determined to move quickly to start a constructive dialogue with a goal of cooperating in curbing proliferation and in making further reductions in nuclear weapons. Already preliminary discussions have started on a new strategic arms reduction treaty, a follow-on to START.

But success is far from assured. Russia and the US have been far apart on other issues, most notably NATO enlargement, BMD deployment in Eastern Europe, and how future treaties could deal with “tactical” nuclear weapons and reserve warheads. But, understanding what is at stake, it is encouraging to see both sides moving to make a fresh start.

Besides working to reduce American and Russian arsenals, our two governments should do everything they reasonably can to keep new arsenals from being created. The Agreed Framework was successful in stopping North Korea (NK) from constructing nuclear bombs for 8 years, which was no small accomplishment since they could have built 50 to 100 nuclear weapons during that period. But it did not cause them to give up their aspirations for nuclear weapons. During the second year of the Bush administration, the Agreed Framework was terminated by actions taken both by NK and the US.

This resulted in NK reopening their nuclear facility at Yongbyon and beginning to reprocess spent nuclear fuel to make plutonium. At this point the Chinese became concerned and established the 6-party talks with NK. For the first few years these talks were unproductive; indeed during that period NK built about a half-dozen nuclear bombs, tested one of them, and tested at least four ballistic missiles. So it is hard to consider the 6-party talks a success! But after the NK nuclear test, President Bush authorized a change of policy in dealing with NK. This resulted in some tangible progress in the 6-power talks, but the final outcome of the 6-power talks is still in doubt.

P 6---DISABLEMENT AT YONGBYON

One important result has been achieved, with the nuclear facilities at Yongbyon largely disabled, but NK shows no signs of being willing to negotiate away their nuclear bombs.

Whatever happens in NK, Iran promises to be an even more dangerous proliferator. The EU and Russia have had no significant success in restraining Iran’s uranium enrichment program. And the Bush administration was reluctant to get involved in discussions with Iran without preconditions that Iran was not willing to provide. It seems clear that any chance of success with Iran will require Russia and the US to develop at the highest levels a joint strategy for an aggressive diplomatic initiative with Iran.

P 7---TRACK 2 DISCUSSIONS WITH IRAN

Beyond NK and Iran, there are dozens of other nations that readily could become nuclear powers but have voluntarily refrained from doing so under the NPT. To sustain these nations continuing support for the NPT, the US and Russia need to demonstrate that they are carrying out their responsibilities under the NPT; that is, moving seriously towards the elimination of their nuclear weapons.

The Obama administration has stated that it intends to work for the ultimate elimination of nuclear weapons, but, until that goal is achieved, it will maintain a safe, secure and reliable
deterrent. It would be a real boost for the world if President Medvedev would join President Obama in this goal.

Of course, it will be many years before the goal of zero nuclear weapons can be realized, so as Russia and the US work towards this long-term goal, they should set a short-term goal of reaching what some have called a “base camp” or “vantage point”. The steps leading to this short-term goal should reduce nuclear dangers from their present level, while at the same time move the world closer to the vision of nuclear weapons elimination.

When that short-term goal is reached it will be possible to reevaluate whether the geopolitical conditions permit moving closer to nuclear elimination. That decision need not be made now and, indeed, it is not now possible to envision the geopolitical conditions that would permit moving toward the final goal. But establishing a vision of zero nuclear weapons is the key to creating political conditions that allow the world to take the practical, short-term actions that make us far safer than we now are.

What are some of the short-term actions our governments can take to reduce global nuclear dangers; that is to move us to the base camp? For the US, I have proposed the following short-term goals:

**P 8---STEPS TO THE BASE CAMP**

1. State clearly that America’s goal is to prevent nuclear weapons from ever being used, either by a state or by a non-state actor, and that the sole purpose of American nuclear weapons is deterrence.
2. Reaffirm American support for the agreed positive and negative security assurances that we have made to non-nuclear NPT states.
3. Continue to reduce reliance on nuclear weapons, and do this in a transparent manner; the United States should take the international lead in reducing the salience of nuclear weapons;
4. Seek further reductions in the nuclear forces; initially these reductions would need to be made bilaterally with Russia; at some level, they would need to include the other nuclear powers; reductions should be considered for both the deployed forces and the reserve forces; numbers in the range of 1000 to 1500 deployed weapons are reasonable, but other aspects of the agreement (verification procedures, downloading and attribution rules and stability features) probably will be more important than the actual numbers.
5. Seek to ratify the Comprehensive Test Ban Treaty (CTBT); the administration should assemble an expert group to analyze the policy and technical issues raised by the CTBT and then present the treaty to the Senate for ratification; if the administration is successful in ratifying the treaty, it should then work with other holdout nations to do the same.
6. Restart discussions on a Fissile Material Cutoff Treaty, including provisions for verification.
7. Strengthen the IAEA in its vital role of containing proliferation. This would include seeking universal adoption of the Additional Protocol, and Security Council review when nations depart the NPT.
8. Provide leadership in promoting universal recognition and adoption of “best security practices” in all states that have nuclear weapons and weapons-usable fissile material, including in civilian programs.
All of these actions have their counterpart actions in Russia; indeed, it will not be possible to make sustained progress on these goals in America unless Russia is taking comparable actions.

This is an extensive set of initiatives, but the danger of widespread proliferation and nuclear terrorism is real and imminent, and any serious effort to reduce that danger will require the leadership of Russia and the United States. The danger of a new CW-like hostility developing between the US and Russia is also real, and our effort to reduce that danger will require opening a positive strategic dialogue between our two nations.

I would hope that this conference can provide many of the ideas and some of the momentum for such a strategic dialogue.
THE IMPERATIVE OF A RUSSIAN-AMERICAN STRATEGIC DIALOGUE

William J. Perry
Moscow
19 March, 2009
Three Security Challenges

• Reducing the danger of nuclear proliferation

• Reducing the danger that a terror group will get and use a nuclear weapon

• Reducing the danger that the US and Russia will drift into a hostile relationship with some of the dangers of the Cold War
PRIORITY PREVENTIVE ACTIONS

• Programs that reduce and protect existing nuclear arsenals

• Programs that keep new arsenals from being created.
Cooling tower inner structure removed

114 5MWe reactor
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence

• Reaffirm support for positive and negative security assurances made to non-nuclear NPT states.
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence
• Reaffirm support for positive and negative security assurances made to non-nuclear NPT states.
• Reduce reliance on nuclear weapons transparently
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence
• Reaffirm support for positive and negative security assurances made to non-nuclear NPT states.
• Reduce reliance on nuclear weapons transparently
• Make further reductions in US/RU nuclear forces
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence
• Reaffirm support for positive and negative security assurances made to non-nuclear NPT states.
• Reduce reliance on nuclear weapons transparently
• Make further reductions in US/RU nuclear forces
• Ratify the Comprehensive Test Ban Treaty
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence
• Reaffirm support for positive and negative security assurances made to non-nuclear NPT states.
• Reduce reliance on nuclear weapons transparently
• Make further reductions in US/RU nuclear forces
• Ratify the Comprehensive Test Ban Treaty
• Restart discussions: Fissile Material Cutoff Treaty
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence
• Reaffirm support for positive and negative security assurances made to non-nuclear NPT states.
• Reduce reliance on nuclear weapons transparently
• Make further reductions in US/RU nuclear forces
• Ratify the Comprehensive Test Ban Treaty
• Restart discussions: Fissile Material Cutoff Treaty
• Strengthen IAEA in role of containing proliferation
STEPS TO THE BASE CAMP

• Prevent nuclear weapons from ever being used; sole purpose of US nuclear weapons is deterrence
• Reaffirm support for positive and negative security assurances made to non-nuclear NPT states.
• Reduce reliance on nuclear weapons transparently
• Make further reductions in US/RU nuclear forces
• Ratify the Comprehensive Test Ban Treaty
• Restart discussions: Fissile Material Cutoff Treaty
• Strengthen IAEA in role of containing proliferation
• Promote adoption of “best security practices”
The western expert community holds a view that Russia has exercised a considerable if not fundamental influence on the Iranian nuclear program. Unfortunately, this stereotype is quite enduring which has negatively influenced the Russian-American cooperation in nonproliferation of nuclear weapons. This however does not stand the test of existing facts which can be easily shown with analysis of the emergence and development of the Iranian nuclear program up to the unraveling of the corresponding crisis in 2003.

First, the Iranian nuclear program was designed back in the times of Shah Mohammad Reza Pahlavi, with the US and western European countries then playing an active part in it. In particular, it was the US who supplied a 5-MWe capacity research reactor to the Tehran nuclear research center in 1967, and a little later – “hot chambers” to extract plutonium from irradiated nuclear fuel.

Second, the plan of the nuclear energy development worked out by Iran in 1974 did not rule out the creation of closed nuclear fuel cycle. France, US, and FRG were to become principal suppliers of nuclear technologies. The plan included building an experimental facility for uranium laser enrichment and shipping a French-made SNF reprocessing unit. Besides that, Iran’s Nuclear Energy Organization paid one billion dollars to purchase 10 percent of stock of the gaseous diffusion uranium enrichment plant owned by international consortium Eurodif that was being built in Tricastan, France.

Third, in the final stage of the Iran-Iraq war, Tehran used the black market network spun by Pakistani scientist Abdul Qadir Khan to purchase technical documentation and a number of components for two first-generation small-capacity gas centrifuges (P-1). It also acquired a technical description of converting gaseous uranium into metallic state and machining of metallic uranium into hemispheres. It is obvious that these processes have military applications.

Fourth, it was China that in the 90s provided Iran with technical documentation on uranium conversion and supplied two sub-critical assemblies, 27-kW-capacity miniature neutron source reactor and zero-power heavy water research reactor capable of annual output of 100 g of plutonium.

Fifth, in 1994-1996 and again through the Abdul Qadir Khan network, Iran purchased two containers of Pakistani uranium enrichment equipment sufficient to assemble around 500 P-1 gas centrifuges.

As seen from the provided examples, all nuclear proliferation-sensitive equipment was supplied to Iran by western states and China, or otherwise through the black market network. Russia took no part in any of this.

Now let us take a look at the current state of the Iranian nuclear program.

**Iranian Uranium Program**
Tehran was able to achieve some major successes in development of the uranium program. For instance, the uranium conversion facility in Isfahan has produced large quantities of uranium hexafluoride. By early February 2009, about 357 tons of this substance was produced.

The number of running gas centrifuges in the uranium enrichment facility in Natanz has reached 4 thousand. In addition to that, about 15 hundred centrifuges have been assembled and are under vacuum, while another 5 hundred are being assembled. Thus, Iran is about to arrive at 6 thousand operational gas centrifuges, which means a 50 percent realization of plans announced by President of the Islamic Republic of Iran Mahmud Ahmadinejad in April 2008 on an additional installation of 6 thousand centrifuges in defiance of five UNSC resolutions.

In the period between February 2007 and November 2008, the centrifuge cascades were fed about 10 tons of uranium hexafluoride which was enriched to 3.5 percent in uranium-235. The uranium enrichment process is ongoing as of now, and by the end of January 2009 it produced 1010 kg of low-enriched uranium hexafluoride. If this material undergoes further enrichment, it can produce a volume of fissile material sufficient to build one nuclear warhead on the base of weapon-grade uranium.

The modernization of gas centrifuges is going on. Even though most are first-generation small-capacity P-1 centrifuges (Iranian name IR-1), some more advanced models (IR-2 and IR-3) are under test run. In particular, a cascade of ten IR-2 centrifuges is in operation at the experimental uranium enrichment facility in Natanz since January 2003.

**Iranian Plutonium Program**

The Iranian plutonium program is much less advanced. Since September 2004, a 40 MW-capacity IR-40 heavy water research reactor is under construction in Arak. It will be able to produce about 9 kg of plutonium per year. Of concern is the fact that, following August 2008, Iran has not allowed IAEA inspections of this facility, while the state of construction of specific units does not permit to conduct required monitoring with satellite data.

By today, the nuclear reactor under construction is already provided with nuclear fuel and heavy water supply. To this end, the Arak heavy water production plant was put in operation in 2006, and by February 2009, technological line for production of natural uranium pellets and assembling them into fuel rods was installed. At the same time, Iran does not possess a productive capacity for SNF regeneration and plutonium extraction on an industrial scale.

Furthermore, let us consider the real Russian interests in Iran that are fairly often overstated.

**Russian interests the policy area**

Maintaining partner relations with Tehran is a condition of Russia’s significant influence in the Middle and Near East region. During the 90s, Iran was Russia’s traditional political partner in containing the Sunni radical groups in the North Caucasus, preventing the isolation of Armenia, peaceful settlement in Tajikistan, as well as assisting the throw down of the Taliban regime in Afghanistan. During the 2000s, Moscow was able to restore its influence in the North Caucasus and Central Asia which somewhat reduced the need in Russian-Iranian partnership.
As a regional rival of Turkey, Iran considerably mitigates the latter’s influence in the Caucasus, so Russia regards as desirable its participation in the “Caucasus Platform for Stability and Cooperation” proposed by Ankara.

At the same time, the present Russian-Iranian relations in the political sphere are controversial and limited. One of the reasons is that the present Iranian leadership, pursuing its narrow domestic interests, has fairly often undermined Moscow’s position in front of the West. Another reason is that Tehran, in its aspiration to become a leader of the Muslim world, is consistently striving to involve Moscow into the orbit of its anti-Western policy. The latter stands in obvious opposition to Russian national interests.

**Russian interest in the economic area**

Iran is an important trade partner (bilateral trade in 2007 reached 3.3 billion dollars) both in hi-tech products and areas such as oil and gas production/transportation, railroad construction under the “North-South” project as well as food and consumer products supply.

Iran is a major importer of Russian-made weapons. In 2006, Russia supplied Iran with twenty-nine “Tor M-1” missile systems and other weapons to the amount of about 1 billion dollars. At the same time, a contract for delivery of five divisions of “S-300 PMU1” intermediate- and long-range missile systems signed two years ago has not been completed due to political reasons;

Iran is an important importer of nuclear energy products. Some 300 Russian suppliers were involved in the Bushehr energy reactor construction, which created about 20 thousand jobs. Russia is also prepared to supply the nuclear fuel for the duration of the reactor life cycle.

In the whole, however, the Russian-Iranian relations are not too strong. The prospects for future economic cooperation are extremely vague due to sanctions already imposed on Iran by the UNSC (Res. 1737, 1747, 1803), USA, and a number of other leading states. Also blocking these prospects in the fact that Moscow and Tehran, as two largest exporters of hydrocarbon products, can directly compete against each other, particularly on the European market.

In this connection, Russian-Iranian space cooperation may be illustrative. Iran’s first satellite “Sinah-1” was developed in Russia and launched into orbit by “Kosmos-3M” carrier from Plesetsk space launch site. However, Russian-Iranian space cooperation did not develop much further because Tehran chose to cooperate with Beijing to create domestic space capacity. As a consequence, the Iranians developed their next “Environment-1” satellite in cooperation with China and Thailand, and put it in space with a Chinese launcher in September 2008.

Another illustration of fairly complex relations between Russia and Iran is a de-facto blocking of Iran’s joining the Shanghai Cooperation Organization as a full-standing member state. The reason is probably Moscow’s unwillingness to create additional problems in the development of this organization, given Tehran’s confrontation with a number of leading western countries.

**Russian interests in the security area**

Due to territorial proximity, any armed conflict of another state with Iran may lead to destabilization first in the South, and then North Caucasus. It should be also kept in mind that the
population of any of these republics is but a fraction of the population of Iran, and there are about 1 million “internal refugees” from Nagorny Karabakh on the territory of Azerbaijan.

The protracted conflict around the Iranian nuclear problem is strengthening positions of radical groups in the Muslim world and pushing several regional states towards starting applied military research in the nuclear sphere.

The described political and security situation gives Moscow serious grounds for concern. Iran’s ongoing uranium enrichment program is not economically well-founded because the only domestic nuclear energy reactor is going to be fully supplied with the Russian-made fuel. Plans on building other energy facilities or selling the produced nuclear fuel abroad are not supported by any practical activity. In these circumstances, the international community is entitled to a skeptical view of the peaceful purpose of the Iranian nuclear program, especially taking in account earlier large-scale secret activities in this area.

In parallel to the nuclear program, the Iranian missile program is being implemented with a fairly fast pace. At present, Iran already has missiles with a range of 2-2.3 thousand km and a real potential of increase to the intercontinental one (6 thousand km). The danger is apparent given the location of Russia’s southern regions with population above 20 million including the Volgograd and Astrakhan oblasts within the range of Iran’s latest “Shehab-3” missiles.

The ideology of today’s Iranian leadership is orthodox “Khomeinism” manifesting itself in extremely provocative anti-western and anti-Israeli foreign policy and active support of Islamic extremist groups. At the background of unresolved regional problems this is seriously aggravating the international security situation in the proximity of regions of Caucasus and Central Asia strategically important to the Russian Federation.

Summing up everything said above, today’s Russian-Iranian relations may be characterized as a “wary partnership” which extends, among others, to the nuclear sphere. In particular, it would be unacceptable to Russia if Iran continues to grow stockpiles of weapon-grade plutonium and uranium, stops its relations with IAEA, exits NPT, and becomes a next de-facto nuclear state. This is the reason why Moscow opposes Iran’s acquisition of full nuclear fuel cycle as a technological basis for building nuclear weapons, and considers imperative the continuation of IAEA inspections of Iran’s nuclear facilities and re-institution of the 1997 Additional Protocol to IAEA safeguard agreements on the Iranian territory.

Besides, Russia is most seriously concerned that the absence of this problem’s resolution may lead to a so-called “nuclear domino effect” whereupon nuclear weapons will be acquired by Turkey, Saudi Arabia, Egypt, Algeria and possibly some other states. That said, Moscow is against introduction of sanctions or any solutions, including coercive, outside of the UNSC. It believes that sanctions should be commensurate with the actual threats from Iran. Otherwise, the solution of the Iranian nuclear problem may have catastrophic consequences, above all for the neighboring countries.

At the same time, Moscow believes that the international community should continue to talk with the Iranian leadership while, possibly, extending the range of problems under discussion and considering Tehran’s significant influence on the solutions for Iraqi, Afghan, Palestinian, and other regional problems in the security sphere. For Moscow, good neighborly relations with Iran are a major factor of regional cooperation.

In all probability, in the next year the international community should focus its attention on the process of involving Iran in the settlement of regional security problems because it is the situation in this sphere that is pushing Iran towards acquisition of nuclear weapons. Russia could
take an active part in this process and thus reduce the threat emerging from Afghanistan and improving security in Caucasus.

Therefore, the situation around the Iranian nuclear problem is growing more complicated. By an extreme exertion of its own resources, Iran continues to increase its nuclear and missile capacity thus creating a potential threat to all neighbor states. Precisely for this reason, the international community, no later than 2009, must realize some innovative ways to solve this problem: change the format of the talks, accede to a partial satisfaction of Iran’s regional ambitions by actively engaging it in solution of international issues, and the like. Otherwise, the question of feasibility of a military solution of the Iranian nuclear problem may come back to the agenda.
An American View of the Iranian Nuclear Problem
Mark Fitzpatrick, Director of the Non-Proliferation and Disarmament Program, the International Institute for Strategic Studies

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

Intro: Having worked on Iran issue for 12 years, I must take share of responsibility for failure.

1. Governments say: “not a failure; just hasn’t succeeded yet” (because real sanctions not yet imposed).
   • Natanz: 1010kg of 3.5% low-enriched UF6. If further enriched to >90%, enough for 1 nuclear weapon.
   • Arak reactor: ideal for plutonium production.
   • Whether or not Iran weaponizes, danger that these capabilities may spark a proliferation cascade.
   • Iran also refuses to answer IAEA questions about past conduct or allow proper verification of current activities.

2. Many caveats to conclusion that Iran now has produced enough LEU for a weapon.
   • Range of uncertainty about how much is enough for a weapon.
   • IAEA would detect further enrichment at Natanz or diversion to elsewhere.
   • One weapon is not sufficient as a reliable deterrent. To take the huge risk of diversion, Iran would want to make sure it got more than one weapon out of it.
   • Most states would want to test – unless received a workable design. (from AQK)
   • Reconvert the HEU to metal and fashioning a weapon would take at least 6 months. So states would have time to react – if they had the political will. In case of North Korea, the international community did not do much.

3. A false dichotomy is sometimes posed: bombing Iran or Iran with the bomb. But bombing Iran could spur it to get the bomb quicker than otherwise would be the case.
   • In the aftermath of an unprovoked attack, Iran could be expected to withdraw from the NPT and engage the full resources of a unified nation in a determined nuclear-weapons-development programme.

4. Is there any way to avoid the worst-case options? Important to understand what is meant by “Iran with the bomb.” Does it mean a latent capability: mastery of enrichment and stockpile that could be put to weapons use quickly? Or actual building a bomb?
   • Having a latent capability or a stockpile of LEU isn’t the same as having a bomb.
• Otherwise Japan, Germany, Netherlands, Brazil would be considered de facto nuclear states. For Iran, the line is nearly invisible.
• Assumption is that for a country with intentions and lack of transparency, latent capability = weapon.

5. To me, Iran’s intentions are clear: the purpose of the enrichment program is a weapons capability.

• Secrecy – AQ Khan’s business was nuclear weapons technology. Violation of safeguards in 14 different ways over 18 years.
• Economic illogic. LEU produced at Natanz can’t be used for Bushehr because only Russia can fabricate certified fuel. And Iran can’t be self-sufficient because it must import uranium ore.
• Military connections. Plans for uranium metal hemisphere casting. Evidence of weapons design work up until 2003.

6. Policy to date has not been a total failure.
• For nearly two decades, Western strategy on the Iran nuclear issue emphasised denial of supply. It worked for over a decade. Useful to keep this success in mind. Problem was failure to stop A.Q. Khan.
• Since 2002, there has also been a demand-side dimension to the strategy, aimed at changing Iran’s cost–benefit calculations through inducements and pressure. European incentives did contribute to tactical shifts in Iranian policy, especially when Iran saw how easily Saddam was toppled.
• There was a missed opportunity in 2003, but US failed to listen to Iran’s outreach then, when a far more flexible president was in power.
• Today, neither incentives nor disincentives are strong enough. Maybe nothing would be, if Iran is determined to have the bomb. But a rational economic actor would at least be willing to compromise on timing.

7. An assumption that Iran’s program will continue unabated leaves some (Pickering, Luers, Walsh etc) to advocate trading acceptance of the enrichment program for limits and transparency.
• Theoretically a good idea, but I doubt Iran would accept real limits that would impede it from achieving a weapons capability.
• Based on Iran’s past diplomacy, it can be expected to neither accept nor reject proposed restrictions, but rather to shunt them aside through non-responsive counter-proposals and endless negotiation and filibuster.

8. Recognizing the reality that Iran has a latent capability does not mean it should be accepted as legitimate.
• Iran’s defiance of five Security Council resolutions puts it in continuous breach of international law.
• There are downsides to granting legitimacy to a program the UNSC has said must be suspended. It would establish a new negotiation benchmark, and could increase the
net proliferation risks. Among other costs, it would be much more difficult to impose supply-side controls on a program that is granted legitimacy.

9. Four categories of proliferation risks. Biggest risk is not diversion of material. IAEA can detect it today with adequate confidence.
   • Problem is threat of clandestine enrichment and NPT break-out.
   • Clandestine risk can be lowered by IAEA Additional Protocol and by foreigners on ground, in a multinational enrichment consortium. But AP is not fool-proof.
   • Legitimacy that expanded Iran’s access to foreign technology would increase the risk of more quickly being able to produce weapons material in the vent of break-out.
   • Other proliferation risk is the impact on others. Accepting enrichment in Iran means it cannot be controlled elsewhere. Result will be to stimulate the potential for a proliferation cascade.

10. The trick is how to build barriers between a latent Iranian nuclear weapons capability and actual weapons production.
   • Best policy: tougher sanctions, export controls, financial isolation to make it more difficult for Iran to expand the enrichment program and to impose a cost Iran might decide is too great to pay.

11. Meanwhile offer engagement.
   • Not more incentives up front--doing so gives Iran reason to wait for a better offer.
   • But engagement, to demonstrate incentives offered are real.
   • If Iran is ready to negotiate, then incentives can be considered:
     i. Security assurances
     ii. Normalizing relations
     iii. Lifting sanctions
   • Did it with North Korea – no less onerous a rogue state, but less dangerous because NK also a failed state.

12. If Iran continues to reject offers, containment and deterrence strategies will be critical to keeping Iran from crossing the line to weapons production.
   • Deterrence policies were employed effectively during the Cold War against far more powerful opponents. There is reason to believe that such policies would be effective in forestalling the emergence of a nuclear-armed Iran. Deterrence means convincing the potential adversary that force will be used if red lines are crossed.
• Natanz: 1010kg of 3.5% low-enriched UF$_6$. If further enriched to >90%, enough for 1 nuclear weapon.
• Arak research reactor: ideal for plutonium production.
• Whether or not Iran weaponizes, danger that these capabilities may spark a proliferation cascade.
• Iran refuses to answer IAEA questions about past conduct or to allow proper verification of current activities.
Caveats to claim of 1 weapon’s worth

– Uncertainty about how much is enough for a weapon
– IAEA would detect further enrichment at Natanz or diversion to elsewhere.
– One weapon is not a reliable deterrent. To take the huge risk of diversion, Iran would want to be able to produce multiple weapons.
– Most states would want to test first—though maybe not if they received a workable weapons design.
– Reconvert the HEU to metal and fashioning a weapon would take at least 6 months.
The only thing worse than bombing Iran would be Iran with the bomb,” Senator John McCain.

- A false dichotomy. It left out an even worse outcome.
- Bombing Iran could do more to spur than to delay the country’s acquisition of nuclear weapons.
If the Bush Administration could translate these good words into a coherent vision and positive action, then there is a basis for a deal with Iran, not just on the nuclear issue, but the other issues that bedevil the US-Iran relationship. President Bush’s words address the long-standing motivations behind Iran’s quest for a nuclear capability: a need to achieve prestige, assert national pride and sovereignty and secure what they see as Iran’s natural leadership in the region. Iranians want to be taken seriously and they believe that having a nuclear capability will ensure that Iran is accorded equality and respect.

These motivations sparked the Shah’s small nuclear weapons research program in the 1970s and they inspired his clerical successors to reinvigorate the program in the mid-1980s.

Iran’s leaders today have another motivation; they see a nuclear capability as the best way to ensure the survival of the Islamic regime. It is a means of self-preservation, in terms of protecting the regime both from outside threats and internal opposition. The technological achievements of the nuclear program and the economic progress that is believed will flow from it strengthen the regime’s internal and external standing.

Notwithstanding the government’s claims that fuel for nuclear reactors is the sole purpose for the enrichment program, most Iranians privately acknowledge that a strategic calculation is also involved. They maintain that Iran should have the capability to build nuclear weapons if needed, because they live in a dangerous neighborhood, with nuclear-armed Russia, Pakistan, India, and Israel.
Meaning of “Iran with the bomb”?  

- Does “Iran with the bomb” mean mastery of enrichment and LEU stockpile? Or evidence of actual building a bomb?  
- Latent capability ≠ a bomb.  
  - Otherwise Japan, Germany, Netherlands, Brazil would be considered de facto nuclear states.  
  - For Iran, the line is nearly invisible.  
  - Assumption is that for a country with intentions and lack of transparency, latent capability = weapon.  

If the Bush Administration could translate these good words into a coherent vision and positive action, then there is a basis for a deal with Iran, not just on the nuclear issue, but the other issues that bedevil the US-Iran relationship. President Bush’s words address the long-standing motivations behind Iran’s quest for a nuclear capability: a need to achieve prestige, assert national pride and sovereignty and secure what they see as Iran’s natural leadership in the region. Iranians want to be taken seriously and they believe that having a nuclear capability will ensure that Iran is accorded equality and respect.

**These motivations sparked the Shah’s small nuclear weapons** research program in the 1970s and they inspired his clerical successors to reinvigorate the program in the mid-1980s.

Iran’s leaders today have another motivation; they see a nuclear capability as the best way to ensure the survival of the Islamic regime. It is a means of self-preservation, in terms of protecting the regime both from outside threats and internal opposition. The technological achievements of the nuclear program and the economic progress that is believed will flow from it strengthen the regime’s internal and external standing.

Notwithstanding the government’s claims that fuel for nuclear reactors is the sole purpose for the enrichment program, most Iranians privately acknowledge that a strategic calculation is also involved. They maintain that Iran should have the capability to build nuclear weapons if needed, because they live in a dangerous neighborhood, with nuclear-armed Russia, Pakistan, India, and Israel.
1. Secrecy – AQ Khan’s business was nuclear weapons. Violation of safeguards in 14 different ways over 18 years.

2. Economic illogic. Enrichment not economical unless 5-10 NPPs. Natanz LEU can’t be used for Bushehr. Iran can’t be self-sufficient because it must import uranium ore.

Policy has not been a total failure

Western strategy for 2 decades emphasised denial of supply. It worked for over a decade – except for stopping A.Q. Khan.

Since 2002, a demand-side strategy, to affect Iran’s cost–benefit analysis through inducements and pressure. E3 incentives (and US-led invasion of Iraq) led to tactical shifts in Iranian policy.

Today, neither incentives nor disincentives are strong enough. Maybe nothing would be?
• An assumption that Iran’s program will continue unabated makes some scholars advocate acceptance of the enrichment program in exchange for limits and transparency.
  – Theoretically a good idea, but would Iran accept real limits that would impede it from achieving a weapons capability? I doubt it.
  – Iran’s program can be limited in other ways.
Recognizing the reality that Iran has a latent capability does not mean it should be accepted as legitimate.

– Iran’s defiance of five UNSC resolutions puts it in continuous breach of international law.

Many downsides to granting legitimacy.

– It would establish a new negotiation benchmark, and could increase the net proliferation risks; more difficult to impose supply-side controls.
4 categories of proliferation risks

1. Diversion of material.
   -- IAEA can detect today with adequate confidence.

2. Clandestine enrichment
   -- can be lowered by Additional Protocol and by foreigners on ground. But AP is not fool-proof.

3. NPT break-out.
   -- Legitimacy that expanded Iran's access to foreign technology would increase this risk.
4. Externality risk - impact on others.

-- Accepting enrichment in Iran means it will be much harder to persuade others not to enrich.

-- Result will be to stimulate the potential for a proliferation cascade.
How to build barriers to weapons production?

Best policy:
– tougher sanctions,
– export controls,
– financial isolation,
– other tools to exploit vulnerabilities

Make it more difficult for Iran to expand the enrichment program and to impose a cost Iran might decide is too great.

Sanctions also are an element of diplomacy
UNSCR 1696 forecast sanctions if Iran does not comply.

Iran is already paying price of de facto sanctions
• Switzerland’s two largest banks, early this year ceased all operations in Iran, based on an internal risk assessment.
• Many other banks in several European have stopped new loans.
• US Treasury announced in mid-September that one of Iran’s major banks, Bank Saderat, would no longer have access to the US financial system, meaning, essentially, that Iran cannot sell oil for dollars through Bank Saderat, because of it was Iran’s channel for funneling money to Hezbollah.
• US Treasury officials have been visiting European capitals to try to persuade regulators and banks to stop doing business with Bank Saderat and any other banks involved in illicit activities.

