



European Human Resources Observatory for the Nuclear Energy Sector

*Massimo FLORE
Berlin, 23 May 2016*

Joint Research Centre
the European Commission's
in-house science service

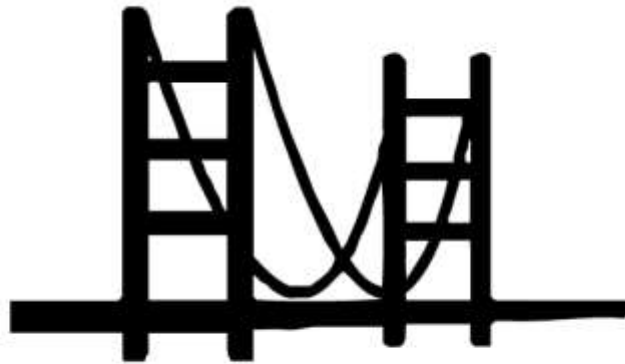


ec.europa.eu/jrc

**Knowledge
broker**



Science

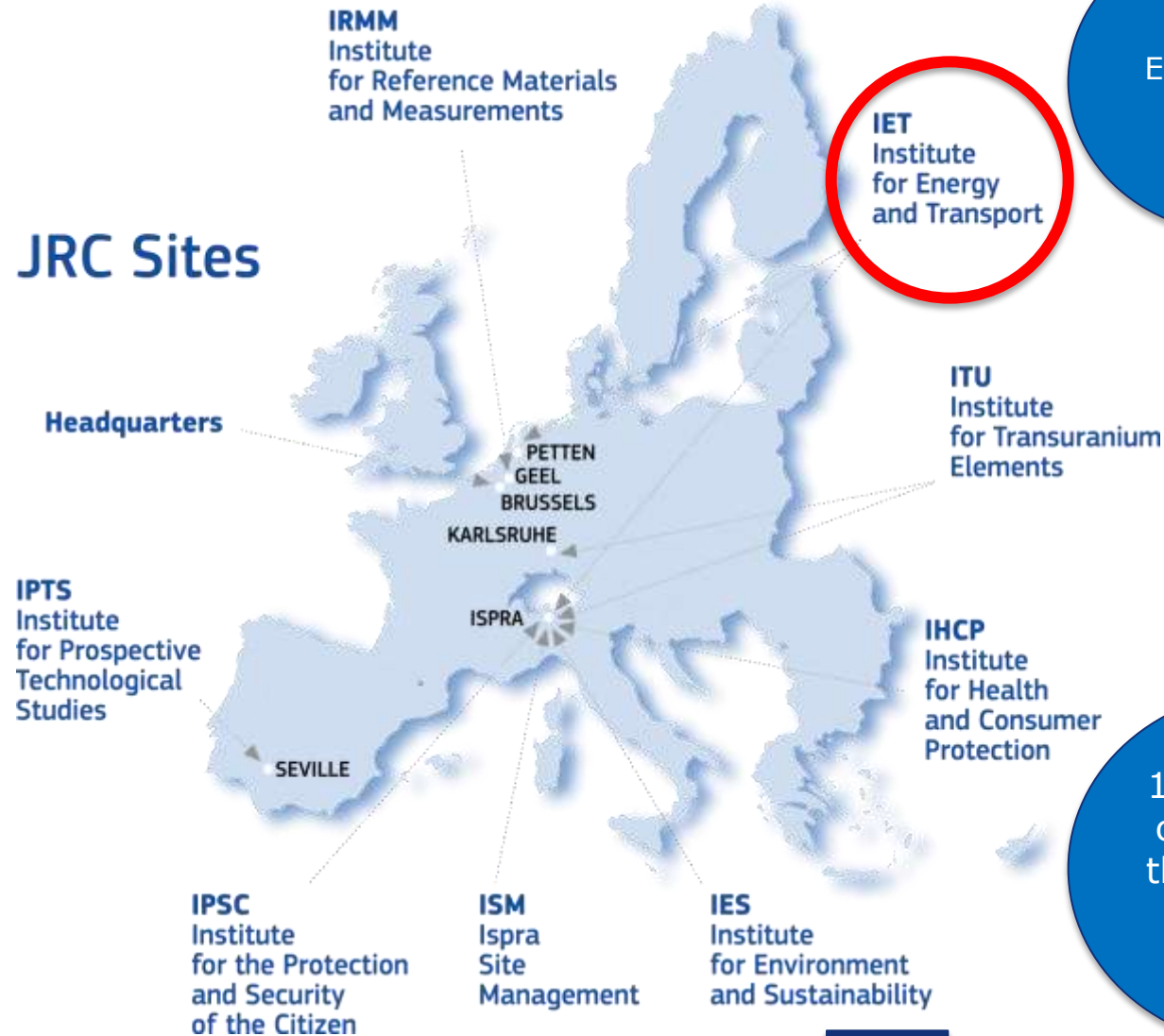


**Scientific-technical
support to EU policy
makers**



Policy

JRC Sites



Established in
1957

7 institutes
in 5
countries

2,845
permanent
and
temporary
staff

1,398
scientific
publications
in 2010

125 instances
of support to
the EU policy-
maker
annually



**Institute for Energy
and Transport**

provides support to
European Union policies
and technology innovation to
ensure sustainable, safe,
secure and efficient energy
production, distribution and
use and to foster sustainable
and efficient transport in
Europe

Petten (NL)

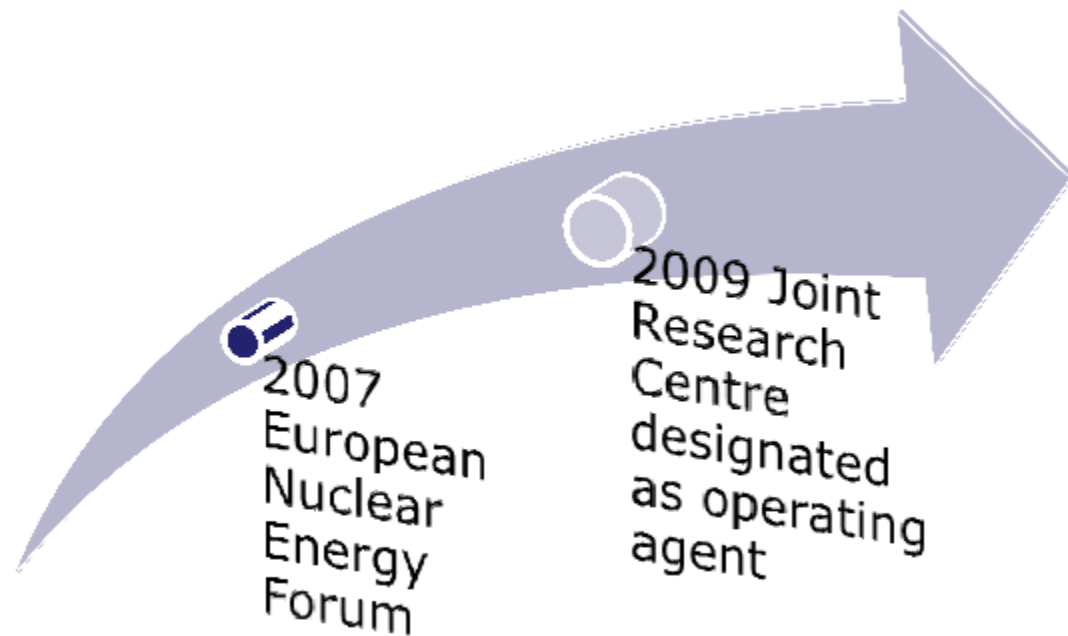


Ispra (IT)



- ❖ Organization
- ❖ Bottom-up Approach
- ❖ Top-down Approach
- ❖ ECVET Implementation

Genesis





Operating
Agent



Senior
Advisory
Group



European
Commission

Senior Advisory Group Members



SCK·CEN ACADEMY
FOR NUCLEAR SCIENCE AND TECHNOLOGY





European
Commission



JOINT RESEARCH CENTRE Institute for Energy and Transport (IET)

European Commission > JRC

[HOME](#) [ABOUT](#) [DOCUMENTS](#) [RESOURCES](#) [ECVET](#)

European Human Resources Observatory for the Nuclear Sector



Influence of Long Term Operation



Set Plan Study on Education and Training



Set Plan Roadmap on Education and Training



Training Courses

[Teleperm Xs-Special](#)
GERMANY
[Operation and Safety of PWRs](#)
FRANCE
[Nuclear Reactor Theory](#)
BELGIUM
[PD621 Grade 91 and other Creep strength Enhanced Ferritic Steels](#)
SPAIN
[PD634 Comparison of Quality Assurance Management](#)
ITALY

[more](#)

EHRO-N Member Login

[Log In](#)
[Register](#)

EHRO-N News Feeds Subscription



Internal news

[Ten nations petition Brussels for nuclear](#)

Updated date: 3 months 1 week ago

[Nuclear Engineering International magazine training awards programme](#)

Updated date: 3 months 1 week ago

[Some observations on the career orientations, mobility and expectations](#)

Updated date: 3 months 1 week ago

[more](#)

External News

<http://ehron.jrc.ec.europa.eu/>



- ❖ Organization
- ❖ Bottom-up Approach
- ❖ Top-down Approach
- ❖ ECVET Implementation



