

International Forum on

Energy and Environmental Opportunities in the Russian State Research Centers and Nuclear Cities

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Status of Current Initiatives

Viktor Belkin, MINATOM Senior Manager for the Department of International and External Economic Cooperation, called for finding new directions of cooperation on conversion/job creation/new industry creation in the Russian nuclear cities. It is necessary to convey conversion as a concrete action with respect to disarmament. The Russian complex has already been downsized by factor of two as of 1999---MINATOM's challenge now is to find work opportunities for the displaced. Approximately 70,000 jobs will need to be created in the 2005-2007 timeframe. The Russian government has developed a number of federal programs to assist in this; but not all of these plans have been realized. Almost no money has been allocated for conversion activities between 1998-2000. This year, MINATOM is working on 32 conversion projects, at a funding level of \$9 million. Russian side is contributing \$7 million top this effort, but the funding level remains insufficient. It is anticipated that by 2005, only 4,000 jobs will have been created (~10% of the number of jobs needed). This rate is too small to address the problem, Belkin stressed. He would be grateful if the ENCI Forum is able to find new sources of income and job opportunities for the nuclear cities. The need to support Russian conversion work is well understood by Europe and Italian Ministry of Foreign Affairs, as well as other governments and groups that are trying to support the goals of the U.S. Nuclear Cities Initiative. Therefore it is beneficial for the U.S. and Russia to shift to civilian roles and apply Russian scientific potential to commercial activities.

Director of the U.S. Nuclear Cities Initiative William Desmond stated that there is room for broader cooperation between the U.S. and European efforts within the context of ENCI. Energy Efficiency and Environmental Management projects are not included in the NCI work plan, and a European focus in these areas would be helpful. He added that weapons complex conversion is very difficult, and the process is a vast consumer of resources and time, as proven by the U.S. complex conversion experience. He admitted that the NCI program was short-sighted at the point of its launch in 1998: the Initiative did not recognize the amount of time involved and what would be required for the program to be successful. In addition, the cultural differences and disparity of resources add new levels of challenge to the initiative. However, there have been successes within

the NCI program, he pointed out: the establishment of the Analytical Centers for Nonproliferation in Sarov and Snezhinsk; the opening of the Zheleznogorsk International Development Center; the establishment of the Sarov Open Computing Center; and the involvement of western companies in some projects.

RANSAC Executive Director Ken Luongo in his presentation commented on the role that non-governmental organizations can play in developing commercial projects to assist in the downsizing of the Russian complex, and the NGO community's ability to be a catalyst in generating new government activity and initiatives. In addition, the NGO community can provide objective analysis of government program's results. NGO's are able to be a real value to political leaders by providing objective commentary as well as to the press. Ultimately, NGO's are able to create discussion for a where new ideas and strategies are developed. RANSAC has been able to take advantage of new opportunities where none previously existed. In particular, RANSAC helped establish four Nonproliferation Analytical Centers, two of which are in the closed cities; has coordinated the disparate NGO activities in the nonproliferation field. The NGO community, while it does have minimal funding as compared to government initiatives, does have the ability to be highly flexibility and is therefore able to cross over government barriers that can impede progress.

Didier Gambier, of the European Commission, argued that the European Union (EU) does not bring the solution to the downsizing of the Russian nuclear complex: Russia does. Russia has the ability to make the most of the cities and the resources they offer. The closed cities are well-placed in relation to European markets and have a strong history of science and technology development, although these cities will have to modernize their research and communications infrastructure. In Gambier's view, science cooperation is the correct response to the proliferation risk, but results cannot be achieved through bilateral programs only. In order for these downsizing programs to be successful, there must be a number of initiatives in place focused on developing closed cities abilities. A transparent environment must be established that is able to demonstrate results and "show something" for the money provided. Gambier further argued that any downsizing program must be science and industry-driven, not security driven.

