



Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition

Executive Summary
Policy Briefs

Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition – Executive Summary & Policy Briefs

European Commission
Directorate-General for Research and Innovation
Directorate C — Clean Planet
Unit C2 Clean Energy Transitions
Contact Dr Maria Georgiadou
Email Maria.Georgiadou@ec.europa.eu
RTD-PUBLICATIONS@ec.europa.eu
European Commission
B-1049 Brussels

Manuscript completed in December 2023
First edition

This document has been prepared for the European Commission, however it reflects the views only of the authors, and the European Commission shall not be liable for any consequence stemming from the reuse.

PDF	ISBN 978-92-68-10174-2	doi:10.2777/475784	KI-05-23-482-EN-N
-----	------------------------	--------------------	-------------------

Luxembourg: Publications Office of the European Union, 2024

© European Union, 2024



Reuse is authorised provided the source is acknowledged and the original meaning or message of the document is not distorted. The European Commission shall not be liable for any consequence stemming from the reuse. The reuse policy of European Commission documents is implemented by Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39).

For any use or reproduction of elements that are not owned by the European Union, permission may need to be sought directly from the respective rightholders.

Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition

Executive Summary Policy Briefs

Authors:

Karsten Gareis, Eriona Dashja, Tobias Hüsing, Petr Popov, Carola Schulz, **empirica**

Elizabeth Pollitzer, Hans M. Borchgrevink, **Portia**

Clemens Striebing, Martina Schraudner, Nathalie Voigt, **Fraunhofer-IAO CeRRI**

Stefan Gorgels, Christian Danne, Octavio Morales, Isabella Müller, **DIW-Econ**

Beatrix Hausner, Azadeh Badieijaryani, **ÖGUT**

Emilija Gligurovska, Mihaela Dimanoska, **GDCC**

Table of Contents

Executive Summary..... 3

Policy Brief 1: Gender Representation in Post-secondary Education
Related to the Energy Transition 11

Policy Brief 2: Underrepresentation of Women in the Energy Sector 17

Policy Brief 3: Working Conditions of Women in the Energy Sector 25

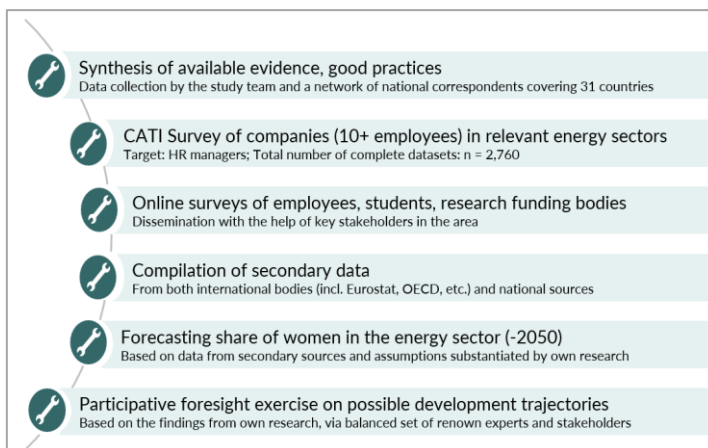
Policy Brief 4: Key Insights from a SURVEY Among Higher Education
Students 30

EXECUTIVE SUMMARY

In the critical journey towards a sustainable energy transition, a key component of the European Green Agenda, the role of gender equality and balance cannot be overstated. Given the crucial need for a just and equitable energy transition to ensure its success, it is vital to ensure that women are not only part of the workforce but also actively involved in decision-making processes, including managerial and research & innovation roles. This inclusion is essential not just as a matter of justice, but as a **strategic imperative to harness diverse perspectives, skills, and experiences crucial for innovative and effective solutions in the energy sector**. The representation of women in these key areas not only drives progress towards gender parity but also enriches the sector with a broader range of ideas and approaches, ultimately leading to more resilient and adaptable energy systems.

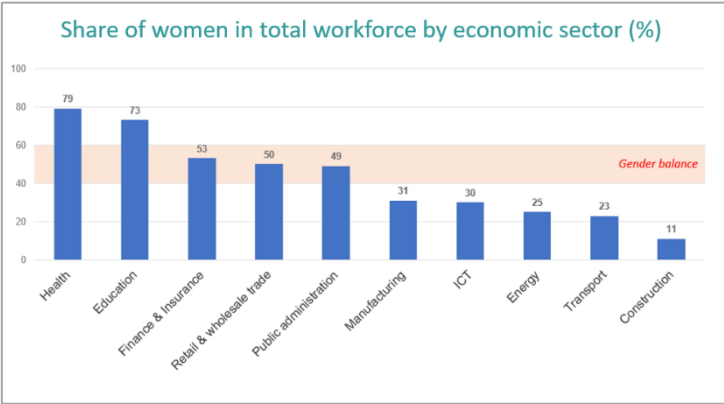
This report delves into the current state of gender balance in the energy sector, highlighting the importance of female involvement at all levels of decision-making and exploring strategies to foster a more inclusive energy landscape. Our **mix of methods** included:

- Interview surveys of HR managers in energy companies, energy sector employees and students in tertiary education;
- Analysis of secondary data from Eurostat, the OECD, and a large body of existing quantitative research on women's representation in the energy sector;
- A forecast of the size of the female workforce in the energy sector until 2050;
- Analysis of the status in all SET Plan countries (EU27, Iceland, Norway and Turkey) plus Australia, Canada, the UK and the USA in the spheres of policymaking, the business and higher education sectors;
- Identification and description of good practice in measures to boost gender balance in the energy sector from across Europe and beyond;
- A participatory foresight exercise involving representatives from all key stakeholder groups.



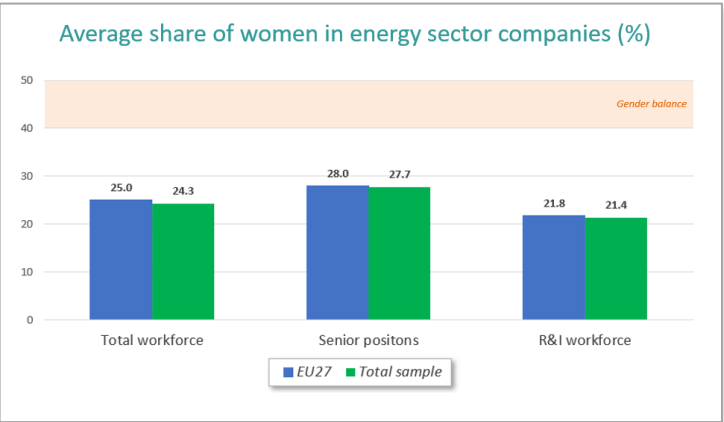
Gender balance and equality in Europe's energy sector today

Our representative survey of energy sector companies found that **EU energy sector companies employ only one woman for every three men in their workforce (25%)**, with little variation across countries. This means that energy is one of most gender imbalanced sectors of the entire economy, at the same level as transport (women's share 23%), with only construction showing a worse gender imbalance (women's share 11%)



The **percentage of women among senior positions is somewhat higher (28%)**, which can partly be explained by the importance of manual, male-dominated job roles in the sector, which negatively affects the share of women in the total workforce, but not so among positions with executive power.

The average share of women in the R&I workforce in energy sector companies in the EU27 is 22%. This means that **the average energy sector company (with 10+ employees) works with R&I teams of which only one in five members is a woman**. Regarding this indicator, notable disparities exist among different country groups: In the UK, Ireland, Southern European states, and Baltic EU countries, the proportion of women in companies' R&I workforce ranges between 26% and 30%. In contrast, in Continental Western Europe, the average is significantly lower at only 12%, while Northern and Central-Eastern European countries fall somewhere in the middle. This is a reflection of the well-known fact that many countries of southern Europe have high shares of female scientists and researchers, as do the Baltic countries and most central-European member states.

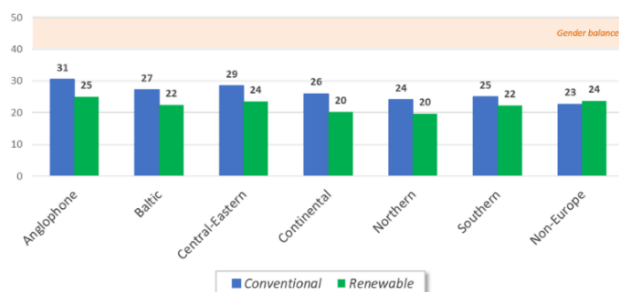


Contrary to what has frequently been claimed, our research does find **no indications that the share of women is higher in renewables than in the conventional energy sector in Europe**. Instead, companies operating in the EU renewables sector have slightly lower shares of women in their total and R&I workforces than those in the conventional energy sector. This implies that **the ongoing shift from fossil to green, renewable energy sources and related infrastructures will not automatically lead to stronger inclusion of women** in the energy industry workforce. Notably, the proportion of women is particularly low

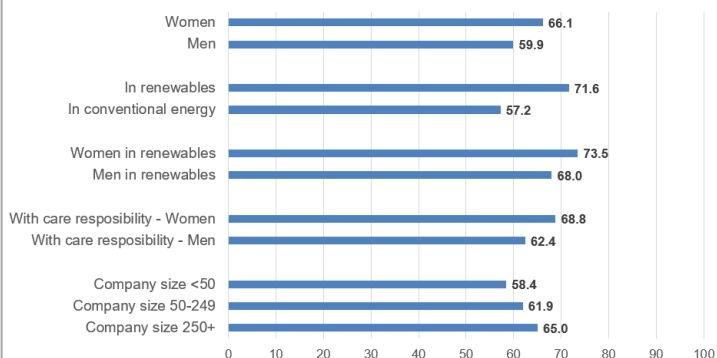
in hydrogen energy and in heat pumps, comparatively young sectors for which strong growth in employment is expected for the coming years.

Our findings on women's perceptions of working conditions show that **satisfaction with working conditions in the energy industry is high for the large majority of both women and men.** 73% of female respondents in our employee surveys reported that their current working hours and patterns suited their personal circumstances, not less than among men. Two-thirds of women employees (66%) reported that their line manager actively supports flexible working hours and patterns, an indicator that company policies on work-family balance are effectively implemented in practice by those who make decisions regarding the permissibility of flexible arrangements, like working from home. Our positive findings about women's perceptions of working conditions, in particular concerning work-family balance, may need to be seen against the background of the recent COVID-19 pandemic. As availability of remote working options spread across large sections of the economy, employees benefitted from an expansion of options to balance work and family responsibilities. There are clear indications, however, that a post-pandemic backlash against remote work has already set in. Moreover, **one-third of female employees in the energy sector still do not have proper access to flexible working conditions.**

Average share of women in the total workforce of energy sector companies (%)



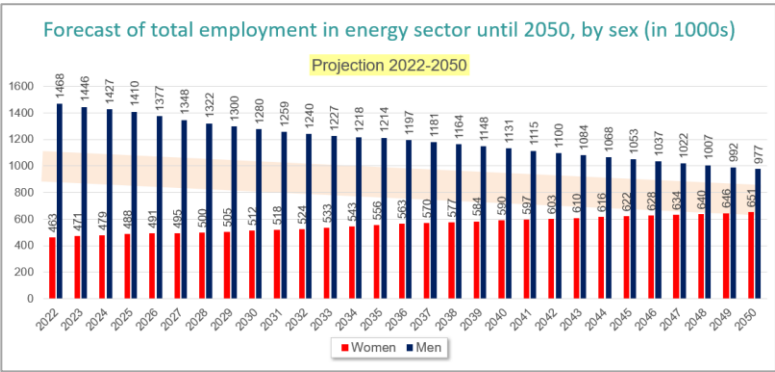
Line manager actively promotes flexible working hours / patterns (in %)



With regard to gender pay gaps in the energy industry, our survey confirms earlier findings according to which women's and men's perceptions differ significantly. **37% of women employees notice a gender pay gap in their company, but only 25% of men.** Among women in the renewables sector, the share is 44%. The same pattern was observed concerning perceptions of other types of gender discrimination, i.e., subtle gender bias in daily working life: One in three women employees finds that male staff receive more respect from outsiders, that people see female ambitiousness as off-putting, and that some male colleagues are only superficially supportive of gender equality; less than 20% of men employees hold the same views.

