

**What is useful to know about STU  
FEI STU  
INPE FEI STU  
...and education activities in nuclear  
decommissioning in Slovakia**

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Bratislava*

# Origin and history

- **1762 Mining and Forestry Academy**  
Empress of Austro-Hungarian monarchy Maria Theresa founded first technical higher education institution in the world in Banská Štiavnica
- **1937 University of Technology of M. R. Štefánik**  
First Slovak technical university was founded in Košice
- **1939 Slovak University of Technology, Bratislava**
  - Branch of Construction Engineering
  - Branch of Specialized Sciences
  - Branch of Forestry and Agricultural Engineering
  - Branch of Chemical Engineering
  - Branch of Mechanical and Electrical Engineering



# STU today

Faculty of Civil Engineering

Faculty of Mechanical Engineering

Faculty of Electrical Engineering and Information Technology

Faculty of Chemical and Food Technology

Faculty of Architecture

Faculty of Materials Science and Technology in Trnava

Faculty of Informatics and Information Technologies

Institute of Management

**STU Research Centre**

**Lifelong Learning Institute**

**Multimedia centre, Computing Centre, Publishing House, Archive,  
Student Houses, Academic Sports Centre, University Ensemble Technik**

# STU numbers

**150.000 graduates**

**14.000 students in all forms of study**

**1.400 teaching and research staff**

**800 industrial contracts and orders**

**600 state research projects**

**95 international projects**

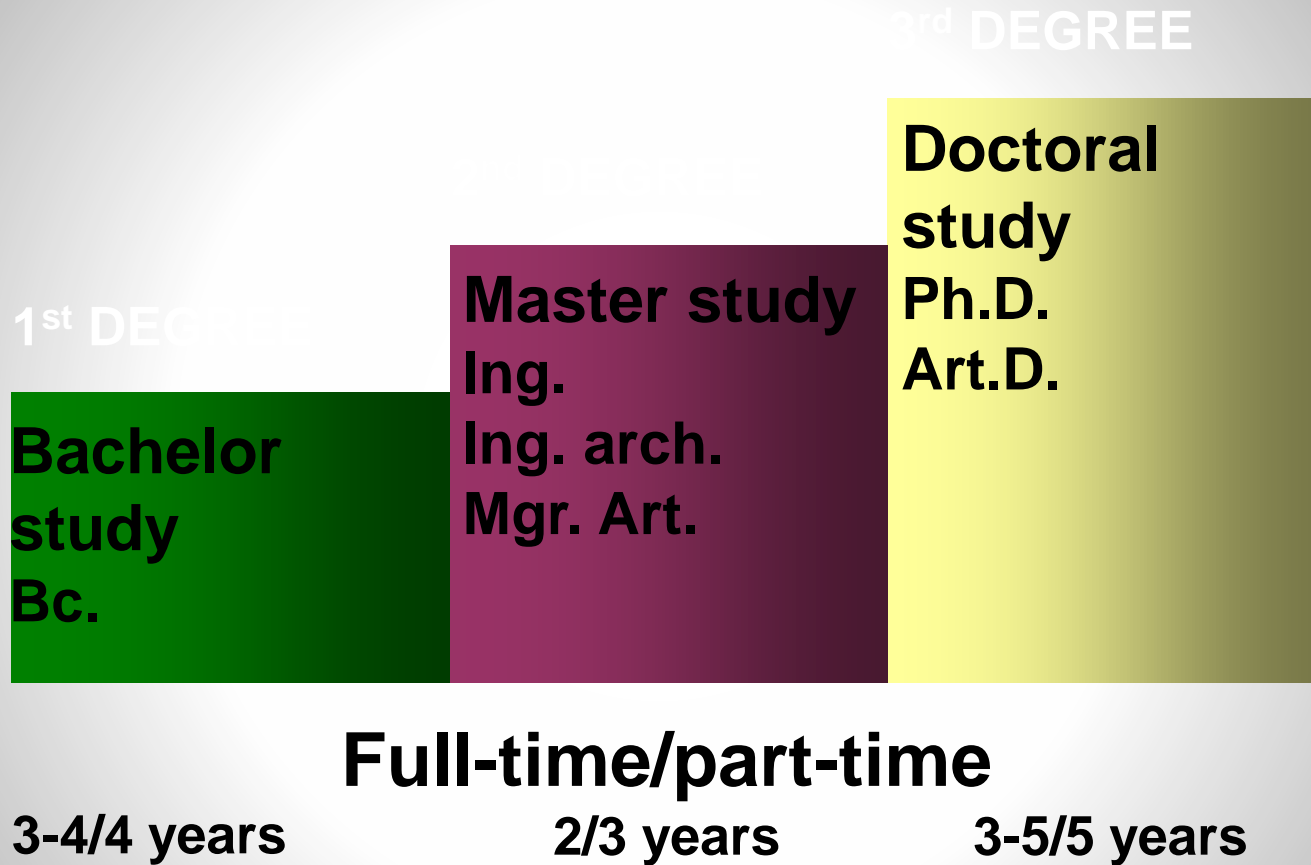
**7 faculties (schools)**

**1 institute**

# Education

- **harmonized with Bologna Declaration**
- **Bachelor, Master, Doctoral Study**
- **European Credit Transfer System (ECTS)**
- **Master and Doctoral students engaged in research**
- **modern training methods, laboratories, project works**
- **study programs in English**
- **Lifelong learning**

