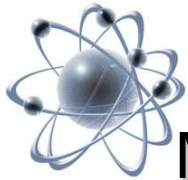




# National Research Nuclear University “MEPhI” – Russian National Center for Nuclear Education and Training



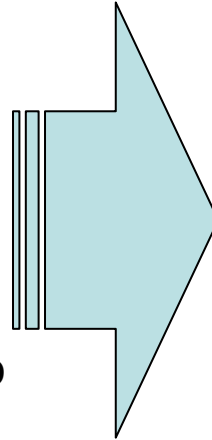
**M. Strikhanov**



# Nuclear Education in Russia

## Main challenges:

- human resource development for Russian nuclear renaissance (engineering, technology, research)
- human resource development to support Rosatom international activity
- integration into the world system of nuclear education
- restructuring of higher education system in the Russian Federation: two level study (master and bachelor degrees), new national educational standards for higher education
- negative demographic trends and unpopularity of technical education among young people
- graduates from Moscow Universities stay in Moscow and do not go to regional enterprises



## Presidential Decision:

To create National Research Nuclear University MEPhI as a educational and research holding for nuclear industry inside and outside of the Russian Federation

**MEPhI mission is to provide together with Rosatom the high level human resources for national nuclear industry inside and outside the Russian Federation.**

# Restructuring of Russian System of Higher Education

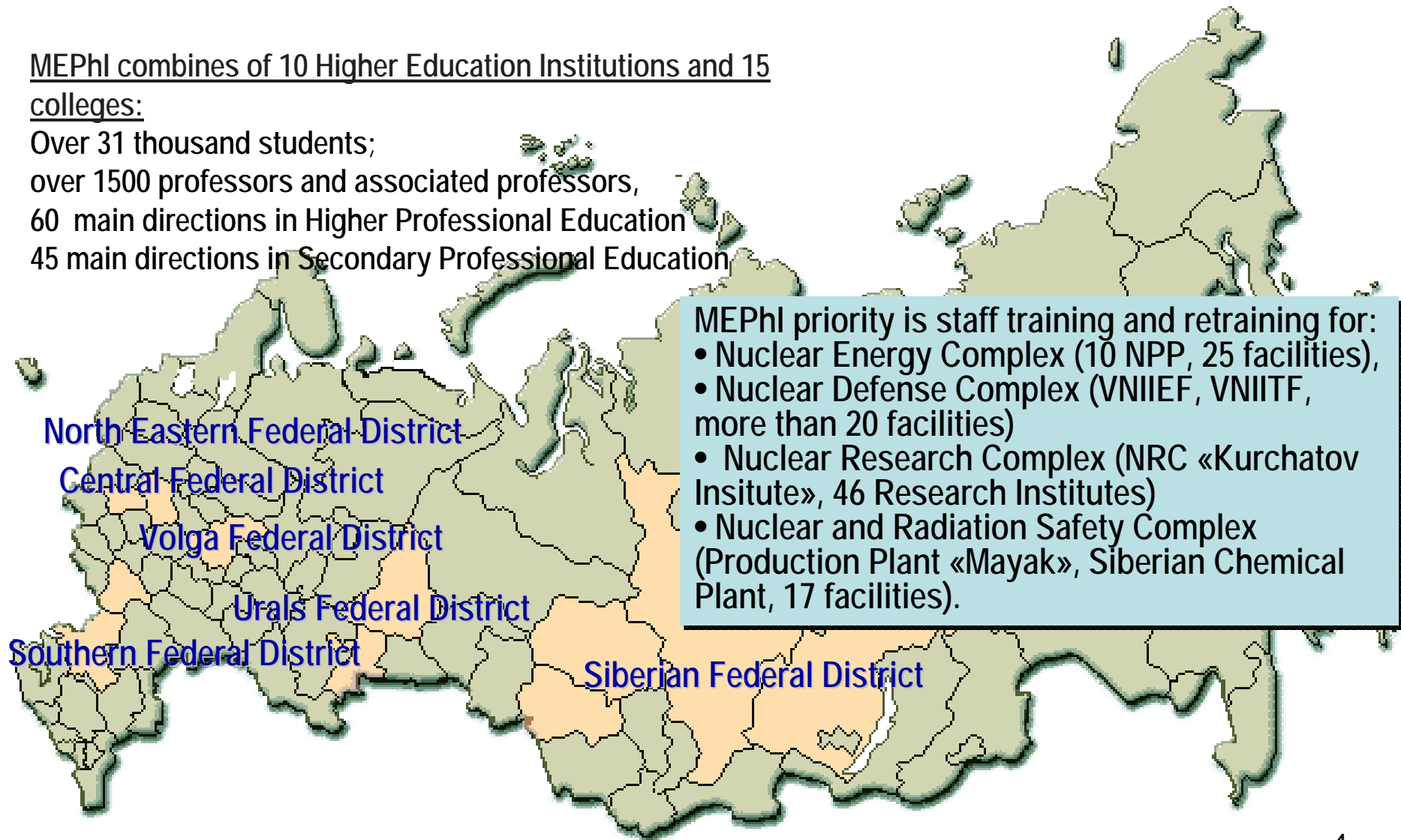
- ◆ 2 National Universities – Moscow State University and S-Petersburg State University.
- ◆ 29 National Research Universities were organized in 2008-2010.
- ◆ 7 Federal Universities were organized in 2006-2010.
- ◆ Association of Russian Leading Universities was established in 2010.