These de facto sanctions an the threat of further sanctions may be helping Iran find solution to sequencing problem
UNSC sanctions would make price more visible; If Russia and China ultimately block UN sanctions, US, Europe and Japan, through their financial leverage, can impose sanctions outside the UN.
Meanwhile offer engagement.
   – Not more incentives up front--doing so gives Iran reason to wait for a better offer.
   – But engagement, to demonstrate that the incentives offered already are real.

If Iran is ready to negotiate, then incentives can be considered:
   • Security assurances
   • Normalizing relations
   • Lifting sanctions
These were all offered to North Korea.
Containment and deterrence

If Iran continues to reject incentives, containment and deterrence strategies will be critical to keeping Iran from crossing the line to weapons production.

Deterrence means convincing potential adversary that force will be used if red lines are crossed.
As we know, Russia, together with China, participated in working out and adopting resolutions on Iran. The essence of the Russian position was to make sure that the resolutions did not provide a basis for the use of force against Iran and to avoid angering the United States as much as possible. Russia considered it acceptable to vote for various relatively harmless sanctions, but did not go beyond that. As previous experience shows, these resolutions and sanctions do not really affect Iran’s position.

As far as Russia’s actual interests are concerned, this course of action – sitting on two chairs at once – has lead to a simultaneous worsening of relations with both Iran and the US, as Russia in fact accepted the role of a commentator of the U.S. policy. This, however, is fairly common for the Russian foreign policy on a number of other directions.

There is little doubt that Russia is interested in preventing the proliferation of nuclear weapons as much as other NPT parties, including the United States, NATO and EU member countries. Iran turning into a nuclear power would have been one more step toward weakening the nuclear nonproliferation regime, which, regrettably, is occurring at an ever accelerating rate. It could have also helped further destabilize the situation in the Middle East. All of this, of course, is not desirable for Russia.

At the same time, I believe that from a narrow military perspective, Iran’s hypothetical acquisition of nuclear weapons would not present a fundamentally new threat or challenge for Russia. This region is already the home of several nuclear states – Israel, Pakistan, India and China, who possess nuclear weapons with ranges covering the territory of Russia and CSTO (Collective Security Treaty Organization) states. I should also note that Israel and Pakistan acquired their nuclear weapons not entirely without consent and support of the US and other western countries. At that time, security interests of Russia (or Soviet Union) had been given little consideration. The United States recently signed a nuclear cooperation agreement with India, even though there were objections against this agreement in India, the United States, and other neighboring states.

The appearance of a nuclear Iran on the world map would mean for us a certain change in the situation but would not entail any serious fundamental changes at this theater of military operations. If we consider a possibility of nuclear leaks, then we should note that objectively Pakistan already possesses an Islamic nuclear bomb and that it was from there that the related materials had leaked elsewhere. Iran, on the other hand, despite all external pressure, continues to declare its firm commitment to NPT, is ready to cooperate with IAEA, and has consistently stated its interest in friendship, cooperation, and good neighborly relations with Russia. Unlike some Arabic states and Turkey, Iran has not been supporting Islamic extremism on the Russian territory. This is something that is very valuable.
Since one can see how Iran’s hypothetical nuclear threat would not bring any fundamental changes for Russia, Iran’s neighbor, there is no real reason why the United States would see things differently. Iran does not possess nuclear weapons and it is unlikely that they will build them soon, if ever at all. Furthermore, Iran has not delivery systems capable of reaching the U.S. territory. Besides, Iran would never venture a first strike against the United States or its European allies, unless it was an act of self-preservation and had stronger nuclear and other military capabilities. Iran is ruled not by lunatics but by quite rational thinking people who stand on the foundation of more than a millennium-old political and cultural tradition and experience.

With that said, we can ask one question – why does the United States feel that Iran is such an important issue when, objectively speaking, is not vitally critical for the US and its own security? I think that the first answer that comes to mind is that the US and Israel are not fearful of a nuclear attack from Iran but rather are concerned that they would lose the option to apply force against Iran if it were to obtain a single nuclear warhead.

Everyone keeps in mind how force was used against Yugoslavia and Iraq, without much deliberation. Why? Because it was well known that these countries did not have weapons of mass destruction and the aggression would remain unpunished. North Korea is a totally different case. It has to be treated and talked to with respect. And nobody really knows whether North Korea actually has nuclear weapons and how many of them. The possibility that the weapons might exist turns out to be sufficient enough in protecting DPRK from aggression.

It is fair to ask, does Russia want to enable the situation in which the United States and its allies could use force against Iran without retribution? Does it want to allow a war at its southern borders? For the sake of what? So that the United States could preserve its claim to global leadership, which is eroding away, and its right to intervene in the affairs of any region of the world? The answer to this question is clear.

Why does the United States not want to reach an agreement with Iran that would preserve its peaceful nuclear program to which it is entitled as a member of the NPT? What is the reason the United States does not want this issue to be discussed and resolved within the IAEA framework, as is required by the NPT? Why does the United States demand a full halt of the peaceful Iranian nuclear energy program and does not want to consider a time-proven solution, such as agreements that would exclude the militarization of these programs?

It is said that Iran’s current peaceful nuclear program is just one step away from building nuclear weapons. But many other countries are just one step away from the creation of nuclear weapons – Germany, Japan, Netherlands, Sweden, Taiwan, etc. Contrary to Iran, these countries are capable of building their nuclear weapons within a few months if they chose to do so. They also have weapon-grade fissile materials. Why would one apply double standards to Iran so openly and so persistently? Why are other countries encouraged to use these double standards?

There are at least two answers to that question. First of all, the United States deliberately keeps the Iranian nuclear issue artificially hot. For the United States, it is a way of applying constant pressure on Iran with a view to change the existing regime and to bring Iran back into the US sphere of influence. Washington is still unable to come to terms with the loss of this country. As to the aversion to Iranian nuclear programs, I should note, that it was the United States that was standing at the cradle of those programs when power in Iran belonged to the amenable US regime. There was no aversion then.

Does Russia want a return of Iran into the US sphere of control and influence? The answer here is clear as well.
Second, a rollback of Iran’s peaceful nuclear programs and internationally-supported decision to this effect are obviously designed as a way of accepting (if only tacitly) Israel’s exclusive nuclear status in the region. This is what it is all about, despite the discussion about Iran’s so-called plans to “wipe Israel off the map”.

It is also a fact that, given the size of Israel’s territory, its considerable Muslim population, and the low accuracy of Iran’s weapons, Iran would hardly have the capability to use nuclear weapons against Israel. But with the use of Israeli weapons against Iran or other Muslim states the case is exactly opposite. This is precisely the state of affairs that Israel, with the U.S. support, would be willing to preserve for a long time. But who needs that other than Israel and the United States?

Even though the Obama administration keeps sending signals about its readiness to be flexible in respect to Iran, so far it does not look like we are talking about any serious changes in the strategic goals of the American policy in this region. The most probable outcome is that the former tough line policy that has yet to deliver any results will be now served in a softer packaging. Following a well-known American habit, Washington will be trying to obtain from the Iranians concessions in substantively critical issues while offering in return some little-meaning gestures like meetings, handshakes or even high-level visits to Tehran combined with vague promises of American constructive action in the future. We can already see such first attempts now with the expression of readiness to invite Iran to an international conference on Afghanistan in the Netherlands. They are ready to sit at one table with Iran, but only in company of a dozen other states, and only with the purpose of inviting Iran’s help in freeing the American war chariot from the mud in Afghanistan. Of course Iran might be interested in assisting the United States in leaving Iraq and Afghanistan and in getting U.S. forces farther away from its borders. That is why Tehran responded with consent to come to Holland. That is why it also conducted negotiations with the American participation in Baghdad. But these half-measures and half-steps would hardly lead to a substantive resolution of the U.S.-Iranian problem.

It is obvious that a serious agreement between Washington and Tehran is only possible on the foundation of America’s providing unequivocal guarantees of non-use of force, non-interference in the Iranian internal affairs, Iran’s territorial integrity, and recognition of its right to a peaceful nuclear industry. This has been long and well known in Washington, but it is still trying to avoid such decisions.

It is hard to tell for how long this would go on. As long as the United States is not ready for a serious quest for negotiated solutions I do not see any particular reason for others to be upset about this. The less successful the United States is in the Middle East, the less probable is an escalation of its coercive policies in other regions of the world. The more difficult are Iran’s relations with the United States and its NATO allies, the stronger is Iran’s desire to seek an alternative in developing cooperation with other countries. The more effective is Iran in resisting the pressure of the West, the higher is its prestige in the world and in the Middle East in particular. Anyway, such have been the results of the American policy so far.

This does not mean that a sitting-on-the-fence approach to the Iranian problem remains most practical and preferable for Russia. It was possible to reach an agreement on the Iranian issues based on a reasonable compromise over the past years, and not once but many times. The United States was blocking all these possibilities. As we can see, it will carry on blocking them further. This, of course, did not help to resolve the situation, but further complicated it. The costs of this line of action have affected not only the United States but many other states, including Russia.
Just a short time ago, Iran was running 300 centrifuges and proposed talks based on its refusal to produce nuclear weapons and on most stringent control by IAEA. In response, it heard non-serious demands to altogether stop all uranium enrichment work and ban research in that area. Now Iran runs about five thousand centrifuges and is aiming for more. But it is still open to reaching an agreement on the basis that it is not going to exceed a certain threshold of enrichment, will remain within the NPT and will actively cooperate with IAEA. Is not the time to test the Iranian position and see how a negotiated solution might look like? If it looks decent, then let’s come up with an appropriate agreement and open it for signing to everyone who is ready for a constructive resolution of the Iranian nuclear problem and is tired of the current fruitless American policy. Those who are not ready may have an option to keep their existing course so they would eventually change their mind or find themselves in isolation.

In this situation, the United States, who still wants to call the tune in the Iranian affairs, has only two realistic options: to continue its current fruitless course of a conflict with Iran while America is being rocked by economic crisis and its positions in the Middle East become increasingly shakier, or to make a decision to start direct serious talks with Iran, display flexibility and come to an agreement. In this case, of course, those who obediently follow the US policy to the detriment of their own interests in development of good cooperative relations with Iran would make fool of themselves. I believe that it definitely makes no sense to wait until we get conned or ditched [by the United States]. The issue is that [those who want to see the conflict resolved] should take the initiative.

As we know, the U.S. side is now probing a possibility of securing Russia’s support for its future policy towards Iran. It is accompanied by vague suggestions of various “tradeoffs” with other problems that are of concern to us.

It appears that the key precondition for cooperation with the United States on Iran should be a substantial correction of the current U.S. line. Carrying on with the attempts to dictate conditions to Iran and with attempts to achieve goals by coercion would bring no results; it would be a permanent irritant in the international relations and could even entail a possibility of military complications. Cooperation with the US in this context would not be in the interests of Russia, or the international community as a whole.

At the same time, a constructive agreement with Iran, which still remains open, has been firmly placed on the agenda by the developments in the situation. If the United States consistently fails to overcome the inertia of the past, it is incumbent on us to help it, even though initially it would require overcoming its doubts. In any case, the existing situation can not be considered normal. Keeping things as they are would be counterproductive.
Session V

Chairman:
Gennadiy Chufrin

Speakers:
Ashley J. Tellis, Non-Proliferation and the American-Indian Civil Nuclear Initiative (CNCI)

Vladimir Moskalenko, Pakistan and Problems of Nuclear Nonproliferation

Anton Khlopkov, Middle East Nuclear Problems
Non-Proliferation and the American-Indian Civil Nuclear Cooperation Initiative (CNCI)
Ashley J. Tellis, Senior Associate at the Carnegie Endowment for International Peace.

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

The civilian nuclear cooperation initiative (CNCI) between the United States and India has been controversial in the United States and internationally. I will not revisit the supporting and opposing arguments, but lay out the assumptions underlying the initiative insofar as they bear on nonproliferation (NP).

Three Initial Propositions

CNCI was driven from the beginning by strategic—not economic or nonproliferation—considerations. It evolved from the United States’ recognition of reality: thirty years of US policy in the Indian subcontinent had failed and reinforcing failure was not a good strategy—India had nuclear weapons that were not going away. It was designed to remove the last outstanding irritant to improving US-Indian ties, integrate a rising power into the international system, and preserve the larger balance of power in Asia. The CNCI was not intended as a nonproliferation initiative even though it was sometimes sold as such during the later Congressional debates. To be sure, nonproliferation considerations were never disregarded, but they were subordinated to other vital strategic interests.

Three Key Assumptions

First, the Nuclear Nonproliferation Treaty (NPT) system was fundamentally successful: the biggest challenges to the regime came principally from violators who were state signatories, which could be dealt with by means internal to the regime; integrating an outlier like India, therefore, was not judged to be fundamentally subversive of regime success.

Second, the NPT had three outliers who would remain outliers durably—and were recognized internationally as such. Each represented a unique security problem that could not be mitigated through treaty adherence and hence demanded unique “Treaty Plus” solutions. A “Treaty Plus” solution was judged as not stressing the treaty unduly because the outliers were recognized as unique; consequently, such a solution would have minimal impact on other potential violators or on other Non-nuclear weapons states (NNWS). It recognizes that there was a distinction between the NPT and the broader NP regime: the latter clearly permitted innovative solutions that were not originally part of the NPT itself.

Third, the international community could be persuaded that India represented a unique outlier because it passed a three-fold test; because of its specific importance to the NP regime; and because it was the only outlier not compensated in any way for responsible behavior.

The threefold test in this context referred to the following questions:
1. Did the state to be accorded exceptional treatment develop its weapons in violation of a freely accepted NPT obligation? In India’s case, like Pakistan’s and Israel’s, the answer is “no.”
2. Does the state to be accorded exceptional treatment exhibit good non-proliferation
behaviors? In India’s case, like Israel’s, the answer is “yes.”

3. Does the state to be accorded exceptional treatment need access to nuclear energy cooperation for development purposes (and providing such access satisfied US strategic interests as well)? Only in India’s case is the answer “yes.”

The US-India agreement also provides positive benefits to the NPT regime. The events of 9/11 and exposure of the AQ Khan nuclear smuggling network, shows that bringing India—with its nuclear competencies—into the global system was better than leaving it outside. This is particularly important because India has not been compensated like Pakistan and Israel have been in other, different, ways. While Indian behavior has thus far been responsible despite this fact, it clearly needed to be reinforced through an international agreement that defines clearly enforceable benefits and obligations.

Were the Bush Administration’s Assumptions Proved Right?

In retrospect, all three of the administration’s assumptions were correct. Regime violators like Iran, Syria, and North Korea were unable to convince any state that their violations either resulted from or would be exacerbated by special treatment for India; no existing NNWS either announced its decision to review its NPT adherence because of the special treatment for India. Successfully consummating the CNCI with India in the US Congress, the IAEA, and the NSG confirmed the judgment that the nonproliferation regime was robust enough to integrate India on special terms even as it confirmed that the special terms defining India’s integration were acceptable to the international community. Through its actions, the international community accepted the case for treating India as unique. Further, the US decision to reject the option of a categorical solution involving all three outliers (because each required separate solutions) was not contested by the international community.

The CNCI Solution and its Impact on the NPT

The CNCI is a limited innovation by definition and encompassing only India. It did not satisfy India entirely by adjusting its de jure status, though it permitted India access to civilian nuclear cooperation despite its maintaining a weapons program. The access to civilian nuclear cooperation, however, is constrained in many ways unlike that of a NWS: in other words, India has been brought in from the out house to a half way house rather than to the main house.

On balance, the CNCI has had minimal negative impact on the NPT, and some positive benefits: the latter include Indian export control behaviors being regulated, Indian participation in managing Pakistani and Iranian proliferation being secured, and Indian support being garnered for the global NPT regime and its innovations, which will be even more critical over time.

I concede that the CNCI threatens the international yearning for equity from the perspective of the NNWS, but this threat is exaggerated because the NPT itself is the embodiment of inequity; inequity writ large is a reality of international politics; India was accepted as unique through the collaborative processes utilized to implement the CNCI; and the fact that CNCI was supported by majority of the international community.
Pakistan and Problems of Nuclear Nonproliferation
Vladimir N. Moskalenko, Professor and Senior Researcher, Institute for Oriental Studies at the Russian Academy of Sciences
Peter V. Topychkanov, Researcher, Institute for Asian and African Studies, Moscow State University; Coordinator, Program for Nonproliferation Problems, Moscow Carnegie Center

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

A look at a broad issue area of nonproliferation on the example of an individual state – Pakistan – gives a chance to evaluate possibilities of advancing towards nuclear weapons by other states which have already made a certain progress, “threshold” ones included. It also gives a chance to identify principal threats inherent in this process as well as ways of countering this advancement. With a view to these objectives, this paper is devoted to 1) specific features of the process of building of nuclear weapons by Pakistan, the nature of internal and external causes and the role of objective and subjective factors; 2) analysis of threats arising from the presence in Pakistan of nuclear weapons, technologies, and materials; and 3) measures for mitigating these threats and countering nuclear proliferation at the national (Pakistan), regional (South Asia), and international levels.

Pakistan is a fascinating state. It emerged in 1947 on confessional grounds as a state for Muslims as a result of the national liberation movement in the British India. Up to 1971 it existed as two wings separated by a 1.5-thousand km stretch of the Indian territory. After the 1971 Indian-Pakistani war, its eastern part became the state of Bangladesh. Despite numerous predictions to the contrary, Pakistan has existed for more than 60 years.

Pakistan’s important quality is its ability to play a bigger international role than suggested by its limited resources. Being a common state with a population about 173 million people, Pakistan has always been involved in global problems – nuclear nonproliferation, terrorism, etc. - and big power policies (both in positive and negative sense). Pakistan participated in military blocks (SEATO in 1955-1973, CENTO in 1955-1979), and developed strategic partnerships with the US and later China. The relations between Pakistan and India incorporate a large set of problems (in particular, unresolved status of Kashmir and utilization of water resources of the Indus basin). These and other differences resulted in several wars and conflicts and have always drawn the attention of the world community to the South Asian region. Another factor which propelled Pakistan into the global arena is Afghanistan, especially after entry of the Soviet troops into that country (in the early 80s Islamic states granted Pakistan the right to represent the Muslim world in the United Nations). Today, the interdependence of problems of Pakistan and those of Afghanistan even produced a new term of “AfPak”. Of course Pakistan got in the focus of everyone’s attention due to the acquisition of its own nuclear bomb, as well as involvement of

---

\(^5\) Pakistan is the only Islamic state possessing nuclear weapons. This is reflected in a wide-spread term often used in reference to its arsenal - “The Islamic Bomb”. Now, Pakistani leaders regard this term as discriminatory. “No one else's bomb is called Hindu, Jewish, Christian, Capitalist and Communist, yet our bomb becomes 'Islamic' as if it
Pakistan nationals lead by the “father” of the nuclear bomb Abdul Qadir Khan in setting up of international nuclear materials and technologies proliferation network. These and other developments have determined Pakistan’s position in global “high society”.

**Pakistan’s nuclear choice**

Studies on nuclear issues suggest that originally, every state is conscious of the choice between peaceful or military use of nuclear energy (with exception of Argentina and Brazil who developed nuclear industries without a clear idea of the end goals). If Australia, Italy, Canada, Netherlands, FRG, Japan, and other states made their choice in favor of the peaceful atom, the “Big Five” (Great Britain, PRC, USSR/Russia, USA, France) as well as Israel, India, Pakistan, SAR purposefully worked to build nuclear weapons. The intent of the latter four states was made clear by their refusal to join the NPT.

The examples of India and Pakistan, as well as some other states, show that the choice of the military nuclear option may not necessarily be either original or finite. For instance, initially India, whose policy was rooted in peaceful Gandhi principles, was sincere in its declarations that nuclear weapons were not acceptable and India’s nuclear energy industry will only be used to peaceful ends. It was only in the process of realization of the external threats (from China and Pakistan) and national interests that the Indian leadership began to be leaning towards acquiring nuclear weapons. Prestige considerations played a major role. As the world’s biggest democracy, India sought to assume a respected position in the international arena, i.e. close to the “Big Five”. In the words of Atal Bihari Vajpayee, India’s Prime Minister in 1998-2004, acquiring nuclear weapons made the nation feel more confident. The Indian example suggests that an assessment of nuclear proliferation prospects should not ignore the matter of prestige. If India had been offered, at a proper time, the status of the UNSC permanent member, its advancement towards a nuclear weapon could have been halted if not altogether stopped.

In its military nuclear program, Pakistan followed in India’s track, literally step in step. Even Pakistan’s response to the Indian nuclear test of May 1996 was fully symmetrical: in two days, Pakistan exploded six nuclear devices (India made five explosions in 1998 but it conducted another peaceful nuclear explosion in 1974). However, prior to the test, Pakistan advanced a range of proposals of political and propaganda nature, possibly as an attempt to hold India back makes it illegitimate. The idea is illogical and essentially racist”. (*Musharraf P.* In the Line of Fire. A Memoir. London, 2006, p. 286.)


7 In this way, South African Republic voluntarily gave up its nuclear weapons and joined the NPT in 1991, while North Korea, on the contrary, left NPT in 2003 and thus demonstrated its intent to build a nuclear weapon.


9 In 1964, China held a nuclear test. India did not receive security guarantees neither from USSR nor from the US both of which were weary of being pulled into a possible war between China and India. The position of the two powers contributed to India’s decision to start its own nuclear military program.


from developing a military nuclear program and thus save itself a costly and dangerous option. In particular, Pakistan proposed, at different times, to create a South Asian nuclear- or missile-free zone, adopt an Indian-Pakistani declaration to reject acquiring or building nuclear weapons, and place all nuclear sites in India and Pakistan under the IAEA full-scope safeguards. Pakistan offered to join the NPT together with India as two non-nuclear states, or join the CTBT (also with India). After Pakistan became assured of India’s choice of the nuclear weapon option, it started in mid-70s the development of its own nuclear military program (triggered by defeat in the India-Pakistan war of 1971, which resulted in creation of Bangladesh and the Indian nuclear test of 1974). By that time, Pakistan was able to achieve a certain progress in the nuclear energy industry, interest to which was conditioned by insufficient resources. Just 20 percent of Pakistan’s energy resources come from inside the country while the remaining 80 percent are imported. The operation of Tarbela Dam, the largest hydroelectric facility in the country, is complicated by unresolved dispute with India on utilization of the water resources of the Indus basin. Hydroelectric power industry is affected by irregular precipitation patterns. During draughts, the authorities have to save energy and resort to rolling blackouts in the cities.

Pakistan began to develop its nuclear energy industry in the mid-1950s. In launching a military program, it was short of both a scientific and technical base and raw materials. In 1965, Pakistan put in operation a 10-MW research reactor that used US-supplied fuel. In 1972 in Karachi, capital of Sindh province, the first 125-MW-reactor nuclear power facility KANUPP (Karachi Nuclear Power Plant) was put in service (built with Canada’s assistance). China assisted to build the 300-MW Chashma power plant near Pakistan’s capital Islamabad. It started operation in 2000. All these power plants are under IAEA safeguards. As a whole, nuclear power production does not exceed 2.3 percent of Pakistan’s total energy. However, back in the early 90s, it was planned to raise the nuclear power share from 2 to 10 percent. At present, Pakistan considers plans of building ten new nuclear power stations in the course of 20 years (given the failed projects of the early 90s, serious breaches of the nonproliferation regime that came to light in the beginning of the 2000s, and political and economic instability, these plans are hardly realistic). Apart from building nuclear power plants, Pakistan was extracting the uranium ore which is now processed in Dera Ghazi Khan and Issa Khel (Punjab province, 1978 and 1990 respectively). Uranium enrichment is carried out in Kahuta (Punjab, from 1984), conversion – in Islamabad (from 1986), and manufacturing of the uranium fuel – in Chashma (Punjab, since 1986)\(^{12}\). In the 70s, plutonium production facility was built in Chashma (Punjab). France, which carried out this construction, terminated its cooperation with Pakistan in 1978 because by that time, Pakistan’s nuclear weapon choice was apparent. Neither of these facilities is subject to IAEA safeguards. In the course of the civilian nuclear program development, Pakistan created a scientific and technological base and other requisite conditions for transition to the military program. This transition did not happen exclusively due to the Indian factor. Pakistan sought to strengthen its position with Islamic states through becoming the first one in possession of nuclear weapons. The line on the “Islamic bomb”, to be rejected by Pakistani leaders at a later time (see fn.1), was used to an advantage by Pakistani leader Zulfikar Ali Bhutto to get assistance from wealthy Arab states. Money for the “Islamic bomb” came from Saudi Arabia, Libya and the United Arab Emirates.

Assistance with nuclear energy industry and delivery missiles came from China and North Korea. With the latter, the bilateral cooperation stimulated, on the one hand, the work on Pakistani missiles, and on the other – the North Korean military nuclear program. Back in June 2002, the CIA presented a report assessing the situation on the Korean peninsula. The report noted the rapid development of the North Korean nuclear program in the second half of 1990-early 2000s, which was facilitated by cooperation between NKPR and Pakistan. The latter received a good deal of the report coverage. Moreover, by remark of an expert associated with the report, the text contained direct charges of nuclear technologies proliferation against Pakistan. According to the text, Pakistan had started transfers of technologies for building and testing of nuclear weapons (including centrifuge blueprints) to North Korea.

In return, it received technologies for building intermediate-range delivery missiles. This relates to the Pakistani liquid-fuel Ghauri-1, -2, and -3 missiles (first was tested 6 April 1998 with the range of 1300 km and payload of 500-750 kg; second – 14 April 1999, 1500-2300 km and 700 kg, and third – 15 August 2000, 2700-3500 km, payload unknown). According to some views, Ghauri-1 is a complete copy of the North Korean No Dong (range -1300 km; payload – 700-1000 kg), while Ghauri-2 and -3 are the result of combination of North Korean and Pakistani designs.

This interconnection between the Pakistani missile program and the North Korean nuclear program is now categorically denied by the official Islamabad. Transfer of nuclear technologies to North Korea is written off to illegal activities of Abdul Qadir Khan.

On the whole, Pakistan was building its nuclear weapons by great concentration of internal resources and cuts of many budget expenditures. Widely known are the words of Z.A. Bhutto that “we will eat grass or leaves, even go hungry, but we will get one of our own”.

An important part belonged to Abdul Qadir Khan, who in 1972-1975 worked in the European uranium consortium “URENCO” and then returned to Pakistan. He headed the Project 706 in Kahuta (near Islamabad) on industrial enrichment of uranium (in 1984 the project was renamed A.Q. Khan Research Laboratories). By 1987, the project produced enough enriched uranium to make a nuclear device. In late 1980s, all was in place for a nuclear test (in 1983-1984, China may have provided Pakistan with designs of a nuclear explosive device).

Pakistan’s progress in the development of nuclear technologies aroused concern of its principal strategic ally – the US, where lawmakers adopted the Glenn (1976), Symington (1977), and Pressler (1985) amendments to Foreign Assistance Act (in 1994 these amendments were extended to the Arms Export Control Act). Unlike India, Pakistan did not possess a large manufacturing base for nuclear program development, and these amendments hit it hard (though in 1981 Pakistan was granted a six-year immunity in respect of the Symington amendment due to

---

16 See statement of P. Musharraf: “This deal (with North Korea in paying cash for missile technologies- P.T.) did not include transfers of nuclear technologies as believed by some uniformed commentators (Musharraf P. In the Line of Fire. A Memoir. London, 2006, p. 286).
its special role in the Afghanistan situation). The impasse was overcome by illegal trafficking of necessary components and nuclear materials. Later on, the network set up by A.Q. Khan began to export these components and materials to Libya, Iran, and North Korea. Top military officers, in particular, generals Mirza Aslam Beg and Jehangir Karamat, chiefs of Army Staff respectively in 1988-1991 and 1996-1998, were privy to the A.Q. Khan activities. It could not have been otherwise given the military’s close supervision of the nuclear program. A thick curtain of secrecy, absence of transparency or any civilian control - all allowed A.Q. Khan to engage in the lucrative trafficking for a long time. This outrageous breach of the nonproliferation regime by Pakistani nationals has strongly discredited Pakistan and helped India establish cooperation in the nuclear sphere with the US, because in contrast to Pakistan, India did not get its reputation stained by similar offenses.

The nuclear test of May 1998 complicated Pakistan’s position even further. Based on UNSC Resolution 1172 of 6 June 1998, the US imposed sanctions against Pakistan which restricted many bilateral cooperation programs: the US stopped the financing of military and technical cooperation, banned sales of dual-purpose products, suspended trade and economic assistance programs. The purpose of sanctions was pressing Pakistan into signing the Comprehensive Nuclear Test Ban Treaty (CTBT), declaring moratorium on production of fissile materials, cutting nuclear delivery missile programs, banning exports of nuclear materials and military technologies.

However, Pakistan continued building nuclear materials stockpiles, improving its missile capability, and creating the nuclear forces command and control systems. The most important part of Pakistan’s nuclear plans is to proceed with qualitative and quantitative development of the nuclear weapons and create an arsenal sufficient to ensure that “any nuclear attack on Pakistan or its armed forces is followed by adequate nuclear retaliation capable of inflicting an unacceptable damage to the aggressor.” Due to the classified nature of information on Pakistani nuclear forces, estimates of numbers of nuclear devices are very scattered and divergent. They are based on estimated amounts of weapon-grade uranium and plutonium. Some American experts believe that Pakistan has in possession, or can assemble in a few hours or days, about 30-50 uranium and 3-5 plutonium devices. According to other sources, the Pakistani nuclear arsenal comprises from 15 to 60 and more warheads.

---

18 During this period, the nuclear program chain of command was comprised of the following links: Prime Minister – Chairman of the Army Staff – Major General, Director General of Combat Designs Development Division – A.Q. Khan (Musharraf P. In the Line of Fire. A Memoir. London, 2006. p. 285).
Pakistan’s strategic nuclear forces

<table>
<thead>
<tr>
<th>SNF components</th>
<th>Pakistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body in charge of SNF</td>
<td>National Command Authority (founded in 2000 and headed by President)</td>
</tr>
</tbody>
</table>

**Stockpiles of weapon-grade nuclear materials, 2005 (estimate)**

| Weapon-grade plutonium (number of warheads) | 36-80 kg (10-20 warheads) |
| Enriched uranium                        | 1100-1400 k (50-110 warheads) |

**Nuclear weapons delivery means, 2007**

<table>
<thead>
<tr>
<th>Aviation (range, km; payload, kg)</th>
<th>21 F-16A (1600;4500); 11 F-16B (1600;4500).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tactical missiles (range, km; payload, kg)</td>
<td>95 Hatf I (70-100; 450-500); ? Abdali/Hatf II (180-200;450-500); 50 Ghaznavi/Hatf III (90;500-700); 6 Shaheen/Hatf IV (&gt;450;750-1000).</td>
</tr>
<tr>
<td>Strategic missiles (range, km; payload, kg)</td>
<td>15-20 Ghauri/Hatf V (~1300;700-1000).</td>
</tr>
</tbody>
</table>


Pakistan adopted a 15-year program for equipping the three main armed force branches with nuclear weapons. Having declared the right to the first use of nuclear weapons, Islamabad declined the possibility of joining the NPT as a non-nuclear state and assumed an ambiguous stand on CTBT. At the same time, it declared a unilateral moratorium on nuclear testing, expressed readiness to stop production of fissile materials for military purposes, and indicated its interest to participate in preparation of the treaty banning such production. Besides, possibly for propaganda purposes, it declared opening two nuclear sites for IAEA inspections.

