



# Skills4 Nuclear\*



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# Analysis of Existing Nuclear Workforce Assessment Studies

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## EXECUTIVE SUMMARY

The European nuclear sector is entering a phase of renewed growth and strategic importance. Nuclear technologies are increasingly recognized as essential for energy security, achieving climate goals, industrial innovation and healthcare. In the healthcare sector, new diagnostic and therapeutic methods, particularly in cancer treatment, and the expanding range of radioisotopes, are creating increased demands on isotope production capacity, safe hospital application, and the availability of a suitably skilled workforce. In response to the challenges posed by achieving climate goals and to ensure energy security, several EU Member States are launching new nuclear build programmes and investigate into Small Modular Reactors (SMRs) and nuclear technology for energy demanding markets (for example district heating, desalination and hydrogen production) while also continuing long term operation (LTO) of existing Nuclear Power Plants (NPPs), decommissioning, and waste management activities.

This expansion together with ensuring the LTO of current NPPs will soon generate substantial employment opportunities across a wide range of skill levels. However, the sector faces a critical challenge: an aging workforce and a shortage of new talent finding its way to the nuclear sector. Addressing this requires, a prompt response with a coordinated, evidence-based workforce planning based on a long-term vision.

In this report, the analysis of 21 existing (nuclear) workforce assessments from national, sectoral, and European perspectives is presented. The report identifies trends, methodologies, and outcomes, and highlights both strengths (best practices) and weaknesses of such assessments.

The most important lessons learned from the existing workforce assessments are:

- Most assessments map current workforce and future demand, but fewer address HR supply and skills strategy;
- Job classification frameworks vary widely which limits comparability;
- Governmental support is common, but recurring assessments are rare;
- Desktop research and stakeholder surveys are the most used methodologies;



- Best practices include scenario-based planning, stakeholder collaboration from the beginning, and standardized data collection;
- Weaknesses include outdated data, lack of long-term forecasting, and coordination gaps.

Therefore, it is advisable to:

- Harmonize the used job classification frameworks across EU member States using, where possible, the existing ESCO job classification;
- Conduct recurring, structured workforce assessments;
- Use scenario-based modelling to anticipate future needs;
- Strengthen stakeholder collaboration and governance;
- Invest in education and vocational training pipelines;
- Align workforce planning with national and EU policy;
- Create a framework for nuclear operators to provide up-to-date info about current and future workforce need.

This deliverable lays the groundwork for a European Nuclear Skills Strategy that supports sustainable workforce development for all nuclear technologies.



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## ACRONYMS AND ABBREVIATIONS

AMR	advanced modular reactor
ANDRA	L’agence nationale pour la gestion des déchets radioactifs
ANVS	Autoriteit Nucleaire Veiligheid en Stralingsbescherming
BNRA	Bulgarian nuclear regulatory authority
BSc	Bachelor of Science
CEA	Commissariat à l’énergie atomique et aux énergies alternatives
CEIDEN	Spanish nuclear energy technology platform - Plataforma Tecnológica de Energía Nuclear de Fisión
CLoP	Central Laboratory for Cardiovascular Protection
COVRA	Centrale Organisatie Voor Radioactief Afval
EDF	Électricité de France
EHRO-N	European Human Resources Observatory for the Nuclear Sector
EPZ	Elektriciteits-Produktiemaatschappij Zuid-Nederland
EQF	European Qualifications Framework



ESCO	European Skills, Competences, Qualifications and Occupations
EU	European Union
FLORES	Forward Looking at the Offshore Renewables
FTE	Full time equivalent
GIFEN	Groupement des Industriels Français de l’Energie Nucléaire
HBO	Hoger beroepsonderwijs
HR	Human Resources
HFR	Hoge flux reactor – high flux reactor
HVAC	Heating, ventilation and airconditioning
ICHtJ	Institute of Nuclear Chemistry and Technology
ISCO	International Standard Classification of Occupations
KCB	Kerncentrale Borssele
LTO	Long term operation
MBO	Middelbaar beroepsonderwijs
MSc	Master of Science
NCBJ	National Centre for Nuclear Research
NCRRP	National Centre of Radiobiology and Radiation Protection
NEA	Nuclear Energy Agency
NPP	Nuclear power plant
NREL	National Renewable Energy Laboratory
NRG	Nuclear Research & consultancy Group
OECD	Organisation for Economic Co-operation and Development
P&PM	Project and Programme Management
PEJ	Polskie Elektrownie Jądrowe
PPEJ	Program polskiej energetyki jądrowej
RHI	Regional Health Inspectorates



RI Delft	Reactorinstituut Delft – Reactor institute Delft
RQF	Regulated Qualifications Framework
S4N	Skills4Nuclear project
SMR	Small modular reactor
SNETP	The Sustainable Nuclear Energy Technology Platform
STEM	Science, Technology, Engineering and Mathematics
STHSE	Science, Technical, Health, Safety and Environment
TU Delft	Technische Universiteit Delft – Technical University Delft
UK	United Kingdom
URENCO	Uranium Enrichment Company
US	United States
WHO	World Health Organisation
ZUOP	Zakład Unieszkodliwiania Odpadów Promieniotwórczych



## 1 INTRODUCTION

Nuclear technologies are increasingly recognized as essential to Europe's strategic objectives—not only in energy production, but also in healthcare, space exploration, agriculture, and industrial innovation. The recent energy crisis has accelerated this recognition, prompting many EU Member States to launch new nuclear build programmes and to investigate into advanced technologies such as Small Modular Reactors (SMRs) and nuclear fusion while also continuing LTO of NPPs, decommissioning, and waste management activities. Initiatives like the European Industrial Alliance on SMRs and the integration of nuclear into the EU's "Beating Cancer" action plan underscore the sector's growing relevance.

This renewed focus on nuclear will generate a significant number of jobs across Europe, spanning a wide range of skill levels and disciplines. However, the sector faces a dual challenge: an aging workforce and a looming skills gap. Many experienced professionals are expected to retire in the coming decade, while the pipeline of new talent remains insufficient. Addressing this challenge requires coordinated action to:

- Improve the sector's visibility and attractiveness;
- Develop a clear, long-term view of workforce needs across all roles—from educators and regulators to engineers, researchers, and technicians;
- Attract, develop and retain young people into STEM studies and vocational pathways;
- Reskill and upskill professionals from other sectors;
- Promote diversity, inclusion and gender balance within the nuclear workforce.

This deliverable provides an analysis of existing nuclear workforce assessment studies from across Europe and beyond and addresses the abovementioned challenges by:

- **Synthesizing insights** from 21 national, sectoral, and European-wide workforce assessments.
- **Identifying strengths and weaknesses** in current workforce planning approaches.



- **Comparing nuclear workforce needs** with those of other strategic sectors such as hydrogen and renewable energy.

The findings presented here are intended to inform policy decisions at European, national, and regional levels. They provide a foundation for the development of a long-term Nuclear Skills Strategy that is adaptable to local contexts and designed to complement existing initiatives.

For more information about the Skills4Nuclear initiative visit <https://www.skills4nuclear.eu>.



## 2 ANALYSIS OF THE WORKFORCE ASSESSMENTS

In total, 21 workforce assessments were processed and analysed. This chapter presents the review methodology and the results of the analysis. The list of workforce assessments including direct hyperlinks is available on the Skills4Nuclear website (<https://www.skills4nuclear.eu/page/workforce-assessments/>).

The 21 workforce assessments were organised in four categories namely national assessments, sectoral assessments, European wide assessments and other reports. The national reports were performed on a national level. (Barrins, Apperley, & Donlevy, 2023; Bulgarian Nuclear Regulatory Agency, 2022; Bundesministeriums für Wirtschaft und Energie und des Bundesministeriums für Umwelt, Naturschutz und nukleare Sicherheit, 2020; Cogent Skills, 2025; GIFEN, 2023; Hämäläinen & Suolanen, 2019; Ministerstwo Klimatu i Srodowiska, 2023; Nuclear Skills Delivery Group, 2024; Nuclear Skills Strategy Group, 2023; Nuclear Skills Strategy Group, 2021) (Schotten, Bastiaansen, Schumacher, & van der Veen, 2024; Scholten, Bastiaansen, Karsten, & van der Veen, 2022) One or more reports from UK, France, Germany, the Netherlands, Bulgaria, Finland, Poland and Australia are available. The sectoral assessments described workforce assessments performed for specific sectors namely the European hydrogen sector, the European offshore renewable energy sector, the European fusion research programme and the US national wind energy sector. (European Hydrogen Skills Alliance, 2023; European Hydrogen Skills Alliance, 2023; Fasoli, Bécoulet, Vecchio, & Belonohy, 2024; McDowell, Stefek, Smith, Pons, & Ahmad, 2024; Sdoukopoulos, 2024) The European wide assessments include an EHRO-N report on the demand and supply for nuclear experts within the EU-28 Civil nuclear energy sector, a Deloitte report on the economic and social impact of nuclear energy by Nucleareurope and an assessment of the EU's nuclear research, development and innovation landscape and workforce readiness for decarbonisation performed by Jensen Hughes for SNETP. (Eriksen, Christiaensen, Chenel Ramos, Van Kalleveen, & Hirte, 2019; Deloitte, 2025; Gasparini, Nurmilaukas, & Mercurio, 2025) The one report in the other category is the WHO report Essential public health functions: A guide to map and measure national workforce capacity. (World Health Organization, 2024) Most of the reports were available in English, either as a translation from the original language or directly



provided in English. Only 3 reports (2 in Dutch, 1 in Polish) were only available in their original language. (Ministerstwo Klimatu i Środowiska, 2023; Schotten, Bastiaansen, Schumacher, & van der Veen, 2024; Scholten, Bastiaansen, Karsten, & van der Veen, 2022)

## 2.1 Methodology for analysis

The 21 reports were collected based on internet search, previously collected reports and reports provided by parties that are S4N partners. The collected reports were distributed between the partners in such a way that each report was processed by two partners. Each partner reviewed the reports based on several criteria that were discussed and agreed upon in advance. The criteria are listed in Table 1 starting below and continuing on the next two pages. For each criterium a short description and the type of requested data is described.

**Table 1 Criteria used for the analysis of the workforce assessments.**

<b>Criterion</b>	<b>Description</b>	<b>Type</b>
Methodologies	Summary of the methodologies used to collect and validate the data for the workforce assessment.	Open answer
Resources	Summary of the resources that provided the data for the workforce assessment.	Open answer
Stakeholders	Overview of the stakeholders that were involved in the process of the workforce assessment including their roles and responsibilities.	Open answer
Main outcomes	Summary of the main outcomes of the report.	Open answer
Best practices	The best practices described by the author that are essential for performing an effective workforce assessment.	Open answer



<b>Criterion</b>	<b>Description</b>	<b>Type</b>
Weaknesses	Weaknesses described by the author of the workforce assessment and if available suggestions to resolve these weaknesses for future assessments	Open answer
Workforce assessment steps	Which steps, based on the 2023 EHRO-N report, of a workforce assessment were described in the report. (Eriksson & Eriksen, 2023)	Multiple response question: <ul style="list-style-type: none"> <li>○ Mapping current workforce</li> <li>○ Future demand</li> <li>○ Mapping HR supply</li> <li>○ Gap analysis</li> <li>○ Skills strategy</li> </ul>
Government support	If the report and/or nuclear workforce assessment was supported by the government and if yes, how the government supported the performed work.	Yes/no/not clear question If yes, additional open answer
Job classification	If a job classification was used while performing the workforce assessment and if yes, a description of the used job classification	Yes/no/not clear question If yes, additional open answer
Data	A brief description of the data presented in the report with attention for the level of detail and specificity of the data.	Open answer
Recurrency	Was the report part of a recurrent study? If yes, the frequency was described.	Yes/no/not clear question If yes, additional open answer



Criterion	Description	Type
Related studies	If any related or relevant other study was mentioned it could be mentioned here.	Open answer
Other	If any other kind of information relevant to the S4N work was described in the report that couldn't fit in any other criteria could be provided here.	Open answer

The input from the partners was collected through a Microsoft Forms survey to allow easy and durable data processing. The Microsoft Forms survey is available via <https://forms.office.com/e/LRTuApmBpU>.

## 2.2 Summary of the collected reports

### 2.2.1 Analysis of the reports

Based on the performed analysis of the 21 existing (nuclear) workforce assessments, the data below summarizes the information.

Job classification

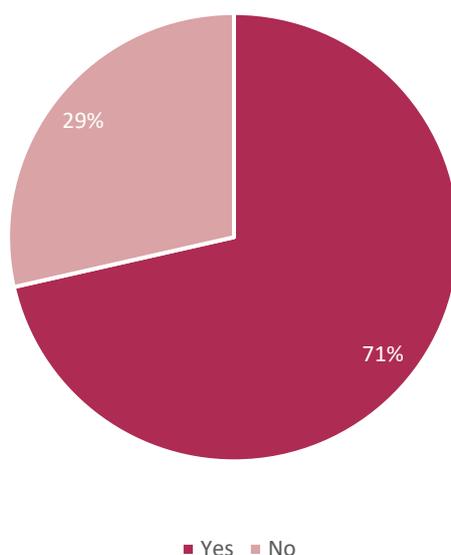


Figure 1 Report Usage of Job Classification.



Figure 1 ,on the previous page, shows that 71% of the analysed reports used a defined job classification in their workforce assessment. The reports that don't describe a job classification are either presenting high level data or focussing on a skills strategy without having performed a partial or full workforce assessment. The used job qualifications are summarised in Table 2 starting below.

**Table 2 Overview of used job classifications.**

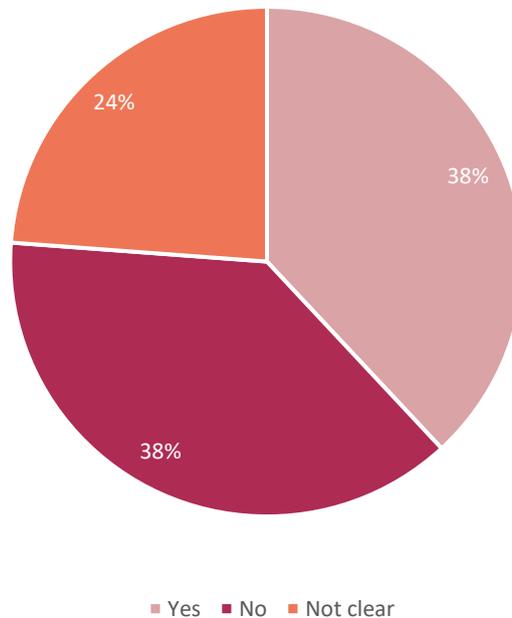
<b>Author</b>	<b>Taxonomy</b>
EHRO-N (Eriksson & Eriksen, 2023)	OECD-NEA pyramid of competence for workforce and EQF level for supply side. (The European Qualifications Framework, n.d.; OECD NEA, 2012)
Finnish Ministry of Economic Affairs and Employment (Hämäläinen & Suolanen, 2019)	Four sectors and several areas of competence: 23 areas defined on MSc and BSc level, and 8 areas defined on secondary vocational level with significant overlap of areas between the MSc/BSc and secondary vocational level. (Hämäläinen & Suolanen, 2019; Eriksson & Eriksen, 2023)
Cogent skills (NNSG, NSDG) (Cogent Skills, 2025; Nuclear Skills Strategy Group, 2023; Nuclear Skills Strategy Group, 2021)	Six Functions with subfunctions containing specialist areas and role levels (1-8) based on RQF.
Technopolis group (Schotten, Bastiaansen, Schumacher, & van der Veen, 2024; Scholten, Bastiaansen, Karsten, & van der Veen, 2022)	Adaptation of OECD-NEA pyramid of competence with nuclear, engineer, technician and nuclear aware as categories and the EHRO-N job classification.