Gender balance in the energy sector 2010-2050

The share of women in the EU27 energy sector workforce has grown from 19% in 2010 to 24% in 2022. EU agency Cedefop's Skills Forecasts estimate that total energy sector employment will contract slightly in the years until 2035. Under the assumption that the downward trend of jobs in energy will continue in the 15 years beyond that date, our forecast projects that the number of women employed in the sector must grow by 200,000 until 2050 across the EU27 to achieve minimum gender balance (i.e., 40% share of women), on top of the replacement demand.



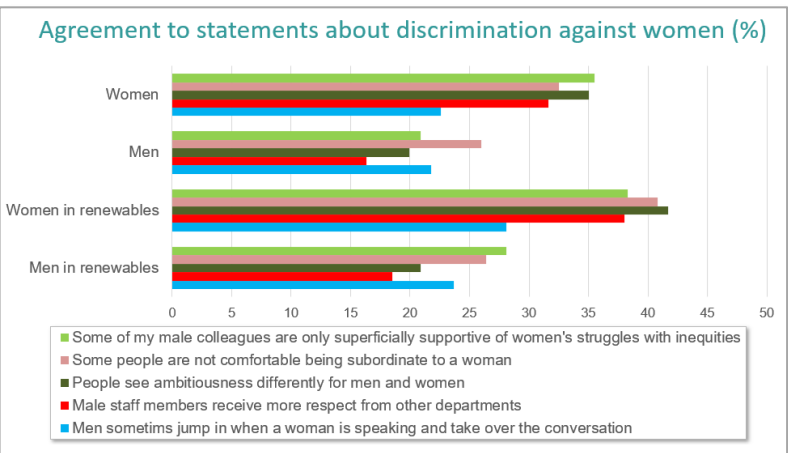
Explanatory factors

Several factors can be distinguished that impact on a company's performance regarding gender balance among the entire workforce, management roles, and staff engaged in R&I.

In the **societal** domain, **culturally embedded gender roles** have a strong effect on women's interest in and availability of careers in the energy sector. There are powerful gendered images associated with industries and occupations, particularly in STEM fields. A wealth of research found a **masculine culture of engineering** which consists of deeply ingrained societal expectations and interactions within the engineering profession. These gendered stereotypes can discourage women from pursuing careers in energy and contribute to their underrepresentation in these fields. Moreover, the persistent unequal division of care work between both genders keeps limiting women's access to full-time employment and career advancement.

In the **governance** domain, standards, policies, regulations, and funding programmes can have a significant impact on women's representation in the sector. There is great variety in legislation

on women equality and in approaches used for achieving gender balance in practice. One striking example is national legislation in Norway and Iceland for publicly listed companies and public sector organisations to set a quota of at least 40% representation of both genders



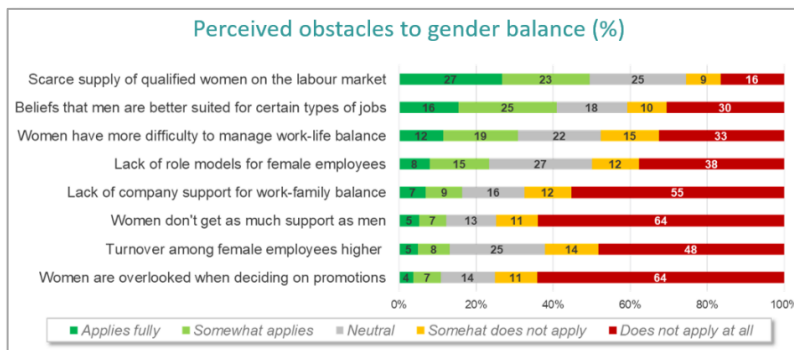
on company boards, which has yielded impressive results. Because of the controversy involved about the expected benefits and potential pitfalls of using quotas, this kind of intervention to achieve gender balance is unlikely to become reality in most EU member states.

In the domain of **education and training**, there are **systematic barriers and biases** that can deter girls and women from pursuing a career in STEM, as required for many jobs in the energy industry. In many educational systems, there is a trend towards early **specialisation** which might discourage students from exploring STEM fields if they did not initially select them. The result has been an undersupply of female, STEM educated graduates in the energy sector labour market, which greatly affects companies' ability to source the talent required. Our survey findings confirm the extent to which shortages on the labour market put pressure on energy sector companies just at a time when the energy transition forces companies to adapt to a fast-changing business environment. 30% of EU27 energy sector companies report severe difficulties in filling vacancies over the past 5 years, and 59% acknowledge at least some difficulties; even more expect skills shortages to persist in the near future.

In the **organisational** domain, the **corporate culture** of a company, whether it is a start-up, family business, or multinational

corporate group, can have a significant impact on the exclusion of women. The company's self-image, which is closely tied to its size, demographics, and market sector, also plays a role.

The way leadership is lived is an important part of the corporate culture. Leadership and culture are those aspects that tolerate or encourage certain behaviours or not.



Key issues and recommendations to achieve swift progress

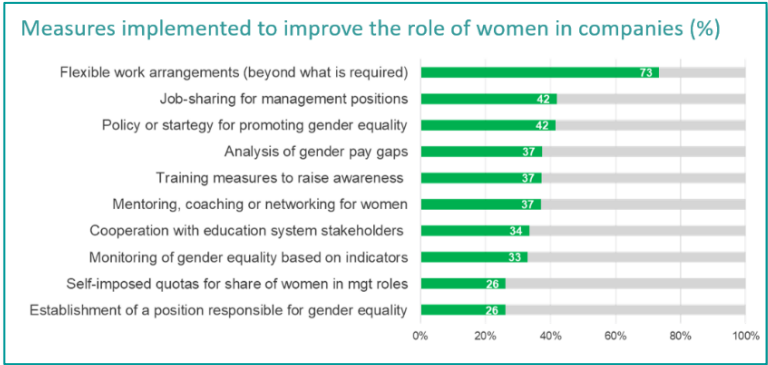
From our research we derived a range of recommendations for actions that are found to be effective and can thus form the basis for an intersectoral roadmap for industry, policymakers, and the higher education system:

Overcoming structural barriers: To ensure the professional development of women in the energy sector, evidence suggests that companies will benefit from implementing a well-designed **equal opportunity policy**, for which they must devote sufficient resources in terms of HR personnel, training and other resources for change management. **Mentoring programmes** can be highly effective, especially if they are integrated into reward systems. Successful programmes establish strong mentor-mentee relationships, offering career guidance and support. However, there is a need for “strong and visible long-term executive sponsorship and funding [...] for mentoring to thrive and become part of an organizational

culture”¹. Developing **HRM innovations** to create opportunities for upskilling, recognising transferrable skills from degrees not directly related, and facilitating re-entry into the workforce through skill development programmes can greatly contribute to increasing gender diversity.

Networking: Networking and visibility can be powerful tools for increasing the representation of women in the workforce. An example are **cross-company or HRM-specific networks** that facilitate mutual learning and the exchange of experiences among professionals, often combined with a shared commitment to meet defined targets, such as in the case of **Equal by 30**, an international campaign bringing together governments, public and private sector organisations around a public commitment to accelerate gender equality and diversity in clean energy transitions and close the gender gap by 2030. Networking is also essential for boosting a company’s or sector’s ability to source the female talent needed to achieve gender balance. In our survey of energy industry companies, the most commonly reported barrier to achieving gender balance was the limited availability of qualified female candidates in the labour market. Against this background, companies that directly hire from study programmes offered by regional and national universities can have a decisive advantage.

Commitment: Efforts to advance women within an organisation become evident in **strategic plans** and **specific policies** addressing harassment and gendered violence. The allocation of **resources** for recruiting women, the regular **monitoring** of equality figures, and the imposition of **sanctions** for non-compliance with gender targets also contribute to gender diversity. Additionally, a clear commitment from political and organisational **leaders** positively influences the promotion of gender equality. For all the excellent work that employee resource groups centred around women’s interests are doing, cases of organisations that have successfully achieved a marked increase in gender balance almost without exception benefitted from top-down implementation, i.e., strong, visible commitment by top management to gender equality as a transversal goal across all activities of the organisation.



Promoting an inclusive corporate culture: Fostering an inclusive corporate culture that celebrates diversity can be achieved by ensuring that organisational processes and practices are transparent, that is, relevant information about decision-making is easily accessible to all employees when requested, and the organisation’s corporate mission and operations recognize public interests and needs, e.g., societal responsibility and sustainability. Transparency in how corporate decisions are being made, backed by public interest, enhances the visibility of the organisational diversity efforts, challenging gender stereotypes and promoting more considerate and accepting of difference attitudes in society.

¹ Dickinson, K., Jankot, T., & Gracon, H. (2009) ‘Sun Mentoring: 1996-2009’, p. 64, available online: [Link](#)

Facilitating work-life balance: Introducing flexible work models that give employees a high degree of freedom to manage their work and private responsibilities enables an inclusive work environment and supports the needs of working parents. Provision of flexible work arrangements such as generous parental leave tailored to individual needs and remote working allows women to balance professional and family responsibilities effectively and encourages people with substantial care responsibility not just to carry out their job, but, importantly, to pursue a career. Furthermore, up-skilling and re-entry schemes should be more widely adopted to prevent younger women (and men) being forced to follow a career path that does not offer potential for professional growth and may result in opting for more gender-stereotyped job roles.

Non-linear career pathways: Expectations of a professional career leading from school STEM profile, via STEM further studies into STEM jobs, should be challenged. A higher **permeability of careers** is needed to help address existing and future skill shortages: Companies that diversify their recruitment to include a wider range of academic disciplines can tap into a larger pool of female professionals, especially given the lower representation of women in STEM fields compared to areas like the humanities. In addition, the permeability of professional development opportunities within organisations is important. The negative effects of rigidly separated career paths in areas such as research and development, production, sales, and administration can hinder women's advancement. By creating more flexible and interconnected career paths, organisations can facilitate the upward mobility and growth of female professionals, enhancing gender diversity within the workforce.

Fostering interest in STEM careers: As our analysis of Eurostat data shows, higher education institutions (HEIs) in the large majority of EU countries are not producing nearly enough female, STEM trained graduates needed to enable the energy sector to achieve gender balance in R&I positions. HEIs and employers in the energy industry should collaborate on **career awareness initiatives** to raise awareness of female students during their studies of the type of job roles that can be available to them. Being exposed to professionals working in the energy sector can act as catalyst for fresh interest in STEM and energy careers and help challenge prevailing social stereotypes. These interactions can encourage a more diverse group of students to explore and pursue careers in male-dominated STEM fields. More **interdisciplinary study programmes** are needed to produce more female graduates in STEM-related fields because they integrate diverse perspectives and subjects, making STEM more accessible and appealing to women who might otherwise choose non-STEM disciplines.

Creating gender-sensitive study environments in Europe's education systems: HEIs and providers of vocational education and training (VET) should integrate gender-sensitive curricula into STEM education. These curricula require validation to help make male-dominated fields more accessible to girls and women exploring careers in energy. A 'gender-inclusive' curriculum is one that has been consciously designed to recognise and acknowledge the evidence that males and females are likely to bring different cultural experiences to their learning experience. In an applied area such as engineering, this would include students' experiences of the applications of engineering in daily life, which may vary according to gender, ethnicity, culture, and class.

Increasing the attractiveness of HEI and VET technical degree programmes can be achieved by making the social effects and relevance of energy-related technical degree programmes more visible as part of the curriculum and encouraging critical reflection on the directions that a career in the energy sector could take by designing course content in a more interdisciplinary way. By creating an inclusive and interdisciplinary learning framework, HEIs and VET providers can help attract women to pursue STEM-related careers, ensuring a diverse talent pool in the energy sector. Research suggests that "for an equitable sustainable

education in the areas of energy and sustainable society, science and technology knowledge should be acquired in conjunction with humanities and arts, through a multidisciplinary approach that infuses technical training with social sciences, arts, ethics, and business”².