# Study degrees



# International cooperation

- **university agreements**
- **international projects**
- **mobilities**
- **memberships**
- **organisation of events**

# Co-operation with industry

- **industry direct agreements or orders**
- **research and innovation projects realised jointly with enterprises**
- **engagement of small and middle enterprises in international projects**
- **mobilities and vocational training for students at enterprises of European research area**
- **support to establishment of small companies**



# Faculty of Electrical Engineering and Information Technology is based on 8 Institutes:

INSTITUTE OF AUTOMOTIVE MECHATRONICS

INSTITUTE OF COMPUTER SCIENCE AND MATHEMATICS

INSTITUTE OF CONTROL AND INDUSTRIAL INFORMATICS

INSTITUTE OF ELECTRICAL ENGINEERING

INSTITUTE OF ELECTRONICS AND PHOTONICS

**INSTITUTE OF NUCLEAR AND PHYSICAL ENGINEERING**

INSTITUTE OF POWER AND APPLIED ELECTRICAL ENGINEERING

INSTITUTE OF TELECOMMUNICATIONS

OFFICE FOR EUROPEAN UNION PROGRAMS

INSTITUTE OF COMMUNICATION AND APPLIED LINGUISTICS

TECHNOLOGICAL INSTITUTE OF SPORTS

SPECIALIZED CENTRES

# STUDY PROGRAMS

Bachelor (Bc.) programs:	Master (Ing.) programs:	PhD. programs:
<ul style="list-style-type: none"><li>• Applied Informatics</li><li>• Automotive Mechatronics</li><li>• Electrical Engineering</li><li>• Power engineering</li><li>• Electronics</li><li>• Robotics and Cybernetics</li><li>• Telecommunication</li><li>• <b>Nuclear and Physical Engineering</b></li></ul>	<ul style="list-style-type: none"><li>• Applied Electrotechnics</li><li>• Applied Informatics</li><li>• Applied Mechatronics and Electromobility</li><li>• Robotics and Cybernetics</li><li>• Electronics and fotonics</li><li>• Power Engineering</li><li>• Telecommunication</li><li>• <b>Nuclear and Physical Engineering</b></li></ul>	<ul style="list-style-type: none"><li>• Applied Informatics</li><li>• Applied Mathematics</li><li>• Automation and Control</li><li>• Robotics and Cybernetics</li><li>• Electromagnetic Theory</li><li>• Measurement Science</li><li>• Mechatronics</li><li>• Metrology</li><li>• Microelectronics</li><li>• Physical Engineering</li><li>• Power Engineering</li><li>• Radioelectronics</li><li>• Telecommunication</li><li>• <b>Nuclear Power Engineering</b></li></ul>