European
Commission



JRC SCIENTIFIC AND POLICY REPORTS

PUTTING INTO PERSPECTIVE THE SUPPLY OF AND DEMAND FOR NUCLEAR EXPERTS BY 2020 WITHIN THE EU-27 NUCLEAR ENERGY SECTOR

An EHRO-N report

Veronika Simonovska
Ulrik von Estorff

2012



Joint
Research
Centre

Report EUR 25291 EN



JRC SCIENCE AND POLICY REPORTS

POST-FUKUSHIMA ANALYSIS OF HR SUPPLY AND DEMAND

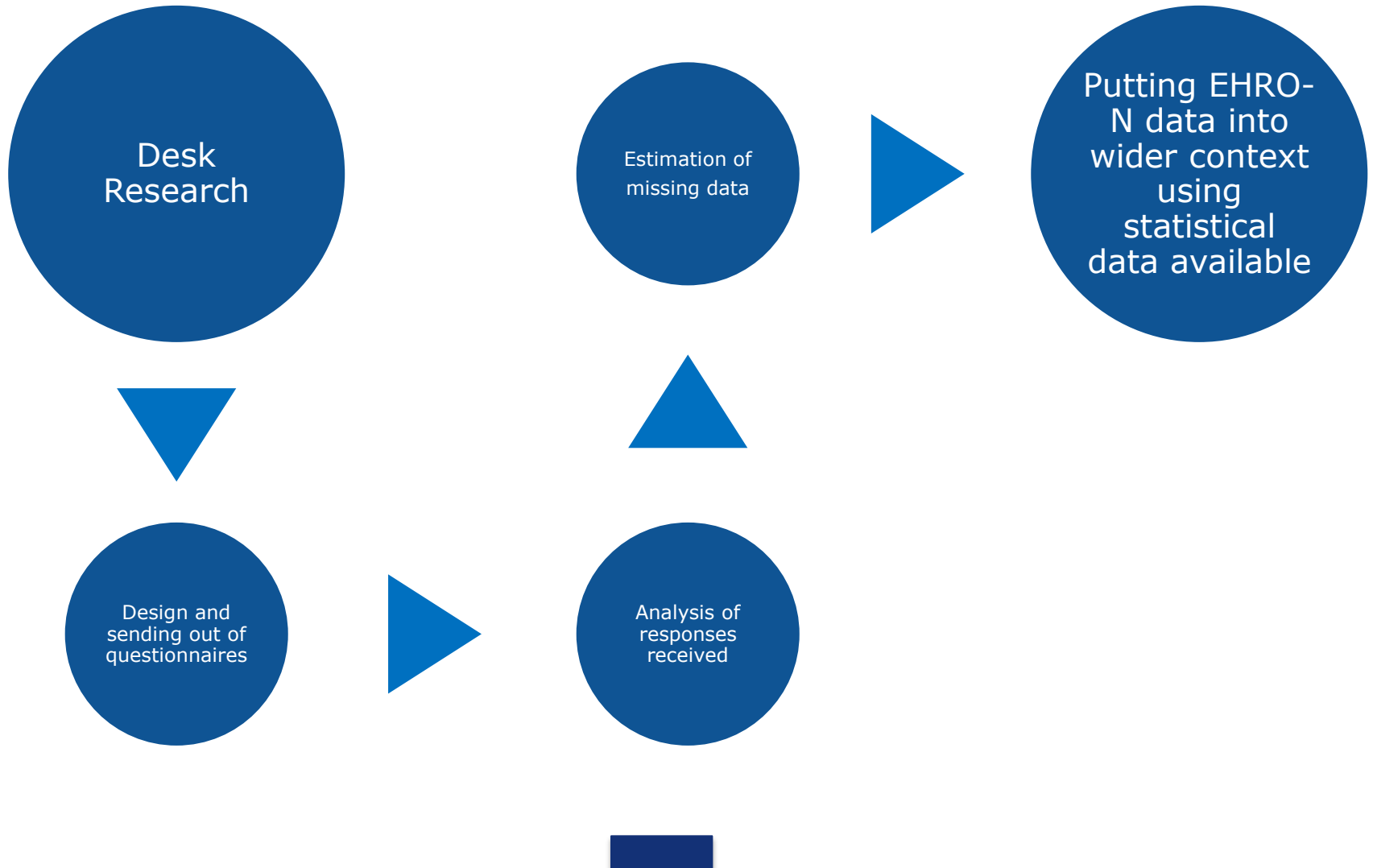
Roberto Brancucci
Massimo Fiore
Ulrik von Estorff

