Talent Management for Nuclear Power in Russian Federation

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Advisor to Director General
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Russian Nuclear Power in a Nutshell

Nuclear electricity in energy mix (%)

- United States of America: 20
- France: 72
- China: 4
- Japan: 19
- Russia: 19
- Korea, Republic Of: 28
- India: 3
- Canada: 15
- Ukraine: 55
- United Kingdom: 20
- Sweden: 15
- Belgium: 15
- Germany: 15
- Spain: 15
- Czech Republic: 15
- Pakistan: 15
- Switzerland: 15
- Finland: 15
- Hungary: 15
- Slovakia: 15
- Argentina: 15
- Brazil: 15
- Bulgaria: 15
- Mexico: 15
- Romania: 15
- South Africa: 15
- Armenia: 15
- Iran, Islamic Republic Of: 15
- Netherlands: 15
- Slovenia: 15

Total Number of Reactors: 450

- United States of America: 58
- France: 39
- Japan: 35
- Russia: 24
- Korea, Republic Of: 22
- India: 20
- Canada: 19
- Ukraine: 15
- United Kingdom: 15
- Sweden: 15
- Belgium: 15
- Germany: 15
- Spain: 15
- Czech Republic: 15
- Pakistan: 15
- Switzerland: 15
- Finland: 15
- Hungary: 15
- Slovakia: 15
- Argentina: 15
- Brazil: 15
- Bulgaria: 15
- Mexico: 15
- Romania: 15
- South Africa: 15
- Armenia: 15
- Iran, Islamic Republic Of: 15
- Netherlands: 15
- Slovenia: 15

Total Net Electrical Capacity 30 GWt el

Bilibino NPP
- 4 units
- Reactor type: EGP-6
- Thermal Power: 65 MW
- Electric Power: 12 MW
- Cogeneration
  - U#1 1974-2019
  - U#2 1974-
  - U#3 1975-
  - U#4 1976-
### Nuclear Icebreakers

<table>
<thead>
<tr>
<th>Year</th>
<th>Ship</th>
<th>Reactor Type</th>
<th>Commissioning</th>
<th>Image</th>
</tr>
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<tr>
<td>1959</td>
<td>“Lenin”</td>
<td>OK-150</td>
<td>1959</td>
<td><img src="image1" alt="Image" /></td>
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<tr>
<td>1970*</td>
<td>“Lenin”</td>
<td>OK-900</td>
<td>1970*</td>
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<td>1975</td>
<td>“Arktika”</td>
<td>OK-900A</td>
<td>1975</td>
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<tr>
<td>1977</td>
<td>“Sibir”</td>
<td>OK-900A</td>
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<td>1985</td>
<td>“Rossiya”</td>
<td>OK-900A</td>
<td>1985</td>
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<tr>
<td>1989</td>
<td>“Sovetskiy Soyuz”</td>
<td>OK-900A</td>
<td>1989</td>
<td><img src="image6" alt="Image" /></td>
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<tr>
<td>1989</td>
<td>“Taymyr”</td>
<td>KLT-40M</td>
<td>1989</td>
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<td>1988</td>
<td>“Sevmorput”</td>
<td>OK-900A</td>
<td>1988</td>
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<tr>
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<td>“Sevmorput”</td>
<td>OK-900A</td>
<td>1989</td>
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<tr>
<td>1989</td>
<td>“Vaygach”</td>
<td>KLT-40M</td>
<td>1990</td>
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<td>“Yamal”</td>
<td>OK-900A</td>
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<td>“50 Let Pobedy”</td>
<td>OK-900A</td>
<td>2007</td>
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<td>“50 Let Pobedy”</td>
<td>OK-900A</td>
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<td>OK-900A</td>
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* OK-150 is replaced by OK-900

3 nuclear icebreakers of the Project 22220 are currently under construction.
Rosatom: Some Achievements in 2020

3 November, 12:03  Belarus NPP, Unit#1  (VVER-1200, Gem 3+) connected to the grid. First kWt*h were produced.

3 October 18:00  Icebreaker “Arctica” (2 nuclear reactors RITM-200, 175 MWt each) during the sea trials reached the geographical North Pole (maximum ice thickness – 3 m).

22 May,  Floating NPP “Academician Lomonosov” started commercial operation (2 nuclear reactors KLT-40S, total installed capacity – 80 MWt-el)
Youth is Future

WYF in Egypt (2017), 3200 participants from 113 Countries
World Youth Forum launched in 2017 with the initiative of young Egyptians and supported by President of Egypt

"Egypt’s Youth are its hope… With their Enthusiasm and knowledge, Egypt’s future will be built… And with their dedication Egypt will prevail“

Mr Abdelfattah El-Sisi, President of Egypt

Young people are at the heart of the 2030 Agenda

"This is important to all of us and especially to young people. Today’s generation of young people is the largest in history. They are more educated, active and connected than ever before. They have high aspirations for the future. They can be a powerful force for the SDGs.”