Challenging gender stereotypes: Media and societal actors should conduct future-oriented awareness campaigns challenging outdated gender role stereotypes. These campaigns can play a pivotal role in influencing public perception of gender roles. By challenging existing norms, these initiatives can help shape societal environment where gender equality is not only accepted but actively embraced as a good and right thing to do. This, in turn, motivates girls and women to consider and pursue STEM and energy-related careers. Researchers found that, when implemented correctly, entertainment-education outreach was an extremely effective and cost-efficient method of changing individual attitudes, behaviours, and beliefs³. This phenomenon creates an opportunity for media and society to make a positive difference in the overall composition of top talent in the energy industry.

Recommendations to the European Commission

We recommend that the European Commission makes effective use of the instruments at its disposal to help achieve gender balance in the energy sector and in decision-making on the energy transition. This could include efforts to:

- **Put gender equality at the heart of the energy transition** by an extension of EU Gender Equality Strategy reporting, strategic use of events such as the European Sustainable Energy Week (ESEW) and the SET Plan Conference, and rebooting the European Commission’s Equality Platform for the Energy Sector.
- **Revision of funding programmes** to fully exploit their potential for boosting gender balance in the energy transition, such as the Multiannual Financial Framework, Horizon Europe, the Erasmus+ programme, Marie Curie Skłodowska Actions, COST actions, EIT InnoEnergy, and ERA-LEARN on Clean Energy.
- **Stepping up efforts to monitor gender balance through the use of appropriate indicators**, such as those produced by the European Statistical System and by EU agency Cedefop (Skills Forecasts).

² Skowronek, M. et al. (2022) 'Inclusive STEAM education in diverse disciplines of sustainable energy and AI', *Energy and AI*, 7: 100124, p. 1, available online: [Link](#).

³ Singhal, A. and Rogers, E. (2012) 'Entertainment-education: A communication strategy for social change', London: Routledge, available online: [Link](#).

POLICY BRIEF 1: GENDER REPRESENTATION IN POST-SECONDARY EDUCATION RELATED TO THE ENERGY TRANSITION

Key insights

This policy brief analyses secondary data from Eurostat and the OECD on gender representation in post-secondary education related to the energy transition. The analysis reveals that female graduates are underrepresented in most STEM fields. However, there are some educational levels where the percentage of women is higher than that of men, and there are some indications of increasing representation of women.

Objectives of this policy brief and methods applied

This Policy Brief is based on the Study on Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition. It focuses on exploring the representation of women in post-secondary education in EU27. The Policy Brief examines the likelihood of graduation from and transition to higher levels of post-secondary education among women and men. It pays particular attention to education in science, technology, engineering, and mathematics (STEM)⁴ studies, which are integral to most energy-related education. The study team primarily utilised secondary data from Eurostat⁵, the OECD⁶, and the SheFigures report⁷ to map energy-related education. The analyses found that, while the overall share of women in post-secondary education is equal to or higher than men, there are variations in women's representation across subjects. Graduation and transition levels of women tend to be lower in most STEM fields. The differences are especially prominent at the bachelor's and doctoral levels in Information and Communication Technology (ICT) and across all levels in Engineering, Manufacturing & Construction. Except for a few countries within the EU, women's representation in these fields has not significantly increased since 2015.

⁴ The study divides STEM into three broad ISCED fields (Natural Sciences, Mathematics and Statistics; Information and Communication Technologies; Engineering, Manufacturing, and Construction), which include five narrow fields relevant to the study (Environment, Physical Sciences, Mathematics and Statistics, Information and Communication Technologies, and Engineering and Engineering trades).

⁵ Eurostat Database: educ_uae_grad02; educ_grad5; educ_uae_ent02; educ_uae_mobg01

⁶ OECD Stat Database: Graduates by field; New entrants by field; International graduates by country of origin

⁷ European Commission, Directorate-General for Research and Innovation (2021) 'SheFigures': Proportion (%) of women among graduates; Ratio of bachelor graduates to bachelor entrants; Ratio of doctoral entrants to master's graduates

Exhibit 1: Shares of women and men graduating from STEM study programmes in EU27 by educational level (in %, year 2020)

	Total		Natural sciences, mathematics and statistics		Information and communication technologies		Engineering, manufacturing and construction	
	Women	Men	Women	Men	Women	Men	Women	Men
Bachelor	58.5	41.5	55.0	45.0	20.6	79.5	25.6	74.4
Master	58.0	42.0	54.0	46.0	55.0	45.0	33.2	66.8
PhD	47.4	52.6	43.5	56.5	21.2	78.8	29.4	70.6

Data source: Eurostat

Women among bachelor's graduates

Women tend to be equally or better represented than men among bachelor's graduates in general. In 2020, nearly all countries in EU27 (except Germany) had shares of women of at least 50%. The average across EU27 countries was 58.4%. In 2020, the share of female bachelor's graduates in Natural Sciences, Mathematics & Statistics was at 55%, which is close to the overall share of female bachelor's graduates. The proportion of women was substantially lower in ICT (20.6%) and Engineering, Manufacturing & Construction (25.6%). However, the compound annual growth rates show a trend towards higher representation of women in ICT. Not only did ICT have the highest growth rates of bachelor's graduates, but it was also the only field where the number of female graduates increased faster than their male counterparts (5.8% for women and 3.6% for men).

Women among master's graduates

At the master's level, the share of female graduates in the EU27 countries was 58% in 2020, and therefore very similar to the bachelor's level. The proportion of women among master's graduates had already reached a similarly high level in 2015 and has changed little since then. Just as for the bachelor's, women were slightly better represented than men among master's students in Natural Sciences, Mathematics & Statistics (54%). In the field of ICT, the share of female master's level graduates (55%) was also higher than that of men, and it was more than twice as high as the representation at the bachelor's level. However, women were underrepresented among master's graduates in Engineering, Manufacturing & Construction, where they only accounted for 33.2%. While women's representation in this field has not progressed at all since 2010, the number of female graduates in ICT has grown significantly and at a faster rate than their male counterparts between 2010 and 2020.

Women among doctoral graduates

Like at the bachelor's level, female doctoral graduates in 2020 were significantly underrepresented in ICT and Engineering as well as in Manufacturing & Construction. In addition, they were also underrepresented in Natural Sciences, Mathematics & Statistics, albeit only slightly. Analysis of time series data reveals that there has been no progress since 2015 in considerably increasing the share of women in any of the three fields. However, in the narrow field of Environment, which falls under the broad field of Natural Sciences, Mathematics & Statistics and tends to be relatively popular among women at all levels of tertiary education, the proportion of women is balanced and growing at a faster rate compared to other fields. Irrespective of gender or field, the number of doctoral graduates at European level has decreased over time, and the general share of women at this level of

education in EU27 (47.4% in 2020) remains lower than at the bachelor's (58.5%) and master's (58.0%) levels.

Two outliers

Some of the noteworthy cases of outliers to the described trends were Denmark and Luxembourg. In Denmark, the two STEM fields of Natural Sciences, Mathematics & Statistics and Information & Communication Technologies became somewhat more popular among women at the master's level in 2020 compared to 2015 (by 1.89% and 1.45% among women, respectively compared to 0.46% and 0.53% among men). Only Engineering, Manufacturing & Construction became slightly more popular among men, increasing by 1.65% (compared to 1.24% among women). Moreover, Luxembourg exhibited exemplary improvement in the shares of women among STEM graduates at both the bachelor's and master's levels. This success may possibly be partly explained by recent, concerted efforts of both countries' research systems to improve gender equality in higher education.⁸ Further examination of the reasons for Luxembourg's as well as Denmark's progress in a case study may be beneficial for facilitating the road towards gender equality in STEM education in Europe at large.

Graduation and transition statistics

While the analysis shows a substantial underrepresentation of women in STEM when accounting for all fields of study as a whole, it also indicates that in certain STEM fields (bachelor's and master's level in Natural Sciences, Mathematics & Statistics and master's level in ICT), more women than men graduated at the bachelor's or master's level. At the doctoral level, meanwhile, women are significantly underrepresented among graduates in all three STEM fields. It is worth noting that female doctoral graduates with degrees in STEM fields made up 34.4% of all female doctoral graduates in the EU27 countries. This is more than the STEM share of all female bachelor's and master's graduates combined.

In 2020 the ratio of female master entrants to female bachelor's graduates was higher than that of men in ICT (women: 0.95 vs. men: 0.74) and Engineering, Manufacturing & Construction (women: 1.05 vs. men: 0.75). However, more men transitioned from bachelor's to master's degrees in Natural Sciences, Mathematics & Statistics (women: 0.88 vs. men: 0.92). The overall transition from master's to doctoral level was low, both in general (women: 0.08 vs. men: 0.11) and within STEM fields. Almost as many women as men pursued a doctoral degree in ICT (women: 0.09 vs. men: 0.10) and Engineering, Manufacturing & Construction (women: 0.10 vs men: 0.11), while significantly more men than women did a PhD in Natural Sciences, Mathematics & Statistics (women: 0.22 vs. men: 0.32).

Degree Mobile Graduates

Graduates whose country of origin is different from the country where they graduated at a certain tertiary level of the International Standard Classification of Education (ISCED) are known as degree mobile graduates. Here, too, women's representation aligns with the trends observed in the findings concerning tertiary education. Women were underrepresented

⁸ See <https://eige.europa.eu/gender-mainstreaming/toolkits/gear/legislative-policy-backgrounds/luxembourg> and <https://eige.europa.eu/gender-mainstreaming/toolkits/gear/legislative-policy-backgrounds/denmark>

among degree mobile bachelor's and master's graduates in ICT (24.6% for bachelor's graduates and 25.9% for master's graduates) and Engineering, Manufacturing & Construction (31.2% for bachelor's graduates and 31.3% for master's graduates). While women were, on average, still relatively well-represented in Natural Sciences, Mathematics & Statistics (39.3%) at the doctoral level, the same cannot be said for ICT (20.3%) or Engineering, Manufacturing & Construction (25.1%). One notable outlier, however, was Croatia which exhibited relatively high shares of women across the STEM-related fields of study and the different levels of education. Croatia may serve as a compelling case for a more in-depth analysis of the factors motivating female students to pursue education abroad.

Women in vocational education

Post-secondary non-tertiary education is expected to gain increasing importance due to the growing need for upskilling and retraining the workforce in the context of the green transition. Vocational education and training can thus play a vital role in addressing skill gaps, reducing recruitment bottlenecks, and improving long-term employability.⁹ In general, female representation in vocational education in EU27 is high (61.2%). However, it remains significantly lower in the fields of ICT (21.1%) and Engineering, Manufacturing & Construction (17.4%). Finland stands out as an outlier, as it has noticeably increased women's presence in each of the three broad STEM-related fields of study and even reached the highest share of female graduates in Engineering, Manufacturing & Construction.¹⁰ In conclusion, similar gender disparities persist in post-secondary non-tertiary education as they do in tertiary education, but cross-country heterogeneity is more pronounced, which most likely reflects the fact that vocational programmes differ strongly between Member States. Women's representation is relatively low in STEM-related fields of study compared to other fields. Only in the narrow field of Environment, women account for a relatively high share of all graduates (44%).

Non-formal education

Furthermore, the study team emphasises the need to examine gender representation in non-formal education, which refers to adult education not leading to any recognised qualification or certification. This aspect plays a significant role in the energy transition. The findings show the importance of non-formal education in accompanying the transition to low-carbon economies. On the one hand, non-formal programmes have the potential to reach a wider audience than formal education, including individuals with limited access to formal education or those at a later stage in their careers (lifelong learning). On the other hand, providers of such programmes can tailor and customise their programmes to better meet the needs and educational goals of specific groups or individuals, such as developing skills relevant to greening the economy or the energy sector. At the European level, the female participation rate in non-formal education and training was somewhat higher (7.4%) than the male participation rate (6.2%). However, gender-related data specifically focusing on non-formal educational programmes with a STEM orientation are not yet available.

⁹ European Centre for the Development of Vocational Training (2022) 'An Ally in the Green Transition'; Thessaloniki: CEDEFOP.

¹⁰ In Finland, the share of women among post-secondary non-tertiary graduates in Natural Sciences, Mathematics, and Statistics rose from 0% in 2015 up to 42.9% in 2020. In ICT the share of women rose from 0-11.1% and in Engineering, Manufacturing and Construction it rose from 47.3-61%.