2014

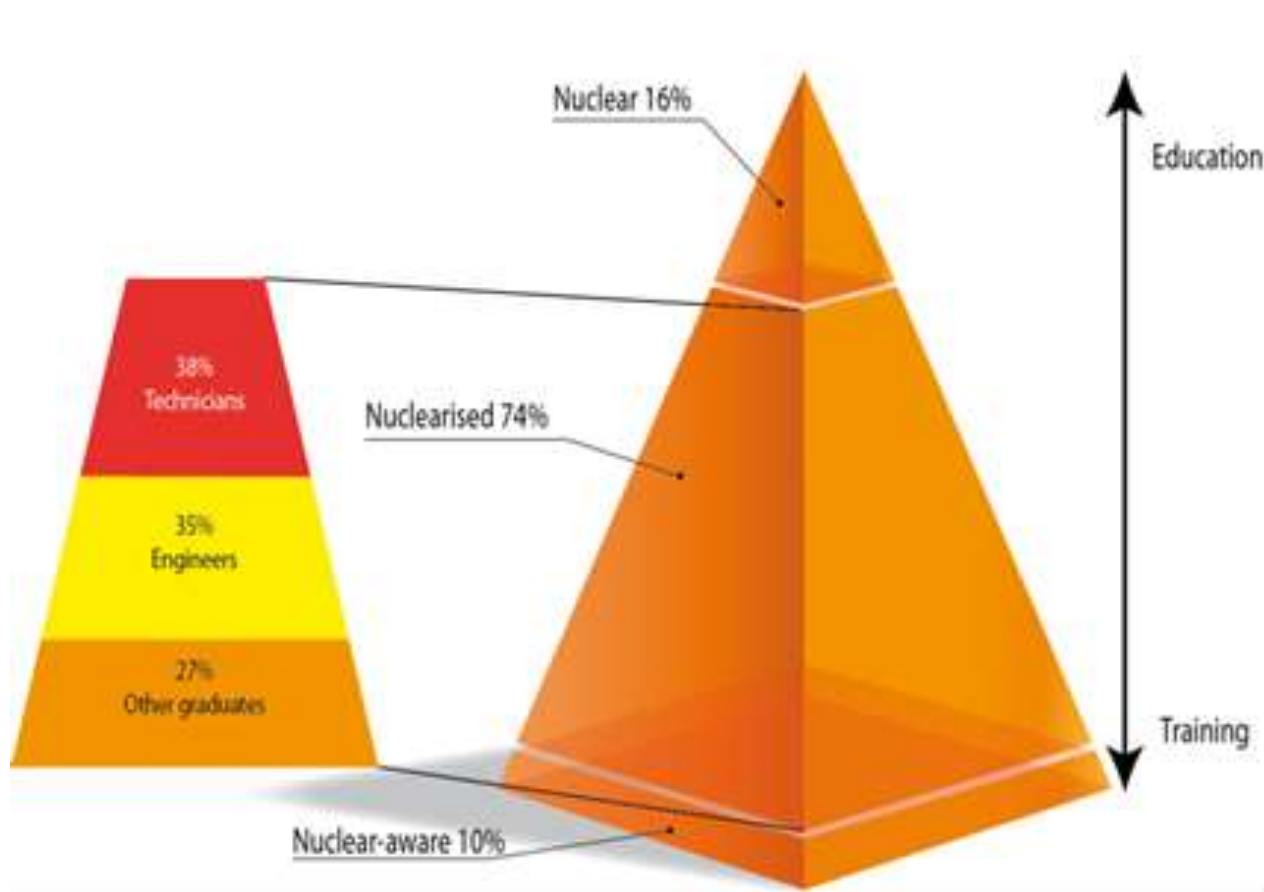


Report EUR 27017 EN

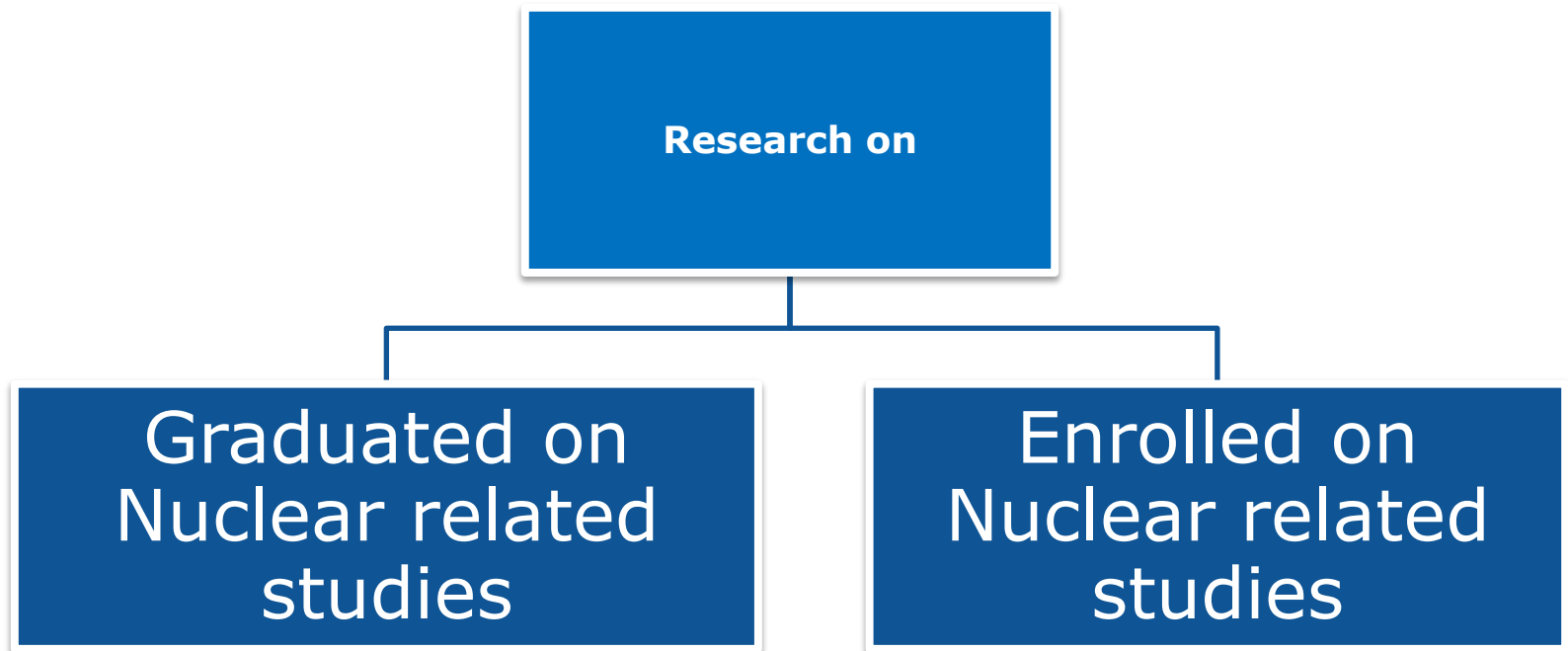
Methodology



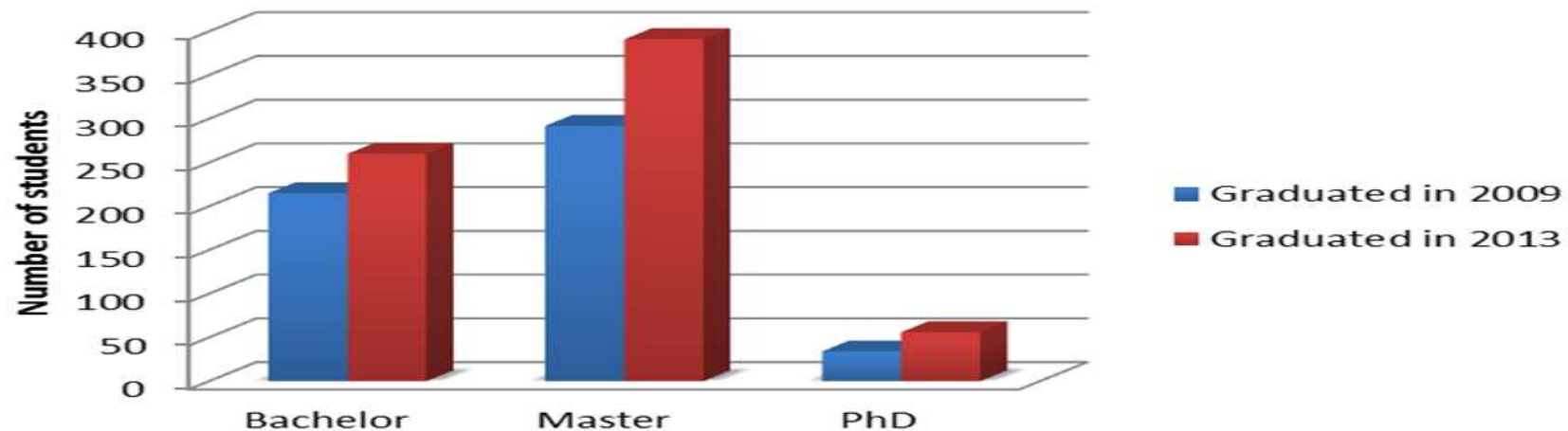
Nuclear Skills Pyramid



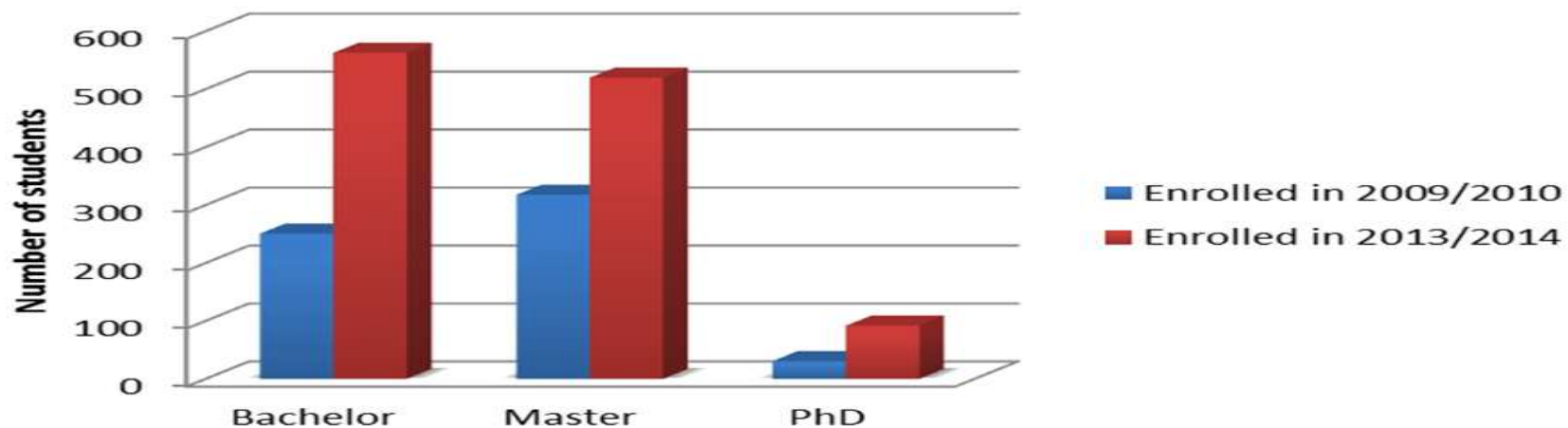
Supply Side



Students graduated in nuclear related studies



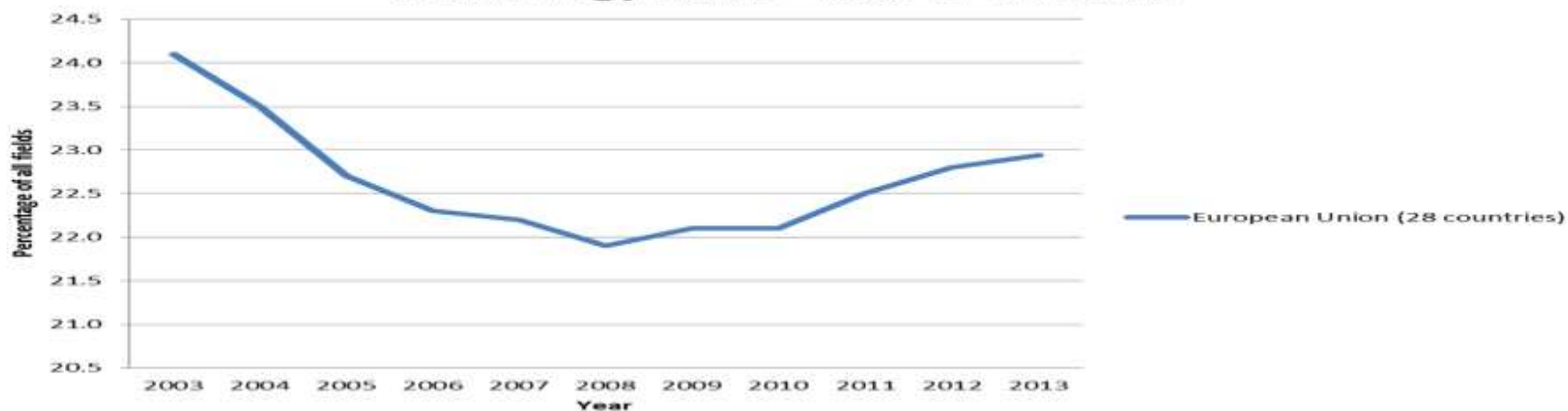
Students enrolled in nuclear related studies



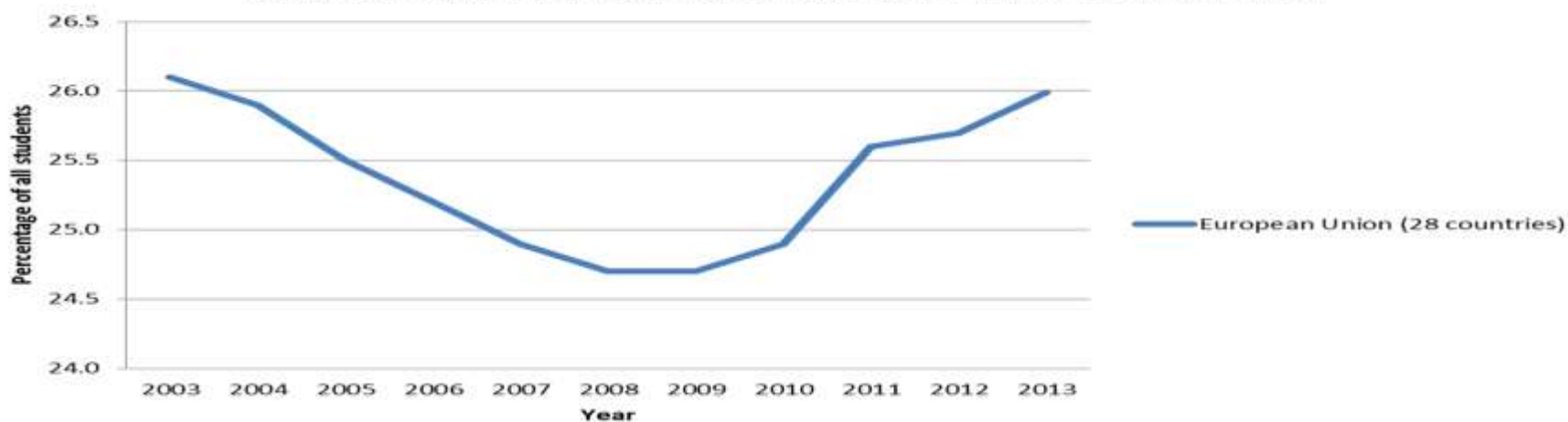


European
Commission

Evolution of Graduates (ISCED 5-6) in Maths, Science and Technology fields - as % of all fields



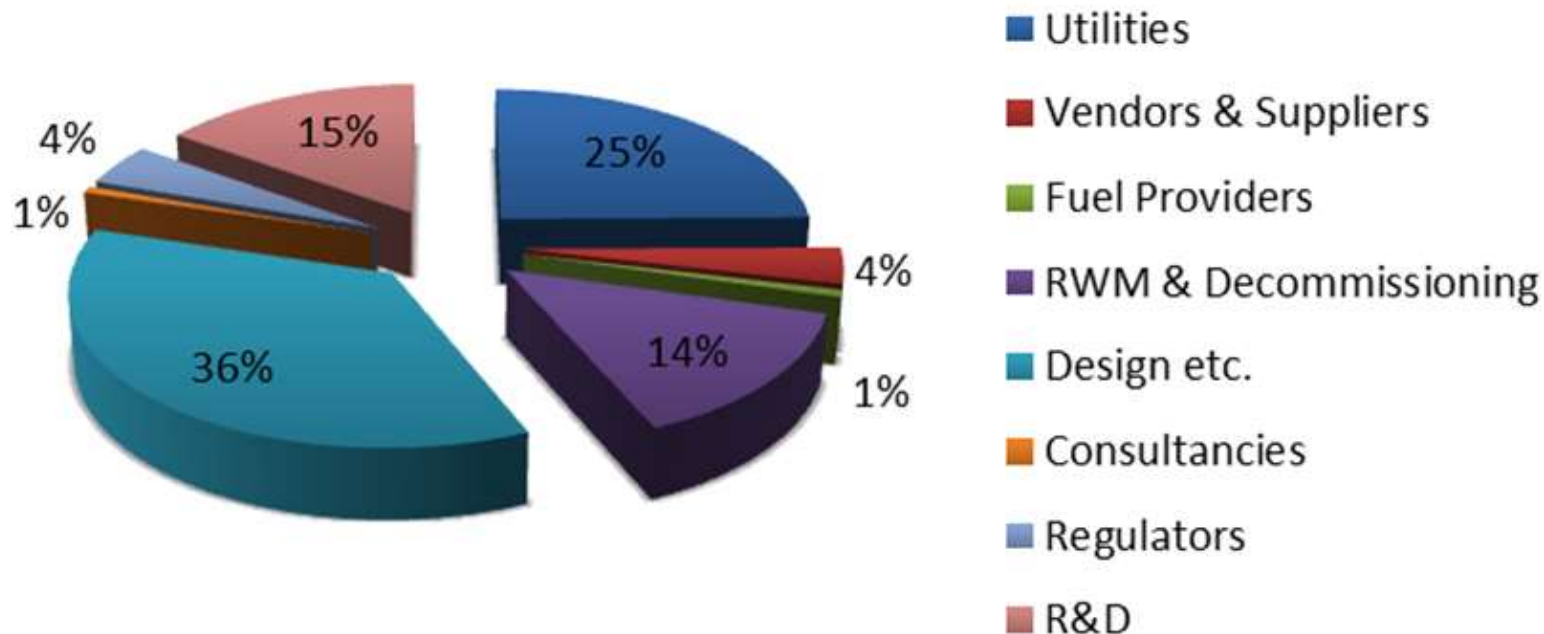
Evolution of students (ISCED 5-6) enrolled: science, maths, computing, engineering, manufacturing, construction - as % of all students