Author	Taxonomy
GIFEN (GIFEN, 2023)	Sector-specific nuclear workforce taxonomy covering 97 professions in 20 activity segments based on job families: engineering and design, manufacturing, construction and installation, operation and maintenance, quality, safety, regulatory, supporting and skill levels (operator, technician and engineer/manager). The system is cross-referenced with the French national employment classification (ROME).
European Hydrogen Skills Alliance (European Hydrogen Skills Alliance, 2023; European Hydrogen Skills Alliance, 2023)	Combination of ESCO subgroups, EQF and hydrogen knowledge requirement on a scale from 0 to 3.
Eurofusion (Fasoli, Bécoulet, Vecchio, & Belonohy, 2024)	The survey structured analysis by competence areas and operational roles, particularly those linked to ITER’s commissioning and operation. It categorised technical and scientific staff according to work package roles, engineering disciplines, and operational readiness functions.
FLORES (Sdoukopoulos, 2024)	ESCO
NREL (McDowell, Stefek, Smith, Pons, & Ahmad, 2024)	Based on the North American Industry Classification System codes.
WHO (World Health Organization, 2024)	Classification based on three groups (health and care workers, core public health personnel, and occupations allied with health) with different occupation in each group. Links with ISCO are proposed.
BNRA (Bulgarian Nuclear Regulatory Agency, 2022)	The strategy used occupational categories linked to education levels, specialties, and legally regulated positions.



### Recurrency

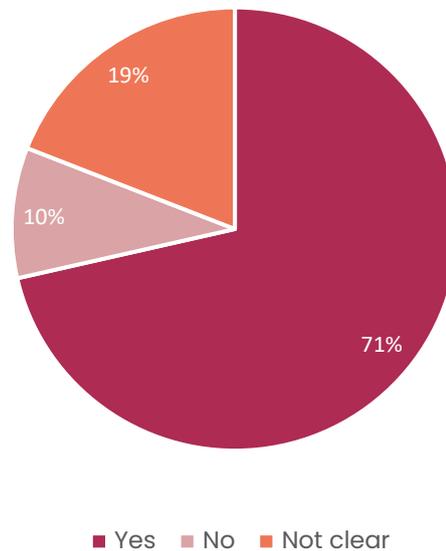


**Figure 2 Recurrency described in the reports.**

Just under 40% (8) of the analysed assessments clearly report a recurrency of the workforce assessment. The reported frequencies are annual, every 2 years, each 3 years, each 5 years at the latest, and to some degree recurrent but no fixed frequency. For the other 13 reports, it is not clear from the report if the performed work will be repeated, or the nature of the report indicates that a recurrence is probably not expected.



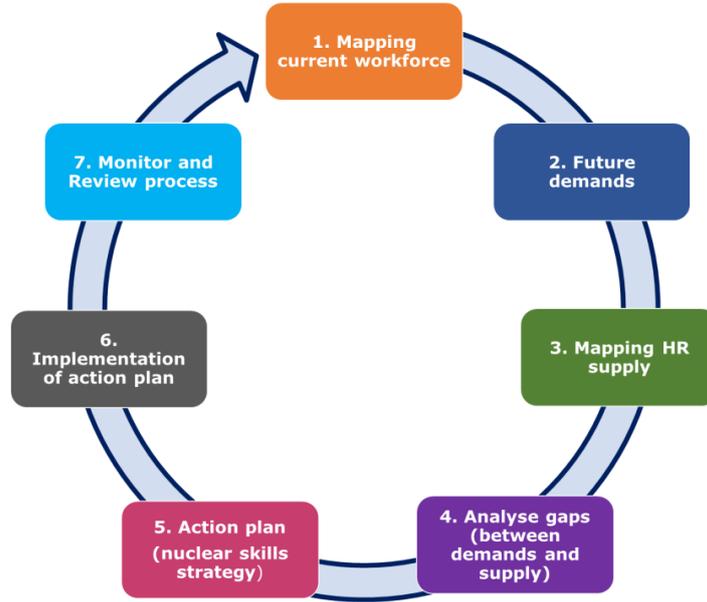
## Governmental support



**Figure 3 Governmental support described in the reports.**

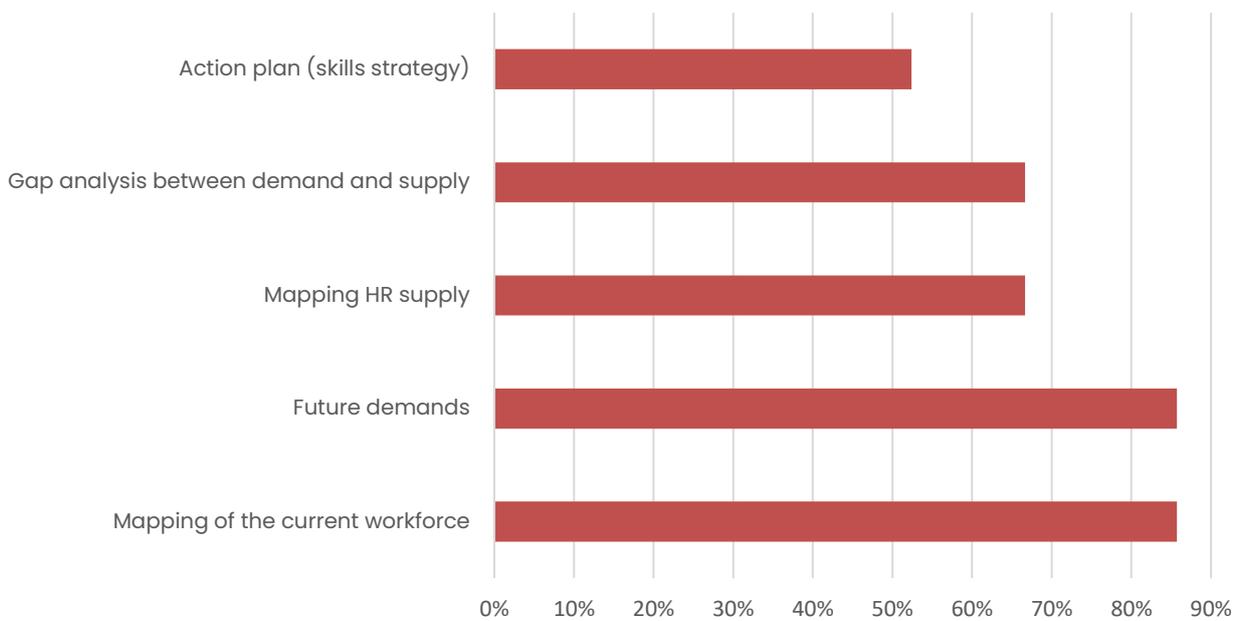
The majority of the reports described some form of governmental support used for the assessments. In some cases, this means that national governmental institutions or ministries provided data on the workforce, in other cases the national government was the commissioner and funding party of the report. Other ways of national or regional governmental support, in between the two described above, were also mentioned. Some reports like the Green Skills for Hydrogen report and the FLORES report even received European funding.

The 2023 EHRO-N report on job classification and taxonomy describes the workforce capability and planning cycle as presented in Figure 4 on the next page. In this cycle, phases 1 to 3 describe the actual workforce assessment whereas the following phase are the evident consequences from the workforce assessments. For the analysed reports, it was evaluated which phases (1 to 5) were described within the reports. It should be noted that not all reports contain all steps and that the steps can be described separately, without hierarchy. The result is presented in Figure 5 on the next page.



**Figure 4 The Workforce capability and planning cycle taken form the EHRO-N report on job classification and taxonomy. (Eriksson & Eriksen, 2023)**

The occurence of each workforce assessments step

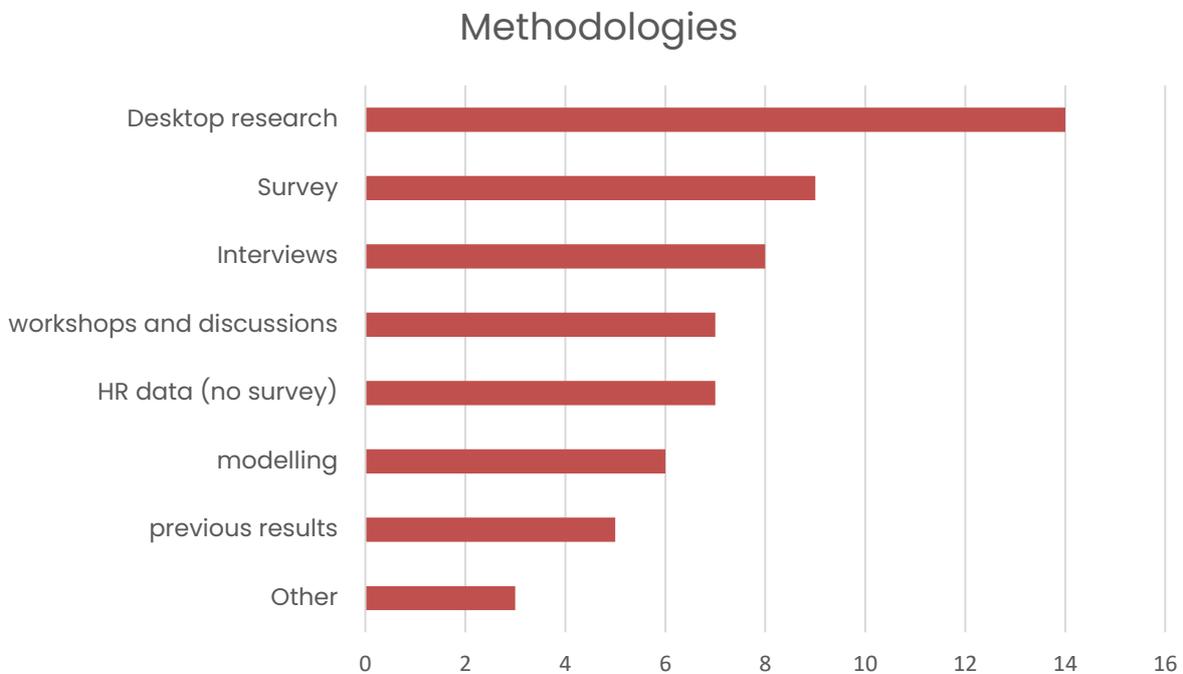


**Figure 5 The steps of a workforce assessment and their occurrence in the analysed reports.**



Most reports, 18 out of 21, map the current workforce and describe the future demand. Two reports that don't map the current workforce are purely skills strategy documents without representing any data. The other report is the FLORES report in which there is no mapping of the current workforce, but the future demand and gap analysis is performed based on an analysis of the current job offers within the respective sector. Only 14 reports present data on the HR supply, and an equal number of reports perform a gap analysis between demand and supply. Just over half of the reports, describes a skills strategy. Only eight reports describe all five phases, two additional reports present data on the first four phases but don't provide a skills strategy.

The used methodologies to perform the workforce assessments are presented in Figure 6 below. It should be noted that some reports present no data. This is included in the 'Other' category. Another used methodology that is accounted for in the 'Other' category is the analysis of job vacancies. Most reports also present data that is collected using a combination of methods. On average about 3 (2.8) different methods were used per report.



**Figure 6 Summary of the used methodologies in the analysed reports.**



It is clear from Figure 6 that desktop research (14) and collecting data from stakeholders, which includes data collection through a survey (9) and direct HR data collection (7), are the most used methodologies. The analysed reports mention that (semi-structured) interviews, workshops and discussions with stakeholders are most often used to validate the data that is gathered via desktop research, surveys and HR data collection. A limited number of reports used modelling and/or were able to use previous published results as a source of data.

The involved stakeholders depended strongly on the work performed in the reports. Overall, the involved stakeholders were the (nuclear) industry, research institutes, governmental and regulatory bodies, education and training institutes including universities, community colleges and vocational schools, (inter)national organisations, and service providers.

The data presented in the reports was diverse. Some reports presented only very high-level data on the number of jobs needed in the future or even no data at all. Other reports presented very detailed data (including demographics) on the current workforce and sometimes on the HR supply. The list of mentioned details includes sector of employment, job type, gender, age, level of education, educational background, location, mobility, contract type, ethnicity, disability and sexuality.

The reports were also analysed to identify best practices and weaknesses when performing a workforce assessment. The best practices and weaknesses were listed and categorised. The list with lines from the performed analyses is available in ANNEX I complete list of 'best practices' and 'weaknesses'. Below, only the categories are listed. It should be clear that the information below is an interpretation based on the analysis of the reports.

The best practices are summarised as followed:

- Monitor and adjust continuously/workforce assessments should be agile and flexible
- Align with national policy
- Define clear objectives
- Use different data sources and validate the data with the project owners and other stakeholders



- Use a scenario-based approach
- Ensure stakeholder collaboration and create an atmosphere of trust
- Standardize data collection
- Use modelling
- Take care of the four workforce assessment phases (mapping current workforce, future demands and HR supply, and performing gap analysis between demand and supply)

The gathered weaknesses are that:

- The data is not up to date
- Future job profiles and requirements might not be clear in case of new technologies
- There is a lack of coordination
- There is lack of data or detailed data
- There is a lack of long-term prospect
- There is a lack of job classification
- There are privacy concerns

To counteract these weaknesses several solutions were proposed in the reports that were analysed. The early and active engagement of all stakeholders, preferably within a governing structure, was mentioned several times. This action could tackle the lack of coordination, the lack of data and the lack of detail in the data. Harmonizing the data collection and using a standardised job taxonomy could also improve the collection of the data. The use of a standardised job taxonomy also mitigates the lack of job classification. The ESCO (and ISCO) classification were proposed several times. Using a unified job classification will make comparison between national studies more efficient. To tackle the lack of long-term prospect, it was mentioned to use the long-term HR planning of the stakeholders. Additionally, a national policy or strategic plan appears to be an important to address this weakness. To keep the data up-to-date continuous updates of the data and the analysis are proposed.



## **2.2.2 Main outcomes of the European national nuclear workforce assessments**

Next to the analysis of the collected reports related to the process of a workforce assessment, the reports were also analysed on the main outcomes. This part of this deliverable describes the main outcomes of the European national nuclear workforce assessments.

### **2.2.2.1 Spain**

Even in the case of Spain, a country with a set shutdown calendar in the near term, the forecasts done by the national nuclear energy platform (CEIDEN), showed the need of nuclear professionals well above the current E&T capabilities. (CEIDEN KEEP+, 2023)

The information is based on the response of 23 companies on their national and international activities in 2023. In total, 2157 new staff, 1433 academic graduates and 724 technicians, are needed in the period 2023–2027. The detailed numbers are presented in Table 3 on the next page. The data was processed anonymously, therefore no companies or institutes are mentioned by name but they are represented by a number..