Insightful practices

Interdisciplinary study programmes, i.e., programmes that combine STEM studies with other disciplines such as economics and social sciences, have been shown to be able to attract more female students to post-secondary education in STEM fields.¹¹ Such programmes might contribute to eventually overcome the gender gap also in the energy sector. Examples include the following:

EU level: The European Institute of Innovation and Technology (EIT) offers the EIT InnoEnergy master's programme in Environmental Pathways for Sustainable Energy Systems.¹² In this programme, "students learn to address societal challenges with technical solutions in fields like renewable energy, solar systems, biomass processing, offshore energy and more". The programme involves seven European universities.¹³ The programme welcomes 50-60 students per year. Women's participation has increased steadily to the extent that in 2021, 20 out of 53 participants were women. The plan is to keep their share increasing.

Austria: The University of Applied Sciences Burgenland is in an excellent position to boost women participation in energy related study programmes due to its experience in establishing the "most female software engineering programme in Austria"¹⁴. Two novel programmes are of relevance for the energy transition: (a) BSc in Energy and Environmental Management: The course combines energy engineering and energy management with ecology and environmental engineering, business economics and law.¹⁵ (b) Master in Sustainable Energy Systems: The curriculum connects the topics of business, environmental economics, politics and law with management and personal development. Furthermore, an in-depth study of eight alternative forms of energy is provided within the programme.¹⁶

Germany: The University of Stuttgart offers a BSc in renewable energies. It benefits from the fact that energy technology is one of the university's interdisciplinary focal points. Students can attend courses in mechanical, electrical, and civil engineering, and computer science as well as in the supplementary areas of environmental sociology or business administration.¹⁷ The Berlin University of Applied Sciences (Hochschule für Technik und Wirtschaft Berlin) offers a BSc in Information Technology and Economics - women's programme. This programme not only focuses on applicability, practice orientation and interdisciplinarity, but is also available exclusively to women. In this way, barriers to studying in a male-dominated domain are sought to be overcome.¹⁸

Spain: The University of Cadiz' MSc in renewable energies and energy efficiency does not only teach STEM subjects (assessment of resources, knowledge about technologies) but also relevant legislation, energy control and management tools.¹⁹

¹¹ See Wächter, C. (2012) 'Interdisciplinary teaching and learning for diverse and sustainable engineering education', in: Béraud, A., Godfroy, A.-S., Michel, J. (eds): 'GIEE 2011: Gender and Interdisciplinary Education for Engineers', Rotterdam et al: Sense.

¹² See <https://www.innoenergy.com/for-students/master-school/master-s-in-sustainable-energy-systems/>

¹³ Students choose two universities for their studies: In year 1, Royal Institute of Technology in Stockholm (KTH, Sweden) or Universitat Politècnica de Catalunya – Barcelona Tech (UPC, Spain). In year 2 the choice is between KTH, UPC, Politecnico di Torino (Italy), Eindhoven University of Technology (Netherlands), Instituto Superior Técnico (Portugal), Aalto University (Finland) or University of Science and Technology (Poland).

¹⁴ With a share of 35% female students, the software engineering program has currently the highest rate in the country, see: [www.fh-burgenland.at/fileadmin/user_upload/Pressemeldungen/2021/Medieninfo_Weiblichster Software Studien_gang_FH_Burgenland.pdf](http://www.fh-burgenland.at/fileadmin/user_upload/Pressemeldungen/2021/Medieninfo_Weiblichster_Software_Studien_gang_FH_Burgenland.pdf)

¹⁵ See www.fh-burgenland.at/studieren/bachelor-studiengaenge/bakk-energie-und-umweltmanagement/

¹⁶ See www.fh-burgenland.at/studieren/master-studiengaenge/ma-nachhaltige-energiesysteme/

¹⁷ See www.uni-stuttgart.de/studium/bachelor/erneuerbare-energien-b.sc./

¹⁸ See <https://fiw.htw-berlin.de>

¹⁹ See <https://oficinadeposgrado.uca.es/wp-content/uploads/2023/02/WEB-Energias-Renovables-y-eficiencia-sep17-E.pdf?u>

France: CIFE European Institute offers a Master in global energy transition and governance, for which a strongly multidisciplinary approach is chosen. The programme analyses the links between the different levels of energy governance, from an international to a local level, offering problem-focused learning with theory and practice.²⁰

Ireland: University College Dublin offers to innovative programmes targeting students who are less interested in traditional engineering education: (a) The MSc in renewable energy and environmental finance programme aims at graduates from Business, Economics, Engineering, Mathematics, Environmental Science and Physics. It offers an understanding of the fiscal side of renewable and sustainable energies, as well as management and innovation.²¹ (b) The MSc in Sustainable energy and green technologies combines renewable energy exploitation, efficiency in energy generation and utilisation, mitigation of environmental impacts, business innovation and job creation opportunities, plant biotechnology and entrepreneurship.²²

United Kingdom: The University of Manchester's MSc in renewable energy systems and clean technology provides the foundations of solar, wind and marine energy technologies and also the knowledge required to understand the efficient distribution of renewables, their integration into zero-carbon infrastructure, and to determine the economic and climate issues affecting the choice of renewables.²³

Conclusion

Women's representation among graduates in vocational and tertiary education was fairly balanced when not differentiated by field of study. However, in STEM, female graduation rates were lower when considering all fields collectively. In the fields of ICT and Engineering, Manufacturing & Construction, women's graduation remains especially low compared to men's. The same pattern was visible among degree mobile graduates. Moreover, a comparison of women's presence in STEM-related fields in 2020 to 2015 makes apparent that improvements in women's representation are progressing slowly. Nevertheless, it is important to acknowledge the significant heterogeneity across countries and in narrow fields of study, which should be taken into account when generalising the results of this study.

When analysing the propensity to graduate as well as the propensity to transition to higher levels of education, an equal share of women and men graduated from STEM-related bachelor's and master's programmes and continued their studies from the bachelor's to the master's level. However, the share of women who graduated from doctoral studies and continued their education at the doctoral level was smaller than that of men. The findings of this report indicate that further actions are necessary to ensure equal participation of women in post-secondary education and training that relates to the energy transition.

²⁰ See www.cife.eu/en/3/description_257-1

²¹ See www.mastersportal.com/studies/270480/renewable-energy-and-environmental-finance.html

²² See https://hub.ucd.ie/isis/!W_HU_MENU.P_PUBLISH?p_tag=PROG&MAJR=X413

²³ See www.manchester.ac.uk/study/masters/courses/list/09009/msc-renewable-energy-and-clean-technology/

POLICY BRIEF 2: UNDERREPRESENTATION OF WOMEN IN THE ENERGY SECTOR

Key insights

This policy brief examines the underrepresentation of women in the energy sector and highlights the challenges faced by companies in achieving gender balance. On average, EU energy sector companies employ only one woman for every three men in their workforce (25%), with little variation across countries. The percentage of women among senior positions is somewhat higher (28%), which can partly be explained by the importance of manual, male-dominated job roles in the sector. Regarding women's share in R&I, there are strong differences between country groups: The Anglophone, Southern and Baltic Europe countries, with figures between 26% and 30%, stand in contrast to the Continental Europe cluster, in which the average companies' R&I workforce includes only 12% women. Companies operating in the EU renewables sector have slightly lower shares of women in their total and R&I workforces than those in the conventional energy sector. Further analysis reveals that implementing measures like flexible working arrangements and job-sharing are positively correlated with success in improving gender balance.

Objectives of this policy brief and methods applied

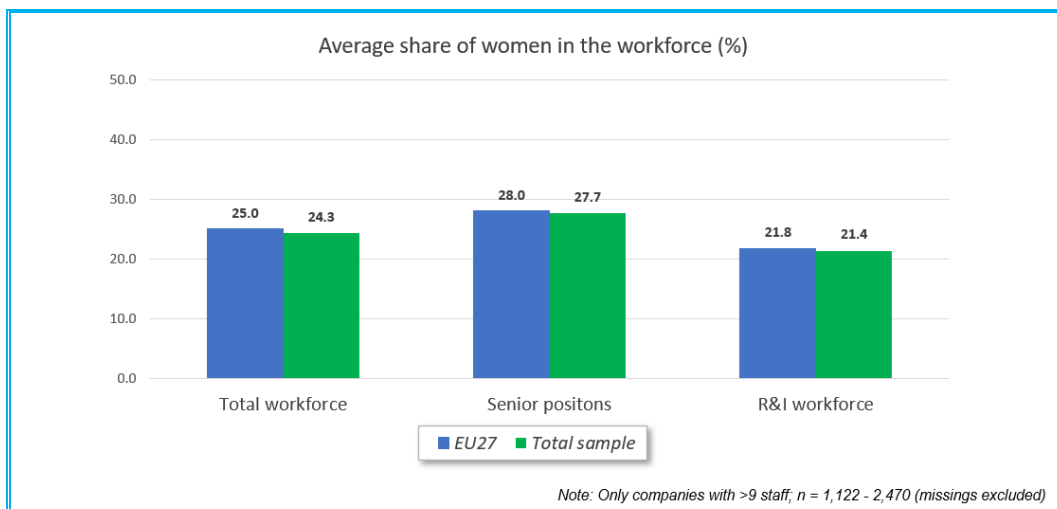
This Policy Brief is based on a survey of companies in the energy sector conducted in summer 2023 in 35 countries. The survey was conducted with the head of HR or a member of management responsible for HR matters. It focused on exploring gender ratios in different occupational groups in the energy sector, difficulties in filling vacancies, attitudes about gender balance, perceived barriers to the employment of women and measures taken to promote gender equality in the sector. The data presented in this policy brief provides further evidence for the underrepresentation of women in the energy sector; it highlights differences between countries and subsectors and gives indications about the most effective company interventions for boosting gender balance.

Current share of women in energy sector companies

The **average share of women in the workforce** of energy sector companies across the entire sample is 24.3%, and 25.0% for the EU27 (see chart below). This confirms previous analyses according to which energy is one of the most gender imbalanced sectors of the EU economy. According to the data, companies operating in the renewables subsector have a slightly lower share of women among their staff than companies operating (exclusively) in the conventional energy subsector in all regions apart from Non-Europe. While the International Renewable Energy Agency (IRENA)²⁴ has concluded from its research at global level that the renewables sector has a higher share of female employees than the conventional energy sector, this does not appear to be the case in Europe, at least if looking at the total of renewables companies. It follows that in the EU, the ongoing shift to renewable

²⁴ IRENA (2019): 'Renewable Energy: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency.

energy sources will not automatically increase women's representation in the energy industry.



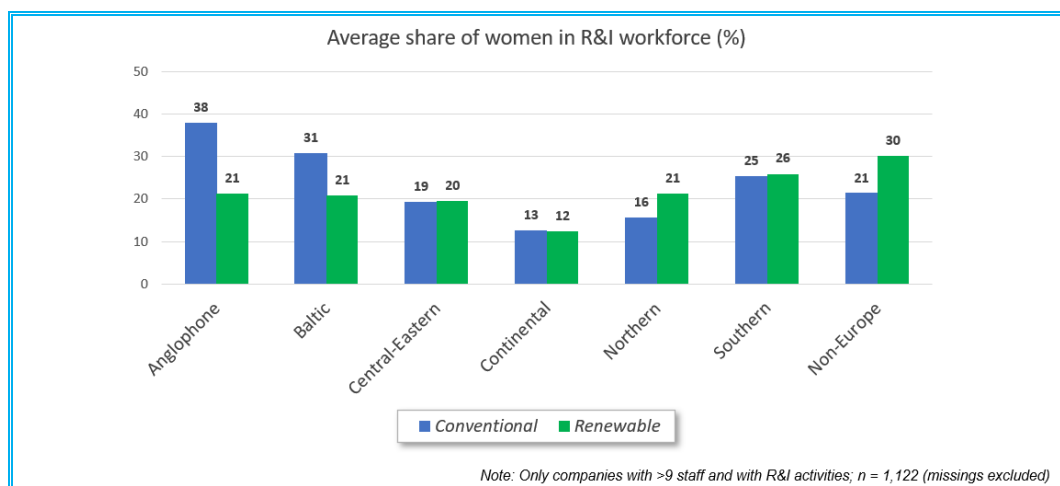
The **average share of women among senior staff** (i.e., employees holding executive positions) in EU energy sector companies is 28.0% – higher than for the entire energy workforce. There are marked differences between country groups in Europe.