He called for a "cultural revolution" that recognizes the need for some investment in the closed cities that comes from somewhere besides the military sphere. Gambier stated that since the EC works through the ISTC, a similar model should be developed for the closed cities efforts. Specifically, Gambier described the EC's history of promoting groups to discuss specific issues, in the form of "Contact Experts Groups." These groups provide a means of coordinating international approaches to specific issues. He asserted that such a CEG for the closed cities---an International Working Group for the ENCI---would require more than just governmental financial support: commercial and private industry should also be involved. However, the goals of the two groups must be shared. The sides should push projects that are in support of the downsizing and redirection of the workforce goals. The EC would be willing to support the projects that are the "best of the best" but EC funding must not be the only source of funding.

The most valuable projects will have to have an impact on city growth and be commercially viable. The EC, through the ISTC, is willing to be a partner in supporting some of the projects proposed at the Forum. It is willing to maintain the dialogue; build

confidence; improve access to facilities in the cities; and work to attract outside resources. Government funding will not achieve conversion, he reiterated: industry and non-governmental financing are essential.

Gambier stressed that there is no need to re-invent the wheel: a number of mechanisms already exist working toward redirecting the Russian complex workforce. But it must be proven that the investment in these cities is justified, and will bring a good return. Some questions remain, however. In particular: How to involve other programs; What are the projections of MINATOM's funding for conversion projects (and the cost per job); and how will HEU proceeds be distributed among the programs. Gambier, in conclusion, stressed that only 5-10 out of every 3,000 technologies gets commercialized. No one is tackling the question of how to successfully enter the technology market or how to make industry more willing to invest in technology development within the closed cities. He added that research itself is an economic opportunity, and a role that scientists within the closed cities could readily fulfill.

Viktor Belkin responding to Gambier's comments about improving access to the closed cities, stressed that MINATOM has strict rules on access, but is working with DOE and the NCI to improve access. Some progress is being made, however: in 1999-2000, there were more than 350 visits from foreigners to the three cities under the NCI program. However, visits must be substantiated with concrete outcomes. Belkin recognized that there is a clear need for the Russian government to make atmosphere more conducive to industry so that they want to invest there.

Giovanni Iannuzzi, Italian Ministry of Foreign Affairs General Director for Political Affairs, in his presentation stressed that ways were needed to improve the efficiency of ongoing downsizing efforts. He was supportive of the IWG concept, and of the funding of research activities that has proven to be very effective, but threats remain and Russian nuclear complex workers are still doing weapons work. Currently there is no effective transition mechanism in place. Such a mechanism might help in the commercialization of new technologies. There is currently no clear definition of goals and effective measures focused on market demand. A clear path is missing, he argues, and therefore these workers will continue to work as part of the weapons workforce.

Commercialization results are low, and that low tally is the result of focusing on finding partners for Russian products, and not tailoring the Russian technologies to western demand. Success, therefore, occurs only in the short- or medium-term. Increasing coordination of the different international programs to find alternative jobs was stressed at the NCDI conference in March, and such coordination is possible through the proposed IWG. Success will be tied to concrete technologies, which have clear financial goals in place at the start of the project. The international community must make every effort to market the abilities of the closed cities, and the European Nuclear Cities Initiative can act as a "cradle" for increased and in-depth coordination among the European institutions working in this area.

Yevgeney Avrorin, Director of VNIITF in Snezhinsk, commented that it is essential to think about organizational measures as a factor in the success of these programs. The successes of the ISTC program are based on strict formal requirements that all of the projects must meet. The challenges faced by the U.S. NCI program are related to the fact

that these procedures are not in place for those projects. The benefit provided by the ISTC program is its focus on engaging scientists in fundamental areas of scientific research. Maurizio Martellini added that the problems associated with marketing new technologies is a western problem, too. It is necessary to develop parameters, and work from real demands. Projects must be based on clear critical technology needs. For example, Italy's most critical technologies are robotics and manufacturing. The commercialization process needs to be reversed, so that the needs of government and the markets are identified first.

