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POST-FUKUSHIMA ANALYSIS OF HR SUPPLY AND DEMAND

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2014

The logo for the European High Level Group of Experts (EHRO-N). The text "EHRO-N" is written in a bold, sans-serif font. The "E", "H", "R", and "O" are in blue, while the "N" is in red. To the right of the "N" is a stylized atom symbol with a central blue nucleus and three blue orbits. The entire logo is set against a background of colorful, wavy lines in shades of blue, purple, and green.

EHRO-N

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Abstract

In the framework of EHRO-N mission to provide qualified data on human resources needs in the nuclear field within the European, this report explores the effects on Human Resources Supply and Demand after the accident at the Fukushima-Daiichi nuclear power plant in Japan. The event has raised concerns about the future of the nuclear industry globally. Before this analysis, no comprehensive picture on the demand/supply of nuclear HR was available for the whole European Union. Apart from a few countries, such as Finland, UK, France, etc., who have monitored their national nuclear workforce through comprehensive surveys, the availability of data varies, indeed, from country to country. A comparison based on data available with previous report has been made.

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LIST OF ABBREVIATIONS

CEDEFOP	<i>European Centre for the Development of Vocational Training</i>
DG ENER	<i>Directorate-General for Energy</i>
DG RTD	<i>Directorate-General for Research and Innovation</i>
DG TREN	<i>Directorate-General for Transport</i>
E&T	<i>Education and Training</i>
EC	<i>European Commission</i>
ECVET	<i>European Credit System for Vocational Education and Training</i>
EHRO-N	<i>European Human Resource Observatory for Nuclear</i>
ENEF	<i>European Nuclear Energy Forum</i>
ENEN	<i>European Nuclear Education Network</i>
ENS	<i>European Nuclear Society</i>
EQF	<i>European Qualifications Framework</i>
EU	<i>European Union</i>
EURATOM	<i>European Atomic Energy Community</i>
EUROSTAT	<i>Statistical Office of the European Union</i>
FORATOM	<i>The European Atomic Forum is the Brussels-based trade association for the nuclear energy industry in Europe</i>
HRST	<i>Human Resource in Science and Technology</i>
HRSTE	<i>Human Resource in Science and Technology in terms of Education</i>
HRSTO	<i>Human Resource in Science and Technology in terms of occupation</i>
IAEA	<i>International Atomic Energy Agency</i>
IGD -TP	<i>Implementing Geological Disposal of Radioactive waste Technology Platform</i>
ISCED	<i>International Standard Classification of Education</i>
MELODI	<i>Multidisciplinary European Low-Dose Initiative</i>
OECD/NEA	<i>Organisation for Economic Cooperation and Development/Nuclear Energy Agency</i>
RWM	<i>Radioactive waste management</i>
S&T	<i>Science and Technology</i>
SAG	<i>Senior Advisory Group</i>
SNE - TP	<i>Sustainable Nuclear Energy Technology Platform</i>
SET	<i>Science, Engineering and Technology</i>
STEM	<i>Science, Technology, Engineering and Mathematics</i>
TSOs	<i>Technical Safety Organisations</i>
WMOs	<i>Waste Management Organisations</i>

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1 INTRODUCTION

One third of the electricity produced in the European Union is generated by 132 Nuclear Power Plants situated in 14 EU member states. Safe and sustainable use of nuclear energy is ensured from 1957 through the Euratom Treaty, but it is only since the 90s that the European Union has been building up its nuclear knowledge base. The Chernobyl accident in 1986 and the recent 2011 Fukushima Daiichi disaster, turned public opinion perspective against nuclear energy exploitation, leading some member states to a gradual phase out. Younger generations' interest in nuclear studies decreased dramatically and nuclear education was abandoned by many engineering faculties. Meanwhile the first generation of senior nuclear experts started to retire with a resulting gap between incoming and outgoing flows of experts. This led gradually to a shortage of qualified professionals and an increased risk of loss of valuable knowledge for the nuclear community.

1.1 BACKGROUND

In 1999 the European Council adopted a specific programme on research and training in the field of nuclear energy, stating that: "Nuclear energy has the potential to provide Europe with a secure and sustainable electricity supply at a competitive price. Efforts to develop the safety and security of nuclear energy systems can strengthen the Community's industrial competitiveness, through exploiting the European technological advance and enhance the acceptability of nuclear energy. Minimising radiation exposure from all sources, including medical exposures and natural radiation, will improve the quality of life and will help in addressing health and environmental problems".

In 2007 the European Nuclear Energy Forum (ENEF), an initiative of the European Commission, began its activities to discuss on transparency, opportunities and risks of nuclear energy, following several EU Council decisions addressed to face the rising scarcity of adequate skilled professional resources for the nuclear energy sector.

In October 2008 a permanent entity was set-up to observe and monitor the nuclear human resources in the European Union; the European Human Resources Observatory in the Nuclear Energy Sector (EHRO-N). The idea was developed during the Working Group "Risks" of the fourth ENEF Meeting which was dealing with the adaptation of the European education system to nuclear stakeholder's needs.

The Joint Research Centre's Institute for Energy and Transport in Petten (NL) was appointed as the operating agent, responsible for the support and execution of the tasks under the general direction of the Senior Advisory Group, which is composed by high-level experts representing different types of nuclear stakeholders coming from EU Member States.

In 2011 the European Commission adopted the "Energy Roadmap 2050", which explores the "challenges posed by delivering the EU's decarbonisation objective while at the same time ensuring security of energy supply and competitiveness".

The same year EHRO-N was officially launched.

Its mission is to provide qualified data on human resources needs in the nuclear field within the European Union and high-level expert recommendations on EU-wide nuclear Education and Training action, thus promoting lifelong learning and cross border mobility. The objective is to produce and regularly update a quality-assured database on the short, medium and long-term needs of human resources for the nuclear energy sector and analyse the gaps and deficiencies in the European nuclear education and training in order to elaborate recommendations, in close cooperation with other relevant actors in the area. The analysis of the existing data has been used for the development of European schemes of nuclear qualifications and mutual recognition, taking advantage of existing EU initiatives as ECTS or ECVET, and to provide information and recommendations to the European Commission.

Under the guidance of the Senior Advisory Group, which meets twice a year, EHRO-N has produced a periodic trend analysis for the nuclear human resources situation and analysed the quality of European nuclear education and training infrastructure, benchmarking the data with Asian and North American experiences.

Before this analysis, no comprehensive picture on the demand/supply of nuclear HR was available for the whole European Union. Apart from a few countries, such as Finland, UK, France, etc., who have monitored their national nuclear workforce through comprehensive surveys, the availability of data varies, indeed, from country to country. However, national data and reports on nuclear HR are missing for most EU's Member States. Similar reports in quantifying nuclear HR needs produced by international organizations, such as IAEA and OECD/NEA, do not always provide complete data.

1.2 EHRON-TEAM

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2. NUCLEAR ENERGY IN THE EU

Nuclear energy accounts for over one quarter of the electricity generated in the whole EU. A large part of it is produced in only one country, France. Furthermore, a number of European countries have strong mutual electrical network link with Russia, Belarus and Ukraine. Uranium supply came from Kazakhstan, Canada, Russia, Niger and Australia.

Nuclear is widely considered a low-carbon source of energy, but today the sector faces major challenges within the European Union with a raising number of member states phasing down nuclear energy production, which leads to the closure of a number of reactors and will decrease the current capacity of 122 GWe in the near term.

Construction of new plants is currently underway in Finland, France and Slovakia, but all have experienced cost overruns and delays, while Bulgaria, Czech Republic, Lithuania, Poland, Hungary and UK have planned to build new reactors before 2030.

EU nuclear power¹

Country	2013 nuclear generation		Reactors operable at June 2014		Reactors under construction at June 2014		Reactors planned at June 2014		Reactors proposed at June 2014	
	TWh	% e	No.	MWe net	No.	MWe gross	No.	MWe gross	No.	MWe gross
-										
Belgium	40.6	52	7	5943	0	0	0	0	0	0
Bulgaria	13.3	30.7	2	1906	0	0	1	950		
Czech Rep.	29	35.9	6	3766	0	0	2	2400	1	1200
Finland	22.7	33.3	4	2741	1	1700	0	0	2	2700
France	405.9	73.3	58	63130	1	1720	1	1720	1	1100
Germany	92.1	15.4	9	12003	0	0	0	0	0	0
Hungary	14.5	50.7	4	1889	0	0	2	2400	0	0
Lithuania	0	0	0	0	0	0	1	1350	0	0
Netherlands	2.7	2.8	1	485	0	0	0	0	1	1000
Poland	0	0	0	0	0	0	6	6000	0	0
Romania	10.7	19.8	2	1310	0	0	2	1310	1	655
Slovakia	14.6	51.7	4	1816	2	942	0	0	1	1200
Slovenia	5	33.6	1	696	0	0	0	0	1	1000
Spain	54.3	19.7	7	7002	0	0	0	0		
Sweden	63.7	42.7	10	9508	0	0	0	0		
UK	64.1	18.3	16	10038	0	0	4	6680	7	8920
EU	833.2	27%	131	122,233	4	4362	19		15	

¹ In the EU in 2013, 50% of electricity was from conventional thermal sources, 27% from nuclear, 12% from hydro, 8% from wind and 3% from other sources (Eurostat).

3. EHRO-N REPORT: METHODOLOGY AND LIMITATIONS

The data was gathered and analysed following the steps of the previous report.² The following methodology was applied:

1. Supply side: Desk research of higher education institutions in the EU-28 that offer nuclear energy related degrees. Various sources were used including the databases of ENEN and ENS.
2. Demand side: Desk research of the nuclear organisations that are active in the EU-28 nuclear energy sector. Information was benchmarked with data available from the existing EURATOM national contact points and through direct telephone calls.

The challenge and potential limitation was setting up a complete list of higher education institutions in the EU-28 that offer nuclear energy related degrees and a list of nuclear energy stakeholders active in the nuclear energy sector in the EU-28.

3. Design of the questions and sending out the questionnaires to the institutions from the points 1 and 2 above.

Two different surveys were designed for the two sets of databases:

- The first one was sent to the higher education institutions (see Annex 2), in order to find out the numbers of students at bachelor, master and PhD level that graduated from/enrolled in an EU-28 academic institution in a given year.
 - The second one was sent to the nuclear stakeholders (see Annex 1), in order to receive numbers of employed nuclear experts in the EU-28 in 2013 according to age groups and the numbers of experts expected to retire and be recruited in the short- (2015) and medium-term future (2020).
4. Analysis of the responses received;

The analysis of the responses received was done on a case-by-case basis:

- If a country sent data about its nuclear energy sector supply and/or demand, this data was taken as the most accurate with no further enquiries on our part.

² V. Simonovska, U. von Estorff, Putting into perspective..., Petten, 2012, JRC70083

- Where no data was received either through a national contact point or from a mother company, stakeholders were contacted directly. Data received was listed under the country where the seat of the contacted stakeholder was.
5. Putting the complete EHRO-N data into wider context using statistical data available from Eurostat.

The relevant statistical information from OECD, IAEA and Eurostat, in particular on the numbers of science, engineering and technology (SET) graduates and HRST employees supplied and/or demanded in the EU-28, was used, so that the quantitative data gathered via EHRO-N questionnaire was put into the wider context of supply and demand of highly skilled personnel in the EU-28.

6. Comparison with last survey (2011) among stakeholders and universities that answered both times. Comparisons through statistical calculations were performed, in order to analyse trends.

3.1 CONTACTING HIGHER EDUCATION INSTITUTIONS - SUPPLY SIDE

Two questions were relevant when contacting the higher education institutions, offering nuclear engineering studies/nuclear energy - related subjects in the EU-28:

1. Number of nuclear engineering students/students following nuclear energy - related subjects that graduated in year 2013
2. Number of nuclear engineering students/students following nuclear energy -related subjects that started their studies in year 2013/2014

3.2 CONTACTING NUCLEAR STAKEHOLDERS - DEMAND SIDE

Several questions were performed, through a questionnaire, to the stakeholders that were contacted during the study.

- Type of organization (Utilities; Vendors & Suppliers; Consultancy; R&D Institute; Regulatory authority and TSOs; Fuel fabrication, enrichment and supply; Waste management and decommissioning; Design, engineering, manufacturing and maintenance; etc.).
- Total number of nuclear experts employed and the respective age span.
- Number of nuclear experts expected to retire and to be recruited in the short- and medium-term future.
- Number of nuclear experts who will be employed in decommissioning projects in the short- and medium-term future.