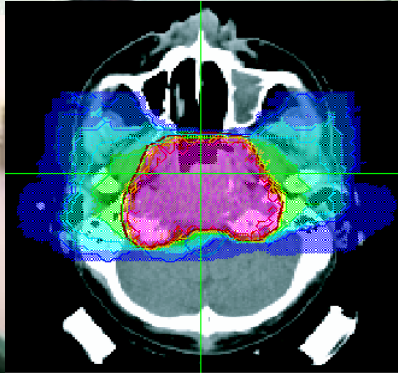
*Slovak University of Technology*

*Faculty of Electrical Engineering and  
Information Technology*

*Institute of Nuclear and Physical  
Engineering*

# INPE FEI STU activities

- Research



- Training



# INPE FEI STU

Graduate abilities

Knowledge

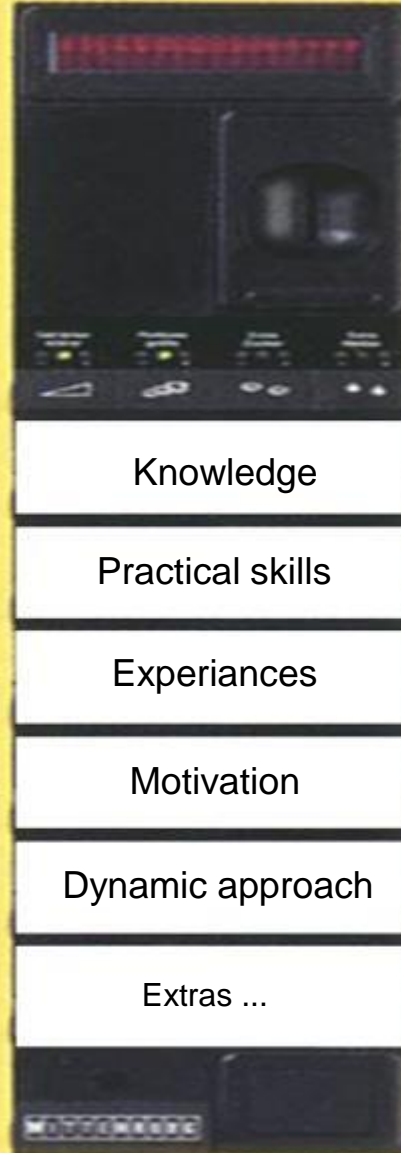
Practical skills

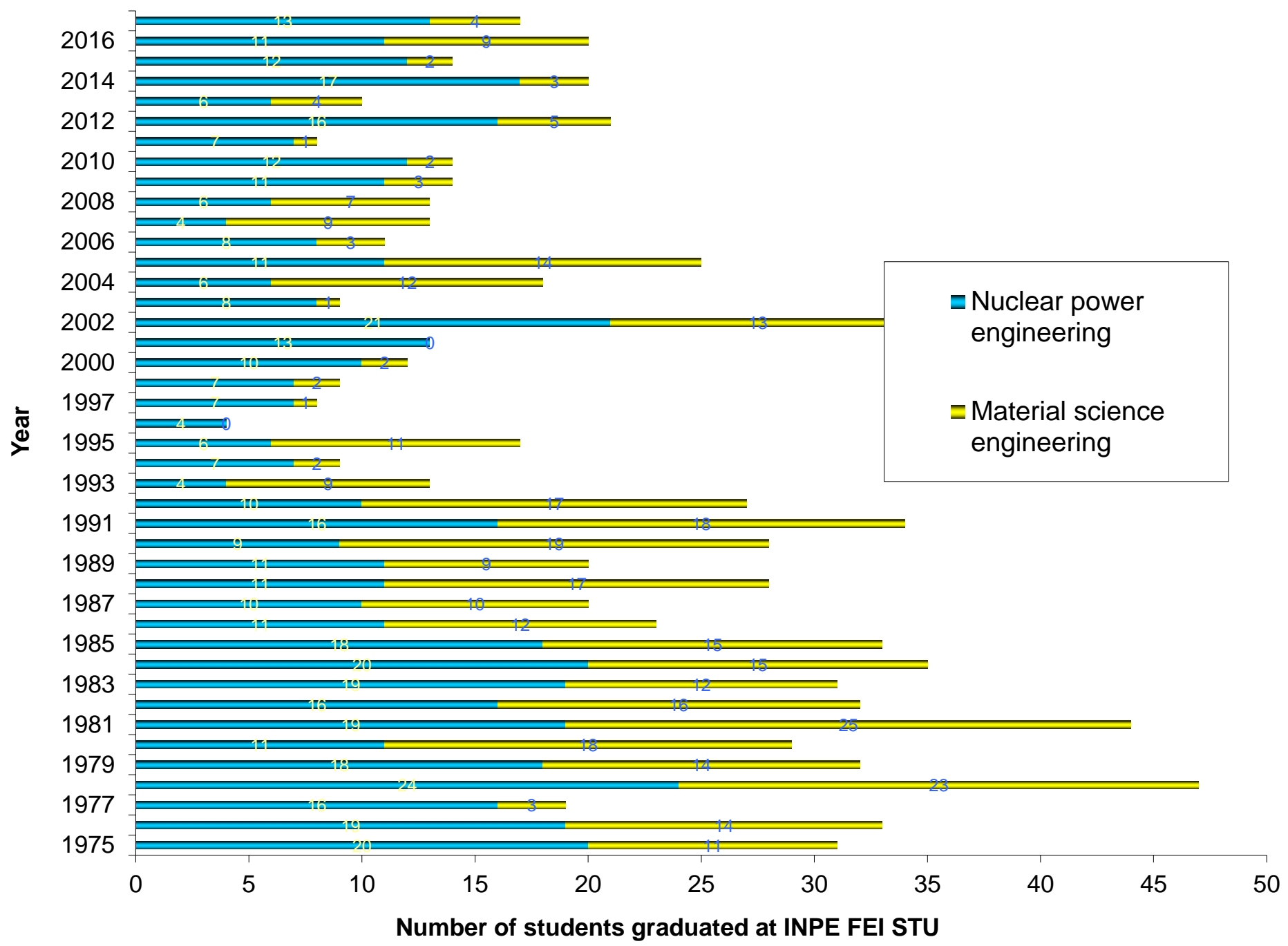
Experiences

Motivation

Dynamic approach

Extras ...