**Table 3 Estimate of the number of new hires in the nuclear sector in Spain in the period 2023–2027. (CEIDEN KEEP+, 2023)**

	Academic graduates						Vocational training technicians					
	2023	2024	2025	2026	2027	Total	2023	2024	2025	2026	2027	Total
1	80	63	33	20	20	<b>216</b>	76	60	31	19	19	<b>205</b>
2	27	45	63	33	36	<b>204</b>	16	16	16	16	16	<b>80</b>
3	30	34	39	45	52	<b>200</b>	20	20	16	10	-	<b>66</b>
4	20	25	30	25	25	<b>125</b>	4	8	10	12	16	<b>50</b>
5	42	29	24	1	1	<b>97</b>	7	9	10	9	9	<b>44</b>
6	16	16	16	16	16	<b>80</b>	10	10	10	5	5	<b>40</b>
7	10	15	12	9	14	<b>60</b>	12	6	5	5	0	<b>28</b>
8	12	10	9	8	8	<b>47</b>	4	5	5	4	5	<b>23</b>
9	12	8	8	8	8	<b>44</b>	2	4	6	3	3	<b>18</b>
10	3	3	2	1	10	<b>19</b>	5	3	3	0	0	<b>11</b>
11	3	2	2	4	6	<b>17</b>	5	5	-	-	-	<b>10</b>
12	3	3	3	2	2	<b>13</b>	5	5	-	-	-	<b>10</b>



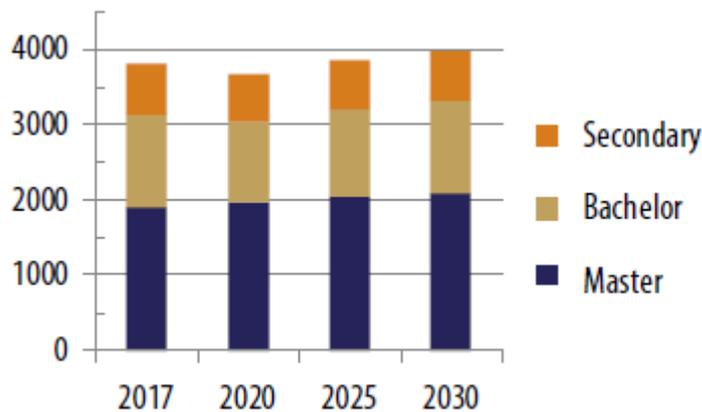
13	4	4	-	-	-	<b>8</b>	1	1	2	2	3	<b>9</b>
14	1	2	0	1	1	<b>5</b>	1	1	1	1	1	<b>5</b>
15	1	1	1	1	1	<b>5</b>	2	1	1	1	0	<b>5</b>
16	2	3	-	-	-	<b>5</b>	0	1	1	1	1	<b>4</b>
17	1	1	1	1	1	<b>5</b>	0	1	0	1	0	<b>2</b>
18	1	2	0	0	0	<b>3</b>	0	0	0	0	0	<b>0</b>
19	1	1	1	1	1	<b>5</b>	0	0	0	0	0	<b>0</b>
20	2	4	5	7	8	<b>26</b>	1	2	2	3	4	<b>12</b>
21	12	24	30	50	60	<b>176</b>	0	0	0	0	0	<b>0</b>
22	23	4	5	6	5	<b>43</b>	8	14	11	13	14	<b>60</b>
23	10	7	7	6	0	<b>30</b>	18	8	7	9	0	<b>42</b>
<b>Total</b>	<b>316</b>	<b>306</b>	<b>291</b>	<b>245</b>	<b>275</b>	<b>1433</b>	<b>197</b>	<b>180</b>	<b>137</b>	<b>114</b>	<b>96</b>	<b>724</b>



### 2.2.2.2 Finland

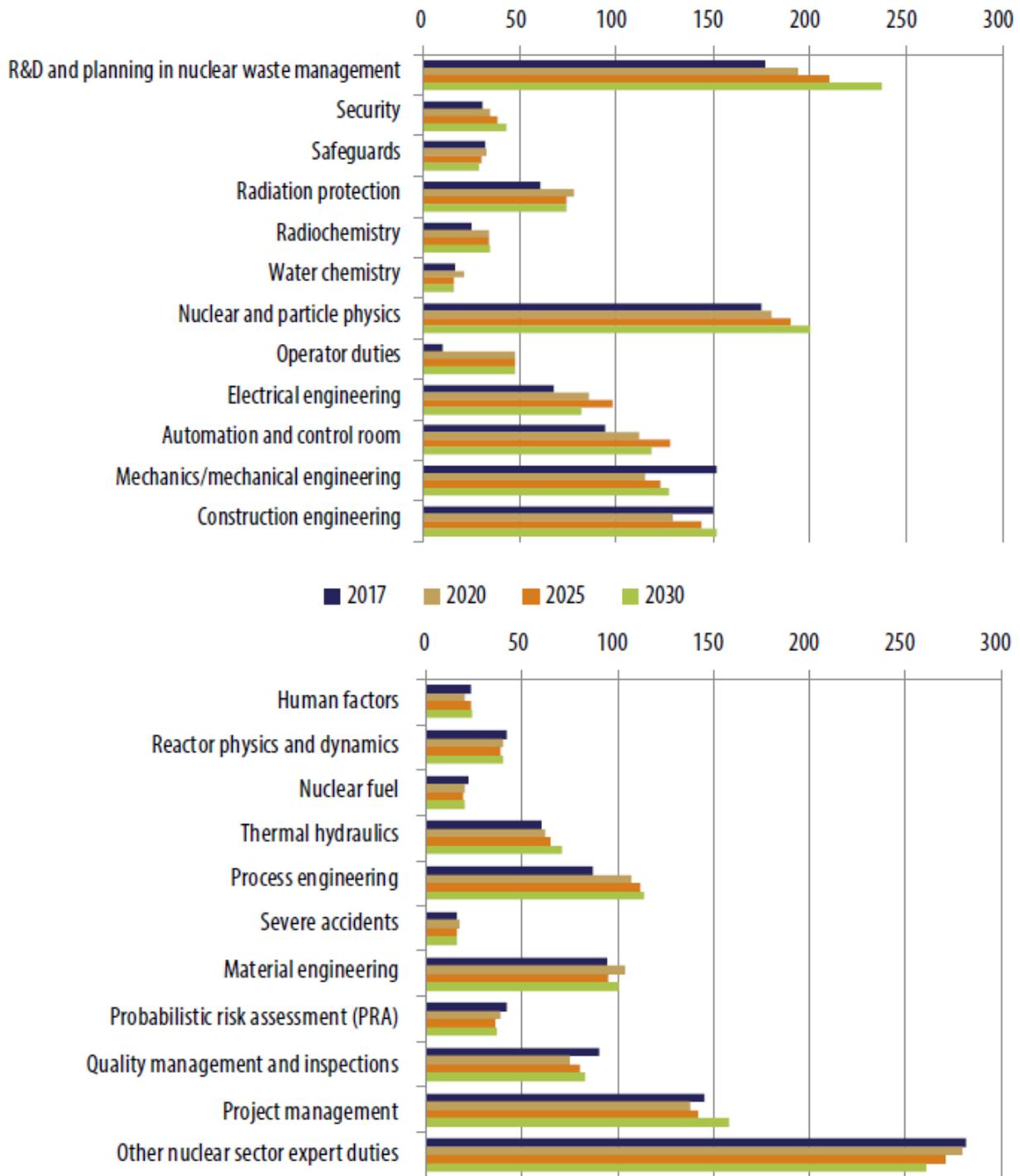
The Finnish study, published in 2019, maps the current workforce and expressed the future demand in the nuclear sector. This study collect input from their key nuclear actors namely three nuclear powerplants (Fortum, Teollisuuden Voima Oyj and Fennovoima Oy), the nuclear waste management company (Posiva), VTT Technical Research Centre, the Radiation and Nuclear Safety Authority and the Ministry of Economic Affairs and Employment, as well from universities (including universities of applied sciences, and other industrial companies associated with the nuclear power plants.

The mapping of the total current workforce and the total future demand with 5-year gaps is shown in Figure 7. The total numbers of experts working in the nuclear sector are 1895 employees holding a MSc degree (of which 332 hold a postgraduate degree), 1232 employees holding a BSc degree and 680 employees with secondary-level vocational qualifications.

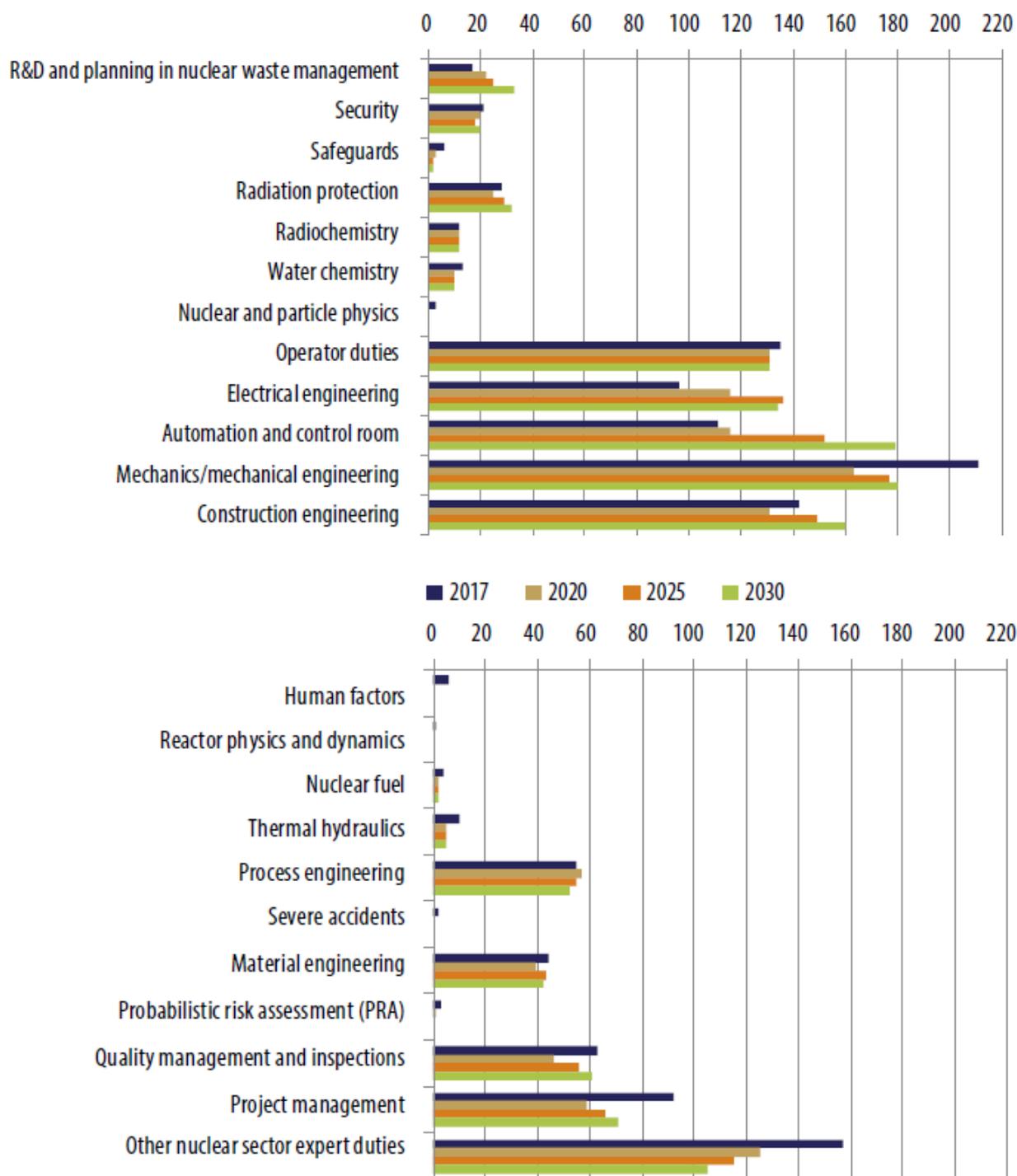


**Figure 7 Expectation of number of employees in the future with the current situation (2017) as reference – directly taken from the original report. (Hämäläinen & Suolanen, 2019)**

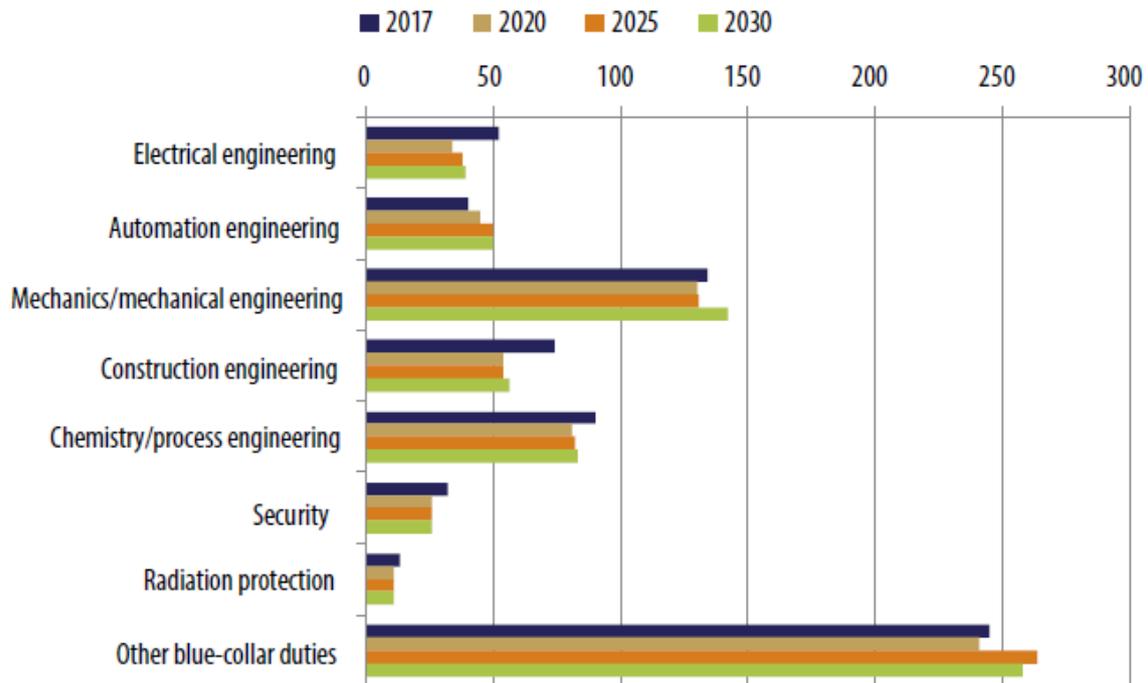
The figures, Figure 8, Figure 9 and Figure 10, on the next pages show a more detailed overview of the future demand per area of competence for employees with MSc, BSc and secondary-level vocational qualifications.