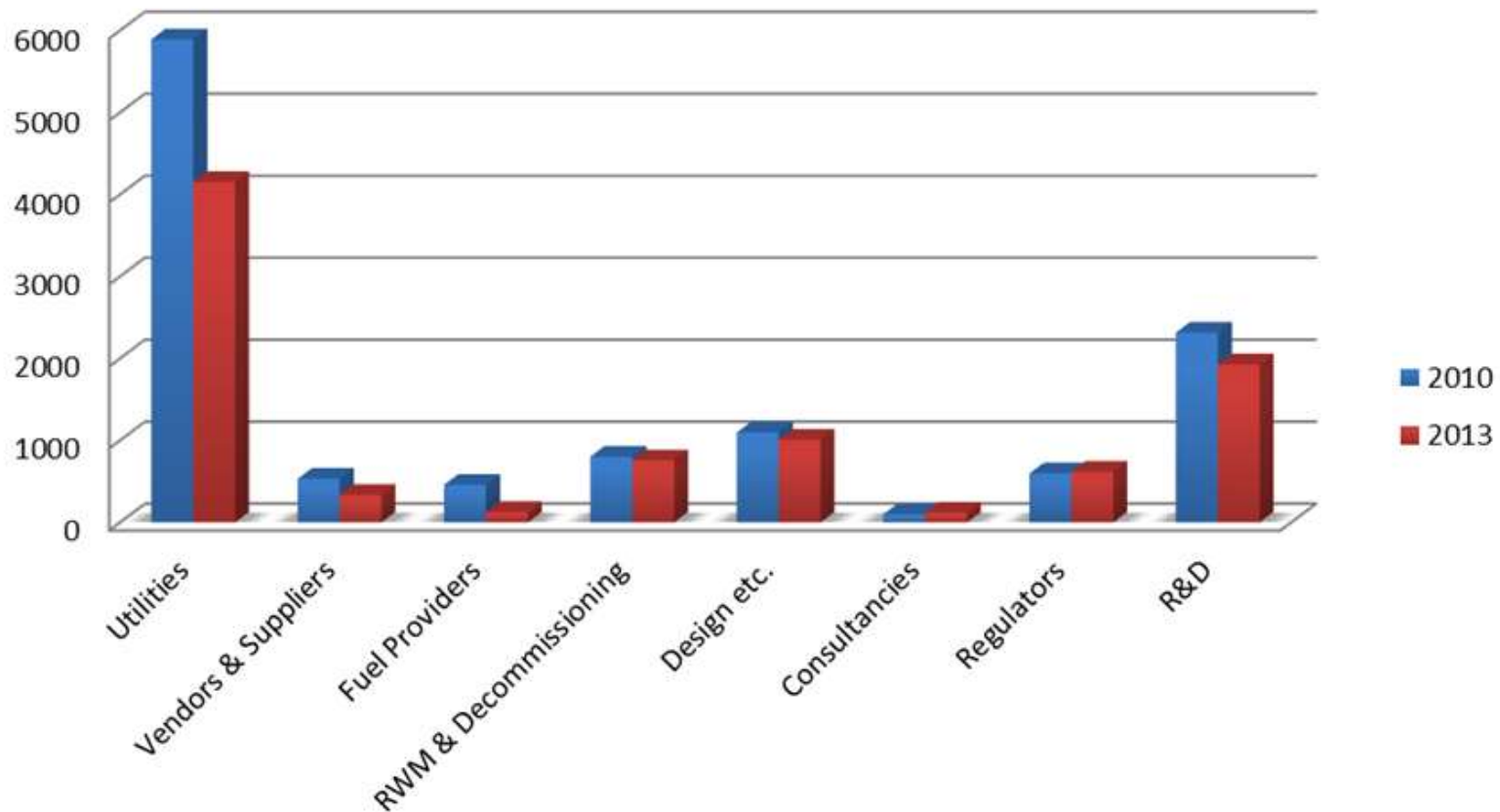
Demand Side



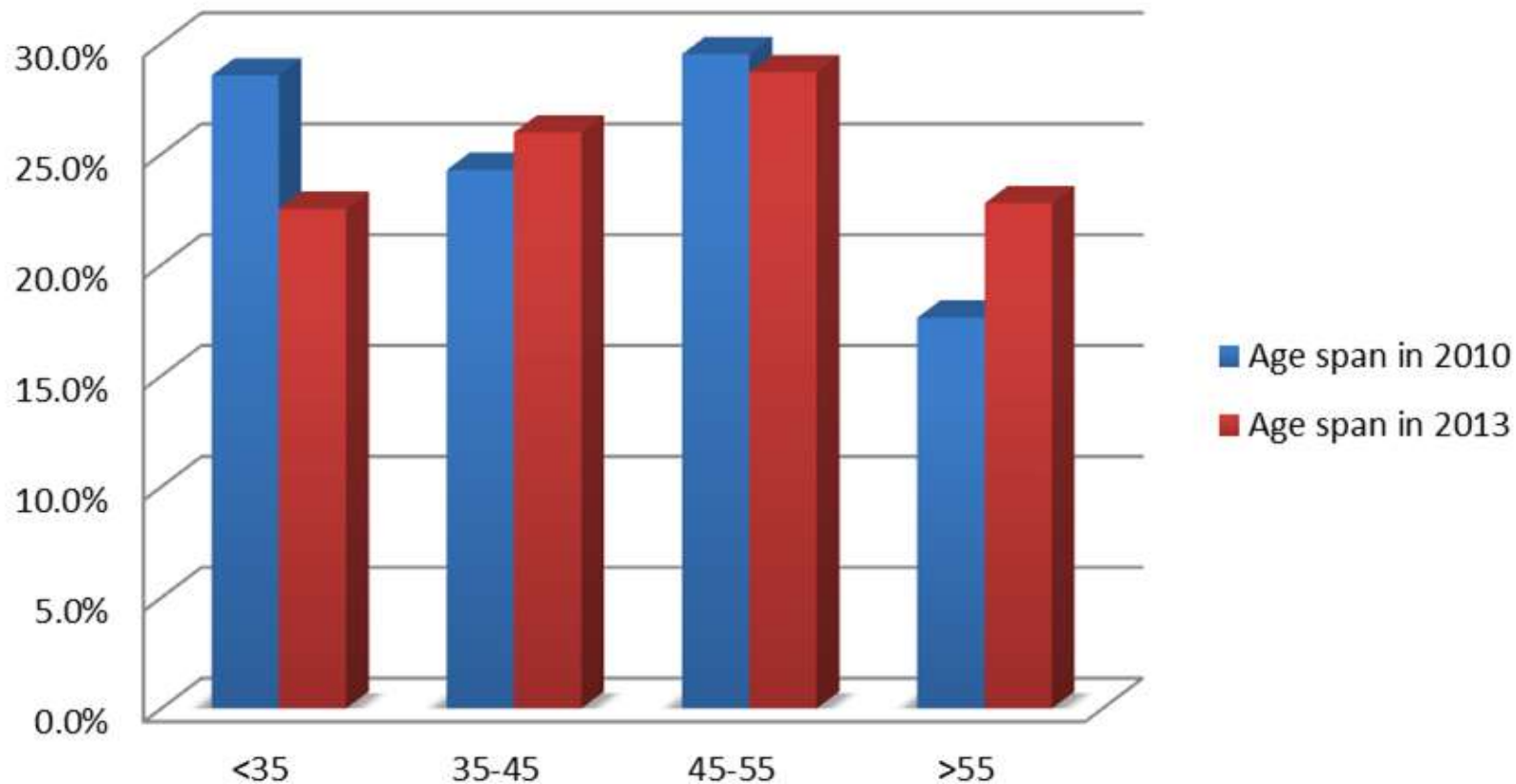
Nuclear workforce in 2013



Nuclear experts employed in 2010 & 2013



Age distribution of nuclear workforce

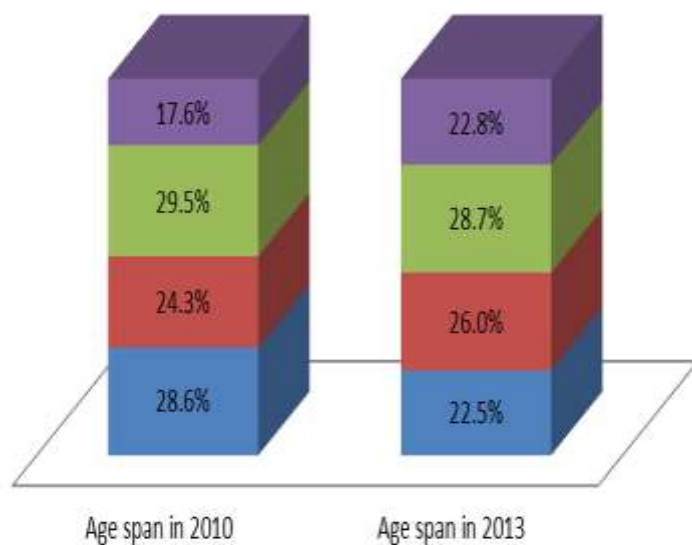




European
Commission

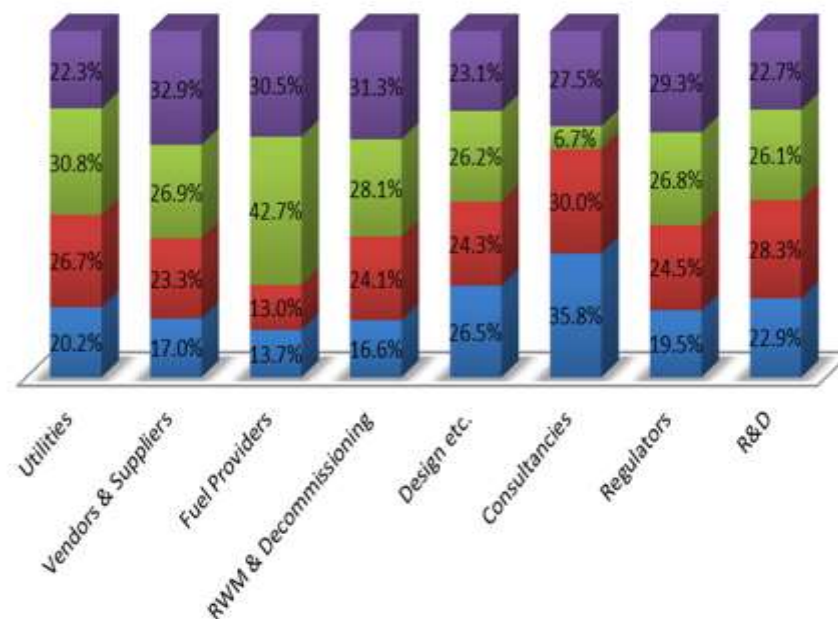
Age distribution 2010 vs 2013

■ <35 ■ 35-45 ■ 45-55 ■ >55



Age span by type of organization (2013)