Looking at the average share of women among senior staff in energy sector companies, the picture changes somewhat. The Anglophone countries still have the highest proportion of women, with 34% in conventional energy and 35% in renewable energy, but they are closely followed by the non-Europe group (33% in conventional and 35% in renewable energy). The lowest share of women among senior staff is found in the continental European grouping, with 22% in both conventional and renewable energy companies.

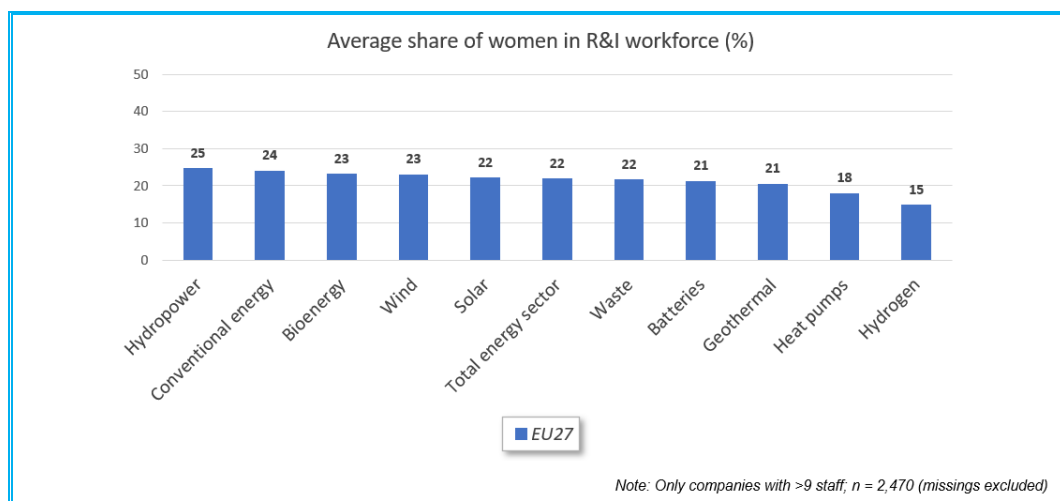
In most country groups, and particularly in the renewables subsector, the figure is significantly higher than for the entire workforce, which is encouraging. Closer analysis of the data revealed that the difference may be explained by the numerical importance of manual, male-dominated labour in many parts of the energy sector, which negatively affects the share of women in the total workforce, but not so among positions with executive power.

While the **share of women in the R&I workforce** is only little lower than in the entire workforce of the average EU27 company, there are sizeable disparities between groups of countries with high female representation in R&I (Anglophone and Southern Europe) and those with very low figures, namely Continental Europe, where the average energy company's R&I team is composed of only 12% women.

For women across the EU to take an equal share in decision making about the energy transition, women need to participate on an equal basis in research and innovation (R&I) in energy sector companies. The survey data show that this is not the case – especially not in those EU countries that have strongest tradition in industrial engineering.



The average share of women in the R&I workforce in energy sector companies in the EU27 is 22% (see chart below). This means that the average energy sector company (with 10 or more employees) works with R&I teams of which only one in five members is a woman. There are notable differences between country groups: The share of women in R&I workforces is lowest in the countries of Continental Europe (12%) and highest in the Anglophone Europe (30%), Baltic (26%) and Southern Europe (25%) groups. Among companies in the renewables sector, the sample from Non-Europe performs best.



Closer analysis of the data shows that companies in the size class 50 to 249 employees tend to have the lowest share of women in their R&I workforces. Among renewables subsectors, hydropower, solar and wind have the highest and heat pumps and hydrogen the lowest figure for female representation among R&I employees (see chart below). Because both hydrogen and heat pumps are comparatively young sectors for which strong growth in employment is expected, the low representation of women in both is worrying.

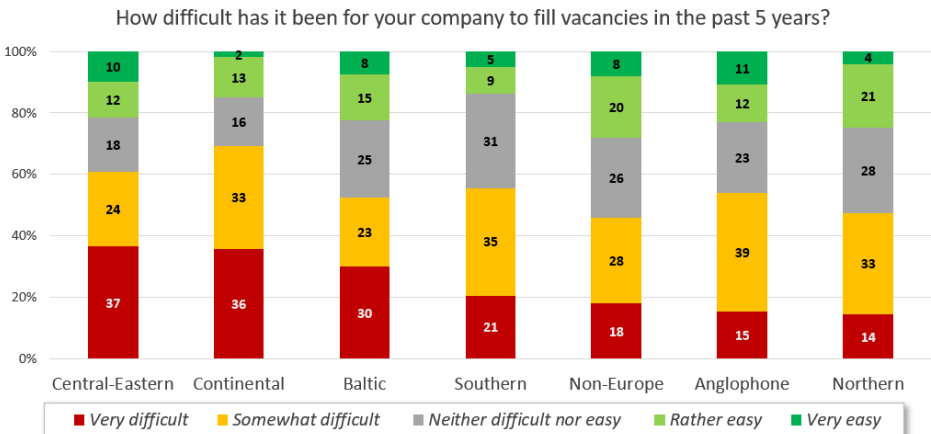
Concerning the **development of women's share in the energy sector** over the last 5 years, the data show evidence of improvements in gender balance. Looking at the total workforce of all countries surveyed, 9% stated that the proportion of women had grown strongly and

32% stated that it had grown somewhat. 54% see no change and 6% even witnessed decreases in female representation. Looking at changes in the share of women in staff holding executive positions, 74% said nothing had changed, while 17% saw a slight increase in the proportion of women, 5% a significant increase and 4% a decrease.

A similar development in the share of women is described for the workforce engaged in R&I. Regarding the proportion of women applying for open positions in R&I, however, the increase over the last five years is even smaller. Here, 78% of the surveyed companies state that nothing has changed and only 13% speak of a slight increase and 3% of a strong increase. In contrast, 7% report a decrease in the share of such applications from women. According to HR managers in the energy sector, therefore, there is a supply side shortage which makes it difficult for them to increase the share of women in R&I positions.

Demand for talent in the energy industry

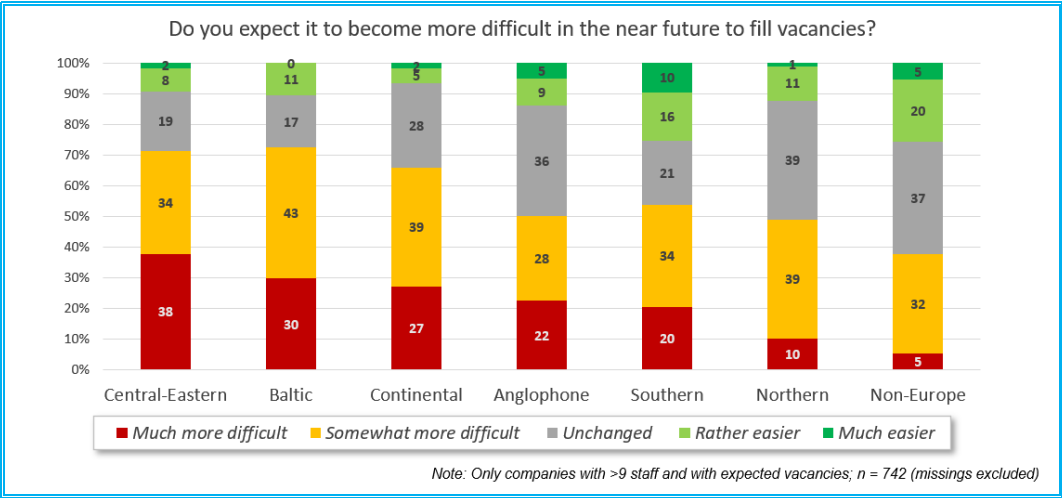
As other parts of the economy, the European energy industry faces challenges regarding filling vacancies. 30% of EU27 companies report of severe difficulties in filling vacancies *over the past 5 years*, and 59% at least some difficulties. Companies in the Central-Eastern and Continental Europe groups, in particular, report strong difficulties (37% and 36%) and at least slight difficulties (61% and 69%) to fill vacancies in the past five years. Only 22% (Central-Eastern) and 15% (Continental), respectively, found it rather easy or very easy to fill vacancies. Companies in the Northern Europe cluster were least likely to report such difficulties (14% found it very difficult and 47% at least somewhat difficult to fill vacancies), followed by Anglophone Europe (15%; 54%) and the Non-Europe group (18%; 46%).



Note: Only companies with >9 staff and with vacancies in past 5 years; n = 736 (missings excluded)

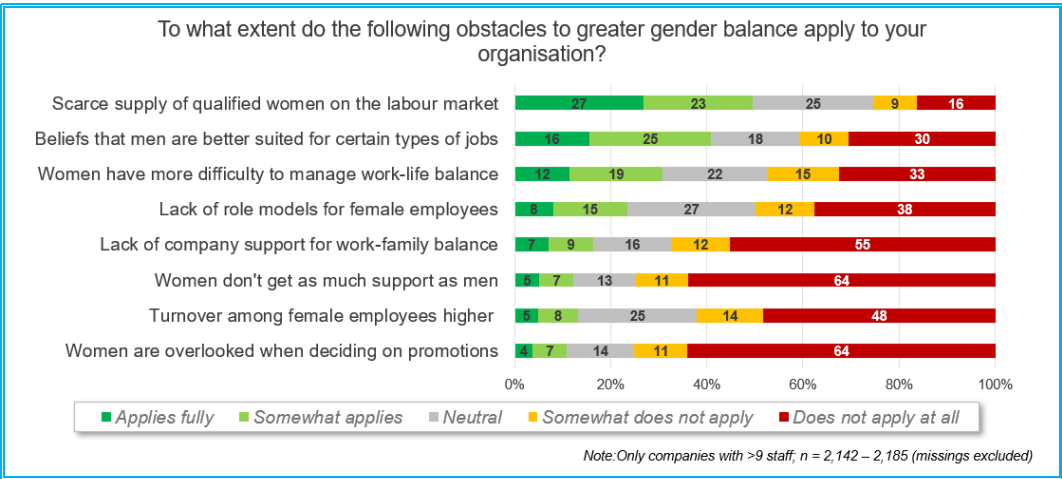
The share of companies *expecting* difficulties *in the coming 2-3 years* in filling open positions even exceeds the experiences of the last 5 years. Companies in the Central-Eastern Europe cluster, again, are most likely to expect it to become a lot or at least somewhat more difficult to find the skills and talent needed (much more difficult: 38%, at least somewhat more difficult: 72%, rather or much easier: 10%) (see chart below). Most energy companies in the Baltic (30%; 73%; 11%) and Continental Europe groups (27%; 66%; 7%) are also expect growing difficulties in sourcing the skills and talent required. In line with the figures for the past five years, companies in the Non-Europe (5%; 37%; 25%) and Northern Europe groups (10%; 49%; 12%) are significantly less likely to expect difficulties in filling vacancies. One in four companies in the Southern Europe and Non-Europe groups even expect it to become

easier soon to find candidates for open positions. In general, however, our findings highlight the extent to which shortages on the labour market put pressure on energy sector companies just at a time when the energy transition forces companies to adapt to a fast-changing business environment.



Attitudes and strategies about gender balance

The survey asked companies to what extent their top management shows full commitment to gender equality, whether they strive to increase the proportion of women in the total workforce and among executive positions, and whether respondents believe that a growing gender balance will have a positive impact on economic results. 69% reported full commitment to gender equality (some commitment: 13%), against a mere 7% who stated disagreement with this statement.



Only 44% of EU companies, however, are also committed to increasing the women share in their entire workforce and 38% to increasing the share of female managers.

Although a lot of research evidence suggests that gender balance has a positive benefit on organisational performance, this is not yet universally acknowledged by business managers.