**Figure 8 Overall number of employees with MSc degree by area of competence– directly taken from the original report. (Hämäläinen & Suolanen, 2019)**



**Figure 9 Overall number of employees with BSc degree by area of competence– directly taken from the original report. (Hämäläinen & Suolanen, 2019)**



**Figure 10 Overall number of employees with secondary-level vocational diploma by area of competence – directly taken from the original report. (Hämäläinen & Suolanen, 2019)**

The report concludes that the demand for personnel in 2023 is only slightly higher than the workforce in 2017. The number of employees with BSc and vocational qualification are expected to be enough to cover the future demand in the most fields. The number of employees with MSc qualification should increase by 10%.

### **2.2.2.3 The Netherlands**

Within a short period of time, the Technopolis group published two publications (2022 and 2024) on the future demand of the workforce in the Netherlands.

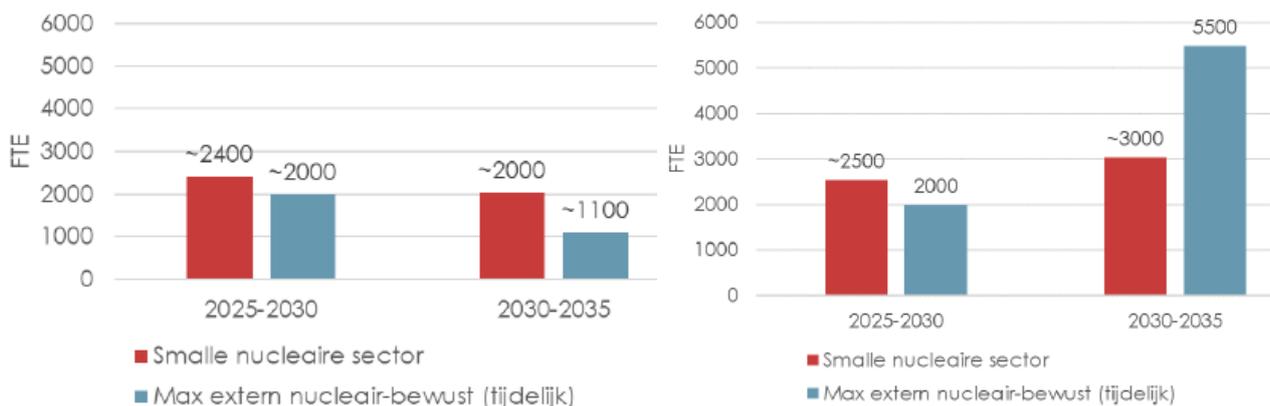
The first publication focuses on two scenarios. The first scenario includes the realisation of PALLAS (new research reactor) and SHINE (medical isotope production facility) and the closure of HFR (research reactor) and KCB (nuclear power plant) according to the plan. The second scenario includes the realisation of PALLAS (new research reactor) and SHINE (medical isotope production facility), the closure of HFR (research reactor), an extension of KCB (nuclear power plant) and the build of two new GEN III nuclear power plants. The target of this first publication is the broad nuclear sector which includes the members of Nuclearair Nederland (COVRA, EPZ, NRG, PALLAS, RI Delft, Urenco and SHINE), the ANVS (regulatory authority) and all other organisations working with radioactive



materials and/or ionising radiation. (Scholten, Bastiaansen, Karsten, & van der Veen, 2022)

The second publication focuses on three scenarios. The first scenario is equal to the second scenario of the first publication, the second scenario build on scenario 1 with 2 additional GEN III nuclear power plants. The third scenario adds the realisation of some SMRs. A big difference with the first publication is that the scope of this report is limited to the nuclear energy sector. This only includes EPZ, Urenco, NRG, ANVS, Ministry of climate policy and green growth, Ministry of infrastructure and water management, TU Delft, COVRA and some potential new actors like DIFFER, Thorizon, ULC Energy and RUG. (Schotten, Bastiaansen, Schumacher, & van der Veen, 2024)

For the small nuclear sector (members of Nucleair Nederland and the ANVS) the expected growth in employees, expressed as full-time equivalents (FTE) is shown in Figure 11 below based on the two described scenarios. Most of these FTEs are for technical skilled people with BSc (HBO, 30%) and secondary vocation level (MBO, 31%) qualifications. (Scholten, Bastiaansen, Karsten, & van der Veen, 2022) For all non-English figures a translation of the texts is available in ANNEX III Translation Details for Non-English Figures and Tables.

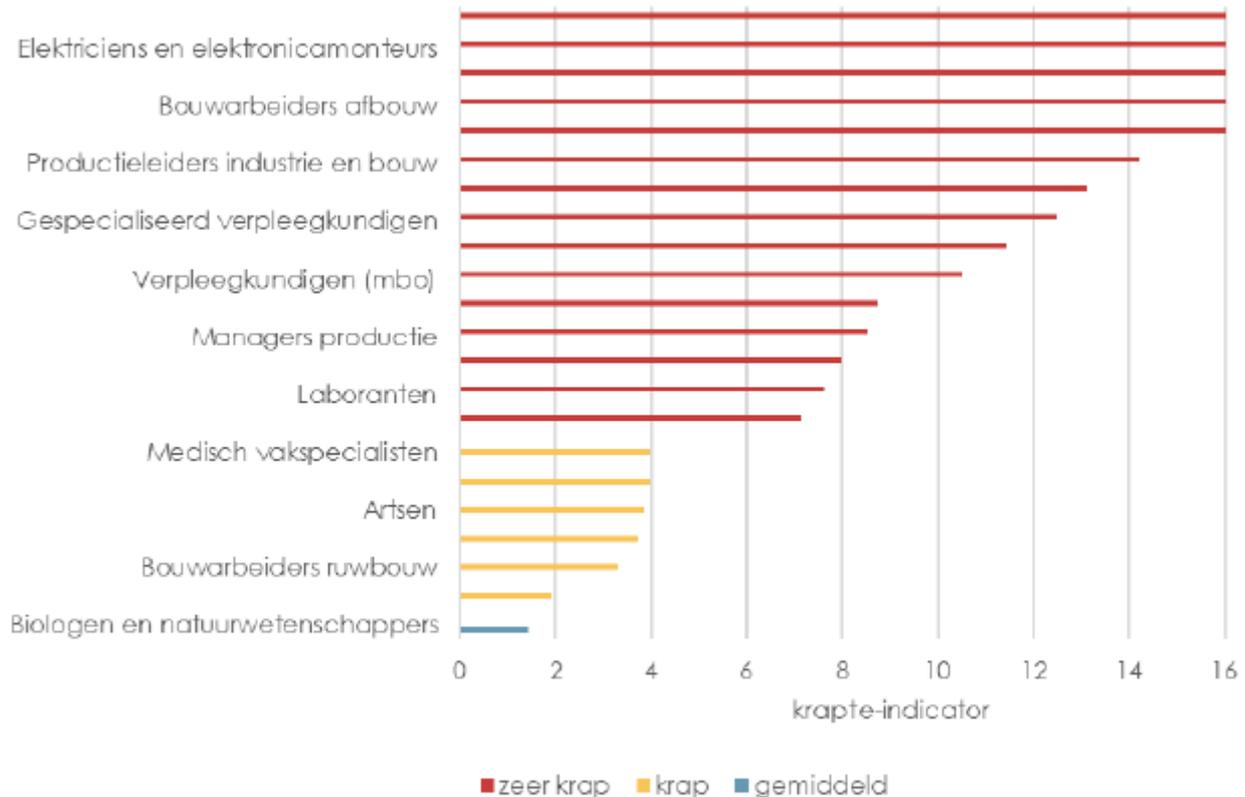


**Figure 11 Expected growth of employees, expressed in FTE, in the small nuclear sector in both scenarios (scenario 1, left and scenario 2, right) – directly taken from the original report. (Scholten, Bastiaansen, Karsten, & van der Veen, 2022)**

An increase in employment in the broad nuclear sector is also expected but more difficult to back-up with hard data.



Another important graph presented in this report is shown below. Figure 12 shows the scarcity of some technical occupational groups relevant for the nuclear sector. The bigger the scarcity-index, the scarcer the profile is.



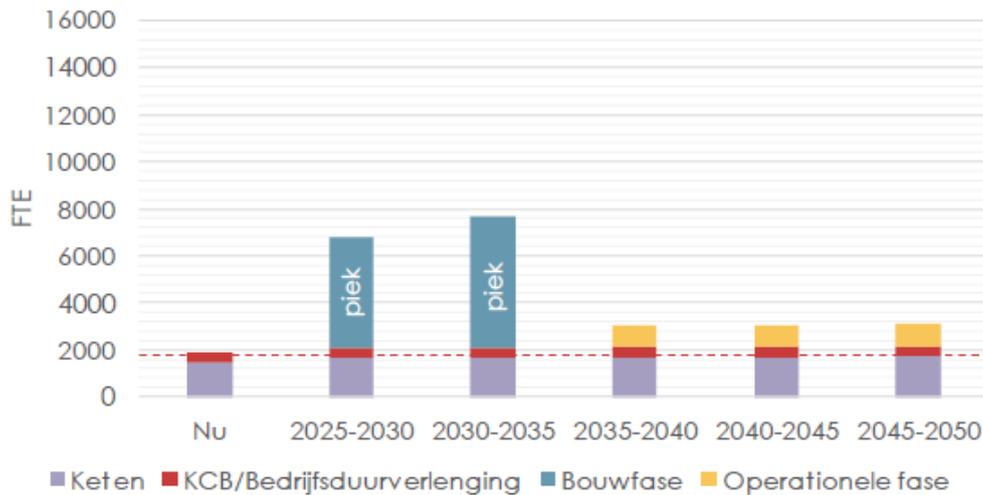
**Figure 12 Scarcity for technical occupational groups relevant for the nuclear sector. The bigger the scarcity index, the scarcer the profile is (ranging from very scarce (zeer krap), scarce (krap) to average (gemiddeld) – directly taken from the original report. (Scholten, Bastiaansen, Karsten, & van der Veen, 2022)**

The reasons for the quantitatively scarceness for these profiles that are mentioned in the reports are the competition within the sector and competition with other sectors (chemistry, defence, shipping, electrical engineering, construction, high tech, offshore energy, and coal and gas), unavailability of these jobs in their area of living and the unwillingness to move, insufficient supply for specific functions, restrictions on nationalities that can be hired and the lack of willingness to reskill or upskill. (Scholten, Bastiaansen, Karsten, & van der Veen, 2022)

The more recent publication, focused on the nuclear energy sector only, shows a prediction comparable in magnitude to the scenario described as scenario 2 in the 2022 report and scenario 1 in the 2024 report. Figure 13, on the next page,

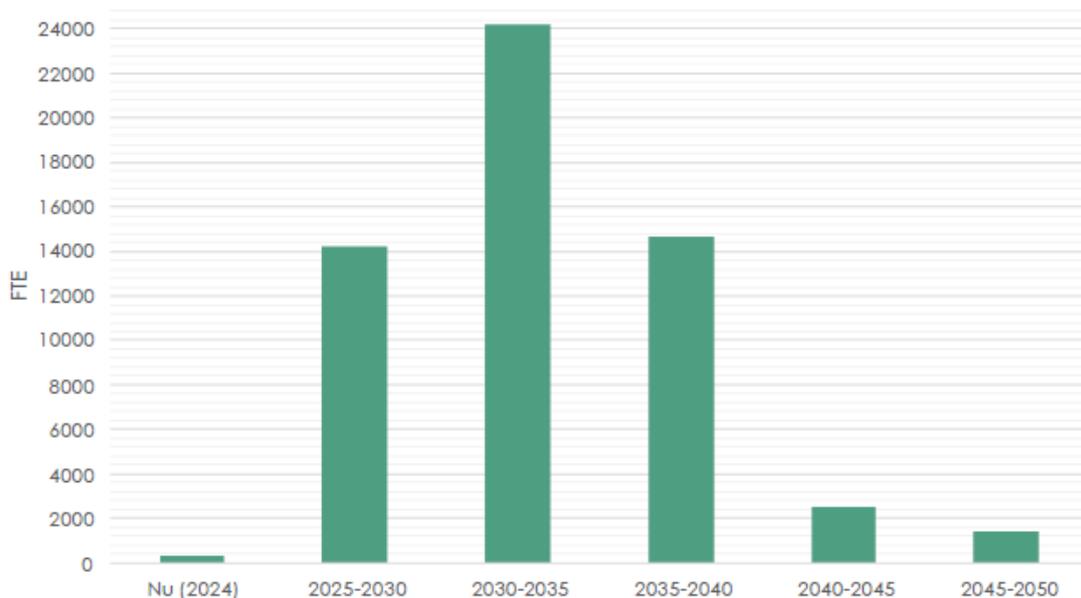


shows a peak from 2025 until 2035, for the construction phase of the new power plants.



**Figure 13 Expected need of employees in the nuclear energy sector – directly taken from the original report. (Schotten, Bastiaansen, Schumacher, & van der Veen, 2024)**

The 2024 report also shows a coarser estimation for the total required FTEs in scenario 2 of that report as presented in Figure 14. About 75% percent of the demand accounts for technical skilled (engineering, natural sciences, building, construction and infrastructure or nuclear specific) employees.



**Figure 14 Expected total number of FTEs for scenario 2 – directly taken from the original report. (Schotten, Bastiaansen, Schumacher, & van der Veen, 2024)**



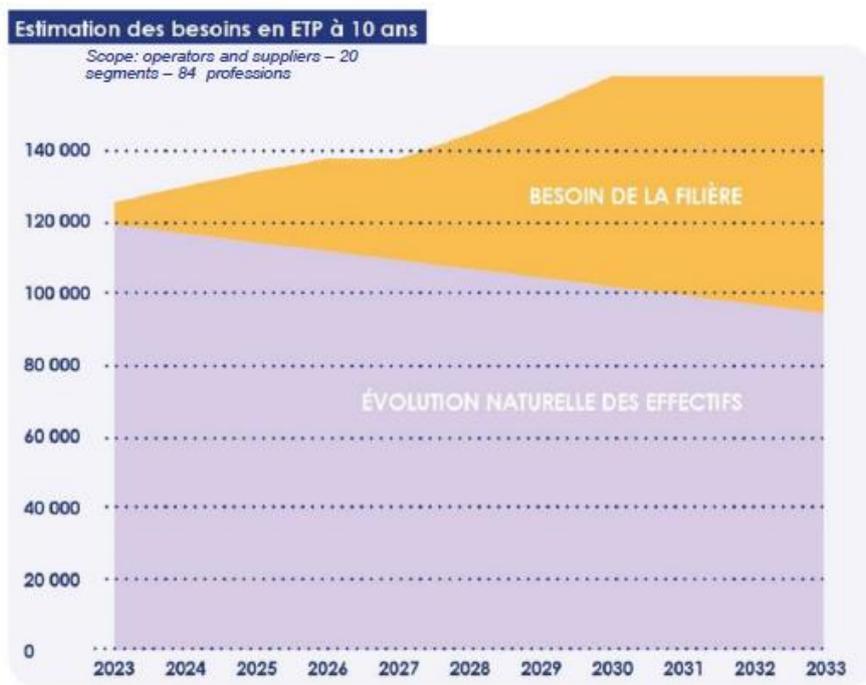
This 2024 report concludes that the domestic supply most probably will not suffice to meet the demand. Reskilling and the attraction of employees from abroad are part of the solution.