Director Avrorin's presentation to the Forum focused on the new, Putin Initiative on nuclear power, and argued it is time to choose optimum nuclear power options. The increased use of coal and its environmental impact means that there is no alternative but nuclear power engineering to address energy supply needs. Problems plague new nuclear power plant development, particular safety in the wake of the Three Mile Island accident and the Chernobyl accident. These facilities also pose a threat to materials security; the problem of waste handling and mgmt; low funding for up-to-date engineering. There are possible technological solutions to the development of fourth generation reactors that would unite international efforts/comprehensive use of experience; formulate new criteria based on current problems. New reaction designs could use very low amounts of weapons-useable materials (possibly even none); new safe designs and instrument monitoring; on-site inspection. This proposal has garnered IAEA support; and as a result one project is in the planning stages. The ENCI could provide a strong opportunity for Russian scientists to develop the criteria required for the most convenient technologies.

Yuri Yudin, director of the Sarov Analytical Center for Nonproliferation, presented on the current activities of the Sarov Center, established in December 1998. The Center's primary missions are to provide technically-based policy analysis in nonproliferation to VNIIEF management, the Russian Ministry of Atomic energy, and other Russian governmental agencies. This center supports the conversion of highly skilled VNIIEF specialists, attracts funding for nonproliferation projects, and facilitates VNIIEF specialists' interaction with the international community. Yudin explained that the Center received support from the U.S. Department of energy to conduct four analyses in 1999: Significance of Russian Legislation on Closed Cities, Nuclear Weapons, and Dual Use technology Export; a Quarterly Information Bulletin; Review of Conversion experience at VNIIEF; and Review of Conversion Experience at Avangard. The Center also conducted analyses with the support of RANSAC and U.S. foundations through the ISTC program. These analyses included: History of Soviet Nuclear Weapons and Nuclear Infrastructure; Control of Alternative Nuclear Materials and Nonproliferation; and Significance of Russian Legislation on Closed Cities, Nuclear Weapons, and Dual Use Technology Export.

In addition, Yudin explained that the Center took part in the creation in 2000 of the Sarov Fund for Energy Efficiency. Principle members of the Fund included VNIIEF; Energopravlenie VNIIEF; EcOil-Energia; and the administration of the city of Sarov. Creation of this center is supported by the Moscow Center for Energy Efficiency, the Analytical Center, and the Sarov Physical and Technical Institute. This Fund will develop targeted programs and investment projects for efficient use of energy resources.; carry

out energy savings analyses in Russian regions; work to call public attention to efficient energy use practices; and create new jobs in the energy efficiency sector.

Energy Efficiency

PNNL's Meredydd Evans provided the history of PNNL's involvement in the establishment of energy efficiency centers in Russia and Eastern Europe. These centers are nongovernmental and not-for-profit and are expected to become financially independent within three years of start-up. These centers' activities include: project development; business support; policy development; outreach and training on energy efficient practices. The Moscow Center for Energy Efficiency (CENEf) has been working on establishing local independent centers throughout Russia; an assessment of district heating energy efficiency improvements; design and manufacture of equipment; energy-use modeling for key sectors (buildings, systems, environment). In the area of fuel cell technology, Evans stressed that Russia needs to find market niches and form strategic partnerships to promote that technology and its refinement. However, there is little interest in energy efficiency practices, and therefore great difficulty finding the financing to support efficiency projects. However, CENEf has been working to stress the value associated with growing self-sustaining businesses; the money savings possible as a result; increasing the long-term energy capacity; and the benefits towards environmental protection.

Evans was followed by the Deputy Director of CENEf, Vitaly Papushkin, who discussed a CENEf led project on energy efficiency at Seversk and Zheleznogorsk. According to him, 35% of these cities budgets goes to cover energy costs. Design capacities are overestimated by 50%. Study fixed basic consumption levels as a reference point. Prediction of power consumption development: population/demographic growth model/migration; models for high-level growth; consumption level set at national average. Results and efficient use in different commercial sectors and the amount of investment required. Basic concept of EE in technical problems on way toward EE (purely political). No barriers to improve in these two cities, or Sarov, or Snezhinsk. Centers can efficiently manage these programs. Have assessed the implementation of cost-effective project (for example, at Seversk) will need \$31 million to cut consumption 500gk to match reduction of 100 mw power unit.