**Pakistan and the nonproliferation regime: threats and solutions**

The existence of Pakistani nuclear program can pose a range of threats to the nuclear nonproliferation regime: 1) threat of “vertical proliferation”, that is, growth of Pakistan’s nuclear potential; 2) threat of “horizontal proliferation” - leaks or transfers of nuclear materials, technologies, or even weapons, to other countries or terrorist and extremist organizations. The realization of these threats would entail a higher probability of using the nuclear weapons in war against India or in aggression or terrorist acts against third countries. However, it would be wrong to believe that these threats can be easily materialized.

Regarding the threat of the “vertical proliferation”, it should be stressed that Pakistani and foreign data show the absence of a rushed nuclear buildup. For example, following the test of the two-stage solid-fuel intermediate-range Shahin-2 (Khatf-6) missile on February 22 of 2008, Chairman of the Joint Chiefs of Staff General Ehsan ul-Haq stated that for Pakistan, “the strategy of minimum but credible deterrence plays the main role; it is the guarantee of peace in the region”\(^\text{24}\). New projects are started and developed slowly (it is especially observable in

comparison with the 1970-80s). According to an analysis of the Institute for Science and International Security based on satellite imagery, the construction of a heavy water reactor in Khushab is carried out very slowly. Yet it is this facility that evokes most concerns about a possible sharp increase in the number of plutonium devices, because if run under full capacity during 220 days of the year, such reactor could provide an annual output of over 200 kg of weapon-grade plutonium. This would be enough for manufacturing 40 or 50 plutonium warheads.\footnote{Albright D., Brannan P. Commercial Satellite Imagery Suggests Pakistan is Building a Second, Much Larger Plutonium Reactor: Is South Asia Headed for a Dramatic Buildup in Nuclear Arsenals. Washington, 2006.}

Under today’s complex political and economical conditions, Pakistan is not able to allocate sufficient resources for the development of its nuclear potential. Budget figures show that there is no military construction.\footnote{R.V. Topychkanov. Pakistan’s armed forces: creation, present state and functions // Eksport voozhenii, 2008. № 4(71), p. 14-15.} Thus, in today’s Pakistan, conditions for vertical proliferation are unfavorable.

The situation is more complicated in respect to the horizontal proliferation. In the first place, this subject is associated with the “Khan network” and possible North Korean or Iranian contacts in the nuclear sphere. It is hard to imagine that Pakistan and North Korea, or Iran, which are all under the magnifying glass of the international community, would risk these activities right now. If Pyongyang and Tehran might be open for these contacts, they would be extremely undesirable for Pakistan which is striving to repair its reputation after the uncovering of the Khan network. As concerns the “Khan network”, despite removal of its main links, some of its elements, especially outside of Pakistani borders, may be still functioning.\footnote{On Iranian-North Korean cooperation, see for example: V.V Yevseev, B.I. Sazhin. The missile and nuclear shield of two rogue states: North Korea and Iran have pooled their resources to build an advanced missile capability // Nezavisimoye Voennoye Obozreniye, 2009, 13 Feb.} This network was connected to other nuclear “black markets” some of which are still in existence (these markets, as a rule, spring around states willing to develop their nuclear programs but lacking resources or unwilling/unable to participate in open international cooperation. At different times, these markets emerged around India, Iraq, Iran, Libya, or North Korea. Besides, in some cases, other countries were also involved in illegal nuclear materials and technologies trafficking – Argentina, Brazil, Egypt, Israel, Syria, South African Republic etc, as well as firms from Australia, Germany, Malaysia, USA, Switzerland, etc.\footnote{Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks. A net assessment / Ed. by M. Fitzpatrick. London, 2007, p. 43-64.}

It is obvious that the main problem of the horizontal proliferation is not A.Q. Khan\footnote{Though Khan is often presented exactly as the main problem: See words of P. Musharraf and George Tenet, former CIA Director: “It became obvious that A.K. is not part of the problem but the problem itself” (Musharraf P. In the Line of Fire. A Memoir. London, 2006. P. 288); «Khan is as dangerous as Osama Bin Laden» (AQ Khan network still alive: US think tank // Times of India. — 2006. — Sept. 8.).} but an absence of effective instruments of international control over storage and transport of nuclear materials.\footnote{All in all, during 1993-2006, 1080 incidents related to illegal storage or transportation of nuclear materials took place. Of these, in 67 percent of the cases the stolen or lost materials have not been recovered. (IAEA Illicit Trafficking Database (ITDB). Vienna: International Atomic Energy Agency, 2006, p. 3-5).} In particular, there is no real control over maritime transfers (IAEA is only sent some relevant paperwork). But its accuracy is not verified in either departure or destination ports. Alarmed by nuclear terrorism, western states and Russia are introducing border radiation

27 On Iranian-North Korean cooperation, see for example: V.V Yevseev, B.I. Sazhin. The missile and nuclear shield of two rogue states: North Korea and Iran have pooled their resources to build an advanced missile capability // Nezavisimoye Voennoye Obozreniye, 2009, 13 Feb.
30 Though Khan is often presented exactly as the main problem: See words of P. Musharraf and George Tenet, former CIA Director: “It became obvious that A.K. is not part of the problem but the problem itself” (Musharraf P. In the Line of Fire. A Memoir. London, 2006. P. 288); «Khan is as dangerous as Osama Bin Laden» (AQ Khan network still alive: US think tank // Times of India. — 2006. — Sept. 8.).
31 All in all, during 1993-2006, 1080 incidents related to illegal storage or transportation of nuclear materials took place. Of these, in 67 percent of the cases the stolen or lost materials have not been recovered. (IAEA Illicit Trafficking Database (ITDB). Vienna: International Atomic Energy Agency, 2006, p. 3-5).
detection systems. Still, control over nuclear materials transfers is absent in most states, including the problem ones and states ruled by irresponsible regimes, which could host materials stolen in transit and redirected for assembling a nuclear device. In this way, some links of the peaceful international nuclear cooperation could be vulnerable to abuse by offenders unless measures for control and protection of the nuclear materials transport are made significantly more exacting.

After the “Khan network” was uncovered, Pakistan was compelled to introduce certain restrictions in this area. In May 2004, in response to the UNSC appeal to members of international community to toughen the laws restricting export of WMD and related technologies (UNSC Res.1540), Pakistan enacted an "Export Control on Goods, Technologies, Material and Equipment related to Nuclear and Biological Weapons and their Delivery Systems Act”. Offenders face imprisonment for a term up to fourteen years, fine of five million rupees and confiscation of property and assets. A positive step could be Pakistan’s – as well as India’s – joining the Proliferation Security Initiative (PSI) as well as existing international organizations for export control in nuclear and missile technologies and materials.

Other threats of horizontal proliferations related to Pakistan are believed to include: 1) Possibility of theft of nuclear weapons or weapon-grade nuclear materials by extremist or terrorist organizations; 2) Possibility of transfer of sensitive information by a Pakistani nuclear specialist to another state or extremist or terrorist organization; 3) Attacks on nuclear facilities; 4) Possible strike on nuclear sites in the event of war between Pakistan and India; 5) Possible unauthorized launch of a nuclear-tipped missile; 6) Possible political destabilization which could bring to power extremists bent on “vertical” or “horizontal” proliferation or determined to use the nuclear weapons against India or other countries. The greater part of these threats is not conceived likely.

As an example, extremist forces have never gained any broad public support in Pakistan (in all Pakistan’s history, they never won more than 11 percent of electoral vote). But even in the event they seize power, nuclear facilities will still remain under control of the military. Under the arrangement whereupon the decision to use the nuclear weapons is taken by three top officials – President, Chairman of Joint Chief of Staff, and Chairman of the Strategic Plans Division – political actors do not possess any real control over the nuclear potential of the state.

A possibility of unauthorized launch of a nuclear missile is recognized both in India and Pakistan. That is the reason why both states not only continue on a regular basis to exchange information on nuclear facilities, according to Agreement of Non-Attack against Nuclear Installations and Facilities of 1991, but also undertake further efforts to reduce possibility of a nuclear conflict. In February 2007, India and Pakistan signed an Agreement on Reducing the Risk from Accidents Relating to Nuclear Weapons. Its purpose is to eliminate the threat of nuclear confrontation and set in place reliable systems of nuclear command and control in India and Pakistan. According to the agreement, the parties commit to establish a reliable system for across-the-border notification on “false alarms”, “accidents”, and “inexplicable incidents” which could trigger nuclear retaliation from the neighbor.

In considering the threats related to a terrorist attack on Pakistani nuclear installations or possible theft of nuclear materials or technologies, it should be kept in mind that over recent years,

---

Pakistan achieved a significantly higher security for its nuclear facilities, which now feature three levels of protection. The first level includes on-site protection of laboratories and other nuclear industrial or military facilities. The second level is under the charge of a special-purpose nuclear security group made up of excellently trained servicemen and headed by a 2-star general. This unit is part of Strategic Plans Division which in its turn is part of the National Command Authority headed by President – top command authority for strategic forces whose key positions are staffed by the military. This protection level applies to nuclear facilities with a workforce of around 8-10 thousand people. The third, so to say “external”, protection level is provided by the most powerful of Pakistani special services – Inter-Service Intelligence, which established Technical Department headed by a brigade general which is in charge of surveillance systems on nuclear sites (e.g. surveillance cameras). Equipment for this department is provided by foreign states, in particular, the US. Every personnel member employed in the three protection levels is subject to rigorous selection and regular checks. In expert evaluation, the nuclear facilities security system put in place under P. Musharraf is transparent and effective\textsuperscript{34} which has considerably reduced the threat of theft or seizure of nuclear weapons, materials, or technologies. Most likely in this respect could be a purposeful transfer of a minor amount of material, some components or technologies by a worker from a nuclear facility. Terrorists’ laying hands on Pakistani nuclear weapons is practically infeasible not only because the weapons are securely protected but also because, according to a tacitly accepted practice both in India and Pakistan, the weapons are stored in disassembled state – the delivery vehicle separately from the warhead. Even more, the nuclear charge is also stored separately from the warhead. Upgrading this tacit practice brought about by inadequacy of nuclear forces command and control systems to an official Indian-Pakistani agreement could play a positive role.

In the whole, the existence of Pakistani nuclear weapons and nuclear military program does pose threats to the nonproliferation regime, but these threats are not as grave as sometimes presented by mass media. Nevertheless, even a minor probability of the threat realization compels to search for effective counter measures.

Probably, the greatest deal of attention should be devoted to prevention of conflict between India and Pakistan, and, above all else, use of nuclear weapons. The existing nuclear confrontation in the South Asia is marked by high instability. The geographic proximity of the opposing parties and absence of adequate nuclear warning and combat command systems, as well as insufficient carrier survivability at launch positions, create a higher incentive for preemptive strike to disarm the opponent and prevent the nuclear retaliation.

Though during peace time, forces at both sides remain at reduced combat readiness, in event of crisis or already going war, they by necessity will be put into state of heightened combat alert (nuclear explosive devices assembled, warheads fitted on missiles, missiles deployed on combat positions). If these moves become revealed to the other party, it may perceive them as preparation to attack. Faced with a fateful dilemma – launch or lose – one of the sides (or Iran-Iraq war both) may make a catastrophic choice.

It is prerequisite to press India and Pakistan to incorporate the principle of no first use of nuclear weapons into their respective nuclear doctrines. In this case, in South Asia there would be two states that possess nuclear weapons but carry a no-first-use obligation; if they join China

which has already declared this principle, the entire military and strategic regional sub-system (India-China-Pakistan) would become more stable and secure.

Another way to reduce the risk of nuclear conflict could be reaching of a reciprocal obligation not to deploy nuclear weapons in Kashmir, that is, both in the Indian state of Jammu and Kashmir and in the areas of Kashmir controlled by Pakistan. Such agreement would endow the parties with moral obligations which, in the event of a crisis situation, could block or delay taking decisions fraught with serious threats for regional and global security. The same and even broader objectives can be achieved by an agreement on maintaining the intermediate – and long-range (over 500 km) nuclear-missile forces in a state of reduced readiness (i.e., turn the existing arrangement into law) and notification of the changes in this state related to exercises, tests, or operational reasons. Guarantees of these arrangements, which are in fact a material implementation of a no-first-use obligation, can be provided by national means of technical control of Russia and USA and/or UN permanent observers stationed in the military bases of the two sides. As a reward for implementing these measures, Russia and the US, in addition to assistance with control, could supply India and Pakistan with technologies for combat control systems blocking unauthorized use of nuclear weapons (electronic locks).
Middle East Nuclear Proliferation
Anton Khlopkov, Executive Director of PIR Center (Center for Policy Studies in Russia)

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

Middle East has been a core focus of discussions during last three NPT Review cycles and with no doubt will continue to be of the same importance during 2010 NPT Review Conference.

The good news is that due to low technical level and lack of expertise in the nuclear area none of the countries of the region, except Iran and Israel, is capable to produce independently significant amount of fissile materials now or will be able to produce it with no significant foreign assistance within next 15-20 years. According to NIE report of 2007, Iran decided to halt its clandestine nuclear activities in 2003 and is not likely to be able to produce enough HEU for a single bomb until sometime between 2010 and 2015.

During the last 12 months only by the Gulf countries, excluding Iran and Iraq, almost 20 agreements and MOUs on nuclear cooperation were signed with the countries, which possess advanced nuclear technologies, including Canada, China, France, Japan, Russia, South Korea, the U.K, and the U.S. However the technologies requested by the countries of the region do not threat the nonproliferation regime (light water power and research reactors, exploration of uranium deposits). Bahrain, Saudi Arabia, and the United Arab Emirates (UAE) in 2008 affirmed an intention to forgo sensitive indigenous fuel-cycle technologies.

The international control over the nuclear activities of the countries in the region should be expanded through implementation (after its signing and ratification) of IAEA Additional Protocol, which provides the IAEA with additional rights to monitor civilian nuclear programs. As of March 2009, the Protocol entered into force for 90 countries, only 2 of them (Jordan, and Kuwait) represent the Middle East region.

The bad news is that in 1990-2000s the Middle East was one the key region for deliveries by illicit nuclear proliferation network run by A.Q. Khan, including supply of fissile material production technology and nuclear weapons-related design information. At least Libya and Iran are in the list of countries, which were supplied with equipment and documentation from the network. But the full scope of network activity in the Middle East and list of items supplied to the region and points of destinations are still to be investigated.

There is also a high possibility that North Korea transfer sensitive nuclear technology to countries of the region with no control from IAEA. From my standpoint, this is one of the most urgent issues to be addressed within six-party talks. When answer my question during a meeting in Moscow a few months ago, U.S. Assistant Secretary of State for East Asian and Pacific Affairs Christopher Hill said that the issue was raised by him during the talks, but with no answer from North Koreans.

According to some estimates, North Korea control about 80% of missile related export of the Middle East region and so development of its missile program and, probably, nuclear one strongly depends on funding by Middle East countries. North Korea also plays an important part
in Iran’s nuclear program in the sense that Iranians are applying lessons of Pyongyang’s experience in playing diplomatic games.

Syria is recently widely discussed as one of the key clients of the Pyongyang. IAEA investigates allegations that Damascus carried out secret nuclear activities and that Syria was building near the town of Al Kibar a gas-graphite reactor, based on a North Korean design. The Agency investigation into an alleged nuclear site in eastern Syria, based on U.S. intelligence information, has not yielded clear-cut evidence of guilt or innocence.

Current 5+1 diplomatic strategy with regard Iranian nuclear crisis is very unlikely to work. Any agreement with Iran should address two core issues: Iranian security concerns and status of its enrichment program. Any attempt to reach an agreement based on zero enrichment in Iran or with no security guarantees in the package of incentives will be doomed to failure. For this particular reason the recent 5+1 efforts have failed.

But there are still several years within which the agreement with Iran may be reached; although the clock is ticking and with the passage of time the ‘cost’ of any potential agreement will be increased as Iran continues to make progress in development of its own nuclear fuel cycle capacity.

From my point of view, the whole concept promoted by the U.S. first of all and by some other countries as well how to meet the non-compliance challenges in the region is wrong. The primary goal of this concept is to punish Iran for its past undeclared nuclear activities, but from my point of view it should be to investigate Iran’s past undeclared nuclear activity, to solve the crisis and expand international control over Iranian nuclear program in accordance with the current international norms, established by IAEA.

The recent US administration was a part of the Iranian problem, and prevented a few possible solutions of so called ‘Iranian nuclear crisis’. For example,

- While a common ground was found to expand bilateral contacts on security issues after 9/11, Bush administration in January 2002 included Iran into the ‘axis of evil’, and missed a unique opportunity to dramatically improve the relations with Iran (and probably have a positive impact on the nuclear situation).

- Later during Iran-EU3 negotiations the Bush administration blocked Iranian proposal to limit its enrichment capability with 16 centrifuges;

- Last year the U.S. excluded security guarantees to Iran from 5+1 proposal in spite of the fact that initially they were drafted by German diplomats.

During the recent years inadequate attention was paid to the lack of universality of the nuclear nonproliferation regime in the region. Israeli nuclear program was almost ‘ignored’ during international nonproliferation forums (excluding Arab states), while nuclear progress in Iran and Syria often were exaggerated. Iran's enrichment capabilities sometimes were treated as equivalent to nuclear weapons status. So the balance should be reached between the issues of non-compliance and nonproliferation regime universality, when the nonproliferation challenges in the Middle East region are discussed.

**Conclusions**

- Iran is the only country of the region with a near term chance to reach a technical level of nuclear weapons capability in addition to Israel.
- Current 5+1 (P5+Germany) diplomatic strategy with regard Iranian nuclear crisis is very unlikely to work.

- The problem of Iranian nuclear program should be put into broader regional context.

- Israel should be ‘returned’ to the nonproliferation equation in the region.

- The concept of the Middle East nuclear-free zone should be revived, instead of Gulf nuclear free-zone which was actively promoted in the region recently, and excluded Israeli nuclear weapons from the discussions.

- A Middle East free-zone of national enrichment and reprocessing facilities could be established as one of the first step towards Middle East nuclear-free zone.

The following steps should be done with this regard:

- **Step One.** To freeze the capacity of uranium enrichment and reprocessing facilities operated in the Middle East, and establish a moratorium on introduction of new enrichment and reprocessing facilities, including research- and laboratory-scale ones, into the region.
  
  Due to technical problems with operation of centrifuge cascades and its components production, Iran could consider seriously the option to freeze development of its enrichment program at the current scope, especially if the issue will be put into broader regional context.

- **Step Two.** To suspend all enrichment and reprocessing related activities in the region, including at research and laboratory scale installations.
  
  This step will also help Iran to meet UN SC resolutions 1737 (2006), 1747 (2007), 1803 (2008), 1835 (2008) and to return Iranian nuclear dossier from UN SC to IAEA.

- **Step Three.** To establish a Middle East free-zone of national enrichment and reprocessing facilities. Those facilities which are located in the region (Natanz enrichment plant and Dimona reprocessing plant) should be converted into multinational ventures and put under international control and management or closed.
  
  Israel, which likely has produced enough plutonium for about 200 weapons, might be argued that this is sufficient to meet its deterrence needs. Iran recently has offered to establish an international enrichment and fuel fabrication consortium on their soil, with additional IAEA safeguards to assure against military use.
Session VI

Chairman:
Adam Scheinman

Speakers:
Siegfried S. Hecker, Management of the Korean Nuclear Crisis

Alexander Vorontsov, Russian-Korean Cooperation and its Impact on the Nuclear Problem of the Korean Peninsula

Vladimir E. Novikov, Prospects for Establishment of a Nuclear-Free Zone on the Korean Peninsula
Management of the Korean Nuclear Crisis
Siegfried S. Hecker, Co-Director, Center for International Security and Cooperation, and Professor (Research), Stanford University; Conference Co-Chairman

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
Management of the Korean Nuclear Crisis

Siegfried S. Hecker
Center for International Security
and Cooperation
Stanford University

Presentation at the
2nd Conference on US - Russian
Cooperation on Nonproliferation
Moscow, March 19, 2009
Nuclear North Korea - 50 years in making

• Capabilities

• Intent

• What is the threat?

• What are lessons learned?
Nuclear North Korea - 50 years in making

• **Capabilities**
  • How do we assess, how do we know?
  • What does North Korea have?

• Intent

• What is the threat?

• What are lessons learned?
Remarkable access allowed us to assess capabilities

They have the bomb, but not much of an arsenal

Jan. 2004 Yongbyon
Aug. 2005 Pyongyang
Nov. 2006 Pyongyang
August 9, 2007, Yongbyon
Feb. 14, 2008, Yongbyon

Back to the Table of Contents
Empty machine shop and stored machining lathes

Yongbyon disablement - 2008

Hecker

Back to the Table of Contents
The Yongbyon plutonium labs - small and primitive

August 9, 2007
Nuclear reactors by 1994

- **5 MWe reactor**
  - (6 kg Pu per year)

- **50 MWe reactor**
  - (55 kg Pu per year)

- **Potential capacity of ~ 50 bombs/year**

- **200 MWe reactor Taechon**
  - (200 kg Pu per year)

Hecker
Nuclear reactors by 2009

5 MWe reactor
(Unloading fuel rods)

50 MWe reactor
(55 kg Pu per year)

DPRK decided to give up Yongbyon

200 MWe reactor Taechon
(200 kg Pu per year)

Hecker
North Korea has the bomb

- **Weapons-grade plutonium (bomb fuel)**
  - Estimated at 40 to 50 kilograms (declared 30 kg)
  - Sufficient for ~ 6 to 8 bombs (perhaps only 4)

- **Nuclear weapons**
  - One nuclear test with limited success
  - Most likely have a few simple bombs
  - Unlikely to have confidence to mount on missiles

- **Uranium enrichment**
  - DPRK denies program in spite of strong evidence
  - Most likely research not production scale

- **Active missile (space) development program**

Militarily, DPRK nuclear arsenal is not much. Politically, it appears sufficient.
Nuclear North Korea - 50 years in making

- **Capabilities**
  - How do we assess, how do we know?
  - What does North Korea have?

- **Intent**
  - Difficult to assess and easy to change

- **What is the threat?**

- **What are the lessons learned**
Intent?

- **Civilian nuclear power** – 1960s – 2002

- **Nuclear weapons**
  - Likely as early as 1970s
  - Declared having a “deterrent” in 2003
  - Tested nuclear device in Oct. 2006

- **Denuclearization Joint Statement** – Sept. 19, 2005

- **Reasons for nuclear weapons**
  - Security
  - Prestige
  - Domestic considerations and bargaining chip
Current 6-party process

- Disable facilities - slowed down
- Declaration - in dispute
- Dismantle facilities, redirection of workers
- Eliminate nuclear weapons and plutonium
- Remediation of nuclear sites

North Korea is buying time
Kim Jong Il still in power  
Confidence is increasing  
Slow-down is working  

Feb. 28, 2009
Kim Jong Il still in power
Confidence is increasing
Slow-down is working

Likelihood of giving up weapons is small and diminishing

Feb. 28, 2009
Nuclear North Korea - 50 years in making

- **Capabilities**
  - How do we assess, how do we know?
  - What does North Korea have?

- **Intent**
  - Difficult to assess and can change quickly

- **What is the threat?**

- **What are the lessons learned?**
My view of greatest threats from North Korea

- Weapons – moderate, possibly last resort, and possible domino (Japan, South Korea, etc.) (Capacity for weapons build-up is limited)

- Fissile materials export – moderate, possibly last resort. Security of materials OK for now

- Nuclear technology export – very high
  - Syria and possibly Iran
Syrian reactor site at Al Kibar bombed by Israel on Sept. 6, 2007

Before bombing

After bombing

Back to the Table of Contents
Satellite Photos Show Cleansing of Syrian Site

Before bombing by Israel on September 6, 2007

After Syrian cleanup in Oct. 2007
A masterful job of deception in Syria

Byzantine fortress in Zippori (Sepphoris) National Park, Israel

There are also Byzantine/Crusader-age fortress ruins in the immediate vicinity on the Euphrates River, at Halabiya and Zennobia.
Nuclear North Korea - 50 years in making

- **Capabilities**
  - How do we assess, how do we know?
  - What does North Korea have?

- **Intent**
  - Difficult to assess and can change quickly

- **What is the threat?**
  - Nuclear export remains greatest threat

- **What are the lessons learned?**
DPRK has upper hand in 6-party process

In spite of:

• 2003 Expelled IAEA and withdrew from NPT
• 2003 Restarted reactor and reprocessed fuel rods
• 2005 Second reprocessing campaign (claimed to have a deterrent)
• Oct. 2006 Tested a nuclear device
• Post Sept. 2007 Shown to have built a plutonium-producing reactor in Syria
• Have dragged out disablement, put a heavy price on Yongbyon dismantlement, and told U.S. to get used to dealing with a nuclear weapon state
Lessons learned

• Dual-use nature of nuclear energy
  • Nature of fuel cycle is important

• A few bombs go a long way politically

• The importance of dialogue

• Important to evaluate capabilities

• A house divided yields advantage to adversary

• Find common ground among parties
Starting the discussion of the subject, it would make sense to offer a brief characterization of Russian key interests on the Korean Peninsula. Moscow regards both Korean states as partners. Their relationships have independent value to Moscow and rest on principles of good neighborly interaction and cooperation. Russia maintains a firm and genuine stand in favor of nuclear-free status of the Korean Peninsula and proceeds from understanding that the North Korean possession of nuclear weapons stands in fundamental contradiction to its national security interests as well as goals of sustaining the global nonproliferation regime.

At the same time, Russia’s first priority is and will be the goal of maintaining peace, security, and stability on the Korean peninsula. Moscow believes that due to sharing a common border with North Korea, any Korean armed conflict will unavoidably inflict heavy damage to the military-and-political, economic, environmental, humanitarian, demographic, etc. security of Russia.

In this way, in a hypothetical situation whereupon Russian leadership was facing a dilemma whether to support military action against North Korea aimed at elimination of its nuclear weapons or act towards preserving peace on the Korean peninsula, Moscow will opt for the second path. In other words, Russia is firmly committed to the nuclear disarmament of North Korea but exclusively by peaceful diplomatic means.

In the context of the subject under discussion, it seems appropriate to comment on a wide-spread Western contention that the Soviet Union was involved in the onset of the North Korean nuclear program. It is well known that the USSR trained, by various estimates, from 200 to 3000 nuclear physicists from North Korea, mainly in the Dubna Joint Institute for Nuclear Research (JINR), supplied an IRT-2000 experimental reactor located in the north of the country, supplied a radio-chemical laboratory, signed an agreement and started work on building a nuclear power plant, etc. But it is also indisputable that all cooperation in the nuclear sphere was strictly limited to the realm of the “peaceful atom”. It was under Moscow’s pressure that Pyongyang entered the Non-Proliferation treaty and later joined the IAEA. In this connection, quite telling is a comment made by a knowledgeable Russian specialist: “If just for a second we agree with the oft-repeated western view of the Institute as a training site for the North Korean nuclear weapons program, then there immediately follows a question: in this case, where is the Bulgarian, Czechoslovakian, GDR, Romanian, Kuban, or Mongolian A-bomb? Scholars from these states did fundamental research in the JINR at the same time with the North Korean scholars, sharing same labs and same equipment… If we do follow this “logic”, we may as well appoint … Japan to be the progenitor of the North Korean nuclear program because it is known that a number of North Korean chemists and physicists who stood at the cradle of the North
Korean nuclear program had been educated and did nuclear research in Japan prior to moving to North Korea.”

It may be added that the Yongbyon reactor which is the main production site of weapon-grade plutonium was built by the North Koreans themselves as they used open-source information to replicate the “Calder Hall” British model.

It is obvious that the North Korean nuclear weapons came into being as a result of a political decision taken by the state leadership fairly long time ago under the pressure of permanent external threat (including nuclear threat) to their security. North Korean leaders’ perceived vulnerability grew larger with the collapse of the USSR when their nation became the only Northern Asian state without nuclear weapons or nuclear umbrella provided by allies. At the root of the external threat as it is perceived in Pyongyang lies the unsettled crisis in relations between the DPRK and the US and the permanent presence in the Washington agenda of the theme of “regime change” by peaceful or not-so-peaceful means. It is not accidental that the working vocabulary of North Korean Foreign Ministry officials defines the substance of issues under discussion in the six-party talks in Beijing as “North Korean-American nuclear problem”.

In settlement of the Korean Peninsula nuclear problem, Moscow proceeds from the following: Six-party talks in Beijing provide an optimal format which has proven its viability and practicability.

DPRK displays readiness to full-scale cooperation when its partners give priority to goals related strictly to nonproliferation, display sincerity of intent and don’t attempt to tie the nonproliferation issues to a hidden agenda of regime change in Pyongyang.

At that, Korean leadership has in full measure displayed readiness for forward steps and good-faith negotiations based on “take and give” principle as well as iron-clad intransigence in face of attempts to apply pressure and compel it to unilateral concessions. This has been also noted by well-known US experts on North Korea. “Pyongyang's position is that as long as Washington remains its foe, it feels threatened and will acquire nuclear weapons and missiles to counter that threat. <…> Whenever the United States failed to keep its side of the bargain, North Korea was all too quick to retaliate - in 1998 by seeking the means to enrich uranium and testing a longer-range Taepodong missile, in 2003 by reigniting its plutonium program and giving nuclear help to Syria<…>.”

Authors cited above also believe that if Washington ends enmity, Pyongyang will no longer feel threatened and can get rid of nuclear-and-missile weapons.

This approach appears to be quite realistic and is in many ways consonant with our assessments. In our view, in an event of giving priority to official goals declared in the six-party talks agenda, it may be possible to expect an eventual advancement to realization of one or another version of the nuclear disarmament model achieved in South African Republic.

However, in an event of attempts to realize the policy of “regime change” under nonproliferation disguise, new crises on the Korean Peninsula and rollbacks in the efforts of resolving the nuclear problem will inescapably follow. This was so in 2006 when in response to an attempted financial blockade based on the US Treasury initiative to fight North Korean illicit

---

33 Ibid.
economic activities Pyongyang played hardball and carried out first missile and then nuclear tests.

It looks that a similar situation unfortunately repeats itself in spring of 2009. The very decision to launch the satellite on April 5, with all multi-purpose intent of this action, addressed mainly, as it is believed, to Washington, in our view, in many ways was a response to yet another attempt at realization of the policy of regime change, this time most actively advanced by Seoul.

It is known that in the course of 2008 the relations between Republic of Korea (ROK) and DPRK underwent deep transformation and from the state of productive cooperation rolled back to a threshold of a new Cold War.

It is apparent that this development is brought about by a new approach to the northern neighbor of the present presidential administration of ROK which has rejected the policy of engagement carried out by two previous presidents as a “failed” line of unilateral concessions and proclaimed a “pragmatic course”. The official Seoul declares that the efforts to strengthen the elements of pragmatism and reciprocity in bilateral relations do not negate its commitment to continuation of full-scale dialog and cooperation. This approach has been symbolized by the concept of “Vision 3000, Denuclearization, Openness”. The keynote factor of this approach is a de-facto dismissal of decisions of two inter-Korean summits (2000 and 2007) through appealing to a totality of all agreements that have ever been reached between two Koreas.

In parallel, Seoul claimed that in the preceding decade there was an unjustifiable decline of cooperation in the framework of the US-South Korean alliance and set off its accelerated restoration and buildup, including along the line of tripartite coordination mechanism (US-Japan-ROK).

