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EU Solar Jobs Report 2025

Solar workforce navigating slower growth

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Foreword

Welcome to our Solar Jobs Report 2025,

For many years, solar has been Europe's most powerful job engine – creating career opportunities in a future-proof technology, supporting communities and citizens through local employment, and driving the transition to a renewables-based energy system that underpins the EU's energy security. After years of extraordinary growth, the solar sector reached another record in 2024, with 865,000 people working in the industry. While momentum slowed to 5% year-on-year growth, this still far outpaced the broader EU labour market, which grew by only 0.8%.

2025, however, looks very different – and may mark a pivotal point. For the first time in a decade, the European solar sector is set to lose jobs. With solar market growth projected to turn negative this year largely due to the long-time solar sector's job driver – the more job-intensive residential rooftop segment weakening –, the EU solar workforce is expected to contract by 5%, falling to around 825,000 jobs. This setback reflects both policy frameworks that fail to sufficiently attract solar investment and meet consumer demand in the post-energy crisis environment, and global production overcapacity, where European manufacturers face immense competitive pressure.

Yet this is not necessarily the start of a story of decline. If the right policies for solar and storage are created in Brussels and implemented across the Member States – placing European citizens and businesses at the centre – the European solar success story will continue. In fact, the medium-term outlook still foresees employment recovering from 2026 onwards, reaching more than 916,000 jobs by 2029. However, this means the symbolic million-jobs milestone will most probably only be within reach after 2030, much later than originally hoped for.

As if the market environment were not challenging enough, the solar sector faces another key obstacle: the urgent need for a skilled, diverse, and future-ready workforce. Across Europe, companies struggle to recruit enough qualified electricians, roofers, engineers, and other solar specialists, in particular for wider residential electrification. Without swift action, this skills bottleneck risks holding back Europe's solar potential.

Encouragingly, the EU has started to respond, with initiatives like the European Solar Academy under the Net-Zero Industry Act and the broader Union of Skills Strategy. However, compared to other global solar regions, Europe's efforts still lack scale, coherence, and sustained funding.

This report therefore outlines clear policy recommendations: from establishing a European Solar Skills Intelligence Hub, to securing stable and accessible funding for training, boosting vocational pathways and ensuring inclusive access to solar careers.

If the European Union wants to continue to bank on solar power as the cornerstone of its competitiveness, energy security, and sustainability, now is the time to act.

Enjoy reading our report,

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In 2024, the EU solar sector reached a new high by adding about 65 GW of new solar PV capacity, with a 5% increase in full-time equivalent jobs

65.1 GW

65.1 GW installed in 2024: fourth consecutive year of record-setting installations

3.3%

33% annual market growth: a decrease from 31-51% in the previous three years

865,000

865,000 FTE jobs in 2024: a 5% increase over 2023

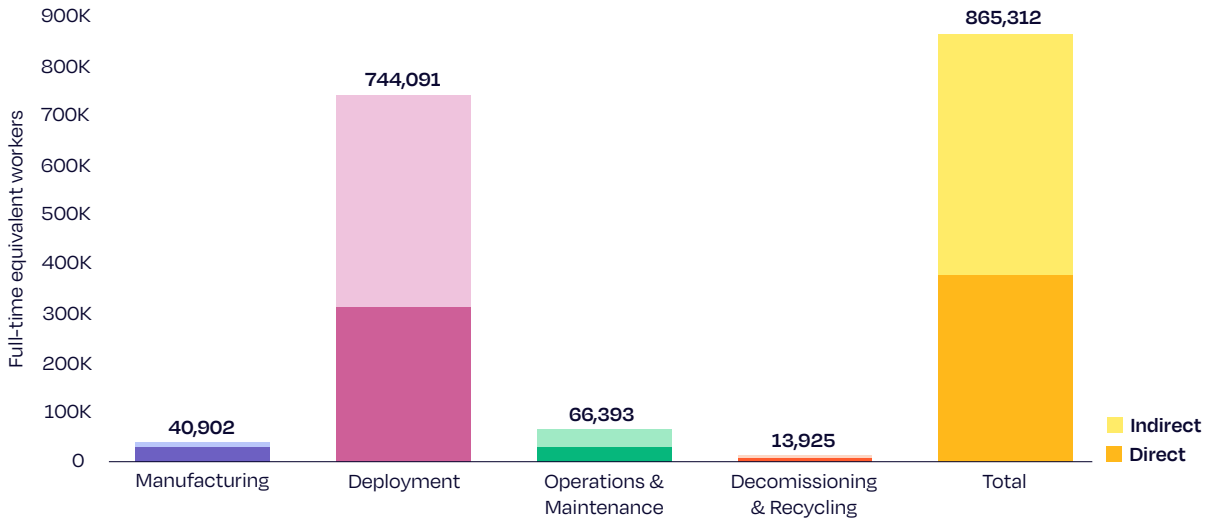
The European solar industry stands at a crossroads in 2025, balancing between the remarkable momentum of recent years and new challenges emerging on the horizon. In 2024, the EU solar sector reached a new high by adding 65.1 GW of new solar PV capacity, marking a fourth consecutive year of record-setting installations. However, the pace of growth has cooled significantly compared to the extraordinary expansions of the prior three years. After the energy crisis triggered by surging electricity prices in 2022 and 2023, annual growth has slowed to 3.3%, down from the exceptional 31-51% increases seen in the previous three years. This deceleration was largely expected as energy markets stabilised and the temporary drivers fuelling the boom subsided.

Employment in the European solar sector mirrors the broader market trends. In 2024, solar employment grew modestly to 865,000 full-time equivalent (FTE) jobs, a 5% increase over the 826,000 FTEs recorded the previous year (Fig. 1). This job growth outperformed our previous forecast by 4.2%, a testament to the sector's resilience and adaptability as actual installed capacity exceeded expectations.

Figure 1

EU solar PV employment grows by 5% and reaches 865,000 in 2024, with a strong concentration in the deployment sector

EU27 solar job market in 2024



Direct jobs accounted for 377,000 FTEs, or 44% of all jobs, while indirect jobs, made up 488,000 FTEs (56%) in 2024

The composition of employment is revealing: direct jobs, involved in the core solar value chain (such as manufacturing, project development, and installation), accounted for 377,000 FTEs, or 44% of all jobs. Indirect jobs, supporting a diverse range of connected activities in upstream or downstream sectors, made up 488,000 FTEs (56%). This segmentation underlines the wide-reaching economic impact of the solar industry, which supports local economies and stimulates complementary sectors across Europe.

The vast majority of jobs, 744,000 FTEs or 86% of the total, are concentrated in solar deployment activities. This highlights both the vitality and vulnerability of the sector: job creation is highly dependent on ongoing market expansion and installation activity. Operations & Maintenance (O&M), an area steadily gaining importance as the installed base grows, generated 66,000 FTEs (8% of total jobs) in 2024. Solar PV manufacturing, a segment that plays an essential role not only within the broader solar ecosystem but also from the perspective of EU strategic autonomy and energy independence, contributed 41,000 FTEs. The segment is facing strong challenges posed by international competition and supply chain uncertainties. Lastly, the still emergent Decommissioning and Recycling segment represents promising avenues for future employment as Europe's solar fleet matures.

The current employment patterns reflect both strengths and vulnerabilities of the EU solar sector. While deployment remains the backbone of the solar labour market, the strong reliance on this single segment makes it vulnerable to oscillations in deployment volumes, which need to be kept predictable and stable through reliable, long-term oriented policy frameworks.

Tordesillas, Spain. © BayWa r.e

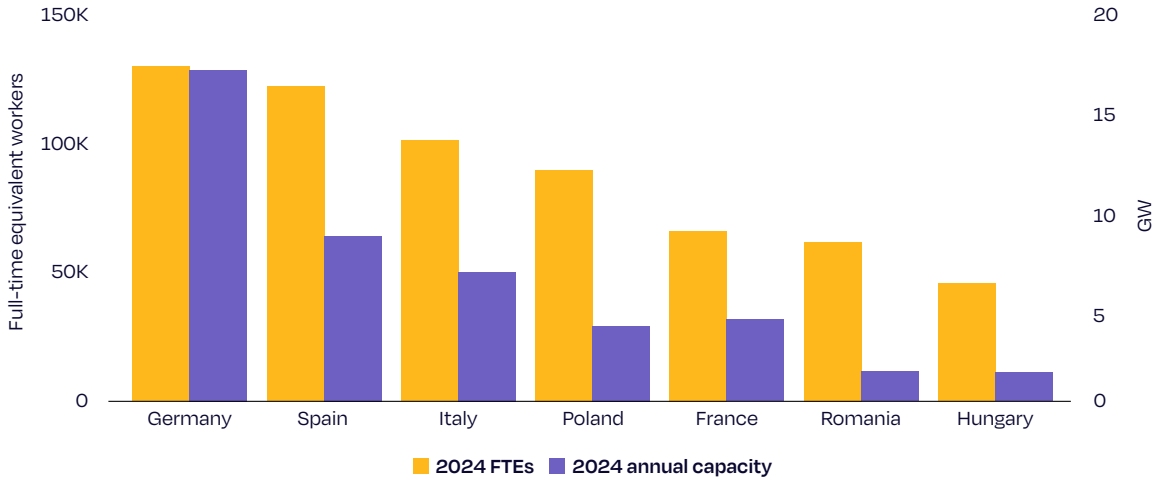
Germany remained the leading EU country for employment, with around 128,000 direct and indirect FTEs, Spain ranked second with 122,00 FTEs and Italy third surpassing 100,000 workers

Looking at specific country employment figures, Germany remained the leading EU country for employment, with around 128,000 direct and indirect FTEs, though this was a decrease compared to the previous year. Spain ranked second with 122,000 FTEs, maintaining strong employment levels despite a slight drop in installations. Italy saw significant growth, with the solar job market surpassing 100,000 workers, placing it third in the EU. Other top markets included Poland (90,000 FTEs), France (66,000 FTEs), Romania (62,000 FTEs), and Hungary (47,000 FTEs). Overall, the largest national solar markets also represented the largest sources of solar employment in the EU as of 2024 (Fig.2).

Figure 2

The leading solar PV markets are also amongst the largest employers, with Germany, Spain, and Italy at the forefront

EU27 top 7 FTE countries and annual installed solar PV capacity 2024



A decrease by 5% is expected in 2025, but towards 2029, employment is expected to rise again, reaching 916,000 FTEs in the Medium Scenario

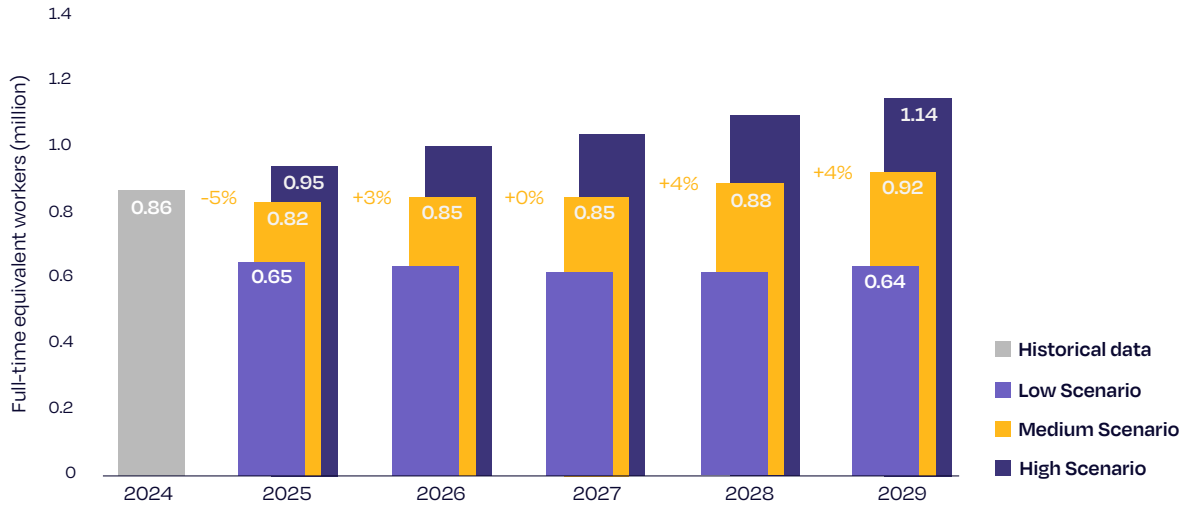
A closer look at market forecasts anticipates a further loss of momentum in solar employment creation, driven by a 1.4% decrease in annual solar PV installations expected in 2025. The slight market contraction anticipated in 2025 is expected to temporarily reduce solar jobs, which decrease by 5% to 825,000 FTEs under the Medium Scenario (Fig. 3). Nevertheless, as solar PV installations will regain a positive growth rate towards 2029, employment is expected to rise again, reaching 916,000 FTEs in the Medium Scenario by that year, and up to 1.1 million in the High Scenario.