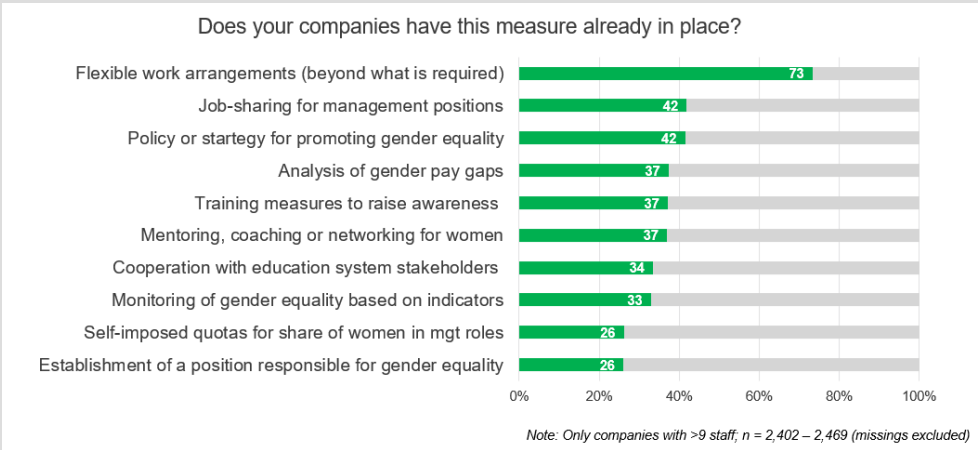
43% of the EU27 sample do indeed agree that increasing gender balance will have a positive effect on economic results, against 16% who disagree.

Perceived obstacles to the employment of women

Among perceived obstacles to gender balance, the factor mentioned by the largest share of companies is a „scarce supply of qualified women on the labour market” (49% agreeing fully or somewhat in the EU27), followed by “beliefs that men are better suited for certain types of jobs than women” (44%) (see chart below). 29% perceive “female employees having more difficulty to manage work-life balance” as an obstacle, while only half as many (14%) see “lack of company support for work-family balance” as a problem. The responses suggest that HR managers in energy sector company tend to consider the challenge a supply-side issue rather than a problem caused by the company’s organisational culture and practices.

Company measures to boost gender balance: Do they make a difference?

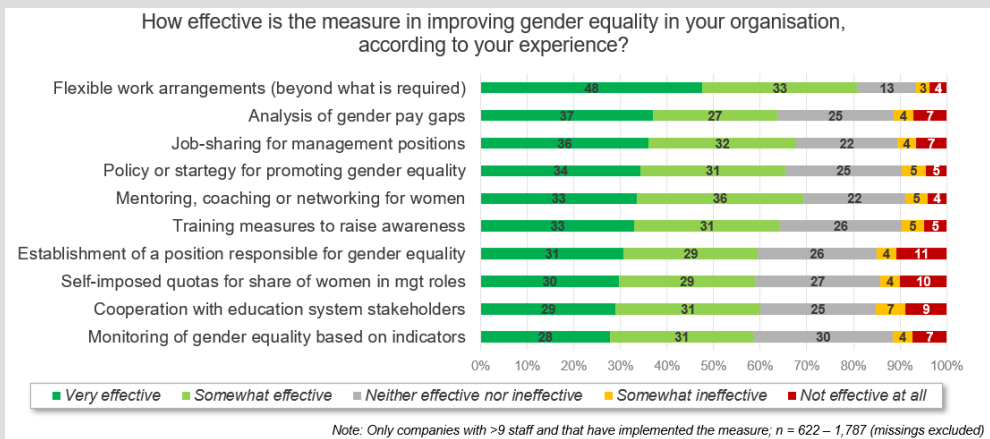
What can help to overcome these obstacles and what is already being done to achieve gender balance in the energy sector? Most of the companies surveyed stated that flexible work arrangements like remote work from home or part-time work (beyond what is required by law) have already been implemented (73%) (see chart below). Companies also perceive flexible working conditions as the most effective intervention for promoting diversity.



Regression analysis determined that companies that report an increase in the share of women in the total workforce are indeed significantly more likely to offer flexible working conditions, and job-sharing for managers. However, only job-sharing for management positions, also known as "topsharing" in some countries and offered by 42% of companies surveyed, had a statistically significant effect on increasing the proportion of women among managers as well as R&I staff. Companies in the country clusters Southern Europe, Baltic and Non-Europe use this measure more often than average. The effectiveness of measures taken, as perceived by the companies themselves (see chart below), also shows a similar picture. Here, flexible working arrangements, the analysis of gender pay gaps and job sharing for management positions are perceived as most effective on average. It must, however, be noted that not all measures that are frequently used or considered effective by HR staff contribute to a higher proportion of women or help women to develop in a company and be promoted to management ranks.

Further measures positively related to the overall proportion of women among employees are the implementation of gender equality plans (implemented by 42%) and gender equality trainings (implemented by 37%). Measures such as the analysis of gender pay gaps (37%), and mentoring, coaching, or networking for women (37%), already implemented by more than one in three energy sector companies, were not found to be correlated with improvements in gender balance. The same applies to cooperation with education system stakeholders (applied by 34% of the companies), monitoring of gender equality based on indicators

(33%), self-imposed quotas for the share of women in management roles (26%) and the establishment of a position responsible for gender equality (26%).



Further analysis of the data also showed that companies implementing a greater number of measures were more successful in improving gender balance in recent years. Recently set up companies, moreover, display significantly better gender balance compared to longer established ones.

Towards explanations

While the energy sector anticipates a growing demand for talent in the coming years, and many companies within it express a commitment to gender equality, the representation of women, especially in leadership and research & innovation roles, has remained largely unchanged over the past five years. Moreover, HR managers in the industry expect the situation not to change soon, one reason being the perceived scarcity in supply of female candidates for R&I positions in the energy sector.

A range of explanations have been brought forward for the striking underrepresentation of women in the energy sector, as well as in other industries heavily relying on STEM-educated talent. Two main factors appear to play a strong role. Firstly, a wealth of research²⁵ found a masculine culture of engineering which consists of deeply ingrained societal expectations and interactions within the engineering profession. This culture often discriminates against non-male behaviours and perpetuates toxic masculinity, hyper-competitiveness, and macho behaviour. This culture, at times, may inadvertently favour traditionally masculine behaviours, which can lead to an environment that might feel exclusive or overly competitive. This culture can influence the career choices of young individuals and impact the decisions of diverse energy workers to remain in the sector. Our findings suggest that there may be variances across European countries regarding how prevailing engineering norms might affect women's participation in the R&I workforce within the energy sector. However,

²⁵ For example, see: Carberry, A. R. & Baker, D. R. (2018). The Impact of Culture on Engineering and Engineering Education. *Innovation in Science Education and Technology* 24(1): 217-239. and: Bastalich, W.; Franzway, S.; Gill, J.; Mills, J. & Sharp, R. (2007). *Disrupting Masculinities*. Australian Feminist Studies, 22(54): 385-400. and: Williams, J. C. (2021). *Bias Interrupted: Creating Inclusion for Real and for Good*. Harvard Business Review Press.

attributing the lower participation rate of women in energy R&I only to the 'engineering culture' would not capture the full picture.

Secondly, evidence from employee surveys and qualitative studies indicates that working conditions in the energy sector, often due to the inherent nature of the work, are perceived as challenging for those with family obligations. While some aspects of the job might be immutable due to their inherent characteristics, it remains crucial to explore flexible working conditions that promote a better work-life balance. These working conditions should be diverse in their available forms and implemented effectively. Additionally, addressing discrimination against employees who request flexible working arrangements is necessary to encourage greater female representation in the sector.

Methodological notes

The survey was conducted using computer-assisted telephone interviews (CATI) by consortium partner GDCC. The survey aimed to gather information from companies in the energy sector with more than 10 employees. 2,760 complete responses were collected from EU27 countries, non-EU SET Plan countries (CH, NO, IS, TR), as well as Australia, Canada, U.K. and USA.

Note that our survey results are not weighted by company size, i.e., they are not adjusted for the size of each company in terms of its number of employees, because of missing data on the universe. In other words, small companies and large companies are treated as equals in our calculations. This means the results might not give a fully accurate picture of the entire energy sector workforce. For example, if a large company with 500 employees introduces a new policy, it affects more people than if a small company with 10 employees does the same. But in our results, both companies would be counted equally. EU averages are also not weighted by country size.

Due to the limited number of companies in the address database, the sample does not always allow for analysis at individual country level. Therefore, the following country groupings are used to in the following to present geographical differences: Anglophone Europe (Ireland & U.K.), Baltic (Estonia, Latvia, Lithuania), Central-Eastern Europe (Bulgaria, Croatia, Czechia, Hungary, Poland, Romania, Slovakia, Slovenia), Continental Europe (Austria, Belgium, France, Germany, Luxembourg, Netherlands, Switzerland), Northern Europe (Denmark, Finland, Iceland, Norway, Sweden), Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain, Turkey), and Non-Europe (Australia, Canada, United States).

POLICY BRIEF 3: WORKING CONDITIONS OF WOMEN IN THE ENERGY SECTOR

Key insights

Job satisfaction among most workers in the energy sector is high, with little difference between the conventional and the renewable energy industry. Against expectations, our survey data does not give any indication that female employees, including those with private care responsibilities, are more critical of conditions for work-family balance in their current jobs. We argue that this may be due to the recent experience with flexible working patterns during the COVID-19 pandemic. As one-third of female employees in the energy sector still report not having sufficient access to flexible working conditions, further efforts should be undertaken to spread favourable environments for work-family balance to increase the share of women who enter, and remain in, this traditionally male-dominated sector. Gender pay gaps continue to be an issue in energy companies, with marked variation across EU member states. Moreover, men are significantly less likely than women to be aware of such differences in remuneration. Subtle gender bias as perceived by women at their workplace is significantly correlated to plans for leaving the job, low job satisfaction, and limited perceived career prospects. Strikingly, these correlations were also found, albeit less strongly, for men perceiving subtle gender bias against female employees, which suggests that organisational cultures which discriminate against women have a negative impact on job satisfaction for both women and their male coworkers, and thus may harm the ability of companies to attract and hold on to employees whose skills are increasingly scarce in the labour market.

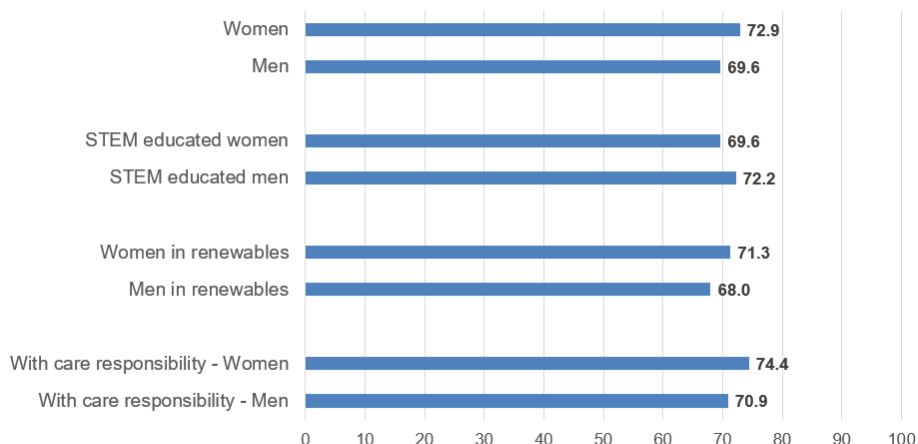
Objectives of this policy brief and methods applied

This Policy Brief's objective is to present key findings from an online survey of energy sector employees conducted within the context of a project on gender balance in the energy sector, funded by the European Commission. While not statistically representative of the EU energy sector workforce, the results of the survey offer important insights about perceived working conditions in the industry, particularly about differences between the renewable and conventional energy sectors, and according to the socio-economic characteristics of workers in the industry. The majority of 563 responses were from Germany, France, Spain, Italy, Poland, Sweden and the Netherlands.

Perceptions about working conditions

Satisfaction with working conditions in the energy industry is high for the large majority of both women and men. 73% of female respondents in our employee surveys reported that their current working hours and patterns suited their personal circumstances, not less than among men. Two-thirds of women employees (66%) reported that their line manager actively supports flexible working hours and patterns, an indicator that company policies on work-family balance are effectively implemented in practice by those who make decisions regarding the permissibility of flexible arrangements, like working from home. Contrary to expectations, the survey data does not give any indication that female employees with care responsibilities for young children, senior household members and/or persons with disabilities are more critical of conditions for work-family balance in their current jobs.

