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EU Solar Jobs Report 2026

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Foreword

Welcome to our EU Solar Jobs Report 2026,

One million jobs!

This is the milestone Europe's solar and battery storage sectors reached in 2025. And more than one in ten of these jobs already came from battery storage.

This is a powerful reminder of what solar has become for Europe. In challenging economic and geopolitical times, low-cost solar power continues to help the European Union reduce its dependence on fossil fuels while strengthening its energy security and competitiveness. Solar continues to grow and create jobs. In 2025, solar employment increased by 1%, twice as fast as employment across the EU economy, supported by another surprisingly strong year for the market, with 69 GW of new capacity installed.

This year's report also reflects how our energy system is changing. For the first time, we include battery storage employment in our analysis. Solar and storage increasingly go hand in hand: batteries help integrate growing volumes of solar, provide flexibility and resilience, and enable Europe to make better use of its home-grown renewable electricity. Already today, the sector supports more than 100,000 jobs across the battery storage value chain.

But we cannot take this success for granted. Europe's solar market is entering a more challenging period. Under our Medium Scenario, solar employment is expected to contract towards 2030, as annual installations fall initially before recovering to broadly today's levels by the end of the decade, while rising productivity reduces deployment jobs by more than 20%. At the same time, solar jobs in operations and maintenance, manufacturing, and recycling are expected to grow as Europe's solar fleet expands and the industry matures.

This makes the policy choices we take today even more important. Europe needs to keep solar growing, accelerate electrification, expand grids and energy storage, and strengthen its industrial base to build resilience. None of this is new. But if we want a stronger, more competitive and secure Europe, we must now pursue this agenda with renewed urgency and full force. This report adds another key message: we must ensure that workers have the skills required for a clean and secure energy system, largely based on solar and battery storage.

One million solar and storage jobs is a milestone to celebrate. Now we need to make sure Europe builds on this milestone – and creates many more.

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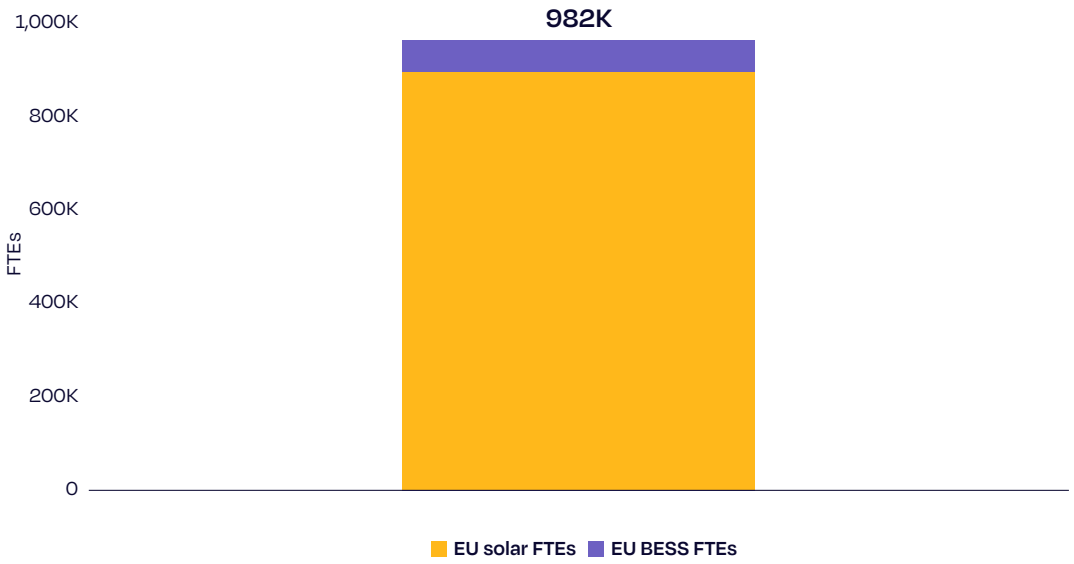
Solar and battery storage employed around one million people across the European Union in 2025

Europe's solar and battery storage industries reached a major employment milestone in 2025, accounting for a combined 982,000 full-time equivalent (FTE) jobs across the EU (Fig. 1). Solar PV employed 874,000 FTEs, with battery energy storage systems (BESS), assessed for the first time in this study, adding a further 108,000 FTEs in 2025. The strong employment performance was driven by another year of substantial market deployment. The EU installed 69 GW of new solar PV capacity in 2025, exceeding earlier expectations, while battery storage deployment reached 27 GWh. Direct employment represented 44% of total jobs, while the remaining 56% were indirect jobs stemming from supply chains and supporting activities. As solar and storage become increasingly integrated technologies, workforce planning and skills policies will need to evolve accordingly, supporting the wider electrification and the growing interaction between solar PV, batteries, grids and digitalisation.

