

IAEA
International Conference on Challenges Faced by Technical and Scientific Support
Organizations (TSO) in Enhancing Nuclear Safety and Security
25-29 October 2010
Tokyo, Japan

Conducting Education, Training and Research in a Globalized Environment



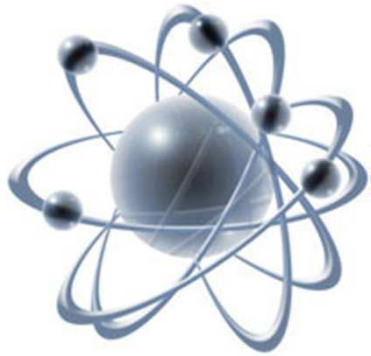
*I. Sokolova, Federal Service for Environmental, Industrial and
Nuclear Supervision, Deputy Head of Department*



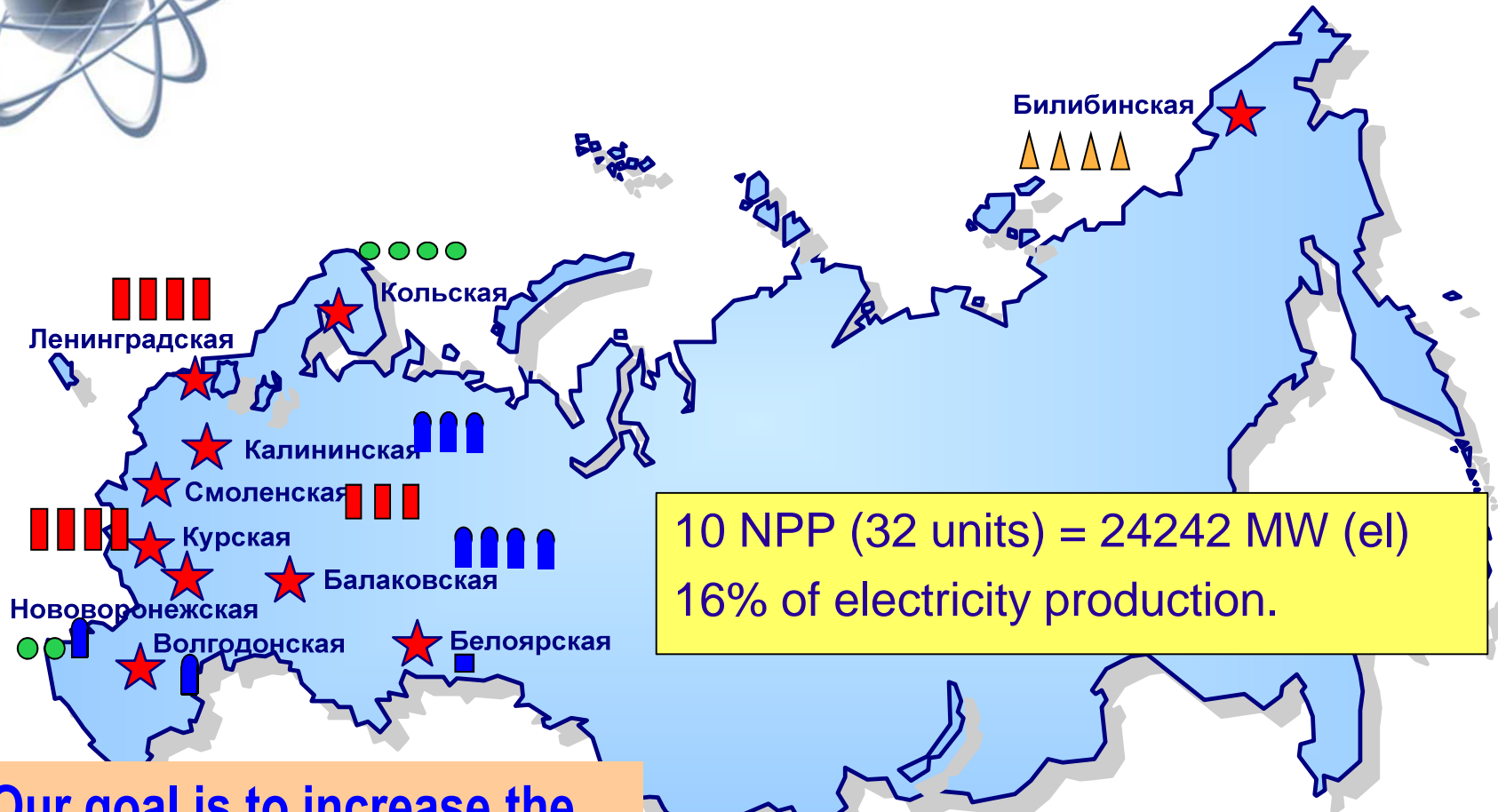
*E. Kryuchkov, National Research Nuclear University "MEPhI",
Vice rector*