**2.2.2.4 France**

The data presented in the French program Match report are collected by the project owners (EDF, ORANO, Framatome, ANDRA, CEA and others) who shared their 10-year expenditure projections, and supply chain companies. This data is translated into personnel need forecasts using workload models.

The MATCH programme focusses on 20 segments comprising 84 professions.

The expected growth in direct jobs (by the operators and their tier 1 suppliers) is from 125 000 FTEs in 2023 to 155 000 FTEs in 2033 as presented in Figure 15 below. This accounts for around 60 000 FTEs that need to be recruited in this period to account for both the expansion and the replacement of leaving staff (to other sectors or retirement). Most growth in activity is expected in the supply chain (+35%). For all non-English figures a translation of the texts is available in ANNEX III Translation Details for Non-English Figures and Tables.

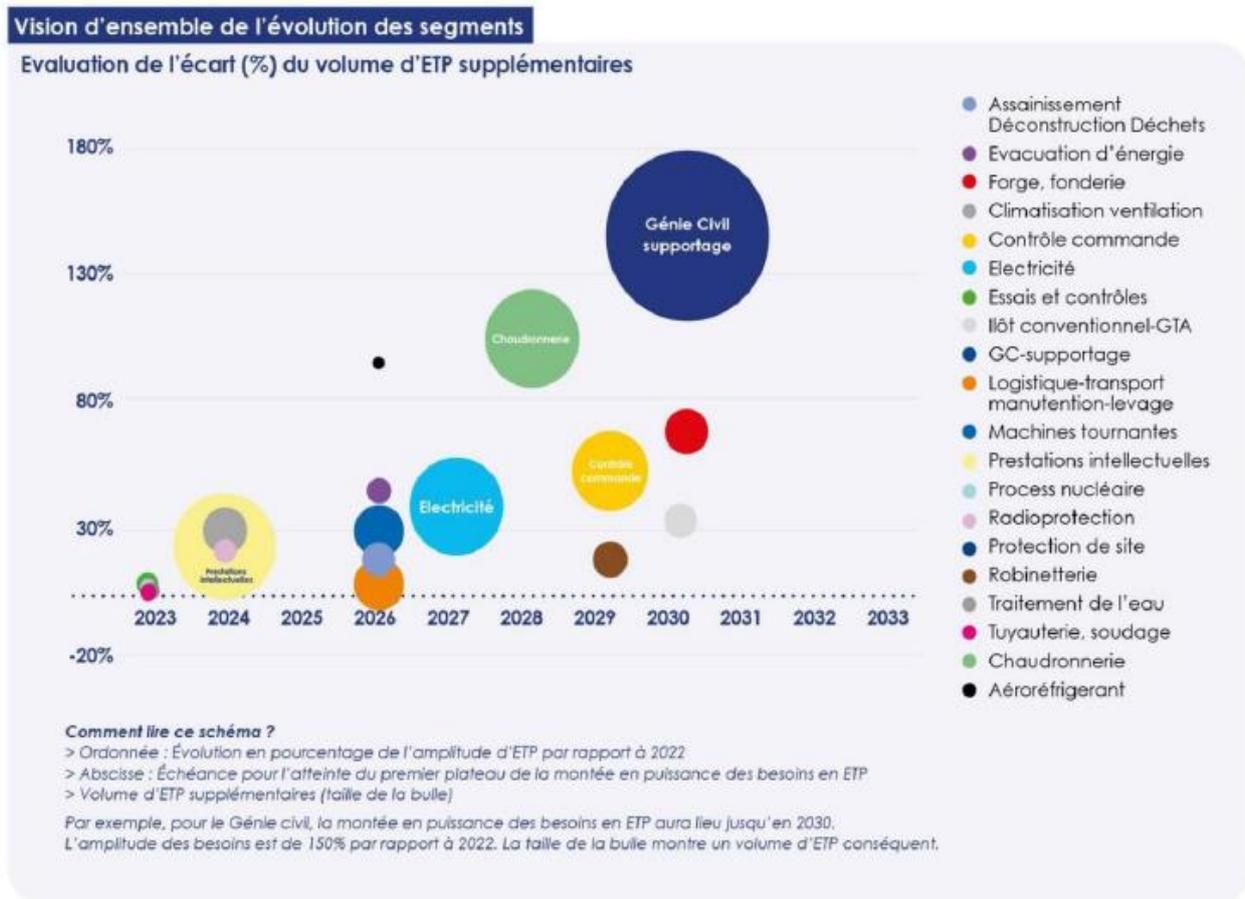


**Figure 15 Estimated total number of FTEs on direct jobs in the French nuclear sector – directly taken from the original report. (GIFEN, 2023)**



The above-mentioned number is extrapolated to 100 000 FTE recruitments for the complete nuclear sector based on 220 000 jobs.

Figure 16 below shows the growth of the respective segments on a timeline. The Y-axis illustrates the percentage growth compared to 2022, the x-axis indicates the deadline for reaching first plateau regarding the ramp-up in FTE and the bubble size indicates the number of additional FTEs. The biggest amount of additional FTEs is expected in the segments civil engineering support, boiler making and electricity. This illustrates the need for both nuclear experts and vocational and technical skilled workers.

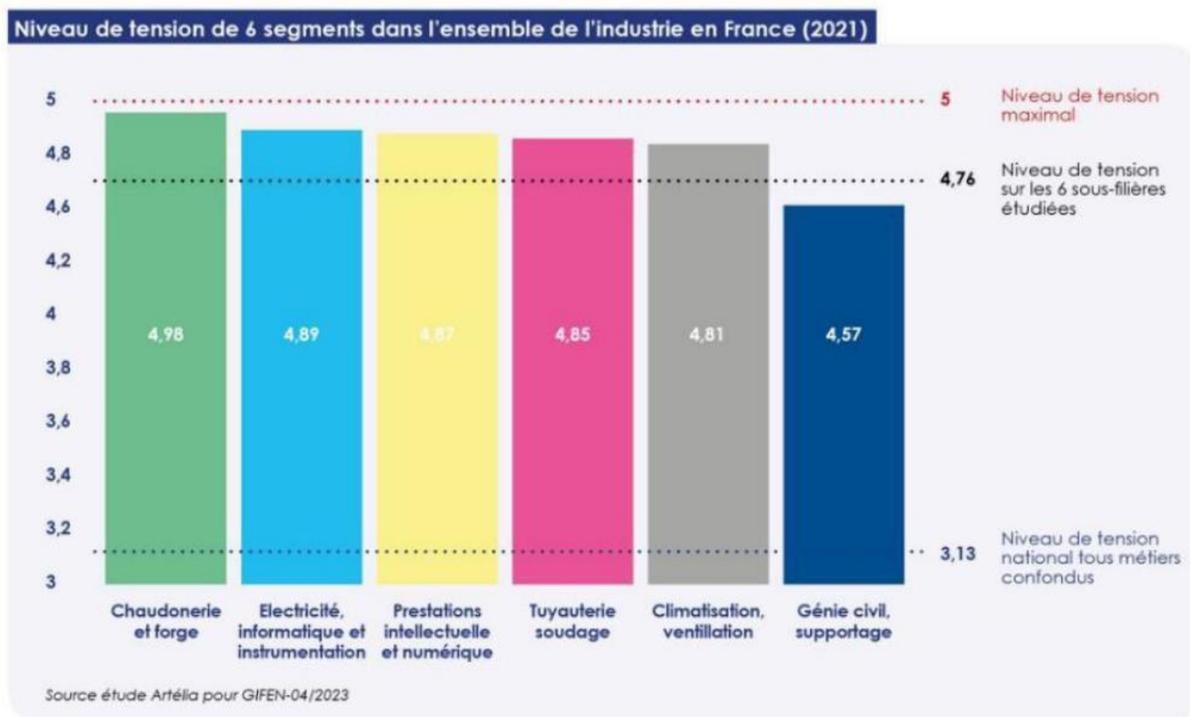


**Figure 16 Expected growth of the segments in function of the timeline – directly taken from the original report. (GIFEN, 2023)**

Detailed information for each segment like the expected growth in FTEs and required skills (top 10 jobs needed) are presented in the original report.



Figure 17, presented below, shows the tension level for 6 industry sectors, blacksmithing and forging; electricity, IT and instrumentation, Intellectual and numerical services, piping and welding, HVAC, and civil engineering, for which the nuclear sectors is competing with other industries. It is clear, that the level of tension is well above the national average and reaching values near the maximum of the scale.



**Figure 17 Tension level for 6 segments of the industry in France - directly taken from the original report. (GIFEN, 2023)**

The report states that the fact that the nuclear industry is part of the larger industrial system can't be ignored and forces the nuclear industry to consider the competition with other industries and the need to coordinate with each other. Working on the attractiveness and efficiency of the nuclear sector is therefore important.



### 2.2.2.5 Bulgaria

Currently, Kozloduy units 1 to 4 are being decommissioned while units 5 to 6 are in long term operation. The Bulgarian government is investigating a possible construction of a second nuclear power plant in Belene and adding more capacity at the Kozloduy NPP site. Based on this information the need for highly qualified employees is estimated and described in the report. (Bulgarian Nuclear Regulatory Agency, 2022) In Table 4 below, the staff need for the LTO of Kozloduy unit 5 and 6 and for the State Enterprise 'Radioactive Waste' are tabulated.

**Table 4 Human resources needs for the period 2021-2032 for the LTO of Kozloduy NPP AED and the State Enterprise 'Radioactive Waste' – summarised from the original report. (Bulgarian Nuclear Regulatory Agency, 2022)**

<b>Educational degree</b>	<b>Speciality</b>	<b>Kozloduy NPP AED</b>	<b>State Enterprise 'Radioactive Waste'</b>
MSc	Nuclear Energy	76	75
	Electrical Power Engineering and Electrical Equipment	30	22
	Mechanical and Instrument Engineering	29	22
	Physics	29	10
	Plasma physics and plasma technology		8
	Engineering physics		8
	Nuclear Energy and Technology	17	15
	Automation, Information and Control Engineering	17	11
	Machine Engineering Equipment and Technology	9	16
	Material Science		22
Chemical Technologies	9	11	
Electronics	6	8	



<b>Educational degree</b>	<b>Speciality</b>	<b>Kozloduy NPP AED</b>	<b>State Enterprise 'Radioactive Waste'</b>
	Information Technology	5	8
	Chemistry/Chemical Engineering	4	8
	Radiochemistry	-	8
	Radioecology		5
	Automation, Information and Control Computer Systems	-	8
BSc	Electric Power Engineering and Electrical Equipment	20	15
	Machine Engineering Equipment and Technology	17	11
	Mechanical and Instrument Engineering	16	11
	Automation, Information and Control Engineering	12	6
	Computer Control and Automation	10	6
	Computer Systems and Technology	6	6
	Engineering Chemistry and Advanced Materials	4	5
Secondary vocational	Electrical Power Engineering	213	44
	Technology of Machine Engineering	190	110
	Thermotechnics – hvac	100	40
	Automated Systems	102	34
	Automation of Continuous Production		18
	Technology of Inorganic Substances	73	33
	Computer Engineering and Technology	48	16



<b>Educational degree</b>	<b>Speciality</b>	<b>Kozloduy NPP AED</b>	<b>State Enterprise 'Radioactive Waste'</b>
	Nuclear Energy (including RAW management)	42	40
	Electrical Equipment in Production	27	20
	Industrial Electronics	12	8
	Ship Machines and Mechanisms	7	-
	Electrical systems	-	10
	Electrical Machinery and Apparatus	-	10
	Lifting and Transport Equipment Mounted on Road Vehicles	-	33

Table 4 excludes the HR needs for the Kozloduy NPP new builds. Here it is estimated that depending on the selected project between 502 and 1109 staff members are necessary to operate the new build. For the construction itself, on average 3000 people will be necessary. 25% of these people will be managers and engineers, 70% will be technically skilled workers and 5% will perform auxiliary activities. Other actors in the nuclear sector such as the National Centre of Radiobiology and Radiation Protection (NCRRP), the Regional Health Inspectorates (RHI) and the Bulgarian Nuclear Regulatory Agency (BNRA) report their challenges regarding recruitment but no numerical estimates for the coming period are made.

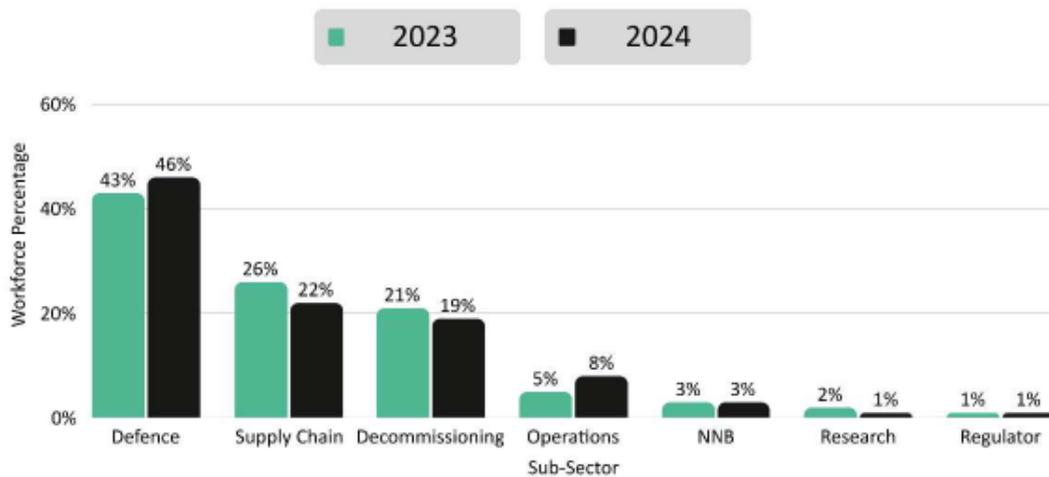
### **2.2.2.6 The United Kingdom**

The United Kingdom reports annually on the workforce development in both the civil and defence nuclear sector. (Cogent Skills, 2025; Nuclear Skills Delivery Group, 2024; Nuclear Skills Strategy Group, 2023; Nuclear Skills Strategy Group, 2021) The data presented in the following figures are representing the nuclear sector in the UK including the foreseen large scale new builds, the planned extensions of existing power plants, the defence operation, decommissioning and



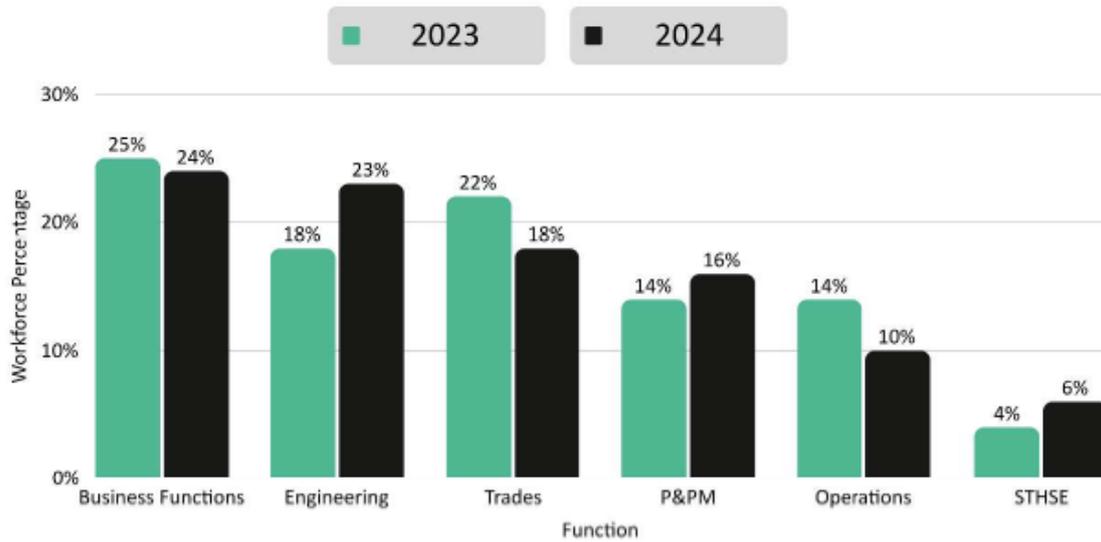
waste management activities, and possible investments in SMR/AMR reactors. (Cogent Skills, 2025)

The current workforce is estimated at 96 000 showing a 15% increase from 2023 data. The distribution of the workforce between defence and civil sector is roughly evenly distributed with 46% working in defence and 54% working in the civil sector. A further division of the workforce in the civil subsectors is shown in Figure 18 below.