All of this produced a well-predictable negative response of DPRK.

As we know, Seoul’s official position in respect to present crisis in inter-Korean relations runs in short as follows. Maintain the principle of linking the continuation of cooperation with DPRK to the latter’s abandonment of nuclear weapons and commitment to a policy of openness; don’t respond to criticism and practical steps of Northern Korean leadership in limiting the contacts with South, considering them yet another attempts at realization of the traditional tactic by Pyongyang in applying pressure on the newly elected presidential administration of ROK; proceed from the view that in the face of firm position of Seoul, Pyongyang will soon return to normal diplomacy and accept new rules of the game proposed by Seoul. A special accent is made on proclaiming Seoul’s commitment to the idea of broad cooperation with the North, maintaining good will in search for dialog and desire to save the crumbling relationship.

In this connection, some observers, without placing doubt on Seoul’s sincerity of intentions, believe that the current crisis in the inter-Korean relations to a large extent has been a result of insufficient qualification of the Lee Myung-bak team who is in charge of the North Korean affairs but don’t have experience or personal knowledge of North Koreans and thus have miscalculated the expected Pyongyang response to Seoul’s innovations. Same observers believe that South Koreans will realize their missteps and make necessary adjustments in their approach.

However, more justified are conclusions of another group of policy scholars who argue that the Lee Myung-bak administration is not undertaking an “adjustment” of the “appeasement” policy of its predecessors but in fact is consciously and purposefully embarking on a radically different course. Briefly it may be characterized as a fundamental U-turn from the “engagement” track to the policy of “regime change”.

These assumptions explain the inflexibility with which Seoul continues to affirm the principles of the its new policy despite its obvious catastrophic consequences for relations with
DPRK and enduring immunity to broad criticism both from within and outside of the state and numerous warnings and actual response steps by Pyongyang. The essence of this approach is reflected in the present motto of the official Seoul “Waiting is also policy”.

Nevertheless, unbiased analysis of Seoul’s concept of “Vision 3000” reveals that practically every component is prone to criticism and is unacceptable to Pyongyang. The Korean peninsula is stepping away from the principle of equal cooperation and towards a concept of “Big Brother” whereupon a prosperous South is willing to help the poor North if the latter takes the “path of reason” and accepts, in essence, preconditions posed by Seoul: denuclearization, openness, human rights. In this situation, it was clear from the beginning that the North Koreans who not in words but in deed place supreme value in national pride and dignity and “the right to live and die in their own way” will reject this approach straight off.

It is also clear that the introduction of the denuclearization demand in the agenda of bilateral inter-Korean relations is not methodologically correct because its realization to a predominant degree depends on third, non-Korean, player – Washington. Attempts to push DPRK on the path of radical reforms and openness and broad cooperation in human rights can only be read by Pyongyang as traditional elements of the regime change policy. Such concerns, no doubt, were exacerbated by non-stop year-long actions on mass sending through the DMZ of anti-North Korean leaflets (with attached banknotes) by a number of South Korean NGOs, widespread speculations in Seoul about the state of health of Kim Jong-il and plans of using associated problems to advance the unification goal on the terms of the South. Explanations of the South Korean authorities of their inability to stop floating of the leaflets due to respect of democratic rights of NGO members are not seen as persuasive in the North.

Careful reading of government think tank analytic papers as well as Seoul’s practical steps confirm that the ideologues of the new course towards DPRK from the very beginning were fully aware of the fact that the new draft is fundamentally different from the policy of two preceding center-left administrations and in fact is a negation of their legacy, and equally aware of the fact that innovations will automatically trigger a sharply negative reaction of the North. This is to say that the present downturn in the inter-Korean relations was, in essence, pre-programmed and conceived as a long-term situation (possibly for duration of Lee Myung-bak’s presidential term). In this, policy authors were given a practical assignment to try to preclude the more dramatic forms of crisis and its development along a catastrophic scenario. This mindset reflects general downgrading of the importance of the North Korean relations factor in foreign policy priorities of the new Seoul administration.

It looks like the right conservatives who came back to power in the last ROK elections run in respect of North Korea the course which in some main aspects is similar to the “regime change” policy pursued by the Bush administration during its first six years. At the same time, Seoul puts serious and somewhat successful effort into creating a public image of a party open to dialog and genuinely striving for continuation of the inter-Korean cooperation while painting Pyongyang as responsible for the current crisis and not capable of heeding the reasonable “pragmatic’ propositions of the South.

This was aided by an easily predictable reaction of Pyongyang. As it might have been expected, true to its tradition of “responding to dialog with dialog, and to hardness with super-hardness”, Pyongyang undertook steps outlined in the beginning of this paper and easy to be presented as outright belligerent and aggressive. This has naturally lead to a considerable increase of tension on the Korean Peninsula whose end is not yet in sight. I would still like to
believe that the “war of nerves” will not cross the line to a real war; yet the danger of an unprovoked accidental conflict is growing.

It is obvious that these developments to a certain extent complicate broad international situation in the North Eastern Asia and do not improve the atmosphere for six-party talks on denuclearization of Korea in Beijing.

However, there is a reverse impact of international factor on the intra-Korean one. It bears a multi-directional character but the predominant vector is position of the new US Democratic administration which is leaning more than its predecessors to direct dialog and the policy of “engaging” Pyongyang. It is this element that introduces into the Korean equation a hope of overcoming the present deadlock. It is not a secret that arrival of Democrats in the White House both raised alarm in the camp of the South Korean “new right” and strengthened demands within the ruling party to Lee Myung-bak to be consistent in aligning with Washington and as part of it, make conciliatory adjustments in relations with North Korea.38

Still, so far the situation has developed along a different and increasingly disturbing track. The satellite (according to Pyongyang) or missile (according to the West) launch carried out by DPRK on April 5th 2009 and subsequent U.N. Security Council’s statement adopted after tense debates, along with Pyongyang response to it became steps moving backwards the process of Korean Peninsula denuclearization.

Even though western expectations were that Pyongyang, having encountered disapproval of its actions, would “cool off”, the North Koreans did exactly the opposite – in the spirit of their tried tactic of “responding to hardness with super-hardness”. Classifying the U.N. Security Council’s statement as “bandit-like” and “criminal act”, DPRK Foreign Ministry spokesman communicated that in Pyongyang, “they strongly renounce” the action of the UN Security Council because it is a “gross infringement on the state sovereignty”. At the same time, it was announced that North Korea would take the following measures in response:

- Leave the six-party talks and denounce all agreements achieved in this framework
- Explore the possibilities for building its own light-water reactor nuclear power plant
- Strengthen the national nuclear deterrence potential and re-assemble the nuclear installations that were dismantled according to agreements in the six-party framework
- Reprocess the fuel rods that were removed earlier from the 5-MW Yongbyon reactor

The Korean side proposed that IAEA representatives in the Yongbyon nuclear center and American technical experts observing dismantling operations in Korean nuclear facilities leave the country.

What we are observing today is fast escalation of tensions on the Korean Peninsula. So far, everything has been limited to sharp political declarations and threatening words and no one has undertaken any irreversible actions. The hope remains that following some time, after the dust has settled, the situation may return to a normal trajectory.

No one is interested in escalating the situation further. For DPRK this would be fraught with final break of communication with the external world, denial of hopes of receiving assistance;

and for its neighbors – growth of regional unpredictability as well as political and material costs undesirable during the present financial crisis.

Of most concern is the fate of the six-party talks which, having passed through stages of stagnation and crisis, are currently at the edge of final failure. This after five years of intense work crowned with a number of major agreements whose realization brought the Korean nuclear program to a halt. It would be appropriate to recall that, apart from significant political and diplomatic efforts, Russia had made some serious “payments” in the form of supplying DPRK with fuel-grade black oil to the amount of about $150 million. We would not like to see wasted these assets extracted from the Russian economy.

At this point, one thing is clear. The Beijing dialog will probably not re-start until the next few months if only for the reason that for face-saving considerations, it would be difficult for Pyongyang to recall its statement on leaving the six-party talks immediately. Under an optimistic scenario, we can expect that DPRK will turn the issue of its return to the six-party process into a bargaining chip with Washington or possibly, other partners.

However, we cannot exclude a worst-case scenario either, for instance, if the North Koreans opt to go all the way to the end, applying hard pressure on opponents. As soon as DPRK might conclude that the six-party process has exhausted itself and is of no further utility, Pyongyang’s next steps may be removing seals from the radio-chemical laboratory to resume plutonium extraction from spent fuel rods (by expert estimates, this could take from one to three months) and restarting of the disabled nuclear reactor (about one year). If all of this proves insufficient to convince the world in the seriousness of its intent, North Korea may well carry out another nuclear test or new ballistic missile launches.

In pushing DPRK onto this way, of help may be activities of sanctions committee established in accordance with the UNSC resolution 1718. This SC resolution authorizes the Committee to impose further restrictions on the list of goods, individuals and companies subject to already existing bans. It appears that some states are ready to make the most of this situation in order to “punish” Pyongyang. If this kind of activity turns into specific “disciplinary” actions, reaction of the North Koreans is not difficult to predict. On April 17, there was a warning: DPRK’s television broadcast a statement that Pyongyang will regard any new sanctions as “declaration of war” and "the Lee group of traitors should never forget that Seoul is just 50 kilometers away from the Military Demarcation Line."

DPRK’s leaving the six-party talks, if this actually happens, will become a hard blow for the US Democratic administration: the Republicans will justifiably blame the new president’s team for inability to properly manage assets which have been created over the course of many years. The end of the six-party process will be a failure of the Democrats’ proclaimed course in resolution of the Korean problem (normalization of relations with Pyongyang and energizing the six-party talks) and attempts of distancing from the “incorrect” line of the Bush administration. There will be a relapse of an unfortunate tradition whereupon every new US president starts his own Korean policy with a sharp crisis, bordering on a military conflict, in relations with DPRK.

Only a month prior to events under discussion, US Secretary of State Hillary Clinton characterized as a mistake the Republican decision of leaving the “framework agreement” with DPRK which brought about second nuclear crisis and finally the acquisition of nuclear weapon by Pyongyang. And now Washington is close to becoming if not the initiator but at least an

active accomplice in torpedoing the six-party talks on resolution of the Korean Peninsula nuclear problem.

Facing the dilemma of choice between the goal of neutralizing a rudimentary missile program (only three tests in eleven years!) or the actually established nuclear one which had been seriously and productively dealt with by participants of the six-party process, American strategists seem, in part under the pressure of allies, to be once again leaning towards “exemplary punishment” of DPRK for the satellite launch. The US foreign policy elite yet one more time is demonstrating inability to understand the North Koreans’ way of thinking and political culture, mistakenly believing that increase in the Western pressure will sooner compel Pyongyang to come back to the six-party talks. In real life, it happens exactly the opposite way as had been predicted more than once before by knowledgeable Korea experts, some of them American.

It is our deep conviction that in the unfolding alarming situation it is necessary to direct maximal efforts to the salvation of the six-party process. The policy of expanding sanctions and building pressure on Pyongyang is not only unpromising but also counter-productive and dangerous. As happened many times before in distant and not-so-distant past, unilateral hard pressure will induce the DPRK leadership not to terminate their missile and nuclear programs and come back to the negotiation table but, on the contrary, boost these programs and irrevocably lose trust in the six-party talk partners. It will convince the leadership of impossibility of providing for national security and development by diplomatic means. The only outcome of the policy of pressure and regime change will be the final wrap-up of attempts at economic reform started in 2002, strengthening of the position of hawks and orthodox military in the state leadership and concurrent weakening of influence of reformers and technocrats.

In a word, life has over and over confirmed a simple truth that the engagement policy furthers solving the tasks of nuclear nonproliferation in respect to Korea while the policy of pressure and regime change, in contrast, leads to the growth of DPRK’s missile and nuclear potential. Moscow is guided by appreciation of these realities in steering its policy towards preservation of viability of the Beijing six-party talk process on resolution of the nuclear problem on the Korean Peninsula, and, in the long run, achieving there peace and stability. These themes, without doubt, were on the negotiation agenda of Foreign Minister Lavrov during his visit to DPRK in the end of April 2009. It is appropriate to remark that at that as well as previous times, in the most critical crisis moments, Russian Foreign Ministry envoys were first among high foreign officials to arrive in Pyongyang.
The problem of speaking on this subject is that my presentation today is the concluding one and thus should sum up what my colleagues have already offered on the subject before me. I did not see their papers in advance, so there is a danger of repeating, or directly contradicting the views of my colleagues.

Another difficulty is that the very title of my paper seems to contain a hidden assumption that I know the solution for the North Korean nuclear program and even know the timeframe of this solution.

In my view, a direct and concise response to the question implied in the title should contain the following.

The prospects for establishing a nuclear-weapon free zone (NWFZ) on the Korean Peninsula in the short-term perspective appears more than vague and even gloomy. This can be supported by historic experience. I have studied various aspects of nuclear nonproliferation for more than 30 years and have all the grounds to attest that over recent years this problem has become more acute. In the late 70s I was most concerned about the danger of building the nuclear weapons by the apartheid regime in South Africa and achieving a secret access to nuclear weapons by Western Germany. At the present time, the nuclear nonproliferation problem is posed much more gravely because at least four states have acquired a de-facto nuclear status while the nonproliferation regime itself is undergoing a deep crisis. No less bleak is the situation around the nuclear-free zone on the Korean Peninsula. In the end of 1994 our Institute hosted a visit by Admiral Endicott who was an active proponent of creating a nuclear-weapon free zone in this region. In 1994, the well-known US-North Korean Framework Agreement was signed, and the retired Admiral spoke with enthusiasm about a coming nuclear-weapon free zone on the peninsula. He was quite surprised that I did not share his view. Now 15 years have passed, and what do we see? Framework Agreement is deceased; DPRK left the NPT, tested a nuclear explosive device and is not displaying a desire to get a non-nuclear status in a fast and cheap way. All these facts provide foundation for the conclusion on the prospects for the nuclear-weapon free zone.

However, such conclusion bears a rather intuitive and emotional character. I will attempt a further detailed and better structured analysis of this prospect.

First of all, it appears expedient to agree on definitions and consider experience of creation of the already existing NWFZs from the point of view of its relevance to the North Korean situation.

According to the UN definition, nuclear-weapon free zone must meet the following requirements: it “should provide for the effective prohibition of the development, manufacturing, control, possession, testing, stationing or transporting any type of nuclear
weapon”, and these requirements stand both for the states located in this zone (region), and for official nuclear-weapon states that have signed the pertinent treaty.40

It should be noted that when a NWFZ is established, the treaty may contain (besides the baseline ones) some additional requirements related to regulating particular regional issues. They usually include: a call for denuclearization; creating mechanism for verification and assessment of compliance of state parties with treaty provisions; provisions for environment protection, as well as adoption of an additional protocol obligating the five nuclear weapon states to provide negative guarantees – “not to use or threaten to use nuclear weapons against NWFZ states”.

Not counting some minor differences in requirements set for each NWFZ, UN sets forth the following key goals pursued with the creation of NWFZs:

- Strengthening of the international nuclear nonproliferation regime;
- Strengthening of peace and security in the region;
- Strengthening national security of the states of the region;
- Providing instrument for building trust among state parties;
- Reinforcing and complementing other instruments of the nonproliferation regime.

Even without deep analysis of the above goals it is clear that establishment of NWFZs cannot be a momentary action but rather is a long process requiring consistent and durable efforts in achieving consensus by its participants.

As seen from analysis of the process of establishing NWFZs, they are founded on the idea of achieving two main goals:

1. Strengthening the nuclear nonproliferation regime by implementing a set of measures precluding (or making minimally possible) the emergence of regional nuclear rivalry that may eventually result in acquiring of nuclear weapons by a state inside this zone. Thus the regional security is significantly strengthened.

2. It becomes a step towards complete elimination of nuclear weapons at the global level.

Without any doubt, establishment of NWFZ on the Korean Peninsula fits with these goals. But as they say, the devil is in details. The UN definition of NWFZ mentions nuclear weapons, while in the case of the DPRK, we may speak about a nuclear explosive device. Of course it is clear that in this context the difference is minor. But it does exist and it offers to Pyongyang a minimal yet still certain leeway for political games.

I am not involved in the six-party talks so I can provide only a cursory analysis of contention points which may potentially emerge during the process of establishing the NWFZ in this region.

As I understand, in our case we understand the concept of “nuclear weapons” as “nuclear explosive device, and nuclear weapon-grade materials, and installations with sensible

technologies for their production”. It concerns primarily the extracted weapon-grade plutonium, Yongbyon gas-graphite reactor, and radio-chemical laboratory located in the same place. Apart stands the question of existence in PDRK of a fairly large-scale uranium enrichment facility which has been the subject of much talk by American representatives but so far no one has been able to provide persuasive data on its location and much less on its production capacity.

It is possible that in our case, the concept of “nuclear weapons” probably means to at least a part of the American military and political establishment any dual-use facilities or installations even if their capacity does not allow for production of any meaningful volumes of nuclear weapon-grade materials.

Finally, we cannot neglect the problem of “employing” the North Korean specialists directly involved in the military nuclear program. By varying estimates, there may be from six hundred to one thousand people. What can be done about them? Get them employed in South Korea? But this option will hardly find support in Japan, China or the United States.

But even if it were possible to solve all problems related to the definition of “nuclear weapons” in establishment of a NWFZ on the Korean Peninsula, there would emerge a no less complicated problem of monitoring and verification. If respective cases of Yongbyon gas-graphite reactor and radio-chemical laboratory are relatively simple – it is complete dismantling and liquidation, the case of the nuclear explosive device and the volume of produced and extracted plutonium may present considerable difficulty. How can we determine how much weapon-grade plutonium had been produced and extracted, what amounts have been used for nuclear testing and where are the guarantees that Pyongyang did not create a secret cache somewhere set aside for a “rainy day”?

As I see it, no less controversial is the situation with proving the presence or absence of PDRK’s secret uranium enrichment production. We cannot exclude a possibility that in the past, North Korea carried out no more than laboratory research in this area. However, in an atmosphere of mutual distrust it is easy to get a situation described by a well-known Oriental saying: “It is hard to find a black cat in a dark room, especially if the cat is not there”.

Some experts believe that DPRK’s return into NPT, signing and ratification of the Additional Protocol and consent to intrusive inspections could be an effective instrument of control and building trust and transparency. In my view, implementation of these measures would not only require a long time before Pyongyang agrees to intrusive inspections but also place North Korean leadership in a situation of complex choice. DPRK undoubtedly analyzed the outcome of intrusive inspections in Iraq. Then the US were able not only to identify practically all important targets for future air strikes but also get access to key figures in Iraqi military leadership which in many respects predetermined fast defeat of Iraqi armed forces and, in the final count, the execution of Saddam Hussein. Given these considerations, PDRK will hardly give an easy consent to intrusive inspections.

The considerations presented above already give food to sad thoughts. However, there exists a much more serious reason to regard the prospects for establishing the NWFZ on the Korean Peninsula as quite gloomy.

Among key goals for establishing the NWFZs, UN identifies that of strengthening of national security of the states of the region. How can national security of PDRK be strengthened? Or, to put it more accurately, under what circumstances will the national leadership conclude that abandonment of nuclear weapons and establishment of NWFZ is indeed in the national interest of North Korea? The answer is obvious and somewhat of cynical nature. It will be possible if PDRK’s military and political elite is provided convincing guarantees of preserving national

279

Back to the Table of Contents
security (and own security) backed up by considerable economic assistance. In my personal view and the view of most Russian colleagues, we can hardly doubt an assumption that, from the perspective of North Korean leaders, theoretically, such guarantees can be only provided by the United States whom Pyongyang regards as the main threat to the present regime. It is this very aspect that I believe presents great difficulties. I am pressed hard to imagine what “convincing guarantees” might look like under the atmosphere of deep mutual distrust. Without doubt, it should be a legally binding document, perhaps a bilateral treaty with concurrent provision of guarantees by other six-party states and possibly UN. But even in this case the signed document does not look like a panacea to me. We know of recent examples of US unilaterally abrogating treaties – take the AMD Treaty. Mind that in this case the treaty counter partner was Russia and not a much economically and militarily weaker PDRK.

Drawing on the above observations we can make a conclusion that the probability of establishing NWFZ on the Korean Peninsula in the near future seems to be very low.

However, I would not like to conclude my presentation in this low key. In my view, the denuclearization of PDRK is possible but it is going to be a long, gradual, and not easy process. Nevertheless, as one of most critical initial stages I would suggest providing North Korea with a material opportunity to ensure the energy security of the state. As the only real instrument of providing for energy security that can be seriously considered by Pyongyang I would name resuming the construction of two light-water reactors provided North Korea meets the required conditions.

It could be possible to start with energy security and enhance this process by similar steps in other areas (provided Pyongyang complies with an established “code of conduct”) which in the final run could lead to an actual denuclearization of the peninsula and establishment of a regional nuclear-free zone.
Session VII

Chairman:
Anatoly Zrodnikov

Speakers:
Laura S.H. Holgate, Fuel Assurances: Comparison of Current Proposals and Future Prospects

Anatoliy Diakov, The Nuclear Renaissance and Prevention of Proliferation of Technologies for Uranium Enrichment and Spent Nuclear Fuel Reprocessing


Valentin B. Ivanov, Nuclear Fuel Cycle Protection: Russian Option
Fuel Assurances: Comparison of Current Proposals and Future Prospects
Laura S.H. Holgate, Vice President, Russian/ New Independent States Programs, the Nuclear Threat Initiative

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
Fuel Assurances:
Comparison of Current Proposals and Future Prospects
By Laura S. H. Holgate

Nuclear Energy is Growing

- 50% growth in energy demand in next 20 years
- 439 nuclear power plants world-wide
  - 35 under construction
  - 300+ planned/proposed
- Climate change concerns favor carbon-free power sources
Proliferation Risks Also Growing

- Fuel cycle technologies are inherently dual-use
- Barriers to uranium enrichment are lowering
  - Khan network spread technology
  - Centrifuge plants easier to conceal
- More enrichment → more risk of theft/diversion/clandestine production
Why Pursue Enrichment?

- Security of fuel supply
- Value-added product
- Demonstrate technical prestige
- Scientific imperative/inertia
- Nuclear weapons program
- Nuclear weapons “hedge”

How can legitimate desires be satisfied in ways that expose dangerous motivations?
Balancing Energy Security and Nuclear Security

- NPT guarantees access to nuclear technology for peaceful purposes (Article IV)
- Iran defends uneconomic enrichment as security of supply for civilian power

- How can we spread nuclear power without also spreading nuclear weapons capabilities?
Proliferation Resistant Fuel Cycles

- "Proliferation resistance" derived from institutional structures and relationships rather than technology
- Moving away from nationally held fuel cycle facilities to multinational facilities under robust international safeguards
- Interim step: assurances of supply
Fuel Assurances

- Mechanisms to assure nuclear fuel supplies for states with good nonproliferation credentials who experience political disruptions
- Multinational fuel supply approaches not new
  - 1946: Acheson-Lilienthal report
  - 2006: IAEA Special Event on multilateral fuel assurances
- IAEA Statute contains provisions to hold nuclear material on behalf of member states in support of peaceful use
WNA Study: 2006

- 3 layers of fuel assurance
## Multiple Assurance Proposals

<table>
<thead>
<tr>
<th>Source: Arms Control Today, November 2006</th>
</tr>
</thead>
</table>

### NTI’s fuel bank proposal is
- **Different**
- **Compatible**
- **Necessary**

### Table: Multiple Assurance Proposals

<table>
<thead>
<tr>
<th>Problem To Be Solved</th>
<th>Russian Nuclear Centers proposal</th>
<th>U.S. Global Nuclear Energy Partnership (GNEP) initiative</th>
<th>World Nuclear Association (WNA) proposal</th>
<th>U.K. enrichment facilities approach proposal</th>
<th>German Multinational Uranium Enrichment Center (IUA) proposal</th>
<th>Japanese Standby Enrichment Center proposal</th>
<th>Nuclear Threat Initiative proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility</td>
<td>Replacing existing Russian fuel storage facilities with regional fuel banks</td>
<td>Avoiding establishment of new fuel banks in additional regions</td>
<td>Developing a shared element of new fuel banks in additional regions</td>
<td>Ensuring a shared element of new fuel banks in additional regions</td>
<td>Ensuring a shared element of new fuel banks in additional regions</td>
<td>Ensuring a shared element of new fuel banks in additional regions</td>
<td>Ensuring a shared element of new fuel banks in additional regions</td>
</tr>
<tr>
<td>Assurance Mechanism</td>
<td>Multinational fuel cycle programs</td>
<td>Russian enrichment facilities</td>
<td>Collecting enrichment plants, IMABU inspection</td>
<td>Collective inspection of enrichment plants, IMABU inspection</td>
<td>Collective inspection of enrichment plants, IMABU inspection</td>
<td>Collective inspection of enrichment plants, IMABU inspection</td>
<td>Collective inspection of enrichment plants, IMABU inspection</td>
</tr>
<tr>
<td>Eligibility</td>
<td>National States that agree to participate in the program</td>
<td>Supplier state approval of recipients, ensuring of enrichment and repatriation</td>
<td>Supplier state approval of recipients, ensuring of enrichment and repatriation</td>
<td>Supplier state approval of recipients, ensuring of enrichment and repatriation</td>
<td>Supplier state approval of recipients, ensuring of enrichment and repatriation</td>
<td>Supplier state approval of recipients, ensuring of enrichment and repatriation</td>
<td>Supplier state approval of recipients, ensuring of enrichment and repatriation</td>
</tr>
<tr>
<td>Practical Aspects</td>
<td>Designing functional fuel cycle plants in new centers</td>
<td>Task with U.S. technical assistance, technology sharing of funding and sustainability</td>
<td>Implementing inspection collective inspection</td>
<td>Task with U.S. technical assistance, technology sharing of funding and sustainability</td>
<td>Implementing inspection collective inspection</td>
<td>Task with U.S. technical assistance, technology sharing of funding and sustainability</td>
<td>Task with U.S. technical assistance, technology sharing of funding and sustainability</td>
</tr>
<tr>
<td>Roles of IAEA</td>
<td>Establishing regional enrichment programs, safeguards</td>
<td>Management, approval, safeguards</td>
<td>Approve design and operation of reactors, manage fuel enrichment</td>
<td>Management, approval, safeguards</td>
<td>Approve design and operation of reactors, manage fuel enrichment</td>
<td>Management, approval, safeguards</td>
<td>Management, approval, safeguards</td>
</tr>
<tr>
<td>Roles of Industry</td>
<td>Performing fuel enrichments at designated centers</td>
<td>Performing fuel enrichments at designated centers</td>
<td>Performing fuel enrichments at designated centers</td>
<td>Performing fuel enrichments at designated centers</td>
<td>Performing fuel enrichments at designated centers</td>
<td>Performing fuel enrichments at designated centers</td>
<td>Performing fuel enrichments at designated centers</td>
</tr>
</tbody>
</table>
Russian Proposal: Angarsk Enrichment Center

- Angarsk Electrochemical Combine
  - 10% of Russia’s SWU production capacity
  - Never part of weapons production cycle

- International Uranium Enrichment Center (IUEC) announced in 2006
  - Partner states can “buy in”
    - Guarantee LEU supply
    - Participate in profits from sales
    - No access to enrichment technology
  - Kazakhstan and Armenia have joined
  - IAEA asked to safeguard LEU storage

- Includes “bank” of LEU for IAEA use
  - 2 cores
  - Owned by Russia, transferable to IAEA based on prior agreement
German Proposal: Multilateral Enrichment Sanctuary

- **New enrichment plant**
  - Multilateral ownership
  - Located on coastal extraterritorial site in nuclear “newcomer” state
  - Designed, built and operated by current enricher
    - No access to technology for host state or plant owners
  - International safeguards
NTI Proposal: Sept 2006

- NTI offers $50 M to IAEA to create LEU “fuel bank,” if:
  - Matched by $100 M from member states, in cash or in kind
  - IAEA takes steps to create the bank within 2 years
- All other conditions to be defined by IAEA and member states
IAEA Fuel Bank Proposal

What it is:
- Incentive
- Based on choice
- Last-resort
- Small
- LEU as UF6
- Transparent
- Reliable

What it isn’t:
- Constraint
- Abridging rights
- Market alternative
- Fabricated fuel
- Political
Key Questions

- Reserve contents
- Bank location
- Access conditions
- Pricing
- Fuel fabrication
- Export control
- Matching commitments
Reserve Contents

- Low enriched uranium \(\rightarrow\) not weapons usable
  - 4.95% enriched
- Most flexible form = UF6
  - Beneficiaries unknown at time of creation
- At least one full reactor core = 50-60 MT for typical 1000 MWe reactor
  - Potential users may insist on more
  - Commercial firms concerned about a large bank
- LEU purchased by IAEA
  - LEU blended from HEU highly desirable but not necessary
  - National “flags” may limit impact
Bank Location

- **Outside 6 major suppliers**
  - US seen as politically risky supplier
  - “Big 6” linked diplomatically → a problem with one can become a problem with all

- **Existing nuclear infrastructure**
  - Technical capacity
  - Regulatory maturity

- **Good nonproliferation & nuclear safety record**
  - IAEA safeguards/Additional Protocol?
  - CPPNM as amended?
  - CNS?

- **Candidates**: Sweden? Switzerland? Kazakhstan? South Africa?
Access Conditions

- **Enrichment status – KEY ISSUE**
  - Some say “forswear/forsake/enrichment”
  - Others say any distinction limits “rights”

- **IAEA members or NPT signatories?**

- **Good nonproliferation record**

- **IAEA safeguards**
  - Additional Protocol?

- **Clear, objective, nonpolitical**

- **IAEA decision-making mechanisms**
Pricing

- **Fuel bank is not charity or subsidy**
  - Bank users will have market-based fuel contracts and means to pay
  - Not an alternative to market

- **Payment basis**
  - Contract price
  - Index to market
  - Other?

- **IAEA uses payment to replenish bank after use**
  - Market adjustments
Fuel Fabrication

- UF6 will require fuel fabrication based on user’s reactor specs
- LEU disruption may or may not affect fabrication services
  - Some redundancy in fabrication providers
  - Likely to grow over time
- Manageable with planning
  - Advance contracting/regulatory provisions by user as part of secure supply program
  - “Line jumping” premium to ensure timely delivery
Export Control

- Complex system of national and international limits on nuclear materials transfers to ensure peaceful use
- Key issues: reliability and timeliness
- IAEA-owned material still governed by laws of bank host nation or fabricator
- Manageable with planning
  - “Deflagging”
  - Pre-granted licenses
  - NSG revisions
Matching Commitments

- All fuel suppliers have stake in creating effective fuel bank – including through financial support
  - Reinforce market
  - Limit competitors
- Pledges exceed matching requirement: $107M
  - US: $50M appropriated to DOE in FY08 – already transferred to IAEA
  - Norway: $5M, February 2008
  - UAE: $10M, August 2008
  - EU: €25M ($32M), December 2008
  - Kuwait: $10M, March 2009
March 2009 BOG

- Kuwait pledge exceeds matching requirement
- Russian paper on Angarsk
- Statements of support from many states, but continued concerns from G-77
- Strong appeal from DG ElBaradei
- DG will prepare specific proposals on Angarsk and IAEA banks for June 2009 BOG
Hard Questions

- Will BOG decision occur before NTI deadline (September 2009)?
- Will potential users see the benefits?
  - For their own use (or not)
  - For the nonproliferation regime
- How should the small-scale enrichers be treated?
  - Argentina, Australia, Brazil, India, Iran, Japan, Pakistan, South Africa
- How will NSG treat fuel banks?
Example

- Vietnam contracts with Areva for reactors and fuel supply
- French-Vietnamese trade dispute causes Areva to cancel fuel delivery
- Vietnam unable to identify other commercial suppliers
- Vietnam requests assistance from IAEA
- IAEA considers request and approves LEU provision from fuel bank
- LEUF6 sent to fabricator
- Fuel delivered to Vietnam
Today, many countries are turning towards the nuclear energy option to satisfy their growing energy needs. Factors stimulating the growing interest in nuclear energy include limited stocks of hydrocarbon fuel and its costs, the need to reduce climate change emissions as well as significant improvements in reactor technologies. Since the time of the Chernobyl disaster, the reliability and efficiency of nuclear energy reactors has substantially increased. Hence, today the capacity utilization factor for most nuclear stations amounts to 90 percent, while in the 70s of the last century it used to be around 50. As a result of implemented improvements, the installed capacity of existing reactors increased by 20 percent, and their service life now extends to 60-70 years.