*E. Kapralov, Federal State Unitary Enterprise VO "Safety",
Deputy Development Director*



Nuclear Power in Russia

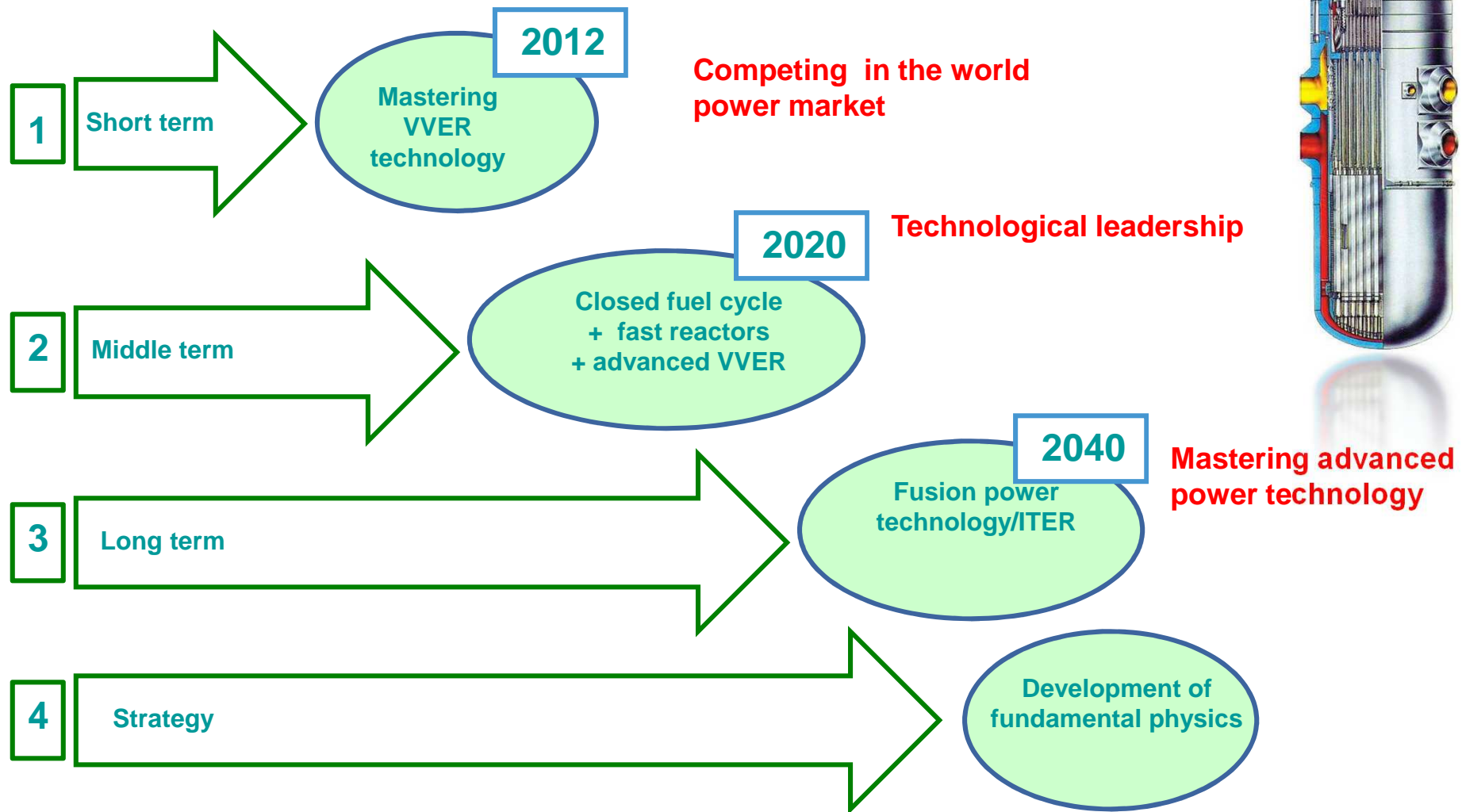


Our goal is to increase the fraction of nuclear power generation to 25% to 2020.

V. Putin

Russia has to increase the power of nuclear power plans from 23.5 GW in 2006 to 53.2 GW in 2020.

Nuclear Power in Russia (R&D horizons)



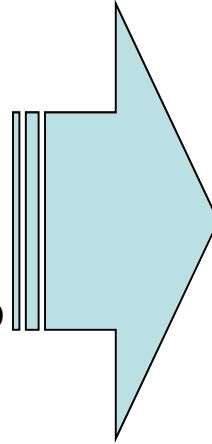
SAFETY CHALLENGE: Such an ambitious program requires paying much attention to nuclear and radiation safety: Regulatory infrastructure including consistent and competent Regulatory Authority and TSOs



Nuclear Education in Russia

Main Challenges:

- human resource development for Russian nuclear renaissance (engineering, technology, research, safety, safety regulation)
- 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 and organizations



Decisions:

- establish a throughout education and training system, including college education, university education and special professional training
- create National Research Nuclear University MEPhI as a educational and research holding for nuclear industry inside and outside of the Russian Federation

Whole Educational Process

- School education
- Secondary special education
- Higher professional education
 - Bachelor
 - Specialist
 - Master
- Post graduate course (optional)
- Advanced training and retraining