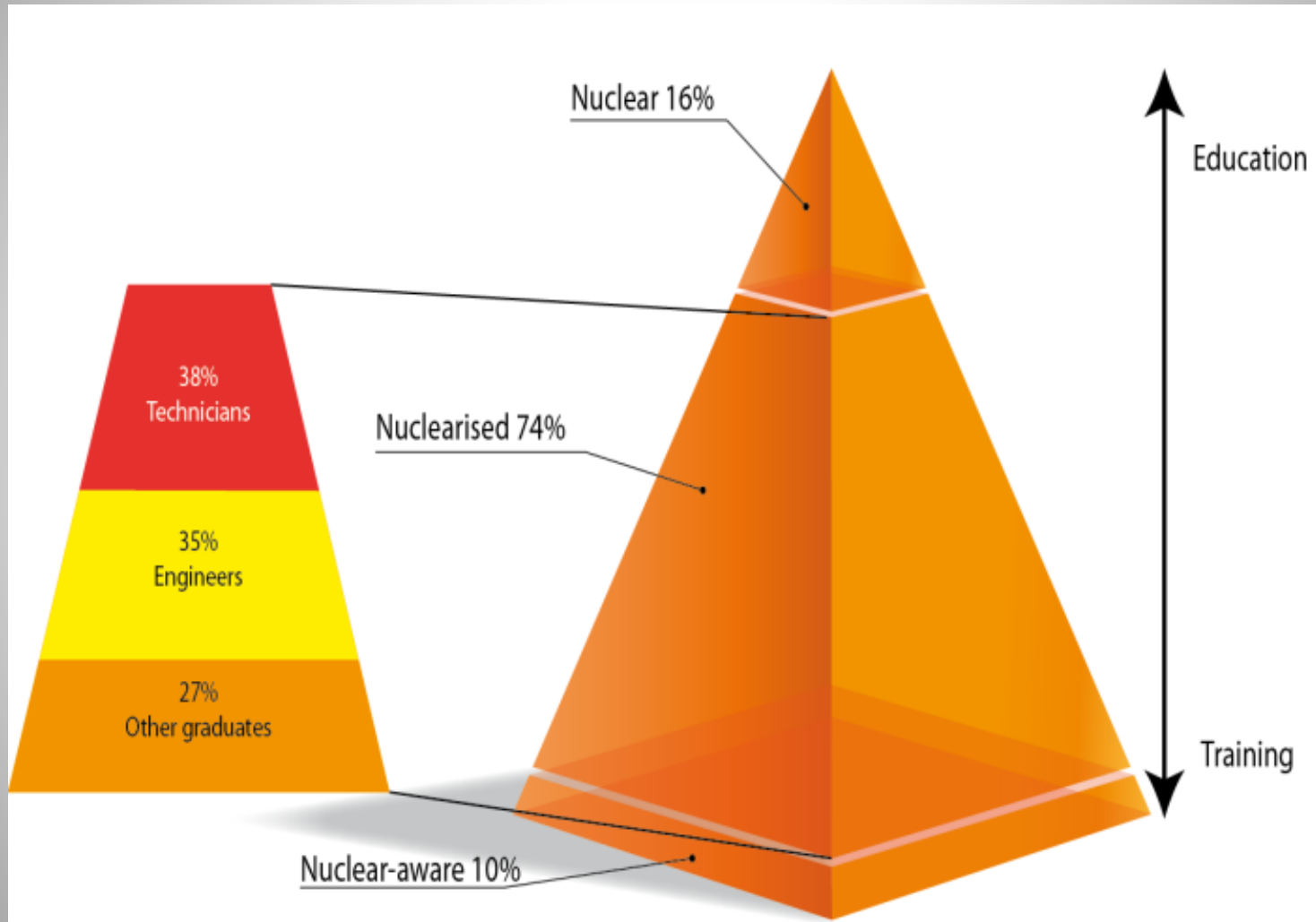
# COUNCIL DIRECTIVE 2011/70/EURATOM

## Article 8 - Expertise and skills

*“Member States **shall ensure** that the national framework require all parties to make arrangements for **education and training** for their staff, as well as research and development activities to cover the needs of the national programme for spent fuel and radioactive waste management in order to obtain, maintain and to further develop necessary expertise and skills.”*



