ГОСУДАРСТВЕННАЯ КОРПОРАЦИЯ ПО АТОМНОЙ ЭНЕРГИИ «РОСАТОМ»

Human Resource Development
For Infrastructure and Capacity Building in the Countries Embarking on Nuclear Programmes

V.Artisyuk

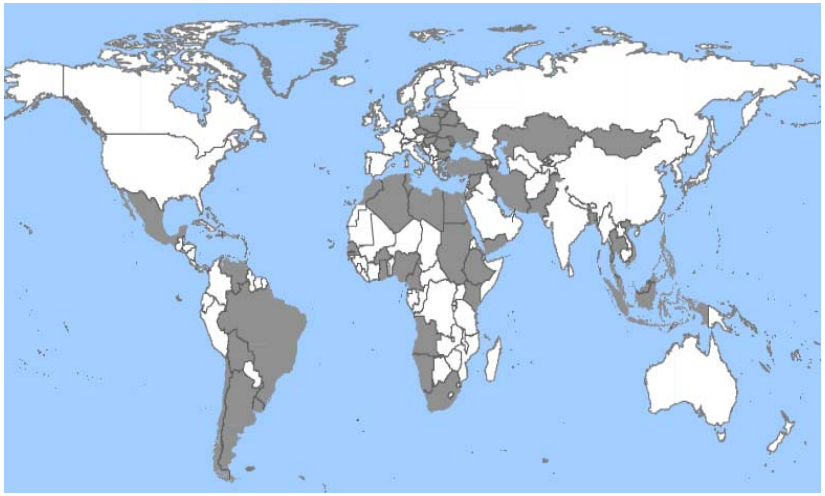
Central Institute for Continuing Education&Training, Obninsk, Russia

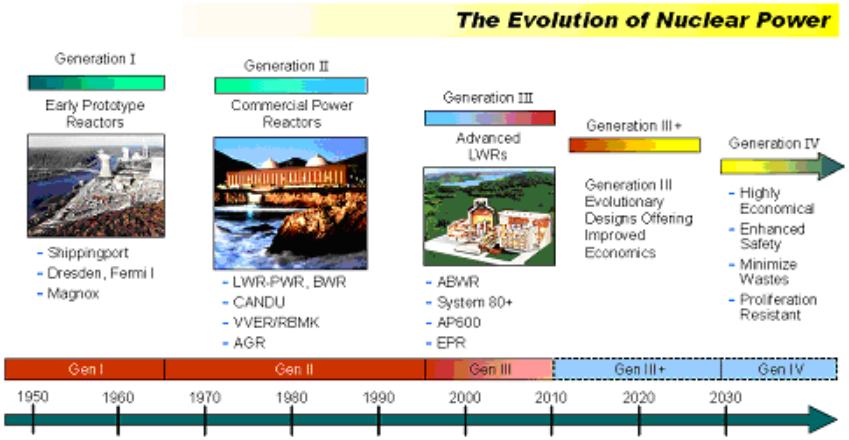
International Forum "ATOMEXPO 2010"
7 June 2010

Contents

1 Global challenge of nuclear E&T

Nuclear renaissance - Global trends





Expanding nuclear power to developing countries

Quality change: Generation – IV reactors (nuclear developed countries)

Nuclear renaissance - Trends in Russia

*

ЭКСПОРТНЫЕ ВОЗМОЖНОСТИ РОССИЙСКОЙ ТЕХНОЛОГИИ

Конкурентоспособность на мировом рынке требует обеспечения государственной поддержки для продвижения капиталоемких продуктов российских ядерных технологий на внешний рынок

ПРОЕКТ №2: НОВАЯ ТЕХНОЛОГИЧЕСКАЯ ПЛАТФОРМА

Технологические заделы:
- Натриевая тематика: БН-350, БН-600 (все установки - 140 реакторолет)
- Свинцовая тематика: транспортные РУ (свинец-висмут) на на АПЛ
- Смешанное уран-плутониевое топливо (экспериментальные технологии)
- Переработка ОЯТ (Маяк и экспериментальные неводные технологии)

Основные развилки при определении архитектуры замкнутого топливного цикла с энергоблоками на быстрых нейтронах

Increasing export

New Nuclear Power Platform (closed fuel cycle based on fast reactors)

Global Challenge of Nuclear Education

- aging of nuclear personnel

- increasing demands in nuclear specialists in both developing countries (expanding nuclear power) and developed countries (closing fuel cycles)

- lack of experts in developing countries

- unattractiveness of technical sciences
  (in developed countries)- «hard sciences»- are really hard!

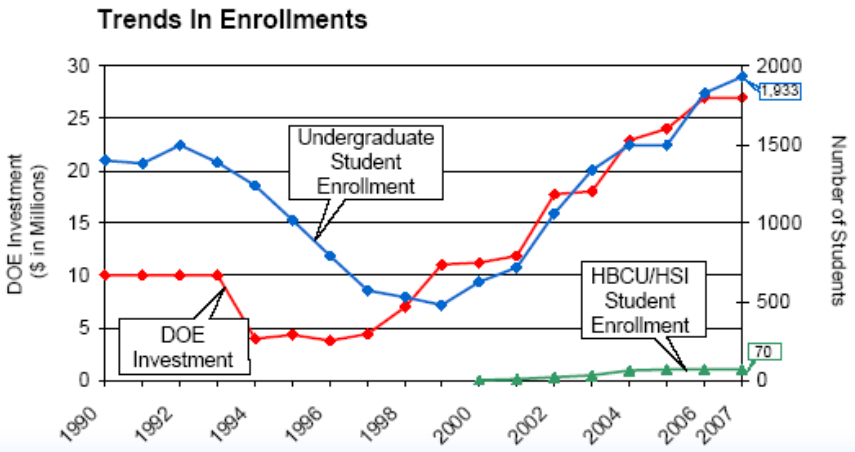
- specifics of nuclear power technology “globalness” and long consequences