Figure 1

Solar and storage powered about 1 million EU jobs in 2025

EU solar and storage FTEs, 2025



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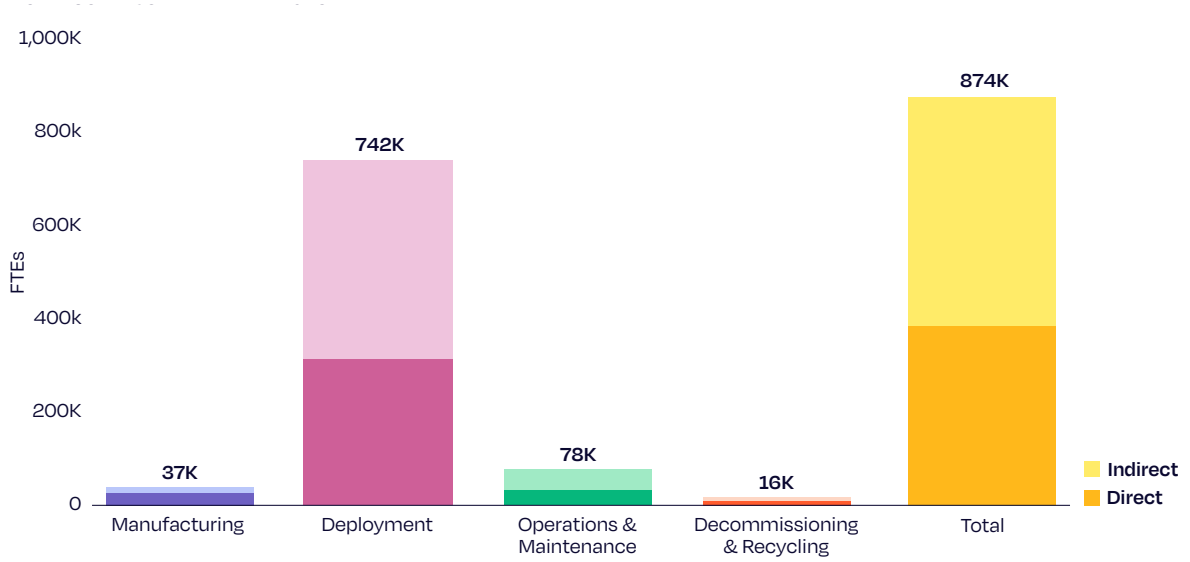
Solar employment remains overwhelmingly concentrated in deployment activities, which represented 85% of all jobs

At 874,000 FTEs, the EU solar workforce grew by 1% year on year in 2025. Employment continues to be highly concentrated in deployment activities with 742,000 FTEs, representing 85% of all solar jobs (Fig. 2). At the same time, operations & maintenance (O&M) employment increased to a record 78,000 FTEs, reflecting Europe's expanding solar fleet. Manufacturing employment, however, continued to face significant challenges from international competition, factory closures and low utilisation rates, falling to around 37,000 FTEs, or just 4% of total solar employment. Within the manufacturing segment, inverter production remained by far the largest contributor, with 90% of manufacturing jobs. The continued dominance of deployment activities highlights the importance of maintaining a sufficient pipeline of qualified installers, electricians, roofers, and engineers. Ensuring adequate training capacity, improving access to skills funding for SMEs and implementing the installer-gap provisions of RED III will therefore remain critical to sustain project delivery and avoid workforce bottlenecks.

Figure 2

The EU solar sector supported 874,000 FTEs in 2025, heavily concentrated in the deployment phase

EU-27 SOLAR JOB MARKET IN 2025



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Executive Summary

Solar PV and battery employment remains concentrated in a handful of markets and is increasingly driven by utility-scale deployment. Germany remained the EU's largest solar employer with around 165,000 FTEs, closely followed by Spain, while Italy ranked third with approximately 85,000 FTEs. Combined, these three countries accounted for nearly half of all solar jobs across the EU.