Dr. Vladimir Zhigalov, Director of the VNIIEF Investment Department, in his presentation stressed that all bilateral and international cooperation is closely linked to continuing nonproliferation work. The cities have a highly skilled staff with diverse talent, and legislation is in development to promote improved marketing relations. If the cities have any weaknesses, he allowed, it is that there is low integration of their capabilities into the market. There is a real opportunity for launching energy projects with Europe.

VNIIEF's Dr. Svetlana Monakhova provided to the participants of the Forum a list of the training programs for VNIIEF specialists in sustainable energy, particularly in the areas of ecological monitoring; language training (these two are already in place); and ecological training. The current problem faced is that they must retrain excess workers, but still keep a number of nuclear specialists. There are a number of problems newly

trained ecologists can focus on: nuclear waste management; nuclear power generation; and disposal of HLW and excess HEU and weapons grade plutonium. These ecological training programs have been tested at schools and VNIIEF development center. List of eco-training courses: nature conservation; engineering support; economic aspects of environmental management. EM program developed for MINATOM personnel. The focus on environmental projects has been a successful direction, she pointed out. There is a clear need for basic science and technology knowledge, the development of databases, and English language training. PNNL's Evans, in response to Monokhova's presentation, pointed out that many nuclear scientists have the same educational background as energy engineers---only the professional experience is different. Therefore this area is now in a competitive sphere. Personnel level is so high, there's no doubt the program is a success.

Environmental Cleanup Technologies

Dr. James Fuller informed participants of the concept of Debt Conversion/Debt for Ecology, and its possible use to help stabilize Russian nuclear cities. Using the example of the Polish EcoFund, Fuller explained how that country's ecological situation and poor economic conditions left them unable to resolve their own cleanup challenges. The Polish federal government was successful in negotiating with creditors program based on ecological restoration, wherein outstanding debt was converted at a discount into money that never left the country, and was used to improve their own ecological conditions. Under Fuller's proposal, London Club, Paris Club, and the Russian Federal Government would support the establishment of debt-swap Russian Eco-Funds on a regional basis, and focused on Russian Cold War legacy ecological problems. These funds would be directed at the following goals: support defense conversion projects with significant scientific and engineering content ; improves the environment around the nuclear sites, making it more attractive to international commercial investment; improves health and safety of the local Russian people; reduces the likelihood of pollution transport beyond Russia's borders; and reduces the proliferation threat. Possible pilot projects under this initiative could include: reducing downstream contamination on the Techa River; reprocess accumulated high-level wastes; close out disposal depositories for liquid radioactive waste (on Lake Karachai and Cascade Reservoirs); decommission reactors and other facilities; reconstruct solid radioactive waste burial grounds; establish a low-level solid waste processing facility and repository, and deactivate contaminated areas at production sites.

PNNL's Charles Cole described to the participants the history of the Russian Academy of Science's collaboration with the U.S. on subsurface radioactive contamination. The successes of the U.S.-Russia Joint Coordinating Commission on Environmental Management (JCCEM) and the Academy projects are based on mutual interest and mutual benefit. The JCCEM's effort to develop an extensive database on Tomsk subsurface plumes was based on the belief that the Russian data would be valuable to U.S. cleanup effort. That "value" is the basis for financial support of the project. Many of the remediation technologies and monitoring techniques developed have a large potential market: these technologies can be used worldwide on non-nuclear, hazardous material contamination in a number of countries.

Sandia National Lab's Ralston Barnard provided an overview of the Zheleznogorsk Tank Retrieval and Closure Demonstration Center. This center was developed to test Russian-origin tank waste retrieval techniques that could be applied to both Russian and U.S. weapons complex high-level waste tanks. Scientists and engineers from both the Mining and Chemical Combine and the U.S. DOE jointly developed the tasks for the center. As planned, once technologies are successfully demonstrated, the Center will assist in the creation of an enterprise to market technologies and execute tank retrieval projects. This project currently uses NCI funding to develop its management structure and business model. The Center demonstrates the effectiveness of U.S.-Russian technical Collaboration, which can lead to commercial opportunities.