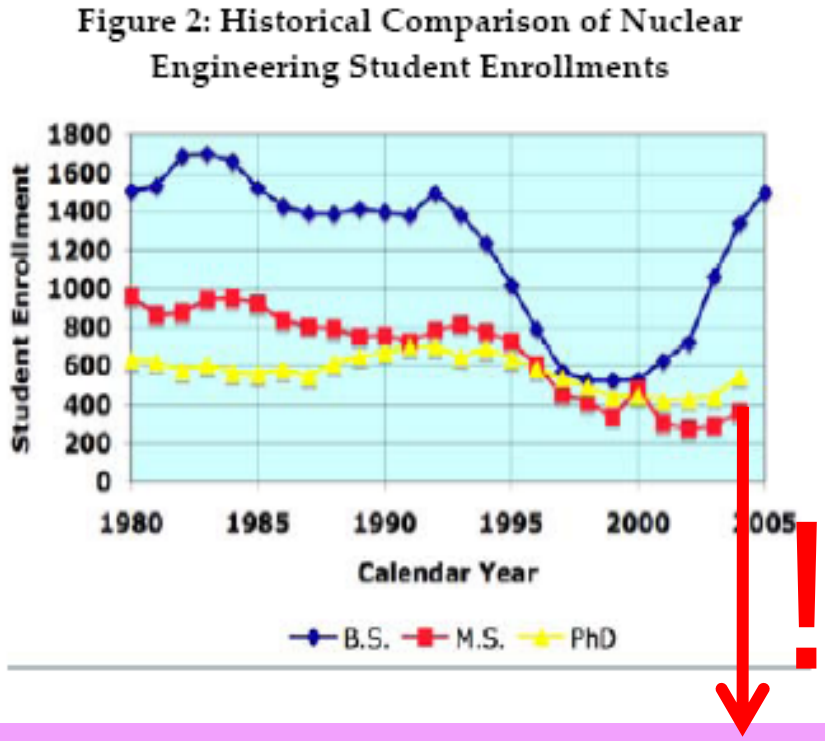
Response in the USA

POCATOM

Investments vs Results*:

Status of Nuclear Engineering Education





Conclusion : Inertia of university system

* Sekazi K. Mtingwa (Masachusets Institute of Technology) U.S. Workforce and Educational Facilities' Readiness to Meet the Future Challenges of Nuclear Energy Proceedings of Global 2009,Paris, France, September 6-11, 2009

«Bottle neck» of nuclear education (conclusions of the IAEA)

IAEA
International Atomic Energy Agency

IAEA Technical Meeting
on the
Role of Universities in Preserving and Managing Nuclear Knowledge

10–14 December 2007, IAEA HQ, Vienna, Austria, Room C 02 I
Scientific Secretary: Peter J. Gowin

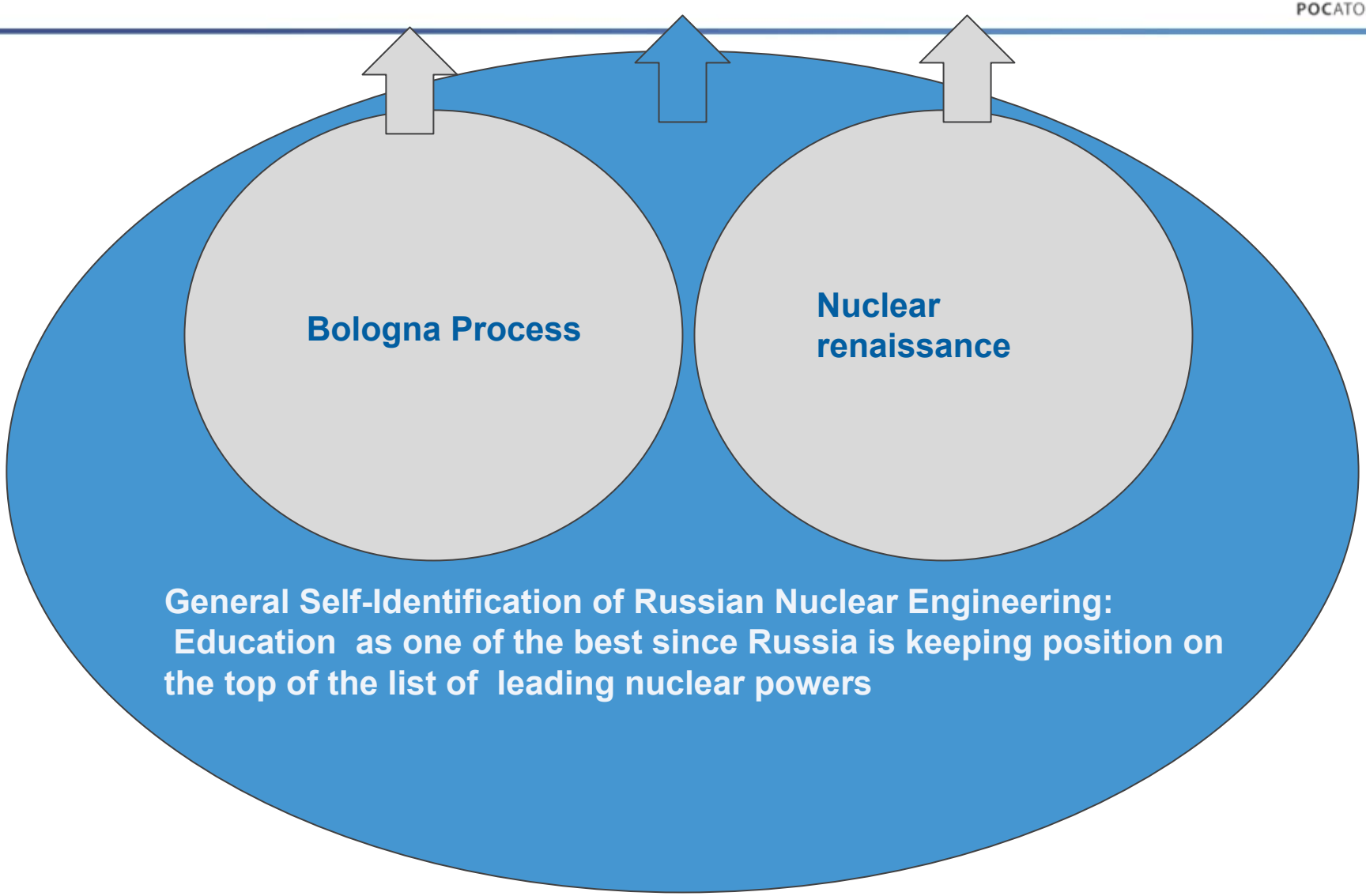
Conclusions:

The "bottle neck" is lack of professors

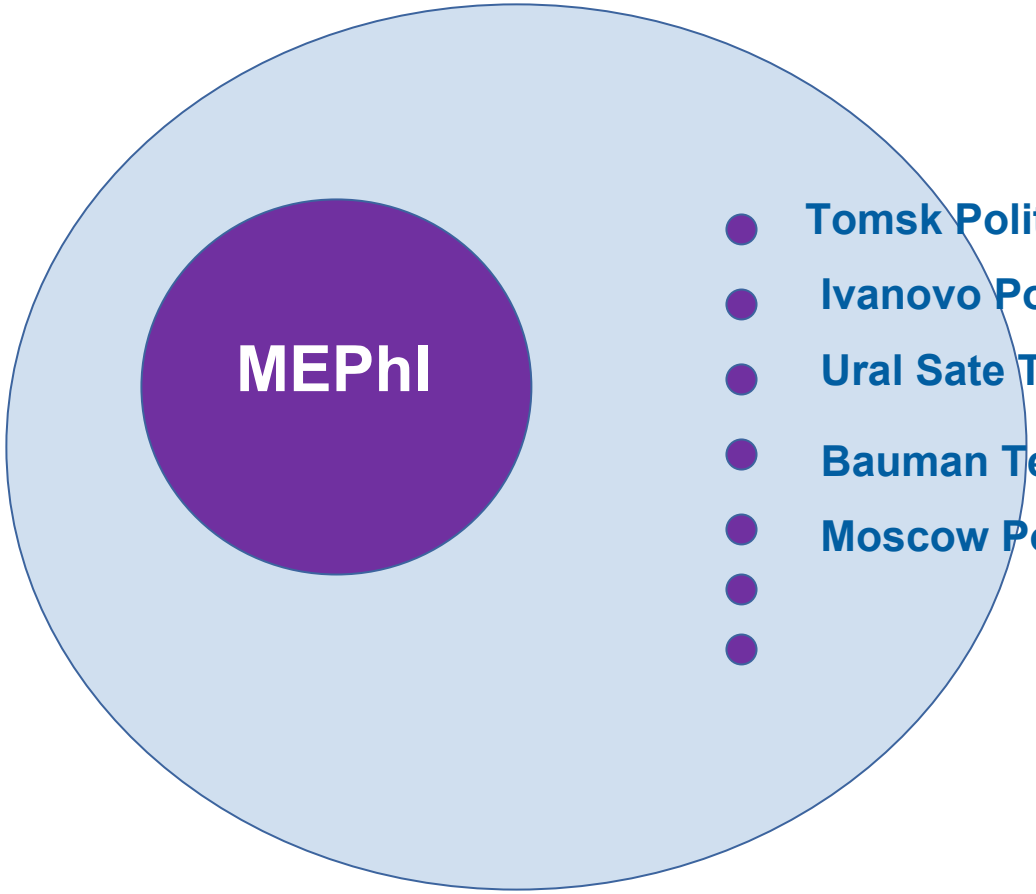
(not students!)

To become professor requires about 12-15 yrs!

Challenge of Education&Training in Nuclear Field

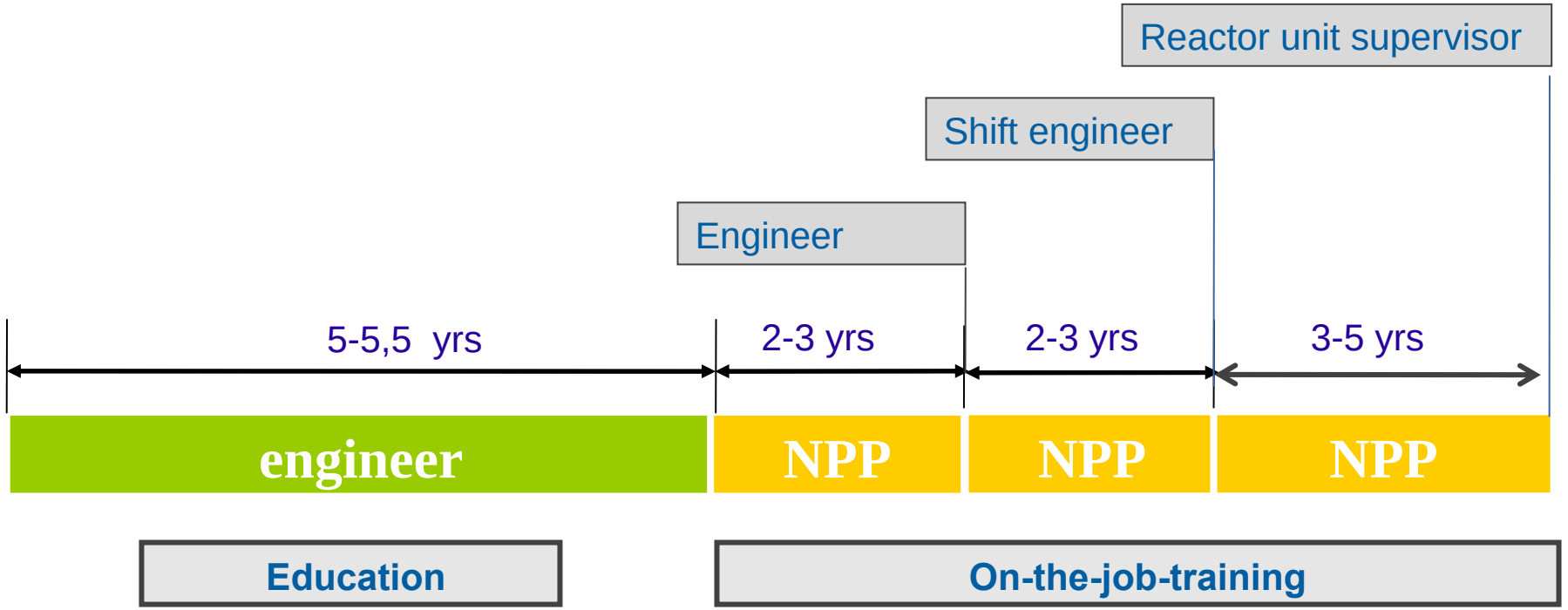


Consortium of Nuclear Universities in Russia



- Tomsk Politechnic University (TPU)
- Ivanovo Power Institute
- Ural Sate Technical University
- Bauman Technical University-Moscow
- Moscow Power Institute (MEI)