There are 439 nuclear power reactors with total combined capacity of 375 GWe operating in the world today. According to an IAEA projection, by 2030 the pessimistic scenario for combined capacity of nuclear energy stations worldwide would be around 473 GWe, and the optimistic one around 680 GWe. The most intensive plans for nuclear energy production are being developed in China, India, Russia, as well as South Korea and Japan.

It may be suggested that as a result of the current global energy crisis, projections of the nuclear energy production could be adjusted. For example, South Africa has abandoned the plan of building a second nuclear plant. At the same time, China declared intentions to build by 2030 70 GWe of installed capacity instead of an earlier target of 40. India also intends to raise the installed capacity from the existing 4.12 GWe to 63 GWe in 2030. Russia was planning the construction of 42 reactors by 2030, including activation of 11 new blocks by 2015. However, it cannot be entirely ruled out that these plans may yet be revised.

The number of countries that have requested IAEA consultations and technical support in the development of domestic nuclear energy is a reflection of interest in the nuclear energy. By the end of 2008, this number was 49. On the other hand, only 26 of those states have any initial projects for building their own nuclear energy blocks. Of these 26, only 6 countries – that is Bangladesh, Belorussia, Indonesia, Iran, Turkey and Vietnam – have more or less concrete projects.

An anticipated broader spread of nuclear energy projects may potentially lead to proliferation of nuclear fuel cycle (NFC) technologies. In this connection, of special concern is proliferation of fissile nuclear materials technologies. Front-end components of NFC as well as spent nuclear fuel (SNF) reprocessing are exactly same as technologies for production of weapon-grade fissile materials. In this way, a state possessing uranium enrichment or spent fuel reprocessing facilities may be also capable of creating nuclear weapons. North Korea provides a convincing example. Due to this circumstance, it is a common understanding today that the greatest risks to the nuclear nonproliferation regime are related to proliferation of SNF
technologies. In words of IAEA Director General El Baradei, the nuclear fuel cycle is the “Achilles heel” of the nonproliferation regime.1

As of today, several states have claimed their right to acquire these technologies. This is indeed a right accorded to states by the Nuclear Nonproliferation treaty (NPT).

As is well known, the NPT does not preclude peaceful development and use of nuclear energy. Article IV reads that “Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes”.

However, NPT not only provides for the right to peaceful use of nuclear energy but also places upon parties certain clear-cut obligations.

According to NPT Article II, “Each non-nuclear-weapon State Party to the Treaty undertakes <…> not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices <…>”.

Article III commits state parties “to accept safeguards <…> with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons <…>”.

The presence in the NPT of the right to develop the NFC, which is regarded by some as a “gap in the nonproliferation regime”, combined with some recent cases of breach of obligations by some states and individuals, unavoidably raises questions about whether the NPT is compatible with the goal of nonproliferation and whether it is capable of adequately protecting the international security from emerging threats.

A broad use of nuclear energy and the states’ right to the NFC technologies call for solutions which, on the one hand, would prevent proliferation of sensitive nuclear technologies, and, on the other, ensure access of interested states to external sources of NFC services and products.

On possible ways of solving this problem:

It may seem that the solution of the problem should lie in the following two directions:

One of them posits that the states forfeit acquiring the uranium enrichment and SNF reprocessing technologies if they do not possess them at this time under the condition of guaranteed access to NFC services and compliance with all NPT obligations. This was the essence of President Bush proposal of 2004.

However, this option does not stand a chance of realization, at least in the near future. Moreover, its realization as of now would have even been counter-productive to the strengthening of nonproliferation regime because it requires a revision of the NPT, or in other words, “opening” of the Treaty. This way entails introduction of one more discriminatory division of state parties into those allowed to possess NFC and those that are not, in addition to one already in place – that between the “legitimate” nuclear and non-nuclear states. Given the reluctance of non-nuclear states to accept additional limitations of NPT, it would be difficult to count on the success of the negotiation process with participation of 140 state parties. Many states believe that limitations on technologies development should be universal for all states of the world community but not imposed for some and lifted for others.

The second direction is connected to the transition to innovative nuclear energy industry supporting the stability of the nonproliferation regime by means of its inherent technological properties. Apparently this way requires the development of new types of energy reactors and fuel cycles. At present, a number of international projects are doing work in this direction (INPRO, Generation IV, GNEP+ANFC). Still, we can only count on creation and use of such
technologies in a distant perspective. So, even given the fact that we can expect the actual broad use of nuclear energy in novice states not earlier than 2020-25, it is most probable that they will be using the existing technologies, that is, light water reactors (LWR) and corresponding nuclear cycle technologies. Therefore, we need to look for other ways that, given the 60-to-70-year life cycle of today’s reactors, would provide a solution of the problem for the duration of the next century.

As many experts believe, a solution for the problem of nonproliferation of NFC technologies in the context of projected rise in the number of states using nuclear energy could be possible along the following tracks:

- Setting up institutional barriers;

- Ensuring a guaranteed supply of NFC services;

- Offering of various stimuli to the novice states by nuclear technologies supplier states

As a whole, these measures, without recourse to legal barriers against the development and use of nuclear energy by novice states, would stimulate their voluntary opting-out of acquiring the NFC technologies.

Institutional barriers should entail adoption by novice states of obligations without which they could not expect to get support from the supplier states. These obligations should include:

- Adoption and ratification of the 1997 IAEA Additional Protocol on safeguards;

- Joining the Vienna Convention on Civil Liability for Nuclear Damage;

- Setting up of legislative base and operation infrastructure required for safe peaceful use of nuclear energy and guaranteeing compliance with nonproliferation obligations by novice states

A relatively short time ago, IAEA prepared and published a document entitled “Milestones in the Development of a National Infrastructure for Nuclear Power”. It lays out main infrastructure components needed for a state that wishes to develop peaceful uses of nuclear energy. Probably, the decision about the preparedness of a state to develop nuclear energy should be taken by IAEA.

To prevent the novice states from perceiving these requirements as yet another discriminatory regime, it would be advisable for nuclear states to extend the 1997 Additional Protocol to their own nuclear civilian infrastructure.

Among the motives pushing states to acquire NFC technologies, energy security should be considered the most important. Therefore, ensuring the guaranteed supply of the entire range of civilian nuclear fuel cycle products and services and, above all, uranium and enrichment services, is the critical task in preventing proliferation of sensitive NFC technologies. Without providing these guarantees, it would be difficult to expect states (especially those considered “troublesome”) to readily give up their domestic enrichment facilities.

It is important to note that from the very start of the nuclear energy industry, the uranium and nuclear fuel market has demonstrated a high standard of supply reliability. The existing world uranium enrichment capacity is currently higher than the demand. Given motivation and potential capabilities of the market participants, it could be suggested that in terms of its
technological and economic possibilities, this market will be able to meet the demand for these services under any scenario of the world nuclear energy industry development.

At the same time, the risk of denial of access to NFC market services still exists, mainly on political grounds. So, there is a need to create such set of conditions under which any customer strictly observing the nonproliferation regime obligations would hold reliable guarantees of access to NFC services.

In the opinion of the World Nuclear Association experts, the provision of such guarantees would involve designing and implementing a set of activities aimed both at reinforcement of the existing NFC services market and providing guarantees for economically profitable purchase of these services on the international market to any state that uses nuclear energy and has forgone the acquisition of sensitive technologies. These activities include:

- International guarantees of fuel supply (1996 initiative of 6 states – France, Germany, Netherlands, Russia, USA, and UK);

- Setting up of reserves of enriched uranium (fuel bank) under the aegis of IAEA (Nuclear Threat Initiative 2006, Russian initiative of 2007);

- Setting up of a multilateral nuclear fuel cycle mechanism (proposal of IAEA Director General El Baradei) which can be realized through conversion of existing national NFC facilities into facilities under multinational control (Angarsk enrichment plant) or building new regional multinational centers. E.g., for Pacific and South Asian region countries, such center could be built in Australia which possesses large reserves of natural uranium. Another center could be created for the Middle Eastern and Mediterranean states.

It is also necessary to create mechanisms that would stimulate novice states to forego acquiring their own NFC technologies. This could be realized through:

- Offers of financial assistance and help in building the nuclear energy infrastructure;

- Supply of reactors and use of reactors in the “black box” mode. E.g. supply of small-capacity reactors for sea water distillation (floating power plant);

- Offer of “package” contracts. These contracts could link supply of energy reactors with supply of fresh fuel and return of spent fuel for the duration of the entire life cycle. AtomStroyExport contract to build the nuclear plant in Iran can be an example of such package agreement. In accordance with the intergovernmental Russian-Iranian agreement, Russia has taken obligations to supply the fresh fuel and take back the SNF during first 10 years of the Bushehr plant operation. The attractiveness of these arrangements for novice states lies not only in guaranteed supply of fresh fuel but also the absence of the problems related to dealing with SNF, which removes major barriers to national programs of nuclear energy development.

Conclusion

I believe that consistent substantive realization of this strategy approved by all NPT state parties would respect national legislation and international obligations of nuclear supplier states. Without restricting the rights of novice states, it could offer material value in realization of their plans of using nuclear energy to meet their energy needs.
U.S. – Russian Nuclear Technical Cooperation: Past and Future
Arian L. Pregenzer, Senior Scientist of the Cooperative Monitoring Center, Sandia National Laboratories

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
U.S. / Russia Nuclear Technical Cooperation
Past and Future

Presented at
The 2nd U.S. – Russian Nuclear Non-Proliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, March 18 - 20, 2009

Arian Pregenzer
Sandia National Laboratories

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy’s National Nuclear Security Administration under contract DE-AC04-94AL85000.

Back to the Table of Contents
Introduction

- US / Russian Federation (RF) technical cooperation will continue to be essential for reducing the threat of nuclear / radiological proliferation and terrorism

- Past cooperation covered broad range of topics
  - US/RF arms control
  - Securing nuclear weapons and material
  - Prevention of nuclear material smuggling
  - Limitations in quantity and production of weapons fissile material
  - Defense conversion
  - …

- Future cooperation should be structured to take into account
  - Changing priorities of US and RF governments
  - Evolution of the US-RF relationship
  - Changes in the global security environment
Timeline for US / Russia Nuclear Technical Cooperation

Technical measures to verify arms control
- Test limitation treaties
- INF Treaty
- START

S&T
- Pulsed power
- Fusion

Technical options for future arms control
- Warhead storage monitoring
- Warhead dismantlement transparency
- Excess fissile material monitoring (tri-lat initiative)

Technical measures for US / RF treaties or agreements

Technical options for multilateral agreements or treaties

Technical US/RF Confidence Building Measures (CBMs)

Adversaries

1991

U.S. Assistance

2009

Partners

Nuclear weapons safety and security
- Transportation
- Sites / facilities

Nuclear material security
- Facilities
- Borders

Material quantity and production limitations
- Pu disposition
- HEU blend-down / transparency

Defense conversion
- S&T for NW personnel
- Nuclear institute / industry partnerships

Technologies for combating terrorism

Radiological source security

Global nuclear weapons safety and security

Global missile proliferation

Global nuclear energy safety and security

Global nuclear detection

Back to the Table of Contents
### Future Options

**Arms Control / Confidence Building**

#### US/RF Arms Control

- **Focus on potential treaties in the 3 – 10 year time horizon**
  - Anticipate reductions to “small” numbers

- **Evaluate technology gaps and possible monitoring requirements**

- **Jointly develop and demonstrate technical measures**
  - Build on previous WSSX activities

- **Possible technical focus areas**
  - Non-deployed warheads
  - Warhead accounting
  - Warhead dismantlement
  - Nuclear production infrastructure
Future Options
Arms Control / Confidence Building

Multilateral Arms Control

• Fissile material production cutoff
  - Joint development, testing and demonstration of monitoring options
    • Classified material (build on Trilateral Initiative)
    • Naval fuel production
    • P-5 activities?

• Multilateral nuclear arms reductions
  - US/RF leadership of multilateral efforts to evaluate technologies for monitoring deep cuts in nuclear arsenals globally
  - US/RF cooperation to establish a “Dismantlement Laboratory”
Future Options
Arms Control / Confidence Building

US/RF Confidence Building

• CTBT
  ▪ Development, testing, and evaluation of nuclear test site transparency measures
  ▪ Could ease ratification of CTBT in U.S.

• Missile Defense
  ▪ US/RF joint evaluation of the global missile threat (existing capabilities and proliferation potential) and possible responses
    • global INF
    • missile defense
  ▪ Development and testing of technically-based CBMs for missile defense sites in Europe

Back to the Table of Contents
Future Options  
Preventing and Responding to Proliferation and Terrorism

**Nuclear Weapons Security**

- Creation of US/RF working group to evaluate the evolving global threat to nuclear weapons
- Evaluation of technical options for addressing the threat
  - Site security
  - Weapons security
  - ...
- Demonstration of security systems to address evolving threat
- Development of principles and guidelines for global NW security
- Leadership of development of global nuclear weapons security principles and guidelines

**Nuclear Emergency Response**

- Evaluation of international nuclear weapons and/or material search and recovery capability
- Joint development of Russian MOD Emergency Response Center
Future Options
Preventing and Responding to Proliferation and Terrorism

Nuclear Energy Security

• Development and demonstration of real time remote monitoring for sensitive nuclear fuel cycle technologies
• Development and demonstration of international safe and secure spent fuel cycle management, including take-back and interim storage

Nuclear Detection

• Joint evaluation of requirements for nuclear detection to counter nuclear terrorism globally
• Simulation or demonstration of nuclear detection architectures
Lessons Learned from Past Technical Cooperation

- Focus on most important common problems
- Obtain commitment at the highest levels on both sides
- Insulate technical programs from political issues
- Develop a clear legal framework for cooperation
- Maintain consistency of personnel: success depends on strong personal relationships that can take years to develop
Questions to Guide Future Technical Cooperation

• What are the major shared security challenges between the US and Russia?

• What are the highest priorities for addressing these challenges?

• Where could technical engagement or collaboration have the greatest impact?

• How can we structure future US/Russia nuclear security technical cooperation to survive the current economic crisis?
Nuclear Fuel Cycle Protection: Russian Option
Valentin B. Ivanov, Chief Researcher at the Institute of Ore Deposits, Geology, Petrography, Mineralogy and Geochemistry; Russian Academy of Sciences

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
Sources of Proliferation from Nuclear Fuel Cycle

- Enriched uranium (Technology of enrichment)
- Extracted plutonium (from reprocessing)
- Extracted minor actinides (from reprocessing)
- Spent fuel (material for dirty bombs)
- Accumulated plutonium (blankets of breeder reactors)
- Weapon grade uranium and plutonium in store
Ways for Protection

- Safeguards (IAEA)
- International account and control system
- Fuel leasing
- Leasing of nuclear power plants
- Nuclear islands
- Technical and technological protection. (New generation of NPP and new fuel cycle)
International Account and Control Systems

- Status of national account and control systems
- Problems of national systems
- Problems of international system implementation. Legislation, techniques, metrology, methodic, center of control, accept to information
- Ideas for implementation:
  - Control of international transport of fissile and radioactive materials out of balance zones;
  - Intellectual containers (system of satellite based recognition);
  - International legislation development
Control of international transport of fissile and radioactive materials
Leasing of Fuel

- Russian legislation for nuclear fuel leasing
- International SNF storage
- Problems:
  - Absence of the international detailed legislation and precedents;
  - Lack of 123 Agreement RF-USA;
  - Time of cooling;
  - Remained suspicions because of bilateral contracts
- Bushehr fuel leasing
SNF storage sites in Russia

**Russian SNF storage:**
Krasnoyarsk Mining and Chemical Combine

**International SNF storage:**
Krasnokamensk, Chita region
Leasing of Nuclear Power Plants

- Small NPP as a power source in remote locations for isolated energy system (nuclear "battery"). Also it’s effective for water desalination
- Projects: Russia (Uniterm, ABV-6m, SVBR); USA (Hyperion, NuScale); Japan (Toshiba 4S)
- Modular design, integral nuclear reactor is delivered factory sealed, never opened on site, the material inside would not be appropriate for proliferation purposes
Nuclear islands

Fast reactors

NPP units

Spent fuel

Reprocessing (regenerating) plant

Fuel assembly contains minor actinides and fission products

Radioactive wastes

Wastes temporary storage

With decommissioning

Wastes final repository

Depleted uranium
Technical and Technological Protection

- Loaded fuel: U-238 + Pu-239,240 + minor-actinides + maximum allowable amount of fission products.
- Unloaded fuel: U-238 + Pu-239,240 + minor-actinides + fission products.
- Waste arising from reprocessing: minimum allowable amount of fission products, traces of fissionable elements, U-238, products arising from reprocessing of working medium and spent equipment.
- Materials for final disposal: almost all the waste arising from reprocessing. (In case of implementing the Th-232 and U-233 based fuel cycle, which is not technologically developed now, the material flows will be different).
Flow-chart of U-Pu Fuel Industrial Line for the BN-800 Reactor

MAYAK plant

MOX fuel production complex

MOX fuel

MOX Fuel Production by Pyroelectrochemical Method

RIAR

Production of Vibropacked fuel elements with MOX fuel

Fuel assembly production

Back to the Table of Contents
Utilization of WWER-1000 and RBMK Reactors’ SNF in the New Generation Fast Breeder Reactors’ Fuel Cycle

WWER and RBMK SNF Storage Complex

Fuel Assembly Production

Pyroelectrochemical reprocessing with extraction of PuO₂ granulate

Fuel decladding and pellets crushing

PuO₂ granulate

UO₂ granulate

Vibropacked fuel elements production from PuO₂ and UO₂ mechanical mixture

PuO₂

Power-grade PuO₂ Storage Complex

FBR fuel assembly

Wastes Preparation and Storage Complex

FBR

Back to the Table of Contents
Implementation prospects for BN-800

Combination of pyroprocess and vibropacking technology are proposed as basis for creation of BN-type MOX fuel productions and recycling in different scenarios.
Safety Analysis of Fuel Cycle Processes

- **Key aspects of safety**: water and organic solvents are not used; all chemical operations are performed in one closed-circuit apparatus; the reprocessed product is almost ready for use after removal from the apparatus; HLW is in the compact solid form; unification and compactness of equipment; simple control scheme.

- **Radiation safety**: crystalline base of the product; working medium is molten mixture of chlorides; only concentrated materials are involved in the process.

- **Nuclear safety**: no moderators and reflectors of neutrons; uranium and plutonium are as oxides or chlorides only; the processes are performed discretely; impossibility of spontaneous chain reaction in case of severe accidents.

- **Technical and chemical safety**: no radiolysis of chemical medium; no fire-hazardous equipment elements; explosive gases and substances are not used; recovery and recycle of chlorine is provided.

- **Non-proliferation safeguards**: arrangement in shielded cells, remote and automated control; chemical stability of the pyrochemical product; principal of technology based on batch processes.
WHAT WE HAVE NOW:
Good results of test on MOX-MOX reprocessing

- Three processes combined from the same operations (dissolution and recovery)
- Equipment and ways for improvement
- New understanding of MA behavior and methods for their partitioning
- Initial data on wastes (glass form and ceramic as additional option)
- Understanding of decladding procedures (but only old demo-tests)
- Methods for refabrication (some technical arrangements)
- Tested methods and new ideas for analytical control
Flow Chart of Recycle Products Formation and Movement

**Category A**
- Decontamination of equipment
- Samples return
- Rejected fuel
- Salts return

To pyrochemical reprocessing

**Category B**
- Equipment
- Steel granules
- Cover and filter of Chlorinator-electrolyzer

Decontamination, decontaminating solution evaporation (or sorption)

- Dry residual
- Steel waste

To special reprocessing

Crushing and burning

Pyrographite

Ash

Dust from hot cells
Capabilities of Technologies of Minor-actinides Inclusion in Fuel Elements

- **Neptunium inclusion in oxide nuclear fuel** (pyroelectrochemical method of uranium, plutonium, and neptunium oxides deposition from molten chlorides, obtaining of fuel in the crystal form suitable for vibropacking, homogeneous neptunium distribution in fuel). This allows obtaining (U, Pu, Np)O₂ compositions containing up to 10% of neptunium with neptunium and plutonium content not higher than 40-45% of the total mass).

- **Americium and curium inclusion in oxide nuclear fuel** (possibility of including up to 5% of americium in oxide fuel during the pyroelectrochemical reprocessing has been studied; several methods have been proposed but not tested on a pilot-industrial scale: sintering-crushing, pyrohydrolysis of uranium hexafluoride with a seed of an americium oxide particle).

- **Designing of the fuel pin with mixed vibropacked neptunium containing fuel** (fuel pins containing uranium dioxide and 5% of neptunium are still under irradiation in the BOR-60 reactor, a burnup of 13.1% is achieved, the fuel pin with neptunium and mixed fuel has been designed).

- **Designing of the fuel pin with mixed vibropacked americium and curium containing fuel** (several options of the source compositions: mechanical mixture of dioxide granulates after pressing, sintering and crushing; granulate obtained by pyrohydrolysis using the seed of actinides; mixtures of granulates obtained by pyroelectrochemistry).

- **Designing of the facility for reprocessing of spent fuel with included actinides** (the reprocessing flow chart has been developed).
Pouring into containers, sealing

Induction melting

Phosphate waste

Spent salts

Waste of traps with ceramic materials

Grinding

Charge

Induction melting of glass (alumofluorinephosphate)

Induction melting

Glass

Glass Ceramics

Pouring into containers, sealing

For storage

Flow Chart of Waste Vitrification and Glass Ceramics Preparation
Self-protection of Spent Fuel of the BOR-60 Reactor due to Gamma-irradiation

Pyroelectrochemical process

- Initial BOR-60 SNF, 25.7 W: 3.3 kg
- Electrolyte 25.7, W: 13.6 kg
- PuO₂ 5.2, W: 0.5 kg
- UO₂ 3.8, W: 2.0 kg

Gamma intensity, W

Radiation dose per 1 m, Sv/h

Limit of self-protection
Prospects of Complete Use of Separated Plutonium and Accumulated SNF during the Period of Transition to the New Fuel Cycle

- BN-800 startup
- Startup of the SNF reprocessing plant
- BN startup
- SNF in the storage facility
- NO SNF in the storage facility

- 38 Kt of SNF
- 40 t Pu
- 34 t of Pu
- 14 Kt of SNF

- 2003
- 2012
- 2025

Back to the Table of Contents
Conclusions

- All the ways nuclear fuel cycle protection against proliferation should be developed and implemented
- Key results can be received due to technical and technological protection
- Only close international cooperation – real way to success
Session VIII

Chairman:
Siegfried S. Hecker

Speakers:
Alexander Kalyadin, Counter-Proliferation and a Role of the UN Security Council, Proliferation Security Initiative

Michael Levi, Dealing with the Threat of Nuclear Terrorism

Elina Kirichenko, First Line of Defense: Legislative Base of Physical Protection, Accounting and Control of Nuclear Materials (NMPC&A) and Russian National System of Export Control

Mark Mullen, Model Guidelines for Nuclear Detection Architectures
The world is going through a series of deep transformations, some of them directly related to an increased threat of WMD proliferation, which requires a more precise identification of priorities and objectives in the area of nonproliferation and state cooperation on this issue.

The problem is most critical in the nuclear sphere. The Nonproliferation Treaty (NPT) has sustained an assault of a range of destabilizing factors. Today, as never before, the NPT regime is vulnerable to new challenges and stands in need of more rigorous administration.

Maintaining the viability of the NPT regime poses as a major task in a revised Foreign Policy Concept signed by President Medvedev in July 2008.

US President Obama also named this problem as one of the most critical foreign policy priorities of the US. Thus, both Moscow and Washington have affirmed their commitment to strengthening the nonproliferation regime. This issue is acquiring a certain additional context and we hope that Moscow and Washington will now be finding more points of agreement to strengthen the nonproliferation system with the support of UN and international law. It should be stressed that greater control over preventing the WMD from falling into the hands of non-state actors and combating the nuclear terrorism are priorities of Russian-American cooperation in the nonproliferation sphere. Russia and the US are two states which can consolidate the efforts of the international community in setting barriers against proliferation of means of mass destruction.

Resolving these problems require, above all, a boost of collective effort in finding political and diplomatic solutions (dialog, diplomatic talks, compromises, reciprocity, peaceful settlement of disputes between states, appropriate procedures and methods of conflict resolution). At the same time, in the contemporary environment, an important supplemental role should belong to hard enforcement of the NPT regime and appropriate legitimate collective counter-proliferation measures.

In recent years, circumstances emerged that require making the nonproliferation compliance enforcement system more effective.

The international community has been confronted with breach of obligations not to acquire nuclear weapons and attempts to use the NPT membership as a political cover for illegitimate nuclear programs and easier access to dual-purpose technologies and materials. Moreover, “traditional” challenges and threats are now complemented by the new ones – “black markets” in nuclear materials and equipment, possibility of terrorist access to WMD, delivery systems, and related materials and technologies.

Under the conditions of globalization and the current global financial crisis, these risks have increased. To control them, we need new international procedures and means of preemption or enforcement, including additional restrictions within existing nonproliferation regimes.
The international community is facing specific tasks which are conceivably impossible to be solved by traditional means based solely on nonproliferation treaties and corresponding mechanisms or export control forums. We need multilateral measures that would enable us to effectively combat WMD “black market” dealers, terrorists seeking to get hold of WMD, and threats arising from the “problem states” in breach of the NPT regime.

**The PSI track**

One of these instruments is the Proliferation Security Initiative to combat WMD trafficking launched by the US in May 2003.

The PSI objective is “to establish a more coordinated and effective basis through which to impede and stop shipments of WMD, delivery systems, and related materials flowing to and from states and non-state actors of proliferation concern”.

Targets of interdiction activities are states and non-state entities involved in WMD proliferation (through efforts to develop or acquire WMD or transfers of related materials, etc.)

Specific tasks of the Initiatives are met by a range of measures. They include: exchange of information concerning suspected proliferation activity; dedication of appropriate resources and efforts to interdiction operations and capabilities; coordination among participants in interdiction efforts; work to strengthen when necessary relevant national legislation and international law to support PSI objectives.

The Initiative envisages measures to interdict proliferation activities: in particular, providing consent to the boarding and searching of a state’s own flag vessels by other states, and to the seizure of WMD-related cargoes; actions to stop and/or search any vessels in their internal waters and the identified cargoes; enforcing these conditions on vessels entering or leaving state’s ports, internal waters or territorial seas; denial of use of states’ territorial facilities as transshipment points, including the seizure of WMD-related cargoes.

The Initiative is not an international forum or organization; rather, it is oriented to “collaborative practical effort” of interested states. The Initiative participants collaborate with many other states outside of the PSI framework. Specific activities are implemented by state partnerships based on joint agreements.

An important PSI area is holding exercises on interdicting illegitimate WMD transfers. PSI operates without a charter, headquarters, chairman or budget. The total number of states supporting the PSI is more than 90.

Russia joined the PSI on May 31, 2004. It is believed that on the whole, PSI strategic ends and tasks meet national interests of the Russian Federation. The decision to join the PSI was aided by adoption of the UNSC Res. 1540 on nonproliferation which laid out a legal base, principles, and mechanisms for combating the “black markets” in WMD and related materials.

Russia bases its PSI participation on a number of principles. They comprise compatibility with the norms of international law (and in particular provisions of international agreements in nonproliferation and export control) and national legislation; accord in threat assessments and voluntary nature of decision making; non-interference with legitimate economic and technical cooperation; utilization of nonproliferation potential of the UN and other international institutions and mechanisms; a lack of a bias against any individual state. In counter-proliferation efforts, Russia puts emphasis on the leading role of the UN.

The PSI framework sets up operational partnerships, including in exchange of information and national capacities in interdiction operations. Exercises on interdiction of
illegitimate WMD trafficking are held regularly. Ongoing is work on improving the legal base of interdiction, including with countries outside of the PSI.

Russia is an active participant of the PSI operational Expert Group (OEG) meetings.

PSI mechanisms, including those for exchange of sensitive information and combating the WMD and related materials proliferation networks can be employed to disrupt the WMD and related materials trafficking into the Russian and post-Soviet territory. Russian efforts in this area are focused on strengthening control over the entire territory, territorial waters and air space of the Russian Federation. Obviously, Russia has been and will be handling these tasks independently and in close cooperation with its neighbors.

A deeper Russian involvement in PSI activities could be of special significance for the success of this multilateral counter-proliferation effort because Russia is a power possessing both nuclear weapons and stocks of fissile materials and thus holding special responsibility for their safety. Besides, Russia borders zones of higher WMD proliferation concern (from the Middle East to the Korean peninsula) and is capable of major contribution to development and implementation of the PSI activities.

PSI is increasing its visibility in a variety of international formats.

It has been mentioned in G-8 documents; and its elements have been included in UNSC resolutions. PSI issues are being discussed in the International Maritime Organization, The International Civil Aviation Organization as well as multilateral export control regimes. PSI has become an element of the global nuclear order and a widely accepted enforcement instrument applied under pre-specified conditions.

But much has yet to be done to strengthen the potential of PSI member states in the military and law enforcement area, and especially intelligence and rapid identification and neutralization of wrong-doers. An important problem is adjusting the international nonproliferation strategy to new conditions.

In particular, it is very important to achieve a qualitatively new level of cooperation between the intelligence, military, and law enforcement agencies of the Russian Federation and the US. This sphere of cooperation is subject to certain restrictions and stands in need of further formalization of interaction and clear definition of procedures. A positive “reset” of the American-Russian relations could bring respective policies of dealing with potential proliferators closer to each other and activate interaction in this area, which could open new horizons and possibilities for effective and legitimate (both bilateral and multilateral) activities, including bans, sanctions and punishments, in countering the WMD development programs.

Coercive actions in respect to repeated proliferators are acceptable and necessary, but such actions should be coupled with the prerogatives of the USSC and carried out in compliance with the norms of the international law. This is a critical aspect of the counter-proliferation issue because the PSI status features a major gap. Namely, it is an absence of formal connection between this counter proliferation framework and the UN Security Council. This circumstance creates tension and can even call to question the legitimacy of PSI coercive action.