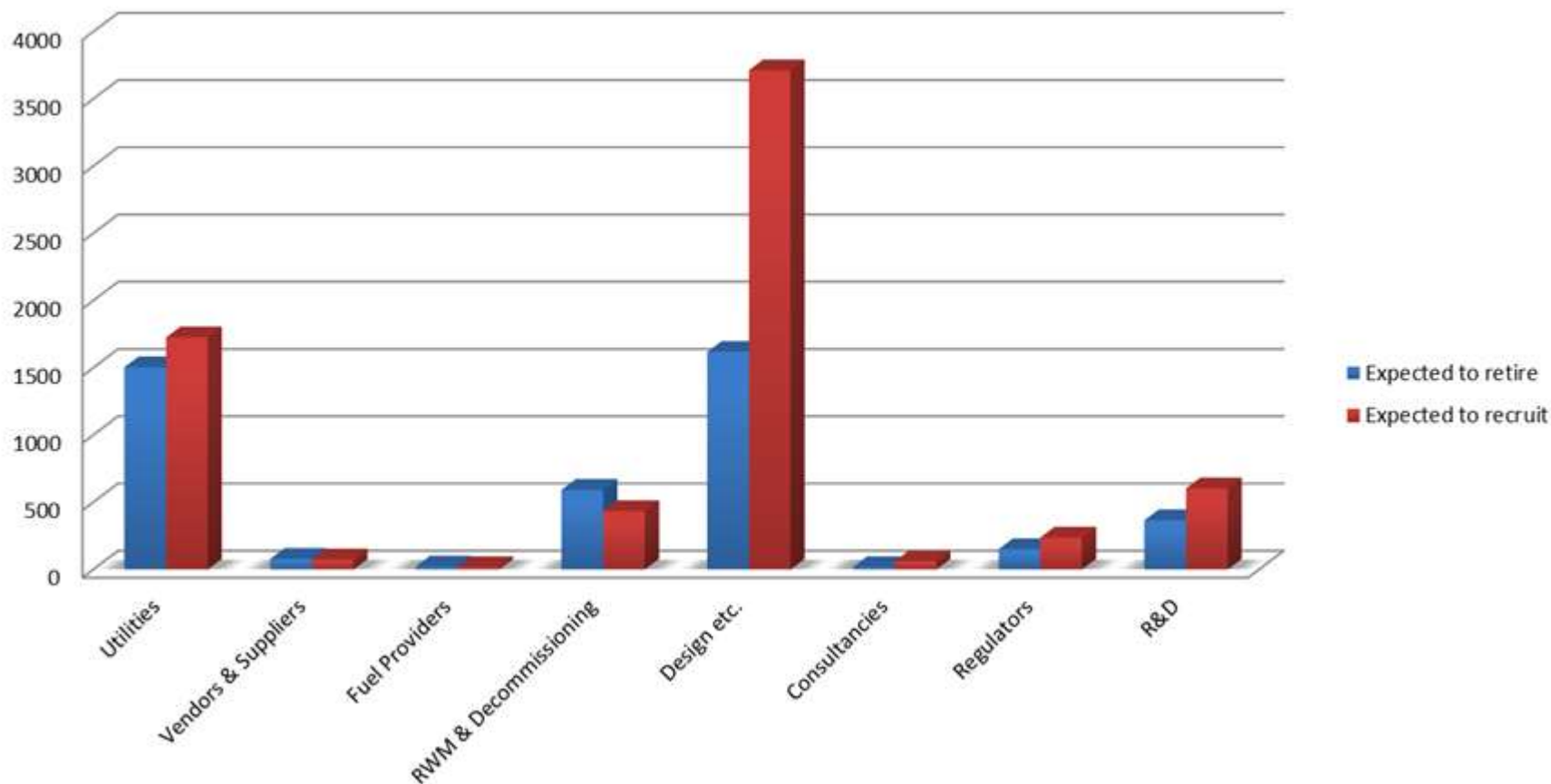
■ <35 ■ 35-45 ■ 45-55 ■ >55





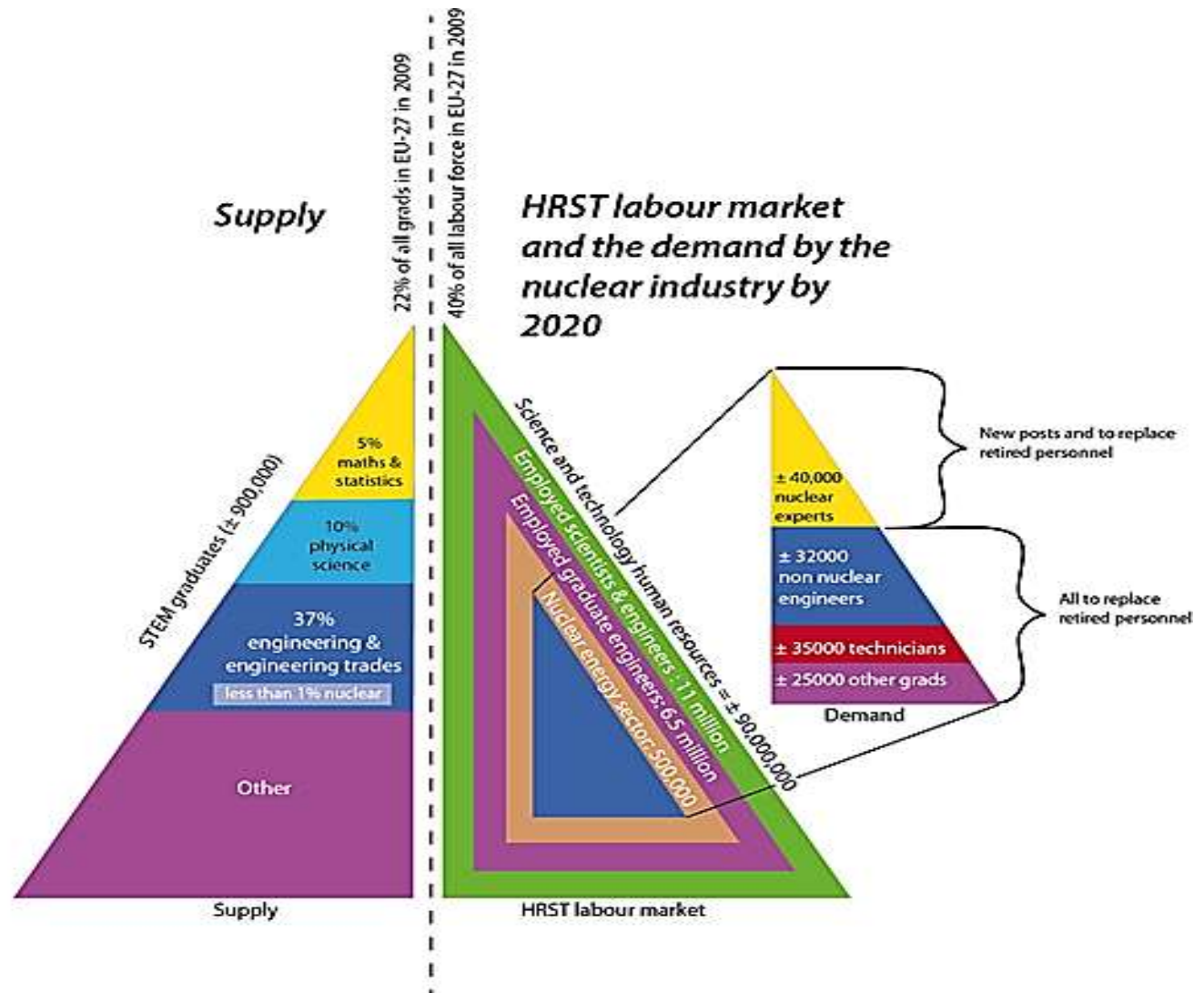
European
Commission

Expectations by 2020

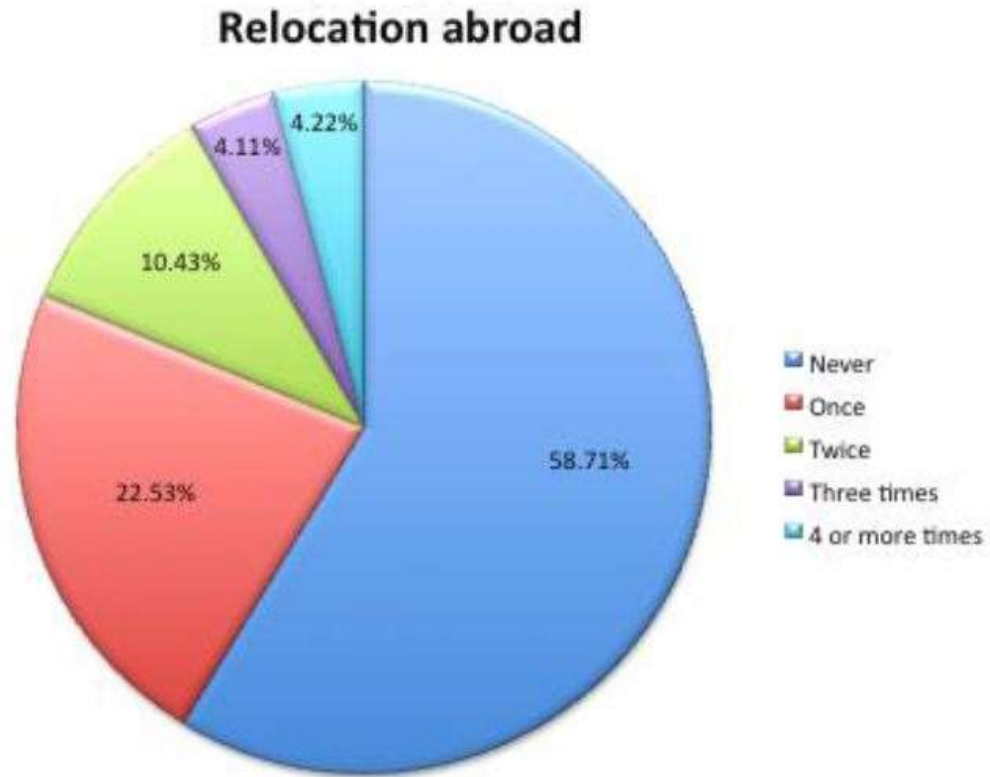




European
Commission

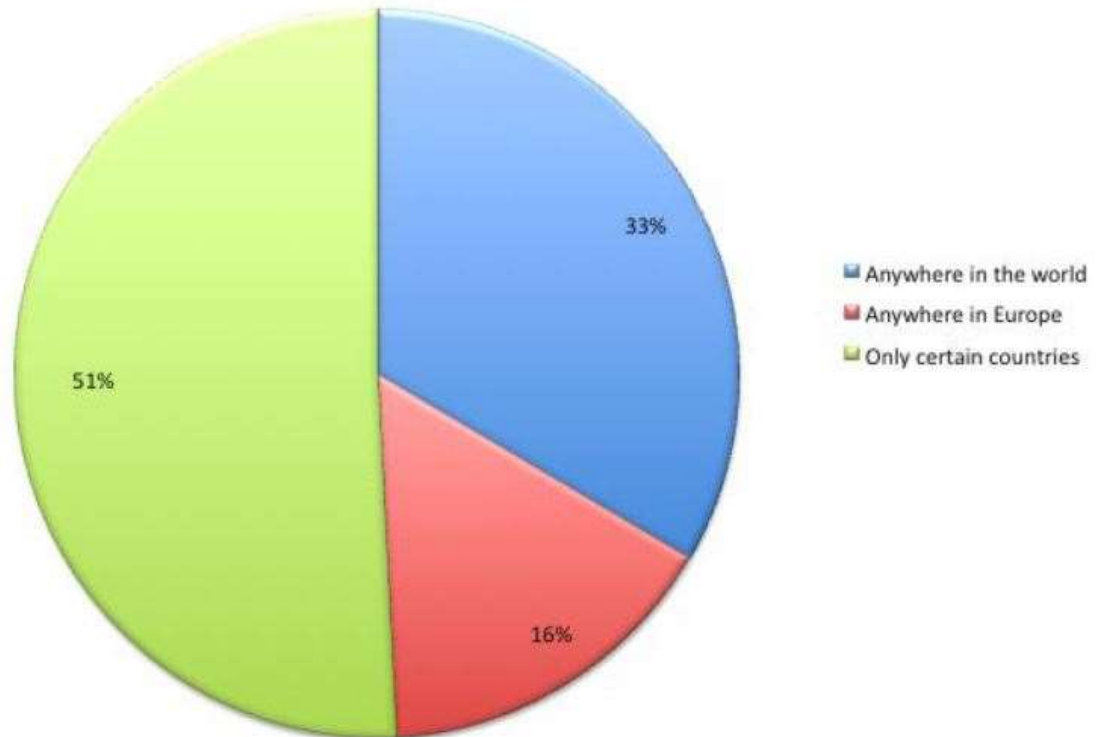


Geographical mobility



Geographical mobility

Where would you be prepared to relocate to for a job opportunity in the nuclear sector?