4 LIMITATIONS OF THE METHODOLOGY

The limitations related to the above methodology were:

- The lists of higher education institutions offering nuclear energy related courses and nuclear energy stakeholders might not encompass the totality of all organisations actually involved in the nuclear energy in the EU-28. This is especially true as far as the significant number of subcontracting companies that operate in the nuclear energy sector is concerned.
- There seems to be a certain understanding of what a “nuclear expert” is, but when it gets down to numerically defining the term, the definition loses clarity as some organisations may refer to the term differently. Thus, the definition and interpretation of a “nuclear expert” is limited to this report.
- The definition of a “nuclear stakeholder”, especially the division per types of stakeholders, is limited to this report. Some organisations may fall in one or two groups of different stakeholders but this was not taken into consideration for the division per types of stakeholders used in this report.
- Much less organisations were prepared to communicate their data on students/needs for nuclear experts. This made the estimation of the missing data unavoidable.

- The benchmarking of the supply data proved to be challenging because of a lack of a central source of information on national level against which received data could be checked. Thus, best possible estimates on the basis of other available reports and figures were made.

5 SUPPLY OF AND DEMAND FOR NUCLEAR EXPERTS IN THE EU-28

In the following section are shown the results from the last survey, the analysis and the comparison with the previous report.³

5.1. SUPPLY SIDE: HIGHER EDUCATION INSTITUTIONS' SUPPLY OF NUCLEAR EXPERTS IN THE EU-28— ACCORDING TO THE DATA RECEIVED

Twenty-five different higher education institutions responded from the following countries: Austria, Belgium, Bulgaria, France, Germany, Hungary, Italy, Malta, Poland, Slovenia, Spain and United Kingdom.

The data received from the contacted institutions covered the:

1. Number of students following nuclear energy related subjects that graduated in 2013.
2. Number of students following nuclear energy related subjects that began with their studies in the academic year 2013/2014.

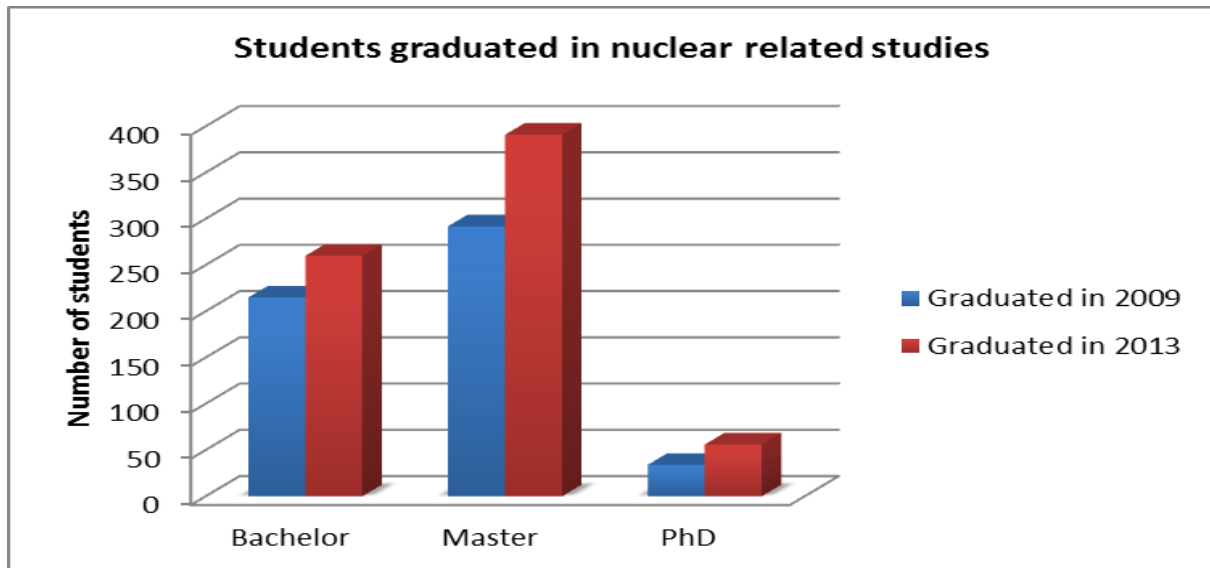
The initial results from the showed that:

1. Slightly more than 700 nuclear engineering students and students following nuclear energy related subjects graduated in the year 2013 on BSc, MSc, or PhD levels in the higher education institutions in the EU-28.
2. Around 1.200 students started their nuclear engineering and nuclear energy related studies in the year 2013/2014.

A comparison among the Universities who responded to both surveys (2010 and 2014) showed an increasing number of students graduated and enrolled over the last years. Benchmark with the data available from Eurostat confirms the increasing trend in the last five years.

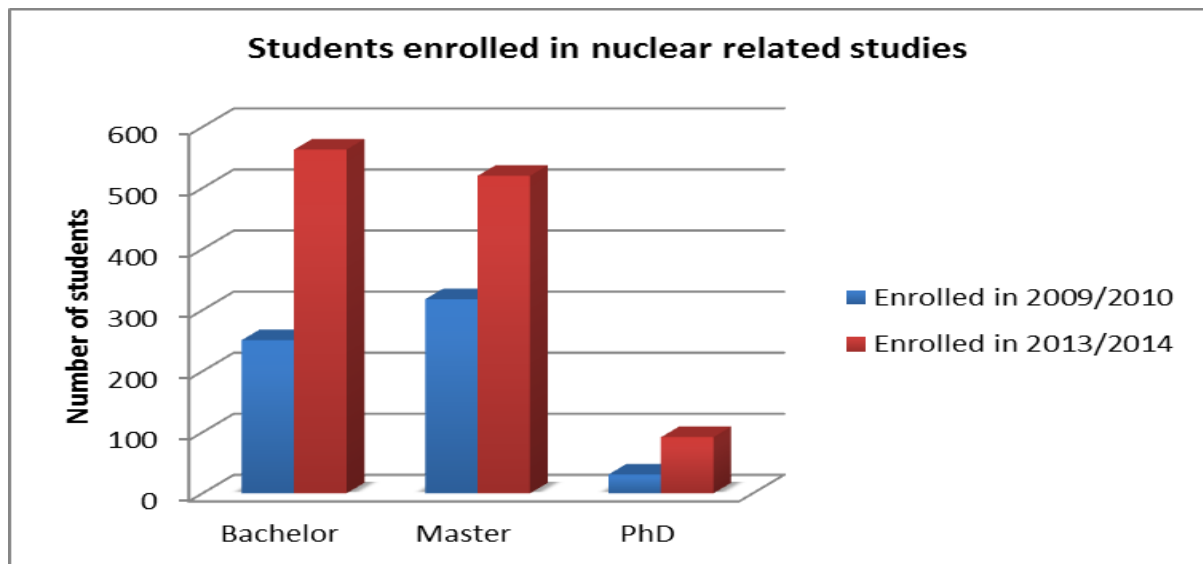
³ V. Simonovska, U. von Estorff, Putting into perspective..., Petten, 2012, JRC70083

Figure 1: Number of nuclear engineering students/students following nuclear related subjects that graduated in 2009 and 2013 on BSc, MSc, PhD level in the EU-28 (received data)



Source: EHRO-N

Figure 2: Number of nuclear engineering students/students following nuclear related subjects that started their studies in year 2009/2010 & 2013/2014 in the EU-28 (received data)



Source: EHRO-N

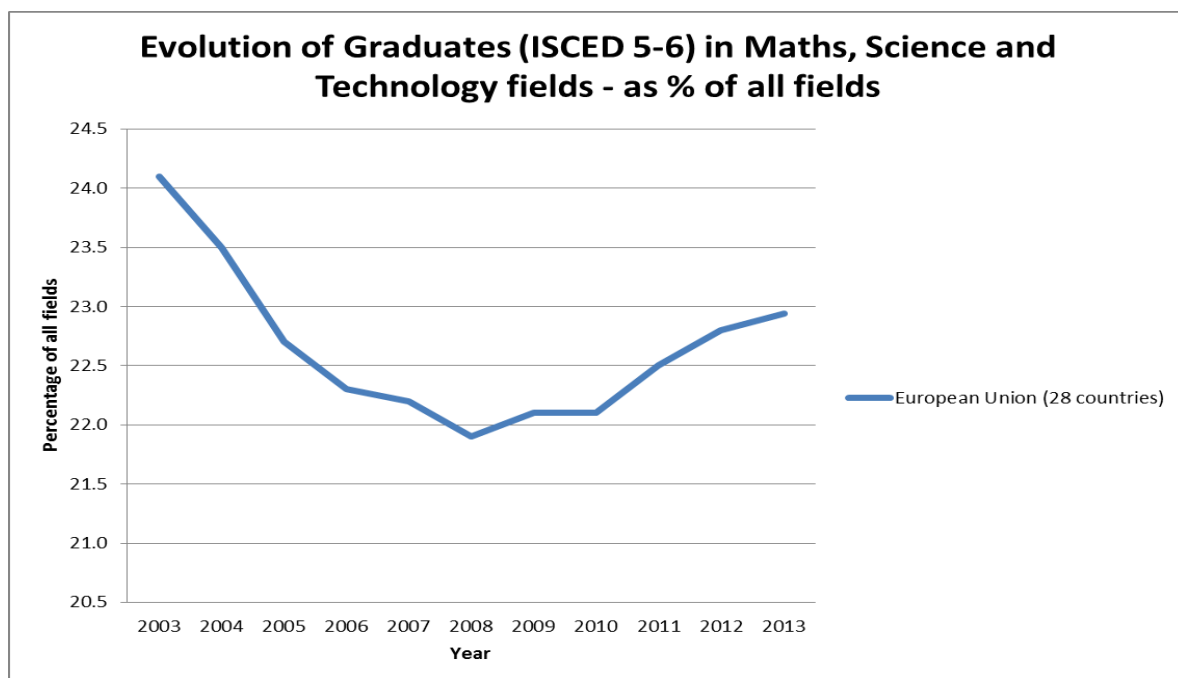
5.2 SUPPLY OF RELEVANT GRADUATES IN THE EU-28 FOR THE NUCLEAR ENERGY LABOUR MARKET

Relevant statistical data available from Eurostat (ISCED 1997)⁴ on EU-28's graduates in the nuclear related field was used. Unfortunately, Eurostat available data goes no further than year 2012. An estimation of data for the year 2013 was done taking into account the trend of the last five years and all the data in our possession.

The number of all students that graduated in 2012 was 4.838.704. The share of graduates of math, science and technology (STEM) fields was 22.8%. The estimation for 2013 brought almost 23% of graduates in maths, science and technology fields.

The percentage of all students graduated in maths, science and technology fields have increased in the last 5 years. Countries that had a number of graduates above the EU-28 average (>23%) are: Austria, Finland, France, Germany, Greece, Ireland, Italy, Portugal, Romania, Slovenia, Spain and Sweden.

Figure 3: Graduates levels 5-6 (ISCED 1997) in Mathematics, Science and Technology fields - as % of all fields in the EU-28

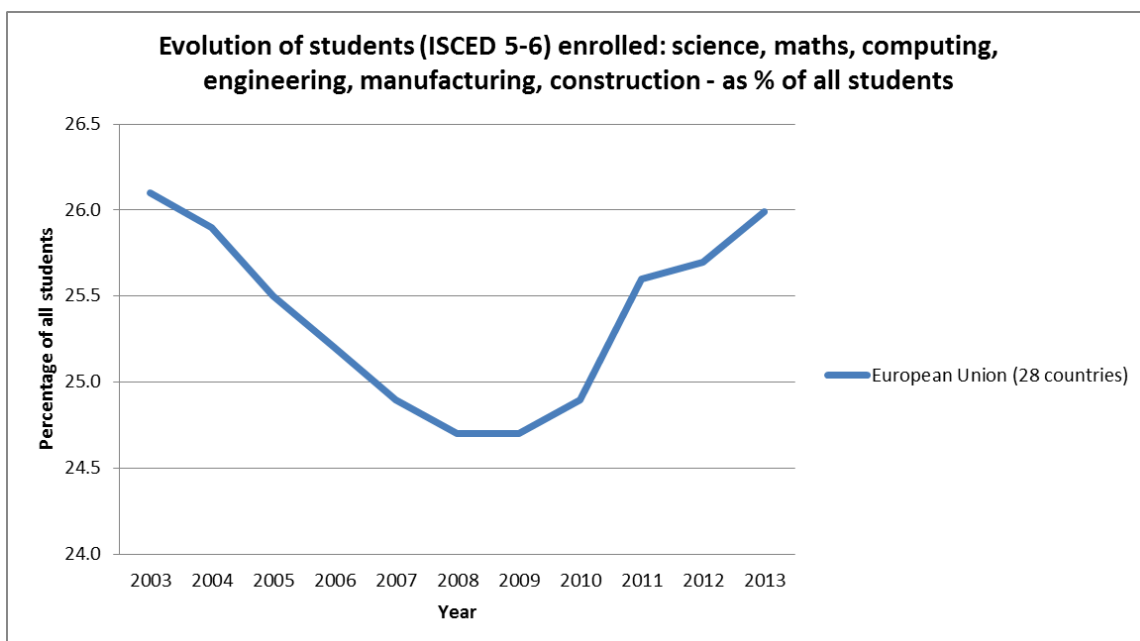


Source: Eurostat

⁴ ISCED is the International Standard classification of Education and it was developed and designed by Unesco in the early 1970's to serve "as an instrument suitable for assembling, compiling and presenting statistics of education both within individual countries and internationally". For the purpose of the report we used the data available about levels 5 (Bachelor and Master level) and 6 (PhD level).