Raphael Della Ratta, of RANSAC, presented on the overlap of Russian expertise in environmental management technologies and the current needs of the U.S. cleanup programs. Using Russian projects under the ISTC, the IPP, and the 14 projects of the U.S.-Russia Joint Coordinating Commission on Environmental Technology (JCCEM) as a gauge of the current scientific and technological capabilities of the closed cities of the Russian Nuclear Weapons Complex, he outlined a number of projects underway in Russia that could be applied to the U.S. cleanup mission. Currently, DOE's Environmental Management programs' science and technology development activities focus on five major problem areas: Deactivation & Decommissioning; High Level Waste in Tanks; Subsurface Contaminants; Nuclear Materials; and Transuranic (TRU) & Mixed Waste. The combined budget for technology development under these Focus Areas amounts to nearly \$150 million for FY2001, within the Office of Science and Technology overall annual budget of \$256 million. The FY2002 budget currently in development has set funding for this program at \$233.5 million, a cut of more than \$22 million from FY2001 levels. And historically, Congress has tended to increase funding for this program, beyond the amount requested by DOE. Della Ratta argued that this program can become a source of potential funding for additional research and development to be conducted by the scientists and engineers within the Russian nuclear weapons complex, especially if they are assembled into focused, well-organized research firms.

Note: a number of presentations followed on specific technology projects that could be undertaken as part of the European Nuclear Cities Initiative:

- North Caspian Region Environmental Risk Mitigation, Olga Vorontsova;
- VNIIEF Environmental project Capabilities; A.D. Eremin;
- Snezhinsk Crisis Situation Center; Yegeny Avrorin;
- Immobilization of HLW using High-Temperature Fusion; Gennady Stoudenkin;
- VNIITF Environmental Control and Monitoring, Viktor Dombrovskiy and Evgeny Zhuravlev;
- Radioactive Waste Handling; Vyacheslav Kuranov;
- Reprocessing, Monitoring, and Storage of Waste; Alexander Tsvetokhine;
- Environmental Monitoring of the Karabash Region; Nina Barycheva;
- Development of 15kw Fuel Cell Vehicles; Vladimir Fateev;

- Developing Technologies for Fuel Cells, Vladimir Chukharev;
- VNIIEF and RAFCO Activities on Fuel Cell Development, Evgeny Novitsky;
- Telemedicine Center Establishment; Production of UV Medical Lasers; and Rapid Prototype Design Center Establishment, Elena Dyakova; and
- Remote Monitoring of Gas Pipelines, A.V. Ratchkov.

Details of these project proposals can be found in the ENCI White Paper. However, it was pointed out by Gambier that the Russian presenters were to be commended for the quality of their presentations, which remained focused on project costs, rates of return, and possible markets for the technologies proposed.

Carbon Management and Emissions Trading

Ram Uppuluri of Environmental Defense opened his presentation with a short history of the NGO Environmental Defense, and their interest in conducting carbon accounting analyses under the Kyoto Protocol. That organization's approach market-based environmental policy is to develop projects that contain a mix of science, economics, and law to achieve environmental results. Uppuluri asserted that there are clear opportunities for scientific collaboration with Environmental Defense and the closed cities that could attract scientists from a range of disciplines to carbon management analyses: oceanography, atmospheric, data management, and optics.

Conclusions

The Forum closed with the development of the Chairman's Conclusions document, which lays out the framework for the establishment of the International Working Group for the European Nuclear Cities Initiative. This IWG has as its goal the development of an integrated international strategy to bring Russian scientists who have promising peaceful research capabilities into partnerships with various agencies and institutions that could result in the further development and commercialisation of new technologies. The commercialisation success rate has been low, because the commercialisation of new technology is difficult. Any coherent strategy to prevent proliferation must take steps to realise in the marketplace the vast potential of expertise and scientific/technical knowledge that exists in the nuclear cities, creating new civil jobs for the excess workers. This should not exclude the financing of basic research, where appropriate.

The IWG can assist with the further coordination of international non-proliferation efforts, supported primarily by the European Union. The International Working Group (IWG) should provide a forum for discussions, for exchanging experiences and for establishing possible synergies and financing mechanisms that will result in a strategic alignment of the various international programs aimed at redirecting the expertise within the Russian nuclear cities.