# National Research Nuclear University «MEPhI» - territorially dispersed educational and research holding for Russian nuclear industry inside and outside the Russian Federation

MEPhI combines of 10 Higher Education Institutions and 15 colleges:

Over 31 thousand students;  
over 1500 professors and associated professors,  
60 main directions in Higher Professional Education  
45 main directions in Secondary Professional Education



## Government of the Russian Federation approved in 2009 University Program of creation and development

### Structure of the Program :

- Human resources, training and retraining for atomic industry
- R&D and Innovations in the University
- United educational and R&D space in the University
- Program Management

### Principal indicators of Program realization

- Indicators of educational activity (4)
- Indicators of research and innovation (6)
- Indicators of human resource development (4)
- Indicators of national and international appreciation (3)
- Indicators of financial stability(4)

Program funding on 2010 :  
\$13,3 M– federal budget  
\$13,3 M – Rosatom co-funding

In 2009 year:  
13 indicators were achieved,  
8 indicators were exceeded

The Program goal is HR development by multilevel professional training and retraining and by integration of education, research and production.

Program Steering Committee is chaired by Sergei Kirienko, CEO of Rosatom.

## Integration with Industrial and Research partners

Research & Educational Centers in MEPhI	Research & Educational Centers created	Research & Educational Centers supported by Federal Program
Total number	51	10
Jointly with leading Rosatom Industrial and Research organizations	26	7

Projects of MEPhI within the Federal Program «National Technologic Basis»	Projects of MEPhI within the Federal Program «New generation nuclear power technologies»
Development of technologies for acquisition oxide and nitrite fuel for existing and prospective reactors using nanopowder	Comparative analysis of safety and effectiveness for prospective closed fuel cycles
Development of digital technology for installation of nondestructive control of fissile materials , for fuel assembly structure in nuclear reactors and dosimetric equipment	Development of technologies of manufacturing prospective fuel types and construction materials for fast neutron reactors

# Modern MEPHI Research & Educational Centers

- Nuclear reactor center
- Radiation material science and radiation protection center
- Physical protection, control and accounting of nuclear materials center
- Radiation accelerator center
- Neutrino Lab
- Nuclear electronics center
- Carbon fiber and carbon-composite material center
- Superconductivity center
- Nanosystems, nanomaterials and nanotechnologies center
- Laser technological center etc.

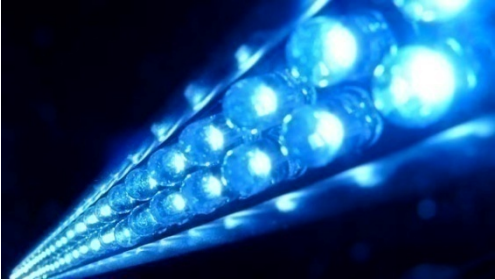


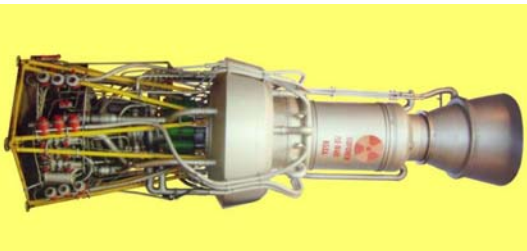
Presidential Working Group approved priority line of development inside Nuclear Technology direction. MEPhI is carrying out educational accompaniment of these line.