The trend of students enrolled in the fields of science, maths, engineering, manufacturing and construction is similar to the graduate students. The percentage of students enrolled in those fields has increased in the last 5 years. The number of all students at levels 5-6 (ISCED 1997) in 2012 was 20.245.895, while the share of students enrolled in science, maths, computing, engineering, manufacturing and construction fields was nearly 26%.

Figure 4: Students at levels 5-6 (ISCED 1997) enrolled in the following fields: science, mathematics, computing, engineering, manufacturing, construction - as % of all students in the EU-28

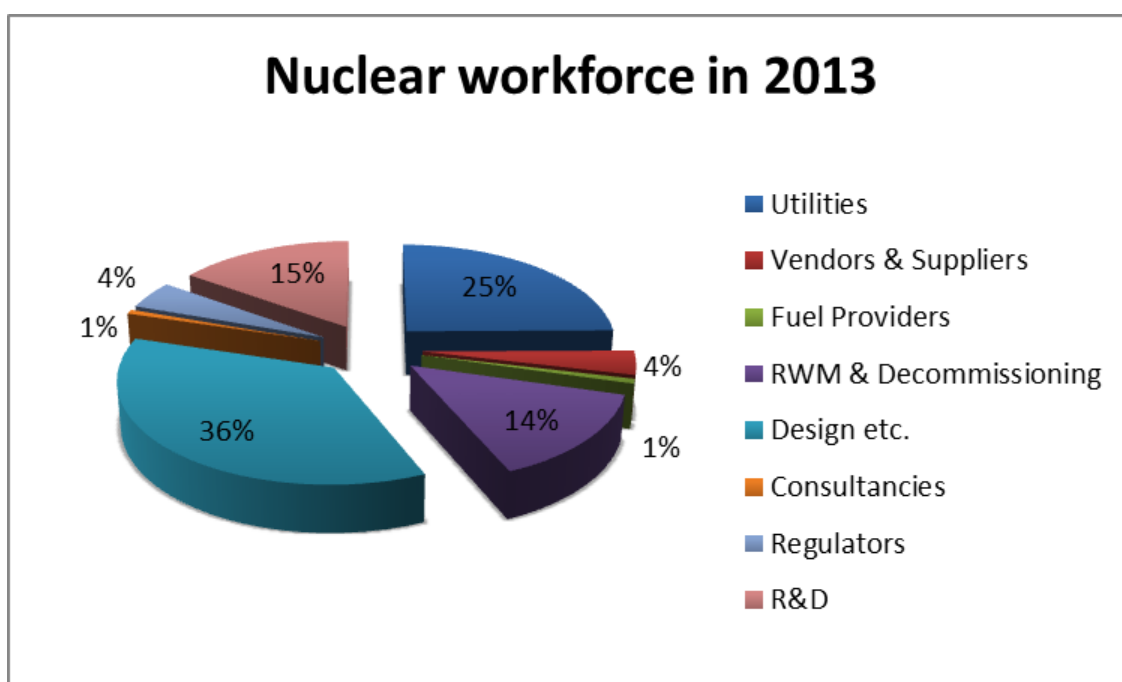


Source: Eurostat

5.3. DEMAND SIDE: RESULTS ON THE BASIS OF THE DATA RECEIVED

The questionnaire was sent to 337 nuclear stakeholders all over Europe. Around a hundred organizations provided us the requested data with a response rate of 33%.

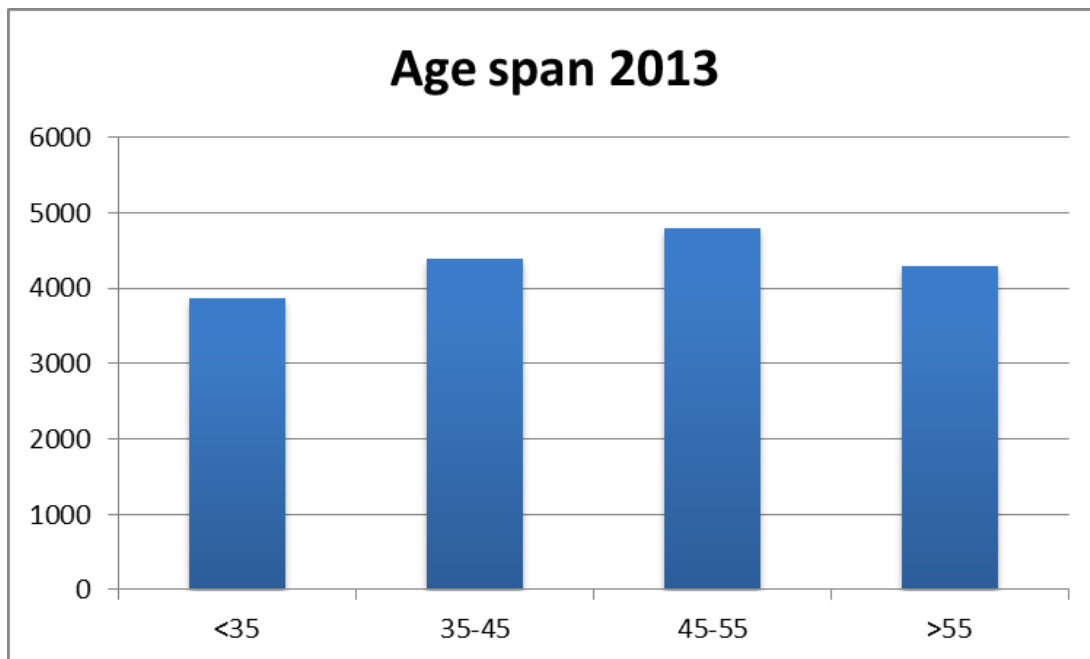
Figure 5: Distribution of the nuclear workforce in 2013 by type of organization



Source: EHRO-N

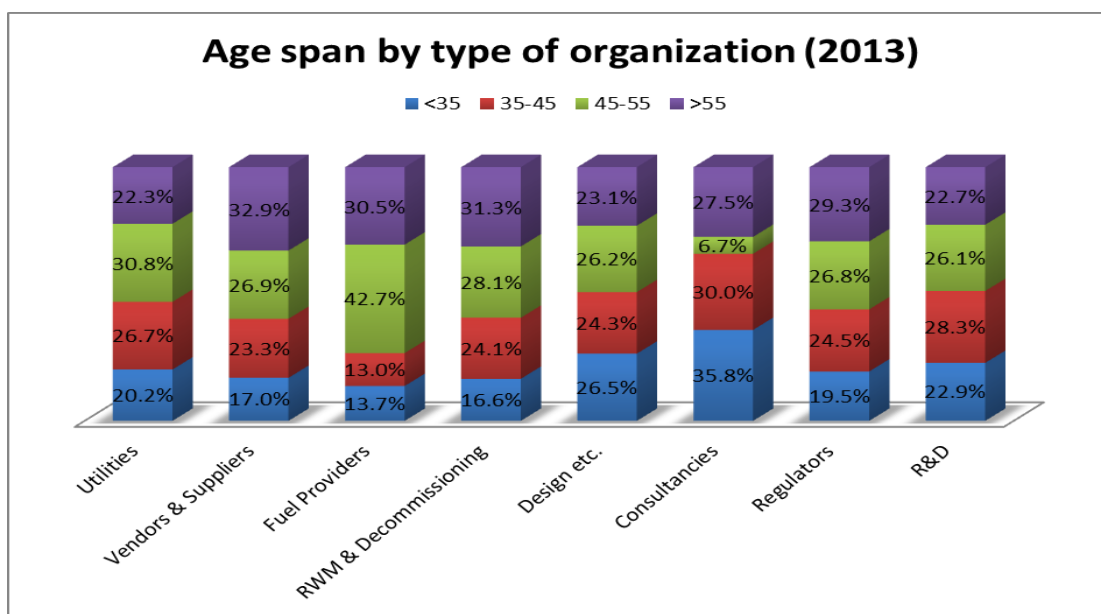
The total number of nuclear experts employed in 2013 according to the available data was around 17.000 units. From the analysis of the age span, the most numerous group resulted to be "45-55", but the sum of age groups "below 35" and "35-45" is smaller than the sum of age groups "45-55" and "above 55", thus probably indicating a lack in recruitment of younger experts in the last years.

Figure 6: Age span distribution of the nuclear workforce in 2013



Source: EHRO-N

Figure 7: Age span distribution of the nuclear workforce in 2013 by type of organization

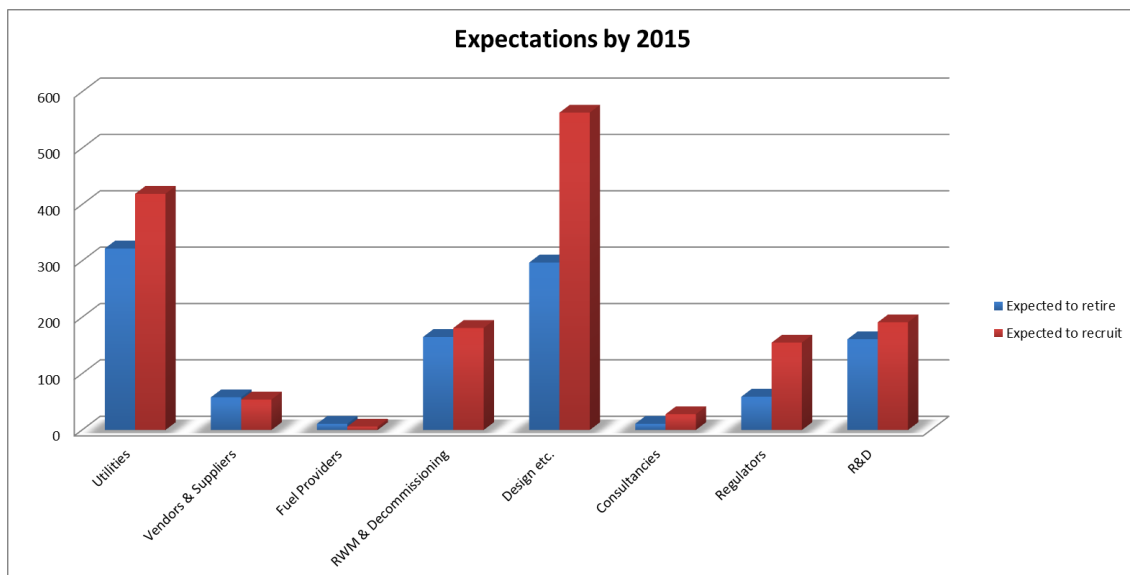


Source: EHRO-N

The age span distribution varies depending on the type of organization. For example, in companies as "Utilities" or "Fuel Providers" the percentage of people above 45 years old is more than 50% of the total employees, while in "Consultancies" or "R&D" organizations younger nuclear experts are concentrated, as the sum of the first two age groups is higher than the sum of the age groups "45-55" and "above 55".