The composition of the workforce is nonetheless evolving. For the first time since this report series began in 2021, utility-scale solar employment edged ahead of rooftop solar, accounting for 50.2% of jobs. This shift reflects the growing weight of large-scale solar projects in key markets such as Spain, Germany, Italy and Romania, alongside a slowdown in rooftop installations across much of Europe. A similar pattern is emerging in battery storage, where utility-scale systems accounted for more than half of newly installed capacity in 2025 and generated almost half of deployment-related employment. These developments highlight the expanding role of large-scale projects in shaping the EU solar and storage workforce.

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The EU solar workforce is expected to decrease by 2030 as solar deployment decelerates

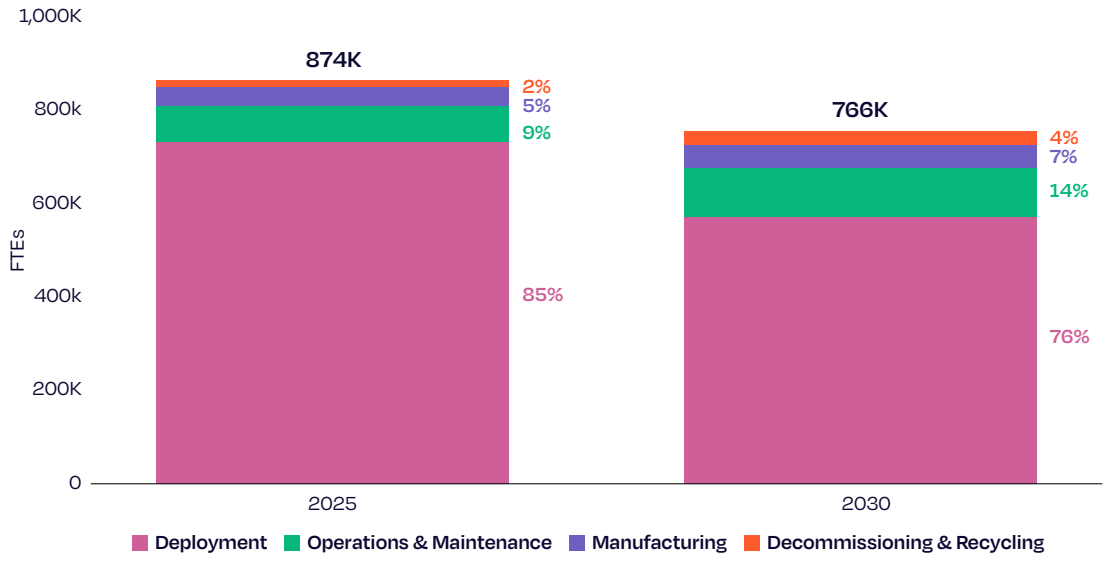
Despite reaching record employment levels in 2025, the European solar workforce is projected to decline from 874,000 FTEs to 766,000 FTEs by 2030 (see Fig. 3). This reduction will be driven almost entirely by the deployment segment, which is expected to decrease by 22%, as annual solar installations stagnate around current levels and productivity gains reduce labour requirements. Importantly, the projected decline does not reflect a contraction of the solar industry itself. Rather, it reflects the transition from a period of rapid market expansion to a more mature market with slower installation growth.

All other value-chain segments are expected to expand. Operations and maintenance employment is forecast to increase from 78,000 to 109,000 FTEs as the EU solar fleet grows from 411 GW to 739 GW by 2030. Manufacturing employment could rise from 37,000 to 49,000 FTEs if announced industrial projects are successfully delivered, while employment in decommissioning and recycling is expected to almost double from 16,000 to 30,000 FTEs as an increasing number of solar projects reach the end of their operational lives. The future solar workforce will become slightly less focused on installing new capacity, although deployment will continue to dominate, accounting for 76% of jobs. At the same time, the share of jobs in manufacturing, operating, maintaining, repowering and recycling Europe's solar fleet will increase by 9 percentage points, together representing almost a quarter of EU solar jobs in 2030.