The EU Solar Job Report 2025 paints a nuanced portrait of a sector in transition. The solar industry's recent rapid expansion and record employment gains are now tempered by emerging headwinds, including the slowdown in residential solar, the scaling back of supportive policies, and the inadequate levels of system flexibility. Continued success will depend on the sector's ability to adapt to changing market conditions, innovate across the value chain, and secure the necessary financial and regulatory backing for sustainable growth.

Figure 3

With slow employment growth rates ahead, the 1 million solar job mark is only reached in the High Scenario

EU27 solar PV FTE scenarios 2025-2029



2025 Jobs report Policy Recommendations

Despite a slowdown in the growth of solar PV full-time equivalent workers (FTE) in 2024 and an estimated 5% drop of solar PV FTEs in 2025, the skills shortage across Europe remains a significant challenge that needs to be tackled. Companies continue to report difficulties in hiring electricians, roofers, engineers, as well as manufacturing specialists with the adequate set of skills, and they also report a lack of funds to reskill and upskill their hires. At the same time, technology is evolving quickly, requiring workers to master new processes, tools, and digital systems.

In today's global context, renewables are crucial for Europe's energy security, and its ability to compete on the world stage. While Asia is already advancing in this race, Europe risks falling behind unless it equips its workforce to meet ambitious green energy targets. Encouragingly, the European Union has increased its attention to this challenge: the European Commission's Union of Skills Strategy established a High-Level Skills Board, a European Skills Intelligence Observatory, a Skills Portability Initiative, and strengthened the Pact for Skills, one of the flagship initiatives of the Commission's European Skills Agenda. Moreover, the European Solar Academy, launched by InnoEnergy under the Net-Zero Industry Act (NZIA), will train 100,000 workers within a couple of years. At the same time, the RESkill4NetZero project is advancing cross-renewables training frameworks to standardise competences across technologies.

These are vital steps, however compared to efforts in other parts of the world, like major investments in Asian Vocational education, and training (VET) systems, the EU still lacks the scale, dedicated budgets, and systemic frameworks to close the workforce gap. Without urgent action, Europe risks limited solar growth alongside persistent skills bottlenecks.

To address this, we propose eleven concrete policy recommendations for 2025. They build on what is working, identify what is missing, and provide targeted actions to ensure Europe's solar workforce is fit for the energy transition.

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A. Building a coherent and well-resourced skills system

1

Establish a European Solar Skills Intelligence Hub

Europe's energy transition will only succeed if labour market planning is based on robust, comparable, and forward-looking data. While the Union of Skills has launched a European Skills Intelligence Observatory, todays' skills assessments remain fragmented, outdated, or unavailable, making it difficult for policymakers, training providers, and companies to anticipate workforce needs, or address shortages in time.

To close this gap, the EU should establish a European Solar Skills Intelligence & Mapping Hub, hosted within the European Skills Intelligence Observatory, to serve as a single reference point. This Hub should not only consolidate existing inventories and publish harmonised datasets but also produce labour market forecasts, disaggregated by Member State, job profile, and qualification level. Member States must fulfil their obligations under the Renewable Energy Directive by collecting, and reporting work-force data in line with a common EU taxonomy. Industry, social partners, and training providers should equally contribute to providing updated information on skills shortages and training programmes.

By combining national data with sector intelligence, the Hub would deliver quarterly dashboards and publicly accessible registries that map training offers, measure employment outcomes, and anticipate future gaps. Such an integrated mechanism would make Europe's solar workforce more transparent, mobile, and responsive, while enabling evidence-based policymaking and funding allocation.

2

Scale and stabilise funding for renewable skills, with simplified solar employer's access

Meeting Europe's solar deployment targets requires durable, large-scale funding for skills that is accessible to for small and medium-sized enterprises (SMEs), that form the backbone of the sector. While the Union of Skills and the Net-Zero Industry Act recognise skills as a pillar of Europe's industrial resilience, they do not allocate resources at the level required to close the solar workforce gap. We support the European Parliament Intergroup on the Future of Education and Skills for a Competitive Europe call for stronger, long-term EU investment in education and skills, including increasing the allocated budget for education and training in the next Multiannual Financial Framework (MFF), and ensuring Member States commit a larger share of their GDP to education and training.

As the Intergroup underlines, education is an investment that yields significant returns, while underinvestment is already a barrier to Europe's competitiveness. Europe has taken an important first step with the launch of the European Solar Academy, launched by the Commission under the Net-Zero Industry Act. As the first of the new Net-Zero Academies, it has already begun upskilling activity, aiming to train up to 100,000 over three years. Yet, more must be done to address the challenges ahead.

2

SolarPower Europe estimates that more than 400,000 new workers will be needed by 2030 to reach 30 GW by 2030 as prescribed by the European Solar PV Industry Alliance. To bridge the gap, the EU should establish a dedicated, multi-annual budget for renewable skills under the upcoming MFF, providing stable resources that can be scaled alongside deployment. Within this financing, it is vital to ensure that SMEs (most employers in the solar sector) can access training funds through simplified procedures, micro-grants, employer vouchers and co-funded apprenticeships. A long-term, well-funded training infrastructure will ensure that the Solar Academy's initial success is expanded across regions, securing both industrial resilience and quality job creation.

To build on the effectiveness of increased funding and simplified access for solar employers, it is also crucial to introduce direct incentives for companies that create jobs in NZIA sectors. In particular, the EU and Member States should consider specific labour taxation measures, such as reduced employer social security contributions or targeted tax credits, for businesses expanding their workforce in solar and other net-zero industries. These fiscal incentives are already being used in other global regions to attract investment and accelerate job creation, and would directly address the cost barriers faced by many solar employers, especially SMEs. By integrating such schemes alongside training funds, Europe can ensure that investments in skills development are matched by strong demand for new jobs, supporting both rapid workforce growth, and the competitiveness of the European solar sector.

3

Map the existing skills initiatives

It is challenging to navigate the numerous skills activities organised across Europe. The European Commission should foster a comprehensive framework encompassing the mapping of all EU funded reskilling initiatives, providing added value to those that are delivering results without creating any extra administrative burden. This work should be anchored in the Union of Skills governance pillar and coordinated through the newly established High-Level Skills Board. Such coordination would ensure that sectoral mapping (like in solar) feeds into the broader European Skills Intelligence Observatory. Projects like RESkill4NetZero aim to connect with other similar initiatives, and there should be more support allocated to such practices, to simplify the navigation in such ecosystems, and make the benefits of such initiatives more available.

B. Ensuring fair, attractive, and inclusive pathways into solar careers

4

Conclude sectoral agreements to enable large-scale retraining and just transitions

To meet its 2030 solar targets, Europe must mobilise not only new entrants but also workers from adjacent sectors such as construction, architecture, heavy industries, manufacturing, and especially industries impacted by the green transition like, oil and gas. Large-scale redeployment requires structured frameworks that provide fair conditions and certainty for both workers and employers.

The EU and Member States should therefore promote sectoral agreements between governments, employers and social partners to establish clear provisions for retraining, and certification support. These agreements should also guarantee social protection during retraining and define recognised pathways into priority solar occupations such as solar PV installations, electrical works, site management, and manufacturing.

Importantly, the Net-Zero Industry Academies should be supporting this process, working with industry and vocational providers to co-develop tailored modules for workers transitioning from declining sectors. By piloting such agreements in Member States with high concentrations of workers at risk of displacement, Europe can demonstrate how retraining can be implemented in a fair, rapid, and scalable way. Embedding these agreements into national strategies will help to normalise lifelong learning, ensure the just transition principle is respected, and accelerate the redeployment of skilled labour into the solar economy.

5

Run coordinated campaigns to improve the attractiveness of technical green careers, as well as apprenticeships and vocational training in and renewable energy technologies

Today, solar careers remain largely invisible in most school and university programmes, while technical pathways are often undervalued compared to theoretical or service-oriented fields. To address this, Europe needs well-designed vocational programmes, particularly in renewable energy technologies , combining cutting-edge technologies, hands-on experience, modern equipment, and teachers who are well-compensated and up-to-date.

SolarPower Europe recently joined the European Alliance for Apprenticeships (EAfA), and we are aligned on purposefully promoting and incentivising apprenticeships (for example, through bonus points in auctions for projects offering training along the renewable energy value chain).

An EU-wide awareness campaign, could further highlight opportunities in the sector, targeting under-represented groups pursuing reskilling as highlighted in the next recommendation. Strengthening vocational pathways also positively impacts the job market by enhancing the social value of technical careers, bridging gaps between theoretical and practical education, and attracting a broader range of talent. Education policies should integrate renewable energy-focused training into VET programmes, promote apprenticeships across different educational pathways, and recognise technical professions as socially respected and viable.

5

The European Strategy for Vocational Education and Training should include a dedicated chapter on renewable energy careers, combining promotion campaigns with clear pathways for students and jobseekers, ensuring a skilled, diverse, and resilient workforce that can drive Europe's energy transition. Complementary efforts, such as career guidance updates, outreach in schools and adult re-entry programmes, will help close information gaps and position technical solar careers as high-opportunity, respectable and accessible alternatives to purely academic routes.

6

Promote gender balance and diversity in solar careers

Europe has made progress with initiatives such as the 2025 STEM Education Plan and the "Girls Go STEM" campaign, which aims to engage one million girls by 2028. Indeed, in 2022 women already made up "about 40% of the solar PV workforce, nearly double the share of the oil and gas industry."[1] Yet despite progress at EU level, most of the women in solar are concentrated in administration roles, the solar workforce remains overwhelmingly male when looking at STEM, Management and other technical roles with percentages ranging from 17% to 35%.[2]

To correct this imbalance, gender and inclusion targets should be embedded in all EU-funded training programmes. Targeted mentorship programmes, scholarships, and awareness campaigns should support women and other under-represented groups to enter technical, scientific, and engineering careers; all roles which women only represent one third of the current workforce. A more diverse solar workforce is not only fairer, but also more innovative and resilient.

C. Future-Proofing Skills through Mobility, Technology, and Innovation

7

Develop cross-renewable career pathways and portable competence frameworks

As Europe scales up solar alongside wind, batteries, hydrogen, and electrification technologies, the workforce must be equipped with skills that are both specialised and portable across sectors. At present, training is too often siloed by technology, creating inefficiencies and limiting labour mobility. The EU should therefore establish cross-renewable career pathways, underpinned by modular competence frameworks and micro-credentials that capture both shared "core green skills" and technology-specific expertise.

Building on the RESkill4NetZero Blueprint and the Renewable Energy Skills Partnership, these frameworks should cover areas such as system design, electrical safety, quality assurance, digital operations, project controls, and sustainability reporting, while embedding recognition of prior learning to ease sector transitions. Workers should be able to accumulate stackable credentials that allow them to move seamlessly from, for example, solar O&M to wind service, or from construction to energy storage commissioning. Establishing such portable competence frameworks will not only reduce mismatches and bottlenecks, but also future-proof Europe's workforce by enabling rapid adaptation to deployment cycles and emerging technologies.

1 https://www.irena.org/Publications/2023/Sep/Renewable-energy-and-jobs-Annual-review-2023
2 https://www.irena.org/Publications/2023/Sep/Renewable-energy-and-jobs-Annual-review-2023

8 Introduce a European Solar Skills Passport

Fragmented certification systems remain big barriers to mobility in the solar workforce. The Union of Skills has announced a general Skills Portability Initiative, but sector-specific recognition is still lacking. A European Solar Skills Passport, developed in partnership with industry and aligned with the outputs of RESkill4NetZero and the European Solar Academy, would ensure that qualifications for installers and engineers are mutually recognised across Member States. This would not only improve labour mobility, but also facilitate rapid deployment of projects where skills are most urgently needed.

9 Adopt an electrification-skills strategy that links solar PV to heat, mobility and storage

Solar deployment does not occur in isolation: solar PV siting, installation and operation increasingly intersect with electrification pathways for heating, transport and buildings. The EU should therefore adopt an electrification-skills strategy that explicitly links solar PV competencies to skills for EV charging infrastructure, heat pumps, batteries, and energy management systems. This strategy should define interoperable competency standards, create joint training modules for cross-device installation and commissioning, and ensure alignment with evolving technical standards. Coordinated curricula and standards will reduce unsafe practice, improve system integration, and maximise the socioeconomic benefits of electrification across sectors.

10 Invest in advanced digital and AI training

Solar is increasingly shaped by advanced technologies such as AI-driven O&M, robotics in manufacturing, and digital energy management systems. Horizon Europe projects like SUPERNOVA already highlight this future demand. To prepare the workforce, Europe should fund specialised training modules in AI, robotics, and digitalisation for solar professionals. Embedding these modules within the Net-Zero Industry Academies would ensure that Europe's solar workers remain global leaders in innovation and efficiency.