**Figure 18 The distribution of the workforce between the civil sub-sectors in 2023 and 2024 – directly taken from the original report. (Cogent Skills, 2025)**

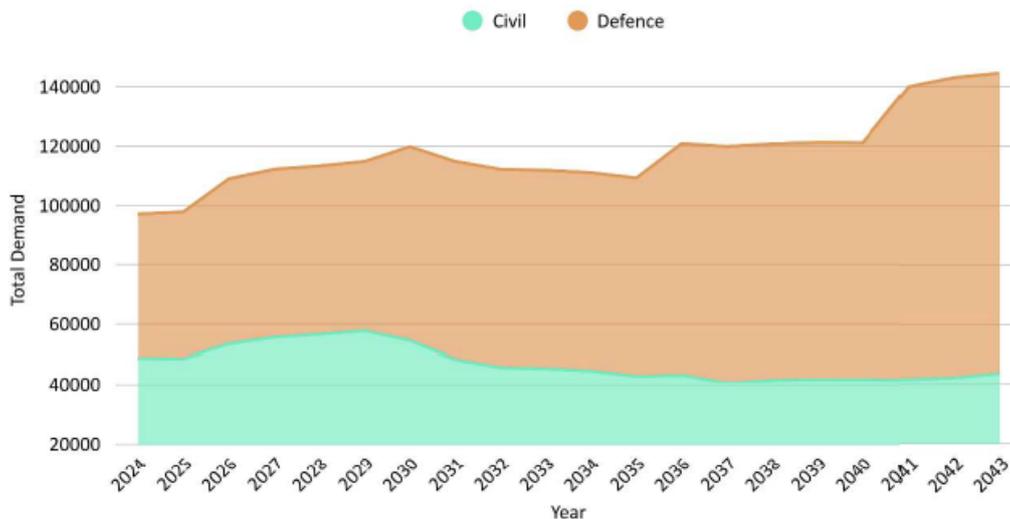
The breakdown in terms of job classification, called functions, is presented in Figure 19 on the next page. The functions are Business, Engineering, Trades, Project and Programme Management (P&PM), Operations and Science, Technical, Health, Safety and Environment (STHSE). A more detailed overview of the subdivisions of these functions is available in Appendix A1 Low Level Resource Codes of the Cogent Skills report. (Cogent Skills, 2025)



**Figure 19 The workforce distribution over the functions– directly taken from the original report. (Cogent Skills, 2025)**

Additional detailed data on the type of recruitment, the number of leavers, the distribution of workforce in the regions of the UK, level, gender, age, disability, and equality, diversity and inclusion are presented in the last UK report. (Cogent Skills, 2025)

The total workforce demand is presented in Figure 20 below. This demand is based on estimations of the major actors and modelling for the civil new build. (Cogent Skills, 2025)



**Figure 20 The modelled workforce demand in the coming years – directly taken from the original report. (Cogent Skills, 2025)**



**Table 5 Gap analysis of workforce demand as function – adapted from the original report.  
(Cogent Skills, 2025)**

Function	Supply	demand			
	2024	2024	2030	2035	2040
<b>Business</b>	23,143	24,697	29,785	29,363	31,665
<b>Engineering</b>	22,598	21,504	27,231	26,319	29,469
<b>P&amp;PM</b>	15,600	13,844	15,062	13,834	14,516
<b>STSHE</b>	6,125	4,355	5,539	5,183	5,614
<b>Operations</b>	10,159	9,289	12,758	8,905	9,705
<b>Trades</b>	17,996	23,544	29,511	27,529	30,311

In Table 5 above, a comparison is made with the demand and supply of the workforce. This table shows that the biggest increase in workforce is expected for the business, engineering and trades functions. For the functions engineering, P&PM, operations and STSHE the current supply is more than enough to meet the current demand. For the functions P&PM, STSHE and operations this trend remains during the whole period.

As for the current workforce data, more detailed data on the workforce demand including the distribution between the sub-sectors and regions is available in the original report. (Cogent Skills, 2025)

Furthermore, the Cogent Skills report mentions the importance of an effective and unified job classification, upskilling beyond formal education as part of the workforce assessment, the importance of detailed nuclear workforce assessment data including details on mobility, leavers, and the supply chain, the added value of dynamic modelling and the need to identify critical skills. (Cogent Skills, 2025)

### **2.2.2.7 Poland**

Poland is taking the first steps in including nuclear energy in their energy mix. The Polish nuclear program scheduled the commissioning of their first reactor for 2033, which was recently rescheduled for 2036. (Ministerstwo Klimatu i Srodowiska, 2023; World Nuclear Association, 2025) By 2044, six nuclear power plants should be deployed. (Ministerstwo Klimatu i Srodowiska, 2023) Based on



the Polish Nuclear Energy Program (PPEJ) and their plan for the development of human resources for the nuclear energy sector, an increase in employees in the nuclear sector is expected.

The department of energy, part of the Ministry of Energy and Environment, expects a growth in their department from 22 positions (in 2023) to 49 positions in 2032. The National Atomic Energy Agency, the regulatory authority, is increasing their workforce from 27 to 110 positions specific positions for the implementation of the PPEJ by 2055. The Office of Technical Inspection will be needing 46 people in the preparation phase, 72 people in the construction phase, 98 people in the start-up phase and 94 people in the operation phase. Although, an increase in the workforce demand is clear, the employees behind these numbers could work in different phases. The operator of the power plants, Polskie Elektrownie Jądrowe (PEJ), reports an increase in employment from 355 employees in 2023 to 1871 employees in 2035 during the exploitation phase. A more detailed overview is presented in Table 6 on the next pages.



**Table 6 Estimated employment development for the program and operation of a three-unit nuclear power plant – translated from the original report. (Ministerstwo Klimatu i Srodowiska, 2023)**

No.	Project phase Year of implementation/ Specification	Design			Construction								Exploitation	
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	The whole program	355	684	901	976	978	1041	1266	1513	1732	1848	1975	1917	1871
1	Program organisation	355	684	901	976	978	967	948	944	920	894	879	740	688
1.1	Leadership & administration	20	27	27	27	27	27	27	27	19	19	18	11	11
1.2	Program and supervision area	124	218	292	320	306	291	293	288	266	230	214	148	125
1.3	Program integration area	73	179	218	229	227	219	207	195	181	141	122	72	55
1.4	Nuclear development area	25	52	118	139	150	161	161	177	200	250	285	277	265
1.5	Legal, commercial and financial area	45	65	67	62	63	60	59	58	58	50	50	50	50
1.6	Corporate operations area	68	146	180	201	205	208	201	198	197	197	191	185	183
2	Operational organisation	-	-	-	-	-	74	318	569	812	954	1096	1177	1183



2.1	Nuclear power plant management	-	-	-	-	-	1	5	7	11	11	14	19	19
2.2	Nuclear affairs office	-	-	-	-	-	-	-	-	-	-	-	-	-
2.3	Nuclear power plant office	-	-	-	-	-	-	-	-	-	-	-	-	-
2.4	Block 1	-	-	-	-	-	73	240	249	315	582	388	388	388
2.5	Block 2	-	-	-	-	-	-	73	240	249	313	382	388	388
2.6	Block 3	-	-	-	-	-	-	-	73	240	249	313	382	388
2.7	Legal and financial office	-	-	-	-	-	-	-	-	-	-	-	-	-
2.8	Corporate Operations area	-	-	-	-	-	-	-	-	-	-	-	-	-



These numbers only represent the employment needs for the first nuclear power plant and do not consider supplier requirements related to the plant's technical construction, nor the needs of the regulatory body.

In support of the developing nuclear energy sector, also the research institutes Central Laboratory for Cardiovascular Protection (CLoP), the institute of Nuclear Chemistry and Technology (ICHTJ) and the National Centre for Nuclear Research (NCBJ) predict and increased employment of specialists in the coming years. Table 7 below shows the number of additional employees each period.

**Table 7 Development of employment in the relevant research centres - translated from the original report. (Ministerstwo Klimatu i Środowiska, 2023)**

<b>Year of employment/ number of new employees</b>	<b>2023 -24</b>	<b>2025- 26</b>	<b>2028- 29</b>	<b>2030- 32</b>	<b>2032 -</b>	<b>Total</b>
CLoP	7	20	36	55	30	148
ICHTJ	55	22	16	30	32	135
NCBJ	20	30	44	52	32	160

Also the waste management organisation, Zakład Unieszkodliwiania Odpadów Promieniotwórczych (ZUOP) needs to expand to facilitate the expected development of the nuclear energy sector in Poland. Currently, 9 specialists are employed which will be raised to 90 specialists by the commissioning of the new surface repository.

### **2.2.3 Comparative analysis of the nuclear sector needs and other European sectors**

As mentioned in several European nuclear workforce assessments presented in the previous part 2.2.2 Main outcomes of the European national nuclear workforce assessments, the nuclear sector will be competing with other sectors for qualified employees. To get an initial idea, the workforce demand of the European hydrogen sector and the European offshore renewable energy sector are summarised.



The workforce demand of the European hydrogen sector was mapped by performing 93 interviews in 19 countries with partners of the whole hydrogen industry supplemented with desk top research. (European Hydrogen Skills Alliance, 2023) 913 occupational profiles were identified. The profiles were linked with the ESCO, EQF and the 3-level H<sub>2</sub> knowledge scale required for each profile. Each profile was also categorised in one of the following three categories namely 'Current', 'Missing' and 'Future'. The profiles in the 'Current' category are the profiles currently employed in the hydrogen sector, the 'Missing' category are those profiles which are hard to recruit due to a shortage of availability. The 'Future' job profiles will be in demand in the coming years. The complete list available in the hydrogen report as Annex 6 – Lists of Current, Missing and Future Hydrogen Occupational Profiles, and is added to the annex of this report: ANNEX II List of current, missing and future hydrogen occupational profiles.

Within each of the three categories, identical or similar job profiles as necessary for the nuclear sector are listed. More important, the hydrogen report also mentions a list of occupation in high demand which is presented on the next pages. Many job profiles mentioned in the European nuclear workforce assessments are presented in the hydrogen list including engineering profiles, (project) management profiles but also profiles identified as critical for the nuclear sector such as electronics, civil and other engineers, lab technicians, maintenance technicians, construction technicians, draftsmen, and welding, fitting and installation technicians, and possibly many others.



214 - Engineering professionals (excluding electrotechnology)	215 - Electrotechnology engineers	311 - Physical and engineering science technicians	210 Project Managers
Balance of plant and equipment engineer	Automation engineer	Assembly technician	Design manager
Biochemical engineer	Auxiliary electrical and mechanical equipment engineer (Balance of Plant)	Automation technician	Development and deployment project manager
Carbon capture and storage professionals	Baseload engineer	CCUS technician	Engineering project manager
Chemical and process Engineer	Power electronics engineer	Certifications specialist	EPC Project manager
Chemical engineer	Electrical design engineer – electrolyzers	Chemical lab assistant	Experienced and junior project manager
Civil engineer	Electrical engineer	Chemical production technician	Green Fuel project manager
Commissioning engineer	Electrochemical engineer	Commissioning technician	Group leader
Construction engineer	Electrolysers engineer	compressors, gas storage technician	H2 production manager
Design engineer	Electronics engineer	Construction technician	Knowledge manager
District heating engineer	Energy planning engineer	Draftsmen	Product manager
Engine development engineer	Energy production and transmission	Electrical technician	Program manager
Infrastructure repurposing engineer	System integration, process reliability engineer	Electrochemical technician	Project and product developers
Environment engineer	engineer specialized in electrolysers, fuel cells	Electrolysers and fuel cell technician	Project Developer
EPC contracting expert	EV engineer	Fire test technician	Project lead infrastructure
Expert in fires, explosions and contamination	Fuel cell engineer	Foreman	Project manager in chemical process
Expert in fuel conversion	Grid management, regulations	Fuel cell mobility technician	Leaders of working groups
Fuel cells engineer	Grid operation specialist	H2 production facilities technician	Project manager planning
Gas facilities construction Project manager	High voltage electrical engineer	Health and safety technician	Project Manager, developer
H2 and ammonia production engineer	Interconnections specialist (onshore – offshore)	Installation and operation technician	Gas industrial process project manager
H2 liquification, compression, transport and Storage	Renewable energy engineer	Laboratory technician	Technical design Project manager
H2 mobility engineer	<b>243 - Sales, marketing and public relations professionals</b>	Maintenance technician	Technology development project manager
H2 new technology, innovation	Ammonia trader	Material science technician	<b>112 - Managing directors &amp; chief executives</b>
H2 specialist, storage, gases, high pressure	Analyst	Mechanic	Area Manager
Hazardous materials management engineer	Business developer	Mechatronics technician	CEO
Hydraulic engineer	Commercialization professional	On-site technician	COO
Industrial engineer	Communication and permitting specialist	Operation and maintenance technician	CTO
International standards expert	Communication expert	port infrastructure operation, bunkering, storage, and support logistics	Development manager
Lead engineer	Demand supply side response specialist	Production technician	Directors
Machine engineer	Energy export specialist	Risk and safety technician	General director
Management engineer	Energy market professional	Service technician	General manager
Manufacturing engineer	H2 global market expert and H2 traders	Ship technician	Manager
Marine engineer	International business developer	Technical designer	Senior officials manager
Marine engines expert	Land access and reservation specialist	Test technician	Technical department manager
Marine infrastructure engineer	Market segmentation manager	Welding, fitting and installation technician	Technical director