Figure 3

EU solar employment is projected to decline by 2030 as market growth stalls

EU-27 SOLAR JOBS BREAKDOWN EVOLUTION 2025-2030



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Policy Recommendations

Europe's solar workforce is moving from rapid expansion into a more complex phase of market stabilisation, technological change and industrial pressure. This does not mean that the skills challenge has been solved. Solar companies still need electricians, installers, roofers, engineers, manufacturing specialists and other workers with the right technical, digital and safety competences. At the same time, employers and training providers face fragmented funding, overlapping initiatives and uneven implementation across Member States.

The European Union has strengthened its skills policy framework through the Union of Skills, the revised Renewable Energy Directive (RED III) and the Electrification Action Plan. The priority for 2026 should be to turn these commitments into an accessible and coherent delivery system that supports the solar sector across deployment, manufacturing, operations and maintenance, recycling and decommissioning.

The recommendations build on the previous edition of the EU Solar Jobs Report 2025, discussions within the Renewable Energy Skills Partnership and insights from International Energy Agency workshops on the future of energy skills. They also draw on Cedefop's 2026 policy brief, "New careers in the green transition: Using online job advertisements to track emerging jobs and skills", particularly its findings on forward-looking skills intelligence, emerging technical and digital roles, vocational education and training capacity, apprenticeships, career transitions and flexible qualifications. Together, these sources help ensure that the recommendations reflect both the specific priorities of the solar sector and wider changes affecting Europe's clean-energy workforce.

The recommendations are structured in two layers. First, a concise list presents seven priorities. Second, each priority is translated into specific actions for the European Commission, Member States, training providers and industry.

At a glance: seven priorities for solar and storage skills

1

Keep solar skills at the centre of workforce and industrial policy

Treat persistent shortages in critical solar occupations as a structural challenge, even when total employment stabilises.

2

Make skills funding accessible to renewable energy SMEs

Create a clear path through existing EU and national funds, with simplified access and support for the real cost of training.

3

Modernise training for a digital, integrated and quality-driven solar sector

Update equipment, curricula and teaching capacity so training reflects current solar technologies and work practices

4

Deliver Action 13 of the Electrification Action Plan with solar at its core

Build practical cooperation across solar, storage, grids, heat pumps and e-mobility while protecting technology-specific quality and safety.

5

Fully implement RED III training and installer-gap requirements

Use Article 18 to improve certification, workforce intelligence, training capacity and corrective action where shortages persist.

6

Connect EU skills initiatives into one delivery framework

Map and link existing initiatives, make outputs reusable, reduce duplication and create clearer access for companies and training providers.

7

Build attractive, inclusive and high-quality pathways into solar careers

Expand apprenticeships, career guidance and regional transition pathways so the solar sector can attract, transition and retain the workers it needs.

Detailed recommendations

1 Keep solar skills at the centre of workforce and industrial policy

Europe cannot deliver its solar, electrification and clean-industry objectives without maintaining the workforce needed to deliver them. A stabilisation in solar employment should not be interpreted as the skills challenge being resolved. Companies continue to face difficulties recruiting electricians, installers, roofers, engineers and manufacturing specialists with the right competences.

Allowing training and recruitment capacity to decline during a market stabilisation would make the sector less prepared for the next phase of deployment. Experienced workers may leave the industry, companies may reduce apprenticeships and investment in training, and existing bottlenecks may become more severe when demand recovers. This would increase the risk of project delays, limit the sector's ability to scale and undermine installation quality, system reliability and Europe's clean-technology competitiveness.

The European Commission and Member States should therefore keep solar workforce development at the centre of competitiveness, industrial, employment and education policy. Workforce planning should reflect the needs of the full solar value chain, from manufacturing and project design to installation, operations and maintenance, recycling and decommissioning. It should also anticipate growing demand for solar design and energy engineers, commissioning and maintenance technicians, quality-assurance specialists and cybersecurity professionals. These roles are essential not only to deploy capacity, but also to ensure that solar installations operate safely, reliably and efficiently throughout their lifetime.

Policy actions

- Embed solar workforce planning in EU and national energy, industrial and competitiveness strategies.

- Map critical occupations and regional bottlenecks through, solar-specific workforce intelligence.
- Align workforce forecasts with future needs to anticipate shortages and prevent workforce capacity loss.