Introduction

This report examines the state of employment in the European Union's solar PV industry in 2024, and provides projections for the next four years. The analysis applies a hybrid FTE methodology, combining employment factors, CAPEX/OPEX models, and EU-wide input/output multipliers to capture both direct and indirect jobs across the entire value chain. Building on last year's edition, the 2025 study updates labour costs and factory utilisation rates to better reflect actual manufacturing activity, and integrates new decommissioning and recycling projections from the EVERPV Horizon Project. Together, these refinements deliver a more accurate and forward-looking picture of solar employment and its contribution to Europe's energy transition.

In 2024, the European Union added 65.1 GW of solar PV, setting a new annual record for the fourth year in a row. Yet, market momentum slowed considerably, with growth easing to 3.3% after the exceptional 31-51% annual expansion seen between 2021 and 2023. This deceleration was anticipated, as the surge in 2022 and 2023 was largely fuelled by unprecedented energy prices during the energy crisis. Looking ahead, 2025 is set to mark a turning point; under SolarPower Europe's most recent Medium Scenario[3], the EU solar market is projected to contract for the first time in nearly a decade, by -1.4%.

The downturn is driven primarily by the rooftop segment, and in particular residential solar. Across several major Member States, households and SMEs are delaying investments in new installations in response to electricity prices returning to pre-crisis levels, and weakened policy support. In many cases, incentive schemes have been phased out or scaled back without adequate replacements, triggering a short-term rush in demand followed by a sharp slowdown. Among rooftop applications, the residential segment faces the steepest contraction: after accounting for around 30% of annual additions between 2020 and 2023, it is forecast to contribute only 15% of new capacity in 2025.

Taking a longer-term view, , this slowdown could put the EU's 2030 REPowerEU solar target at risk. To deliver 600 GW_{AC} (which is the equivalent of 750 GW_{DC}) by 2030, current market dynamics would need to accelerate. Medium-term growth is still expected in the next four years, but at more moderate levels than previously expected. In 2029, the annual EU market is forecasted to reach 84.5 GW, with cumulative solar capacity rising from 338 GW at the end of 2024 to 704 GW.

Solar employment in Europe is highly concentrated in deployment activities, which remain the backbone of the sector. However, other segments also make important contributions: Operation & Maintenance (O&M) jobs continue to expand as installed capacity grows, manufacturing employment remains strategically significant, though under high pressure, and decommissioning and recycling are beginning to emerge as a small but growing source of jobs. Against this backdrop, this study explores the employment challenges and opportunities arising from the evolving solar market in Europe. The analysis builds on historical data and forward-looking scenarios from SolarPower Europe's *Global Market Outlook 2025-2029 and the EU Market Outlook for Solar Power: 2025 Mid-Year Analysis*.

Witnica, Poland. © BayWa r.e.

3 SolarPower Europe (2024): *EU Market Outlook for Solar Power, 2025 Mid-year Analysis*. https://www.solarpowereurope.org/insights/outlooks/eu-market-outlook-for-solar-power-2025-mid-year-analysis

1.1. Methodology

This study employs a hybrid approach to calculate full-time equivalent (FTE) jobs, drawing from methodologies previously used in solar and renewable energy job creation studies. The model estimates both direct and indirect solar FTEs generated annually in each EU Member State, with a focus on four distinct stages of the value chain: (i) Manufacturing; (ii) Deployment; (iii) Operation & Maintenance (O&M); and (iv) Decommissioning & Recycling.

Direct jobs represent FTEs linked to core solar activities, such as solar manufacturing, deployment, O&M, and decommissioning & recycling. These jobs are generated directly through the expenditures made by producers and consumers on solar PV systems and services. On the other hand, indirect jobs arise from business-to-business transactions within the supply chain, which are classified as intermediate activities. These jobs represent the roles in upstream industries that provide goods and services to support the core operations of the solar PV sector. The expenditures by the solar PV industry on these intermediate sectors lead to the creation of indirect full-time equivalents (FTEs) in those corresponding sectors.

The calculation of direct jobs in Manufacturing and Decommissioning & Recycling relies on **employment factors**, which specify the number of jobs created in manufacturing or end-of-life management for every 1 MW of solar capacity in a given country, with distinct values for each value chain segment. In contrast, the approach used for direct jobs in Deployment and O&M is a **CAPEX-OPEX model**. This model determines the aggregate labour cost as a share of total CAPEX (for deployment) or OPEX (for O&M), and divides it by the cost of labour per worker to obtain the number of jobs resulting from solar installations in a specific EU Member State. Deployment jobs are based on the annually installed capacity, while O&M jobs are derived from the cumulative installed capacity.

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Furthermore, in order to assess the indirect impacts of solar PV investments, the report employs an **Input/Output** table that encompasses all 27 EU Member States and 63 sectors, covering a wide range of economic activities. The Input/Output table provides FTE multipliers, which enable the calculation of indirect jobs based on the direct jobs generated. Table 1 presents an overview of the methodology used in this process. All results are reported annually, reflecting the FTEs required to meet the corresponding year's demand. The FTEs numbers presented in this report are therefore always reflecting the end of year situation.

Table 1

Overview of the methodology

Value chain step	**Methodology for direct jobs**		**Methodology for direct jobs**	
Manufacturing	Employment factors	Direct FTEs	Input/Output (FTE multiplier)	Total FTEs
Deployment	CAPEX-OPEX model	Direct FTEs	Input/Output (FTE multiplier)	Total FTEs
Operations & Maintenance	CAPEX-OPEX model	Direct FTEs	Input/Output (FTE multiplier)	Total FTEs
Decommissioning & Recycling	Employment factors	Direct FTEs	Input/Output (FTE multiplier)	Total FTEs

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Table 2 provides an outline of the value chain activities considered in the study. FTEs associated with Deployment, O&M, and Decommissioning & Recycling are determined based on EU installed capacity scenarios. On the other hand, solar jobs related to Manufacturing are derived from EU production capacities for various value chain products, such as polysilicon, ingots/wafers, cells, modules, and inverters. A separate evaluation of job creation is performed for each of these products' manufacturing processes.

Table 2

Overview of the methodology

Category	Category section	Category breakdown
Manufacturing	Polysilicon	Polysilicon Manufacturing
	Ingot/wafer	Ingot/wafer Manufacturing
	Cells	Cell Manufacturing
	Modules	Modules Assembly
	Inverter	Inverter Manufacturing
Deployment	Installation Labour	Mechanical
		Electrical
	Soft Labour	Procurement
		Engineering
		Customer Acquisition
		Permitting
Operation & Maintenance	Operation & Maintenance Labour	Components replacement
		Inverter replacement
		Cleaning
		Reparations
Decommissioning & Recycling	Decommissioning	Removal of Modules
	Recycling	Collection of waste
		Treatment of waste

Regarding Deployment, the study evaluates both installation labour and soft labour, which includes engineering, procurement, customer acquisition, and permitting. Direct O&M jobs encompass activities like component and inverter replacement, as well as cleaning and repairs. Jobs in Decommissioning & Recycling pertain to the removal, collection, and treatment of end-of-life modules.

1.2. Manufacturing scenarios

EU manufacturing capacities through 2029 are evaluated on three different scenarios, which analyses each of the supply chain segment, from polysilicon, to modules and inverters.

In the Low Scenario, solar manufacturing experiences a significant contraction across almost all segments. Polysilicon production for the solar industry declines steadily as the main EU player in this segment transitions entirely to semiconductors, reaching zero by 2029. Cell and module production also fall due to factory closures and intensified international competition, leaving only niche or policy-supported operations in place. Inverter production is halved over the period as European manufacturers lose market share to global competitors. The currently negligible ingot and wafer production see no growth.

Under the Medium Scenario, solar manufacturing maintains a moderate level of activity, reflecting partial project finalisation and selective support for advanced factories. Polysilicon production slowly decreases from 26 GW in 2024 to 20 GW-levels around 2029. Cell and module production gradually increase as the most promising EU companies bring their planned capacities online, and advanced gigawatt-scale factories are established, though smaller projects remain unimplemented. Inverter production stabilises at around 114 GW after initial growth, constrained by competitive pressure, while wafer and ingot production remain negligible, continuing only in niche operations.

In the High Scenario, the EU solar industry successfully implements all announced manufacturing projects, including gigafactories, resulting in robust growth across all segments. Polysilicon production remains at current levels of 26 GW. Cell production scales up as the majority of planned projects commence operations. Module production expands significantly with all announced gigafactories fully operational, reaching 29 GW by 2029. Inverter production rises steadily to 135 GW, driven by capacity expansions from leading manufacturers. Wafer production begins to scale up with the entry of new players, while ingot production remains absent.

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1.3. Changes from previous EU Solar Job Reports

As for every new edition of this study, we have reviewed and updated the manufacturing capacities and the job intensity of manufacturing processes across all value chain segments, incorporating information from public company announcements and insights provided by our members. We have updated labour costs and CAPEX values with the latest available publications, wherever possible, to ensure the most accurate and up-to-date data is considered in our analysis.

In the 2024 edition of the study, we refined our evaluation of jobs in the manufacturing sector by including factory utilisation rates, which represent the ratio between actual production output and the theoretical production capacity, to better reflect actual activity levels. This issue has become increasingly relevant as European manufacturers face strong international competition, leading to reduced production levels. In this report, utilisation rate values have been further updated based on input from industry experts on current production output.

As of this 2025 edition, a different approach has been used to calculate the job creation in the Decommissioning & Recycling segment. Assumptions about future solar PV waste stream volumes in the EU are now based on the EVERPV Horizon Project research study results, published in July 2025.[4] As EVERPV's waste stream projections are larger than our previous estimates, this revision increases the share of Decommissioning & Recycling jobs compared to the previous year's figures. Also, the study models three scenarios (Low, Medium, and High) to reflect uncertainties in capacity growth and disposal behaviour, offering a nuanced understanding of future solar PV waste dynamics shaped by policy and technological trends. While the EVERPV model period begins in 2000, the values are projections rather than observed historical data. As such, the 2024 figures represent scenario outcomes and not verified historical quantities. For the purposes of our study, we use the Medium Scenario as the central reference case. While 2024 is already in the past, the waste quantities for this year are still scenario-based. A consequence of this scenario-based data rather than historical data is that there is a much larger difference in the forecast between one year's Medium Scenario, and the next year's Low Scenario, as the Low Scenario is not a decreasing trend from a historical data point, but is the continuation of a different scenario.

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4 EVERPV is a three-year Horizon Europe project which will aim to offer sustainable solutions for handling end-of-life solar PV panels in the EU, and optimise solar PV recycling techniques. SolarPower Europe is responsible for communications in the project, while supporting market analysis and policy activities. Website link: https://everpv.eu/

Irish Women in Solar

This section highlights the achievements of Irish women in the solar sector, focusing on Dawn Keegan, Grace Curran, and Morgan Pierce. Dawn Keegan, an Environmental and Sustainability Specialist, has led the development of an ESG strategy at Power Capital, emphasising biodiversity, sustainability, and community integration. Grace Curran, Head of Business Development at Neoen, has expanded Neoen's greenfield pipeline in Ireland from under 100 MW to over 1.6 GW. Morgan Pierce, CEO and founder of SolarSmart Energy Ltd, has completed over 1,200 solar PV installations since 2020, helping homeowners and businesses reduce energy costs. A common thread in each women's journey is the importance of mentorship, representation, and the growing opportunities for women in solar.

Dawn Keegan

Job Title: Environmental and Sustainability Specialist

From her early days in residential construction to leadership roles in utilities and renewable energy, Dawn Keegan's career is defined by a constant drive to embed environmental integrity, biodiversity, and innovation into her work.

"I was particularly drawn to solar energy because it tackles climate change, energy security, and economic opportunity at the same time."

Building ESG from the Ground Up

One of Dawn's proudest milestones has been leading the development of an ESG strategy at Power Capital, embedding biodiversity, sustainability, and community into all solar projects.

"I was the first person to hold an environmental role in the company and looking back, I'm very proud of what we've achieved so far."

Power Capitals annual ESG report goes beyond energy production, it highlights Power Capital's growth as a company, celebrates the team's achievements both in house and in the community, and showcases the impactful work being done around environmental protection and sustainability.

Confidence, Representation & Support

When asked whether she's faced challenges as a woman in the professional world, Dawn is honest: there were times she had to speak louder just to be heard. But with time, confidence, and the support of strong role models, she found her voice.

"I've learned to really back myself and build a strong network in the industry. Most people genuinely want to help and share knowledge - you just have to ask."

She's a strong advocate for mentorship, leadership visibility, and creating pathways into technical and executive roles, so that more women feel empowered to pursue careers in clean energy.

"Spaces like WISE(IR) highlight women in leadership, which can be so influential to others who feel like that path isn't possible for them."

Dawn Keegan

Opportunities for Impact

Dawn is energised by the scale of opportunity in solar, not just in generation, but in storage, grid modernisation, and in community energy models that make the energy system more democratic and inclusive. she is drawn to innovation and always searching for ways to do things better.

She's particularly passionate about the growing focus on ethical supply chains in the solar industry.