# European Human Resources Observation in Nuclear – since 2009



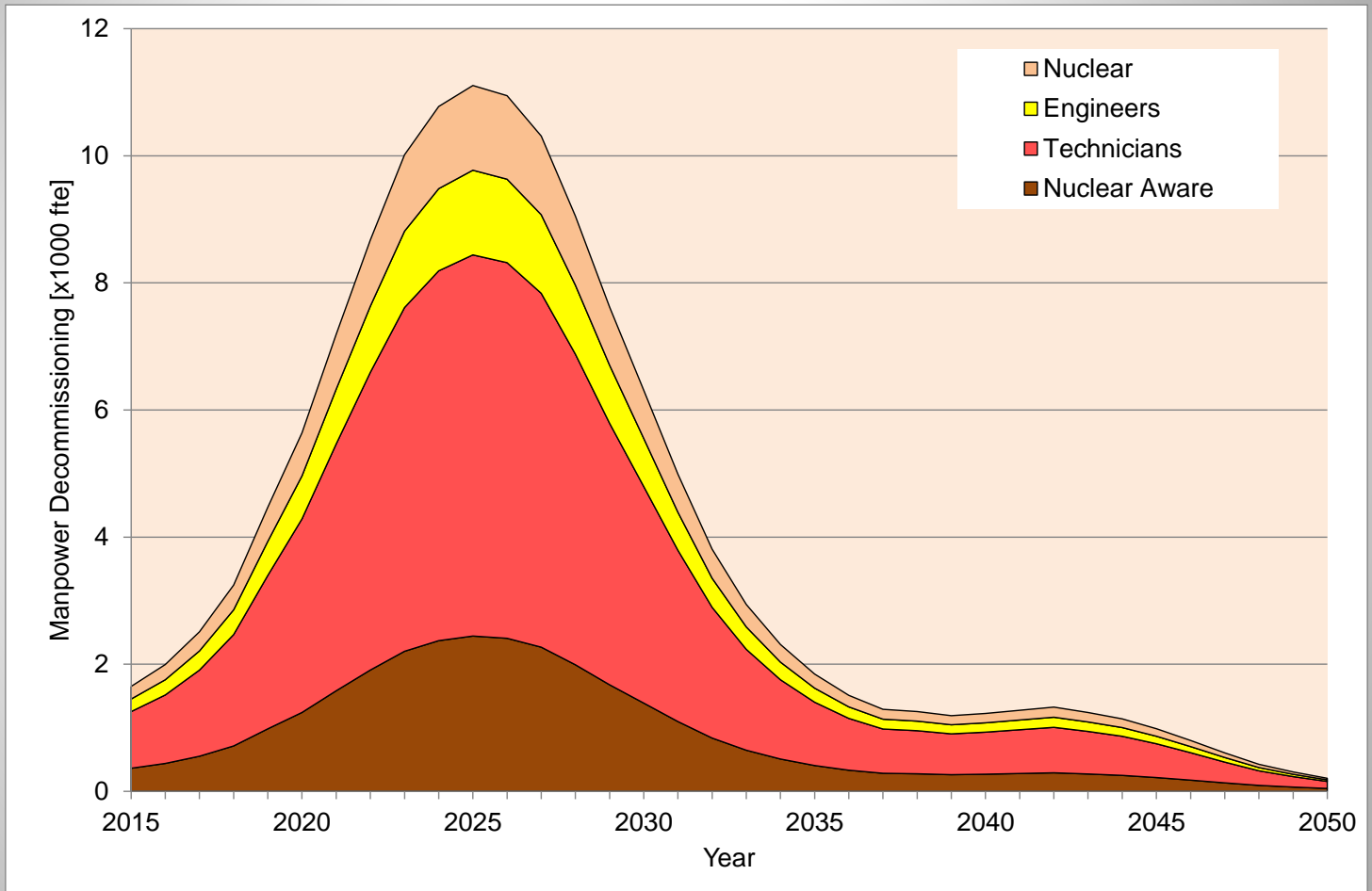


# Workforce Model Sources

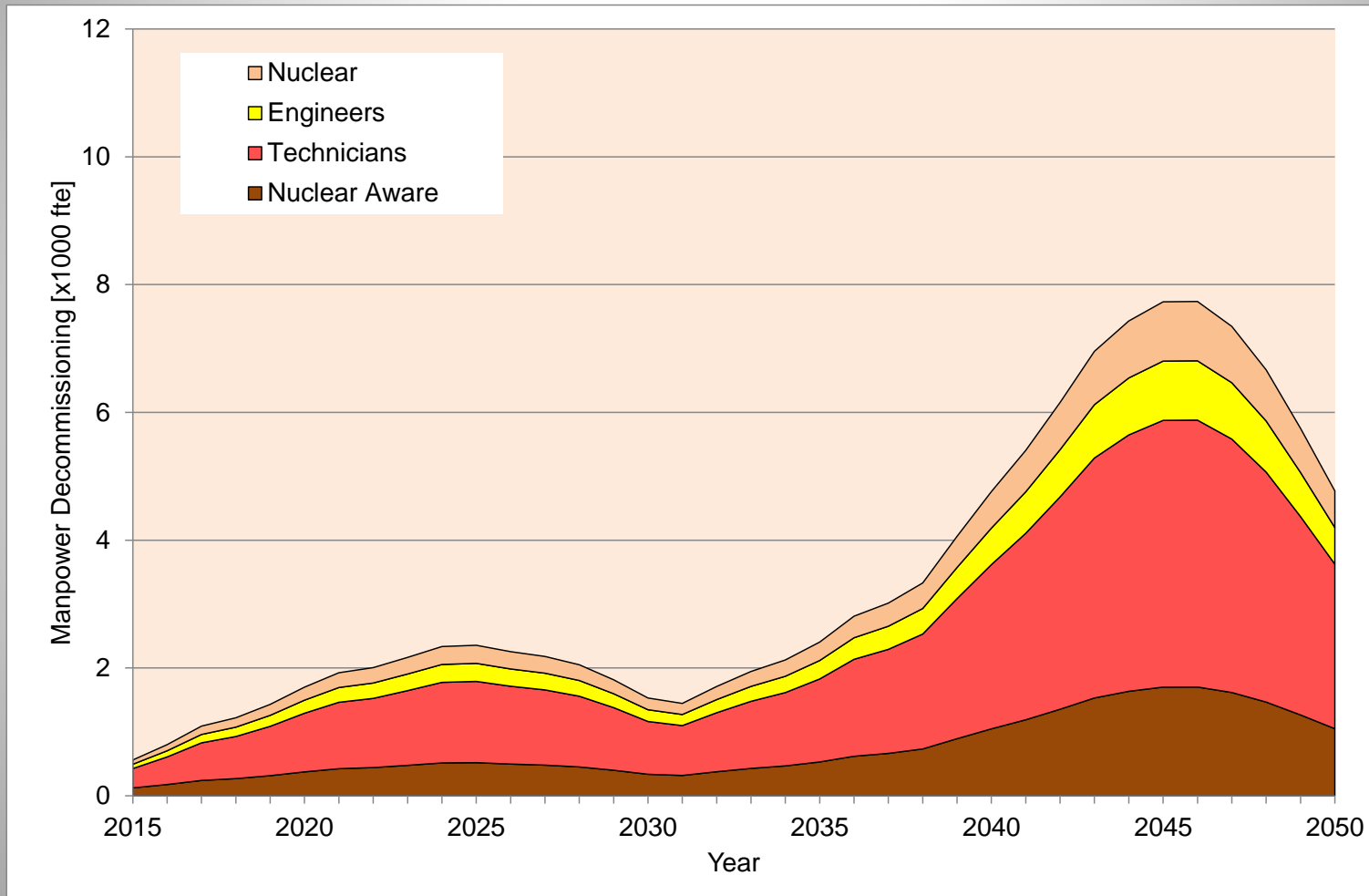
## Decommissioning

- IAEA (2000): 100-200 fte
- Dominion (2004): 150-200 fte
- Goodnight (2011): 100 fte
- EC (2012): 200 fte
- ENEF (2013): 200 fte
- Clement (2015): 140 fte (AREVA)
- OECD (2016): 200-250 fte (Jose Cabrera)  
250 fte (Loviisa 1&2)
  
- 200 fte per unit is selected as reference
  - (fte=full time equivalent)