2 Make skills funding accessible to renewable energy SMEs

Europe already has several funding instruments that can support workforce development, but their impact will remain limited if renewable energy companies cannot access them in practice. Small and medium-sized enterprises (SMEs) make up an important part of the solar value chain, yet they often lack the time and administrative capacity to identify suitable programmes, prepare applications or build the partnerships required to participate.

The European Social Fund Plus (ESF+), Erasmus+, the Just Transition Fund and relevant measures under national Recovery and Resilience Plans can support training, reskilling, apprenticeships and cooperation between employers and education providers. However, funding remains fragmented across programmes, managing authorities and national or regional arrangements. For solar SMEs, navigating this landscape is difficult and resource-intensive.

The European Commission and Member States should focus on making existing funding easier to find, apply for and use. Support should reflect the real cost of training for smaller employers. In addition to course fees, this should include equipment, travel, staff replacement and the working time dedicated to training. Simplifying access would enable more investment in workforce and make better use of existing EU funding for renewable energy skills.

Policy actions

- Create clear national and regional access points that direct renewable energy SMEs to suitable skills funding.
- Simplify application as well as reporting requirements, and expand SME-friendly instruments, including training vouchers, micro-grants and co-funded work-based learning.
- Cover the practical costs of training participation (equipment, travel, staff replacement and paid learning time).
- Secure support specifically for renewable energy workforce in the next Multiannual Financial Framework.

3 Modernise training for a digital, integrated and quality-driven solar sector

Europe's ability to deploy solar at scale increasingly depends on whether training systems keep pace with technological change. Solar workers are no longer dealing only with stand-alone PV installations. They increasingly work with storage, smart-energy systems, digital monitoring tools, electricity grids and other electrification technologies. If training provision does not reflect these developments, skills gaps will affect not only the pace of deployment, but also installation quality, system performance and safety.

Automation, robotics, digitalisation and artificial intelligence are also changing work across solar manufacturing, installation, commissioning and especially operations and maintenance. Alongside established electrical and construction competences, workers increasingly need skills in system integration, digital monitoring, data interpretation, automated processes, preventive and predictive maintenance, cybersecurity and quality assurance.

The European Commission and Member States should therefore support the modernisation of solar training. Vocational education and training (VET) providers need access to latest equipment, software and teaching materials, as well as continuing professional development for trainers. Curricula and assessment methods should be reviewed with the solar industry to ensure that they reflect its working practices, technology and quality requirements.

Training should also cover the full solar asset lifecycle (greater attention should be given to system design, commissioning, performance verification, operations and maintenance, recycling and decommissioning). Initial VET should be complemented by short, modular and stackable courses that allow existing workers to acquire new competences without completing an entirely new qualification.

Policy actions

- Support training providers in acquiring current equipment, software and technical expertise.
- Establish regular industry review of solar curricula, occupational profiles and assessment methods.
- Expand modular training in integrated systems, digital technologies, commissioning, maintenance, quality assurance and cybersecurity.
- Embed safety, performance verification and lifecycle quality in solar training and assessment.

4 Deliver Action 13 of the Electrification Action Plan with solar at its core

The success of Europe's electrification agenda will depend on whether enough workers can install and integrate the technologies on which it relies. Solar PV, storage, grids, heat pumps and electric mobility increasingly intersect in buildings, businesses and energy systems. Skills shortages or poorly coordinated training across these technologies slows electrification, increase installation risks and prevent consumers and businesses from benefiting fully from integrated clean-energy solutions.

Action 13 of the Electrification Action Plan provides an important basis for addressing this challenge. It includes commitments to strengthen the sectoral focus of the forthcoming European Strategy for VET, improve the portability of qualifications and skills, support partnerships between companies and technical schools through the Clean Heat Market Mechanism, and facilitate access to relevant certifications through the Construction Services Act.

The European Commission and Member States should implement these commitments across the full electrification value chain, with solar recognised as a central technology. Cooperation needs to focus on competences shared across solar and relevant technologies. This would help address common workforce bottlenecks and improve the installation and integration of electrification technologies.

At the same time, greater coordination should not result in generic qualifications that overlook technology-specific requirements. Workers operating across integrated systems need transferable competences, but they also require sufficient specific expertise. Action 13 should therefore support mobility and cross-technology cooperation while ensuring the safety, quality and certification requirements of each technology.