Priority line of development: Nuclear technologies	MEPhI educational projects	MEPhI research projects
New technology platform: closed nuclear fuel cycle and fast neutron reactors.	Training & Retraining for new technology platform.	Physics and technology of fast neutron reactors and closed nuclear fuel cycle.
Controlled nuclear fusion.	Training & Retraining for controlled nuclear fusion.	Controlled nuclear fusion. Technical superconductivity.
Development of optimized LWR technologies.	Training & Retraining Education&Education&Training for NPP.	Technologies and materials of NPP. Security and efficiency of LWR.
Fundamental research of matter.	Training & Retraining for Research and Development Center "Kurchatov Research Institute" . Specialist training for federal nuclear centers.	Research of matter in critical conditions. Advanced material and unit development based on laser and plasma beaming sources.



<p>Presidential priorities: Energy Efficiency and Conservation</p>	<p>MEPhI Educational Projects</p>	<p>MEPhI National Research Nuclear University National Research Nuclear University Research Innovative Projects</p>
	<p>Training &amp; Retraining in semiconductors, heterostructures, superconductors.</p>	<p>Technologies of creating Superconducting materials.</p> <p>Energy conservation and Lightning technologies (LEDs and new types of lightning technology equipment)</p> <p>Solar energy devices.</p>

<p>Presidential Priorities: Space Technologies</p>	<p>MEPhI National Research Nuclear University National Research Nuclear University Educational Projects</p>	<p>MEPhI National Research Nuclear University National Research Nuclear University Research Innovative Projects</p>
	<p>Training &amp; Retraining in radiation stability of micro-and nanoelectronic devices, in space ships nuclear generating units</p>	<p>Super-high frequency electronics and creation technologies of radiation stable electronic components base.</p> <p>Creation of transfer nuclear power unit of Mw type.</p>

Presidential priorities :  
Medicine technologies

MEPhI educational  
projects

MEPhI research projects



Training & Retraining in  
Nuclear medicine and  
Telemedicine

Searching and processing of new  
nuclear medicine technologies on the  
base of new generation physical  
instruments

Information – communicative remote  
technologies in assistance of decision-  
making in the diagnosis of dangerous  
diseases

Presidential priorities :  
Strategic Information  
technologies

MEPhI educational  
projects of NRNU MEPhI

MEPhI research projects



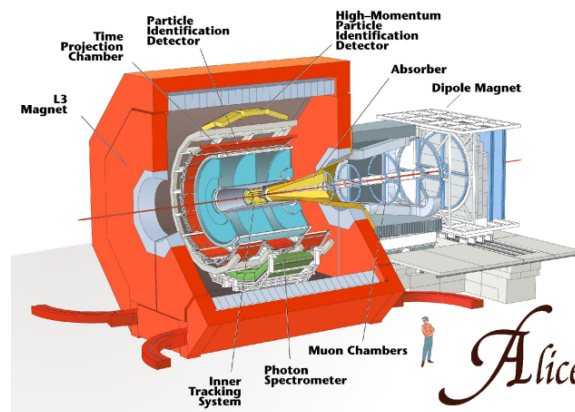
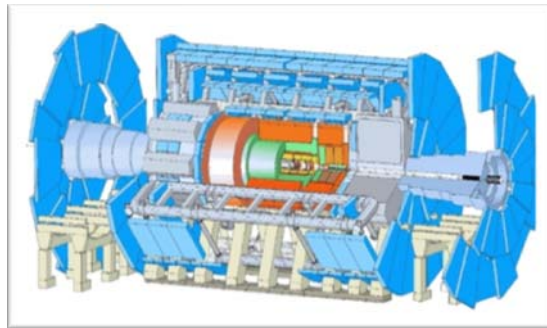
Training & Retraining in  
information  
technologies area.