Current working hours / patterns suit personal circumstances (%)



Note: All employees; n = 535 (missings excluded); Sum of percentages for responses 4 and 5 on 5-point response scale

Our positive findings about women's perceptions of working conditions, in particular concerning work-family balance, may need to be seen against the background of the recent COVID-19 pandemic. As availability of remote working options spread across large sections of the economy, employees benefitted from an expansion of options to balance work and family responsibilities. There are clear indications, however, that a post-pandemic backlash against remote work has already set in.²⁶ Moreover, one-third of female employees in the energy sector still do not have proper access to flexible working conditions.

Perceptions about gender pay gaps

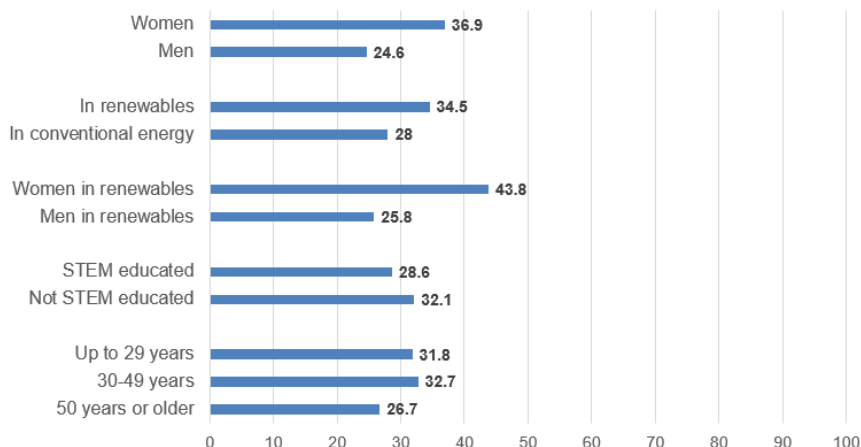
With regard to gender pay gaps in the energy industry, our survey confirms earlier findings according to which women's and men's perceptions differ significantly. 37% of women employees notice a gender pay gap in their company, but only 25% of men. Among women in the renewables sector, the share is 44% compared to 26% among men in the same sector. In total, 35% perceive a gender pay gap in renewables compared to only 28% in the conventional energy sector.

A possible explanation for the worse performance of the renewables sector lays in the latter's higher share of young and fast-growing companies, in which individual negotiations on wages and premiums (which tends to disadvantage women²⁷) is more common than organisation-level negotiation or collective bargaining.

²⁶ See, for instance: Carbonaro, G. (2023) 'Remote work: Is it time for workers to go back to the office?', online article, Euronews, 25/07/2023, www.euronews.com/next/2023/07/25/remote-work-is-it-time-for-workers-to-go-back-to-the-office

²⁷ For example, see: Recalde, M. & Vesterlund, L. (2020), Gender differences in negotiation and policy for improvement, NBER Working Paper, [http://www.nber.org/papers/w28183](https://www.nber.org/papers/w28183)

“I think that women are paid less than men for the same job” (%)



Note: All employees; n = 537 (missings excluded); Sum of percentages for responses 4 and 5 on 5-point response scale

According to data analysed by the International Energy Agency and the OECD²⁸, gender pay gaps are indeed an issue in the energy sector – albeit less so than in non-energy sector. We here use as indicator the gender wage gap conditional on skills²⁹, which corrects for differences in the level of skills required for job positions taken by women and men. Note that the data is from 2018 (latest available). The gender wage gap, thus defined, was -11.1% for the EU27 energy sector, against a value of -15.3% for the non-energy sector. There are notable differences between EU member states: While the best performing countries report energy sector gender wage gaps of between -5% and -7% (Belgium, France, Hungary, Lithuania, Luxembourg, Slovenia, Sweden), others have values of -15% or more (Cyprus, Greece, Latvia, Poland, Spain).

Subtle gender bias as perceived by female and male employees

One in three women employees finds that male staff receive more respect from outsiders, that people see female ambitiousness as off-putting, and that some male colleagues are only superficially supportive of gender equality; less than 20% of men employees hold the same views.

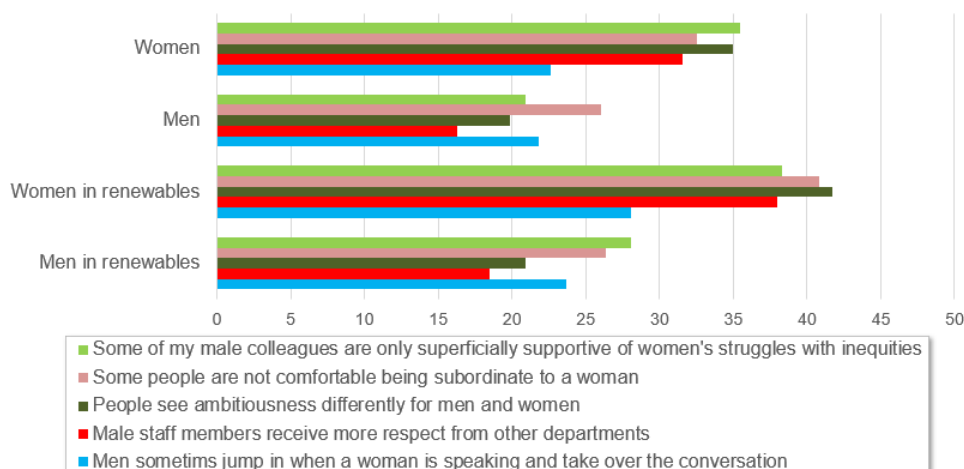
A deeper look into the survey data, using multivariate analysis, found that women who perceive a subtle gender bias at their workplace are significantly more likely to plan to change jobs within the next three years, to report low job satisfaction, and to view career prospects in their company as limited. Strikingly, these correlations were also found, albeit less strongly, for men perceiving subtle gender bias against female employees, which suggests that

²⁸ IEA (2023), Gender and Energy Data Explorer, IEA, Paris, <https://www.iea.org/data-and-statistics/data-tools/gender-and-energy-data-explorer>

²⁹ A figure of 0% would indicate no wage gap, i.e., equal pay for men and women at the same skills level, while a -100% gap would mean zero wage for women.

organisational cultures which discriminate against women are perceived negatively by both women and their male coworkers.

Agreement to statements about discrimination against women (%)



Note: All employees; n = 492-513 (missings excluded); sum of percentages for responses 5 and 6 on 6-point scale

Examples of Good Practice in company-level action for gender equality

Schneider Electric, a French multinational that specialises in digital automation and energy management, has launched **Pay Equity Framework**³⁰ as a means to ensure that the company delivers on its commitment to rewarding employees fairly for the skills they possess and their work performance regardless of gender. The framework identifies gender pay gaps within comparable groups of employees and ensures consistency, fairness, and transparency in pay. The framework was implemented in 2014 with pilots in 12 countries and has since been expanded to over 100 countries, reaching 99.6% of the company's total workforce by the end of 2020. The framework uses a unified global-local methodology to address pay gaps, ensuring consistency while also adapting to local market conditions. Schneider Electric aims to attain and maintain a pay gap of <1% for all employees and to achieve a 50:40:30 gender balance (i.e., women should represent 50% of all new hires, 40% of all frontline managers, and 30% of senior leadership) by 2025. Schneider Electric is partner of "Where Women Work", a networking platform that was set up to showcase the work and achievements of women and shine a spotlight on leading organisations supporting women.³¹

he "50:50 Sustainable Projects" initiative by **ACCIONA**³², a Spanish multinational with a strong foothold in the renewable energy industry, aims to promote female participation and leadership in projects and production centres it operates worldwide. It focuses on reskilling and upskilling women, identifying and promoting internal female talent, enhancing employability of women in critical sectors of the economy, and challenging gender stereotypes. Notable achievements include establishing equal participation in a network code team and promoting female inclusion in key positions in wind energy production. By creating opportunities and

³⁰ <https://www.ifc.org/content/dam/ifc/doc/2023-delta/ifc145-e2e-case-studies-schneider-digital.pdf>

³¹ <https://blog.se.com/life-at-schneider-electric/2019/02/01/female-talents-enjoy-growth-working-at-schneider-electric/>

³² https://procoazrbolsast1.blob.core.windows.net/media/15opitjr/acciona_ener_sust_report_2021_en.pdf

encouraging female participation, the initiative has already contributed significantly to a more diverse and inclusive workforce in the renewable energy sector.

The **#DIEzukunft Initiative**, launched in 2021 by **Salzburg AG**³³, which serves as the multi-utility company for both the city of Salzburg (Austria) and the surrounding state, aims to increase equal opportunities within the company as well as the advancement of women and girls in STEM fields. It promotes a cultural change through an open corporate culture and an attractive working environment. Key elements include promoting gender balance, offering part-time management options (“topsharing”), providing vacation programs for STEM-focused employees, and offering mentoring programs. The initiative also focuses on creating a family-friendly work environment with flexible home office options and childcare support. Salzburg AG actively encourages women in science and technology through targeted recruitment and employer branding measures. They also organise one-week “robo.camps”, workshops designed to playfully introduce kids to computers and engineering, exclusively for girls to spark interest in technology. Another important aspect of the initiative is an internal network that promotes trust, genuine exchange, support, and community among female managers. Large parts of these objectives have already been implemented. The main achievements so far include an increase in the representation of women in leadership positions, the establishment of diverse teams, the promotion of an inclusive corporate culture, the active recruitment of male mentors, and a modern parental leave system.

Methodological notes

A survey targeting employees of the energy sector was conducted in summer 2023. The questionnaires were implemented on the web, namely on EUSurvey and Netigate. The survey made use of a structured questionnaire with a range of closed questions and the option to add open text responses where appropriate. The survey was distributed with the help of the broad network of organisations and experts in the studied countries. In addition, an industry panel provided by Netigate was used to reach the target number of responses. The survey was aimed at any person in the target population of people working in the energy industry, irrespective of gender. The survey took 15 to 20 minutes to answer. All answers were anonymous, and the respondents were not asked any identifiable information, such as e-mail address, to avoid bias. The questionnaire was available in the primary national language of each EU27 country and special attention was paid to formulate the questions in a non-biased, clear and gender-neutral manner, avoiding jargon or ambiguity. No weighting was applied to the dataset.

³³ <http://presse.salzburg-ag.at/news-diezukunft-fuer-mehr-chancengleichheit>

POLICY BRIEF 4: KEY INSIGHTS FROM A SURVEY AMONG HIGHER EDUCATION STUDENTS

Key insights

This policy brief examines the attitudes of students enrolled in higher education about climate change, the energy transition, and how these influence their past and future study and career choices. It focuses on the differences by gender, and also looks into the criteria that students expect to use when selecting a job after having graduated. The vast majority of students view climate change as a critical issue, with female students expressing greater concern than their male counterparts. Additionally, these students widely recognise the importance of successful energy transition in tackling this global challenge. Their perspectives on climate change and energy transition are significantly influencing their career decisions. This trend presents a unique opportunity for energy sector employers. By emphasizing the role their employees play in addressing these pivotal world challenges, they can effectively attract the next generation of graduates. We also found that for female students, study choices are mainly influenced by interest in the subject, personal development prospects, and prior career expectations. Female STEM students prioritise challenging jobs and faculty influence. The interest in the energy sector is high, especially among students in STEM fields, with male students being more inclined towards a job in the energy industry careers.

Objectives of this policy brief and methods applied

This policy brief presents key insights from a survey among higher education students, conducted in the context of a study funded by the European Commission via the European Climate, Infrastructure and Environment Executive Agency (CINEA). The results focus on the energy sector. While not statistically representative of the EU higher education student population, the results of the survey offer important insights about how a variety of factors influence students' study and career choices, including gender, perspectives on climate change and the energy transition as well as specific preferences concerning working conditions. The majority of 648 responses were from Germany, France, Spain, Italy, Poland, Sweden and the Netherlands.

Opinions about climate change and the energy transition, and their impact on choices

How do students think about climate change? Female students are significantly more likely to be extremely concerned about climate change than male students. On average, on a 10-point scale, female students allocate 8.3 points to seriousness of climate change, compared to a 7.6 average level of male students. Furthermore, 38% of women indicate climate change as an extremely serious issue, compared to 25% of male students.