"It's not just about producing clean energy, it's about making sure it's done in a way that truly reflects the values of sustainability, including fairness, respect for people's rights, and a commitment to ethical, responsible practices"

Looking Ahead: From Spotlight to Series

Dawn's goal is clear: to develop projects that restore ecosystems, empower communities, and support Ireland's climate ambitions—while mentoring the next generation of women in solar.

But her work doesn't end here. In the coming months, Dawn will co-author a new Agri-PV and Biodiversity blog series with Solar Ireland, exploring how clean energy and land use can evolve together—sustainably.

"It's not just about energy, it's about what we give back to the land and the people."

Grace Curran

Job Title: Head of Business Development

Growing with Solar

Grace's interest in protecting the environment took root early:

"I've always cared about sustainability — I was the kid who watched Fern Gully on repeat! That love for nature is what drove me to study Environmental Science and later Sustainable Energy."

After three years in the waste sector, she joined Energia Renewables in 2017 and moved to Neoen in 2021. In just a few years, she has helped expand Neoen's greenfield pipeline in Ireland from under 100 MW to over **1.6 GW** — tangible proof of how dedicated people build Ireland's clean energy future.

Scaling Up: People Power Behind the Numbers

Behind every megawatt are people like Grace, whose commitment and leadership make this progress possible:

"Numbers are one thing — but it's the people behind them who deliver. It's been amazing to see our pipeline grow and to know these projects will power thousands of Irish homes with clean energy."

Leading, Learning and Inspiring

Developing large-scale projects may come naturally, but public speaking once didn't:

"Self-improvement comes from pushing ourselves outside our comfort zone."

Grace reflects on stepping onto the Solar Ireland conference stage twice — a challenge that grew her confidence and visibility.

She is equally committed to building an industry where women can thrive at every level:

"Connecting with other women and having visible role models is so important. I'd love to see even more of our male colleagues supporting this, and for events to aim for real balance on stage and in the audience."

On representation, she adds:

"It's recognised that having balanced representation at senior levels leads to better quality decision-making and outcomes."

Grace Curran

A Solar Future, Powered by Women

Grace sees huge opportunities ahead, from future RESS auctions to more corporate PPAs — and is especially watching how co-located battery storage could solve network constraints:

"Solar here is only going one way: up. Future RESS auctions, corporate PPAs and better battery solutions will unlock even more growth. We know batteries work brilliantly at a household level — now it's about making the business case stack up for grid-scale projects too. That's where real system flexibility will come from."

"My plan is to keep developing high-quality, large-scale solar sites that contribute to Ireland's 2030 targets and beyond — exactly the kind of growth our Scale of Solar report showcases this year," she says.

In Her Words

Biggest mentor: *"My mam — the hardest working person I've ever met. She did her degree and masters at the same time as me while working full time. Her example drives me every day."*

Thank you, Grace, for powering the people side of Ireland's solar scale-up — and for inspiring others to do the same.

Morgan Pierce

Job Title: CEO and founder of SolarSmart Energy Ltd

We are delighted to feature **Morgan Pierce, CEO and founder of SolarSmart Energy Ltd,** one of the few female-owned solar installation companies in Ireland. Since launching in 2020, SolarSmart has completed over 1,200 domestic, farm, and commercial solar PV installations, helping homeowners and businesses reduce energy costs while accelerating Ireland's progress toward its climate action goals.

A Leap into Solar Energy

Morgan's path into the solar industry wasn't a conventional one. Having built a career as an entrepreneur in the tech sector, she was first introduced to solar PV when a former mentee approached her in 2018 to assess the viability of domestic rooftop solar in Ireland. What began as a simple market evaluation quickly became a passion.

"I completely fell in love with the technology and the opportunity for impact. I could see the environmental benefits, of course, but I also saw the huge impact for homeowners and businesses—enabling them to become energy producers. What a concept—being able to make one's own electricity."

In 2020, amidst the uncertainty of the pandemic, Morgan saw an opportunity to make her mark in this emerging industry. She trained in solar PV installation, became a registered SEAI domestic solar contractor, and partnered with skilled installers to bring SolarSmart to life. Now, just five years later, SolarSmart is one of Ireland's highest-rated rooftop solar installer on TrustPilot, with a 37-strong team, warehouses in Dublin and Cork, and a fleet of 14 vans servicing 20 counties.

Proud Milestones in a Fast-Paced Industry

The pace of rooftop solar installation is relentless, requiring precision, coordination, and a strong team to deliver multiple installations each day. For Morgan, a defining moment came when SolarSmart surpassed 1,000 domestic rooftop installations in 2024—a milestone that underscored the company's impact on homeowners across Ireland.

"In the evening, when the photographs of the day's installations are put into the group chat, I'm privileged to celebrate proud moments every day."

Morgan Pierce

Women in Solar: Strength in Diversity

As a woman in a male-dominated industry, Morgan doesn't view her gender as a challenge but rather as an opportunity to stand out. She firmly believes that gender diversity improves industry performance, and while trades like roofing and electrical work remain largely male-dominated, women play a critical role in project management, sales, and operations.

"Half our sales team are women, and project management is also female-dominated. Behind every great solar installation is a woman who planned the whole effort."

She sees an urgent need to increase female representation in solar, not just for equality's sake but because diverse teams drive better problem-solving and decision-making. She highlights multi-tasking and coordination as areas where women excel, making them well-suited for roles in scheduling, project management, and overseeing multiple installations.

"Rooftop solar is a sector where the pace can be frenetic. We're commissioning multiple solar systems every day. Women are particularly well-suited for jobs which involve multi-tasking, juggling several issues at one time, and scheduling multiple teams to complete multiple tasks."

Encouraging More Women into Renewable Energy

Morgan's message to women considering a career in renewables is simple: jump straight in.

"Renewable energy will be a growth sector for the next 30 to 50 years. For young talent entering the workforce, the sector represents a significant 'ground floor' opportunity. There's a skills shortage, and women are equally capable of filling any role in this industry that a man can—maybe not lift 50 kg batteries, but pretty much any other activity women can perform."

She also stresses that women don't need to be electrical engineers to succeed in solar. Roles in project management, site surveying, sales, marketing, and technical support all provide valuable opportunities to contribute to the sector's success.

Morgan Pierce

The Future of Rooftop Solar in Ireland

While large-scale solar farms tend to dominate discussions about Ireland's energy future, Morgan sees rooftop solar as an equally transformative force. With the Irish government setting a target of one million rooftops with solar by 2030, the opportunity is massive—but progress is behind schedule.

"We've only achieved a fraction of that goal, and already it's 2025. The opportunity is absolutely massive, and we need all the talent we can bring to the table."

Another innovation that excites her is the emergence of community energy networks, where local groups can generate, share, and use their own electricity. She believes that as peer-to-peer energy sharing becomes more widespread, it will transform how energy is produced and consumed at a local level.

"I think it will be a very dynamic marketplace when a community can create its own electricity and use it in the most efficient way to power the usage and consumption patterns of different individuals and businesses."

A Vision for Growth

Morgan's ambition for SolarSmart is bold: to scale up operations to 5,000 solar installations per year—a fivefold increase from current levels. While this would represent a significant expansion of the company's market share, she sees it as just the beginning.

"It's still only the tip of the iceberg in terms of helping Ireland meet its million-rooftop goal."

Her leadership style is heavily influenced by her mother, whom she credits as her greatest role model.

"She was an amazing woman—a single mother who raised two successful businesswomen. She taught me to get up every day with a smile, keep my chin up, and work smart."

This resilience and determination have been the driving forces behind Morgan's success in both tech and solar, and they continue to fuel her mission to make rooftop solar a cornerstone of Ireland's renewable energy future.

Morgan's journey highlights the entrepreneurial opportunities within the solar industry and the transformative power of rooftop solar in Ireland's clean energy transition. Her vision for scaling solar adoption underscores the critical role that innovation, leadership, and diversity will play in shaping the future of energy.

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Chapter 3

EU Solar Jobs

The solar job sector demonstrated resilience in 2024, registering a modest 5% increase and reaching 865,000 full-time equivalent (FTE) jobs. While the sectors of Deployment, Operation & Maintenance, and Decommissioning and Recycling continued to experience growth, the manufacturing segment is facing challenges amid fierce international competition.

Looking ahead, projections indicate that, as the pace of solar market expansion slows in 2025, employment growth will likely contract before stabilising at modest rates through 2029. The sector is entering a transitional phase marked by more moderate deployment growth and uncertainty surrounding the future of EU manufacturing. As a result, the milestone of achieving one million solar jobs now appears just out of reach under the Medium Scenario.

EU solar employment registered minor growth in 2024, reaching 865,000 full-time jobs with a 5% annual increase

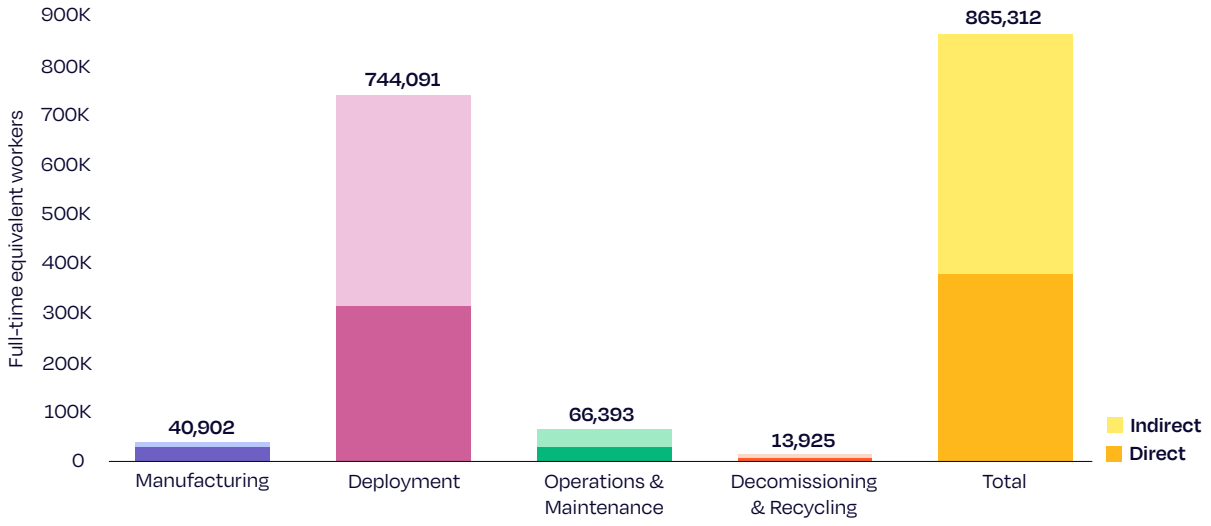
Solar job segmentation

At the end of 2024, the EU solar sector employed 865,000 FTEs, growing 5% from the 826,000 FTEs employed the year before. Direct jobs accounted for 377,000 FTEs, representing 44% of total jobs, while the remaining 488,000 FTEs (56%) were indirect jobs (Fig. 4). In our previous report, we had forecasted EU solar employment to reach 830,000 FTEs in 2024. However, as the EU solar market installed slightly more capacity than what we predicted at the time, this resulted in a 4.2% higher employment level than previously anticipated.

Figure 4

EU solar PV employment reaches 865,000 in 2024, split between direct and indirect jobs

EU27 solar job market in 2024



Solar jobs remain heavily concentrated in the deployment phase, which accounted for 744,000 FTEs, or 86% of total employment, a slight decline from 87% the year before (see Fig. 5). The expansion of total installed capacity has also boosted Operations & Maintenance (O&M) activities, which generated 66,000 FTEs, representing 8% of total solar jobs.

In contrast, the EU manufacturing sector faced several closures and job cuts due to intense international competition, resulting in 41,000 FTEs by the end of 2024, equivalent to 5% of total EU solar employment. This represents a further decline of 2,000 FTEs from 2023, following a loss of 5,000 FTEs from 2022.

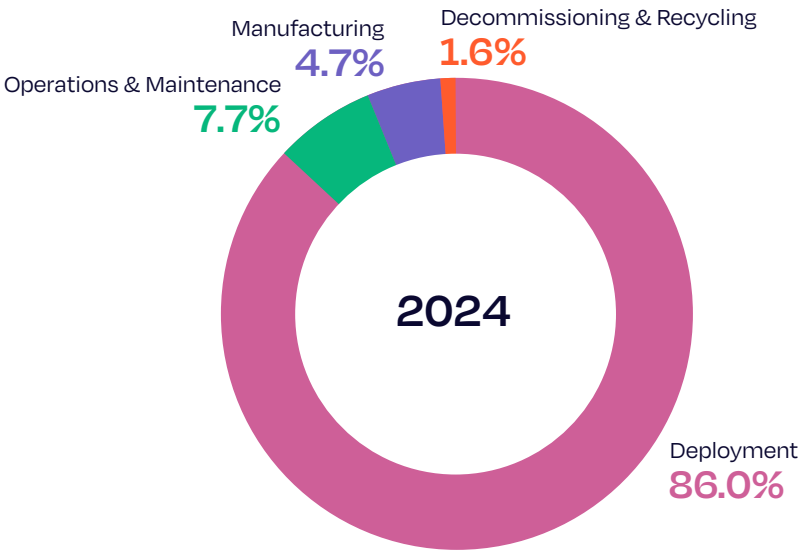
The predominance of deployment jobs over O&M roles reflects the labour-intensive nature of installing solar panels on rooftops and in fields. As long as market growth remains strong, deployment will continue to dominate employment. However, once systems are installed, solar power plants require relatively minimal physical maintenance, resulting in fewer O&M jobs. Looking ahead, O&M employment may decline further as automation, digital monitoring, and AI-driven diagnostics reduce the need for manual inspections.