Technologies with supercomputers

Development of GRID technologies.

# International collaboration

- Participation at the major international experiments in nuclear physics and high energy physics (STAR, ATLAS, ALICE, PAMELA etc.)
- Participation at the international programs of IAEA, ISTC, CERN, DESY etc., conferences and workshops
- Hosting of 30 international conferences and workshops (150 foreign delegations from nearly 25 countries visited MEPhI in 2009).





## MEPhI is Russian Nuclear Education Center (more than 40 programs)

- Nuclear reactors and power installations
  - Nuclear power plants
  - Radiation safety of human and the environment
  - Security and non-proliferation of nuclear materials
  - Physical protection, control and accounting of nuclear materials
  - Material science and technology of new materials
  - Nuclear and particle physics
  - Theoretical physics
  - Plasma physics
  - Physics of kinetic phenomena
  - Applied mathematics
  - Medical physics
  - Electronics and automation in physical facilities
  - Device and methods of for quality control and diagnostics
  - Ecology
- and others



More than 150 modern laboratories and educational-research centers, research nuclear reactor and 5 subcritical assemblies are used for education and training. Over 1500 professors and associated professors give the classes.

## **MEPhI is Training and Retraining Center (more than 200 programs, retraining at 25 MEPhI regional branches near enterprises)**

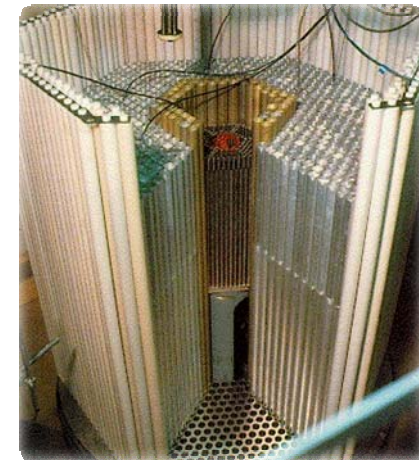
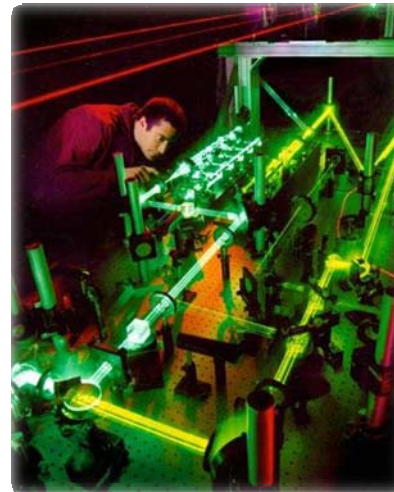
- Modern nuclear installations
- Safety of the nuclear fuel cycle
- Nuclear and radiation safety
- Culture of nuclear material management
- Technological aspects of nuclear non-proliferation
- Environmental protection
- Methods of reactor material diagnostics
- Methods for uranium and nonuranium isotopes separations
- Reliability of nuclear reactors and risk management
- Applied spectrometry of nuclear radiation
- Systems of the mathematical support of the exploitation of VVER type reactors
- Quality control in nuclear industry
- Nuclear physics methods in nanotechnologies
- Mass-spectrometric methods of isotope and element analysis and others





## **MEPhI is Postgraduate “Rosatom” Study Center (more than 30 directions)**

- Nuclear power installations (design, exploitation and decommission)
- Radiation safety of human and the environment
- Thermal physics
- High energy physics
- Plasma physics
- Laser physics
- Semiconductor physics
- Nuclear and particle physics
- Solid state electronics
- Micro- and nanoelectronics
- Theoretical physics
- Mathematical physics
- Medical physics
- Ecology etc.



MEPhI coordinates postgraduate study activity at “Rosatom” research and industrial centers.

# MEPhI is International Center for Nuclear Education and Knowledge

## Aims:

Aim of center creation is determined by the necessity to solve the tasks in the field of MEPhI international activity:

- Creation of system of continuous personnel training for EvrAzES states in the field of nuclear power applications based on the international standards;
- Development of educational service export as the leaders in the world educational market;
- Development of educational and scientific contacts to IAEA, WNU, ENEN, ANENT, biggest scientific centers and universities of USA, EU and Asia.