Policy actions

- Give solar and renewable energy a clear place in the European Strategy for Vocational Education and Training.
- Coordinate training for shared occupations across solar, storage, grids, heat pumps and electric mobility & support the recognition and portability of comparable skills and qualifications while preserving technology-specific requirements.
- Use the Clean Heat Market Mechanism to build practical partnerships between companies, equipment providers and technical schools.

5 Fully implement RED III training and installer-gap requirements

Europe's renewable energy targets cannot be achieved if installer shortages are identified too late or addressed inconsistently across Member States. Article 18 of the revised Renewable Energy Directive (RED III) provides an existing framework for installer qualifications, training provision and the assessment of workforce gaps. Its impact will now depend on timely, transparent and consistent national implementation.

Member States should use these provisions to determine whether enough trained and qualified installers are available for solar PV and other renewable energy technologies. Assessments should identify not only current shortages, but also the capacity of training systems to respond to future demand. Without reliable and sufficiently detailed evidence, policymakers cannot target support effectively, training providers cannot plan capacity and companies may continue to face workforce constraints that delay deployment.

National assessments should therefore distinguish between technologies, occupations and, where possible, regions. The European Commission should establish common definitions, indicators and reporting approaches so that national findings can be compared and consolidated into a coherent European picture. Installer-gap assessments should draw on administrative and training data, sector evidence and labour-market intelligence to capture changing occupations and competence needs. Where there is a significant shortage of qualified installers, Member States should set out corrective measures, assign responsibility, and track progress. This would turn RED III from a reporting obligation into an efficient instrument for workforce planning and renewable energy delivery.

Policy actions

- Publish regular national assessments of installer demand, shortages and training capacity, with a specific breakdown for solar PV.
- Establish comparable EU indicators and reporting methods to create a European picture of installer gaps.
- Combine administrative, training-system and sector data with labour-market intelligence.

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6 Connect EU skills initiatives into one delivery framework

Europe has launched numerous initiatives to strengthen renewable energy skills, but their value will remain limited if their results are fragmented, difficult to access or lost when individual projects end. The priority should now be to connect existing initiatives and turn their outputs into practical resources that companies, training providers and public authorities can use. The Union of Skills, the Pact for Skills, the Renewable Energy Skills Partnership (RESP), the European Solar Academy (ESA), the Net-Zero Industry Academies (NZIA) and EU-funded projects

already support skills intelligence, training development, sectoral cooperation and the portability of qualifications. The challenge is no longer to generate more initiatives. It is to see how they complement one another, reduce duplication and ensure that successful approaches can be adopted beyond the organisations and countries directly involved. This reflects the efforts already established in the working recommendations and in the RESkill4NetZero project documentation.

The European Commission should provide a clear overview of existing renewable energy skills initiatives, including their objectives, target groups, technological and geographical coverage, available resources and implementation periods. This should not become another static inventory. It should help users identify relevant training, occupational profiles, competence frameworks, teaching materials and other tools through a clear and practical access point.

EU-funded projects should also be required to make their outputs accessible, adaptable and reusable. Training materials and competence frameworks should use formats that allow training providers and employers to apply them in different national and regional contexts.

Finally, the Commission and Member States should monitor whether EU initiatives are increasing training capacity, reaching employers and learners, supporting the adoption of useful resources and addressing identified workforce gaps. This would help policymakers direct support towards approaches that are delivering results and discontinue activities that add unnecessary complexity.

Policy actions

- Map EU renewable energy skills initiatives to identify overlaps, gaps and opportunities for closer coordination.
- Create access point for training resources, competence frameworks and reusable project outputs.
- Monitor whether initiatives increase training capacity, resource uptake and employer participation.

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7 Build attractive, inclusive and high-quality pathways into solar careers

Europe will not close its solar workforce gaps by expanding training provision alone. Workers must be able to see how to enter the sector, build a lasting career and transfer existing competences into growing solar occupations. Without credible entry routes, practical learning opportunities and prospects for progression, the sector may struggle to attract and retain the workforce needed across the whole value chain.

The European Commission and Member States should make solar careers more visible through vocational guidance, schools, public employment services and industry outreach. Communication should reflect the diversity of roles available across the solar value chain and present vocational and technical careers as credible routes into a growing strategic sector. This is consistent with the emerging focus on career awareness, youth engagement and targeted action for underrepresented groups in the renewable energy skills strategy developed through RESkill4NetZero.