It is necessary to work out an appropriate procedure of informing the UNSC of PSI plans, and coordinate coercive actions undertaken within this informal counter-proliferation framework with the UNSC Charter prerogatives, bearing in mind a significant confrontational potential of counter-proliferation action. It is essential to strengthen the legal basis of states’ PSI activities and ensure a more effective use of these instruments – combined with rewards and positive stimuli – in the interests of the NPT regime stabilization. This could bolster the international support of PSI effort.
The potential of PSI counter-proliferation partnership could bring greater benefits in the context of more formalized relations between the PSI and UNSC and increasing mutual trust between Russia and USA. It could become a more substantive bilateral project and an advanced cooperation track. Possibly, then it would be easier to utilize the PSI instruments to strengthen UN sanction regimes, in particular, to support effective implementation of UNSC anti-proliferation resolutions 1718 (on North Korea) and 1803 (on Iran). For example, it could be the PSI experience of inspecting suspicious cargoes (interception, vessel inspection, etc.) In this case, the Security Council would acquire additional leverage towards governments that elect to challenge the NPT regime.

It would be useful to hold periodic collective reviews of PSI activities to better understand the nature of threats to the NPT regime and identify ways to meet them. In the end of the day, the UN Security Council remains the main instrument of collective enforcement of the NPT regime.

**UN Security Council as supreme global authority**

Cooperation in the UN framework ought to become the most important area of counter-proliferation efforts. Security Council is the UN supreme body bearing principal responsibility for international peace and security. The UN Charter vests in the Security Council a clearly defined authority to promote the establishment and maintenance of international peace and security with the least diversion for armaments of the world's human and economic resources (UN Charter, Art. 26).

Security Council is imparted with broadest powers including taking preventive and coercive action, economic sanctions and application of force to maintain the international peace and security including countering threats associated with proliferation of weapons, technologies and materials of mass destruction (UN Charter, Chapter VII). In this connection, it would be pertinent to note that proliferation of nuclear and other types of weapons of mass destruction was qualified by the Security Council (in 1992) as a “threat to international peace and security”.

A special power of the UN Security Council is spelled out in the Art. 25 of the UN Charter, according to which it may demand that the Members of the United Nations carry out enforcement measures against proliferating states (in accordance with Chapter VII of the UN Charter), and the Member states must obey its decisions. For example, the Security Council may require that all Member states adopt economic sanctions or other enforcement measures against a state in breach of the WMD nonproliferation regime.

Being the world headquarters for coordinated action in the interest of counter-proliferation, the UNSC is vested with all requisite authority to play the central part in this activity as a body whose legitimacy is universally accepted.

In this respect, it is essential to note some positive developments: UN sanction regimes for North Korea and Iran established on a sufficiently multilateral basis in response to the breach of nonproliferation rules by these states; the established practice of cooperation between the UN and IAEA; advancements in the legal base for countering the WMD terrorism (in this area, UNSC acted in the global law-maker capacity with UNSC Res.1540).

Collective pressure organized by the UNSC plays a major role in the political containment of nuclear adventurism. If this trend holds, favorable prospects may emerge for diplomatic settlement of nonproliferation crises.

However, unique powers of the UNSC are not yet fully put to work in the interests of nonproliferation. The primary reason is the difficulty of reaching consensus among its permanent
members. But other reasons include insufficient resources available to the Security Council and the lack of developed appropriate procedures. Handling counter-proliferation issues becomes paralyzed because of differences between the P5 Members on issues of “high politics” unrelated to NPT, geopolitical rivalry, as well as suspicions nourished by relations of mutual nuclear deterrence and all kinds of phobias.

Experience shows that sometimes, UNSC members have difficulties in working out collective assessments of specific nuclear proliferation threats and prompt identification of counter measures. The evolution of crises around the North Korean and Iranian nuclear programs has revealed difficulties in developing and implementing an effective international strategy of counter-proliferation. The Council at times was not too prompt in considering issues which required an immediate action. Insufficient effectiveness of UNSC counter-proliferation measures remains a subject of deep concern for UN proponents around the world.

There has been an increased pressure from the circles unfriendly to the UN and searching for some alternative sources of legitimacy in enforcing the nonproliferation regime outside the Security Council. Such attempts, undertaken in recent decade, have not resulted in anything good. This is demonstrated by the experience of using the armed force under the slogan of combating proliferation on the basis of decisions taken by individual (or groups of) states unilaterally without the UNSC mandate.

At the same time, of rising urgency is the question of swiftness and commensurability of the UNSC response measures to the challenges of nuclear proliferation and undertaking steps towards adaptation of the UNSC mechanisms and methods to the realities of the multi-polar world.

Some possibilities for greater effectiveness of enforcement measures

To be on top (in the practical sense) of enormously complicated tasks of enforcement in respect to proliferation activities of states and non-state actors, the Security Council and its member states (above all permanent members) must subordinate their competing interests to the objectives of nonproliferation. What is required is political will, unprecedented preparedness and speed in taking and implementing decisions.

It is necessary to equip the UNSC with requisite resources and make its work more effective. It is critical that the Security Council be ready for speedy application of its powers as well as the range of diplomatic, political, information and force instruments at its disposal in the interests of collective action against proliferators.

Measures proposed below could contribute to strengthening the central and coordinating role of the UN Security Council in ensuring universal compliance with nonproliferation rules and enhancing its counter-proliferation potential. They could be implemented prior to reaching a consensus on the UNSC reform deliberated in the United Nations at the present time.

1. It would be useful to achieve an advance agreement between the five great powers – Security Council Permanent Members, and primarily Russia and US, on the guiding principles of coercive action of countering proliferation threats and nuclear terrorism to reinforce the mechanisms of response to such crises on the part of the international community. Unfortunately, efforts to move forward in the handling of this complex subject that have been recently undertaken within the UN framework have not produced results. In particular, the UNSC did not support the High-Level Expert Group recommendation on achieving a greater urgency of enforcement measures adopted by the UNSC¹. To this end, the Security Council was recommended to adopt a preliminary resolution on principles of applying force for implementing
urgent coercive action to counter, among others, threats related to WMD proliferation and WMD use by terrorists in order to strengthen the mechanisms of emergency response. (The purpose of this initiative is to ensure a timely and effective crisis response of the international community). The adoption of concerted criteria would also be useful for determining time frames and parameters of coercive action against specific proliferators.

However, the 2005 World Summit Outcome Document confirmed that “the relevant provisions of the [UN] Charter are sufficient to address the full range of threats to international peace and security”\(^1\), that is, any changes to the UNSC operation methods, including methods of nonproliferation decision-making and combating the WMD terrorism, were considered undesirable.

The lack of progress in the area is fraught with the decline of the UNSC weight and role. It is necessary to define the UNSC prerogatives in the sphere of counter-proliferation in more detail. It should be noted that the UN General Assembly and Security Council have not yet worked out guiding principles of cooperation and assistance in case of terrorist attack with the use of WMD.

2. In the context of ongoing work on an international counter-proliferation strategy, close attention must be given to the Russian proposal on utilizing the potential of the UN Military Staff Committee (MSC). Foreign Minister Lavrov drew attention of United Nations Member states to this matter at the UN General Assembly 61st Session in 2006.

This initiative aims to utilize the MSC functions to enhance the UN potential in maintaining the international peace and security by means of making the MSC an effective coordination mechanism both among the UNSC P5 Members and between other members of the SC and UN in the whole. The renewed MSC should take on a counter-proliferation dimension with a view to creating additional capabilities for strengthening the WMD nonproliferation regime by coercive means (sanctions etc.).

The MSC could be of special assistance in setting up prompt communication between the UN Security Council and international initiatives such as Proliferation Security Initiative (PSI) and Global Initiative to Combat Nuclear Terrorism. The MSC could become an effective coordination mechanism among the UNSC P5 Members and between other members of the SC and UN in this area. The MSC could provide the UNSC with further military expertise on matters such as early detection, operation planning and execution as well as logistical support. By the way, the final document of the UN World Summit of September 2005 contains a passage on the need for Security Council to revisit the issue of MSC composition, mandate and methods of operation.

The UN Secretary General Ban Ki-moon drew attention to desirability of utilizing the MSC potential in the interests of international arms control in his lecture delivered in the New York EastWest Institute on 24 October 2008. In particular, he proposed that the UNSC permanent members open a discussion, including in the MSC framework, on nuclear disarmament safety problems.

3. We need to work out a broader consensus on strategies of enforcement of nonproliferation rule compliance (it is especially important to secure an abiding and active support in this matter of influential non-aligned states). In this connection, we believe it would be important to precede the adoption of UNSC binding decisions on these issues by productive consultations with the broadest possible range of UN member states to smooth the implementation of the adopted resolutions. Of practical interest are recommendations on
improving the mechanisms of such consultations developed by Hans Blix International Independent Commission on Weapons of Mass Destruction.

4. The main lesson of the UN Security Council handling of the Iranian and North Korean nuclear crises is the necessity to address such situations at an early stage. Also, the offender state must get a clear and potent signal regarding the seriousness of the UNSC intent to use its counter-proliferation powers as early as possible.

It is necessary to identify the counter-proliferation measures in advance, before the worst happens. To make the option of leaving the NPT to acquire a nuclear weapon as unattractive and costly as possible, it is expedient to adopt a UNSC framework resolution which would contain provisions of rapid response of the international community to leaving the NPT by a state which had gravely breached the treaty before taking the decision to leave it. Even more so, under these conditions the very leaving of the NPT by such state would constitute an illegal step.

Such document should identify applicable collective actions in accordance with UN Charter Art. 41 and 42 in the case of breach of obligations by the proliferator state (the move to acquire a nuclear weapon). It could contain an advance menu of collective measures that would inevitably follow. Also, tough sanctions could automatically enter into force following the IAEA Director General special report. This could provide an extra political check against abandoning the nonproliferation obligations. Such preliminary agreement could facilitate rapid response to an increasingly complicated international military and political dynamic, including proliferation-related situations.

***

Advance along the above mentioned directions would be instrumental to prevalence in the international relations of multilateral principles, strengthened authority of the UN Security Council, stabilization of the global nonproliferation regime and a greater consolidation of the international community. This could deepen the cooperation in countering the nuclear proliferation and make strategic partnership in this area more substantive and authentic. The international community should move forward in developing a comprehensive strategy combining diplomatic effort and coercive suppression of terrorists seeking nuclear means of mass destruction, dealers of the “black markets” in nuclear materials and technologies as well as other proliferators. Proliferators must encounter growing pressure. It is essential to respond to such threats in a collective and rapid way.
Dealing with the Threat of Nuclear Terrorism

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

My remarks today will focus on the threat of nuclear terrorism and on what can be done about it. I’ve been asked to give you a sense of what the prevailing view among U.S. experts is – which I’ll do – and also to speak about where I think that view might not be entirely correct.

U.S. discussions of most nuclear issues are grounded at least in part by concerns about nuclear terrorism. Most of what we’re discussing at this conference – nuclear proliferation, security for nuclear power, etc – is part of the challenge of preventing nuclear terrorism too. I’ll try to draw a close boundary around my remarks and focus on issue that pertain solely to nuclear terrorism, keeping in mind that prevention requires contributions on a much wider variety of fronts.

The prevailing U.S. view of nuclear terrorism can be summed up in a few points: nuclear terrorism is primarily a fissile material problem, and more specifically, an access to fissile material problem; there are capable groups that are organized and want to obtain nuclear material and hence nuclear weapons; the solution to nuclear terrorism thus lies in preventing access to nuclear material, both through direct security measures and through nonproliferation. When it comes to security for existing materials, analysts focus on a handful of states and areas: Russia and several states of the former Soviet Union; Pakistan; the civilian use of highly enriched uranium (HEU); and North Korea. Looking at this landscape, most U.S. analysts believe that nuclear terrorism is quite likely – a recent survey of experts placed the odds of an attack in the next ten years at about thirty percent.

Past policy debates tended to focus on how much money the world was spending to secure nuclear weapons and materials. The discussion has evolved, though, to focus more on how to most effectively spend that money, and on how to develop creative solutions to the problem. In the case of Russia, in particular, more thinking and effort is being invested in understanding how to make sure Russia becomes self-sufficient in providing the highest level of security for its nuclear facilities.

While materials security rightly remains at the heart of most policy thinking, the mainstream view of what needs to be done has expanded. It now includes, in particular, detection of fissile material in transit as well as deterrence directed at states that might aid terrorist groups. On the detection front, there has been a focus on securing ships and shipping ports, with efforts being coordinated by the Domestic Nuclear Detection Office (DNDO). The dominant view among experts appears to be that these actions are of limited use: we can’t cover all commerce and examine every ship that passes through the world’s ports, which makes detection extremely difficult with an adversary that’s trying to circumvent and avoid our defenses.

Discussions of deterrence focus mainly on North Korea. The logic is fairly simple: North Korea might sell or give nuclear materials to a non-state actor based on an assumption that they’d be able to remain anonymous; if we have a strong forensics and attribution capability it
would remove that anonymity; and a threat of retaliation for any attack that can ultimately be traced to North Korea would deter such transfers in the first place. People focused on this problem tend to see it primarily as technical – if we get the technology for tracing materials right, deterrence will follow. The second current in this thinking looks to expand this sort of deterrence to the inadvertent loss of materials: states would be “held accountable” for any loss of materials, whether it stems from deliberate transfer or negligent security practices; that would encourage them to improve their security in the first place. While enthusiasm for deterrence against deliberate transfers is widespread, appetite for the broader approach is decidedly mixed.

Some Contrary Thoughts

While I agree with the central thrust of most U.S. thinking – nuclear terrorism is an extraordinarily important risk whose response must have materials and weapons security and control at its core – I disagree on some important matters. My sense is that the odds of a nuclear terrorist attack occurring are much lower than what most of the U.S. community at large believes – though I don’t think that this warrants a reduction in our efforts to prevent one. But I do believe that nuclear terrorism is harder than many think and is less appealing to most terrorist groups than we imagine.

Let me start with nuclear detection. It is not the panacea that some supporters claim – but it is essential to addressing the threat, because fissile material protection will always be imperfect. Detection has, however, normally been thought of far too narrowly. Analysts tend to approach detection as a technical problem rather than as a human and organizational problem with an important technical dimension. But it is the latter description that is more accurate – the goal of detection should be to detect plots, not just to detect nuclear materials. Thinking about detection has other problems too. People tend to focus too much on individual elements of a plot, dismissing them as difficult to disrupt. There are, however, many elements that a group needs to navigate in order to pull off an attack; a defense that lowers the odds of success at each stage by only a small amount can, as a whole, have a large impact. Policymakers need to look at the threat and the defense as a whole system.

Effective defense also requires that we start with a more realistic view of the threat of nuclear terrorism than many have in mind. We need to be careful not to fixate on worst-case scenarios – there is no reason to believe that preparing for the worst will actually yield the most effective defense. One terrorist group may be good at one part of a plot but bad at another, while another may be opposite. Different elements of a defense may be useless against one group and valuable against another.

On the deterrence front, I worry that people have extrapolated too far from North Korea, which is a special case. We have a good idea of the characteristics of North Korea’s nuclear materials, which makes attribution relatively easy; we also can be fairly confident that any transfer of weapons or materials from North Korea would be deliberate. But other cases are muddier. Threatening Russia with retaliation for loss of nuclear material is not a useful, effective, or credible threat. Or imagine applying this strategy to Pakistan: if the Pakistani government isn’t worried that its nuclear security might be too lax to prevent fissile materials being used for an attack on its own territory, would it really be worried about someone using stolen materials for an attack on the United States – followed by U.S. retaliation? If Pakistan isn’t worried about an attack at home, the additional U.S. deterrent threat would add little. (This might change, of course, under a more extreme Pakistani leadership.)
To close, let me reiterate a central point: nuclear terrorism is an extremely important problem that we must work together to solve. Materials security and nonproliferation must be at the core of our efforts but must not be their sole focus. A common understanding of the threat posed by nuclear terrorism – not just its magnitude but, more importantly, its details – would be a strong foundation for cooperation. I look forward to discussing this with you.
Having created nuclear weapons (NW), along with the problem of their proliferation, states still continue to put serious effort into setting up mechanisms preventing proliferation of nuclear weapons and nuclear materials.

I. Russian legislative base of physical protection, accounting and control of nuclear materials (NMPC&A)

Even though the term of MPC&A is now broadly used, the physical protection and control and accounting are really two separate fields. A short definition of physical protection is that it is a set of organizational activities and engineering and technical measures at a nuclear site which aim at preventing unauthorized access to nuclear materials (NM) or site, theft of NM, or sabotage against NM or site. Control and accounting is an activity aimed at determining the real amounts of NM inside the nuclear installation or part thereof, changes in these amounts over specified spans of time, control over the amount and movement of NM including control of access to it. The purpose of control and accounting is verification that the NM has not been re-directed to creation of NW or other nuclear explosive devices.

Russia, in accordance with international obligations and standards, has developed a vast legal base relating to NMPC&A. It rests on documents of IAEA (above all, IAEA Information Circular INFCIRC/225/Rev.4, and IAEA Guidelines), UNSC Resolution 1540, 1987 Physical Protection Convention with amendments of 2005 (the Russian Federation has ratified the revised Convention in July 2008).

The key law is the 1998 Law on the use of atomic energy. Physical protection is covered in Chapter 11 (art. 49-52), and NM C&A. – Chapter 4 (art. 21, 22). Besides that, RF has enacted many other laws with provisions relating to NMPC&A (see Appendix 1).

The Law on Nuclear Energy codifies NMPC&A as an activity related to the use of nuclear energy. Ensuring the NM P is a mandatory precondition to acquiring license for operations related to the use of nuclear energy on all stages from project design to decommissioning and transporting of NM. The facility top administrator bears personal responsibility for ensuring the NM P. Art.22 stipulates that NM are subject to state accounting and control on the federal and agency levels within the system of state NM C&A to determine the available volume of these materials at their location site, prevent loss, unauthorized use and theft, provide information to public agencies, nuclear energy administration agencies, and state security agencies about presence and transfers of nuclear materials as well as of their export and import. The rules of the state system of NM C&A are set by Government of the Russian Federation. The on-site accounting and control is performed by the company operating the facility.
The law covers peaceful nuclear activities. For ten years now the Duma is deliberating the Law on Nuclear Weapons which is supposed to codify the use of nuclear energy (including NMPC&A) in the nuclear defense industrial sector.

The existing legal vacuum is filled by a number of normative documents: “Rules for P of nuclear materials, nuclear installations, and NM storage facilities (approved by Government ruling of 19 July 2007, n456), “Provisions for the state system of accounting and control of NM” (Government Decree of 6 May 2008 n352). The rules apply to both civilian and military facilities. Using them as a basis, each agency issues its own documents. At present work is being done on inter-agency coordination.

Of equal importance is how the laws work. Here there are two problems.

First, the problem of financing. The federal budget today does not have a dedicated line for these expenditures. The financing of PC&A is delegated to the on-site level. The situation gets even more complicated due to regular re-organizations of the nuclear complex administration.

In 2008 the Russian-American cooperation program in NMPC&A practically came to an end. The US continued the financing of projects that sustain functioning of the Russian system. When expensive equipment reaches the end of its service lifetime or requires repair or exchange, directors of nuclear facilities could be tempted to discard this equipment instead of devising ways to finance its further operation.

Second, the personnel problem. There is a concern about the retiring of experienced specialists whose responsible attitude had been formed during their days as students. Of great importance is the task of training young specialists who would have comprehensive understanding of the nuclear safety problems, be committed to the principles of safety and profess a culture of NMPC&A. It would be practical to open a Nuclear University at the Moscow Institute for Physical Studies with a site in Obninsk. Simultaneously, we should strengthen the motivation to observe the safety culture, which requires funding support.

II. The national system of export control

The effectiveness of the international NW nonproliferation regime to a large degree depends on the effectiveness of national export control (EC) systems. In this context, a state’s intent of setting up an exemplary system of export control is a critical indicator of this state’s commitment to the WMD nonproliferation policy. In addition to that, in the present situation, harmonization of EC systems of all supplier states of sensitive materials is the principal way towards strengthening the effectiveness of multilateral regimes. It is clear that the national export control system of Russia, which is a state with highly developed military and civilian nuclear complex as well as a powerful military-and-technical potential, is a building block of the international WMD nonproliferation regime.

Control over foreign economic transactions involving nuclear items as well as dual-purpose goods and technologies has been practiced by the Russian state as above all a component of the nonproliferation and counter-terrorism policy. The 1999 Law on Export Control has defined the term of “export control” as related to this particular sphere. The regime controlling the trade in armaments and military equipment falls within the sphere of military and technical cooperation; it has its own legislative base and its own special licensing mechanism.

The 1999 Law provided a greater clarity of the control sphere by codifying the term of “foreign economic activity” and defining it as foreign trade, investment, or other activity, including manufacturing cooperation, in the area of international exchange of goods,
information, labor, services, and results of intellectual activity, including exclusive rights thereon (intellectual property). It involves not only shipments of products or technologies abroad but also their transfer to foreign individuals on the Russian Federation territory. As evident from the definition of the “foreign economic activity”, the state controls not only the transfers of material goods but also the transfers of technologies.

Noncompliance with the legal rules results in criminal and administrative persecution, with the latter applicable for both individuals and organizations.

On the whole, the Russian national export control system has been elaborated according to standards established in developed states. The Russian system includes all necessary elements (see Appendix 2). A reservation should be made though, that the sphere of export control has not yet developed legally binding international standards and criteria of effectiveness. In the nuclear sphere, guidance in provided by the NSG Guidelines.

That said, under the present conditions, the Russian national export control regime faces a certain number of problems. Some of them are related to imperfection of specific elements of export control (also faced by other states), others – to the need of further improvement of the decision-making mechanism, strengthening of enforcement, and cultivation of a better business culture, while yet others – to impact of domestic and external political factors.

As noted above, some problems today are related to the effectiveness of practical application of legal norms by relevant state agencies. For example, most states have already incorporated into their legal codes the so-called “catch-all” provisions which allow the state regulate transfers of goods and technologies not included in control lists if there is a suspicion that the products in question could be used in WMD programs. The enactment of this rule is explained by the practical impossibility to indefinitely expand the control lists. The Russian Law on Export Control stipulates a rule of “comprehensive control”. Yet there are significant differences in interpretation and enforcement mechanisms of this rule. Because Russia in its policy does not agree with “blacklists of states”, this rule is more difficult to be used in practice.

Another example. States, Russia included, try to expand control to all channels of international transfers of technologies, including so-called intangible transfers. Such channels include 1) in-person contacts (scientific conferences, meetings, discussions, scientific exchanges, presentations, inspections, consultations, technical assistance, lectures, seminars, training, including training of foreign students), and 2) communication by email, fax, and telephone. According to the Russian legislation, “commonly accessible” and fundamental scientific research technologies are not subject to control. A stricter control over intangible channels of technologies transfers narrows opportunities of participation in academic conferences and providing training to foreign students.

It is very difficult to find an optimal balance between mutually exclusive strategic objectives of promoting domestic products and technologies on international markets and introducing restrictions related to national and international security; maintaining academic freedom, freedom of speech and information access and security enforcement. This sphere has a large potential for international cooperation. Lobbying in favor of export control rationalization will be growing. Intensification of cooperation between the state, business, and academic communities, as well as international cooperation, remains the principal path for strengthening the effectiveness of export control. In a foreseeable perspective, export control remains a critical component of the international WMD nonproliferation regime. Unfortunately, the problem of politically influenced decision making will persist as export control continues to be an important foreign policy instrument. Decisions taken in the EC sphere cannot be impervious to the political
situation in a state or in the world. The general state of the Russian-American relations has a huge impact on them.

Conclusions

I would like to make a few observations on the role of international cooperation in the area of discussion. Cooperation in the Nunn-Lugar program and G-8 Global Partnership framework contributed to a better understanding of decision-making and policy-making processes in the US and Russia. I was involved in projects on assessing the effectiveness of cooperative threat reduction programs. I can attest with confidence that direct multi-level expert contacts facilitated perceptions of the parties’ motivations and in some ways changed the respective mentalities. During these years, many barriers that stood in the way of cooperation went down, though of course there still persist some fears and concerns accumulated over the decades of confrontation. It is important today not to add fuel to those fears. The reluctance to overcome the lack of mutual trust often conceals group or department interests but not the interests of national or international security.

Trust-building measures for states become a critical aspect which requires maintaining and expanding dialog channels at all levels. This relates, in particular, to the 2004 Russian-US Bratislava initiatives on cooperation in security in the nuclear sphere.

The international community is not making full use of the unique document – UNSC Resolution 1540. This is first international legally binding document which provides a comprehensive and all-encompassing approach to resolution of the problems of WMD, delivery means, and related materials proliferation. Submitting of national reports on implementing the Resolution to the 1540 Committee in fact means building a mechanism for monitoring the state of national nonproliferation regimes. Implementation of Res. 1540 will promote harmonization of national systems of export control and nuclear safety, and raise the standards of associated instruments. However, it would be naïve to expect a prompt realization of this objective because the existing gap in the sophistication levels of national regimes is too big. We should also keep in mind that states’ approaches to nonproliferation problems vary widely. This can be gleaned from careful reading of the declarative part of the Resolution. Of course, even the adoption of standardized export control systems would not guarantee their good-faith and effective use by some states. But at the same time, the Resolution provides an opportunity of geographical expansion of the G-8 Global Partnership program and opens a new direction for the Russian-American cooperation.

Appendix 1.

The key legislative act is the Law on the Use of Nuclear Energy of 1998.
The most important laws with provisions on Physical Protection and Accounting and Control of Nuclear materials.

- On Countering Terrorism (March 6, 2006)
- On the State Secret (July 21, 1993)
- On Information, Informatization and Information Protection (February 20, 1995)
- On Internal Troops of Ministry of Interior of the Russian Federation (February 6, 1997)
- On Agencies Internal Guard (April 14, 1999)
Appendix 2.
Main Elements of National System of Export Control

1. Legislative Base
   Laws (above all, Law on Export Control of 1999)
   Decrees of President, Rulings of Government,
   Internal orders of appropriate ministries and agencies

2. Control Lists
   List of nuclear materials
   Five lists of dual-purpose products

3. Identification of products and technologies
   Identification of goods and technologies subject to export control
   Register of organizations holding permit for independent identification expertise

5. Licensing mechanism
   Licenses: one-time and general
   Performing the state expertise
   Licenses are issued by Department for Export Control at the Federal Service for Technical
   and Export Control (FSTEC)

5. Liability
   Criminal
   Civil and Legal
   Administrative

6. Guarantees of use as declared
   Pre-licensing checks
   Requirement for providing import certificate
   Post-licensing checks, on-site inspections

7. Comprehensive control
Control over transactions with products not included in control lists, if parties to the foreign economic activity are notified by a state agency have reasons to believe that the product in question may be used for building WMD or delivery means

8. In-company programs of export control

Certificate of state accreditation
Advantages: faster turnover of application, possibility of receiving a general license for exporting certain products to certain states

Appendix 3.
Control lists of the Russian Federation

List of dual-use products and technologies which can be used for manufacturing of weapons and military equipment under export control.
List of human, animal, and plant pathogens, genetically modified microorganisms, toxins, equipment and technologies subject to export control.
List of equipment, materials, and technologies which may be used for manufacturing of missile weapons and subject to export control.
List of chemicals, equipment, and technologies which can be used for manufacturing of chemical weapons and subject to export control.
List of nuclear materials, special-purpose non-nuclear materials and related technologies subject to export control.
List of dual-purpose equipment, materials, and related technologies used for nuclear applications subject to export control.
Model Guidelines for Nuclear Detection Architectures
Mark Mullen, Assistant Director, Domestic Nuclear Detection Office (DNDO), U.S. Department of Homeland Security

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
Domestic Nuclear Detection Office (DNDO)

Model Guidelines for Nuclear Detection Architectures

20 March 2009

Mark Mullen
Assistant Director
Domestic Nuclear Detection Office

Back to the Table of Contents
Overview

- The importance of nuclear detection
- The concept of a nuclear detection architecture
- The implementation challenges and opportunities
- Model Guidelines Document for Nuclear Detection Architectures: a contribution to meeting the challenges
- Status of the Guidelines
- Next steps
- Summary
The Role of Nuclear Detection

- Detection is one layer in a multi-layered, defense-in-depth strategy.
- The layers are supported by a foundation of key cross-cutting capabilities and functions such as:
  - Intelligence
  - Law enforcement
  - Information systems
  - Science and technology
  - And others
  - Planning
  - Organization
  - Equipment
  - Training
  - Exercises
  - Operations Support
The Global Initiative to Combat Nuclear Terrorism

- Principle 3 of the Global Initiative Statement of Principles:
  - “Improve the ability to **detect nuclear and other radioactive materials and substances**, to include cooperation in the research and development of national detection capabilities that would be interoperable.”

- Explanatory Note:
  - “Partner nations will maintain a capability to **detect the illicit movement of nuclear and radioactive materials and substances** across borders, port, and airports through a range of possible instruments subject to their jurisdiction. Partner nations will maintain capability to share detection information promptly with other partner nations to prevent potential attacks. Partner nations will fulfill this principle in a manner consistent with **U.N. Security Council Resolution 1540 Operative Paragraph 3**.”
    - Note: Resolution 1540 concerns nonproliferation of weapons of mass destruction
Resolution 1540, Operative Paragraph 3

“Develop and maintain appropriate effective border controls and law enforcement efforts to detect, deter, prevent and combat, including through international cooperation when necessary, the illicit trafficking and brokering in such items in accordance with their national legal authorities and legislation and consistent with international law.”
What is a **Nuclear Detection Architecture**?