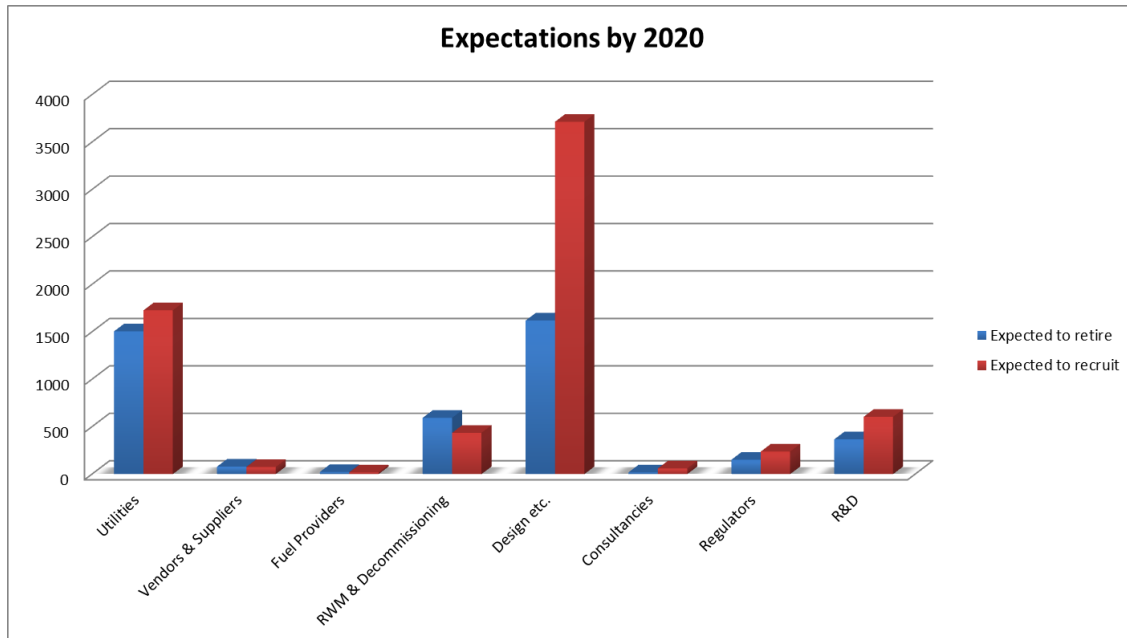
Expectations regarding future recruitment and retirement of nuclear experts show a higher number of recruitments than retirements in the next ten years.

Figure 8: Number of nuclear experts expected to retire and to be recruited by 2015



Source: EHRO-N

Figure 9: Number of nuclear experts expected to retire and to be recruited by 2020



Source: EHRO-N

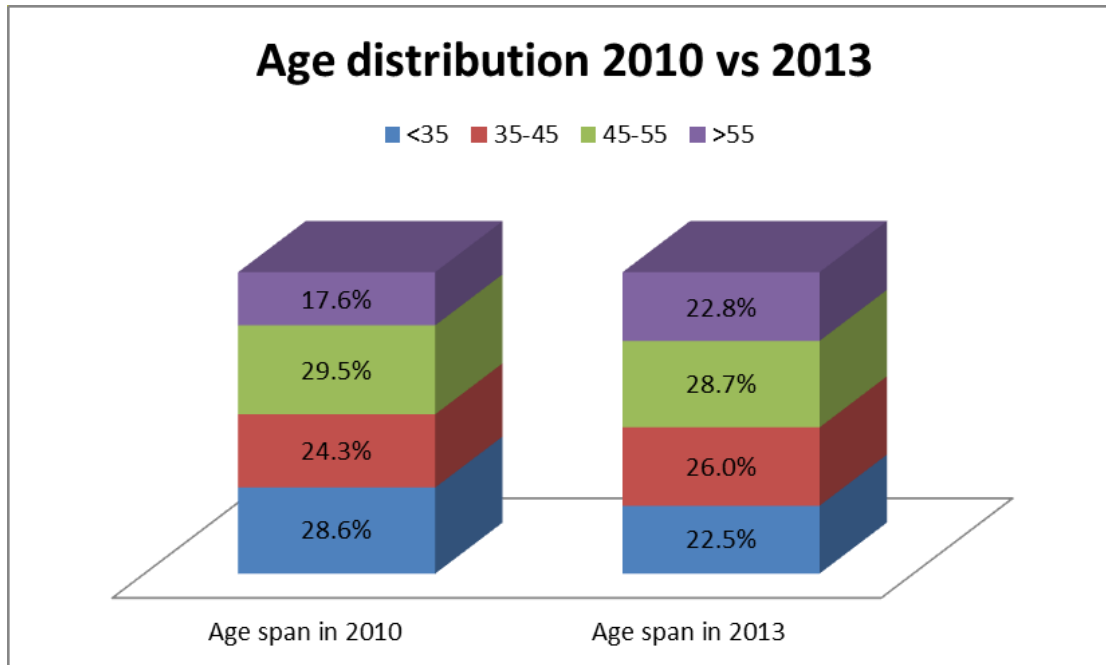
6 COMPARISON WITH THE LAST SURVEY FOR TREND ANALYSIS

A comparison among the stakeholder that responded to both surveys has been conducted. This analysis may not reflect the real situation of the European nuclear field, but it helps getting a relatively good picture on how the market has responded to the 2011 Fukushima accident.

In the comparison, the percentage of people below 35 years old decreased by 4.1 points and the percentage of people above 55 years old increased by 5.2 points. This may be the result of a loss of interest in the sector by younger people as their number has dropped considerably.

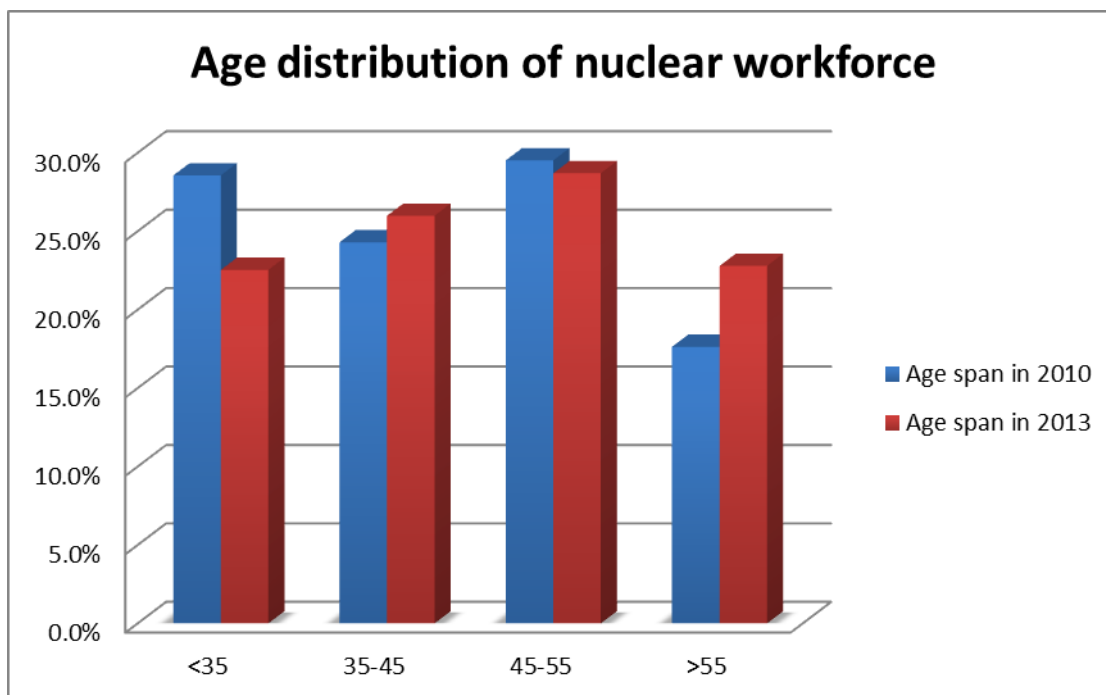
On the other hand, the number of people over 55 grew in the last years. Companies may prefer hire older experts or simply the employees shifted from one group to the other.

Figure 10: Age distribution comparison between nuclear experts employed in 2010 and 2013



Source: EHRO-N

Figure 11: Age distribution comparison between nuclear experts employed in 2010 and 2013

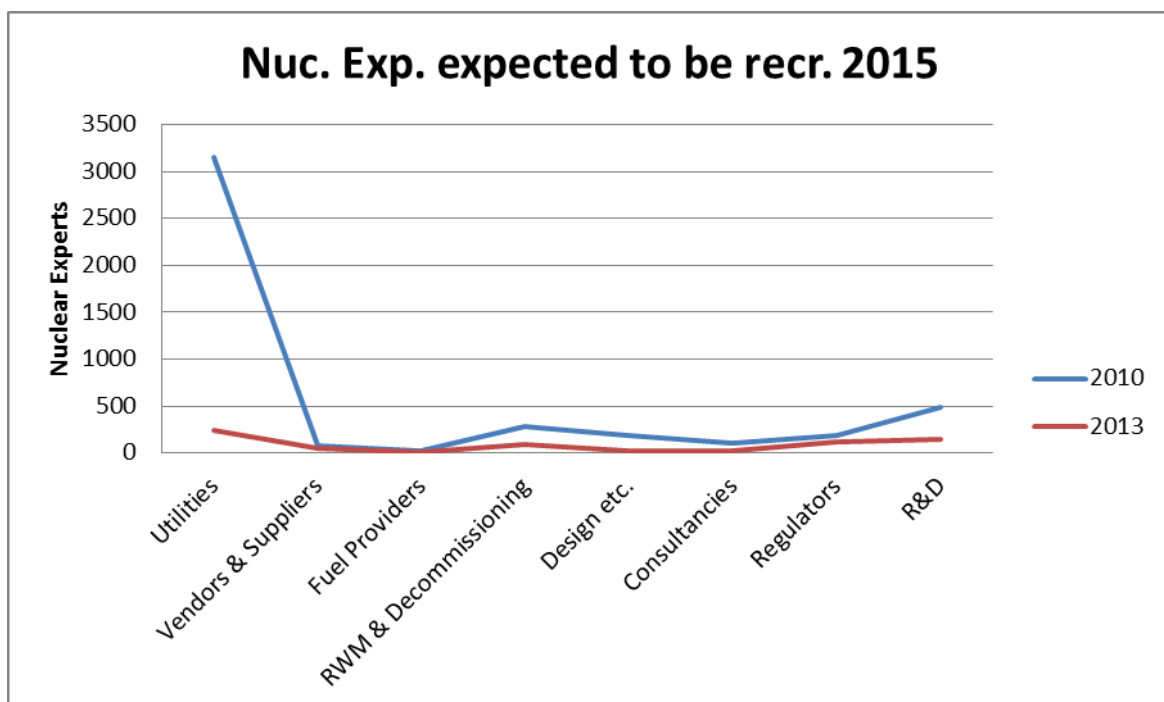


Source: EHRO-N

The number of nuclear experts is considerably lower compared to what the stakeholders expected to recruit by 2015 and 2020. Utilities show the highest difference, having passed from expecting to recruit around 3.200 nuclear experts by 2015 to recruit 250 nuclear experts, with a 90% decrease.

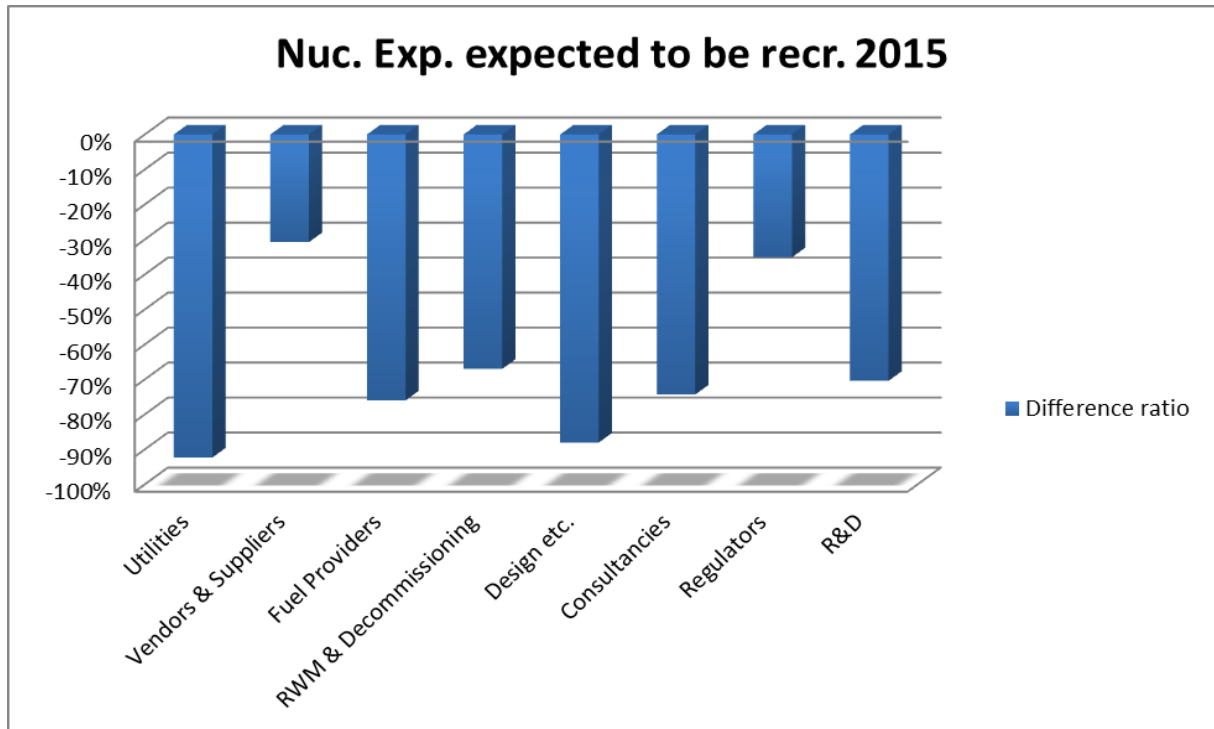
The impact of the Fukushima accident has probably affected the entire nuclear sector. Stakeholders changed their strategies, recruiting less nuclear experts, adapting to the decision made by some countries to stop investing into nuclear and switch to other renewable energy technologies.