## Directions of activities:

- Education. Transfer of knowledge to new generation, to new developing countries and cooperation with the nuclear education of leading powers;
- Scientific enlightening activity – students, specialists, decision makers;
- Informational and analytical work.





## EURATOM-ROSATOM “ENEN-Russia” project in 2010-2012



- ✓ “Development of common ground for cooperation in nuclear education, training and knowledge management”
- ✓ Objective: to define a common basis to allow effective cooperation between the European and Russian networks for nuclear Education and Training
- ✓ The work should start by analysis of the present situation on both sides, define opportunities and barriers for cooperation, test solutions through pilot exercises and define a road map for the expansion of the cooperation
- ✓ Meetings and discussions since June 2008
- ✓ Expect to start in summer 2010 for the period of two years



## MEPhI is Russian center for international cooperation in nuclear education

- Training & Retraining of foreign students and specialists in the field of nuclear engineering and hi-tech (more than 300 people in 2009, Vietnam, Argentina, Jordan, Egypt: 2010 - ~50 students, 2011 – ~150 students, 2012-2014 - ~ 300 students per year) .
- Cooperation with nuclear educational networks (MEPhI has agreement with ENEN and ANENT).
- Cooperation with the foreign nuclear universities for development common master of research programs, postgraduate training, curricula analysis and enhanced (MEPhI has agreement with more than 15 universities from USA and Europe).
- Participation at the IAEA activity and representation of the Russian Federation at the World Nuclear University.
- Coordination of Russian and International Innovation Nuclear Consortiums activity.