European
Commission

Which languages do you speak to a business level?





- ❖ Organization
- ❖ Bottom-up Approach
- ❖ Top-down Approach
- ❖ ECVET Implementation



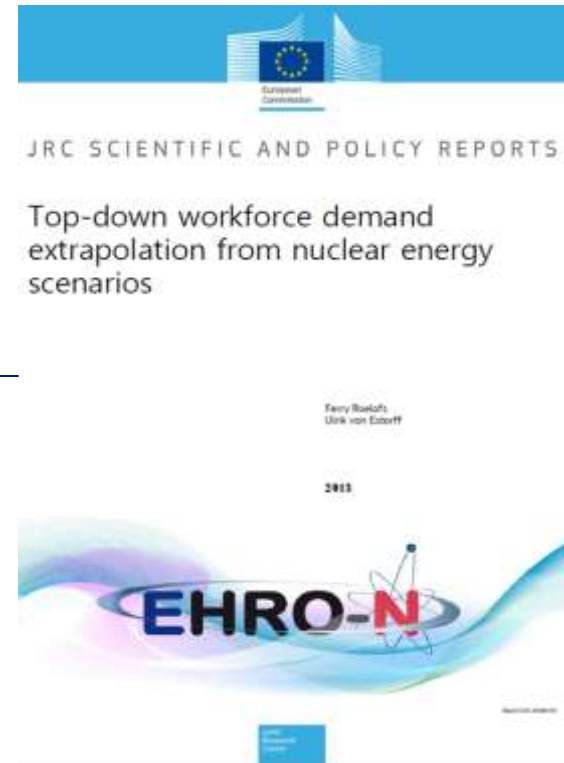
European
Commission



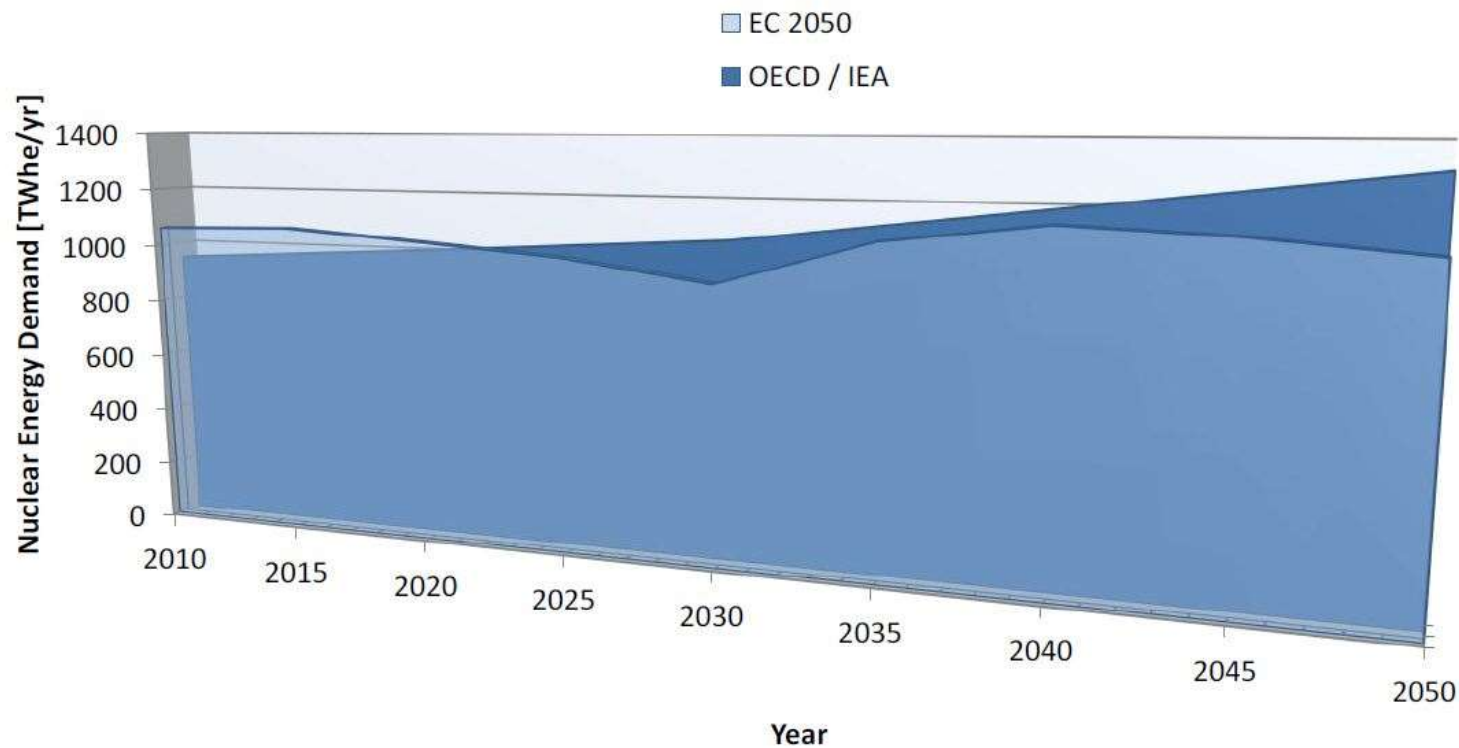
European Commission
Energy Roadmap 2050



OECD/IEA
Technology Roadmap
Nuclear Energy



The EC Energy Roadmap 2050 and the OECD/IEA Technology Roadmap based nuclear energy demand scenarios



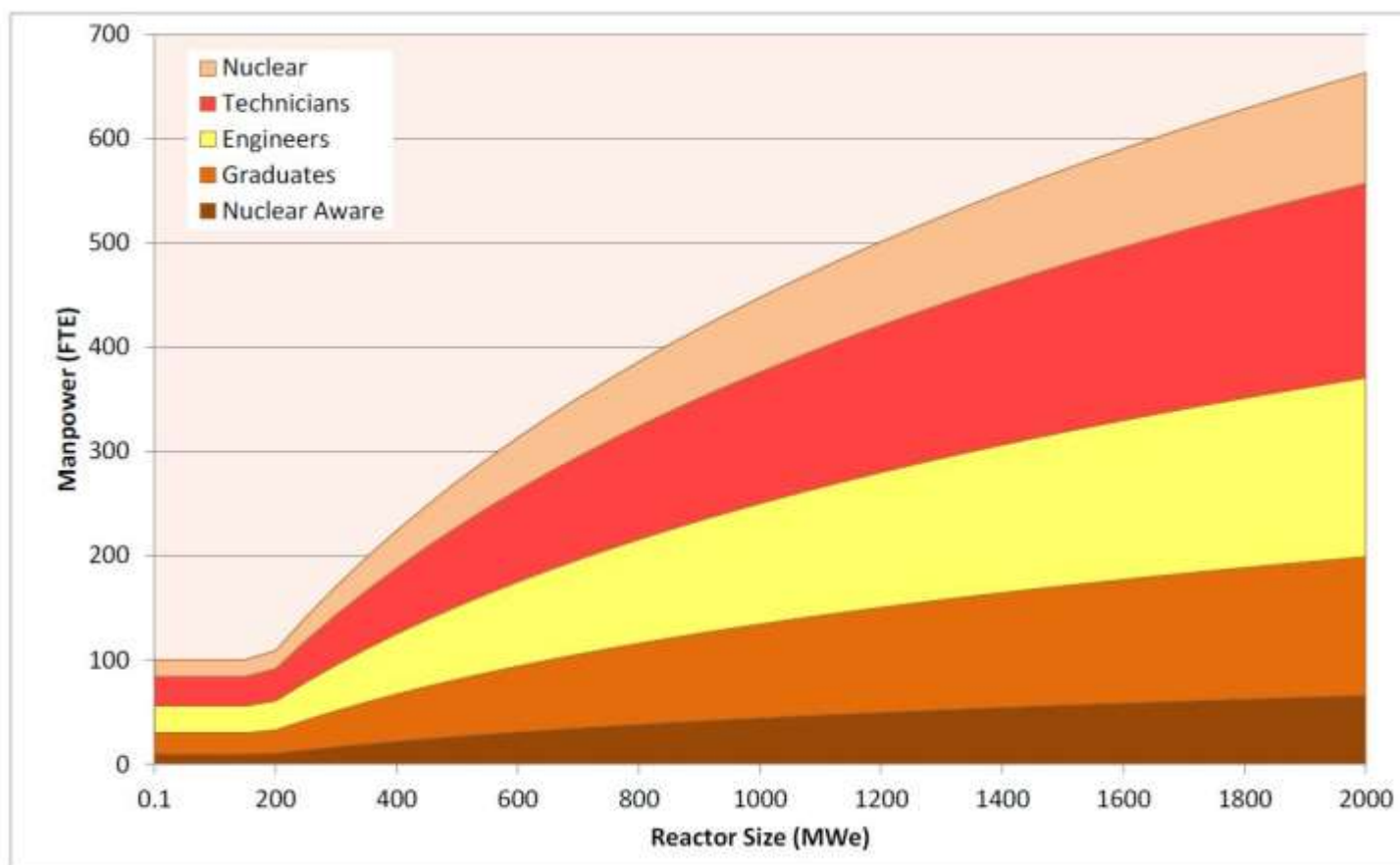
Building New Reactors

Two different generic third generation nuclear reactors are assumed to be constructed in order to fulfil the energy demand