Apprenticeships and paid work-based learning should provide an entry route into solar careers. They allow learners to acquire practical skills in real working environments while helping employers prepare workers for technologies and processes. European evidence identifies apprenticeships as an important mechanism for preparing and reskilling workers for the green transition. Smaller employers should receive proportionate financial and administrative support to offer placements, complementing the broader SME funding measures proposed under recommendation 2.

Career pathways should also allow workers to build on competences acquired in adjacent or declining sectors. Electricians, construction workers, manufacturing specialists and building-services professionals should be able to identify the additional training needed to move into solar occupations, rather than beginning a new qualification from start. Targeted bridging programmes, recognition of prior learning and occupational pathways support these transitions while preserving solar-specific safety and quality requirements. The Cedefop study on jobs driving Europe's green transition similarly highlights transferable skills, targeted reskilling and regional transition strategies as policy priorities.

Finally, attracting people into solar must be matched by efforts to retain them. Public employment and training programmes should monitor whether participants move into relevant employment and remain in the sector, rather than measuring success only through enrolment and course completion. Regional partnerships can connect employers, training providers, public employment services and social partners, particularly in areas undergoing industrial transition.

Policy actions

- Promote careers through vocational guidance, schools, public employment services and industry outreach.
- Expand apprenticeships and paid work-based learning, with support for smaller employers to offer placements.
- Create clear transition pathways from adjacent and declining sectors into priority solar occupations.
- Monitor employment, retention and progression outcomes, including for underrepresented.

Solar employment grows twice as fast as the EU average

The EU solar sector continued to demonstrate its economic strength in 2025. Despite a more challenging market environment and slower deployment growth in several Member States, solar employment continued to expand, outperforming the wider EU labour market and reinforcing the sector's role as a key driver of Europe's clean energy transition.

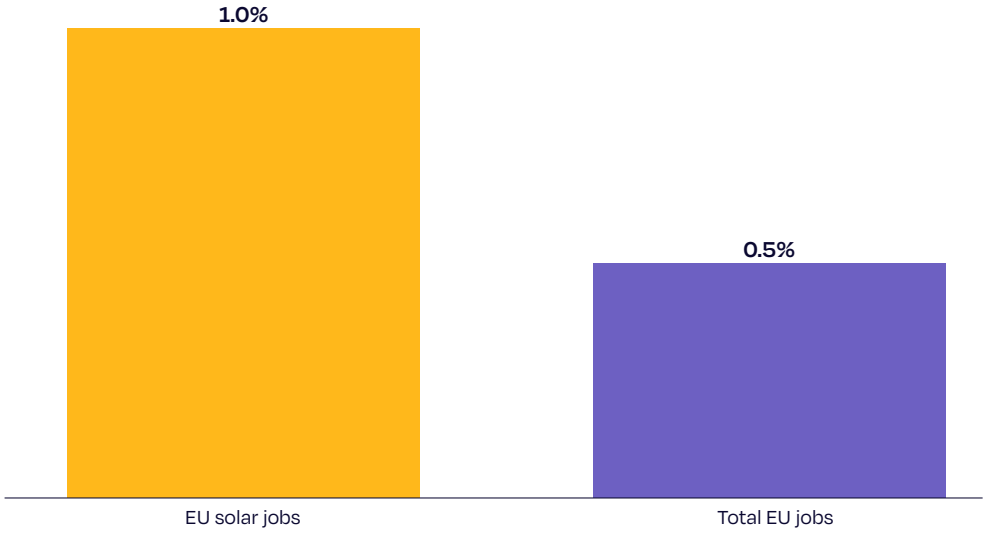
The solar industry remained one of the European Union's strongest clean-tech employers in 2025, with jobs continuing to grow. While total employment across the EU-27 grew by 0.5%, solar employment increased by 1%, twice the rate of the wider economy (Fig. 4).

Although employment growth moderated compared with the exceptional expansion seen in recent years, the sector continued to create jobs across the entire value chain, from manufacturing and project development to installation, operation and maintenance (O&M), and end-of-life activities. This resilience reflects solar's central role not only for energy security, competitiveness and decarbonisation objectives, but also in supporting the EU workforce with attractive jobs in the clean tech sector. Beyond supporting the energy transition, solar continues to generate economic opportunities across all Member States, creating jobs in both local service industries and advanced manufacturing. As the EU must accelerates electrification based to a large extent on solar power, maintaining a skilled solar workforce will be essential.