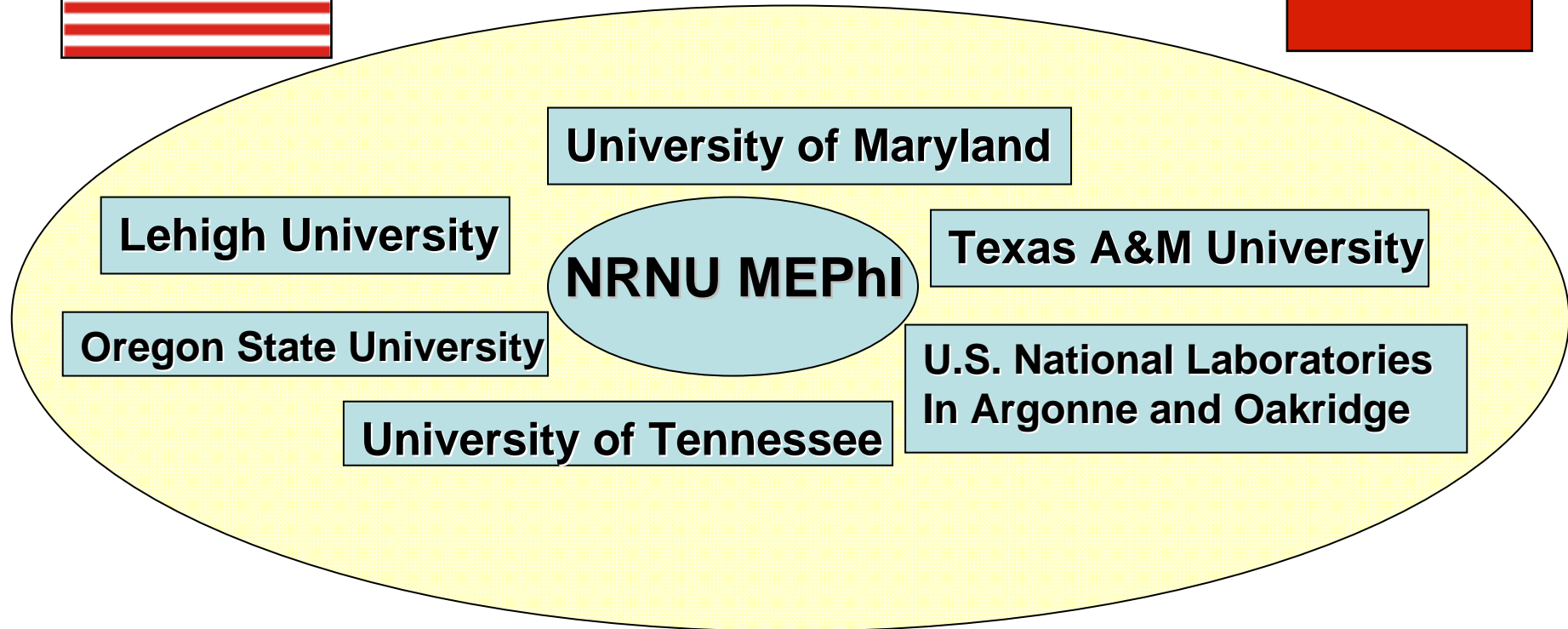


# Russian and International Innovation Nuclear Consortiums

- Russian Innovation Nuclear Consortium was created at 2007 under MEPhI and “Rosatom” initiative for methodological consolidation of Russian nuclear education and supporting of education, science and technology integration. Members of Consortium: all Russian universities that train specialist in nuclear field and 18 nuclear research and industrial enterprises.
- International Innovation Nuclear Consortium was created at 2008 under the MEPhI and “Rosatom” initiative for education experience and best practice exchange between nuclear universities of former SU countries. Members of Consortium: main Russian (10), Belarusian (3), Kazakh (6), Turkmen (1) and Tajik (3) nuclear universities and enterprises.



# The USA-Russian University Consortium



The main Goal: enhance of the education quality in the field of nuclear physics and nuclear engineering.

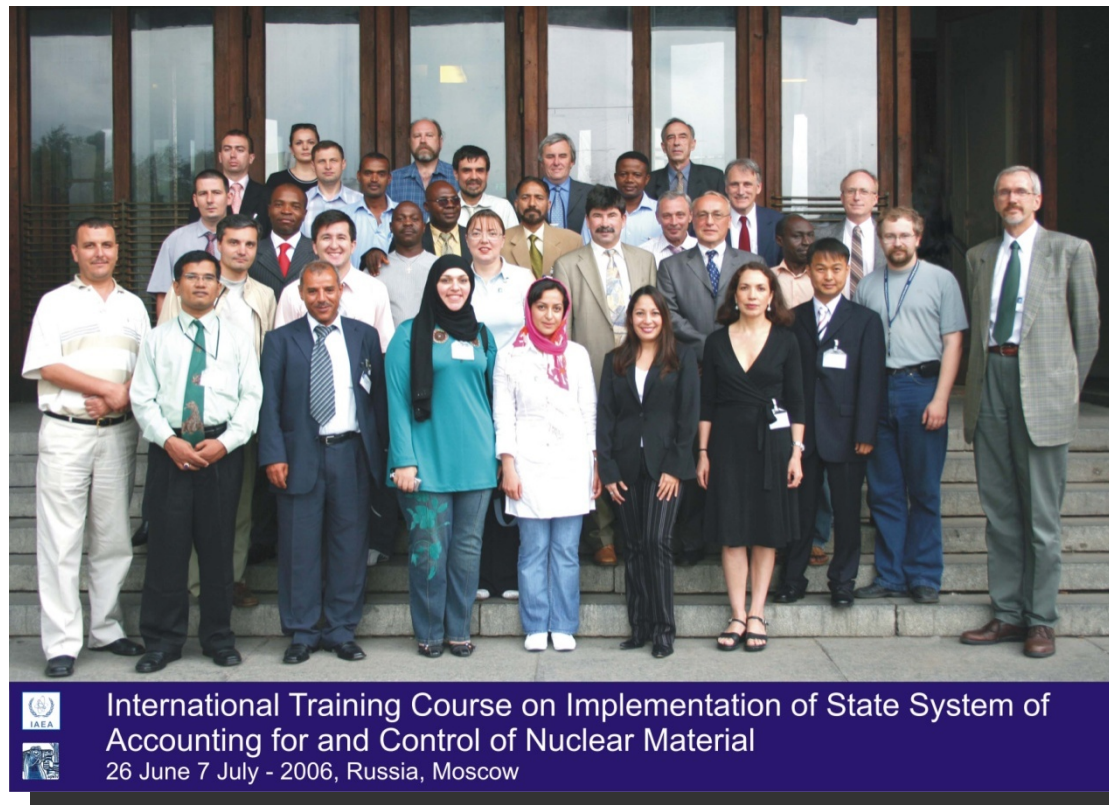
# MEPhI is the Russian Center for Nuclear Knowledge Management