On behalf of the UN Secretary-General Mr Achim Steiner addressed a message to youth at the WYF 2017

Mr Achim Steiner, UNDP

Mr António Guterres, UN Secretary-General
https://wyfegypt.com/index.php
Youth 2030: UN Youth Strategy

“The future of humanity and of our planet lies in our hands. It lies also in the hands of today’s younger generation who will pass the torch to future generations.”

2030 Agenda, paragraph 53

Today is the largest generation of young people ever – 1.8 Billion (~90% in developing countries)

New York, 24 September 2018 – Youth 2030: The United Nations Youth Strategy, launched by Mr. Guterres at a high-level event of the 73rd session of the General Assembly
Rosatom E&T System

Education of personnel in educational entities

Basic school education
- Identifying Talents in schools and attracting them to nuclear industry

Vocational education
- Over 100 educational organizations that provide applicants to Universities

Higher Education (over 230 programs)
- National Research Nuclear University (MEPhI) and the consortium of key universities
- Consortium of 18 leading universities that provide 2/3 of Rosatom yearly employment
- Other Universities - partners

Over 100 technical and classic universities
Nuclear programs and initiatives National collaboration
Consortium of Rosatom Target Universities

Scientific and Research Base
- Math
- Chemistry
- Physics
- IT
- Robotechnics
- Material Science
- Biology
- Laser Technology

Facilities
- Research reactor
- Neutrino water detector
- Education and Research Center of Nuclear Technology
- Radiation and Environmental Safety
- Nanocenter

18 Universities in 23 cities of 19 regions of Russia
60 years of experience in nuclear education
21400+ international students

10500+ postgraduates and doctoral students
30758 academic staff

500+ international business partners
20 Nobel Prize winners

Cooperation with international organizations: ENEN, IAEA, WNU etc.
Education Tracks

1-st level HE

- Bachelor degree or partner country
  - Bachelor of science (Physics)
  - Bachelor of engineering (electrical, chemical...)

2-nd level HE

- Key Master programs
  - Nuclear power engineering
  - Nuclear engineering and applications
  - Material science
  - Radiochemistry

Rosatom Target Universities (Consortium)

- Leading universities
  - MEPHI, TPU, SPbPU, NNSTU, MEU
  - TPU, MEPHI, SPbPU, NNTU, UFU
  - SPSU, MEPHI, UFU
  - MSU (Radiochemistry department)

Recruitment

- Nuclear products
  - NPP

Professional field

- Content
  - Reactor, turbine, water treatment...
  - Exploitation of RR, isotopes, radiation of materials
  - Material science, exploitation of mega science projects...
  - Back-end/Final stages of the life cycle, Nuclear infrastructure - radioactive waste...
International Partnership

**UNIVERSITY AGREEMENTS**
- Joint Programs
- Guest lectures
- E-learning courses
- Summer/Winter Schools

**Educational networks**
- STARNET
- ENEN (ENEN-RU Forum)
- NEST

**Staff (HE) re-training**
- TTT courses
- Scientific educational textbooks
- E-learning courses
Train-The-Trainers Course
“NPPs with SMR: Main Aspects and Life-cycle”

15 to 26 March 2021, Nizhny Novgorod, Russia

Organizers:
• Nizhny Novgorod State Technical University named after R.E. Alekseev (NNSTU)
• Rosatom Technical Academy (Rosatom Tech)

The course is aimed at faculty members and university management involved in the initiation or development of nuclear curricula in universities of countries embarking on nuclear power programmes, in particular, seeking to develop nuclear power with SMR

In cooperation with JSC «Afrikantov OKBM» - the chief designer of RITM-200 and KLT-40S SMRs

The main topics:

- NPPs with advanced SMR
- Design and technological solutions for SMR. RITM-200 and KLT-40S
- Development perspectives and application of NPPs with SMR
- Floating power units: status and options for future projects. Marine atomic water desalination complexes using energy modules with SMR
- SMR for perspective nuclear floating thermal power plants and vessels
- Probabilistic safety analysis for nuclear power plants with RITM-200 and KLT-40S reactor

- Approaches to classification and management. Issues of civil liability for nuclear damage during the construction and operation of SMR
- Physical protection for transportable NPPs with SMR
- Basic principles of nuclear power plant management
- Development of educational programmes on SMR technology

To apply contact head of project office “Nuclear Education Transfer” Mr. Ilia FILIPYEV ISFilipyev@rosatomtech.ru