**Figure 21 List of occupation in high demand for the EU hydrogen sector, part I of II – directly taken from the original report. (European Hydrogen Skills Alliance, 2023)**



Material science engineer	Offshore bidding specialist	<b>211 - Physical and earth science professionals</b>	<b>241 - Economics &amp; Finance</b>
Measurement, instrumentation engineer	Procurement specialist	Application and Process engineer	Accountant
Mechanical and compression engineer	Sales professional	Ecologist	Economist
Mechatronics engineer	Sector coupling specialist and electricity market expert	Fuel cells design engineer	Economist and modelling specialist
Methods engineer	Strategic marketing leader	Geologist	Economy and finances specialist
Operation and maintenance engineer	Supply chain specialist	H2 and fuel cell research and development	Energy market expert, Economist
Permitting, authorization and approval professional	Sustainability and energy transition professional	Industrial processes engineer	expert of electricity markets
Pipeline engineer	Technical sales representative	Industrial, and processes engineer	Expert of energy markets
Planning, design, process engineer	Technology deployment and commercialization specialist	Masterial and industrial science researchers	Finance specialist
Power2X technology specialist	<b>313 - Process control technicians</b>	Material and process engineer	Funding and finance specialist
Process engineer	Assembly technician	Material engineering	H2 finance expert
Product designer	Automation technician	Nanotechnology specialist	Independents Energy market specialist
Production, supply engineer	Commissioning technician	Physicist	Statistics professional
Project Developer	Construction and installation technicians	Process and chemical engineer, risk & safety	<b>242 - Administration professionals</b>
Quality engineer	Electrolysers operation and maintenance technician	Production engineer	Administration professional
Refuelling stations engineer	Installation technician	Research and development	Communication and marketing professional
Research and development expert	Instrumentation technician	Reservoir engineer	Communication specialist
Emerging technology specialist	Maintenance technician	Storage engineer	HR
Reservoir engineer	Material science, and perceiving technician	Subsurface microbiologist	Local public responsible projects for permitting.
Risk and safety engineer	Operation technician	Systems installation and operation engineer	Public affairs and regulations specialist
Sales engineer	Process and material technician	<b>122 - Sales, marketing and development managers</b>	Public strategy specialist
Senior operational manager	Process technician	Business development manager	Responsible of regulatory affairs
Senior project advisor	Quality inspector	Business Manager	Strategy advisor
Service engineer	Renewable energies market specialist	H2 Value Chain Manager	
Simulation engineer	System operation and maintenance technician	Manager of Business development	
Standards specialist	Maintenance, operation, refuelling stations technician	Marketing and communication Manager	
Expert in H2 hazards and safety	Power electronics, conversion, instrumentation technician	Purchase and sourcing manager	
Technology mapping specialist	Technician of system integration, operation reliability, process	Sales and marketing manager	
Test engineer	Test technician	Supply chain manager	

**Figure 22 List of occupation in high demand for the EU hydrogen sector, part II of II – directly taken from the original report. (European Hydrogen Skills Alliance, 2023)**



To address the skill gaps in the hydrogen sector three main solutions are proposed namely the development of collective and collaborative training programmes, both with universities and actors in the sector, upskilling and reskilling of workers from other sectors, and hiring from abroad.

A similar analysis was performed by the European offshore renewable energy sector. Based on desk top research, stakeholder consultation and an analysis of job vacancies in the sector they reported occupational profiles linked with the ESCO, that are high demand for their sector. The list of most demanded occupational profiles is presented in Figure 23 below.

A/A	Broad groups of occupational profiles (ESCO Hierarchy Levels 1 & 2)		Job vacancies	
			Number <sup>15</sup>	Share
1	<b>ESCO-1</b>	<b>Managers</b>	<b>198</b>	<b>20,2%</b>
	ESCO-11	Chief executives, senior officials and legislators	7	0,7%
	ESCO-12	Administrative and commercial managers	171	17,5%
	ESCO-13	Production and specialized services managers	19	1,9%
	ESCO-14	Hospitality, retail and other services managers	1	0,1%
2	<b>ESCO-2</b>	<b>Professionals</b>	<b>542</b>	<b>55,3%</b>
	ESCO-21	Science and engineering professionals	394	40,2%
	ESCO-24	Business and administration professionals	52	5,3%
	ESCO-25	Information and communications technology professionals	85	8,7%
	ESCO-26	Legal, social and cultural professionals	11	1,1%
3	<b>ESCO-3</b>	<b>Technicians and associate professionals</b>	<b>189</b>	<b>19,3%</b>
	ESCO-31	Science and engineering associate professionals	126	12,9%
	ESCO-32	Health associate professionals	1	0,1%
	ESCO-33	Business and administration associate professionals	62	6,3%
4	<b>ESCO-4</b>	<b>Clerical support workers</b>	<b>5</b>	<b>0,5%</b>
	ESCO-42	Customer services clerks	2	0,2%
	ESCO-43	Numerical and material recording clerks	3	0,3%
5	<b>ESCO-7</b>	<b>Craft and related trades workers</b>	<b>20</b>	<b>2%</b>
	ESCO-71	Building and related trades workers, excluding electricians	2	0,2%
	ESCO-72	Metal, machinery and related trades workers	4	0,4%
	ESCO-74	Electrical and electronic trades workers	13	1,3%
	ESCO-75	Food processing, wood working, garment and other craft and related trades workers	1	0,1%
6	<b>ESCO-8</b>	<b>Plant and machine operators and assemblers</b>	<b>6</b>	<b>0,6%</b>
	ESCO-82	Assemblers	6	0,6%
7	<b>ESCO-9</b>	<b>Elementary occupations</b>	<b>5</b>	<b>0,5%</b>
	ESCO-93	Labourers in mining, construction, manufacturing and transport	5	0,5%

**Figure 23 EU offshore renewable energy sector's most in demand occupational profiles – directly taken from the original report. (Sdoukopoulos, 2024)**

Again, the same occupational profiles that show up are also necessary in the nuclear sector.



### 3 CONCLUSIONS

The analysis of 21 (nuclear) workforce assessments across Europe and beyond reveals a sector at a critical juncture. While nuclear technologies are gaining renewed strategic importance, driven by energy security and climate goals, as well as innovation in healthcare and other industries, the sector faces a significant challenge in ensuring a skilled and sustainable workforce.

The findings of this deliverable underscore the need for a coordinated, forward-looking workforce planning. Many assessments demonstrate strong methodologies and stakeholder engagement, but systemic gaps remain in data standardization, long-term forecasting, and cross-sectoral collaboration. Without targeted action, the risk of a skills shortage could undermine Europe's nuclear ambitions.

To address these challenges and support the development of a robust European Nuclear Skills Strategy, the following actions are recommended:

#### 1. **Establish a harmonized job classification framework**

Promote the adoption of standardized taxonomies (e.g., ESCO, ISCO, OECD-NEA) across Member States to enable comparability and interoperability of workforce data.

#### 2. **Implement recurring workforce assessments**

Encourage national and regional authorities to conduct regular, structured workforce assessments to monitor trends, anticipate gaps, and inform policy makers and regional authorities.

Use dynamic modelling tools to anticipate workforce needs under different policy and technology deployment scenarios, including SMRs, fusion, and decommissioning.

Evaluate the collected data with project owners and other stakeholders to validate the data.

#### 3. **Strengthen stakeholder collaboration**

Facilitate cross-sectoral partnerships among industry, academia, regulators, and government to align workforce planning with strategic objectives and ensure shared ownership.



#### **4. Invest in education and training pipelines**

Support targeted initiatives to attract young people into nuclear-related STEM and vocational pathways, including scholarships and apprenticeships.

#### **5. Integrate workforce planning with national policy**

Align workforce strategies with broader national and EU-level energy, health, and industrial policies to ensure coherence and long-term sustainability.

#### **6. Create an attractiveness strategy**

This strategy should look both at attracting junior professionals but also senior professionals from other sectors who can be re- and upskilled.

#### **7. Create a European-level governance mechanism**

Establish a coordinating body or platform to oversee the implementation of the nuclear skills strategy, facilitate knowledge exchange, and monitor progress across Member States.

These recommendations aim to support policymakers in building a resilient and future-ready nuclear workforce. By acting now, Europe can secure the human capital needed to deliver on its nuclear ambitions and maintain global leadership in safe, innovative, and sustainable nuclear technologies.



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## 5 ANNEX I COMPLETE LIST OF 'BEST PRACTICES' AND 'WEAKNESSES'

**Table 8 Overview of the identified best practices.**

<b>Best practices</b>	<b>Category</b>
Collecting data for HR needs and supply at national level.	workforce assessment 4 steps (map current workforce, future demands, map HR supply and gap analysis)
Competence mapping, knowledge transfer programs, education pipeline monitoring, stakeholder collaboration, and international cooperation are key best practices.	stakeholder collaboration
The approach taken to workforce assessment must be agile and flexible.	agile and flexible
Need to align the NWA to other sector's labour market intelligence, to better understand the challenges of skills for nuclear in a wider industrial context (to understand the opportunities and challenges for transferable skills).	transferable skills
The report makes use of different data sources; existing HR data, interviews and surveys and public data, to pull together a complete picture of the question.	different data sources
Develop 5-pillar framework, define 7 strategic objectives and align with the pillars (in a matrix)	define objectives
Align WFP with national security and infrastructure priorities	align with national policy
Use scenario-based and future-focused planning to anticipate demand	scenario-based approach
Map capability needs against timeline	scenario-based approach
Monitor and adjust continuously	Monitor and adjust continuously
the sharing of 10-year workload plans is the foundation of the work; update annually	stakeholder collaboration
the sharing of 10-year workload plans is the foundation of the work; update annually	Monitor and adjust continuously
the establishment of working groups bringing together nuclear operators and suppliers enables collaborative efforts on resource planning challenges;	stakeholder collaboration
the implementation of a dedicated modelling tool provides a quantified basis for discussions;	use modelling
Integration with training systems – map training provision against needs, engage training providers early	workforce assessment 4 steps (map current workforce, future



	demands, map HR supply and gap analysis)
companies recognize GIFEN as a trusted third party for the secure management of data (workload, pricing models, etc.);	atmosphere of trust
a communication program around the results encourages dialogue on the ramp-up topic;	stakeholder collaboration
Scenario analysis – develop multiple scenarios, identify worst-case bottlenecks	scenario-based approach
Secure stakeholder commitment early	stakeholder collaboration
Standardize data collection	Standardize data collection
Validate data through expert review	validate data
Integrate industrial capacity with HR planning	scenario-based approach
Link WFP to national policy	align with national policy
Monitor continuously	Monitor and adjust continuously
Crucial actions remain the creation of a governance structure	atmosphere of trust
regularly updating HR surveys	Monitor and adjust continuously
linking them with education programme overviews	Standardize data collection
mapping current and future competence needs	workforce assessment 4 steps (map current workforce, future demands, map HR supply and gap analysis)
Using the European ESCO tool for identifying job profiles	Standardize data collection
the crucial actions include mapping supply and demand	workforce assessment 4 steps (map current workforce, future demands, map HR supply and gap analysis)
conducting stakeholder surveys	Standardize data collection
modelling policy impacts	align with national policy
cross-government and industry collaboration is essential for success	stakeholder collaboration
Need for a comprehensive multisectoral multistakeholder governance mechanism	stakeholder collaboration
The collection of a wide variety of data and the work carried out to obtain the most reliable estimate possible	different data sources
Plan by phases and use IAEA benchmarks. Structure HR planning around IAEA Milestones and typical owner/operator divisions; treat workforce planning as part of the HR strategy.	workforce assessment 4 steps (map current workforce, future demands, map HR supply and gap analysis)



Make plans “living documents” with a 10–15-year horizon. Update regularly and align to programme milestones.	Monitor and adjust continuously
Form a strategic partnership early. Pair with an experienced country/operator to reduce burden and import know-how.	stakeholder collaboration
Conduct a national workforce survey to assess available competencies.	Monitor and adjust continuously
Inventory and review education & training programmes (HE, VET) against current/future needs.	workforce assessment 4 steps (map current workforce, future demands, map HR supply and gap analysis)
Identify competency gaps that pose programme risks.	workforce assessment 4 steps (map current workforce, future demands, map HR supply and gap analysis)
Define programme objectives early (fleet size, contracting model) to size demand.	Monitor and adjust continuously
Estimate regulator staffing for planning (order-of-magnitude 100–150 in Phase 1) and update by phase.	Monitor and adjust continuously
Assess impact on other national projects’ labour markets to avoid conflicts.	stakeholder collaboration
Crucial actions are periodic workforce surveys	Monitor and adjust continuously
building a governance mechanism	stakeholder collaboration
Partnership and dialogue among state, employers, academia, NGOs	stakeholder collaboration
Continuously examine the extent to which demand can be met by the current education and training infrastructure.	Monitor and adjust continuously

**Table 9 Overview of the identified weaknesses**

<b>Limitations</b>	<b>Category</b>
Limited participation in the surveys	Lack of data
Limited granularity of HR needs	lack of standard job classification
Data gaps (fewer responses from industry)	Lack of data
lack of standard job classification	lack of standard job classification
short planning horizons were noted	lack of long-term prospect
Uncertainty on the distribution of manufacturing centres for SMRs	lack of long-term prospect
There is always a lag in the provision of data	data not up to date



further work to be undertaken to develop accurate workforce profiles for some of the new build projects	future job profiles not clear
Limited quantification	Lack of data
Job classification mainly based on education level	lack of standard job classification
Needs will evolve over time	future job profiles not clear
End-of-period (10-year) evaluations should be interpreted with caution due to greater uncertainty	lack of long-term prospect
Trends are more important than precise figures, especially toward the end of the period	lack of long-term prospect
Data coverage	lack of data
Dependence on declared forecasts	lack of long-term prospect
Limited international workforce mobility modelling	lack of data
Training capacity data granularity	Lack of data
No financial implications for suppliers to meet possible staffing needs provided.	Lack of data
Limited data on gender, mobility, and regional trends.	Lack of data
Detailed information on the workforce requirements for new technologies, most notably small modular reactors, is still scarce	future job profiles not clear
incomplete survey participation	Lack of data
lack of detailed technical skills records	future job profiles not clear
Limited quantification of skills needs based job advertisements	future job profiles not clear
insufficient standardized workforce data collection	Lack of data
Data on workforce demographics and DEI outcomes was hindered by low response rates	lack of data
lack of standardized frameworks	lack of standard job classification
privacy concerns	privacy concerns
Demand estimates are based on fairly loose ideas of future need	lack of long-term prospect
numeration: The size and profile of this workforce is unknown. While varied approaches to measure the workforce and quantify its size have been documented in the literature, the evidence indicates a gap in the use of standardized definitions and limited data availability, even in high-income countries.	Lack of data
Heterogeneity: Commonly, personnel performing the EPHFs are multiskilled and perform multiple functions, from management to clinical roles, which may hinder attempts to profile them. They can have differing educational backgrounds, job titles, skills and responsibilities,	lack of standard job classification



may work at different levels of care, and can even be located outside the traditional health and care sector.	
Intercountry variability	lack of standard job classification
heterogeneity in the basic data	Lack of data
Coordination gaps across stakeholders. The report explicitly points to the need for “appropriate coordination” between programme actors—i.e., this is a current fragility.	Lack of coordination
Data/coverage gaps in the current diagnosis. University capacity tables are “own elaboration based on the university’s declaration,” and the IAEA-recommended national workforce survey is listed as a Phase-1 task—implying it has not yet been executed.	Lack of data