- A comprehensive set of detection systems and the associated resources and infrastructure that, taken together, are intended to provide a capability to detect radiological and nuclear threats.
Global Nuclear Detection Architecture

A multi-layered, international system is crucial for the security of all nations

Security of Radioactive Sources
Materials Protection, Control, & Accountability
Border Protection
Coast Guard / Maritime Inspection
Port-of-Departure Screening
At-sea Interdiction
Potential target

Back to the Table of Contents
Technical and Operational Challenges
Components Can Be Small—Easy to Shield
Passive Radiation Detection

Pictured equipment may not be representative of actual government equipment

Back to the Table of Contents
Active Systems Complement Passive Detection

- X-ray imaging systems (above) can indicate shielding that limits passive detection.
- Data fusion can combine multiple detection techniques (e.g., active detection plus passive detection plus ancillary information).
- Detection of shielded nuclear material is achievable.
Purpose of the Model Guidelines Document

- Provide high-level guidance to nations and organizations interested in improving their capabilities
  - Provide a strategic vision
  - Explain the basic elements
  - Capture principles, guidelines, recommendations and good practices
**Desired Attributes of a Detection Architecture**

- Risk-informed and efficient
- Multi-layered, defense-in-depth
- Graded and balanced
- Capable of adapting and evolving
- Unpredictable (for the adversary)
- Mobile
- Tailored to specific conditions and circumstances
Contents of the Model Guidelines Document

- Executive Summary
- Nuclear Detection Architecture
- National-Level Approach
- Structural Elements of a National Architecture
- Technical Elements of a National Architecture
- Information Architectures
- Implementing Framework
- Conclusions and Path Forward
Status of the Guidelines

- Concept briefed to Global Initiative partners in Rabat, Ankara and Astana
- International workshop hosted by DNDO, March 31-April 1, 2008, in Washington
  - 87 participants
  - 23 countries
- First draft circulated to partner nations, November 2008
- Comments received, February 2009
- Revised draft now being prepared
Next Steps

- Convene international workshop in Germany, April 2009, to
  - Discuss and resolve comments from GI partner nations and observers (IAEA, EU)
  - Lay out a strategy for dissemination and implementation of the finished document
    - 44+ participants
    - 20+ countries (including U.S. and IAEA)

- Publish document, Summer 2009

- Outreach, 2009 and beyond (details to be determined)

- Develop additional guidance on specialized topics, 2009 and beyond (details to be determined)
Summary

- Nuclear detection is an important component in a multi-layered, defense in depth strategy
- A nuclear detection architecture integrates wide-ranging and diverse capabilities, with the goal of achieving “unity of effort”
- Nations can benefit from nuclear detection architectures—their own and those of other nations
- Model Guidelines Document for Nuclear Detection Architectures is aimed at propagating these concepts and capabilities
- International cooperation is essential for both development and implementation of the Guidelines
Session IX

Chairman:
Vladimir Evseev

Speakers:
Richard A. Meserve, Status and Challenges for Nuclear Power Plant Security
Mikhail Barishnikov, Experience of Ensuring Nuclear Material Transport Safety in Projects Involving Repatriation
Adam Scheinman, U.S. – Russian Cooperation in the Field of Nuclear Materials Safety
Kevin Crowley, Elimination of Highly Enriched Uranium (HEU) in Reactor Fuel and Targets
Status and Challenges for Nuclear Power Plant Security
Richard A. Meserve, President, Carnegie Institute of Washington

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
Status and Challenges for Nuclear Power Plant Security

Dr. Richard A. Meserve
President, Carnegie Institution
Former Chairman, US Nuclear Regulatory Commission
Chairman, International Nuclear Safety Group (INSAG)
March 20, 2009
Introduction

• Intense interest in NPP security after 9/11.
• High public expectations for both safety and security.
• Particularly at a time of likely increasing need for nuclear power, it is important to satisfy these expectations.
• This talk will discuss status and challenges in meeting this need.
Response to 9/11 in the US

• Strong security capability at NPPs in place before 9/11, subject to scrutiny by the US NRC.
• NPP security was significantly enhanced in the aftermath of the attacks
  – Enhanced Design Basis Threat
  – Vigorous inspections, including force-on-force drills
  – Requirements to prevent or mitigate consequences of aircraft attack
• Nonetheless, there are continuing challenges.
Relationship between safety and security

• There are many common aspects of safety and security.
  – Common purpose – protection of the public health and safety and the environment.
  – Design philosophy is similar
    • Defense in depth.
    • Prevention, mitigation, and emergency response as elements of strategy
  – Features installed for safety purposes often serve security purposes as well.
    • Protective barriers of steel and concrete.
    • Responsive strategy to prevent release is relevant regardless whether the “initiating event” is caused by an accident or an intentional act.
Concentric Circles of Security

- **Owner Controlled Area**
- **Protected Area**
  - Double Fence
- **Protected Area**
- **Vital Area**
- **Access Control Points**

Back to the Table of Contents
Relationship between safety and security (continued)

• There are also important differences
  – In some circumstances, features to serve security purposes can inhibit safety and vice versa.
    • Delay barriers and access controls can inhibit immediate access by safety personnel or fire fighters and can restrict emergency egress.
    • Bunkering can improve security but limit access for inspection or maintenance
  – There are cultural differences between those involved in safety and those involved in security
    • Openness is the norm for safety, whereas confidentiality is the norm for security
    • Staff drawn from different worlds: security staff from military or police and safety staff from broader engineering world.
Relationship between safety and security (continued)

– There are different interfaces and engagement with the State.
  
  • Security capability dependent on input from many agencies of government, whereas safety responsibility is typically dependent on a single agency.
  
  • Safety remains the primary responsibility of the licensee (aside from emergency response) whereas the state shares responsibility to identify and respond to a security threat.
Challenges

• Need to ensure that safety and security obligations and authority are harmonized with each other.
  – Need to maintain balance between safety and security
  – Centralized management in licensee organization.
  – Favor single regulator with responsibility for both safety and security
  – International activities should seek to ensure harmony.
Challenges (continued)

• Need to bridge the cultural gulf between safety and security
• Need to preserve openness to the extent possible, while protecting security information
• Need to define the boundary between licensee and State responsibilities
• Need to upgrade international security advice and to harmonize it with safety advice.
Experience of Ensuring Nuclear Material Transport Safety in Projects Involving Repatriation to the Russian Federation
Michael Baryshnikov, Deputy Director of the Scientific and Production Company “Sosny”

US– Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

It is beyond doubt that the transport of nuclear materials constitutes the weakest link of the nuclear fuel cycle in terms of ensuring safety of materials. At the same time, the safe transport of nuclear materials can be regarded as an instrument of realization of nonproliferation policy. In this sense, ensuring safety of the nuclear material transport is seen as a critical and momentous task.

At present, Russia has in place a well-established system of providing safe transportation of nuclear materials (NM) that is run by Rosatom companies under supervision of RosTechNadzor, FMBA (Federal Medical and Biological Agency), and other agencies. The “Sosny” Scientific and Production Enterprise is involved in the nuclear material transport as coordinator, transport provider, developer of equipment and documents for shipping of both fresh and spent nuclear fuel coming mainly from research reactors. In its operation, Sosny complies with domestic and international common principles of ensuring safety of the NM transportation.

The experience accumulated by the company in the area of safe NM transport relates, above all, to the following aspects:

1. Preparation for the safe transport.
2. Manufacture and certification of containers, support equipment and transport vehicles for shipping of NM.
3. Direct participation in projects on repatriation of fresh (non-radioactive) and spent (radioactive) nuclear fuel of the Russian origin.

The first area of activity is preparation for safe transport of nuclear materials.

The system providing for safe transport of nuclear materials in Russia is built on the foundation of a detailed normative base that comprises federal legislation, requirements, statutes, rules and norms. In this, Russian documents regulating the transport are well correlated with the international requirements, and in certain areas even surpass them in the stringency of rules.

For example, according to the Russian normative base, each nuclear material transport instance is unique, as its safety is secured by a number of technical documents developed specifically for this case. These documents include technical specifications for spent nuclear fuel (SNF), a certificate/permit for the packaging design and transport, emergency card, special shipping requirements, and the like.

As concerns the import of spent nuclear fuel, according to the Government Decree 418 of June 11, 2003, SNF can be imported into the Russian Federation following a positive review of the State Ecological Expertise based on a unified document developed by responsible agencies.
and agreed upon by Russian ministries. This uniform document comprises a comprehensive list of mandatory activities ensuring the safety of the SNF transportation. They would include development and approval of the transit route and technological details of the SNF import, evaluation of possible consequences of emergency incidents during transit through the RF territory, substantiation of warning procedures and emergency schedule, analysis of risks of radiation impact during the SNF import, handling, or processing, assessments of impact on the environment and population, and proposals for lowering the risks as well as development of anti-terrorist plan.

Providing safe NM transport in practice boils down to implementation of the main principles of ensuring security: nuclear and radiological safety and physical protection. These principles are quite well-known and obvious. In particular, the nuclear and radiological safety is realized by:

− satisfactory characteristics of shipped nuclear materials;
− satisfactory technical condition of the transport and packaging equipment, insulation systems, storage fixtures and loading devices;
− observing the norms for mounting and placing the NM in the cask cavity
− timely and accurate dosimetry and radiation control;
− good working condition of the transport vehicles;
− availability of required fire control systems, radiation control and emergency response devices;
− observing safety rules in mounting/dismounting operations;
− observing the norms and rules in mounting the packages on the transport vehicle;

Among the principles of ensuring physical protection, the following can be named:

- Coordination between the transport personnel;
− responsibility of licensed transport agents;
− assessment of possible threats and development of a safe transport plan;
− multi-layered protection (packaging, transport vehicle, escort);
− ensuring confidentiality;
− choice of transit route;
− minimization of total transport time;
− minimization of the number and duration of transit stages;
− anticipation and prevention of unauthorized access to nuclear materials;
− timely detection of unauthorized access and termination of unauthorized activities;
− timely response by the guard and emergency forces;
use of automated system to monitor the progress of the NM in real time.

It is important to note that safe transportation requires absolute no-exception compliance with all of the listed requirements.

In addition to that, Sosny has analyzed its experience of the NM transport and is able to offer so-called “enhanced safety solutions”. These improved safety solutions may comprise:

- Adaptation of foreign-made casks for Russian conditions. An example of this was adaptation of the SKODA VPVR/M cask that involved certification, manufacturing of supplementary equipment, technical control and modification of regulative documents.

- Non-transit NM transports. It may be possible to avoid problems with transporting the nuclear materials through territories of third countries by choosing a maritime or air transfer. While these types of transport are often used for shipping non-radioactive nuclear fuel, their use for shipping of spent fuel is still uncommon in Russia. At present, work is being done on building the necessary transport means and equipment.

- Unification of the transport vehicles. An example is design, manufacturing, testing and certification of 20-foot ISO containers for shipment of TUK-19 casks with spent nuclear fuel. These containers permit shipment of packages by different transport vehicles. Now the transport of TUK-19 casks does not require special wagons or fixtures: all fixtures of the ISO container are standard.

The second area of the company work on ensuring the transport safety is manufacture and certification of shipment containers, equipment and transport vehicles for shipping the nuclear fuel.

Sosny has accumulated positive experience in certification of transport of casks with both radioactive and non-radioactive fuel by road, rail, sea, and air. In Russia, air shipment has only been used for transportation of fresh nuclear fuel. An analysis of the prospects of air transport of spent nuclear fuel has revealed the absence of a certified shipment container. Certification for air shipment of, say, Russian-made TUK-19 cask requires meeting the conditions for the B(U) type. Certification of the Czech Skoda VPVR/M cask requires meeting the conditions for C type packaging.

Availability of requisite devices and instruments is quite important for ensuring the transportation safety. Sosny has developed a wide range of devices for placing the spent nuclear fuel into casks and the already mentioned ISO containers for shipping the TUK-19 casks.

An example of an enhanced security solution is an option of non-transit sea shipping. To this end, we are currently refitting a Russian-made vessel to meet the class INF 2 requirements allowing transportation of spent nuclear fuel with aggregate radioactivity less than 2x10 TBq.

Principles of ensuring safety of nuclear materials transport can be demonstrated in practice with projects on repatriation of the Russian-produced nuclear fuel back to the Russian Federation.

Unspent fresh nuclear fuel from foreign research centers was being repatriated to Russian facilities for further conversion in the framework of IAEA programs in 2002-2007. Sosny was involved in the total of 10 transports of fresh nuclear fuel to Russian facilities which shipped about 170 kg of highly enriched uranium. All shipments without exception complied with
international safety standards which were guaranteed by participation of IAEA inspectors and US Department of Energy managers.

Non-irradiated TVS were transported in Russian shipping containers of TK-C14, TK-C15, TK-C16 and TUK-30M1 types that provide complete nuclear and radiation safety of transport. Transport means included aircraft, helicopters, and road vehicles. One of the ways to deliver the physical protection was organizing a convoy that would normally include:

- guards vehicles;
- reconnaissance vehicle;
- road police vehicle;
- trucks with the nuclear material cargo.

Besides, inside Russia we used a specially designed vehicle fitted with all requisite functions: fire-arms shielding, direct communication with RosAtom dispatcher service, and a radio transmitter to monitor the location of the vehicle in real time.

Aircraft for nuclear materials transport were provided by a Russian carrier. Depending on the weight of the shipment, two types of Russian-made aircraft were used: IL-76TD for cargos less than 50 tons and AN-12 for cargos less than 20 ton.

The aircraft for transport of nuclear materials were equipped with all requisite devices:

- uploading/unloading crane devices;
- short-frequency range transceiver of “Orlan-85 CT” type;
- traffic alert and collision avoidance system of “Honeywell” TCAS-2000 type;
- area navigation system of BRNAV-5 with 5 mile accuracy;
- flight guiding equipment for MNPS and PVSM airspaces.

The repatriation of irradiated nuclear fuel is performed in the framework of the Russian Research Reactor Fuel Return (RRRFR) program in accordance with Russia’s international obligations which include:

Agreement of May 27, 2004 between the Government of the Russian Federation and the Government of USA on cooperation in return to the Russian Federation of Russian-made research reactor nuclear fuel;

- The directive of Presidents of Russia and the US of February 24, 2004 contained in the Bratislava statement on cooperation in security in the nuclear sphere.

Sosny has been part of practically all spent nuclear fuel transport projects of the RRRFR program which so far has provided shipping of around 317 kg of highly enriched uranium from 6 foreign research centers. Every shipment without exception complies with the international safety requirements, which is monitored by IAEA experts. The program is administrated by managers of the US DoE and RosAtom.

At present, transport of irradiated nuclear fuel from research reactors is performed with Russian-made TUK-19 and Czech-made SKODA VPVR/M casks. Other options include TUK-128 (Russia), NAC-LWT (USA) and CASTOR MTR 2 (Germany). Transport means include
road vehicles, standard 4-axis railroad platforms, train wagons of TK-5 type and maritime vessels of INF 2 class. Empty casks can be carried by air.

Physical protection for nuclear materials shipped by rail is ensured by the following composition of the carrier:

− locomotive;
− platform wagons or special wagons with the nuclear material cargo;
− platform wagon or special wagon with support equipment;
− 1 escort wagon;
− 1 wagon of guard detail with communication equipment;
− 2 buffer wagons.

To sum up, the Sosny experience in transport of fresh and spent nuclear fuel shows that ensuring the transport safety is a comprehensive task that can only be realized with an all-inclusive approach.
Experience in the safeguarding of the Nuclear Materials Transportation during their repatriation in Russia

Mikhail Baryshnikov, R&D Company ‘Sosny’, Moscow, Russia

Russian Academy of Science, Moscow, March 20, 2009
Safeguarding of the Nuclear Materials Transportation

- NM Transportation is the most vulnerable with a view to potential threats.

- Russian system of NM transportation safeguarding is proved to be quite efficient. It is embodied by the Rosatom enterprises under control of the Rostechnadzor, Med-Bio Agency, etc.

- R&D Company “SOSNY” professes the standard Russian and international principles of the NM transportation safeguarding.
Substantiation of the Nuclear Fuel Transportation Safety.

Design, manufacturing and certification of the containers, auxiliary equipment and transport means for the Nuclear Fuel Transportation.

Repatriation of the Russian-origin Fresh Nuclear Fuel.

1. Substantiation of the Nuclear Fuel Transportation Safety.
Russian Legislation (1)

- Основные отраслевые правила ядерной безопасности при использовании, переработке, хранении и транспортировании ядерно–опасных делящихся материалов. ПБЯ–06–00–96 (Минатом России, 1996)
- Отраслевые правила и технические инструкции по безопасной перевозке опасных грузов для каждого вида транспорта.
Правила физической защиты радиоактивных веществ и радиационных источников при их транспортировании. НП–073–06 (Ростехнадзор, 2006)

Положение об обеспечении физической защиты судов с ядерными энергетическими установками и судов атомно-технологического обслуживания. РД 31.2.01–2001

Положение о лицензировании деятельности в области использования атомной энергии, Утв. Постановлением Правительства Российской Федерации N 865 от 14.07.97г.


Нормы расчета на прочность транспортных упаковочных комплектов для перевозки ядерных делящихся материалов. НРП–93 (Минатом России, 1993)

Положение об организации работ по ликвидации последствий аварий при перевозке ядерных материалов и радиоактивных веществ федеральным железнодорожным транспортом. (ПЛА–2001), Минатом России, МПС России, 2002)

Требования к планированию и обеспечению готовности к ликвидации последствий аварий при транспортировании ядерных материалов и радиоактивных веществ. НП 074–06
## International Legislation (1)

- Physical protection of nuclear materials and nuclear facilities, INFCIRC/ 225/ Rev. 4/ Corrected.
- UN Nuclear Terrorism Convention, 2005
- UN Security Council resolution 1373
- UN Security Council resolution 1540
- European agreement concerning the international carriage of dangerous goods by inland waterways (ADN).
International Legislation (2)

- European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR).
- Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID).
- International maritime dangerous goods Code (IMDG).
- European Agreement Concerning the Transport of Dangerous Goods by Inland Waterway (ADN).
- Guidance and considerations for implementation of INFCIRC/225. TECDOC–967
- Handbook on the physical protection of nuclear materials and facilities. TECDOC–1276
Unique documents for every NM transportation

- Technical Specifications on Spent Fuel Assemblies delivery.
- The emergency card describing activities and procedures in extreme situations.
- Special requirements for the transportation (if necessary).
- The program of radiation protection at transportation of radioactive materials.
- The quality assurance program at transportation of radioactive materials.
- Transportation documents.
Unified Project
(Russian Government Decree #418)

Includes (particularly):

1. Development and description of the transportation and technology process chart for the SNF import.
2. Evaluation of consequences of emergency situations which might occur in the process of SNF transportation through the territory of Russian Federation.
3. Justification of the warning and emergency response mechanism during transportation of SNF through the territory of Russian Federation.
4. Analysis of risks associated with the impact of radiation during import, handling, processing of SNF, and handling processing products.
5. Preparation of evaluation materials with respect to the impact on the environment and the population during the implementation of the Unified Project.
6. Justification for the overall reduction of the radiation impact risk and improving environmental safety when the SNF is imported to the Russian Federation.
7. Development of the anti-terrorist measures system.
Nuclear and Radiation Safety Principles

- Satisfactory characteristics of the NM to be transported.
- Satisfactory technical conditions of the Transport Cask Complect (systems of hermetic sealing, fastening elements etc).
- Observance of the loading norms and NM placing requirements.
- Dosimetric and radiometric control.
- Serviceability of the transport vehicles.
- Providing with necessary fire-fighting systems, dosimeters and emergency protection means.
- Observance of safety rules at cargo handling operations.
- Observance of the norms and the rules of the packages loading on a vehicle.
Physical Protection Principles

- Secure coordination between participants of the NM transportation.
- Responsibility of licensed participants of the transportation.
- Estimation of the possible threats and working out of the safe transportation plan.
- Echelon protection (package, vehicle, escort).
- Quality assurance.
- Confidentiality maintenance.
- Minimisation of full time of the transportation.
- Minimisation of number and duration of the separate transportations.
- Preventing to the attempts of not authorised access to NM.
- Detection of the attempts of not authorised access to NM.
- Timely reaction of the protection forces and rescue teams.
- Application of the automatic system of NM condition monitoring in a real time mode.
Enhanced Safety Solution (1)

- Transport package SKODA VPVR/M, made in the frame of RRRFR program for Research Reactors SNF transportation, is certified in Russia in 2006.
- PA “Mayak” equipment is adapted to the work with SKODA VPVR/M.
- Russian specialists regularly check the technical condition and serviceability of the SKODA VPVR/M fleet.
- SKODA VPVR/M operation instructions and manuals are adjusted in the learning curve.

Foreign transport casks adaptation for the Russian reality is the enhanced safety solution.
SNF transportation by sea and by air could avoid the problems concerned to the SNF transit by the third countries territory.

The works on creation and certification of the appropriate transport means and auxiliary equipment are in progress now.

Direct transportation without transit is the enhanced safety solution.
Enhanced Safety Solution (3)

- Russian TUK-19 casks are traditionally transported in special railcars of the TK-5 type.
- International multimodal shipments required to unify loading/unloading procedure from one transport mean into another.
- To solve the problem the special 20-feet containers of the ISO-class are designed, manufactured, tested and certified for the transportation of the TUK-19 casks with the SNF inside.

Unification of the transport means is the enhanced safety solution.
2. Design, manufacturing and certification of the containers, auxiliary equipment and transport means for the Nuclear Fuel Transportation.
It is required that the transport packages used for NM transportation to be periodically certified with getting of the approval of the package design.

Each NM transportation is demanded to have certificate–approval for the transportation of the package with Nuclear Material.

We have positive experience of the certification of both fresh and spent nuclear fuel transportation by means of auto, railway, sea and air transport.
Certification perspectives for the transport casks for SNF transportation

Russian TUK-19:
meeting the shipping conditions of limited activity for packages of type «B(U)».

Czech Skoda VPVR/M:
meeting the requirements for packages of type «C» - placement of cask in a special damping device.

American NAC-LWT:
certification on the conditions of special shipment.
Auxiliary equipment creation

- Special 20-feet ISO-containers for the TUK-19 transportation are designed, manufactured, tested and certified.

- Auxiliary equipment for SNF loading to the transport package (claws, hands, manipulators) are designed, manufactured, tested and certified.
Creation of the new transport means for SNF transportation

- Motorvessel “MCL Trader” (home port – Sankt-Petersburg) is under alteration now with the goal of her compliance to the INF–2 class.
Repatriation of the Russian-origin Fresh Nuclear Fuel

- Unused Russian-origin fresh nuclear fuel was returned from the foreign research centers in the frame of IAEA programs.
- Fresh Nuclear fuel was transported to the Russian enterprises that participate in the program of nuclear fuel conversion.
- Nuclear Material category=1.
Repatriation of the Russian-origin Fresh Nuclear Fuel

<table>
<thead>
<tr>
<th>Consignor</th>
<th>Country</th>
<th>Consignee</th>
<th>Date</th>
<th>HEU returned, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinca, Belgrade</td>
<td>Serbia</td>
<td>NIIAR, Dimitrovgrad</td>
<td>August 2002</td>
<td>48,4</td>
</tr>
<tr>
<td>CNCAN, Bucharest</td>
<td>Romania</td>
<td>NCCP, Novosibirsk</td>
<td>October 2003</td>
<td>14,2</td>
</tr>
<tr>
<td>INRNE, Sofia</td>
<td>Bulgaria</td>
<td>NIIAR, Dimitrovgrad</td>
<td>December 2003</td>
<td>16,9</td>
</tr>
<tr>
<td>TNRC, Tripoli</td>
<td>Libya</td>
<td>NIIAR, Dimitrovgrad</td>
<td>March 2004</td>
<td>16,5</td>
</tr>
<tr>
<td>INP, Ulugbek</td>
<td>Uzbekistan</td>
<td>NIIAR, Dimitrovgrad</td>
<td>September 2004</td>
<td>3,2</td>
</tr>
<tr>
<td>NRI, Rez</td>
<td>Czech</td>
<td>NIIAR, Dimitrovgrad</td>
<td>December 2004</td>
<td>5,7</td>
</tr>
<tr>
<td>TU, Prague</td>
<td>Czech</td>
<td>NIIAR, Dimitrovgrad</td>
<td>September 2005</td>
<td>13,8</td>
</tr>
<tr>
<td>AEI, Sverk</td>
<td>Poland</td>
<td>NIIAR, Dimitrovgrad</td>
<td>August 2006</td>
<td>39,8</td>
</tr>
<tr>
<td>NRI, Rez</td>
<td>Czech</td>
<td>NIIAR, Dimitrovgrad</td>
<td>October 2006</td>
<td>8,8</td>
</tr>
<tr>
<td>DRR, Dalat</td>
<td>Vietnam</td>
<td>NIIAR, Dimitrovgrad</td>
<td>September 2007</td>
<td>4,3</td>
</tr>
</tbody>
</table>
International supervision for the Fresh NF repatriation

- Experts of IAEA participated in the project implementation. They installed the seals at the stage of loading FA into the casks and removed the seals at the stage of unloading FA from casks.

- US DOE performed general management of the projects.
Transport casks for the Fresh Nuclear Fuel transportation

Russian casks TK–S15 and TK–S16 were used to transport fresh fuel assemblies.
Transport means for the Fresh Nuclear Fuel transportation

- All the fresh fuel transportations were made using the airplanes of the Russian Company “Volga-Dnepr”.

- Special trucks escorted by a special automobile column were used to ship the fresh fuel by road.
NM Physical Protection while being transported in automobile column

Automobile column structure:
- Reconnaissance car
- Road inspection car
- Convoy car
- Trucks with the NM
- Security car
Special truck
for the NM transportation

Equipment of the special truck:

- Transport protective device of fire-arms.
- Communication with dispatcher service in Rosatom.
- On-line monitoring of truck location by navigation system.
Airplanes used for the NM transportation

- AN−124−100 (Ruslan): cargo up to 120 tons
- Il−76TD: cargo up to 50 tons
- AN−12: cargo up to 20 tons
Loading/unloading of cargo up to 80 tons without cranes
Loading/unloading of cargo up to 30 tons by on-board crane
Microwave transmitter “Orlan 85 ST”
Warning system of collision of planes in the air (TCAS-2000 of "Honeywell" Company)
Navigation with the accuracy of 5 miles (BRNAV-5)
Repatriation of the Russian-origin Spent Nuclear Fuel

- Repatriation is realized in the frame of the Russian Research Reactor Fuel Return Program (RRRFR).

- SNF import is made in accordance to the US–RF Government Agreement dated 27.05.2004 about co-operation in the import of the Russian-origin Research Reactors Nuclear Fuel for to the Russian Federation.


- Irradiated nuclear fuel is transported to the reprocessing facility of PA “Mayak”

- Nuclear Material category=2.
## Current status of the RRRFR Program

| Country      | Fuel preparation | Russian UP materials elaboration | Transporta\n|\n|---------------|------------------|----------------------------------|----------|
| Uzbekistan    | Complete         | Complete                         | 2006     | 62,6     |
| Czech         | Complete         | Complete                         | 2007     | 80,0     |
| Latvia        | Complete         | Complete                         | 2008     | 14,4     |
| Bulgaria      | Complete         | Complete                         | 2008     | 6,3      |
| Hungary       | Complete         | Complete                         | 2008     | 154,5    |
| Kazakhstan    | Complete         | Complete                         | 2008-2009| In progress|
| Ukraine       | Complete         | In progress                      | 2009     |
| Romania       | Complete         | In progress                      | 2009     |
| Libya         | In progress      | In progress                      | 2009     |
| Poland        | In progress      | In progress                      | 2009-2010|
| Serbia        | In progress      |                                  | 2010     |
| Vietnam       |                  |                                  | 2011     |

Back to the Table of Contents
International supervision for the Spent NF repatriation

- Experts of IAEA and Euratom participate in the project implementation. They install the seals at the stage of loading FA into the casks.
- US DOE performed general management of the program.
Transport casks for the Spent NF transportation used in RRRFR program

- TUK–19 (Russia),
- Skoda VPVR/M (Czech).

are used now

- TUK–128 (Russia),
- NAC–LWT (USA),
- CASTOR MTR 2 (Germany).

could be used in perspective
Transport means used in RRRFR Program

- Special trucks;
- 4-axle railcars;
- TK-5 special railcars;
- Sea ship of the INF-2 class.
- Airplane AH-124-100
Physical Protection while being transported by the railroad

Special train for the SNF shipping:
- Locomotive,
- Railcars or special wagons with cargo,
- Railcar or special wagon with support equipment,
- 1 escort railcar,
- 2 buffer railcar,
- 1 security railcar with all communication means.
Conclusion

R&D Company “SOSNY” experience in transportation of the fresh and spent nuclear fuel testifies that the nuclear materials transportation safeguarding is a complex problem, and it can be solved only with use of the multilateral combined approach.
Thank you for your attention!

R&D Company ‘SOSNY’ Headquarter
11, Derbenevskaya quay,
Moscow, Russia, 115114
Tel.: +7-495-913-6715
Fax: +7-495-913-6716
E-mail: info@msk.sosny.ru

R&D Company ‘SOSNY’, Dimitrovgrad branch
5a, Slavsky str.,
Dimitrovgrad, Ulyanovsk region, Russia, 433506
Tel.: +7-84235-39829
Fax: +7-84235-38328
E-mail: office@sosny.ru
I will address accomplishments and next steps for nuclear material security cooperation between the United States and Russia. I wish to make a few context points up front:

Setting the Context
First, there has been great progress and cooperation over 15 years; I expect cooperation to continue, but it will require presidential-level engagement. There has been cooperation on the international legal regime – ironically the opposite of the NPT’s formative period.

Second, the driving issue for cooperation after the end of Cold War was state proliferation, especially in the Middle East, and facilitated arms control implementation. Now there are more diverse set of drivers for nonproliferation work today:

° Proliferation and terrorism, including illicit trafficking involving terrorist groups, remnants of AQK network, or even organized crime;
° Greater interest in considering eventual elimination of nuclear weapons and political and technical requirements for getting there;
° Enlargement of peaceful uses of nuclear power and proliferation risks associated with it.

Third, in addition to new drivers, dealing today with more diverse set of actors:

° Iran / North Korea – slowdown nuclear programs; avoid major setback;
° New state proliferation (Syria and NK transfers);
° Arms racing in South Asia – moving in unstable directions;
° States having or that may pursue enrichment and reprocessing; and
° P5 nuclear programs – issues of nuclear surety, modernization, and build-down.

Fourth, the proliferation environment more complex, but have major opportunities for progress with political transitions in the U.S. and Russia and prospect of closer alignment on strategic issues, including nonproliferation and counter terrorism. With opportunity comes risk, however, both in terms of exaggerated expectations or proliferation crises.

Nuclear Material Security Accomplishments
There is a staggering list of nuclear security accomplishments since end of the Cold War. We have completed major nuclear security upgrades at Russian sites in 2008:

° more than 2.5B spent by DOE/US on these efforts;
° security upgrades from than 100 sites;
° MPC&A upgrades at 180 buildings plus 30+ outside of Russia

The HEU Purchase Agreement – more than 350MT of weapons HEU eliminated – has been the most successful threat reduction agreement in history. Together, we have eliminated

436
Back to the Table of Contents
civil HEU: ~ 2MT of HEU from U.S. and Soviet-supplied research reactors and returned it to the US or Russia. There have been hundreds of high-risk Russian RTGs secured and disposed of. Also cooperation resulted in the Shutdown / replacement power for 2 of 3 Russian plutonium production reactors – a third is to follow soon. The Second Line of Defense / export control cooperation: thousands of officials trained – Russia cost-sharing deployment of portals at border crossings. The 2005 Bratislava initiative, established a political process to ensure work goes forward and receives the senior level attention; periodic reports with detailed action plans and milestones; need to preserve this high-level engagement going forward.

Where to go from here on cooperation?

Two levels of effort. One involves bilateral measures; second are those having a global or broader effect and for which bilateral / joint cooperation could be pursued.

On bilateral measures list:

- **MPC&A future:**
  - Continue security upgrades at sites where access more granted;
  - Further upgrades at bulk-handling facilities;
  - Address insider threat risks;
  - Maintenance on existing upgrades.

- **2000 Plutonium Management and Disposition Agreement:**
  - Dispose of 68MT of excess military plutonium -- 34 MT in each country;
  - Nearing agreement on approach to bring PMDA into force, including the provision for verification;
  - RF opting for fast reactor disposition for plutonium (could start in 2013/14); US focus is burning Pu as MOX in LWRs;
  - Coupling of programs can encourage skeptics in Congress to see this as a nonproliferation measure.

- **Material Consolidation & Conversion:**
  - Have converted more than 10MT of HEU to LEU, but as a pilot program;
  - Discussing new agreement to consolidate and convert larger stocks of HEU not in weapons;
  - Consistent with comparable efforts in the US to reduce our security footprint and transform a Cold War legacy nuclear complex.

- **Best practices & Sustainability:**
  - Given US investment of ~ 2.5B in MPC&A support, want to see transition to Russian investment and commitment to sustainability. Already building transition into joint plans developed by our teams.
  - Sustainability needed in both countries, or any country with significant nuclear activities, to address resource, management, or technical deficiencies.
Focus is on insider threat; training, developing regulations and procedures for MPC&A systems and operation; inspections; upgrading force protection and transportation – goal is to give shape to a nuclear security culture.