National Research Nuclear University “MEPhI”



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

Goals of the National Research Nuclear University “MEPhI”

- Training and retraining of human resources in modern science-intensive technologies.
- Providing human resources for Russian nuclear power and defense industries, radiation safety complex, scientific technological complex, Regulatory authority and its TSOs
- Training of high-skilled human resources (graduate, postgraduate and doctoral education) in science-intensive specialties.
- Training of managers and analytical experts for science-intensive branches of the Russian economy and specialists for the development of cooperation in science and technologies in the international competitive market.

Nuclear Education Territorial Coverage ("MEPhI" branches)



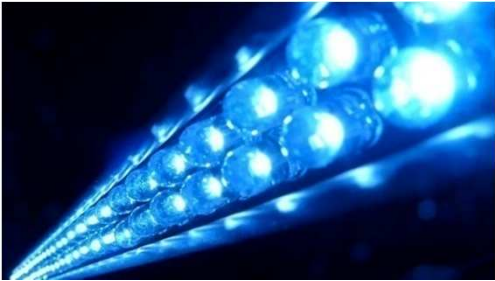
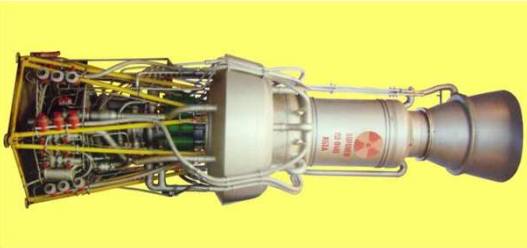
E-learning as an instrument of providing nuclear education and training all over the country


First-priority educational and scientific projects of to be carried out in the years 2010-2012 according to the following fundamental criteria:


- project compliance with the priority lines of Russian economy development (approved by President of Russian Federation);
- integration component of the projects (integration of education, science and industry; integration of education with leading manufacturers).