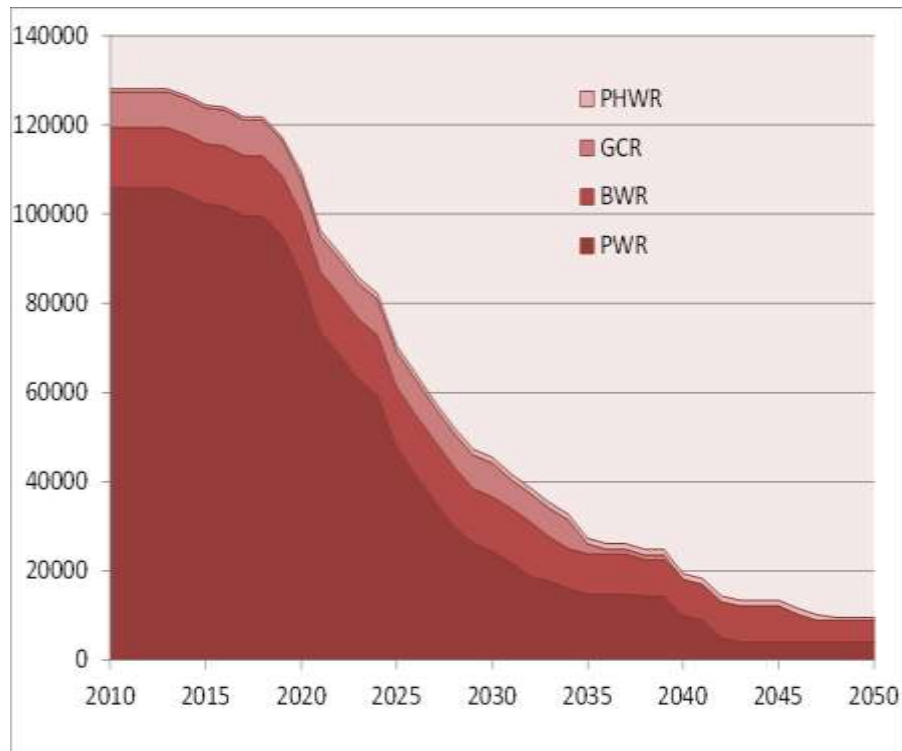


Reactor	Power [MWe]	Efficiency [%]	Load Factor [%]	Lifetime [Years]
Gen III LWR	1400	36	80	60
Gen III LWR	1000	36	80	60

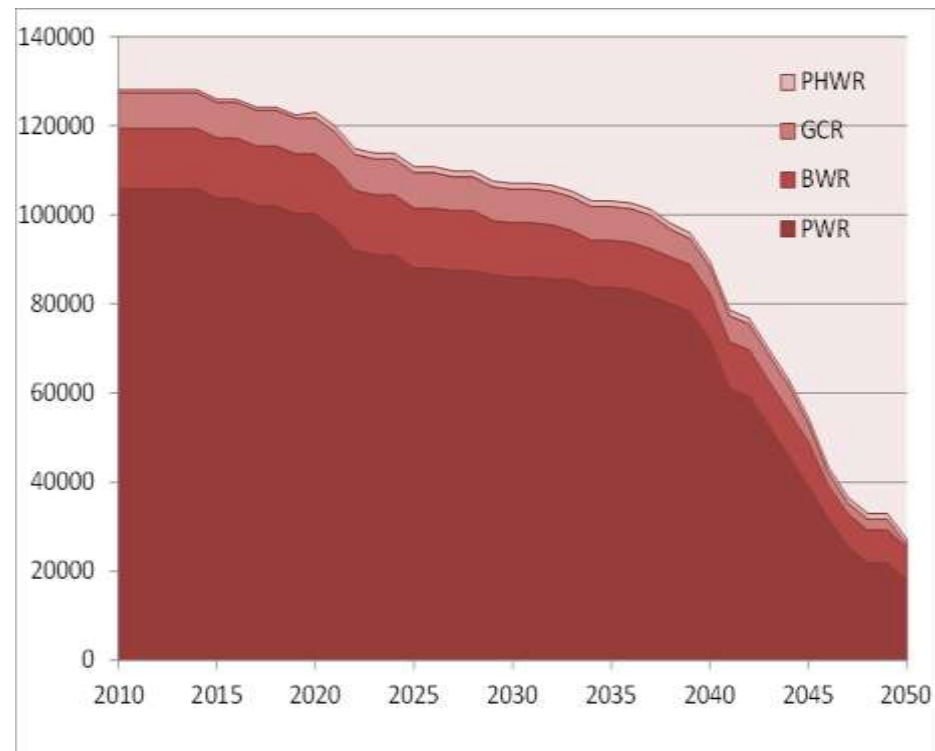
Graphical representation of the manpower required to operate different sizes of nuclear reactors