- **HEU research reactor conversion:**
  - From Bratislava, return remaining existing inventories of Russian-origin spent HEU fuel by end of 2010;
  - Convert significant number of research reactors supplied by or operating within the US or Russia. Requires new fuels in certain cases, but also a commitment to phase-out civil uses of HEU.
  - Recognize environmental obstacles to returning highly radioactive materials; note DOE recently approved a decision allowing the return of up to 1MT of fissile material outside the scope of the US foreign research reactor spent fuel acceptance program.

**On secondary measures list:**

- **Post-START, new agreement:** question of whether to include technical measures to monitor warhead dismantlement. Some work has been done to prepare attribute verification and separately on a “trilateral” US-Russia-IAEA protocol to verify materials removed from military stocks.

  Raises the question of whether the US and RF would wish as a unilateral or bilateral measure to declare additional stocks on excess to defense needs and to agree on measures to ensure those materials are not returned to weapons. Also, it raises the question of whether to seek an agreement to down-blend additional HEU for commercial sale to the US after 2013.

  Topic has relevance to conditions needed for eventual elimination; technical hurdles need to be addressed – technology not proven.

- **Fissile material cutoff treaty:** closely linked to NPT nuclear disarmament goals; complements nuclear security agenda – confirm no new production as efforts to secure existing stocks continues; can take credit for nuclear security work to get at criticism that FMCT will not touch previously produced materials; will also address concern that reliable fuel services that make non-possession of ENR a requirement.

  Obama Administration supports verifiable FMCT; technical work needed in this area to define a cost effective and credible verification approach. Technical challenge to verify old, operating enrichment and reprocessing plants.

- **Next generation international safeguards:** Major effort needed need strengthen IAEA safeguards; prevent the next “Iran”; relevant to eventual elimination. Goal is not to overhaul safeguards, but to ensure existing authorities are used to the fullest extent. IAEA can’t police the world, but it can carry out investigations unmatched by any other international mechanism.
DOE launched next generation safeguards initiative last year. Main elements are: (1) policies and authorities, (2) technology improvements to verify declared and undeclared activities, (3) train / retain new experts, (4) promote international collaboration on safeguards technology and safeguards infrastructure.

U.S. and Russia should be partners in this effort; have the leading technical experts and technology infrastructure to support safeguards enhancements. Good start could be made by negotiating a new agreement that provides for technical work: e.g., a nuclear safeguards and security exchange agreement to replace the expired Warhead Safety and Security Exchange agreement.

- **Reliable fuel services / Enrichment and Reprocessing Controls**: Limiting further spread of enrichment and reprocessing could be considered as an added element of nuclear material security. Need to strengthen supplier policies (new controls under negotiation in the Nuclear Suppliers Group) and incentives not to pursue enrichment and reprocessing (through fuel assurances and commitments to take-back spent fuel). Progress underway on both fronts.

- **Advance UN Security Council Resolution 1540 and global nuclear security standards**: US and Russia should share in a global campaign to strengthen national capacities to control nuclear / radiological materials within or entering / exiting sovereign territory.

  Requires major program of support to raise proficiency of national export control, safeguards, physical protection, and border security systems; update international physical protection recommendations and encourage global adherence (consider Global Initiative to Combat Nuclear Terrorism for this purpose); deeper engagement with China, India, and Pakistan; elevate adherence to Additional Protocol as a global nonproliferation standard.

**Conclusion**

Very broad agenda. Huge amount of work, resources required. Will face difficulties, and will require sustained, high-level senior attention in Washington and Moscow. Hope we can get there with a fresh start in our relationship. Would note that commitment by the US and Russia is essential, cannot make complete this agenda alone – need international commitment to implement nonproliferation measures on a global scale and with urgency.
Elimination of Highly Enriched Uranium (HEU) in Reactor Fuel and Targets
Kevin Crowley, Director, Council on Nuclear Radiation Studies Board, U.S. National Academies

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009
I want to begin by thanking NTI and the RAS for the invitation to participate in this conference.

I was asked to talk about a recent U.S. National Academies study that addresses the elimination of highly enriched uranium from fuel and targets used in research and test reactors.
I will cover the four topics shown in this slide:

First, I'll provide some background on the study and the study charge
I'll then describe the current situation with respect to HEU reactor fuel and conversion
Next I'll describe the current situation with respect to HEU targets for medical isotope production
Finally I'll describe the relevant key findings and recommendations from the report that was issued at the conclusion of our study
The first topic is the background on the study

The study was requested by the U.S. Congress in 2005 as part of the Energy Policy Act. Congress requested the study primarily to resolve a dispute about the technical and economic feasibility of converting medical isotope production from highly enriched uranium to low enriched uranium.

The study was sponsored by the Global Threat Reduction Initiative Office within the Department of Energy’s National Nuclear Security Administration.

The National Academies appointed a committee of experts to carry out the study. This committee had 11 U.S. experts and 3 Canadian experts.

The final report from the study was published in January 2009.

The report can be downloaded for free from our website at the address shown on the slide.
Congress gave us a four part study charge. We did not think that charge was fully adequate so we negotiated a fifth charge with the study sponsor.

The three charges shown in this slide are most relevant to the topic of this conference so I will focus my remarks on them.

The first charge calls for a broad evaluation of efforts being made primarily by DOE to eliminate HEU in the fuel and targets of research and test reactors through its Global Threat Reduction Initiative.

The second charge asks us to examine the feasibility of procuring medical isotopes for use in the United States from sources that do not use HEU. Congress defined “feasibility” primarily in economic terms, but we also assessed technical feasibility.

The third charge on additional steps to improve the feasibility of production without HEU is the charge that we negotiated with DOE.
This slide shows the situation for research and test reactors as of December 2008.

DOE in cooperation with the IAEA has identified 203 operating research and test reactors that use HEU fuel. These reactors are in the civilian and defense sectors but do not include naval reactors. This list is probably not complete because of uncertainties primarily in the number of Russian reactors.

There are 5 HEU fueled reactors under construction. These are in France, China, and Russia. Some of these reactors are planned to be converted to LEU whenever suitable fuels become available.

GTRI has identified 125 HEU reactors for conversion:
- 58 have already been converted
- 40 are planned for conversion with existing LEU fuels (U-Al and U-Si fuels)
- 27 reactors are planned for conversion after suitable higher-density fuels become available. U.S., Russian, and other specialists are working to develop U-Mo alloy fuels for this purpose (need high density U fuels to preserve reactor power characteristics)

There are approximately 78 reactors that are not within the GTRI program scope. These have defense-related missions, unique fuels or special-purpose designs (such as pulse reactors) or are located in countries that do not cooperate with DOE. Most of these reactors are in Russia.

The amount of HEU used in these reactors each year is not well known. DOE estimates about 500 kg per year, but this number does not include all Russian reactors. The number may be greater than 1 MT.
This slide shows the current situation for medical isotope production. The isotope of primary interest is Mo-99, which is used in about two thirds of all medical isotope procedures worldwide.

The primary production method is irradiation of HEU targets in research and test reactors. Mo-99 has a fission yield of about 6 percent.

Between about 40-50 kg of HEU is used annually for Mo-99 production. Most of this HEU comes from the United States and is 93% HEU. S. Africa uses its own 45% HEU.

HEU targets are only irradiated for about 5-7 days before being processed to extract Mo-99 (and sometimes other isotopes). Only about 3% of the U-235 is consumed, so the resulting waste is still HEU and loses its self protection in a year or two.

Almost all of this waste is being stored either as solids or liquids. There are hundreds of kilograms of HEU waste in storage.

Between about 95% and 98% of Mo-99 is produced in four countries using HEU targets: Belgium, Canada, South Africa, and the Netherlands.

The United States imports all of its Mo-99 primarily from Canada and Europe.

Russia produces all of its own Mo-99—most is produced by the Karpov Institute in Obninsk by irradiating HEU targets in the WWR-TS reactor. I understand from Boris Myasoedov that his institute also produces Mo-99 by neutron activation.
I will now describe some of the key findings and recommendations from the study that are relevant to the topic of this conference.

1. We found that DOE is making good progress in eliminating HEU from fuel and targets. Progress has been especially good since the RERTR program was subsumed into GTRI in 2004. The GTRI has converted 20 HEU reactors in the last four years.

2. We also found that from a technical perspective, there is no reason that the out-of-scope reactors that I described in a previous slide cannot be converted to LEU fuel.

3. Congress asked specifically whether LEU targets for medical isotope production have been developed and demonstrated. We found that they had. Argentina and Australia are producing Mo-99 for commercial purposes using 19.75 percent LEU-Al dispersion targets. Argonne National Lab is developing a U metal target that will be used for indigenous production of medical isotopes by several countries, including possibly the U.S.
Key Findings

- LEU targets could be used to produce “large-scale” quantities of Mo-99 for domestic use
- Conversion to LEU targets could require significant expense and time
- Mo-99 producers have no business reasons to convert; consider taking additional steps to accelerate conversion

Congress also asked us whether these LEU targets could be used to produce medical isotopes to supply the U.S. market. We concluded that they could. The metric of interest in terms of production quantity is referred to as “Large Scale” production. Large Scale production is production that exceeds 1000 6-day curies per week. The world demand for Mo-99 is about 12,000 6-day curies per week. The United States accounts for about half of that demand.

However, conversion to LEU targets could require significant expense (tens of millions of US dollars) and time (up to 13 years). The cost and time depends on whether conversion can take place within current facilities or if new facilities are required. Conversion within current facilities can be done more quickly and cheaply.

We also found that Mo-99 producers have no business reasons to convert to LEU targets, so we suggested several steps that could be taken to encourage conversion. I don’t have time to discuss them here but would be happy to expand on this in the Q&A session.
Let me conclude by briefly presenting the key recommendations from the study that are relevant to this conference.

Here are the first two.

READ THEM

DOE and the IAEA told us that they were unsure that they knew the numbers, locations, and characteristics of all operating HEU-fueled reactors. They told us that they were especially uncertain about the situation in Russia.
Perhaps the most important recommendation for this conference is the first one on this slide: READ IT.

The first recommendation has both political and technical components. DOE has asked for help from the U.S. National Academies on the technical component of this recommendation. I will be talking with Russian colleagues in the RAS about the possibility of conducting a joint U.S. National Academies-RAS technical study on conversion of these reactors. The U.S. National Academies and the RAS have had a cooperative agreement for 50 years. In fact, we will be celebrating that anniversary in June.

We also recommended that DOE focus efforts on eliminating the HEU waste that results from medical isotope production. The quantities of this waste dwarf the amount of HEU used each year for medical isotope production.

Finally, let me close by noting that as a follow-up to our study, DOE recently sent letters to all organizations that produce or have expressed an interest in producing medical isotopes. The letter requests a formal commitment to supplying the U.S. market with Mo-99 produced without HEU. DOE plans to report back to Congress on these commitments later this year.

I fully expect that Congress will give DOE direction on implementing the recommendations in our report. This direction is likely to appear in next year’s appropriations bills. Congress could also decide to phase out HEU exports for medical isotope production on the basis of our report.

That ends my formal presentation. Thank you.
Session X

General Discussion, Overview, Recommendations
Nikolay P. Laverov – Vice President of the Russian Academy of Sciences; Conference Co-Chair
Siegfried S. Hecker – Co-Director of the Center for International Security and Cooperation and Professor (Research), Stanford University; Conference Co-Chair
David Holloway – Spruance Professor of International History and Senior Fellow at the Freeman Spogli Institute for International Studies, Stanford University

US–Russian Nuclear Nonproliferation Conference
Russian Academy of Sciences and Nuclear Threat Initiative
Moscow, Russia
March 18 – 20, 2009

We make the following recommendations to our respective governments:
1) It is imperative to resolve the high-level political obstacles that inhibit increased nuclear cooperation.

It is important for our governments to resolve political disagreements that impede crucial cooperation in nuclear matters. Russian participants listed the following at the top of their list:
- NATO expansion eastward.
- Ballistic missile system deployment in Poland and Czech Republic.
- Keeping the INF Treaty in force.
- Preventing weaponizing of space.
- Addressing the imbalance of capabilities in conventional forces.

US participants focused primarily on the need to work cooperatively to address Iran’s nuclear ambitions.

We offer our technical and professional support to assist the governments in overcoming these obstacles. For example, such activities could include analysis to support verification protocols for a START I follow-on treaty, joint examination of the Iranian nuclear and missile threat, and jointly exploring various missile defense scenarios to counter the Iranian threat.

2) Nonproliferation and disarmament are inextricably linked. It is imperative for Russia and the United States to make progress toward disarmament in order to further the nonproliferation agenda and to increase the prospects for a successful 2010 Nonproliferation Review Conference.

Continued reduction in the nuclear arsenals of Russia and the United States is important, but so are additional steps that demonstrate significant progress toward Article VI. For example, ratification of the CTBT, implementing a Fissile Materials Cutoff Treaty, securing all nuclear
materials to the highest international standards, and the question of stability at low number of nuclear weapons all pose significant technical as well as political challenges. We recommend that joint technical collaborations between US and Russian specialists be initiated quickly so as to achieve substantive progress by the 2010 NPT Review Conference. To cite just one example, prospects for ratification of the CTBT could be enhanced by technical collaboration at each other’s test sites to increase our confidence in compliance with and verification of a test ban.

3) **Scientific cooperation and collaboration between Russia and the United States is crucial to deal with nonproliferation threats. It is imperative that this cooperation be rejuvenated and strengthened.**

Joint technical cooperation and collaboration in the nuclear arena has been and continues to be critical to deal with global nonproliferation challenges and to build confidence in US-Russian arms control and disarmament measures. Moreover, enhanced collaboration in civilian nuclear energy and across a broader front of fundamental science will benefit both countries. Unfortunately, strained high-level governmental relations have severely curtailed the successful nonproliferation and defense collaborations initiated nearly two decades ago. In addition, they have prevented the development of increased civilian cooperation. We strongly urge finalizing the civilian nuclear energy 123 agreement and reinvigorating programs such as the lab-to-lab and ISTC programs. The current gridlock in these programs requires support and specific approval at the highest level of our governments.

The Russian participants made it clear that cooperation on the issues spelled out above would be possible only if the political leaders on both sides took a firm public stand in support of such cooperation. The Russian participants, for the most part, are clearly interested in cooperation and believe that the United States and Russia can build on their past experience of collaboration and that in the future we can work together in support of nonproliferation and disarmament in the future.

1 *Center for International Security and Cooperation at the Freeman Spogli Institute for International Studies, Stanford University*

2 *Vice President, Russian Academy of Sciences*
APPENDIX I

Agenda
The 2nd U.S. – Russian Nuclear Non-Proliferation Conference
Russian Academy of Sciences (RAS) and Nuclear Threat Initiative
(Moscow, March 18-20, 2009)

March 18

09.30 – 10.30. Opening Remarks:
Nikolay Laverov – Vice-President of the Russian Academy of Sciences (RAS), Co-Chair of the Conference (Russia)
Siegfried Hecker – Co-Director of CISAC and Professor (Research), Stanford University, Co-Chair of the Conference (USA)
David Holloway, Spruance Professor of International History and FSI Senior Fellow, Stanford University (USA)

Welcome Address:
Vladimir P. Nazarov – Deputy Secretary of the Security Council of the Russian Federation
John Beyrle – Ambassador of the United States of America to the Russian Federation (USA)
Andrey A. Kokoshin – First Deputy Chairman of the Committee on Science and High Technology, State Duma, Federal Assembly - Russian Parliament
Sam Nunn – Co-chairman and Chief Executive Officer, Nuclear Threat Initiative (USA)
Anatoliy Antonov – Director of the Department for Security and Arms Control, Ministry of Foreign Affairs of Russia.

SESSION I. (10.30 – 13.20)
Chairman – Boris Myasoedov, Adviser to the Russian Academy of Sciences (Russia)

10.30 – 10.50. NPT Regime: New Challenges and Threats
Speaker – Alexey Arbatov, Head of the Center for International Security, IMEMO (RAS, Russia)

10.50 – 11.10. Nuclear Non-Proliferation Challenges for the New U.S. Administration

Back to the Table of Contents
Speaker – Charles B. Curtis, President and Chief Operating Officer, Nuclear Threat Initiative (USA)


11.50 – 12.10. Status of Nuclear Disarmament and NPT Regime
Speaker – Anatoliy Antonov, Director of the Department for Security and Arms Control, Ministry of Foreign Affairs of Russia

12.10 – 12.30. The Vision of a Nuclear Weapons-Free World
Speaker – David Holloway, Spruance Professor of International History and FSI Senior Fellow, Stanford University (USA)


13.20 – 14.10. Lunch.

Speaker – Olli Heinonen, Deputy Director General and Head of the Department of Safeguards, IAEA

Speaker – Vladimir Dvorkin, Chief Researcher of the IMEMO (RAS), Major-General, ret. (Russia)

14.50 – 15.10. Trust and Transparency: Foundation for Good Relationship
Speaker – William Fallon, Admiral, ret. (USA)

Speaker – Rady Ilkaev, Scientific Director of the Russian Federal Nuclear Center - the All-Russian Research Institute of Experimental Physics (Russia)

15.30 – 15.50. Expected Renaissance in Nuclear Energy Sector and Necessity in a New System Evaluation of Factors Affecting Proliferation of Nuclear Materials and Technologies
Speaker – Nikolay Ponomarev-Stepnoy, Vice-President of the
15.50 – 16.20 **Panel discussion.**

16.20 – 16.40 **Coffee Break.**

**SESSION III.** (16.40 – 19.00)

Chairman – Nikolay Laverov, Vice-President of the Russian Academy of Sciences

16.40 – 17.00. **Non-Proliferation and Physical Protection Challenges Posed by Global Nuclear Power Development (U.S. View)**  
Speaker – Scott Sagan, Co-Director, Center for International Security and Cooperation, Stanford University (USA)

17.00 – 17.20. **Non-Proliferation Challenges Posed by Global Nuclear Power Development (Russian View)**  
Speaker – Evgeniy Avrorin, Scientific Leader of the Russian Federal Nuclear Centre- the All-Russian Research Institute of Technical Physics (Russia)

17.20 – 17.40. **Strengthening the NPT Regime: Nuclear Weapons-Free Zones, Comprehensive Safeguards, etc.**  
Speaker – William C. Potter, Director of the James Martin Center for Non-Proliferation Studies, Monterey Institute of International Studies (USA)

17.40 – 18.00. **The Importance of the NPT Article VI Realization for Strengthening the NPT Regime**  
Speaker – Roland Timerbayev, Chairman of the Board, PIR-Center (Russia)

18.00 – 18.20. **On a Question of Non-Proliferation Regime Approval in Context of the Renaissance in Nuclear Energy Sector: Creating International Corporation under IAEA Aegis for Industrial Serial Production of Small- and Medium-Power Nuclear Plants**  
Speaker – Evgeniy Velikhov, President of the Russian Scientific Center “Kurchatov Institute” (Russia)

18.20 – 19.00 **Panel discussion.**

19.00 **Reception**
SESSION IV. (09.30 – 11.30)

Chairman – Frederick Iseman, Chairman and Managing Partner of the CI Capital Partners, Advisor to the Board of Directors, Nuclear Threat Initiative (USA)

09.30 – 09.50. **Strategic Imperatives for U.S.-Russian Nuclear Cooperation**
Speaker – William J. Perry, 19th U.S. Secretary of Defense, Professor, Stanford University (USA)

09.50 – 10.10. **Russia’s View of the Iranian Nuclear Problem**
Speaker – Vladimir Evseev, Senior Associate, IMEMO (RAS, Russia)

10.10 – 10.30. **U.S. View of the Iranian Nuclear Problem**
Speaker – Mark Fitzpatrick, Director of the Non-Proliferation and Disarmament Programme, International Institute for Strategic Studies in London (USA)

10.30 – 10.50. **UN Security Council Resolutions on Iran in the Context of U.S.-Russian Cooperation**
Speaker – Yuli Kvitsinsky, First Deputy Chairman, Committee on International Affairs of the State Duma, Federal Assembly (Russian Parliament)

10.50 – 11.30. **Panel discussion.**


SESSION V. (11.50 – 13.30)

Chairman – Gennadiy Chufrin, Adviser to the Russian Academy of Sciences, Member of the Board of Directors, IMEMO (RAS, Russia)

11.50-12.10  **Non-Proliferation and the American-Indian Nuclear Deal**
Speaker – Ashley J. Tellis, Senior Associate of the Carnegie Endowment for International Peace (USA)

12.10 – 12.30. **Pakistan and Nuclear Non-Proliferation Problems**
Speaker – Vladimir Moskalenko, Chief Researcher, Institute for Oriental Studies (RAS, Russia)
12.30 – 12.50. Preventing Nuclear Proliferation in the Middle East (Syria, Israel, Egypt etc.)
Speaker – Anton Khlopkov, Executive Director of the PIR Center (Russia)

12.50 – 13.30. **Panel discussion.**


**SESSION VI.** (14.20 – 16.20)
Chairman – Adam Scheinman, Assistant Deputy Administrator for Nonproliferation and International Security, National Nuclear Security Administration, U.S. Department of Energy

14.20 – 14.40. **A Nuclear Crisis on the Korean Peninsula**
Speaker – Anatoly Torkunov, Chairman of the Moscow State Institute for International Relations (University, Russia)

14.40 – 15.00. **Management of the Korean Nuclear Crisis**
Speaker – Siegfried S. Hecker, Co-Director of CISAC and Professor (Research), Stanford University (USA)

15.00 – 15.20. **Russian-Korean Cooperation and its Impact on the North Korean Nuclear Problem**
Speaker – Alexander Vorontsov, Head of the Department for Korean and Mongolian Studies, Institute for Oriental Studies (RAS, Russia)

15.20 – 15.40. **Prospects of a Korean Peninsula’s Denuclearized Status**
Speaker – Vladimir Novikov, Senior Researcher of the Russian Institute of Strategic Research (Russia)

15.40 – 16.20. **Panel discussion.**


**SESSION VII.** (16.40 – 19.00)
Chairman – Anatoly Zrodnikov, Director General of the State Scientific Center of Russian Federation - Institute of Physics and Power Engineering (Russia)

Back to the Table of Contents
Speaker – Laura S.H. Holgate, Vice-President for Russia/ New Independent States Programs, Nuclear Threat Initiative (USA)

17.00 – 17.20. An Inalienable and Equal Right of all NPT Parties to Promote Research, Production and Use of Nuclear Energy for Peaceful Purposes
Speaker – Anatoliy Diakov, Director, Center for Arms Control, Energy and Environmental Studies, Moscow Institute of Physics and Technology (Russia)

Speaker – Arian L. Pregenzer, Senior Scientist of the Cooperative Monitoring Center, Sandia National Laboratories (USA)

17.40 – 18.00. Russian Proposals for Technological Protection of Nuclear Fuel Cycle
Speaker – Valentin Ivanov, Chief Researcher, Institute of Ore Deposits Geology, Petrography, Mineralogy and Geochemistry (RAS, Russia)

18.00 – 19.00. Panel discussion.

March 20

SESSION VIII. (09.30 – 11.20)

Chairman – Siegfried S. Hecker – Co-Director of CISAC and Professor (Research), Stanford University (USA)

09.30 – 09.50. Counter-Proliferation and a Role of the UN Security Council. Proliferation Security Initiative
Speaker – Alexander Kalyadin, Chief Researcher of the IMEMO (RAS, Russia)

09.50 – 10.10. Dealing with the Threat of Nuclear Terrorism
Speaker – Michael Levi, David M. Rubenstein Senior Fellow for Energy and Environment, Council on Foreign Relations (USA)

Speaker – Elina Kirichenko, Head of the North American Research

Speaker – Mark Mullen, Assistant Director, Domestic Nuclear Detection Office, Department of Homeland Security (USA)

10.50 – 11.20. *Panel discussion.*

11.20 – 11.40. **Coffee Break.**

11.40 – 12.00. **SESSION IX.** (11.40 – 13.30)

Chairman – Vladimir Evseev, Senior Associate, IMEMO (RAS, Russia)

11.40 – 12.00. **Status and Prospects of Nuclear Power Plants Security**

Speaker – Richard A. Meserve, President of the Carnegie Institution of Washington (USA)

12.00 – 12.20. **Safety and Security of Nuclear Material Transportation**

Speaker – Mikhail Barishnikov, Deputy Director of the Scientific and Production Company “Sosny” (Russia).

12.20 – 12.40. **U.S. – Russian Cooperation in the Field of Nuclear Materials Safety**

Speaker – Adam Scheinman, Assistant Deputy Administrator for Nonproliferation and International Security, National Nuclear Security Administration, U.S. Department of Energy,

12.40 – 13.00. **Elimination of HEU in Reactor Fuel and Targets**

Speaker – Kevin Crowley, Director of the Council on Nuclear and Radiation Studies, U.S. National Academies (USA)


13.30 – 14.30. **Lunch.**

14.30 – 16.00. **SESSION X.** (14.30 – 16.00)

**General Discussion. Overview and Recommendations**

Chairmen: Nikolay Laverov – Vice-President of the Russian
Academy of Sciences

Siegfried S. **Hecker** – Co-Director of CISAC and Professor (Research), Stanford University.

David **Holloway** – Spruance Professor of International History and FSI Senior Fellow, Stanford University.
APPENDIX II
The Second U.S. –Russian Nuclear Non-Proliferation Conference Participation List

**Russian Federation**

**Antonov, Anatoliy**- Director of the Department for Security and Arms Control, Ministry of Foreign Affairs of Russia

**Arbatov, Alexey**- Head of the Center for International Security, IMEMO

**Avrorin, Evgeniy**- Scientific Leader of the Russian Federal Nuclear Centre- the All-Russian Research Institute of Technical Physics

**Barishnikov, Mikhail**- Deputy Director of the Scientific and Production Company “Sosny”

**Beyrle, John**- Ambassador of the United States of America to the Russian Federation

**Chufrin, Gennadiy**- Adviser to the Russian Academy of Sciences, Member of the Board of Directors, IMEMO

**Diakov, Anatoliy**- Director, Center for Arms Control, Energy and Environmental Studies, Moscow Institute of Physics and Technology

**Dvorkin, Vladimir**- Chief Researcher of the IMEMO (RAS), Major-General, ret.

**Evseev, Vladimir**- Senior Associate, IMEMO

**Ilkaev, Rady**- Scientific Director of the Russian Federal Nuclear Center - the All-Russian Research Institute of Experimental Physics

**Ivanov, Valentin B.**- Chief Researcher, Institute of Ore Deposits Geology, Petrography, Mineralogy and Geochemistry

**Kalyadin, Alexander N.**- Chief Researcher of the IMEMO

**Khlopkov, Anton**- Executive Director of the PIR Center

**Kirichenko, Elina**- Head of the North American Research Center, IMEMO

**Kokoshin, Andrey A.**- First Deputy Chairman of the Committee on Science and High Technology, State Duma, Federal Assembly - Russian Parliament

**Kvitsinsky, Yuli**- First Deputy Chairman, Committee on International Affairs of the State Duma, Federal Assembly (Russian Parliament)

**Laverov, Nikolay P.**- Vice-President of the Russian Academy of Sciences (RAS), Co-Chair of the Conference

**Moskalenko, Vladimir**- Chief Researcher, Institute for Oriental Studies

**Myasoedov, Boris**- Adviser to the Russian Academy of Sciences

**Nazarov, Vladimir P.**- Deputy Secretary of the Security Council of the Russian Federation

**Novikov, Vladimir E.**- Senior Researcher of the Russian Institute of Strategic Research

**Ponomarev-Stepnoy, Nikolay**- Vice-President of the Russian Scientific Center “Kurchatov Institute”

**Timerbayev, Roland**- Chairman of the Board, PIR-Center

**Torkunov, Anatoly**- Chairman of the Moscow State Institute for International Relations

**Velikhov, Evgeniy**- President of the Russian Scientific Center “Kurchatov Institute”

**Vorontsov, Alexander**- Head of the Department for Korean and Mongolian Studies, Institute for Oriental Studies

**Zrodnikov, Anatoly**- Director General of the State Scientific Center of Russian Federation - Institute of Physics and Power Engineering

462

[Back to the Table of Contents]
United States of America

Berls, Robert- Senior Advisor for Russia/NIS Programs, Nuclear Threat Initiative
Braun, Chaim- CISAC Consulting Professor, Stanford University
Crowley, Kevin- Director of the Council on Nuclear and Radiation Studies, U.S. National Academies
Curtis, Charles B.- President and Chief Operating Officer, Nuclear Threat Initiative
Fallon, William J.- Admiral, ret., United States Navy
Fitzpatrick, Mark- Director of the Non-Proliferation and Disarmament Programme, International Institute for Strategic Studies in London
Hecker, Siegfried S.- Co-Director of CISAC and Professor (Research), Stanford University, Co-Chair of the Conference
Heinonen, Olli J.- Deputy Director General and Head of the Department of Safeguards, IAEA
Holgate, Laura- Vice-President for Russia/ New Independent States Programs, Nuclear Threat Initiative
Holloway, David- Spruance Professor of International History and FSI Senior Fellow, Stanford University
Iseman, Frederick- Chairman and Managing Partner of the CI Capital Partners, Advisor to the Board of Directors, Nuclear Threat Initiative
Levi, Michael- David M. Rubenstein Senior Fellow for Energy and Environment, Council on Foreign Relations
Meserve, Richard A.- President of the Carnegie Institution of Washington
Milonopoulos, Niko- Research Assistant, Stanford University
Mullen, Mark- Assistant Director, Domestic Nuclear Detection Office, Department of Homeland Security
Nunn, Sam- Co-chairman and Chief Executive Officer, Nuclear Threat Initiative
Perry, William J.- 19th U.S. Secretary of Defense, Professor, Stanford University
Podvig, Pavel- CISAC Research Associate and Acting Associate Director for Research, Stanford University
Potter, William C.- Director of the James Martin Center for Non-Proliferation Studies, Monterey Institute of International Studies
Pregenzer, Arian L.- Senior Scientist of the Cooperative Monitoring Center, Sandia National Laboratories
Sagan, Scott- Co-Director, Center for International Security and Cooperation, Stanford University
Tellis, Ashley J.- Senior Associate of the Carnegie Endowment for International Peace
APPENDIX III

The Second U.S. – Russian Nuclear Non-Proliferation Conference Photos

From left to right: Holgate, Potter, and Braun
From left to right: Zhebin, Hecker, and Gudowski

From left to right: Braun, Levi, and Tellis

466

Back to the Table of Contents
From left to right: Semenov, Holloway, and Levin

From left to right: Myasoedov, Laverov, Tellis, Podvig, and Hawthorne
In picture: Pregenzer, Sagan, Timerbayev, Arbatov, and Davydov (U.S. Embassy)

In picture: Ponomarev-Stepnoy, Sukhoruchkin, Holgate, Potter, Khlopkov, Dvorkin

470

Back to the Table of Contents
In picture: Pshakin, Diakov, Potter, Ilkaev, and Ponomarev-Stepnoy

From left to right: Semenov, Arbatov, and Hecker
From left to right: Timerbayev, Perry, and Hecker

In picture: Pregenzer, Podvig, Khlopkov, and Fitzpatrick
From left to right: Podvig, Kvitsinsky, Hecker, and Iseman

President’s Hall at the Russian Academy of Sciences

Back to the Table of Contents