Professional E&T of NPP Personnel (the case of Russia)



To become reactor unit supervisor requires about 12-15 yrs!

Similar to professor!!!

POCATOM

The urgent need to modify nuclear education in the universities

The urgent need to meet the increasing demands in NPP staff for emerging nuclear power programmes in developing countries

2 Specifics of infrastructure development for new entrants

Infrastructure development. Recent international forums

POCATOM

NSSG - Nuclear Safety and Security Group
The Italian Presidency

in cooperation with

EUROPEAN COMMISSION

IAEA International Atomic Energy Agency

ENEA Italian National Agency for New Technologies, Energy and Sustainable Economic Development

International Workshop on Nuclear Safety and Secu
Education and Training in Countries Embarking on
Expanding Nuclear Programmes

Bologna, Italy
8-9 October 2009

IAEA International Atomic Energy Agency

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

DEPARTMENT OF NUCLEAR I

Technical Meeting/Worksh

Topical Issues on Infrastructure D
Managing the Developmer
National Infrastructure for Nucl

9 to 12 February 2010

Cosponsored by the Governments of United States of America

enen

The 2nd Special Event
organized by the European Nuclear Education Network Association
"Needs and strategies on Education &Training for increasing Nuclear Power Production"
Ljubljana, Slovenia, 4 March 2010 at 14-18h

WORKSHOP ANNOUNCEMENT

2. Specifics of infrastructure development

IAEA resource in support of infrastructure development

POCATOM

- Guidance documents
- Support to Technical Cooperation projects
- Integrated Nuclear Infrastructure Review: INIR IAEA Peer Review Service
- Human resources: the key to a successful nuclear power programme

http://www.iaea.org/NuclearPower/Infrastructure/

Expectation from the side of recipeint 1/2

Group:1 NPP VEDOR PROSPECTIVES

EXPERIENCE ,LESSON LEARNED and RECOMMENDATIONS

1. Vendor should provide a Vision to the New Comer
2. The new comer countries need additional information in terms of seminars, trainings & courses from vendors.
3. The information regarding Operators and Regulators should be provided by Vendors or the corresponding organisation of the country of the Vendor
4. The local professional institutes should be involved to impart knowledge as per vendors requirements
5. New Comer countries want proven technologies
6. The cost of NPP must be discussed per technical requirements of the country depending on what they actual want