Figure 12: Number of nuclear experts expected to be recruited by 2015; expectations in 2010 (blue line) vs. expectations in 2013 (red line)



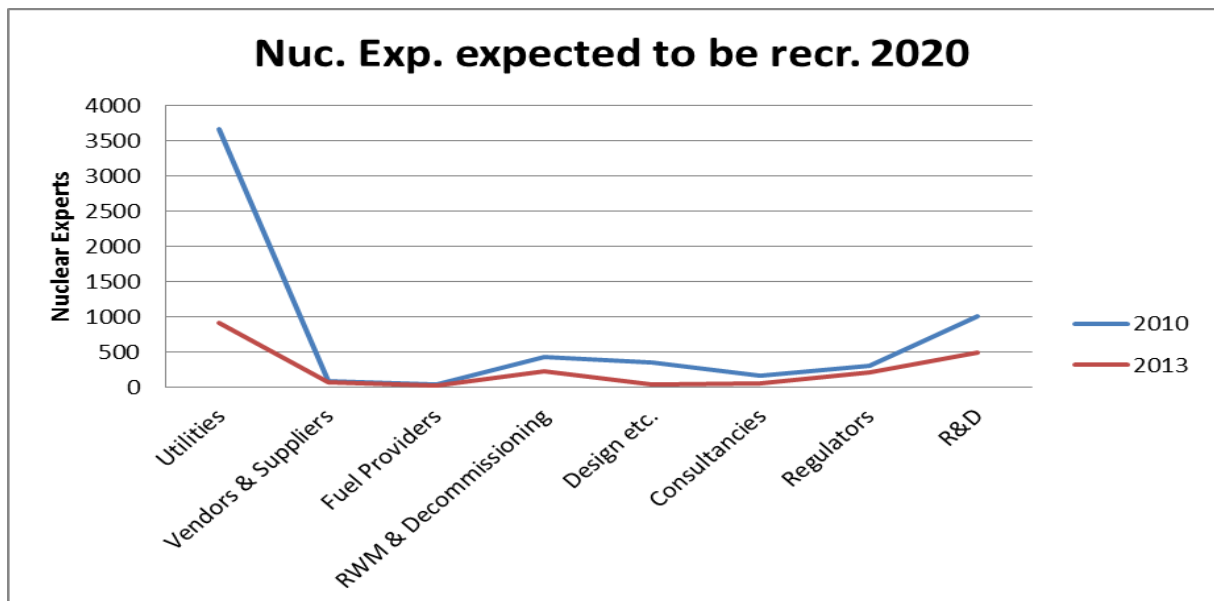
Source: EHRO-N

Figure 13: Difference ratio of the nuclear experts expected to be recruited by 2015; contrasting 2010 and 2013 data



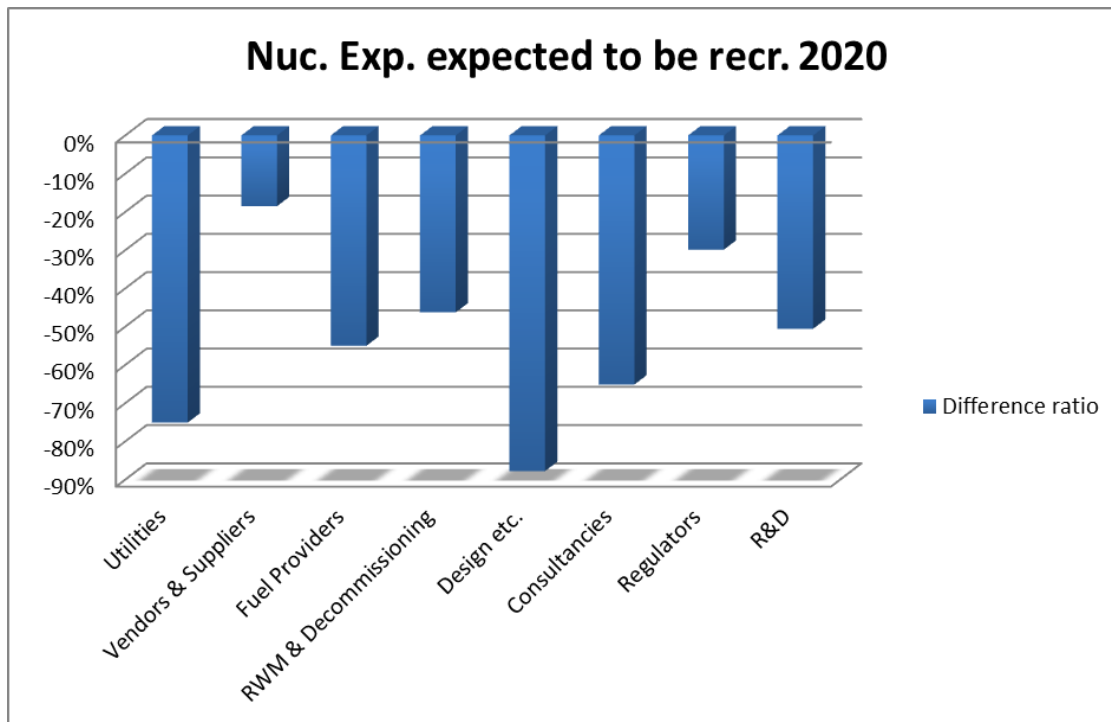
Source: EHRO-N

Figure 14: Number of nuclear experts expected to be recruited by 2020; expectations in 2010 (blue line) vs. expectations in 2013 (red line)



Source: EHRO-N

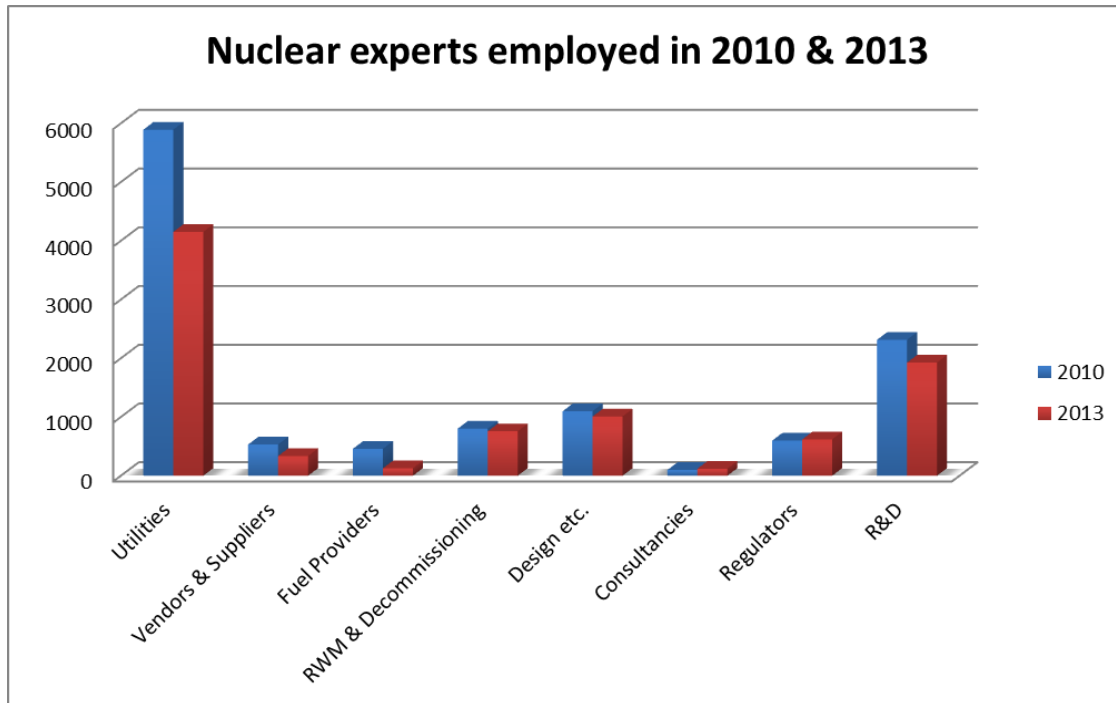
Figure 15: Difference ratio of the nuclear experts expected to be recruited by 2015; contrasting 2010 and 2013 data



Source: EHRO-N

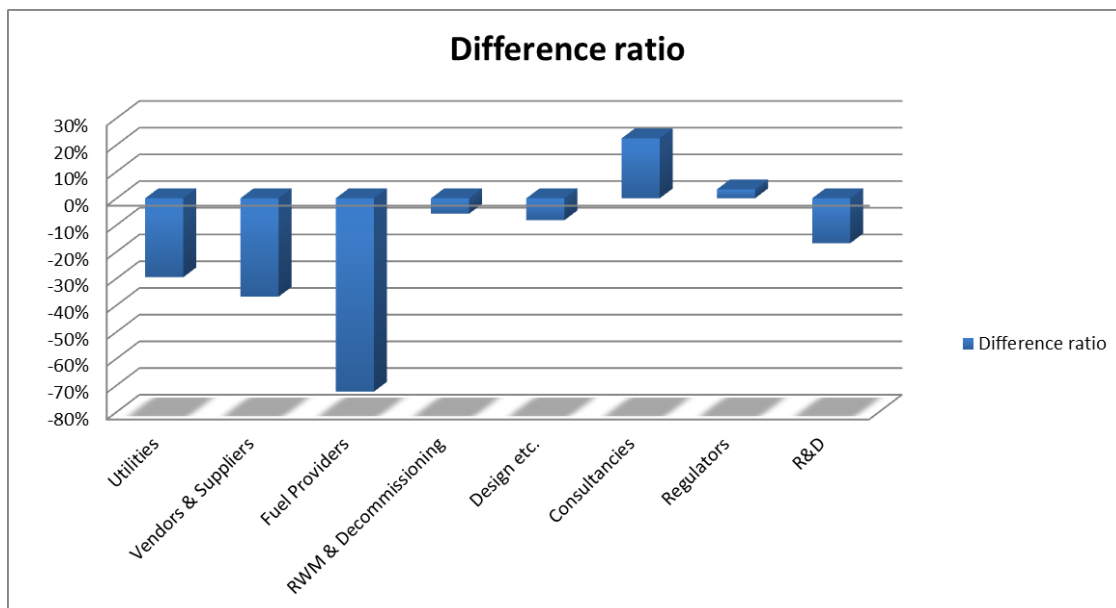
The number of nuclear experts employed has decrease from 2010 to 2013. Some like "RWM & Decommissioning", "Design, etc." and "Regulators" remained stable without major changes, however, others such as "Utilities", "Vendors & Suppliers" and "R&D" seen the number of nuclear experts dropping considerably (-30%, -37% and -17% respectively).

Figure 16: Number of nuclear experts employed in 2010 and 2013 by type of organization



Source: EHRO-N

Figure 17: Difference ratio of the nuclear experts employed in 2010 and 2013 by type of organization



Source: EHRO-N

7 DISCUSSION AND INTERPRETATION OF THE RESULTS

The accident at the Fukushima Daiichi nuclear power plant in Japan on the 11th of March 2011 has raised concerns about the future of the nuclear industry globally. Impacts of the accident on the nuclear power industry were expected, depending on how governments responded to the accident. Some have adopted measures to radically redesign their nuclear and energy policies. In Europe, Germany, Belgium and The Netherlands have decided a progressive opt-out of the country's plant stock, while UK and France have taken a more moderate approach, trying to improve safety and maintaining their current nuclear programs.

It is necessary to analyse two obvious trends. The first is the plight of the electric nuclear energy worldwide. According to the "World Nuclear Industry Status Report 2010-2011",⁵ the interest in nuclear construction began to fade slowly before the Fukushima accident as an increase of attention was given to the development of renewable energy sources. Lack of skilled workers is affecting the constructions of new power plants. Notwithstanding the increasing number of STEM students, there seem to be a loss of interest for the specific area of nuclear knowledge. According to experts, this problem is characteristic for the entire industrialized world, as the labour market seems to prefer more specialists in the nuclear financial than physical sector.