Finally, jobs in Decommissioning & Recycling remain a small share of total employment, accounting for 1.6% or roughly 14,000 FTEs. The increase from last year mainly reflects adjustments in waste generation estimates, as explained in Section 1.3. Significant volumes of solar PV waste are not expected to emerge until around 2030, when the first large-scale systems installed in Europe reach the end of their operational lifetimes.

Figure 5

Most EU solar jobs are in deployment while manufacturing accounts for less than 5%

EU27 total solar jobs breakdown in 2024



Manufacturing roles within the EU solar sector are closely linked to production capacities across Member States, which currently account for only a small share of the global solar PV supply chain, and meet a limited portion of domestic demand. While inverter and polysilicon production remain the backbone of European industrial capacity, activity in ingot and wafer manufacturing is almost non-existent. Although there are plans and ambitions to expand cell and module production within the EU, global solar PV production overcapacity has driven international prices to record lows, creating a challenge for European manufacturers. Several companies closed their doors in 2024, and further closures could occur in the coming years. EU manufacturers are struggling to compete, often operating at low utilisation rates, and a number of companies have already halted production entirely.

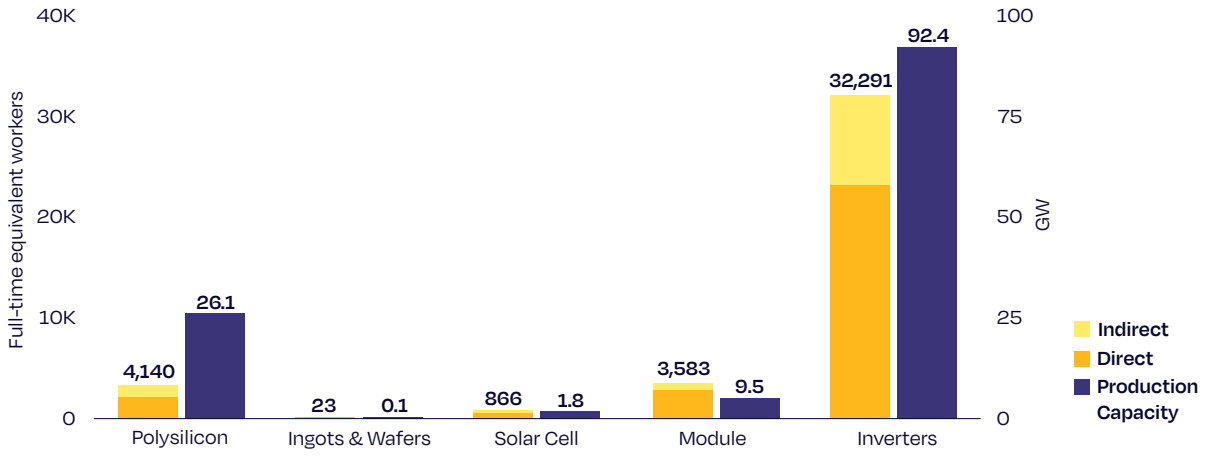
In terms of employment, inverter manufacturing continues to be the leading segment within EU solar production, contributing the majority of solar manufacturing jobs. Inverter manufacturers accounted for approximately 32,000 FTEs across both direct and indirect roles, representing 80% of total employment in the manufacturing sector (Fig. 6). This marks an increase from 28,000 FTEs in 2023, primarily driven by the expansion of overall manufacturing capacity among inverter companies, which grew from 82.1 GW in 2023, to 92.4 GW in 2024. However, this headline growth masks the challenges faced by many EU inverter manufacturers, some of which were forced to lay off staff in 2024. High inventories among wholesalers, weaker-than-expected market demand due to falling energy prices, subsidy uncertainties, and aggressive pricing from global competitors all contributed to a difficult operating environment for domestic producers.

Besides inverters, polysilicon production also plays a significant role, accounting for 10% of solar manufacturing jobs, which translates to 4,100 FTEs.

Figure 6

Inverters and polysilicon production make up nearly 90% of EU manufacturing jobs, driven by a strong industrial base

EU27 solar manufacturing jobs & production capacity in 2024



In terms of production capacity, the module segment experienced the strongest reduction between 2023 and 2024, with capacity diminishing from 13.1 GW in 2023, to 9.5 GW in 2024, resulting in a decrease in jobs from 9,000 to 3,500 FTEs. This sharp decline was largely driven by the closure of several European module manufacturers, including Meyer Burger, Solarwatt, Systovi, Exasun, Energetica, and Recom Sillia, whose shutdowns directly translated into both lost production capacity and employment. On top of a reduction in manufacturing capacity, further lower utilisation rates of the remaining factories are explaining why the job numbers decreased proportionately more than the decrease in production capacity. This steep decline reflects the increasingly difficult market conditions for EU module manufacturers, who struggle to remain competitive amid high import pressure, weak policy support, and eroding margins.

Although already limited, the cell, ingot, and wafer segments all experienced further employment declines in 2024. The production of EDF Photowatt, the only wafer manufacturer directly supplying the solar market, was on hold, and the factory will close its doors in 2025 after a failed attempted takeover. As a result, the only wafer factories still operating in the EU are those specialised in space applications. Altogether, cell, wafer, and ingots activities generate less than 1,000 jobs, representing just 2% of the total solar manufacturing segment.

Job intensity varies significantly across different manufacturing processes. Cell and module production have a higher job intensity, while inverter and polysilicon production need lower numbers of workers. As a result, despite polysilicon's production output being more than twice as high as for modules in 2024, its generation of jobs is not significantly higher.

Country breakdown

Germany is the leading country in the European Union at the end of 2024, with around 128,000 direct and indirect FTEs, representing 15% of total EU solar jobs (Fig. 7). This is a decline from 154,000 FTEs in 2023, despite national installations increasing from 15.1 GW to 17.2 GW. Several factors help explain this apparent paradox. First, the bulk of manufacturing job losses occurred in Germany, home to most of the EU solar manufacturing industry. Second, the share of utility-scale projects increased compared to the previous year: these projects require significantly less labour per megawatt than residential or commercial installations.

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A third factor relates to the methodology of our employment model. The model calculates jobs by assessing annual solar PV installations and the total system CAPEX (in EUR/Watt). It then isolates the portion attributable to labour costs, and divides by the local labour rate to estimate the number of workers. When all other factors are constant, a lower solar PV CAPEX translates directly into fewer jobs per megawatt installed. This is precisely what we observed in Germany: utility-scale CAPEX fell sharply from 0.86 EUR/W in 2023, to 0.55 EUR/W in 2024, a 36% year-on-year drop, according to the International Renewable Energy Agency (IRENA). It is the third steepest reduction in the EU after Greece (-46%) and the Netherlands (-41%). This decline in CAPEX largely explains why, despite Germany's much larger solar PV market, job creation per MW remains modest compared with smaller markets.

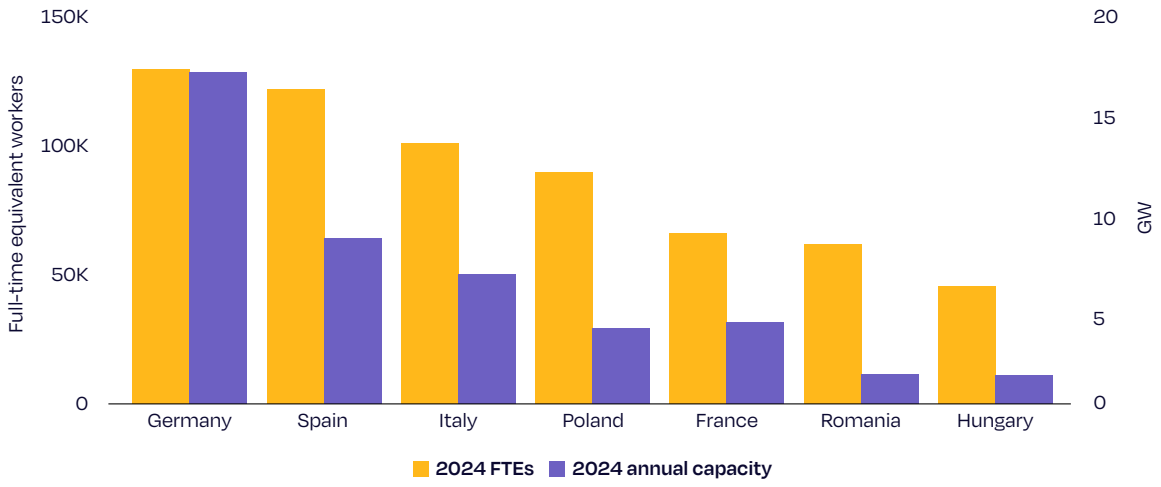
Spain ranked second, with around 122,000 direct and indirect FTEs at the end of 2024. Unlike Germany, Spain's solar employment remained strong despite a slight decrease in annual installations, down 0.9 GW from 2023. This outcome reflects the opposite CAPEX effect: utility-scale CAPEX in Spain rose sharply from 0.60 EUR/W in 2023, to 0.76 EUR/W in 2024, a 27% year-on-year increase, the highest in the EU, compared with just 9% in Italy, the second-largest increase. The surge in system costs amplified job creation, offsetting the impact of lower installation volumes and highlighting how CAPEX variations strongly influence employment outcomes across different markets.

With an acceleration in **Italy's** annual solar PV deployment, increasing from 5.3 GW in 2023 to 6.8 in 2024, its solar job market increased accordingly and just surpassed the 100,000 jobs mark, putting the country at the third spot in terms of solar job volumes. This makes the three largest EU solar markets – Germany, Spain, and Italy – also the top three solar employers.

Figure 7

All top 3 EU solar PV markets reached the 100,000 jobs milestone for the first time in 2024

EU27 top 7 FTE countries and annual installed solar PV capacity 2024



Predictably, most of Europe's largest solar PV markets are also the largest employers, including **Poland** with 90,000 FTEs and **France** with 66,000 FTEs. **Romania** (62,000 FTEs) and **Hungary** (47,000 FTEs) close the top 7 ranking, despite having a smaller market than other countries. Several factors explain their significant role in solar job creation. First, deployment jobs are calculated by dividing the total cost of solar PV installation work by labour cost in the construction sector. Since Romanian and Hungarian construction wages are relatively low compared to the rest of Europe, this results in a higher number of workers, according to the CAPEX model. Additionally, the Input/Output matrix shows high FTE multipliers in the construction sector compared to other major European solar PV markets, meaning that each direct job in the solar PV industry generates more indirect jobs compared to other countries. This trend is also observed in several other Eastern European countries, such as Poland and Greece.

Utility-scale versus rooftop employment

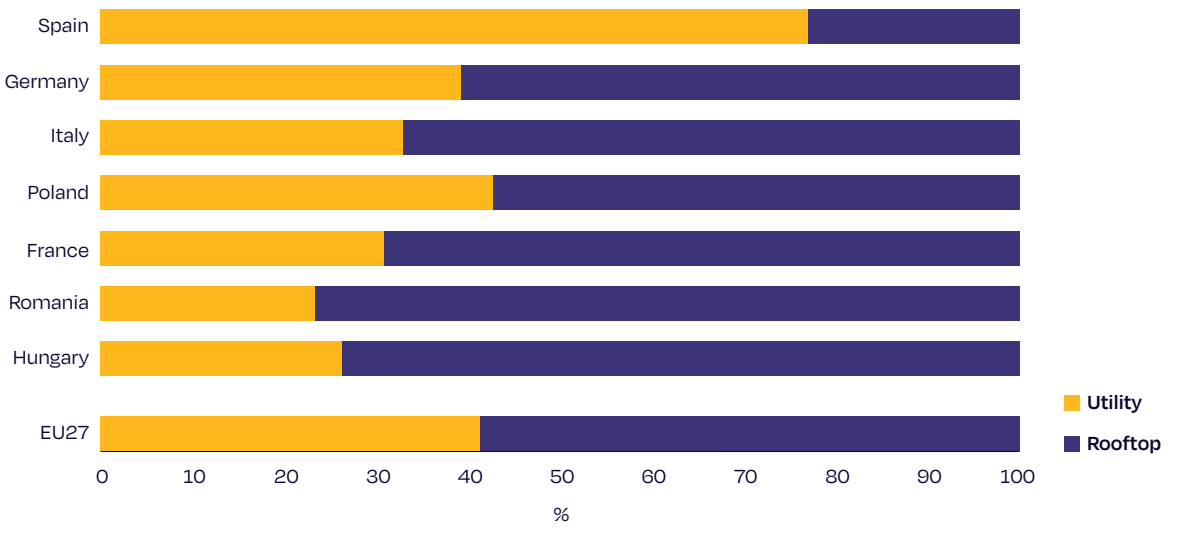
Across the EU, the share of rooftop-related employment declined sharply to 59% in 2024, down from 68% in 2023 and 73% in 2022 (Fig. 8). This mirrors the slowdown in new rooftop installations, which accounted for just 56% of new PV capacity in 2024, compared to 74% in 2023.