Priority line of development: Nuclear technologies	National Research Nuclear University educational projects	National Research Nuclear University scientific innovative projects
New technology platform: closed nuclear fuel cycle and fast neutron reactors.	Specialist training for new technology platform.	Physics and technology of fast neutron reactors and closed nuclear fuel cycle.
Controlled nuclear fusion.	Specialist training for controlled nuclear fusion.	Controlled nuclear fusion. Technical superconductivity.
Design project development of optimized computerized power unit LWR technologies.	Specialist training for NPP.	Technologies and materials of NPP. Security and efficiency of LWR.
Fundamental research of material property.	Specialist training for Research and Development Center “Kurchatov Research Institute” . Specialist training for federal nuclear centers.	Research of material properties in critical conditions. Advanced material and unit development based on laser and plasma beaming sources.
Nuclear and radiation safety	Specialist training for Rostekhnadzor (RA) and TSOs	Physics and technology of nuclear materials measurements. Special measurement methodology for MPC&A oversight (provided for RA and TSOs)

Development priorities: Energy Efficiency and Conservation	National Research Nuclear University Educational Projects	National Research Nuclear University Research Innovative Projects
	<p>Specialists Training in physics and semiconducting materials technology, heterostructures, superconducting materials.</p>	<p>Technologies of creating Superconducting materials.</p>
		<p>Energy conservation and Lightning technologies (Light-emitting diodes and new types of lightning technology equipment)</p>
Development Priorities: Space Technologies	National Research Nuclear University Educational Projects	National Research Nuclear University Research Innovative Projects
	<p>Specialists Training in radiation stability of micro-and nanoelectronic devises.</p>	<p>Super-high frequencies electronics and creation technologies of radiation stable electronic components base.</p>
	<p>Specialists training in space ships nuclear generating units</p>	<p>Creation of transfer nuclear power unit of magawatt type.</p>

Priority directions of development: Medicine technology	Educational projects of NRNU MEPhI	Scientific innovation projects of NRNU MEPhI
	<p>Specialists training in physical medicine area, computerized systems in medicine.</p>	<p>Searching and processing of new nuclear medicine technologies on the base of new generation physical instruments</p> <p>Information – communicative remote technologies in assistance of decision-making in the diagnosis of dangerous diseases</p>

Priority directions of development: Strategic Information technologies	Educational projects of NRNU MEPhI	Scientific innovation projects of NRNU MEPhI
	<p>Specialists training in information technologies area.</p>	<p>Special problems solving technologies on supercomputers (MEPhI-VNIIEF)</p> <p>Development of GRID technologies.</p> <p>Технологии diverse collection, analysis and visualization of scientific information</p> <p>Information safety , monitoring and analysis of economic financial sphere technologies</p>

Priority directions of training and research(1)

- **Nuclear-physics and nanophysics:** physics of atomic nucleus, elementary particle physics, plasma physics, interaction of radiation with matter and physics of high density of energy, quantum physics of condensed matter, physics of nanotechnological processes and laser physics etc;
- **Nuclear-engineering and nanotechnology:** nuclear technology and power engineering, radiation protection, nuclear engineering, nanotechnologies and nanomaterials, laser, plasma, and beam technologies, isotope separation, nuclear materials, radiation material science, micro- and nanoelectronics, physical-chemical technologies, nuclear medicine, biotechnologies etc.;



Priority directions of training and research(2)

- **Modern information technologies:** information technologies in fundamental and applied research, modeling of technological and physical processes, simulators, network engineering, information and technological protection etc.;
- **Economics and management** in the field of high technologies, first of all of nuclear- and nanotechnologies: management, international scientific-technological collaboration etc.