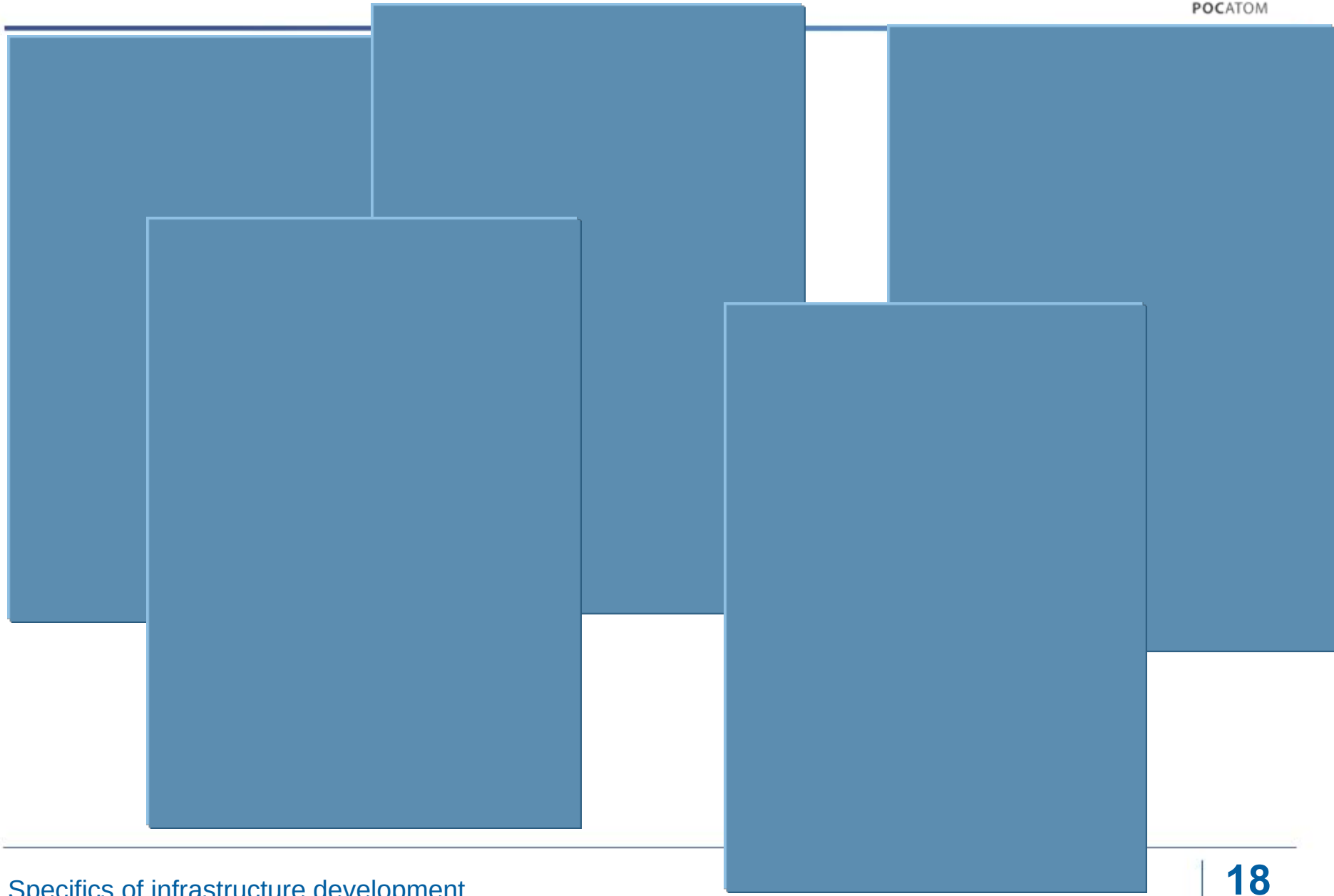
О потребностях стран-реципиентов 3/3

Group: 4 **NPP Vendors perspectives**

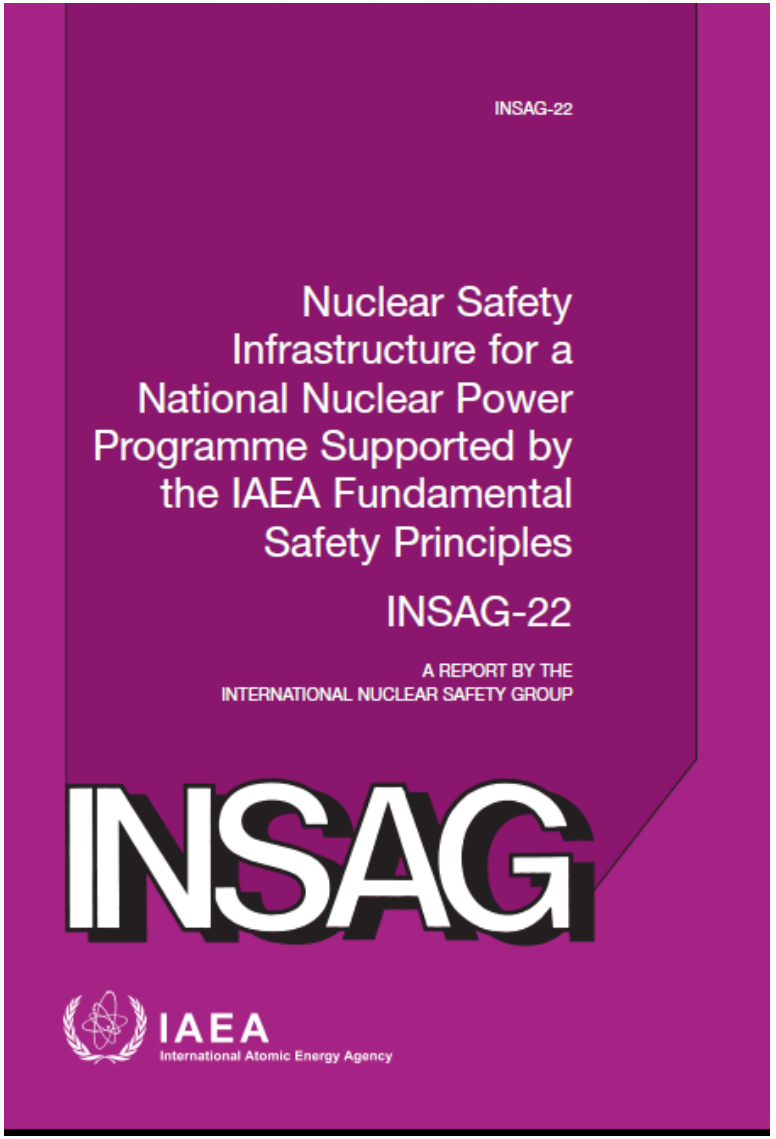
4. RECOMMENDATIONS

1. Newcomer countries should consider working with countries with similar experiences in importing country-of-origin standards, codes, regulations, etc. (i.e. Spain importing US NRC processes for its first unit).
2. Once the technology is chosen, the host country should consider implementing a training program in close cooperation with the regulatory authority, as well as the operator, from the country-of-origin.
3. In order to create a viable and practical localization plan, the host country must work with the vendor community to understand supply chain and human resource needs / opportunities, while at the same time doing an assessment of host country capacities, capabilities, and quality standards.
4. The host country will also need to involve its industry in the development of the plan, and provide access for such industry to the vendor community.