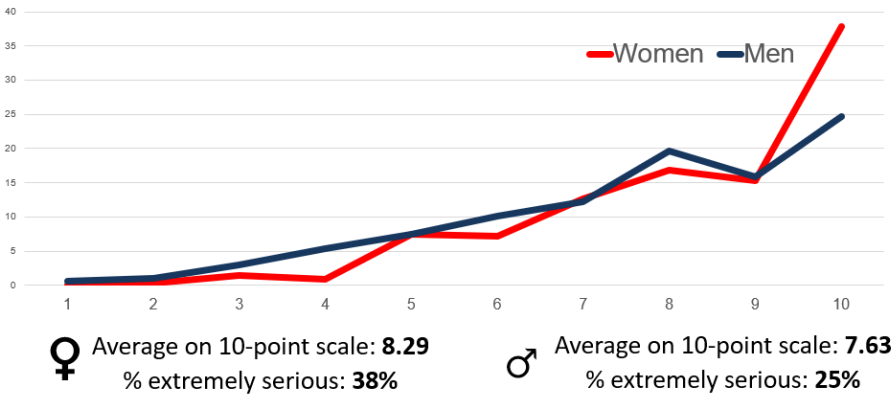
How do students think about the energy transition? Around one in four students, both male and female, considers the energy transition to be of extreme importance for combatting climate change. Female and male students, on average, allocate an importance level of, respectively, 7.7 and 7.5 out of 10 to the role of the energy transition for combatting climate change. Furthermore, 24% of both male and female respondents assign an extremely important role to the energy transition.

How much have these opinions influenced study and career choices? Students enrolled in tertiary education think that their opinions about climate change and the energy transition will exert a strong influence on their (future) career choices. On average, almost a quarter of female students reports that such opinions have influenced their study choice, compared to one third among men. The percentages increase for both women and men in STEM education, to 42% for female and 37% for male STEM students. Importantly, among all segments of the student population, the share of respondents who report that their future career choices will be impacted by their opinions concerning climate change and the energy transition is significantly larger than the share reporting that their past decisions have been influenced by these.

Factors influencing study choice by gender and participation in STEM programmes

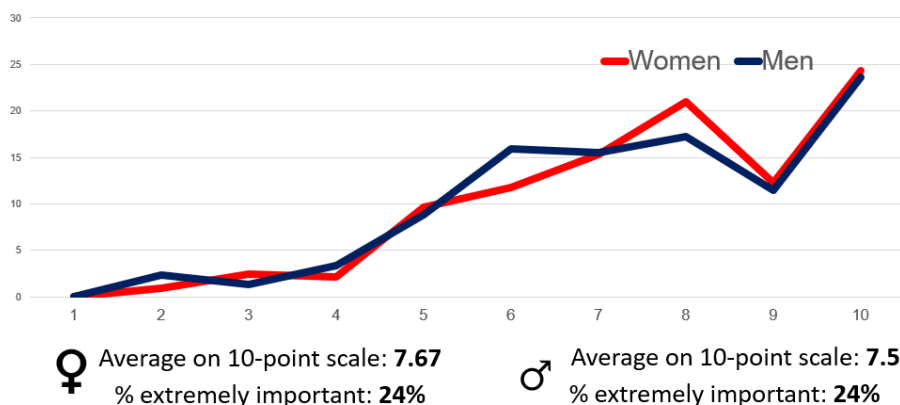
What made female students choose their study programme? The main factors determining the study choice of female students are interest in the subject matter, prospects for personal development and the fact that they always expected to work in this field. When asked what the main factors were for choosing their field of education and training, 59% of female respondents indicate “being interested in the subject matter” and 39% that “they always expected to work in this field”. 29% report “prospects for personal development” as main determinant and 24% “good prospects for employment”.

“How serious a problem is climate change at this moment?” (%)



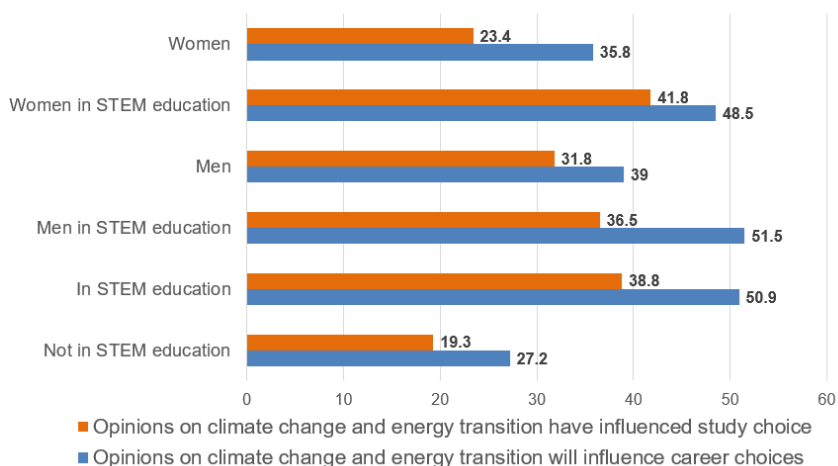
Note: All students; n = 644; Scale: 1 = “Not at all a serious problem”; 10 = “An extremely serious problem”

“How important is the energy transition for combatting climate change?”



Note: All students; n = 644; Scale: 1 = "Not important at all "; 10 = "Extremely important"

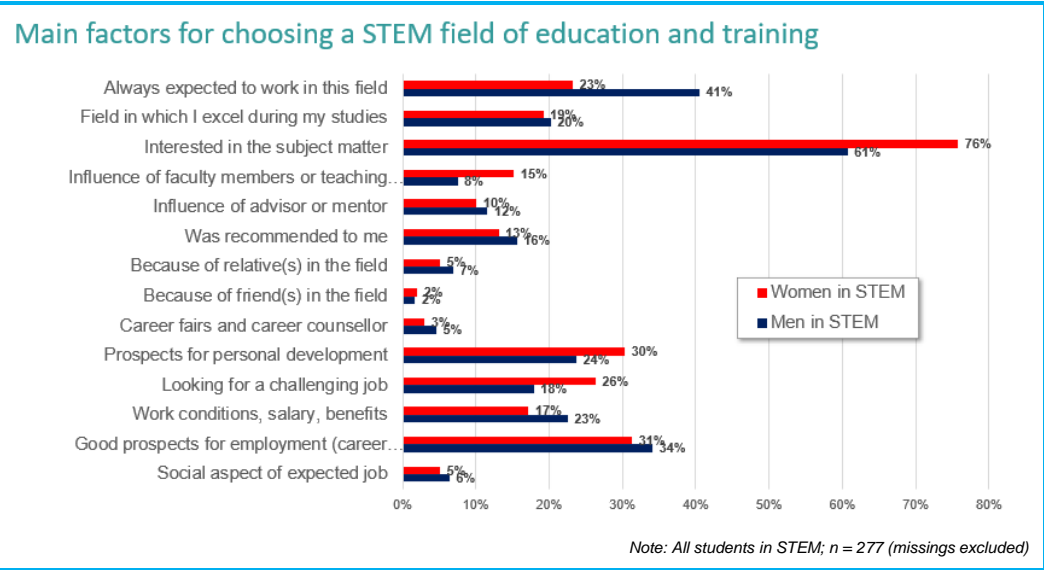
Students reporting these opinions have influenced study choice (%)



Note: All students; n = 620-647; Sum of responses "yes, a little" and "yes, a lot" in %

What made students decide to choose STEM? On top of interest in the subject matter and prospects for personal development, female STEM students are more likely to have decided for STEM because of the wish for a challenging job and the influence of faculty members or teaching assistants. Female STEM students are much less likely to have chosen STEM because they always expected to work in this field. As the graph below shows, a great majority of female STEM students made the choice primarily for their interest in the subject matter (76%). Only 23% of women chose to study STEM because they always expected to work in this field, compared to 41% of men, which points towards the importance of interventions at young age to challenge gender stereotypes among girls about types of jobs available to and suitable for women. Women in STEM are more likely to have chosen their

study programme for their personal development and less likely to have chosen it due to favourable working conditions, salaries and benefits.

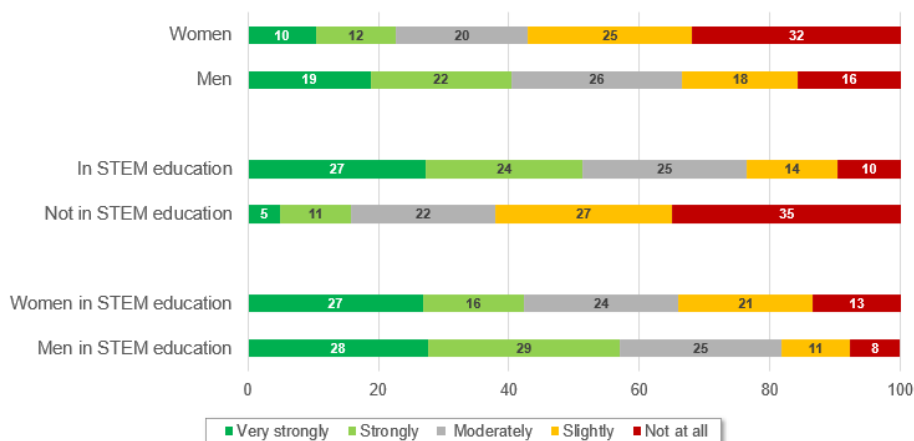


Interest in a career in energy

How many students consider the prospect of a career in the energy sector? There is sizeable interest among students in tertiary education in working in the energy sector, especially among students enrolled in STEM education. Men are significantly more likely than women to consider the prospect of working in the energy sector after completing their studies. This gender difference becomes smaller, but is still significant, for STEM students. On average, male students are more likely to be strongly or very strongly interested in working in the energy sector after completing their studies compared to women (41% versus 22%). These percentages are higher among men and women in STEM education, respectively (57% and 43%). Students who are not enrolled in STEM education are unlikely to consider the prospect of working in the energy sector. This points towards the need for greater efforts to make the sector appealing also for skilled individuals without a background in engineering. This is a challenge many higher education institutions across Europe are working on, for which they are designing and rolling out interdisciplinary study programmes preparing for jobs at the forefront of the energy transition.³⁴

³⁴ Dotti, N.F. et al. (2023) 'Interdisciplinarity for the Net-Zero Transition: the Perspectives of Universities and Research Organisations', CESAER, <https://doi.org/10.5281/zenodo.7848167>

Interest in working in the energy sector after completion of studies (%)



Note: All students; n = 620-647 (missings excluded)

Methodological notes

A survey targeting students in tertiary education was conducted in summer 2023. The questionnaires were implemented on the web, namely on EUSurvey and Netigate. The survey made use of a structured questionnaire with a range of closed questions and the option to add open text responses where appropriate. The survey was distributed with the help of the broad network of organisations and experts in the studied countries. In addition, a student panel provided by Netigate was used to reach the target number of responses. The survey was aimed at any person in the target population, irrespective of gender and field of education and training. The survey took 5 to 10 minutes to answer. All answers were anonymous, and the respondents were not asked any identifiable information, such as e-mail address, to avoid bias. The questionnaire was available in English as well as French, German, Italian, Polish and Spanish. No weighting was applied to the dataset.

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct centres. You can find the address of the centre nearest you online (european-union.europa.eu/contact-eu/meet-us_en).

On the phone or in writing

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696,
- via the following form: european-union.europa.eu/contact-eu/write-us_en.

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website (european-union.europa.eu).

EU publications

You can view or order EU publications at op.europa.eu/en/publications. Multiple copies of free publications can be obtained by contacting Europe Direct or your local documentation centre (european-union.europa.eu/contact-eu/meet-us_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

EU open data

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

This report assesses gender balance in the energy sector and identifies strategies for inclusivity. Women make up only 25% of the workforce in EU energy companies, marginally higher in senior roles. Women's involvement in research and innovation stands at 22%, with significant variations across EU states. The report projects the necessity of adding 200,000 women to the EU27 energy sector by 2050 to attain minimal gender balance. Emphasizing the need to promote STEM careers for women, the report includes concrete recommendation for effective measures.

Studies and reports



Publications Office
of the European Union