# Workforce Decommissioning Without LTO

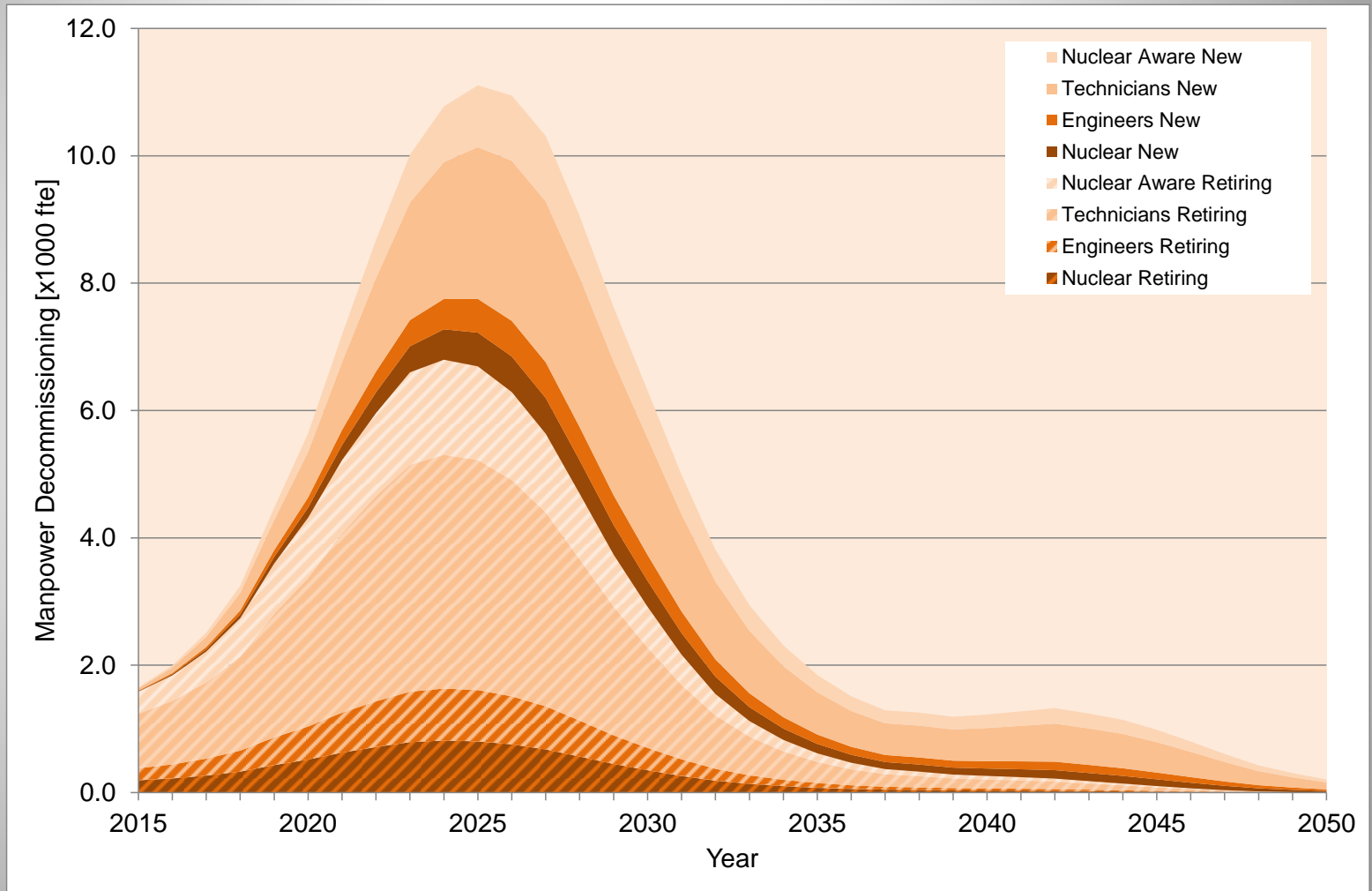


# Workforce Decommissioning With LTO



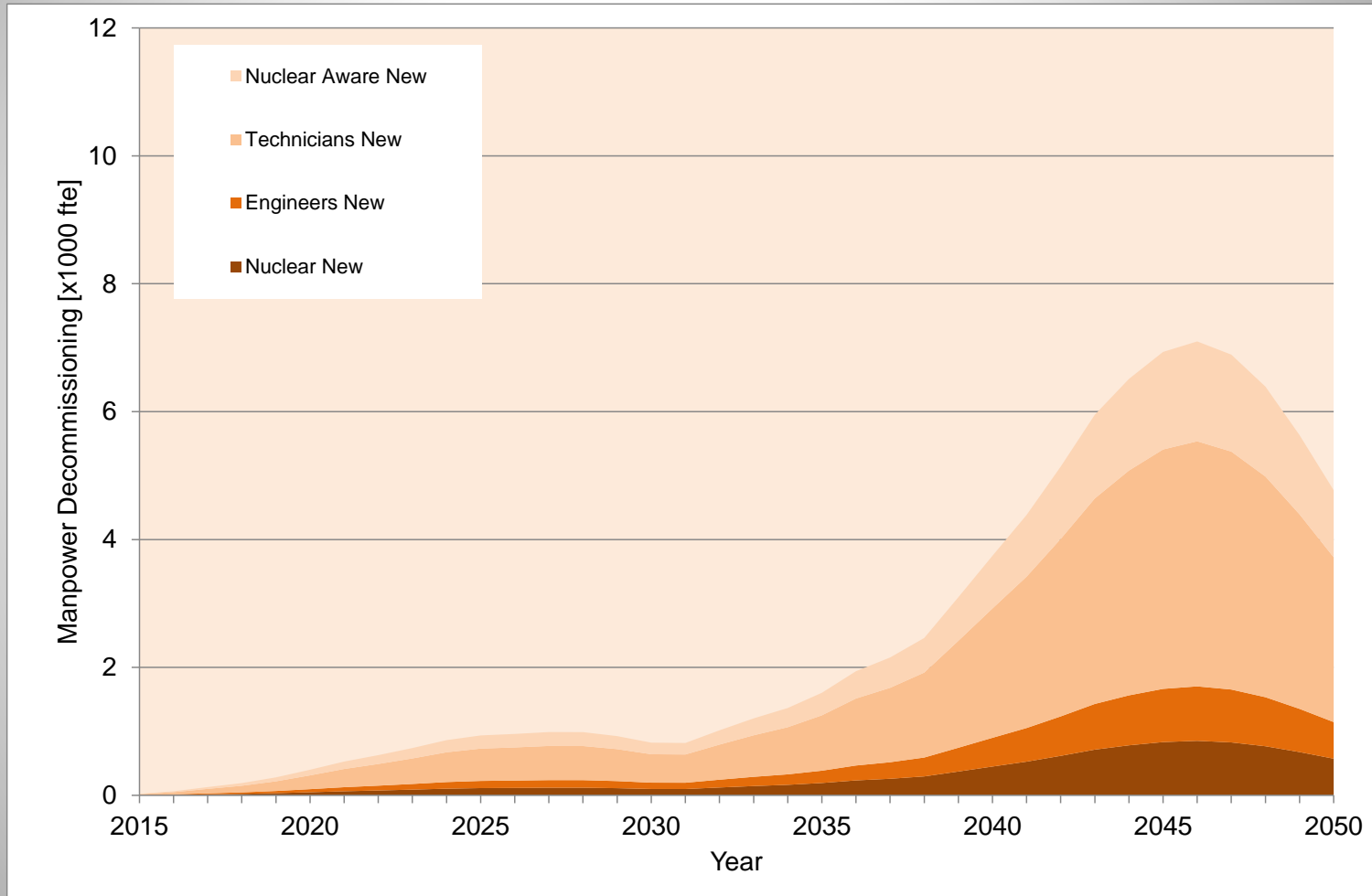
# Workforce Decommissioning

## Without LTO: Retirements vs. New Workforce



# Workforce Decommissioning

## With LTO: New Workforce



# Slovak contribution to national and international decommissioning education



# Slovak nuclear history

## (Knowledge is based on experiences)

1955 – signature of agreement between SU and CSR in nuclear

1957 – Experimental reactor in NRI Rez

1957 – start of the built of NPP A1

1972 – operation of NPP A1

1972 – start of built of NPP V1

1976, 1977 – 2 accidents at NPP A1,

**1979 - decision about A1 decommissioning**

1979, 1980 – operation of NPP V1

1984, 1985 – operation of NPP V2

**1995 – creation of National Nuclear Fund of SR for decommissioning**

1998, 1999 – operation of NPP EMO1,2

**2000 – Bohunice rad/waste treatment and conditioning centre**

**2001 – National radioactive waste repository**

2006, 2008 – shut down of NPP V1

**2008, 2014, 2015 – Strategy (national program for decommissioning and RAW and SF treatment**

# Nuclear Installations in Slovakia

## BOHUNICE SITE

<i>facility</i>		<i>status</i>	<i>licence holder</i>
NPP A-1	HWGCR	decomm.	JAVYS , a.s.
NPP V-1 (EBO1,2)	WWER 440/230	shut down	JAVYS , a.s.
NPP V-2 (EBO3,4)	WWER 440/213	in operation	SE, a.s.
ISFS	wet type	in operation	SE, a.s.
treatment of RAW and SF	different techn.	in operation	JAVYS , a.s.
New NPP	?	?	?

## MOCHOVCE SITE

<i>facility</i>		<i>status</i>	<i>licence holder</i>
NPP EMO1,2	WWER 440/213	in operation	SE, a.s.
Ra-waste Repository	near surface	in operation	JAVYS , a.s.
NPP EMO3,4	WWER 440/213	under constr.	SE, a.s.