IAEA recommendations 1 / 2

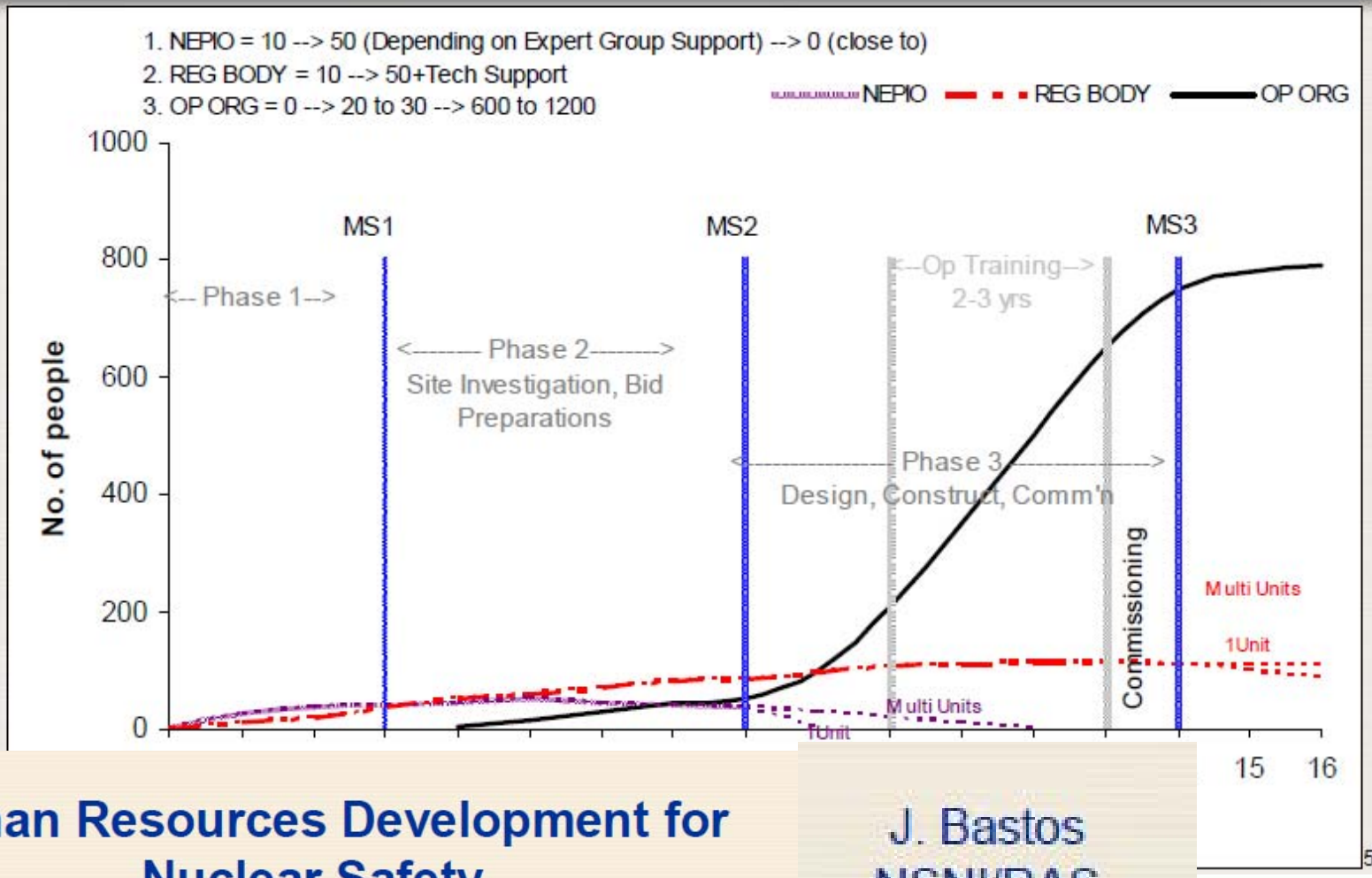


IAEA recommendations



Human Resource Development

Phasing the Training Programme



Human Resources Development for Nuclear Safety

J. Bastos
NSNI/RAS

3 Potential of Russian System of Continuing Education&Training in support of HR development for new entrants

Training on sites

POCATOM

ROSENERGOATOM CONCERN OJSC

Balakovo	NPP	Training Center
Beloyarsk	NPP	Training Center
Bilibino	NPP	Training Center
Volgodonsk	NPP	Training Center
Kalinin	NPP	Training Center
Kola	NPP	Training Center
Kursk	NPP	Training Center
Leningrad	NPP	Training Center
Novovoronezh	NPP	Training Center
Smolensk	NPP	Training Center

- **Department of NPP operating personnel training**
- **Department of NPP maintenance personnel training**
- **Department of general training**
- **Department of training support**
- **Department of software development**
- **Administrative department**

Training on sites

- Annual training of the NPP personnel:
  - Operating personnel – 80-160 hours

  (36 hours of practical experience with the use of full scale and analytical simulators)

  - Other categories of NPP personnel – 20 hours

Qualification upgrade

Qualification upgrade for NPP managers and specialists is provided once in 5 yrs in

Institutes for continuing education and training

Faculties of advanced training (associated with Universities)

Training centers of JSC «Atomtechenergo»

Qualification upgrade

POCATOM

«Atomtechenergo»