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

Nuclear Education provided is regarded as basis of competence set required both by industry and safety regulatory infrastructure

- 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.

Educating, Training and Retraining for Nuclear Safety Regulatory Purposes (RA and TSOs Personnel)

Federal Service for Environmental,
Industrial and Nuclear Supervision
(ROSTECHNADZOR)

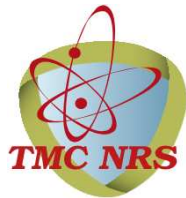
FSUE VO "Safety"

SEC NRS

TMC NRS

Regulatory Authority TSO Contour

Training and Methodological Center for Nuclear and Radiation Safety



- development and maintenance of methodologically unified system of training regulatory authorities' personnel in the field of nuclear and radiation safety, and supervised organizations;
- providing training to the specialists and inspectors, supervising equipment manufacturing and assessment of compliance for nuclear facilities in Russian Federation and abroad being constructed or modernized;
- training, retraining and refresher training of nuclear industry specialists, by means of licensed educational programs.

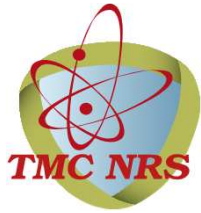
Educational activities are based on the IAEA requirements in the field of training of regulatory authority's and operating organizations' personnel





TMC NRS Training Programs

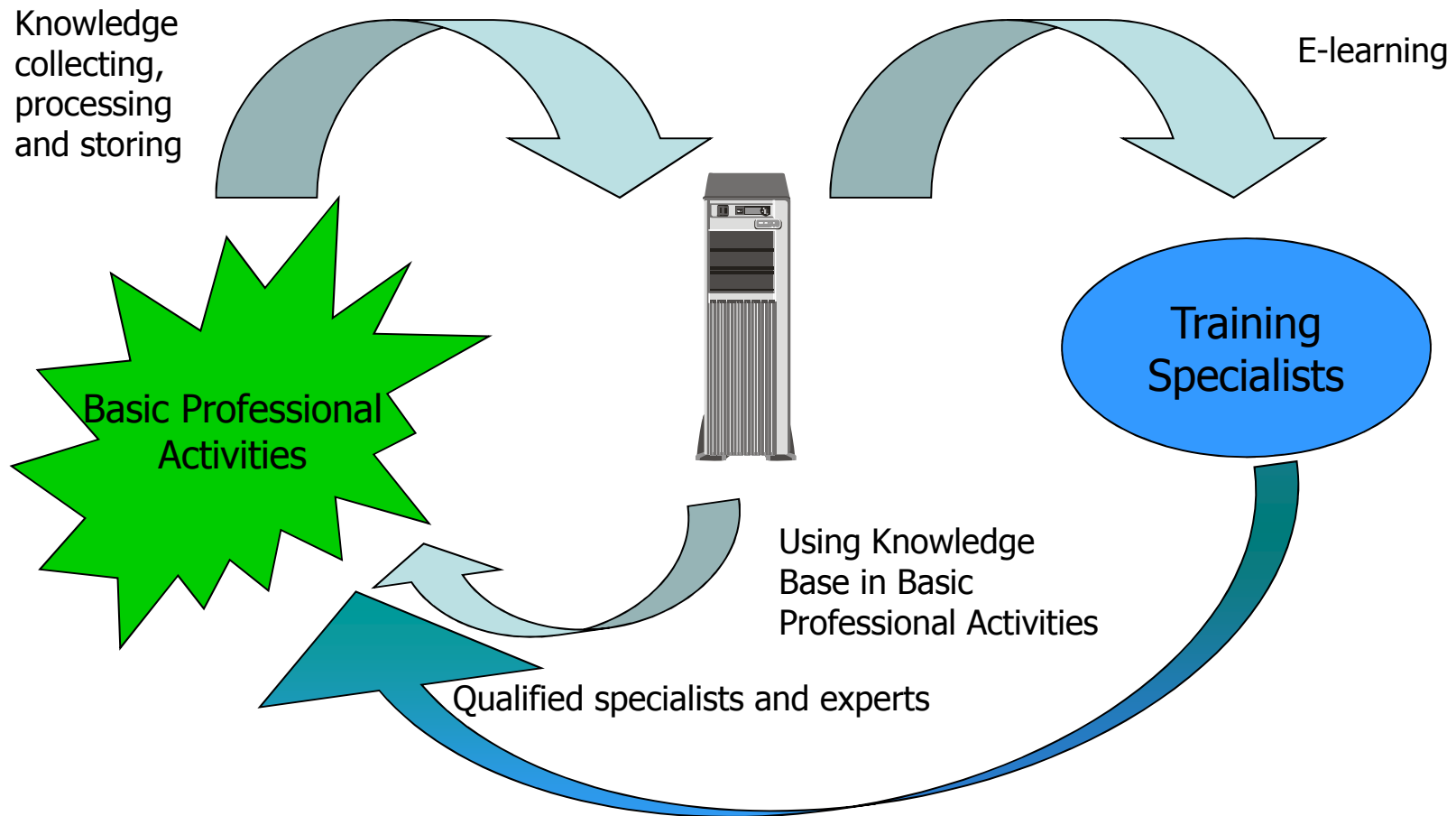
- Engineering of quality management systems at the nuclear, radiation hazardous facilities and production plants (with man-induced risks)
- Quality management at the nuclear, radiation and hazardous facilities and production plants (with man-induced risks)
- Quality management systems (QAP) audit at the nuclear, radiation hazardous facilities and production plants (with man-induced risks)
- Engineering of nuclear and radiation safety management systems
- Management of nuclear and radiation safety
- Audit of nuclear and radiation safety
- Quality supervision of manufacturing and acceptance inspection of the equipment for the nuclear, radiation hazardous facilities and production plants
- Legal framework, codes and standards in the field of nuclear, radiation, industrial and ecological safety assurance