The second trend is the growing need for cheap energy. Industrialized countries, under the pressure of an expanding negative perception of nuclear energy production, can afford investing in projects that use renewable energy, while under-industrialized ones still rely on traditional energy source. At the same time, the attitude towards nuclear energy has not changed in Russia or the USA. What clearly stands out is that nuclear stakeholders are changing business models. This brought a drastic reduction in personnel recruitment expectations compared to five years ago. This could also indicate a change of approach but not necessary a decline of the nuclear sector.

The constant increase of students enrolled in STEM courses indicates a persistent interest for younger generation for an eventual future in the energy sector. It should be concern of stakeholders and governments to attract these skills to the nuclear sector, balancing the increasing allure exerted by renewable energies. Internal courses or training organized by industries may help draw newly graduated students as well as keep current staff updated and motivated.

⁵ <http://www.worldwatch.org/bookstore/publication/world-nuclear-industry-status-report-2010-2011-nuclear-power-post-fukushima-wo>

ANNEX 1: Nuclear Stakeholders

COUNTRY	COMPANY NAME/STAKEHOLDERS	TYPE OF ORGANIZATION
Austria	Atomic Institute of the Austrian Universities (ATI)	Research and Development
Austria	ENCONET Consulting Ges.m.b.H.	Consultancy, Project Management, Training
Austria	University of Applied Sciences FH Campus Vienna	Research and Development
Belgium	Alstom Power	Vendors & Suppliers
Belgium	Assystem	Design, Engineering, Manufacturing, Maintenance
Belgium	Ateliers de la Meuse - Division Seraing	Design, Engineering, Manufacturing, Maintenance
Belgium	BEL V.	Regulatory Authorities, TSO, Reactor Safety
Belgium	BELGONUCLEAIRE	Fuel Fabrication, Enrichment, Supply
Belgium	Belgoprocess	Radioactive Waste Management, Decommissioning
Belgium	Cockeril Maintenance and Ingénierie	Design, Engineering, Manufacturing, Maintenance
Belgium	GDF Suez Group - Branch Energy Europe	Utilities
Belgium/France	GDF Suez Group - Branch Energy Services	Design, Engineering, Manufacturing, Maintenance
Belgium	Federal Agency for Nuclear Control (FANC)	Regulatory Authorities, TSO, Reactor Safety
Belgium	FBFC International (AREVA)	Fuel Fabrication, Enrichment, Supply
Belgium	ONDRAF/NIRAS	Regulatory Authorities, TSO, Reactor Safety
Belgium	SCK CEN	Research and Development
Belgium	Universiteit Hasselt/XIOS dptm. Nucleaire Technologie Universitaire	Research and Development
Belgium	VNS Vinçotte Nuclear Safety (ex AVN)	Consultancy, Project Management, Training
Belgium	Westinghouse Electric Belgium	Vendors & Suppliers
Bulgaria	Astro Engineering LTD	Design, Engineering, Manufacturing, Maintenance

Bulgaria	AtomEnergoproekt Ltd	Design, Engineering, Manufacturing, Maintenance
Bulgaria	Atomenergoremont Plc.	Design, Engineering, Manufacturing, Maintenance
Bulgaria	DPRAO	Radioactive Waste Management, Decommissioning
Bulgaria	Enemona S.A.	Design, Engineering, Manufacturing, Maintenance
Bulgaria	Energoremont Holding	Design, Engineering, Manufacturing, Maintenance
Bulgaria	EnergService AD	Utilities
Bulgaria	ENERGOSTROYMONTAJ-ENGINEERING	Design, Engineering, Manufacturing, Maintenance
Bulgaria	Energy Institute JSC	Research and Development
Bulgaria	Enpro Consult	Consultancy, Project Management, Training
Bulgaria	Eqe Bulgaria	Design, Engineering, Manufacturing, Maintenance
Bulgaria	INRNE Institute of Nuclear Research and Nuclear Energy	Research and Development
Bulgaria	Montagi EAD	Design, Engineering, Manufacturing, Maintenance
Bulgaria	National Electric Company (NEK EAD)	Utilities
Bulgaria	NRA	Regulatory Authorities, TSO, Reactor Safety
Bulgaria	Quantum engineering	Design, Engineering, Manufacturing, Maintenance
Bulgaria	RISK ENGINEERING LTD	Design, Engineering, Manufacturing, Maintenance
Bulgaria	Sakar	Consultancy, Project Management, Training
Bulgaria	Theta Consult	Consultancy, Project Management, Training
Croatia	ABB	Design, Engineering, Manufacturing, Maintenance
Croatia	APO d.o.o.	Radioactive Waste

		Management, Decommissioning
Croatia	Axpo	Vendors & Suppliers
Croatia	Böhler-Uddeholm Zagreb d.o.o.	Vendors & Suppliers
Croatia	Bureau Veritas Group	Consultancy, Project Management, Training
Croatia	CMS	Consultancy, Project Management, Training
Croatia	DLA Piper	Consultancy, Project Management, Training
Croatia	Duro Dakovic	Design, Engineering, Manufacturing, Maintenance
Croatia	EKONERG	Consultancy, Project Management, Training
Croatia	EKOTEH Dosimetry Radiation Protection Co.	Radioactive Waste Management, Decommissioning
Croatia	EMKA	Vendors & Suppliers
Croatia	Enconet	Consultancy, Project Management, Training
Croatia	Hilti Croatia d.o.o.	Design, Engineering, Manufacturing, Maintenance
Croatia	Hrvatska Elektroprivreda (HEP)	Utilities
Croatia	INETEC	Research and Development
Croatia	Kuehne und Nagel	Vendors & Suppliers
Croatia	Mace	Consultancy, Project Management, Training
Croatia	Pipe Supports	Consultancy, Project Management, Training
Croatia	Siemens d.d.	Design, Engineering, Manufacturing, Maintenance
Croatia	The Croatian Radiation Protection Association (CRPA)	Research and Development
Croatia	The Ruder Boskovic Institute (RBI)	Research and Development
Czech Republic	ČEZ, a. s.	Utilities
Czech Republic	I&C Energo	Design, Engineering, Manufacturing, Maintenance
Czech Republic	OSC	Design, Engineering, Manufacturing, Maintenance
Czech Republic	Pro Engineering s.r.o.	Consultancy, Project Management, Training

Czech Republic	ŠKODA JS a.s.	Vendors & Suppliers
Czech Republic	SÚJB - The State Office for Nuclear Safety	Regulatory Authorities, TSO, Reactor Safety
Czech Republic	SURAO	Radioactive Waste Management, Decommissioning
Czech Republic	UJP Praha a.s.	Design, Engineering, Manufacturing, Maintenance
Czech Republic	UJV Rez	Radioactive Waste Management, Decommissioning
Czech Republic	VF a.s.	Radioactive Waste Management, Decommissioning
Czech Republic	Vitkovice Machinery Group	Design, Engineering, Manufacturing, Maintenance
Denmark	Risø National Laboratory for Sustainable Energy	Research and Development
Estonia	Eesti Energia AS	Utilities
Estonia	Estonian Radiation Protection Centre	Regulatory Authorities, TSO, Reactor Safety
Finland	Fennovoima Oy	Utilities
Finland	Fortum Power and Heat	Utilities
Finland	Lappeenranta University of Technology	Research and Development
Finland	Posiva	Radioactive Waste Management, Decommissioning
Finland	Pöyry PLC	Consultancy, Project Management, Training
Finland	STUK - Radiation and Nuclear Safety Authority	Regulatory Authorities, TSO, Reactor Safety
Finland	TVO Teollisuuden Voima Oyj	Utilities
Finland	University of Jyväskylä	Research and Development
Finland	VTT Technical Research Center	Research and Development
France	Alstom Power	Vendors & Suppliers
France	Altran Energy Industry and Life Sciences	Consultancy, Project Management, Training
France	ANDRA	Radioactive Waste Management, Decommissioning
France	AREVA HQ	Vendors & Suppliers
France	AREVA Marcoule	Research and Development

France	AREVA Risk Management Consulting SAS	Consultancy, Project Management, Training
France	AREVA Service - Chalon sur Saone	Design, Engineering, Manufacturing, Maintenance
France	AREVA TA - Aix-en-Provence	Design, Engineering, Manufacturing, Maintenance
France	AREVA TA - Saclay	Consultancy, Project Management, Training
France	AREVA TA - St-Paul-Lez-Durance	Design, Engineering, Manufacturing, Maintenance
France	ASN	Regulatory Authorities, TSO, Reactor Safety
France	Assystem	Design, Engineering, Manufacturing, Maintenance
France	Atos Origin	Design, Engineering, Manufacturing, Maintenance
France	CANBERRA France (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	CANBERRA Lingolsheim (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	CANBERRA Usine de Loches (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	CEA / Marcoule	Research and Development
France	CEA / Saclay	Research and Development
France	CEA/Cadarache	Research and Development
France	CEA/Fontenay-aux-Roses	Research and Development
France	CEDOS (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	CETIC (AREVA)	Consultancy, Project Management, Training
France	CEZUS (AREVA)	Fuel Fabrication, Enrichment, Supply
France	Chalon/Saint-Marcel plant (AREVA)	Vendors & Suppliers
France	CORYS T.E.S.S.(AREVA)	Consultancy, Project Management, Training

France	Creusot Forge (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	Creusot Mécanique (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	EDF	Utilities
France	FBFC Lyon (AREVA)	Fuel Fabrication, Enrichment, Supply
France	FBFC Pierrelatte (AREVA)	Fuel Fabrication, Enrichment, Supply
France	FBFC Romans (AREVA)	Fuel Fabrication, Enrichment, Supply
France	Grenoble INP	Research and Development
France	INSTN Institut National des Science et Techniques Nucleaires	Research and Development
France	Intercontrole (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	IRSN Institut de Radioprotection et de Surete Nucleaire	Research and Development
France	JSPM - EQUIPEMENT (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	La Hague (AREVA)	Radioactive Waste Management, Decommissioning
France	MELOX (AREVA)	Fuel Fabrication, Enrichment, Supply
France	Oakridge	Design, Engineering, Manufacturing, Maintenance
France	Onet Technologies	Design, Engineering, Manufacturing, Maintenance
France	Oxand	Consultancy, Project Management, Training
France	Réel	Fuel Fabrication, Enrichment, Supply
France	RISKAUDIT IRSN/GRS International	Consultancy, Project Management, Training
France	Salvarem	Radioactive Waste Management, Decommissioning
France	SOM (Groupe Ortec)	Consultancy, Project Management, Training
France	SPIE Nucleaire	Fuel Fabrication,

		Enrichment, Supply
France	STMI (AREVA)	Radioactive Waste Management, Decommissioning
France	Technical Centre (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	Technoplus Industries (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	TRIHOM (AREVA)	Design, Engineering, Manufacturing, Maintenance
France	Westinghouse France	Vendors & Suppliers
Germany	ANF Duisburg (AREVA)	Fuel Fabrication, Enrichment, Supply
Germany	ANF Lingen (AREVA)	Fuel Fabrication, Enrichment, Supply
Germany	AREVA NP GmbH (AREVA and Siemens company)	Design, Engineering, Manufacturing, Maintenance
Germany	Babcock Noell GmbH	Design, Engineering, Manufacturing, Maintenance
Germany	Barlage GmbH	Design, Engineering, Manufacturing, Maintenance
Germany	BFS Bundesamt für Strahlenschutz	Regulatory Authorities, TSO, Reactor Safety
Germany	DBE Technology	Radioactive Waste Management, Decommissioning
Germany	Deutsche Gesellschaft zum Bau und Betrieb von Endlagern für Abfallstoffe mbH (DBE)	Radioactive Waste Management, Decommissioning
Germany	E.ON Energie AG	Utilities
Germany	Eckhert & Ziegler Nuclitec	Radioactive Waste Management, Decommissioning
Germany	EnBW	Utilities
Germany	Evonik Energy Services GmbH	Design, Engineering, Manufacturing, Maintenance
Germany	EWN Gruppe - Energie Werke Nord	Radioactive Waste Management, Decommissioning
Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Regulatory Authorities, TSO, Reactor Safety