More info: http://rosatomtech.com/train-the-trainer-courses-for-university-faculty-members/
ROSATOM: International Training Activity on SMRs

FNPP "Akademik Lomonosov", Pevek

Training course on “Simulation Codes for Safety Assessment of SMR and VVER-type reactors”. 03-06.02.2020/ 16 participants

2020

SV on SMR’s and floating 16 – 27 October, 2017/ Financing – IAEA (TC)/ 4 participants

Three Training Courses on HTGR/SMR technology /November- December, 2017./ Total:14 participants

2017

2016

SV on floating NPP and fast reactor SMR technology. Training on floating NPP and fast reactor SMR technology 28.11-16.12.2016/ 3 participants

2015

Training Course on “The Assessment of Advanced Pressurized Water Reactors Utilization in New-comer Countries” 09-13.11.2015/ 5 participants

2013

The Training Seminar on “Introduction to the Liquid Metal Fast SMR Technology” 29.09.-04.10.2013/ 14 participants

2011

The Technical Workshop on the topic “The Development of Curricula for Training of Foreign Specialists in Small-Power Nuclear Plants in Russia” 7.06.2011
Making Use of International Platforms

An intensive 3-days group work on considering SMRs as a harmonization option for energy mix has been held at the Joint Russia-IAEA Nuclear Energy Management School for Young Professionals 2019

OBJECTIVES

DISCUSS DEPLOYMENT OF DIFFERENT SMR TECHNOLOGIES IN A GIVEN REGION BY PERFORMING A COMPARATIVE EVALUATION

PREPARE AND PRESENT YOUR FINDINGS

IAEA INPRO KIND-ET Tool

SMRs AND REGIONS

CAREM Argentina  NuScale USA  RITM Russia  HTR-PM China  SMART Korea

NORTHERN  DRY  MOUNTAIN  ISLANDS

Group projects indicated potential benefits and challenges of SMRs deployment and were evaluated and discussed over with NEM School experts

Four region dedicated groups completed their projects using IAEA INPRO Excel-based tool for comparative evaluation – KIND-ET
EPR Education Track in Russia and Synergy with the IAEA MSc Programme

11 yrs pre-university education

Bachelor (4 yrs) → Master (2 yrs) → PhD (4 yrs)

Specialist (5.5 yrs)

IAEA recommendations and legal framework

• The Federal State Educational Standard of Higher Education 20.03.01 Technosphere Safety (Bachelor’s degree programme) – adopted in 2016
• The Federal State Educational Standard of Higher Education 20.04.01 Technosphere Safety (Master’s degree programme) – adopted in 2015
• Graduates can apply for vacant positions providing for employment in the field of emergency preparedness and response at the enterprises of ROSATOM

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A Look into the INPRO’s Future

INPRO MSc INPRO DIALOG FORUM IN RUSSIA

MAIN TOPIC - SMALL MODULAR REACTORS

INPRO MASTER’S PROGRAMME for nuclear and STEM graduates

ACHIEVING SDGs

INPRO CAPACITY BUILDING ACTIVITIES

OUTPUT – CORE COMPETENCIES

Apply information technology and numerical analyses for modelling, analysis and problem solving

Use analytical tools developed in the IAEA and Russian Federation for long-term energy planning

Examine nuclear energy systems sustainability based upon INPRO Methodology in the areas:
  - Environment
  - Safety
  - Proliferation Resistance
  - Waste Management
  - Infrastructure
  - Economics

Apply principles of project management

INPUT

INTERNATIONAL & RUSSIAN STUDENTS

Nuclear Physics and Engineering | Computer Science | STEM

OUTPUT – CORE COMPETENCIES

INPRO MASTER’S PROGRAMME

ACHIEVING SDGs

OUTCOME – END RESULTS

Strategic and long-term energy planning in support of the development of national position concerning the start of a nuclear power programme

Building trust and increasing awareness of the INPRO activities to promote peaceful uses of nuclear energy under auspices of the IAEA
Feedback from trainees from emerging countries

Expectations from SMR deployment

- Diversification of power sources (reduce dependence on fissile fuel);
- Reduction of carbon footprint (substitute coal plants);
- Water desalination;
- Industrial heat;
- Power supply for remote areas;
- **Increased intellectual potential of nation**;
- Emerging new industrial options through localization including manufacturing. Increasing the level of national technological development.
Feedback from trainees from emerging countries 2/2

Expectations from vendors

• Support in development nuclear power infrastructure (owner/operator, regulatory body);
• **Support in establishing national system of HRD**;
• Localization;
• Attractive financing models;
• Referent SMR in vendor country.
Thank you for your attention

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