VVER

Novo-Voronezh Training Center

RBMK

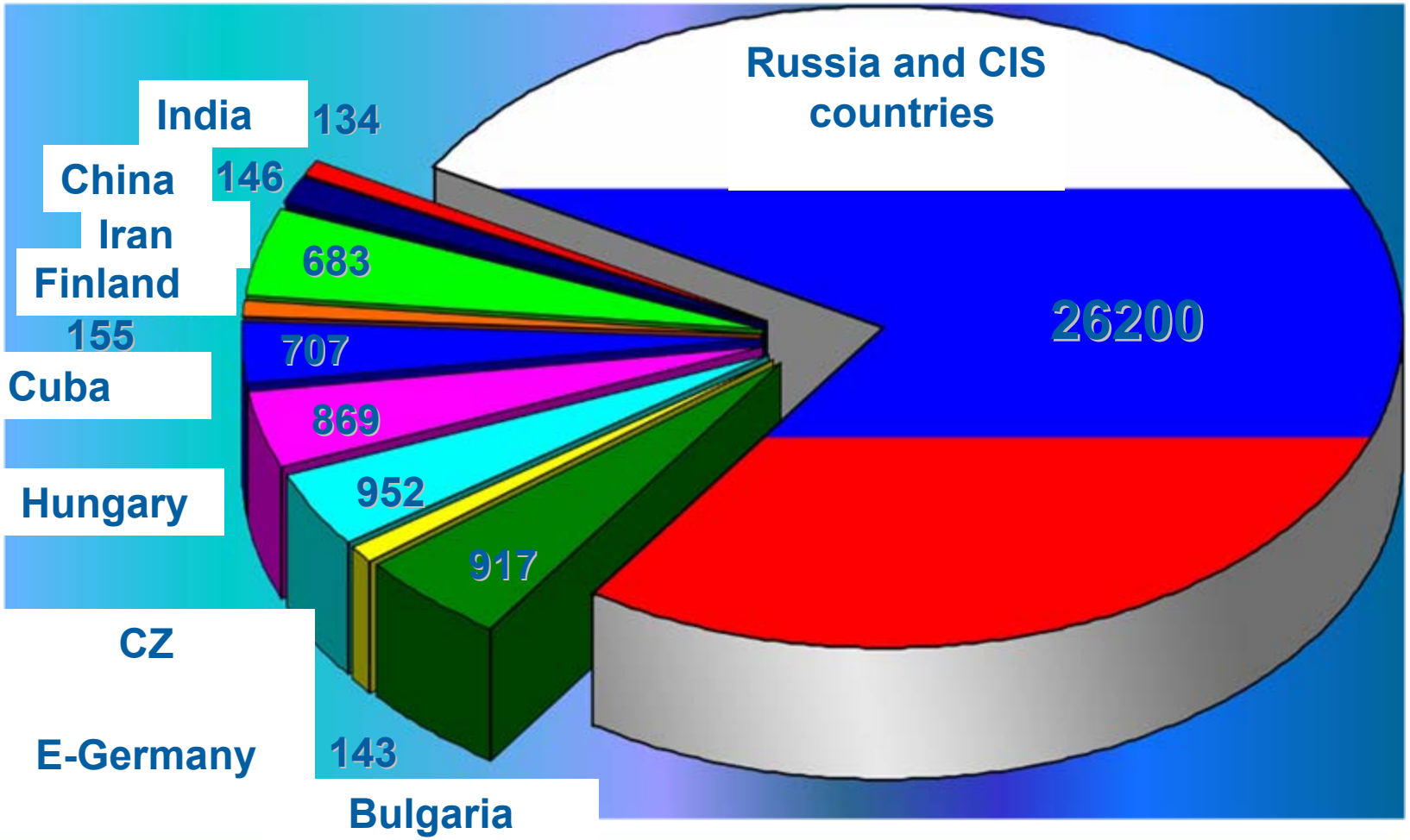
Smolensk Training Center

Functions:

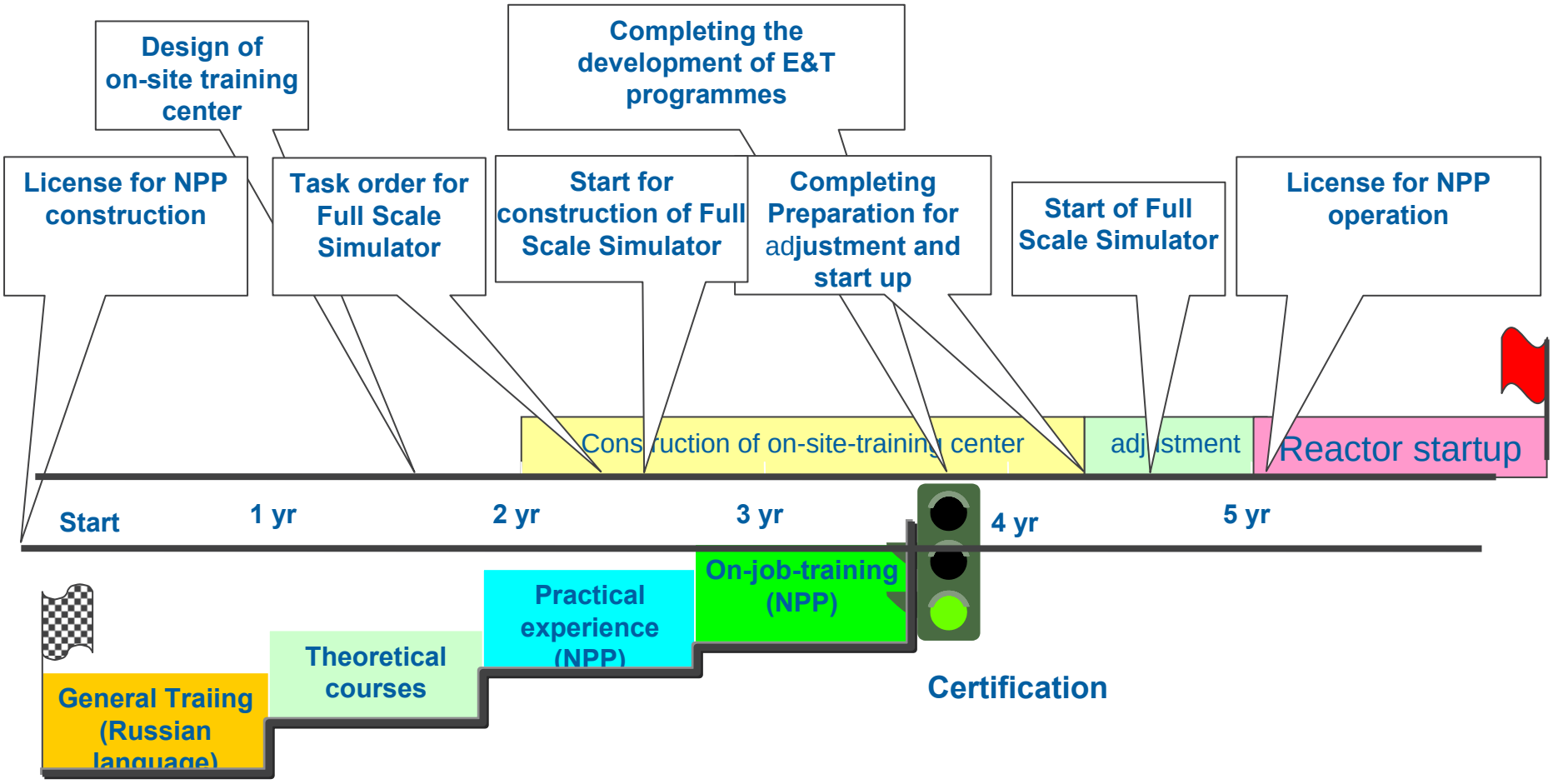
- Training and qualification upgrade of managers, operating personnel, maintenance personnel, instructors
- Development and upgrading the training systems for NPP personnell
- Development and implementation of instructional technologies