Among the Member States which contribute most to solar job creation, Romania and Hungary hold the highest shares of rooftop-related employment, at 77% and 74% respectively. The phase-out of supportive rooftop schemes in Italy continued the marked shift towards utility-scale projects, with rooftop employment dropping from 85% in 2023, to 67% in 2024. Germany also saw a decline, with rooftop jobs accounting for 61% of total solar employment, down 10 percentage points year-on-year. Similarly, Poland's share fell to 58%, compared to 66% in 2023. Spain stands out with the steepest decline: rooftop-related employment has decreased continuously from 52% in 2022 to 32% in 2023, and further down to just 23% in 2024, reflecting the significant slowdown in the country's rooftop market. France is the only large GW-scale country whose rooftop-related solar job share remained steady at 69%, as the market was supported by the successful S21 feed-in tariff programme.

Figure 8

Rooftop solar jobs decline to a record low of 59%, a common trend across leading markets

EU27 top 7 FTE countries - rooftop vs utility-scale jobs breakdown 2024



With a 5% employment decrease expected in 2025, solar PV jobs are declining for the first time in years, with only modest growth on the horizon

For the first time in nearly a decade, the EU solar PV market is projected to contract in 2025. Under our latest available Medium Scenario, annual installations are set to decline by 1.4%, from 65.1 GW in 2024 to 64.2 GW in 2025. This market slowdown is expected to translate into a 5% drop in employment, reducing the solar workforce to around 826,000 full-time equivalents (Fig. 9).

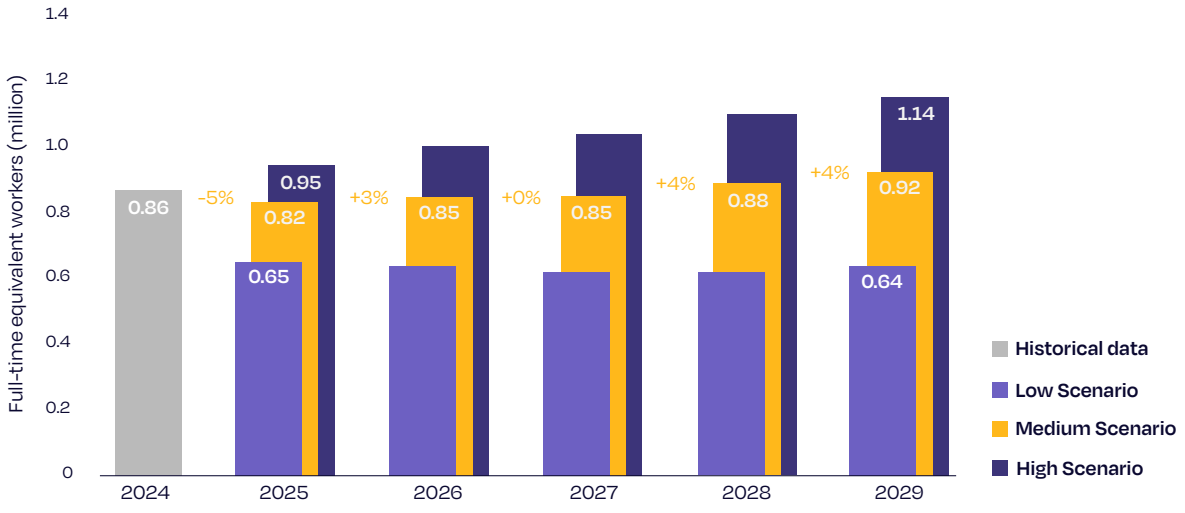
Stronger momentum is possible under the High Scenario, which foresees a 13% annual solar PV market increase to 73.6 GW. In this case, solar jobs would rise to 945,000 FTEs in 2025, supported by accelerated deployment policies and expanded EU manufacturing capacities. Importantly, this scenario would also see the symbolic one-million-job milestone reached in 2027, two years later than anticipated in our previous edition. This is underscoring the current cooling of the European solar sector. By contrast, the Low Scenario depicts a sharp contraction to just 646,000 solar jobs in 2025, reflecting sluggish deployment and further factory closures.

Looking further ahead, by 2029 the Medium Scenario foresees the European solar workforce to surpass 900,000 solar jobs, reaching 917,000 FTEs. The Low Scenario highlights the consequences of weak policy support, trade barriers, and insufficient system flexibility. Combined with continued reliance on global supply chains, this would constrain the EU solar market and reduce jobs to 675,000 FTEs by 2029, a 23% decline from 2024 levels. Under the High Scenario, employment would expand more strongly to 1.1 million FTEs by 2029. While this represents a 38% increase compared to 2024, it still falls well short of the 1.4 million jobs projected in last year's outlook, further confirming the sector's decelerating trajectory.

Figure 9

EU solar employment projected to fall for the first time in years, with lacklustre performance ahead

EU27 solar PV FTE scenarios 2025-2029



Solar job segments development

The vast majority of solar PV job creation in the EU is concentrated in deployment activities, which are closely tied to the pace of annual solar market growth. With the European solar PV market now entering a phase of slower expansion – with growth rates at 3% in 2024, -1% in 2025, and ranging between 4–9% in the following years – the outlook for deployment employment has weakened. Efficiency gains and learning-curve effects reinforce this trend, limiting the number of workers needed across procurement, construction, and installation.

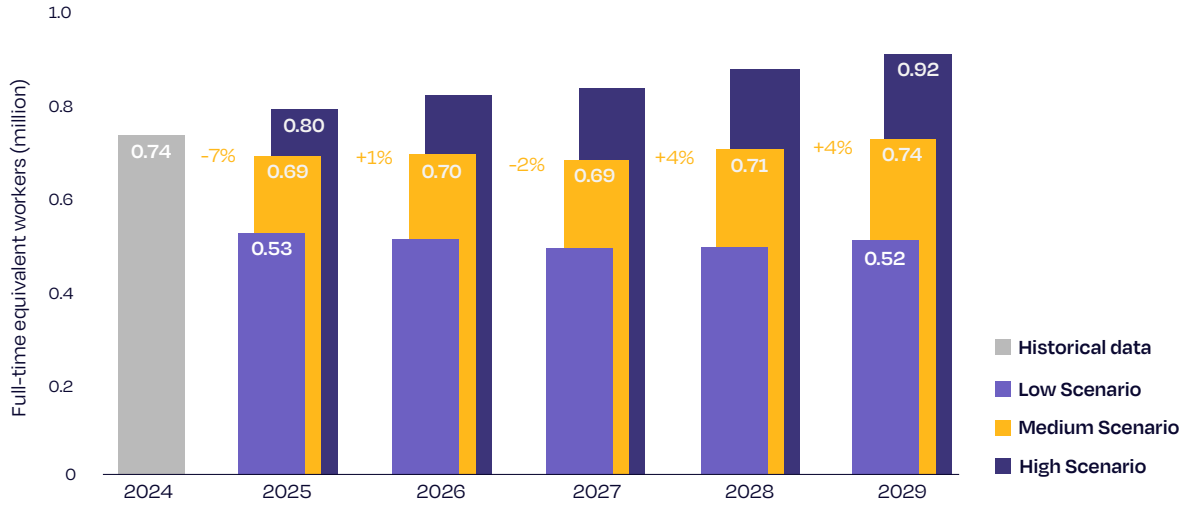
With those overarching trends, **deployment jobs** are forecasted to fall to around 693,000 in 2025, a 7% decrease from 2024 (Fig. 10). This reduction reflects the growing challenges for companies in retaining staff as market growth slows, with rooftop solar PV stagnation in particular triggering layoffs and, in some cases, business closures. Without improved regulatory frameworks to accelerate solar deployment, many firms will be forced to adjust to this new environment, and reorient their strategies to remain viable.

Looking ahead, deployment jobs are expected to reduce further to 686,000 FTEs in 2027 under the Medium Scenario, before returning to modest growth of around 4% in both 2028 and 2029. However, the segment remains highly sensitive to fluctuations in annual solar demand. By 2029, employment in solar deployment could fall to just 515,000 FTEs in the Low Scenario, corresponding to an annual market of 60.1 GW, or conversely rise to 919,000 FTEs in the High Scenario, based on 104 GW of new installations. Notably, in our previous report the deployment segment alone was projected to grow above the one-million mark by 2028, a milestone now out of reach under the current market conditions.

Figure 10

EU solar deployment jobs will experience negative growth as the solar PV market slows down

EU27 solar deployment jobs scenarios 2025-2029

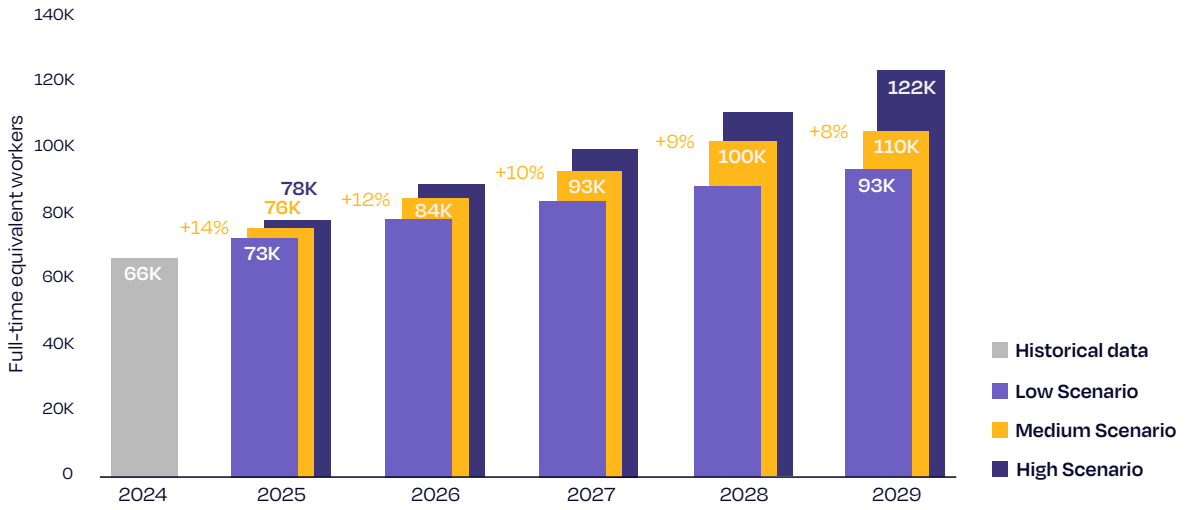


In contrast to deployment jobs, which fluctuate with the annual ups and downs of the solar PV market, **Operations & Maintenance positions** are tied to the cumulative installed capacity and therefore show much greater stability. O&M employment is set to grow steadily between 2025 and 2029, albeit at a decreasing pace as economies of scale, automation, and more moderate capacity growth impacts job creation. Starting from 66,000 full-time equivalent roles in 2024, the O&M workforce is projected to rise by 14% to 75,000 in 2025, and continue expanding to 109,000 FTEs by the end of 2029 (Fig. 11).

Figure 11

EU solar PV fleet expansion drives a steady Operation & Maintenance jobs growth

EU27 solar O&M jobs scenarios 2025-2029



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The trajectory of EU solar manufacturing over the next five years will largely hinge on global competitive pressures, and the strength of European policies aimed at boosting domestic production.