Shutdown profile (installed power) of the current reactor park



No LTO

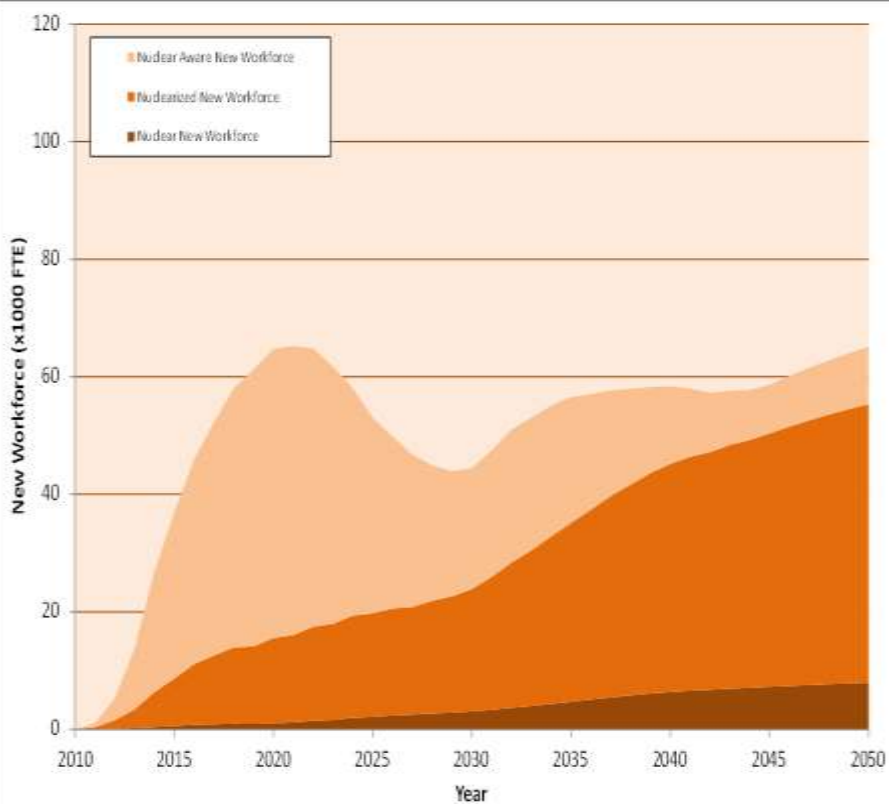


LTO

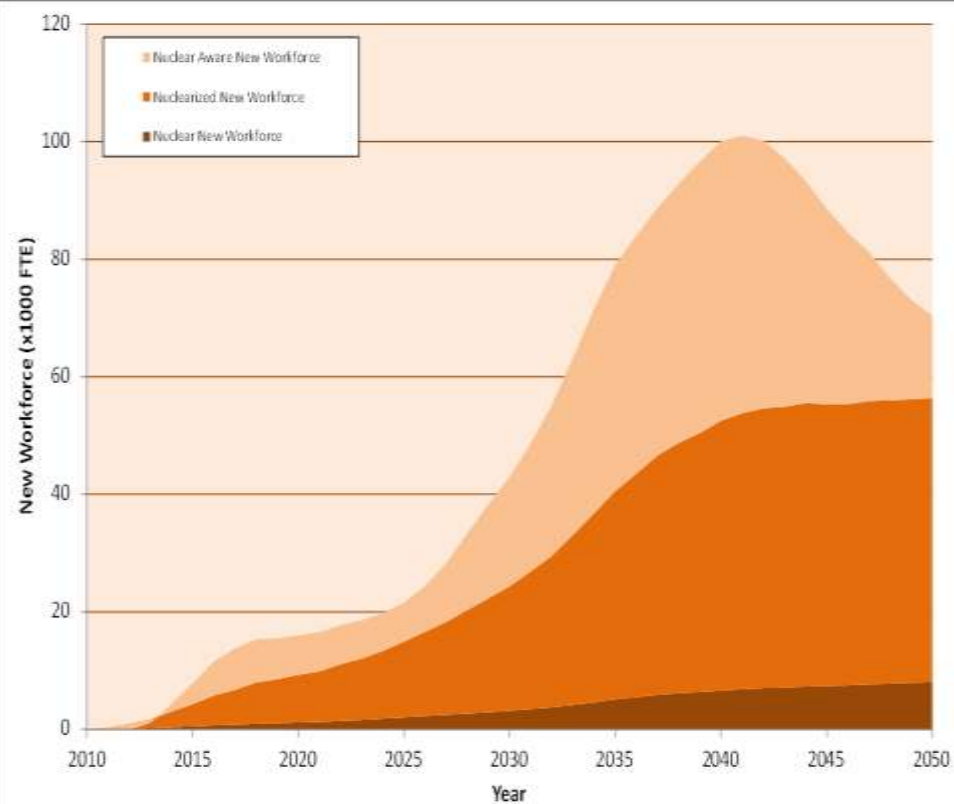


European
Commission

New workforce operations and construction



No LTO



LTO

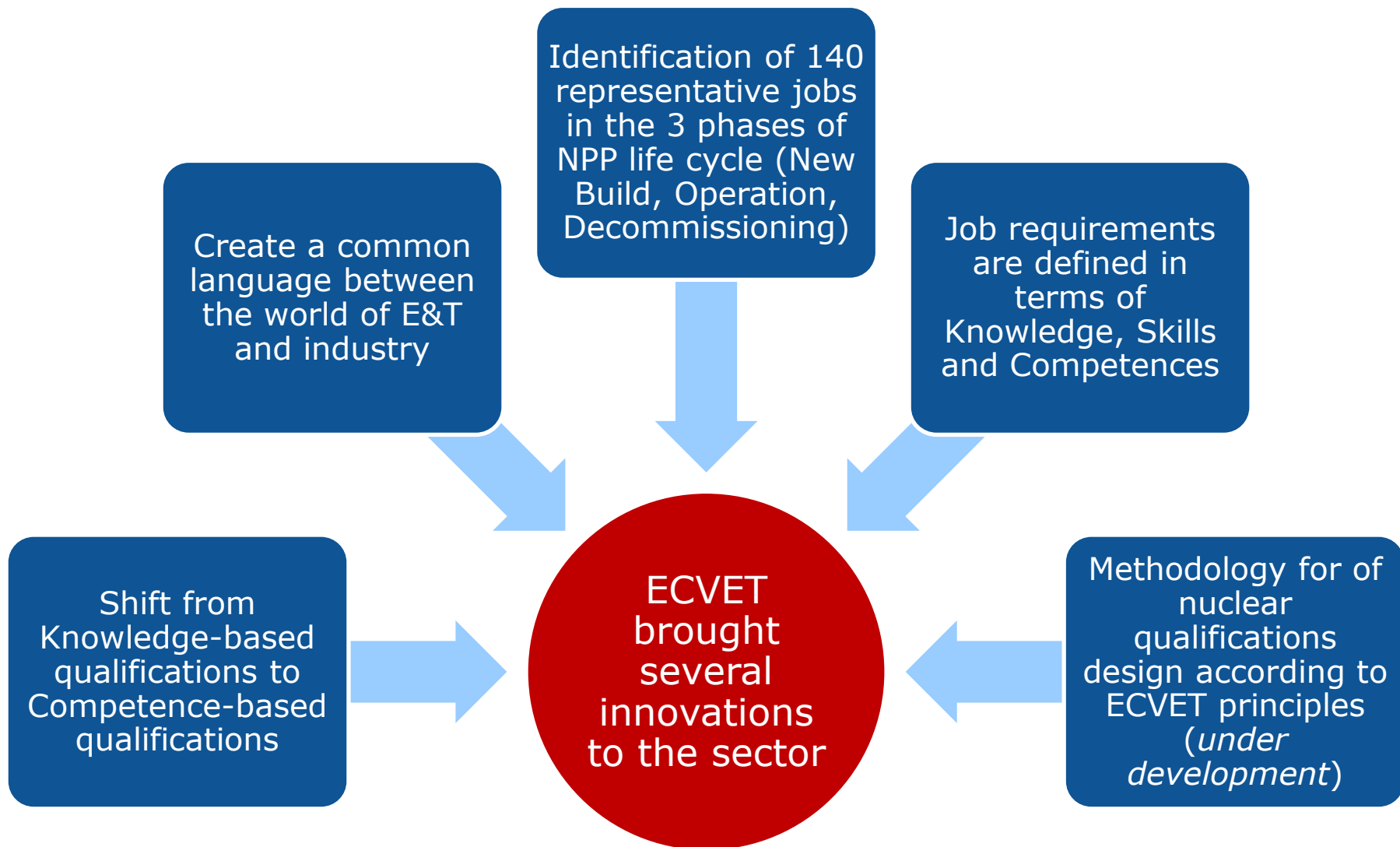


- ❖ Organization
- ❖ Bottom-up Approach
- ❖ Top-down Approach
- ❖ ECVET Implementation



European Credit System
for Vocational Education
and Training

Implementation in the nuclear energy sector



JRC-IET activities for the implementation of ECVET in the nuclear energy sector

Creation of a harmonised vocabulary

- Identifying competences
- Defining learning outcomes
- Designing units and qualifications



**Job Taxonomy
Workshops**

Fostering stakeholders involvement

- Increasing awareness
- Promoting partnerships



**Customised
Seminars**

Communicating ECVET

- Dissemination of the principles
- Sharing achievements



Publications

Job Taxonomy Workshops

- Istanbul (Turkey) February 2015
- Madrid (Spain) Nov 2013
- Bergen NH (The Netherlands) May 2013
- Thessaloniki (Greece) Oct 2012
- Petten (The Netherlands) Feb 2012
- Bergen NH (The Netherlands), Oct 2011

(Contributed by more than 70 experts, representing academia, industry, consultancies and training providers)

Around 150
competence-based job
profiles defined

Ref	Job Title	Occupational Category
2.5.01	Chemistry Manager	Professional
Phase / Area	Alternate job title(s) – specialisations	Functional Category
NPP O	Chemistry and Radiochemistry Manager	Management

Role / Functions

Responsible for all aspects of the Chemistry program relating to analytical and radio analytical data. This encompasses coaching and training, procedures, scheduling, budgeting, laboratory and in-line analysis, quality control, regulatory interface and regulatory requirements.

- Ensure optimal operation and sustainability of chemistry installations, systems and equipment.
- Ensure safety and efficient use of chemical reagents according to requirements of technical specification and operating procedures.
- Coordinate and supervise all type of tests specified in plant technical specifications and operating instructions.
- Supervise the safe reception, storage and disposal of fresh and used chemical reagents.
- Ensure strict adherence of the requirements regarding nuclear safety and radiation protection during implementation of chemistry activities.
- Coordinate the development, update and correction of the documents procedures related to functioning, maintenance and modification of chemistry equipment and related to the chemistry regime.

JOB REQUIREMENTS	
KNOWLEDGE (Cognitive competence)	EQF level (1-8)
Chemical engineering	6
Nuclear safety, radiation protection and safety culture	6
Corrosion and Environmental Degradation of Materials	5
Performance improvement models	5
Radiochemical engineering and Waste management	5
National and international regulations, licensing and standards	5
Process system reliability and safety	4
Data processing and IT tools	4
Nuclear power plant: reactor fundamentals, reactor and power plant systems, ionizing radiation, heat generation and removal, steam supplies system, instrumentation and control	4
Radioisotopes Measurement Applications	4
General management: budget management, business improvement, financial management, human resources, QSE, planning, monitoring and evaluation, risk assessment	3
Cost effective management related to the acquisition of chemicals	3
Training and qualification of personnel	3
SKILLS (Technical and functional competence)	
SKILLS (Technical and functional competence)	
Overseeing and applying complex regulations and procedures	6
Identification of safety requirements	6
Coordinating response to contingency	6
Managing personnel development and monitoring performance	6
Analysing and interpreting the results of analytical measurements	6

Database of competence
items (ca. 3000 entries)

SKILLS			
Technical / Functional Competence, Know-how. Occupational operational competence			
General class	Fields of science	Disciplines	Activity oriented sub-discipline
Technological sciences	Construction technology	Civil engineering	Classify plant areas according to fire grading
Technological sciences	Nuclear technology	Nuclear safety	Define corrective measures to improve safety culture based on operational experience feedback
Technological sciences	Construction technology	Water supply	Design cooling water structures, systems and components
Technological sciences	Electrical technology and engineering	Electric equipment	Perform cabling sizing and insulation
Mathematics	Computer sciences	Information systems and components	Upgrade information systems
Economic sciences	Organisation and management of enterprises	Knowledge Management	Adapt specific technologies for KM
Economic sciences	Organisation and management of enterprises	Production control	Adjust resources needed to carry out planned activities
Technological sciences	Power technology	Power generation	Adjust the energy transfer from the plant to substations
Technological sciences	Nuclear technology	Nuclear safety	Analyse accidents / incidents and elaborate preventive measures
Technological sciences	Mechanical Engineering and Technology	Mechanical Engineering	Analyse and Interpret the results of radiographic tests
Sociology	Occupational sociology	Occupational structure	Analyse data and other information, often utilizing statistical processes to test their theories.
Chemistry	Nuclear chemistry	Radiochemistry	Analyse Effect of radioactive isotopes on chemical and physical properties

Designing nuclear qualifications and training programme

Control Room Operator/CRO

Formal validation of
the competence for
**Senior Reactor
Operator/CRO**
position

Job requirements:
the KSC required to
perform the CRO's
functions/roles (K,S,
C/A defined in the
JD 2.02.02)

Unit 6= Management of abnormal/emergency situations

- 6.1 Nuclear incidents assessment /5
- 6.2 Emergency response management /5

Unit 5=Support training programmes for control room crew

- 5.1 Input for licensing flow for CRO /6
- 5.2 Input for CRO refreshments-at each 6 month /6

Unit 4= Team and technical supervision

- 4.1 Technical supervision /6
- 4.2 Team supervision /5

Unit 3= Interfacing with other departments

- 3.1 Interfacing with maintenance department /4
- 3.2 Interfacing with instrumentation and control /4
- 3.3 Interfacing with other departments/4

Unit 2=Maintenance and testing activities

- 2.1 Nuclear equipment maintenance /5
- 2.2 NPP systems and components /5

Unit 1= Operation of reactor facility

- 1.1 Nuclear operation and national laws /6
- 1.2 Radiation protection and emergency response /5
- 1.3 Chemical regimes of fluids /4

CRO/ EQF 5
Licensing flow
≈1,3 years

Working under supervision
=6 month

LU5, LU6 Recognition of Prior
Learning

CRO licensing
by NPP management

Practical training on simulator
=6 month

LU3, LU4 Recognition of Prior
Learning
Review by
regulatory body

Nuclearization
= 4 month

LU1, LU2

Customised Seminars

- Brussels (Belgium) Sep 2012
- Budapest (Hungary) Oct 2013
- Rome (Italy) Nov 2014

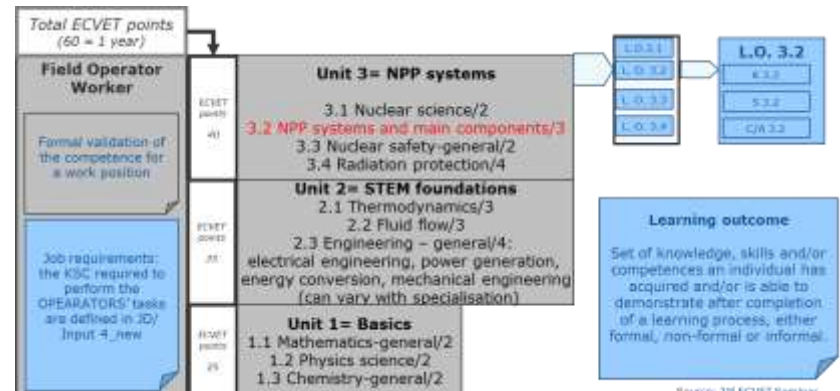
In cooperation with facilitators of ECVET-Team
<http://www.ecvet-team.eu/>



1st Seminar Introduction to ECVET

2nd Seminar Testing qualification design

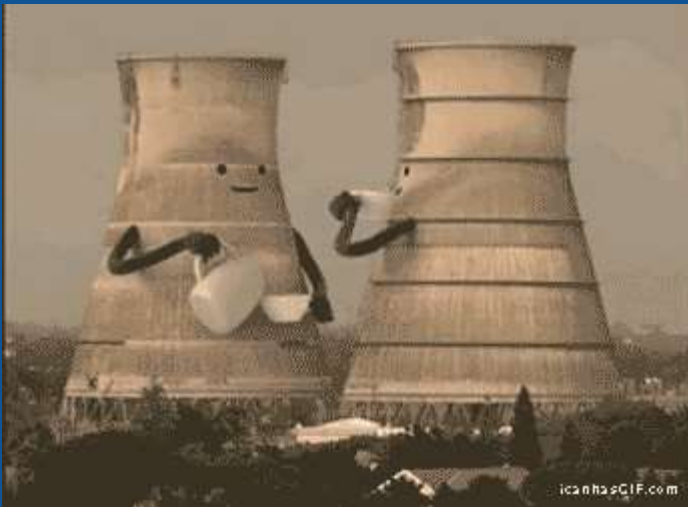
3rd Seminar Study on setting a pilot project



Dissemination

Articles in journals and newsletters,
participation in conferences and
seminars, JRC reports





Massimo FLORE

Scientific Officer

European Commission
Joint Research Centre – IET

massimo.flore@ec.europa.eu