Germany	GRS Berlin	Regulatory Authorities, TSO, Reactor Safety
Germany	GRS Braunschweig	Regulatory Authorities, TSO, Reactor Safety
Germany	GRS Cologne	Regulatory Authorities, TSO, Reactor Safety
Germany	Helmholtz-Zentrum Berlin für Materialien und Energie GmbH	Research and Development
Germany	Helmholtz-Zentrum Dresden-Rossendorf (HZDR)	Research and Development
Germany	IKP Forschungszentrum Jülich	Research and Development
Germany	IntelligeNDT (AREVA)	Design, Engineering, Manufacturing, Maintenance
Germany	Joint Research Centre - Institute for Transuranium Elements	Research and Development
Germany	KIT - Karlsruhe Institute of Technology	Research and Development
Germany	Lisega SE	Vendors & Suppliers
Germany	Nuclear Services Erlangen (AREVA)	Fuel Fabrication, Enrichment, Supply
Germany	NUKEM Technologies GmbH	Fuel Fabrication, Enrichment, Supply
Germany	RWE Power AG Zentrale	Utilities
Germany	Siemens AG (AREVA NP)	Vendors & Suppliers
Germany	Siempelkamp Nukleartechnik GmbH	Design, Engineering, Manufacturing, Maintenance
Germany	Studsvik GmbH & Co. KG	Radioactive Waste Management, Decommissioning
Germany	URENCO Deutschland (Gronau)	Fuel Fabrication, Enrichment, Supply
Germany	Vattenfall Europe AG	Utilities
Germany	VGB PowerTech e. V., Nuclear Power Plant Department	Consultancy, Project Management, Training
Germany	Westinghouse Electric Germany GmbH	Vendors & Suppliers
Greece	Aristotle University of Thessaloniki, Department of Physics, Nuclear Physics Laboratory	Research and Development
Greece	Greek Atomic Energy Commission	Regulatory Authorities, TSO, Reactor Safety
Greece	National Technical University of Athens	Research and Development
Greece	NCSR Demokritos, Institute of Nuclear Physics and Institute of Nuclear Technology & Radiation Protection	Research and Development

Hungary	Budapest University of Technology, Institute of Nuclear Techniques	Research and Development
Hungary	ETV-ERŐTERV Power Engineering and Contracting Co.	Design, Engineering, Manufacturing, Maintenance
Hungary	Hungarian Atomic Energy Authority	Regulatory Authorities, TSO, Reactor Safety
Hungary	Centre for Energy Research Hungarian Academy of Sciences	Research and Development
Hungary	Magyar Villamos Művek Zrt.(MVM Zrt.)/PAKS NPP	Utilities
Hungary	Public Limited Company for Radioactive Waste Management, Decommissioning	Radioactive Waste Management, Decommissioning
Italy	Ansaldo Nucleare	Design, Engineering, Manufacturing, Maintenance
Italy	ENEA Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile	Research and Development
Italy	ENEL	Utilities
Italy	GRNSPG University of Pisa	Research and Development
Italy	Gruppo Sogin	Radioactive Waste Management, Decommissioning
Italy	INFN National Institute of Nuclear Physics	Research and Development
Italy	ISPRA	Regulatory Authorities, TSO, Reactor Safety
Italy	Nucleco Società per l'Ecoingegneria Nucleare	Radioactive Waste Management, Decommissioning
Italy	Università degli Studi di Palermo	Research and Development
Italy	Politecnico di Torino, Energy Department	Research and Development
Latvia	JSC Latvenergo	Utilities
Latvia	Radiation Safety Centre of the State Environmental Service	Regulatory Authorities, TSO, Reactor Safety
Lithuania	Lithuanian Energy Institute	Research and Development
Lithuania	Lietuvos Energija UAB	Utilities
Lithuania	RATA - Radioaktyviųjų atliekų tvarkymo agentūra	Radioactive Waste Management, Decommissioning
Lithuania	State Enterprise Ignalina NPP	Radioactive Waste Management,

		Decommissioning
Lithuania	VATESI	Regulatory Authorities, TSO, Reactor Safety
Netherlands	COVRA N.V	Radioactive Waste Management, Decommissioning
Netherlands	Delta	Utilities
Netherlands	Energy Resources Holding B.V. - ERH	Utilities
Netherlands	JRC - Institute for Energy	Research and Development
Netherlands	KINT Foundation Stichting Kennis Infrastructuur Nucleaire Technologie	Research and Development
Netherlands	Laborelec (GDF Suez Group)	Research and Development
Netherlands	N.V. EPZ	Utilities
Netherlands	NRG Nuclear Research & Consultancy, Project Management, Training Group	Research and Development
Netherlands	URENCO Nederland BV	Fuel Fabrication, Enrichment, Supply
Netherlands	VROM-KFD Ministry of Housing, Spatial Planning and the Environment (now Ministry for Infrastructure and Environment)	Regulatory Authorities, TSO, Reactor Safety
Poland	IFJ PAN Instytut Fizyki Jądrowej	Research and Development
Poland	INCT Instytutu Chemii i Techniki Jądrowej	Research and Development
Poland	Narodowe Centrum Badan Jadrowych (NCBJ – National Centre for Nuclear Research)	Research and Development
Poland	PAA Państwowej Agencji Atomistyki	Regulatory Authorities, TSO, Reactor Safety
Poland	POLATOM Instytut Energii Atomowej	Research and Development
Poland	Polska Grupa Energetyczna SA (PGE)	Utilities
Portugal	ITN (INSTITUTO TECNOLÓGICO E NUCLEAR)	Research and Development
Romania	ANDRAD - Agentia Nucleara Si Pentru Deseuri Radioactive	Radioactive Waste Management, Decommissioning
Romania	ANRE - Autoritatea Nationala de Reglementare in Domeniul Energiei	Regulatory Authorities, TSO, Reactor Safety
Romania	CITON	Design, Engineering, Manufacturing, Maintenance
Romania	CNCAN - Comisii Nationale pentru Controlul Activitatilor Nucleare	Regulatory Authorities, TSO, Reactor Safety
Romania	CNU	Fuel Fabrication, Enrichment, Supply
Romania	Nuclear Fuel Plant Pitesti (FCN Pitesti)	Fuel Fabrication,

		Enrichment, Supply
Romania	ICN Pitesti	Research and Development
Romania	ICPMRR National Institute for Metals and Radioactive Resources	Research and Development
Romania	ICSI	Research and Development
Romania	IFA Institut De Fizica Atomica	Research and Development
Romania	IFIN HH Horia Hulubei National Institute of Physics and Nuclear Engineering	Research and Development
Romania	SN Nucleaelectrica S.A./CNE Cernavoda	Utilities
Romania	Nuclearmontaj	Design, Engineering, Manufacturing, Maintenance
Romania	RAAN - Regia Autonoma Pentru Activitati Nucleare Romania	Regulatory Authorities, TSO, Reactor Safety
Romania	ROMAG-PROD	Research and Development
Romania	TITAN ECHIPAMENTE NUCLEARE S.A	Fuel Fabrication, Enrichment, Supply
Slovakia	AREVA NP Controls, s.r.o.	Design, Engineering, Manufacturing, Maintenance
Slovakia	JAVYS a.s.- Jadrová a vyrad'ovacia spoločnosť a.s.	Radioactive Waste Management, Decommissioning
Slovakia	JESS	Utilities
Slovakia	REAKTORTEST s.r.o.	Design, Engineering, Manufacturing, Maintenance
Slovakia	RELKO Ltd, Engineering and Consulting Services	Consultancy, Project Management, Training
Slovakia	SES Tlmače, a.s (SLOVENSKÉ ENERGETICKÉ STROJÁRNE, a.s)	Design, Engineering, Manufacturing, Maintenance
Slovakia	Skoda Slovakia a.s.	Vendors & Suppliers
Slovakia	Slovenské elektrárne, a. s. - Enel	Utilities
Slovakia	UJDSR	Regulatory Authorities, TSO, Reactor Safety
Slovakia	VUJE, a.s.	Vendors & Suppliers
Slovenia	ARAO	Radioactive Waste Management, Decommissioning
Slovenia	GEN Energija d.o.o.	Utilities
Slovenia	IBE d.d.	Design, Engineering, Manufacturing, Maintenance

Slovenia	IJS - Institut Josef Stefan	Research and Development
Slovenia	IMK - Institute for metal constructions	Research and Development
Slovenia	IMT Institute of metals and technology	Research and Development
Slovenia	Krško Nuclear Power Plant (NEK)	Utilities
Slovenia	NUMIP Engineering, Construction, Maintenance and Production Ltd and Q Techna	Design, Engineering, Manufacturing, Maintenance
Slovenia	Slovenian Nuclear Safety Administration	Regulatory Authorities, TSO, Reactor Safety
Slovenia	SRPA Slovenian Radiation Protection Administration	Regulatory Authorities, TSO, Reactor Safety
Slovenia	University of Ljubljana Faculty of Mathematics and Physics	Research and Development
Slovenia	Welding Institute	Research and Development
Spain	Analisis-DSC	Design, Engineering, Manufacturing, Maintenance
Spain	ANAV - Asociacion Nuclear Asco-Vandellos A.I.E.	Utilities
Spain	AREVA NP Services Spain SLU.	Design, Engineering, Manufacturing, Maintenance
Spain	CIEMAT Centro de Investigaciones Energéticas Medioambientales y Tecnológicas	Research and Development
Spain	CNAT - Centrales Nucleares Almaraz-Trillo	Utilities
Spain	CSN - Consejo de Seguridad Nuclear	Regulatory Authorities, TSO, Reactor Safety
Spain	Empresarios Agrupados	Design, Engineering, Manufacturing, Maintenance
Spain	ENDESA Generación	Utilities
Spain	ENRESA	Radioactive Waste Management, Decommissioning
Spain	ENSA - Equipos Nucleares SA	Vendors & Suppliers
Spain	ENUSA Industrias Avanzadas	Fuel Fabrication, Enrichment, Supply
Spain	ENWESA Operaciones	Design, Engineering, Manufacturing, Maintenance
Spain	GES SIEMSA SPAIN, SIEMSA INDUSTRIA	Design, Engineering, Manufacturing, Maintenance

Spain	GHESA	Design, Engineering, Manufacturing, Maintenance
Spain	IBERDROLA Generación	Utilities
Spain	Iberdrola Ingeniería y Construcción	Design, Engineering, Manufacturing, Maintenance
Spain	Iberinsa Ingeniería	Consultancy, Project Management, Training
Spain	Idom Ingeniería y Consultoría S.A.	Design, Engineering, Manufacturing, Maintenance
Spain	Ingenieria, Estudios y Proyectos NIP S.A.	Design, Engineering, Manufacturing, Maintenance
Spain	INITEC Energía (part of ACS Grupo - Industrial Services)	Design, Engineering, Manufacturing, Maintenance
Spain	Instalaciones Inabensa S.A.	Design, Engineering, Manufacturing, Maintenance
Spain	INYPSA Informes y Proyectos S.A.	Design, Engineering, Manufacturing, Maintenance
Spain	NUCLENOR, S.A	Utilities
Spain	Ringo Valvulas (RV)	Design, Engineering, Manufacturing, Maintenance
Spain	Gas Natural Fenosa Engineering (previously SOCOIN)	Design, Engineering, Manufacturing, Maintenance
Spain	Tamoin Grupo	Design, Engineering, Manufacturing, Maintenance
Spain	TECNALIA Research & Innovation	Research and Development
Spain	Tecnatom S.A.	Design, Engineering, Manufacturing, Maintenance
Spain	Técnicas Reunidas S.A.	Design, Engineering, Manufacturing, Maintenance
Spain	THUNDER ESPAÑA SIMULACIÓN S.L.	Design, Engineering, Manufacturing, Maintenance
Spain	Gas Natural Fenosa	Utilities
Spain	Vector & Wellheads Engineering, S.L.	Design, Engineering, Manufacturing,

		Maintenance
Spain	Westinghouse Electric Spain	Vendors & Suppliers
Sweden	ÅF-Engineering s.r.o	Consultancy, Project Management, Training
Sweden	AREVA NP Uddcomb AB	Design, Engineering, Manufacturing, Maintenance
Sweden	Barseback Kraft AB	Radioactive Waste Management, Decommissioning
Sweden	E.ON Sverige AB	Utilities
Sweden	ES Konsult	Consultancy, Project Management, Training
Sweden	Fagerström Industrikonsult AB	Radioactive Waste Management, Decommissioning
Sweden	FS Dynamics Sweden AB	Consultancy, Project Management, Training
Sweden	KSU Kärnkraftsäkerhet och Utbildning AB	Consultancy, Project Management, Training
Sweden	KTH - Royal Institute of Technology	Research and Development
Sweden	SANDVIK AB	Radioactive Waste Management, Decommissioning
Sweden	SKB - Svensk Kärnbränslehantering AB	Radioactive Waste Management, Decommissioning
Sweden	SSM	Regulatory Authorities, TSO, Reactor Safety
Sweden	Studsvik Nuclear AB	Radioactive Waste Management, Decommissioning
Sweden	Vattenfall AB	Utilities
Sweden	Westinghouse Electric Sweden	Vendors & Suppliers
United Kingdom	Aker Engineering and Technology Ltd	Radioactive Waste Management, Decommissioning
United Kingdom	Alstom Power PLC	Vendors & Suppliers
United Kingdom	Amec PLC Bristol	Radioactive Waste Management, Decommissioning
United Kingdom	Amec PLC Gloucester	Radioactive Waste Management, Decommissioning
United Kingdom	Amec PLC Kent	Radioactive Waste Management, Decommissioning