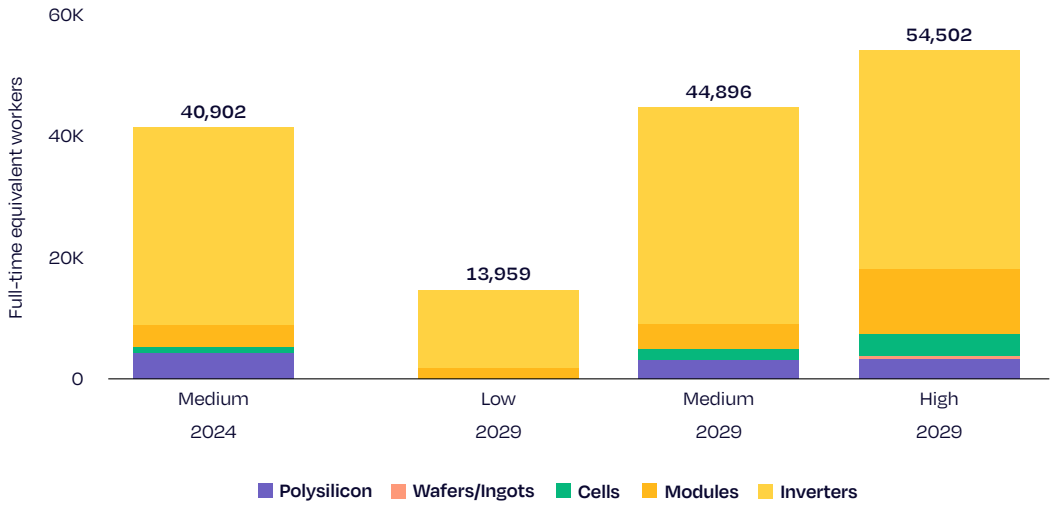
In the Medium Scenario, **EU manufacturing jobs** are projected to increase marginally, reaching around 45,000 FTEs by 2029. This growth is driven primarily by the development of a few larger-scale gigafactories in the module and cell segments. However, international competition is expected to remain strong, limiting the utilisation rates of smaller manufacturers. Moreover, larger gigafactories are less labour-intensive than smaller facilities due to economies of scale. As a result, while these factories improve the EU's supply chain resilience, they contribute only moderately to overall job creation in the solar sector.

In the Low Scenario, EU manufacturing capacity struggles to compete with major international players, and insufficient policy support leads to factory closures and delays or cancellations of planned module and cell projects. Under these conditions, solar manufacturing jobs could plummet to just 14,000 FTEs by 2029, which is a 66% reduction compared to 2024 levels. Conversely, in the High Scenario, strong political support and effective implementation of all announced projects – including gigafactories – could establish a robust domestic manufacturing base, reducing reliance on imports and boosting employment. In this scenario, solar manufacturing jobs could rise to approximately 54,000 FTEs by 2029, a 32% increase from 2024 employment levels.

Figure 12

EU solar manufacturing jobs at high risk, amid global competitiveness concerns and insufficient policy support

EU27 solar manufacturing jobs scenarios 2024-2029



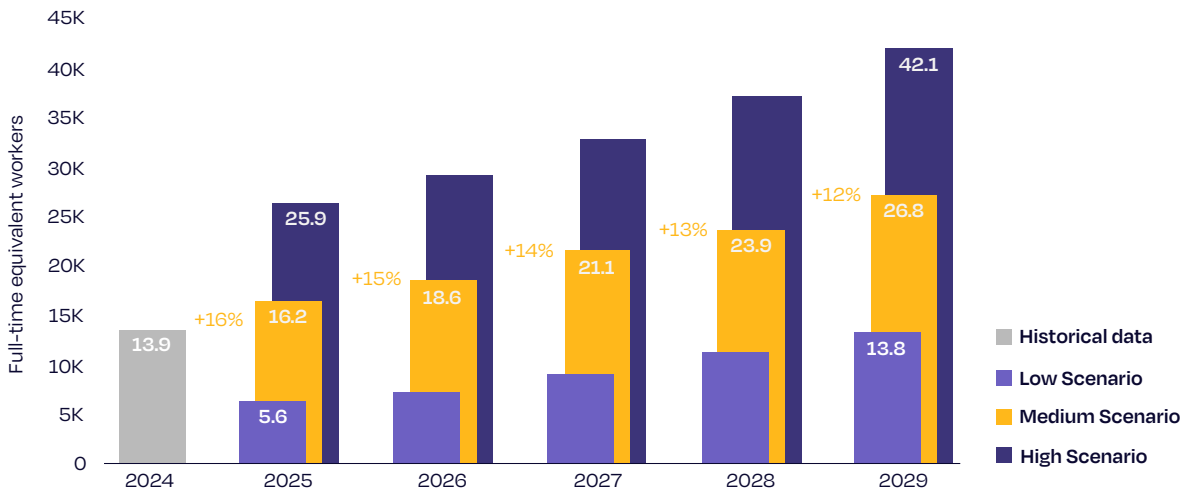
The outlook for solar manufacturing employment in the EU has been significantly revised downwards compared with the previous edition of this report. European manufacturers continue to face intense competition from international players, resulting in factory closures and the delay or cancellation of several expansion projects. Given relatively limited support mechanisms compared with other global regions, the rollout of new production facilities is expected to take time, while there are only four years remaining to meet the European Solar PV Industry Alliance (ESIA) target of 30 GW of European manufacturing capacity by 2025 across each segment of the supply chain. Scaling up large solar manufacturing capacities across the value chain remains a significant challenge under the current regulatory framework, especially in light of the slow progress of the Net-Zero Industry Act. Furthermore, much of the anticipated new production capacity is concentrated in a small number of companies, limiting the broader development of the sector.

Although still relatively small compared to the overall solar workforce, the **Decommissioning & Recycling** sector is set to grow at the fastest pace in the coming years, with double-digit growth rates expected until 2029. In 2024, the segment employed around 14,000 FTEs, mostly linked to waste from transport and installation damage, early equipment failures, and repowering of older systems. As more solar PV installations approach the end of their 25–30-year lifetime, the volume of decommissioned systems will rise sharply, creating additional labour demand. Under the Medium Scenario, employment in this segment is projected to nearly double to 27,000 FTEs by 2029. Scenario variation is quite considerable: in the High Scenario, jobs could rise to 42,000 FTEs, comparable to the size of the manufacturing workforce in 2024, while in the Low Scenario employment would stagnate at around 14,000 FTEs. The wider spread of outcomes in this year's report stems from a methodological change (see Methodology, section 1.3). Instead of internal waste stream estimates, we now rely on the findings of the EVERPV Horizon Project, which provides projections from 2000 to 2050 under three scenarios (Low, Medium, and High). These scenarios begin to diverge as early as 2001, meaning that the 2025 Low Scenario is not a reduction from a single historical data point in 2024, but rather a continuation of the Low Scenario pathway. For the purposes of this study, we use the 2024 Medium Scenario as our central reference and treat it as the baseline value. This shift explains why scenario outcomes diverge more strongly in this year's report compared to previous editions.

Figure 13

Decommissioning and recycling: the smallest but fastest growing EU solar employment contributor

EU27 solar decommissioning & recycling jobs scenarios 2025-2029



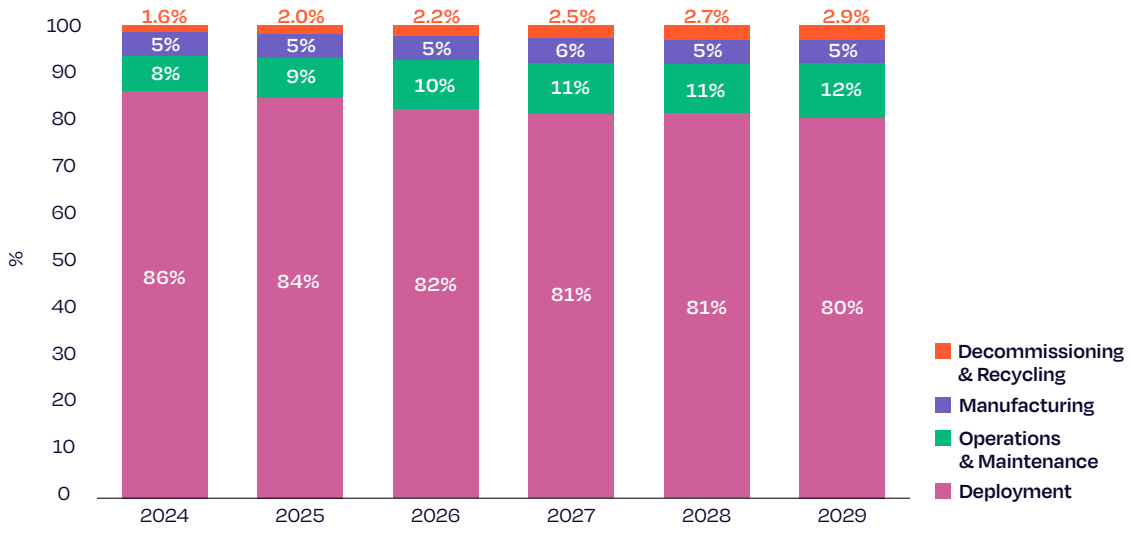
Across the five-year forecast period, total solar employment in the EU is projected to increase in all four segments of the value chain, while the overall distribution of jobs between segments is expected to change only marginally (Fig. 14).

Deployment will remain the backbone of solar employment, though its share is projected to decline from 86% in 2024 to 80% in 2029 as market growth levels off. By contrast, Operations & Maintenance will record the strongest gains, rising from 8% to 12% over the same period, while Decommissioning & Recycling is expected to nearly double its share from 1.6% to 2.9%. Manufacturing jobs are forecast to remain stable at around 5%, a sharp downgrade from last year's outlook, when the segment was expected to reach 9% of total employment. This shift underscores the weakening prospects for EU-based solar manufacturing. Other three segments are projected to see modest gains in their respective shares: O&M jobs are expected to rise from 7% to 11%, Manufacturing from 5% to 9%, and Decommissioning & Recycling roles are anticipated to surpass the 1% mark during this period.

Figure 14

EU solar employment growth remains stable to 2029, with deployment staying above 80%

EU27 solar jobs breakdown evolution 2024-2029



Solar job developments in EU Member States

By 2029, Germany, Spain, Italy, and Poland will continue to represent the four largest solar job markets in the EU, contributing about half of total EU jobs.

Germany still has the most ambitious installation targets for the coming years and is anticipated to remain the leading contributor to solar job creation, with 131,000 solar jobs under the Medium Scenario in 2029.

Italy is expected to move ahead of Spain into second place, supported by steady market growth and a resilient employment outlook. The country is expected to employ 117,000 FTEs by 2029, a solid increase from the 95,000 projected by 2028 in our previous edition. Spain, meanwhile, will remain a major solar employer, though its workforce is projected to stabilise at slightly lower levels than in 2024, reflecting a temporary slowdown in solar PV installations.

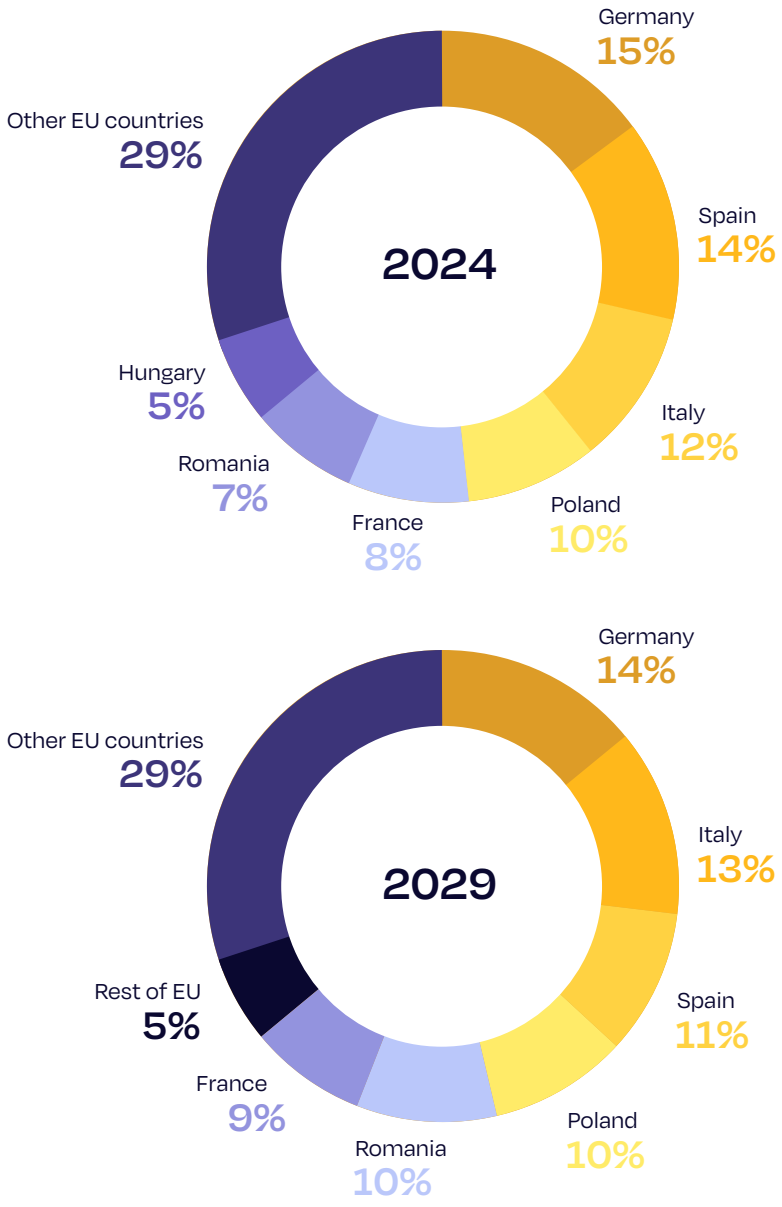
Poland, Romania, and France – all part of last year's ranking – continue to be sizeable contributors to job creation in the solar sector, with 90,000, 88,000, and 80,000 FTEs respectively. Thanks to its strong market development, Romania is set reach rank #5 by 2029, taking over from France, whose market projection was decreased compared to our previous modelling, as a result of reduced support for the rooftop segment and a decrease in its solar target.