- Nuclear knowledge management meeting at MEPhI (January 2010). The first NKM IAEA Mission at the Universities.
- 12 participants from 8 countries (the USA, France, United Kingdom, Canada, Romania, Czech Republic, Austria, Ukraine and IAEA).
- Objectives of the meeting:
  - To share experience and approaches in implementation of nuclear education programmes in technical universities and discuss the role of nuclear higher education in the development of human resources within building a national infrastructure for nuclear power and non-power applications.
  - To identify the basic trends in nuclear education and knowledge management needs to be addressed in order to improve organizational performance
  - To agree on the main assessment criteria to help identify strengths and development areas in the technical university's overall KM strategy
  - To develop recommendations to initiate and improve programmes on nuclear education including knowledge management to increase the organizations' performance and efficiency



# The IAEA SSAC Training Course

In 2004, 2006 and 2008 the IAEA International Training Course on Implementation of State System of Accounting for and Control of Nuclear Materials was successfully realized for 32 countries on the base of nuclear educational-research center of MEPhI by international team of lecturers from Russia, USA, France, Canada and others countries. The next Course will be on September 2010.



# Workshop: “A New Model for U.S.-Russian Nonproliferation and Antiterrorism Cooperation: The Next Generation of Advances in Safeguards and Verification Technologies” (15-16 December, 2008).

***Moscow Center Carnegie Endowment,  
National Research Nuclear University  
“MEPhI”***

Main goal: to discuss a “revolutionary technologies” that will change the way in which we think about safeguards: new methods and approaches to nuclear material control, accounting and detection.

33 participants (12 from USA and 21 from Russia) from 16 organizations.



**Rose Gottemoeller** – U.S. Department of State, Assistant Secretary for Verification, Compliance, and Implementation



## **MEPhI International Center for Nuclear Education Activities**

- Participation of the MEPhI experts in IAEA technical documents development activity (“NKM in research organizations”, “NKM in academic organizations”, “NKM in national programs”, “Methodological background for nuclear nonproliferation and security education”, “Reference curricula in nuclear security”, “Reference curricula in nuclear engineering” and others)
- Participation at the IAEA activity “Nuclear nonproliferation. Responsible science”. (ISTC Grant №-WS01-SB159-10).
- Participation at IAEA Technical Cooperation Programs of nuclear infrastructure development for Armenia and Belorussia.
- Participation of the experts at the IAEA NKM Missions.
- Preparation and presentation at the IAEA conferences the invited papers concerning with the Russian nuclear education system development and NKM at the Russian universities.
- Preparation of the international reference multimedia course “Nuclear Reactor Physics” in Russian language.
- Sign of the Agreements with the 3 USA universities for the cooperation in the field of nuclear education.
- Creation of the Russian video films library “From nuclear bomb to nuclear renaissance” (more than 400 films).

## Admission of school graduates to MEPhI



Enhancement of education in physics, mathematics and chemistry in schools at the regions of "Rosatom" enterprises allocation.

"Rosatom" competition for school graduates, all-Russia scientific competition «Unior» for school students, Khariton's competition

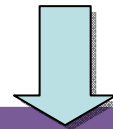
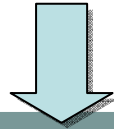
Correspondence physics & mathematics NRNU MEPhI school, preparatory courses at 27 regional NRNU MEPhI divisions

Common Admission Commission of regional-distributed university at 12 regions of Russian Federation.



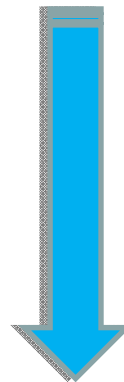
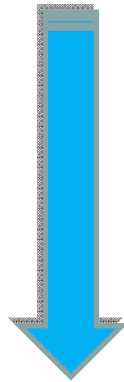


**Program New generation of MEPhI  
faculty members**



**MEPhI Financial support**

**Federal Program Financial Support**



**More than 100 young faculty members per year to renew  
the staff of University**

# Thank you!