United Kingdom	Amec PLC Thatcham	Radioactive Waste Management, Decommissioning
United Kingdom	AREVA PLC	Design, Engineering, Manufacturing, Maintenance
United Kingdom	AREVA Risk Management Consulting Ltd	Consultancy, Project Management, Training
United Kingdom	ARUP	Consultancy, Project Management, Training
United Kingdom	Atkins PLC	Design, Engineering, Manufacturing, Maintenance
United Kingdom	BAE Systems PLC	Vendors & Suppliers
United Kingdom	Balfour Beatty PLC	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Balfour Kilpatrick Ltd.	Design, Engineering, Manufacturing, Maintenance
United Kingdom	BAM Nuttall	Design, Engineering, Manufacturing, Maintenance
United Kingdom	BARTEC Ltd.	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Bechtel Ltd.	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Bendalls Engineering Ltd	Design, Engineering, Manufacturing, Maintenance
United Kingdom	EDF ENERGY – Generation (excluding Customers & New Build)	Utilities
United Kingdom	Canberra UK LTD. (AREVA)	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Carillion	Radioactive Waste Management, Decommissioning
United Kingdom	Cavendish Nuclear Ltd. (Formerly BNS)	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Costain Group PLC	Design, Engineering, Manufacturing, Maintenance
United Kingdom	DBD Nuclear	Design, Engineering, Manufacturing,

		Maintenance
United Kingdom	Doosan Babcock	Vendors & Suppliers
United Kingdom	Dounreay Site Restoration Ltd	Radioactive Waste Management, Decommissioning
United Kingdom	E. ON UK	Utilities
United Kingdom	Environmental Agency	Radioactive Waste Management, Decommissioning
United Kingdom	Fluor Ltd	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Halcrow Ltd	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Jacobs Babtie Ltd	Radioactive Waste Management, Decommissioning
United Kingdom	JGC Engineering & Technical Services Ltd	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Jordan Engineering Services Ltd	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Laing O'Rourke PLC	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Lloyds Register Group Ltd	Consultancy, Project Management, Training
United Kingdom	LLW Repository Ltd.	Radioactive Waste Management, Decommissioning
United Kingdom	Magnox Limited	Radioactive Waste Management, Decommissioning
United Kingdom	Mitsubishi Heavy Industries Europe Ltd.	Vendors & Suppliers
United Kingdom	Morgan Est PLC	Consultancy, Project Management, Training
United Kingdom	Mott Macdonald Group Ltd.	Consultancy, Project Management, Training
United Kingdom	NG Bailey	Design, Engineering, Manufacturing, Maintenance
United Kingdom	NIS Integrated Engineering	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Nuclear Directorate (ND)	Regulatory Authorities, TSO, Reactor Safety

United Kingdom	Nuclear Institute	Research and Development
United Kingdom	Nuvia Ltd	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Parsons Brickerhoff	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Research Sites Restoration Limited	Research and Development
United Kingdom	Rolls-Royce	Vendors & Suppliers
United Kingdom	Sellafield Ltd.	Radioactive Waste Management, Decommissioning
United Kingdom	Serco Assurance Ltd	Consultancy, Project Management, Training
United Kingdom	Sheffield Forgemasters International Ltd.	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Shepherd Engineering Services	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Studsvik UK Ltd	Radioactive Waste Management, Decommissioning
United Kingdom	Harwell Oxford	Research and Development
United Kingdom	UKAEA	Radioactive Waste Management, Decommissioning
United Kingdom	URENCO UK Limited	Fuel Fabrication, Enrichment, Supply
United Kingdom	URS Europe and Middle East HQ	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Weir Group	Design, Engineering, Manufacturing, Maintenance
United Kingdom	Westinghouse Electric Company LLC (Springfields Site)	Vendors & Suppliers
United Kingdom	Wyman Gordon	Design, Engineering, Manufacturing, Maintenance

ANNEX 2: Universities and Research Centres

COUNTRY	INSTITUTE NAME
Austria	Institute for High Energy Physics (HEPHY)
	University of Applied Sciences, FH Campus Wien/Fachhochschule FH Campus Wien
	University of Applied Sciences Wiener Neustadt/Fachhochschule Wiener Neustadt
Belgium	BNEN
	Brussels High Engineers Institute/Institut Supérieure des Ingénieurs de Bruxelles (ISIB)
	Free University of Brussels/Université Libre de Bruxelles (ULB)
	Ghent University/Universiteit Ghent
	SCK-CEN
Bulgaria	Sofia University St. Kliment Ohridski
	Technical University of Sofia
Czech Republic	Academy of Sciences of the Czech Republic/Akademie věd ČR
	Brno University of Technology/Vysoké Učení Technické v Brně
	Charles University in Prague/Univerzita Karlova v Praze
	Czech Technical University in Prague/Ceské Vysoké Učení Technické
Denmark	Aarhus University/Aarhus Universitet
Finland	Tampere University of Technology/Tampereen Tekninen Yliopisto
France	Chemistry Paris Tech/Chimie Paris Tech
	Consortium established by the Paris Tech, the University Paris-Sud 11/Université Paris-Sud11, the École Central Paris (ECP), the National Institute for Nuclear Science and Technology/Institut National des Sciences & Techniques Nucléaires (INSTN) and EDF
	Engineering National High School of Caen/École Nationale Supérieure d'Ingénieurs de Caen (ENSICAEN)
	ENSTA Paris Tech/École Nationale Supérieure de Techniques Avancées
	French Atomic Energy Commission/Commissariat à l'énergie atomique
	Grenoble Institute of Technology/Institute Polytechnique de Grenoble
	High School of Arts and Crafts/École National Supérieure d'Arts et Métiers
	Mines Paris Graduate School/École des Mines Paris (ENSMP)
	Mines School of Alés/École des Mines d'Alés
	Mines School of Nantes/École des Mines de Nantes
	National Academy of Arts and Crafts/Conservatoire National des Arts et Métiers (CNAM)
	National Chemistry High School of Montpellier/École Nationale Supérieure de Chimie de Montpellier
	National Institute for Nuclear Science and Technology/Institut National des Sciences & Techniques Nucléaires (INSTN)
	National Mines High School of Saint-Étienne/École Nationale Supérieure des Mines de Saint-Étienne
	University Bordeaux/Université Bordeaux 1
University Joseph Fourier/Université Joseph Fourier	
University of Montpellier 2/Université Montpellier 2	

	University of Paris VII/Université Paris Diderot
	University Pierre and Marie Curie - Paris VI/Université Pierre et Marie Curie - Paris VI
Germany	Aachen University of Applied Sciences/Hochschule Aachen
	Clausthal University of Technology/ Technische Universität Clausthal
	European Nuclear Energy Leadership Academy (ENELA)
	Hannover University/Leibniz Universität Hannover
	Johannes Gutenberg University Mainz/Johannes Gutenberg Universität Mainz
	Justus Liebig University Giessen/Universität Gießen
	RWTH Aachen University/Rheinisch-Westfälische Technische Hochschule Aachen
	Technical University of Munich/Technische Universität München
	University of Göttingen/Georg-August-Universität Göttingen
Greece	Greek Atomic Energy Commission/Ελληνική Επιτροπή Ατομικής Ενέργειας (GAEC)
	National Centre of Scientific Research Demokritos/Εθνικό Κέντρο Έρευνας Φυσικών Επιστημών Δημοκρίτος
Hungary	Budapest University of Technology and Economics/Budapesti Műszaki és Gazdaságtudományi Egyetem (BUTE)
	University of Debrecen/Debreceni Egyetem
	University of Debrecen/Debreceni Egyetem
Italy	Milan Polytechnic/Politecnico di Milano
	Technical University of Turin/Politecnico di Torino
	Torino University/Università di Torino
	University of Bologna/Università di Bologna
	University of Palermo/Università degli Studi di Palermo
	University of Pisa/Università di Pisa
Lithuania	Kaunas University of Technology/Kauno Technologijos Universitetas
	Vilnius University/Vilniaus Universitetas
Netherlands	Delft University of Technology/Technische Universiteit Delft
	Eindhoven University of Technology/Technische Universiteit Eindhoven
	Radboud University Nijmegen/Radboud Universiteit Nijmegen
	University of Groningen/Rijksuniversiteit Groningen
Poland	AGH University of Science and Technology/Akademia Górniczo-Hutnicza Im. Stanisława Staszica w Krakowie
	Maria Curie-Skłodowska University/Uniwersytet Marii Curie Skłodowskiej
	Poznan University of Technology/Politechnika Poznańska
	Silesian University of Technology/Politechnika Śląska
	Technical University of Lodz/Politechnika Łódzka
	University of Gdansk/Uniwersytet Gdański
	University of Warsaw/Uniwersytet Warszawski
	University of Wrocław/Uniwersytet Wrocławski
	Warsaw University of Technology/Politechnika Warszawska
Wrocław University of Technology/Politechnika Wrocławska	
Portugal	University of Coimbra/Universidade de Coimbra

Romania	Horia Hulubei National Institute of Physics and Nuclear Engineering
	University of Bucharest/Universitatea din Bucuresti
Slovakia	Slovak University of Technology in Bratislava/Slovenska Technická Univerzita v Bratislave (STU)
Slovenia	University of Ljubljana/Univerza v Ljubljani
Spain	Autonoma University of Barcelona/Universidad Autónoma de Barcelona
Spain	Energy, Environmental and Technology Research Center/Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
	Huelva University/Universidad de Huelva
	Polytechnical University of Catalonia/Universidad Politècnica de Catalunya
	Polytechnical University of Madrid/Universidad Politècnica de Madrid
	University of Sevilla/Universidad de Sevilla
Sweden	Chalmers University
	KTH Royal Institute of Technology/Kungliga Tekniska Högskolan Universitet
	Lund University/Lunds Universitet
	Stockholm University/Stockhoms Universitet
	Uppsala University/Uppsala Universitet
United Kingdom	Imperial College London
	Lancaster University
	Nuclear Technology Education Consortium
	University of Birmingham
	University of Glasgow
	University of Leeds
	University of Liverpool
	University of Manchester
	University of Sheffield
University of Surrey	

ANNEX 3: Questionnaires

A3.1 Demand

EHRO-N SURVEY 2013/2014

Please answer the following questions by filling in the grey fields.

1. Name of your organization :

2. Country :

3. Address :

4. Type of organization :

Please tick one category only

- Utilities (NPPs)
- Vendors and big suppliers
- Fuel fabrication, enrichment and supply
- Waste management and decommissioning
- Design, engineering, manufacturing and maintenance
- Consultancy
- Regulatory authority and TSOs
- R&D institute
- Training provider
- University

5. Total number of nuclear experts⁶ employed in 2013 :

6. Age span of nuclear experts employed in 2013:

⁶ "Nuclear experts" refers to working positions filled by:
- nuclear engineers, nuclear physicists and nuclear chemists who have a nuclear higher education background (i.e. Bachelor, Master or PhD);
- or staff who have a non-nuclear technical higher education background (i.e. Bachelor, Master or PhD) with relevant competences/skills in the nuclear field (acquired, for instance, through in-house or other training).

< 35 years old	35-45 years old	45-55 years old	> 55 years old

7. Number of nuclear experts expected to retire

- by 2015 :
- by 2020 :

8. Number of nuclear experts expected to be recruited

- by 2015 :
- by 2020 :

9. Number of nuclear experts who will be employed in decommissioning projects

- by 2015 :
- by 2020 :

10. Which "nuclear expert" job profiles do you find it hardest to recruit in your organization currently?

Please give at least one profile or five maximum (1= most difficult to recruit)

1:	
2:	
3:	
4:	
5:	

11. Which "nuclear expert" job profiles do you think will be hardest to recruit in your organization in the next 5 years?

Please give at least one profile or five maximum (1= most difficult to recruit)

1:	
2:	
3:	
4:	
5:	

A3.2 SUPPLY

EHRO-N SURVEY 2014

Please answer the following questions by filling in the grey fields

We only need data on the number of past year (2013) graduated and enrolled students (2013-2014) at Bachelor, Master and PhD level in nuclear related fields (e.g. Nuclear physics, Nuclear Engineering, Nuclear Chemistry, Physics, Nuclear Science, Mechanical Engineering (nuclear), Nuclear Safety Engineering, Engineering Physics, etc.).

Institution Name: [Click here to enter text.](#)

Country: [Click here to enter text.](#)

City: [Click here to enter text.](#)

COURSE	STUDENTS GRADUATED 2013	STUDENTS ENROLLED 2013/2014

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