# **CEDOD (2014-2016)**

## **Centre for design, operation and decommissioning of nuclear facilities at INPE STUBA**



- 2014-2015 – Accredited study at Bc., MSc. and PhD. level in Nuclear and Physical Engineering.
  - done 2014, accreditation valid since 09/2015  
(reason – escape from general power engineering scheme)
- 2014-2019 – Preparation and performance of post-gradual training courses for Slovak or international institutions in operation or decommissioning of nuclear facilities
- 2015 – Preparation and performance of European Decommissioning Academy (collaboration with IAEA and EC)
  - done EDA started at 7. June 2015
  - Secnd run 4.-22.6.2017

# EDA - 2015

- <http://www.ujfi.fei.stuba.sk/>

Education, training and proper knowledge management has to be skills oriented – therefore we accent:

- on-site training,
- technical tours,
- laboratory exercises,
- best practices exchange



**EDA quality depends on quality of teachers.**

**We addressed best experts from Europe to participate**

<http://kome.snus.sk/inpe/>

## In the first run

# 15 participants from

- Georgia,
- Moldova,
- Kazachstan,
- Czech Republic,
- Slovakia



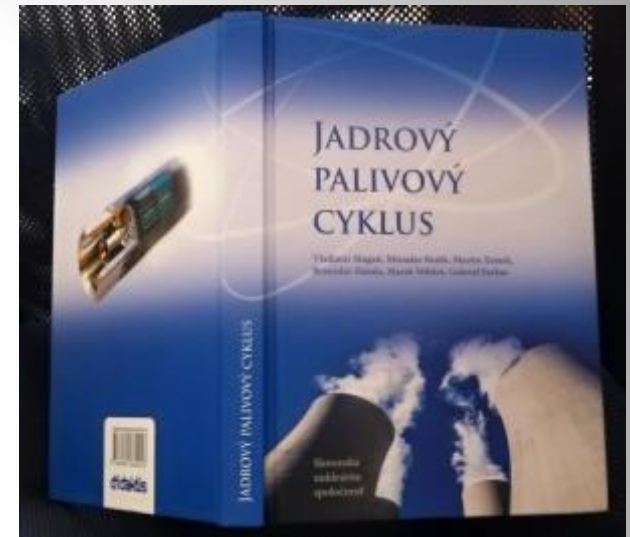
are the first graduates from EDA

**2nd run of EDA 4.6.-22.6.2017, Bratislava,  
Slovakia at <http://kome.snus.sk/inpe/>.**



# Ways for knowledge preservation

- Archivation of memories, (reports, papers, books)
- International experiences and
- Knowledge management,
- Meetings,
- Conferences and knowledge transfer,
- Active involenent of Universities and research institutions
- ...Societal acceptance, motivation for long-term job



# Thank you!



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