Experience of “ATOMTECHENERGO” Training Center – Novovoronezh

Number of trained specialists 1972 - 2008



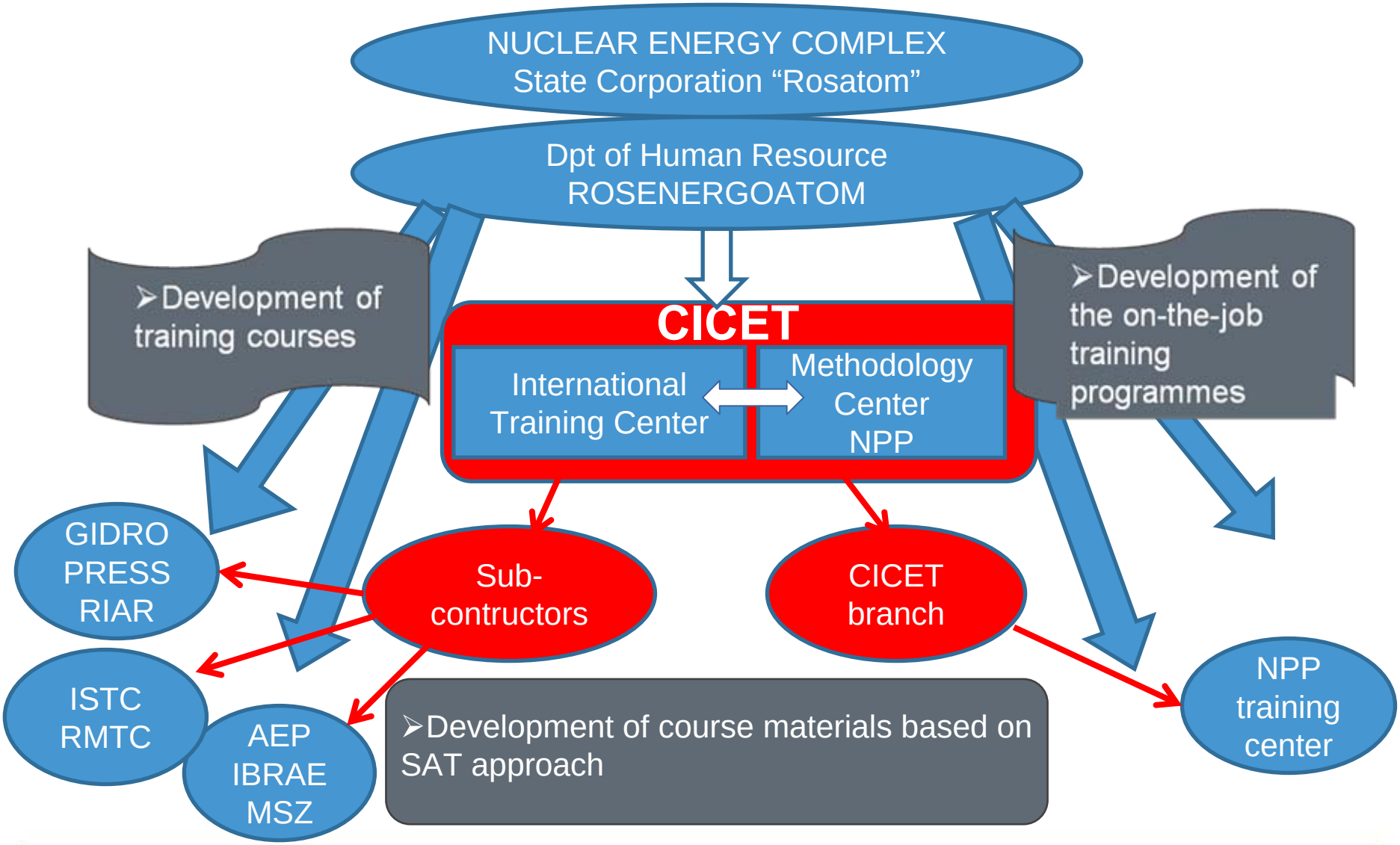
Training of NPP Personnel
(including on-the-job-training in the reference Russian NPP)



Educational program corresponds to the licensed requalification program (equivalent to higher technical university education) > 500 hr

4 Practical example (development of training course in CICET to support capacity building in new entrants)

Russian organizations involved in training course development



Course development: cooperation with industry

Bid invitation	AEP (Moscow), ROSENERGOATOM
Site qualification	AEP (Moscow), ROSENERGOATOM
Characteristics and design of nuclear fuel	“Gidropress”, RIAR (Dimitrovgrad), MSZ, Nuclear Safety Institute (IBRAE, Russian Academy of Science) ROSENERGOATOM
Security and Physical Protection of NPPs	ISTC (Obninsk), RMTC (Obninsk), ROSENERGOATOM

Course development platform SAT

Example: Site selection & qualification

Objectives:
(determined by Egyptian group)

To train personnel,
Particularly the trainers on Preparation of Site Qualification report

Modules of the Course proposed by Russian Group

Required education level of trainees:

BS degree in environmental chemistry&engineering
MS in engineering.

Site selection & qualification

POCATOM

Topics proposed by customer

- Nuclear safety fundamentals, requirements, and guides with special reference to site
- Basic site characteristics&requirements
- Site criteria and objectives of evaluation
- Hazard evaluation (natural&human induced events
- Evaluation of the impact of NPP in the surrounding region
- Methodology of source term evaluation
- Environmental radiological pre-operation and post-operation programmes

Modules of the Course proposed by Russian Group

- Russian reactor technology and NPP system design
- Radiation & Environmental safety
- Safety culture
- Site selection and qualification guidelines: international standards and Russian experience
- Probabilistic safety analysis
- Guidelines to prepare site qualification report
- External human induced events in site evaluation
- Seismology
- Licensing issues
- Migration of radionuclides (hydrogeology and atmosphere)
- Social and economics issues
- Nuclear legislation: international guidelines and Russian standards

Recommended by Russian group

Conclusions

HR development for nuclear infrastructure of new entrants relies on the training system existing in vendor countries

The priority is to train personnel for regulatory body, operator and NPP owner organizations

Advanced training courses are available for potential recipients of Russian nuclear technology.

Thank You
for Your attention!