## 6 ANNEX II LIST OF CURRENT, MISSING AND FUTURE HYDROGEN OCCUPATIONAL PROFILES

The figures below are directly copied from the original report. (European Hydrogen Skills Alliance, 2023)

Current Hydrogen Occupational Profiles		
Manager	Electrical & chemical	Industrial
Senior executive manager Project manager Scientific advisor Technical director Technical design project manager Engineering project manager EPC project manager Construction, project manager Operation project manager Project advisor	Chemical engineer Electrochemical engineers Electrical engineer Automation engineers Electrical design engineers Electrical and power electronics Electrical, renewables engineer High voltage electrical engineer Electrolysis engineers Fuel cell engineer Refuelling stations engineers Simulation engineers H2 and ammonia production engineer H2 and fuel cell research and development Auxiliary electrical and mechanical equipment engineer	Industrial engineer Product design engineer Production engineer Quality engineer Design engineer Process engineer Development and integration engineers Material science engineers Precision engineers Reservoir engineers Certifications engineer
<b>Experts</b>		<b>Civil</b>
Energy storage expert Power2x technology specialists Nanotechnology specialist Physics expert Biomass expert CCUS expert R&D engineer Industrial science researcher Fires, explosions & contamination expert	<b>Mechanical</b>	Infrastructure engineers Civil engineer Construction engineers
<b>Environmental, HSE</b>	Vehicle architect Hydraulic engineer Mechanical engineer Maintenance engineers Engine development engineer	<b>Others</b>
Safety planning engineer Occupational hazards engineer Safety construction, operation engineer Environmental engineers	<b>Finance &amp; Economics</b>	Naval architects Marine engineer Drilling engineers Biomedical engineer Ship captain Geologist
<b>Commercial</b>	Economic modelling specialists Economist Finance specialist H2 finance experts Investment manager	<b>Technicians</b>
Account manager Technology deployment & commercialization specialist Energy demand and supply Business development manager Business developers Business and commercial manager International business developer Sales and marketing manager Sales engineer Technical-sales representative Supply chain manager Supply chain specialists Purchase and sourcing manager Purchaser	<b>Communication</b>	Electrochemical technician Electrical technicians Mechanical technicians Mechatronics technician Automation technicians Production technician Chemical lab assistant Laboratory technicians Maintenance technicians Material science technicians Process and precision technicians Installation coordinator Fire test technicians Safety technicians Service technician Plant operators Machine operators Test band operators Operation technicians Draftmen/"draughtsmen" Welder Pipefitter
<b>Administration</b>	<b>Policy &amp; Legal</b>	
Administrative manager Administration professional	Policy advocacy specialists Public affairs and regulations specialists Expert in regulatory affairs Legal affairs specialist Lawyer Permitting specialists	
	<b>Digitalization</b>	
	Analyst Web designer Software developer Data analytics professionals	



### Missing Hydrogen Occupational Profiles

Manager	Project Manager	Industrial
Senior executive manager Senior operational manager Senior technical manager Finance manager Knowledge manager R&D manager H2 business development manager Industrial process project manager Chemical project manager Gas project manager Green fuel project manager Business development manager Senior operational manager Purchase and sourcing manager Sales manager	Gas facilities construction manager Engineering project manager Industrial project manager Programme manager Project engineer H2 production project manager	System control engineer System integration engineers Process engineers Industrial engineer System engineers Materials engineer Methods engineer Service engineer Machine engineer Design engineers Simulation engineer Operation engineer Quality engineer
	<b>Electrical &amp; chemical</b> Fuel cell engineer Electrical engineer Electrochemical engineer Electric and electronics engineers Automation engineer Renewable energy engineers High voltage electrical engineer Electrolysers engineers Power electronics engineer Conversion, instrumentation engineer Energy planning engineer Electromechanical engineer H2 production engineers Chemical process engineer Chemical production engineer Chemical engineer Electrolysers researcher Fuel cell researcher	<b>Mechanical</b> Mechanical engineer Drilling engineers Maintenance engineers Pipeline engineers Reservoir engineers <b>Environmental, HSE</b> Environmental engineer Health safety and risk engineer Safety and hazards specialist Sustainability specialist
<b>Experts</b> Innovation expert H2 production expert H2 value chain expert Physics expert International standards expert Marine engines expert Biomass expert Energy markets expert EPC contracting expert Sector coupling expert	<b>Communication</b> Communication specialists Permitting specialists Marketing professionals Administration professional Public administration professional	<b>Digitalization</b> IT professionals IT specialist Data analytics professionals
<b>Other Engineering</b> Infrastructure repurposing engineer Backbone construction engineer Construction engineer Commissioning engineer Marine engineer District heating engineer Biomedical engineer CPM engineer R&D engineer CCUS professionals Geologist	<b>Policy &amp; Legal</b> Administration professional International administration staff Legal and regulations specialists Public relations specialist Public strategy specialist	<b>Others</b> Baseload specialist CCUS professional Innovation specialist Standards specialists Special application specialist Gas storage & high-pressure specialist Energy transition professional Operation optimization specialist Certifications specialist
<b>Commercial</b>	Economist	<b>Technicians</b>



Business development manager Business commercial professional Commercialization specialist Business development specialist Technology commercialization specialist Marketing manager Sales and commercial engineer International business developer Energy market professional International business developer energy market specialist Land access & reservation specialist Sector coupling specialist Ammonia trader	Funding and finance specialists Statistics specialist  <b>Maintenance</b>  Maintenance technician Mechanical technician Electrolysers maintenance technicians Service technician Construction technicians Commissioning technician Health and safety technicians  <b>Operation</b>  Operation & optimization specialist Operation and service technician Operation and service technician Operation reliability technicians Electrolysers operation technician system integration Technicians process reliability technician	Electronic technician Electrotechnician Mechatronics technician Electrical technicians Electrical and electronics technician Renewables technician Electrolysers maintenance technician Power electronics technician Conversion, instrumentation technician Electro-mechanical technician Chemical production technicians Production technician Mechanical technician System integration technicians Computer science technician Laboratory technicians Marine technician CCUS technicians
<b>Assembler</b>  Locksmith Foreman Assembly technician		

Future Hydrogen Occupational Profiles		
<b>Managers</b> Sales Manager Project manager Finance manager Knowledge manager H2 Project manager Business development manager Engineering project managers H2 Value Chain Manager communication Manager Sales and marketing manager Business development manager Technology development manager leaders of working groups Engineering project managers	<b>Electrical &amp; chemical</b> Electrical engineer Electrical, renewables engineer Electro-chemical engineer power electronics engineer electronics engineer conversion, instrumentation engineer Energy planning engineer Automation engineer System control engineer Renewables engineer Electrolysers engineer Fuel cells design engineer Robotics and production engineers Chemical engineer Chemical process engineer Chemical production engineer	<b>Industrial</b> H2 production engineers H2 and ammonia production engineer Industrial engineer Materials engineers Machine engineers Methods engineer Design engineer Production engineer Process engineer Production, supply engineer Application and Process engineer Storage engineers System integration engineer Systems design and retrofit engineer Systems installation engineer Mechanical engineers
<b>Experts</b> Expert in fuel conversion Material expert H2 production expert H2 global market & trading expert Energy storage expert Environmental expert EPC contracting expert International standards expert H2 finance experts	<b>Environmental, HSE</b>  Hazardous materials engineers Health, and safety design engineers Environment engineers  <b>Test &amp; Quality</b>	<b>Others Technical Engineering</b> Balance of plant specialist Interconnections specialists Grid operation specialists Operation optimization specialist Standards specialists



<p>R&amp;D technical experts Physics expert Technical experts in H2 hazards Research and development expert Power2X technology specialists Marine engines expert Biomass expert CCUS expert</p>	<p>Test engineer Quality engineer CPM engineer R&amp;D engineer Marine engineer Biomedical engineer</p>	<p>R&amp;D specialists Safety and hazards specialists Certification, permitting specialist Technology mapping specialists</p>
<p><b>Commercial Spe.</b></p> <p>commercialization specialist Offshore bidding specialists Land acquisition specialist Energy market specialist supply chain specialists Permitting specialist Communication specialists</p>	<p><b>Civil</b></p> <p>Construction engineer Infrastructure engineer Urban planning engineers Infrastructure engineers Marine infrastructure engineer</p>	<p><b>Digitalization</b></p> <p>IT specialist Digitalization specialist Artificial intelligence specialist Cybersecurity specialist IT and digitalization engineer software Engineers</p>
<p><b>Technicians</b></p> <p>Fuel cell mobility technicians Electrical technician Renewable energy technician Electromechanical technician Electro-chemical technicians Electronics technicians Chemical production technicians Chemical technician Fuel cell technician Electrolysers technician Support equipment Mechatronics technician</p>	<p><b>Policy &amp; Legal</b></p> <p>Economy and finances specialist renewable generation specialist Funding and finance specialist Economist Public policy specialists Public relations specialist Regulatory affairs specialist Public strategy specialist Legal and regulations specialists Lawyer</p>	<p><b>Industrial</b></p> <p>Process and material technicians System integration technician Process reliability technician Instrumentation technician Compressors technician Gas storage technicians power electronics technician instrumentation technician Production technician Materials technician Manufacturing technician On-site technician Commissioning technician Civil construction technician Equipment assembly technicians Process technician Mechanical technician H2 powertrain technician Ship technician Marine technician Mechanical technician CCUS technician</p>
<p><b>Environmental, HSE Technicians</b></p> <p>Safety technicians Risk and safety technicians Health and safety technicians Fire test technicians Test technician Quality technician</p>	<p><b>Maintenance technician</b></p> <p>Maintenance technician Service technician Refuelling stations maintenance technician Electrolysers maintenance technicians</p> <p><b>Operation &amp; Workers</b></p> <p>Operation technician Plant operator Operators of refuelling stations Electrolysers operator System operators Metal carpenter Fitting and installation technicians Production worker Welding technician Assembly technician Pipefitter</p>	



## 7 ANNEX III TRANSLATION DETAILS FOR NON-ENGLISH FIGURES AND TABLES

Figure 11 Expected growth of employees, expressed in FTE, in the small nuclear sector in both scenarios (scenario 1, left and scenario 2, right) – directly taken from the original report.

Original text	English version
Smalle nucleaire sector	Small nuclear sector
Max extern nucleair-bewust (tijdelijk)	Maximum external nuclear-aware (temporary)

Figure 12 Scarcity for technical occupational groups relevant for the nuclear sector. The bigger the scarcity index, the scarcer the profile is (ranging from very scarce (zeer krap), scarce (krap) to average (gemiddeld) – directly taken from the original report.

Original text	English version
Elektriciens en elektronicamonteurs	Electricians and electronics mechanics
Bouwarbeiders afbouw	Construction workers finishing
Productieleiders industrie en bouw	Production managers in industry and construction
Gespecialiseerde verpleegkundigen	Specialised nurses
Verpleegkundigen (mbo)	Nurses (secondary vocational education)
Managers productie	Production managers
Laboranten	Lab technicians
Medische vakspecialisten	Medical specialists
Artsen	Doctors
Bouwarbeiders ruwbouw	Construction workers structural work



Biologen en natuurwetenschappers	Biologists and natural scientists
(Zeer) krap	(Very) scarce
Gemiddeld	Average
Krapte-indicator	Scarcity index

Figure 13 Expected need of employees in the nuclear energy sector – directly taken from the original report. and Figure 14 Expected total number of FTEs for scenario 2 – directly taken from the original report.

<b>Original text</b>	<b>English version</b>
Nu	Now
Keten	Supply chain
KCB/bedrijfsduurverlenging	Nuclear power plant Borssele/long term operation
Bouwfase	Construction phase
Operationale fase	Operational phase

Figure 15 Estimated total number of FTEs on direct jobs in the French nuclear sector – directly taken from the original report.

<b>Original text</b>	<b>English version</b>
Estimation des besoins en ETP à 10 ans	Estimated FTE requirements over 10 years
Besoin de la filière	Need for the sector
Évolution naturelle des effectifs	Natural workforce evolution



Figure 16 Expected growth of the segments in function of the timeline – directly taken from the original report. and Figure 17 Tension level for 6 segments of the industry in France – directly taken from the original report.

<b>Original text</b>	<b>English version</b>
Vision d'ensemble de l'évolution des segments	Overview of segment Development
Évaluation de l'écart (%) du volume d'ETP supplémentaires	Assessment of the gap (%) in additional FTE volume
Assainissement Déconstruction Déchets	Decommissioning Deconstruction waste
Evacuation d'énergie	Evacuation of energy
Forge, fonderie	Forge, foundry
Climatisation ventilation	Air conditioning and ventilation (HVAC)
Contrôle commande	Control and command
Electricité	Electricity
Essais et contrôles	Tests and inspections
Ilôt conventionnel-GTA	Conventional island group, turbo alternator
GC-soutage	Civil engineering support
Logistique-transport Manutention-levage	Logistics, transport Handling, lifting
Machines tournantes	Rotating machinery
Prestations intellectuelles	Intellectual services
Process nucléaire	Nuclear process
Radioprotection	Radiation protection
Protection de site	Site protection
Robinetterie	taps and fitting



Traitement de l'eau	Water treatment
Tuyauterie, soudage	Piping, welding
Chaudronnerie	Boiler making
Aéroréfrigérant	Air cooler
Comment lire ce schema ?	How to read this diagram?
Ordonnée : Évolution en pourcentage de l'amplitude d'ETP par rapport à 2022	Ordinate (Y-axis) : Percentage change in FTE range compared to 2022
Abscisse : Échéance pour l'atteinte du premier plateau de la montée en puissance des besoins en ETP	Abscissa (X-axis) : Deadline for reaching the first plateau in the ramp-up of FTE needs.
Volume d'ETP supplémentaires (taille de la bulle)	Volume of additional FTEs (bubble size)
Par exemple, pour le Génie civil, la montée en puissance des besoins en ETP aura lieu jusqu'en 2030. L'amplitude des besoins est de 150% par rapport à 2022. La taille de la bulle montre un volume d'ETP conséquent.	For example, in civil engineering, the increase in FTE requirements will continue until 2030. The magnitude of needs is 150% compared to 2022. The size of the bubble shows a consequent volume of FTEs.
Niveau de tension de 6 segments dans l'ensemble de l'industrie en France	Tension level of 6 segments across the entire industry in France
Informatique et instrumentation	IT and instrumentation
Prestations numérique	Digital services
Niveau de tension maximal sur les 6 sous-fillières étudiées national tous métiers confondus	Tension level maximal of the six studied sub-sectors national across all professions

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