TMC NRS Training Programs (continued)

- Fundamentals of physical protection of nuclear, radiation hazardous facilities and production plants (with man-induced risks)
- Inspection activities in the field of physical protection of nuclear, radiation hazardous facilities (with man-induced risks) and production plants
- Integrated quality safety and environmental protection management system
- Audit of nuclear and radiation safety assurance programs (quality and safety management systems) in the field of nuclear energy
- Organization and carrying out of the safety review of the NPP nuclear and radiation safety analyses documentation
- Audit and safety review under the certification system of the production, manufacture and technologies for nuclear installations, radiation sources and storages.

E-learning and Knowledge Management



Nuclear Knowledge Management

- Nuclear knowledge management IAEA Mission 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



International Cooperation for Nuclear Education and Knowledge

Aims:

- 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 following of export of Russian nuclear technology;
- 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



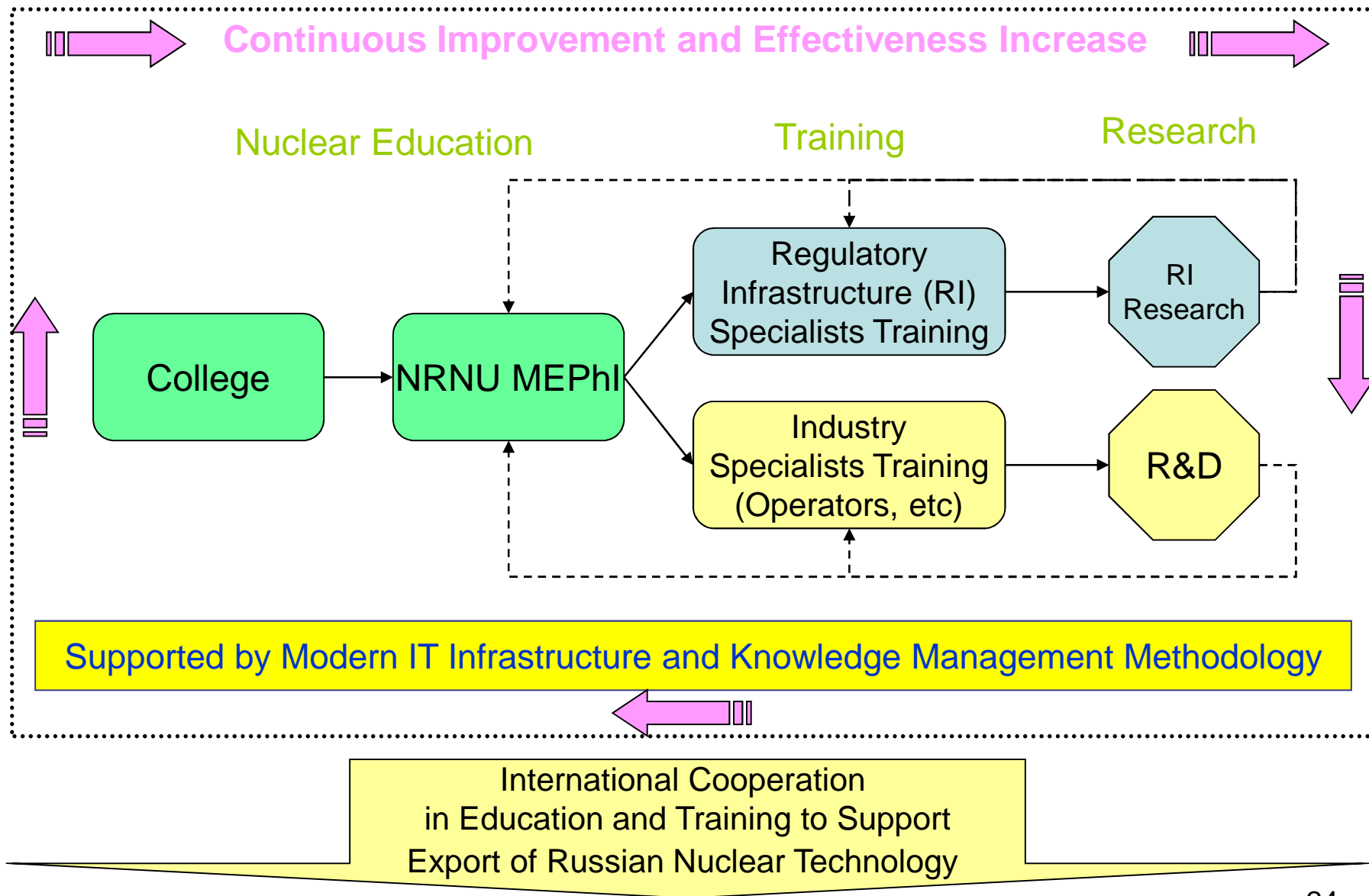
- ✓ “Development of common ground for cooperation in nuclear education, training and knowledge management”
- ✓ Objective: to define a common basis to allow effective cooperation between the European and Russian networks for nuclear Education and Training
- ✓ The work should start by analysis of the present 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

International Cooperation in Nuclear Education and Training

- Training & Retraining of foreign students and specialists at the MEPhI 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).
- Training & Retraining of foreign Regulatory Authorities specialists at the TMC NRS in cooperation with FSUE VO “Safety” and SEC NRS (~15 specialists in 2009-2010, ~50 specialists planned in 2011-2012).
- Cooperation with nuclear educational networks (agreement with ENEN and ANENT).
- Participation at the IAEA activity and representation of the Russian Federation at the World Nuclear University.



Throughout Nuclear Educational and Training System and Perspectives



Thank you for your attention!



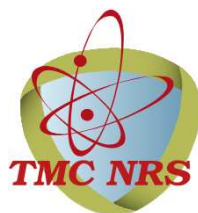
<http://www.gosnadzor.ru>



<http://www.mephi.ru>



<http://www.vosafety.ru>



<http://www.tcnrs.ru>