Notably, the 'Rest of the EU' category collectively ranks as the seventh-largest solar employer by 2029, underscoring the increasingly relevant role of smaller markets in the EU solar landscape.

Figure 15

Germany to remain largest solar employer in the EU, Italy expected to surpass Spain

Top 7 FTE countries 2024-2029



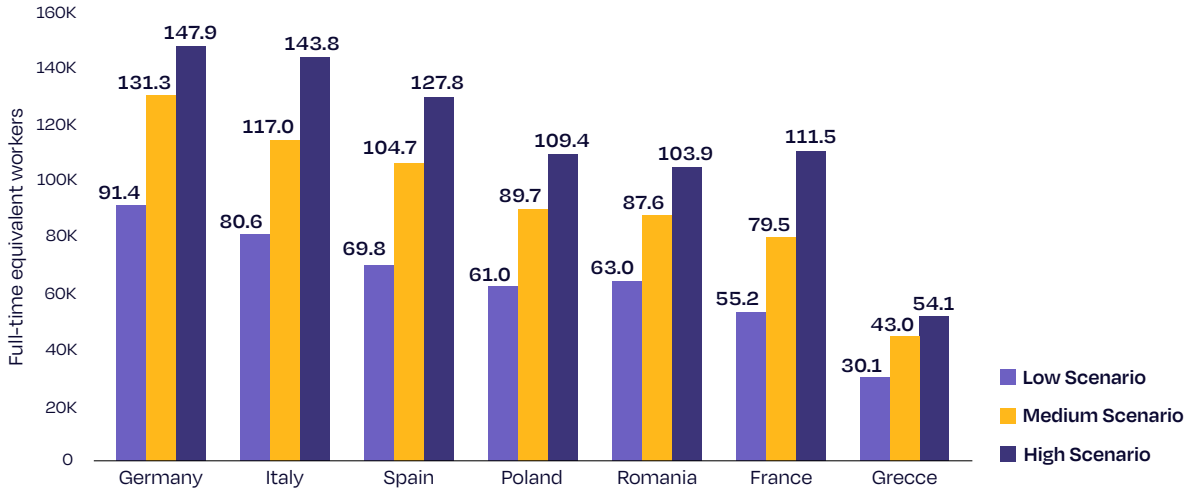
Note: "Rest of EU" is a group of countries which includes Croatia, Cyprus, Ireland, Luxembourg and Malta.
"Other EU countries" includes all the other EU countries which are not appearing on the graph.

In the Medium Scenario, the 3 largest solar employers are expected to exceed 100,000 jobs in 2029, the same amount as in 2024 (Fig. 16). Together, they're excepted to employ employing 353,000 FTEs in 2029, only 2,000 more than in 2024. The seven largest markets will generate 653,000 FTEs in total, representing 74% of all EU solar jobs in 2029 – up from 71% in last year's report. In the High Scenario, 6 markets from this top 7 ranking are projected to surpass the 100,000 job threshold.

Figure 16

The seven largest solar job markets will employ 653,000 people in 2029, representing about 75% of the EU's solar workforce

EU27 top 7 countries scenarios 2029



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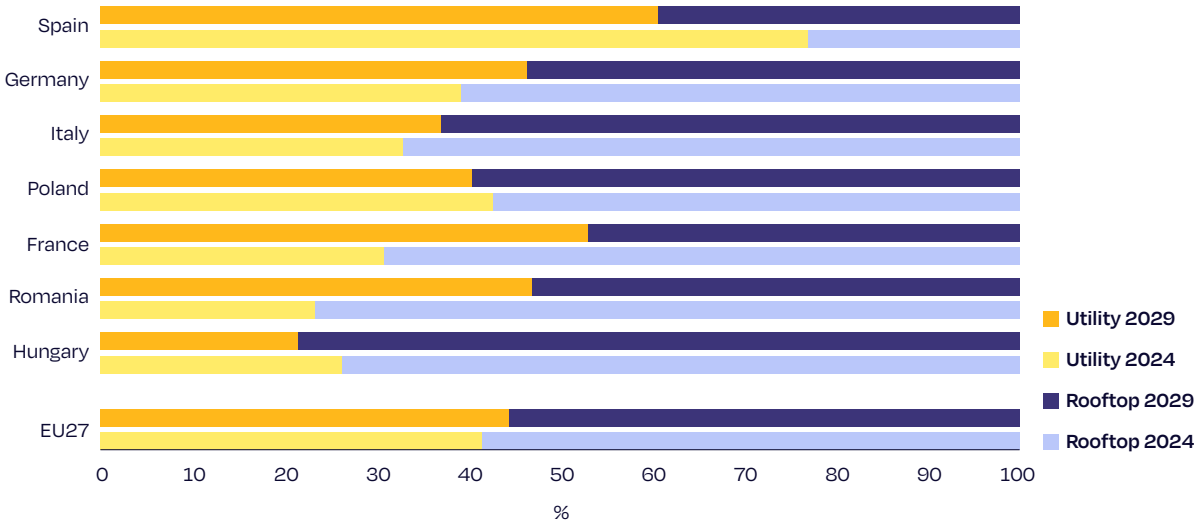
Employment in utility-scale solar continues to rise, mirroring the growing focus on large-scale power plants, and the relative slowdown of rooftop solar PV markets. As a result, the share of rooftop-related jobs is projected to further decline from 59% in 2024 to 56% in 2029 (Fig. 17).

This trend is visible across several leading markets. In Germany, the rooftop share of jobs is set to decline from 61% to 54%; in Italy from 67% to 64%; in France from 69% to 47%; and in Romania from 77% to 53%. By contrast, some countries are following the opposite trajectory. In Spain, the rooftop share is projected to rise from 23% to 40%, though it will still remain the lowest among the leading markets. Poland's rooftop share is expected to grow slightly, from 58% to 60%, while Hungary will continue its increase from 77% to 79%.

Figure 17

EU rooftop solar job share to continue to decline further, down from 59% to 56%

EU27 top 7 countries - rooftop vs utility-scale jobs breakdown 2029



Box 1

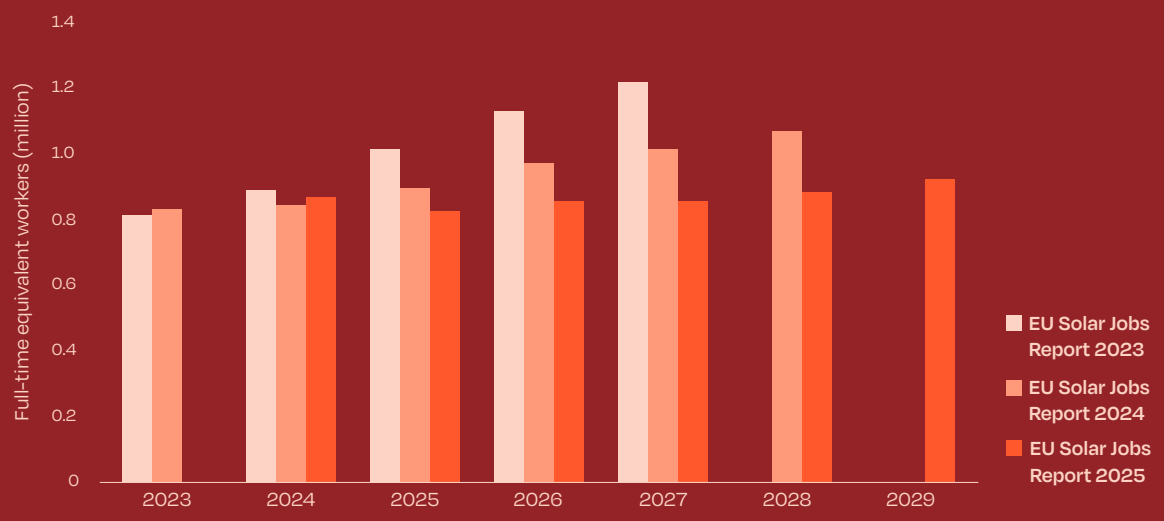
Looking back and forth

Our 2024 EU Solar Jobs Report, published in October 2024, slightly underestimated the employment outcome for 2024. At the time, the Medium Scenario projected around 830,000 jobs, whereas the actual figure turned out 4% higher, largely due to stronger-than-expected solar deployment: we anticipated 63.9 GW of new capacity in 2024, but installations exceeded 65 GW. Looking ahead, however, job creation is expected to slow, reflecting weaker growth in annual installations and persistent challenges in manufacturing. As a result, this year's forecast is between 8 and 18% lower than last year's outlook across the forecast years, and under the Medium Scenario, EU solar employment no longer reaches the 1 million mark within the forecast horizon. In comparison, the 2023 edition expected this milestone in 2025, later revised to 2027 in the 2024 edition. While this downward adjustment is partly explained by the decrease in CAPEX costs (see our Methodology in Section 1.3), it is also a visible effect of the decreasing solar PV market momentum on European jobs.

Figure 18

Achieving 1 million solar jobs is now out of reach in the Medium Scenario

Comparison - Medium scenario of job study 2023, 2024 and 2025



Annex

Annex table 1

Supply chain NACE codes used in FTE multipliers for the calculation of indirect jobs

Category	Category section	NACE CODE	Category breakdown
Manufacturing	Polysilicon	C20	Manufacturing of chemicals and chemical products
	Ingot/wafer	C26	Manufacturing of computer, electronic and optical products
	Cells	C26	Manufacturing of computer, electronic and optical products
	Modules	C26	Manufacturing of computer, electronic and optical products
	Inverters	C27	Manufacturing of electrical equipment
Deployment	Deployment	F	Construction
Operation & Maintenance	O&M	F	Construction
Decommissioning & Recycling	Decommissioning	F	Construction
	Recycling	E37T39	Sewerage, waste management and remediation activities

Source: Eurostat.

Annex table 2

Employment factors used for solar manufacturing jobs (FTE/MW)

Component	FTE/MW
Polysilicon	0.12
Ingot/wafer	0.25
Cells	0.50
Modules	0.60
Inverter	0.36

Source: IRENA, Industry survey.

Annex table 3

CAPEX of PV systems in EU-27 Member States in 2024 (€/W without VAT)

Country	Residential	Commercial	Industrial	Utility
Austria	1.54	0.99	0.74	0.59
Baltic States	1.31	0.87	0.69	0.70
Belgium	1.32	0.99	0.82	0.88
Bulgaria	1.11	0.75	0.65	0.67
Czech Republic	0.86	0.59	0.50	0.42
Denmark	1.32	0.90	0.83	0.95
Finland	1.29	0.85	0.67	0.70
France	1.81	1.32	1.02	1.02
Germany	1.02	0.72	0.66	0.55
Greece	0.81	0.55	0.55	0.52
Hungary	2.41	1.64	1.41	1.06
Italy	1.49	1.17	1.03	0.74
Netherlands	0.83	0.69	0.65	0.59
Poland	1.00	0.85	0.72	0.81
Portugal	1.15	0.95	0.82	0.74
Romania	1.51	1.03	0.89	0.72
Slovakia	1.08	0.73	0.63	0.54
Slovenia	1.07	0.73	0.63	0.80
Spain	1.55	1.01	0.95	0.76
Sweden	1.21	0.99	0.86	0.86
Rest of EU	1.35	1.10	1.02	1.10

Source: IRENA, IEA-PVPS, SPE research.

Annex table 4

CAPEX breakdown for rooftop and utility-scale PV systems 2023

Rooftop systems (residential scale)		
Main costs	**Cost Category**	**Percentage**
Hardware costs	Module	24.74%
	Inverter	13.09%
	BOS	20.23%
Installation labour	Installation labour	17.65%
Soft cost	Customer Acquisition	3.04%
	Procurement & Permitting	5.66%
	Margin	15.59%
Ground mounted (utility scale)		
Main costs	**Cost Category**	**Percentage**
Hardware costs	Modules	33.4%
	Inverters	5.6%
	Racking & Mounting	8.8%
	Grid Connection	9.6%
	Cabling/wiring	5.0%
	Safety & Security	1.9%
	Monitoring & Control	0.8%
Installation labour	Mechanical Installation	8.0%
	Electrical Installation	6.8%
	Inspection	1.8%
Soft costs	Margin	10.4%
	Financing Costs	2.1%
	System Design	1.3%
	Permitting	2.9%
	Incentive application	0.3%
	Customer acquisition	1.2%

Source: IEA-PVPS, IRENA, Otovo.

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