Figure 4

EU solar jobs grew twice as fast as overall European employment in 2025

Employment growth in solar and total EU jobs, 2025



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Solar and storage industry supports 1 million EU jobs

This edition of the EU Solar Jobs study marks an important milestone by expanding its scope to include battery energy storage systems (BESS) for the first time. As solar and storage become increasingly integrated, assessing their combined employment impact provides a more complete picture of the contribution of the industry to the EU economy.

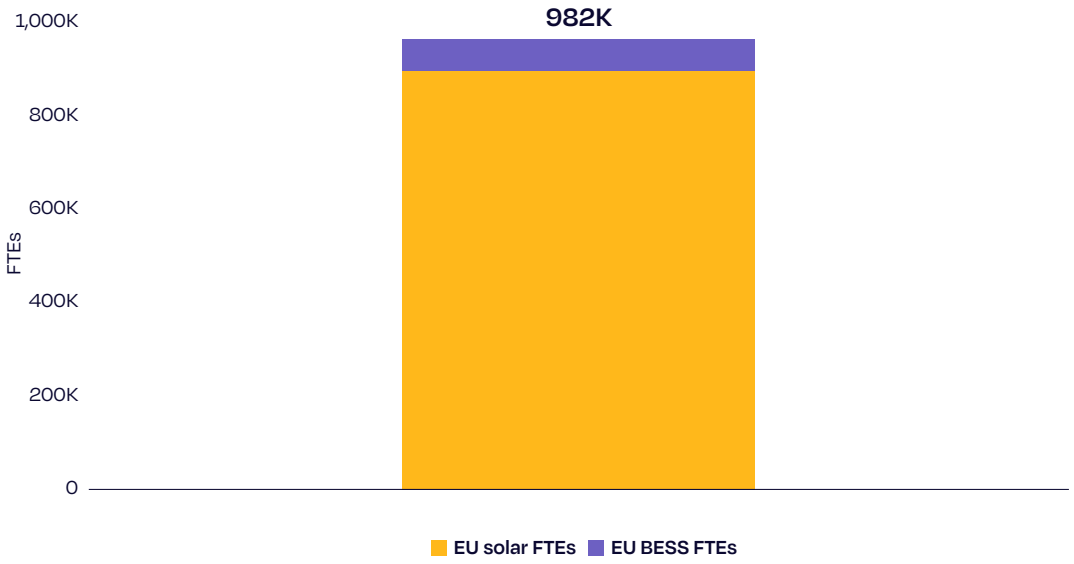
Our analysis finds that combined, the solar and storage sectors supported 982,000 jobs across the EU, highlighting their growing role as a source of industrial activity, investment and employment (Fig. 5).

The inclusion of storage reflects a broader transformation of the European energy system. As renewables account for an increasing share of electricity generation, batteries are becoming essential for flexibility, resilience and grid integration. Alongside solar, they are supporting a rapidly expanding ecosystem of skilled jobs and reinforcing Europe's clean-tech industrial base.

Figure 5

Solar and storage powered about 1 million EU jobs in 2025

EU solar and storage FTEs, 2025



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The report is structured as follows. Chapter 1 analyses employment across the EU solar value chain, covering manufacturing, deployment, operation and maintenance, and end-of-life activities. It examines employment trends across Member States, explores the evolving balance between utility-scale and rooftop solar, and provides workforce projections to 2030. Chapter 2 presents SolarPower Europe's first dedicated assessment of employment in the EU battery storage sector in 2025, including an overview of the manufacturing landscape and job creation across the storage value chain. The methodology and assumptions underpinning the analysis are presented in the Annex.

EU Solar Jobs

The EU solar sector employed 874,000 full-time equivalents, above earlier forecasts as solar installations proved stronger than expected. Employment remained heavily concentrated in deployment, which accounted for around 85% of all solar jobs, while operations and maintenance continued to expand with the installed fleet, and manufacturing remained under pressure from factory closures and intense international competition.

EU solar workforce reaches 874,000 in 2025 as deployment beats expectations

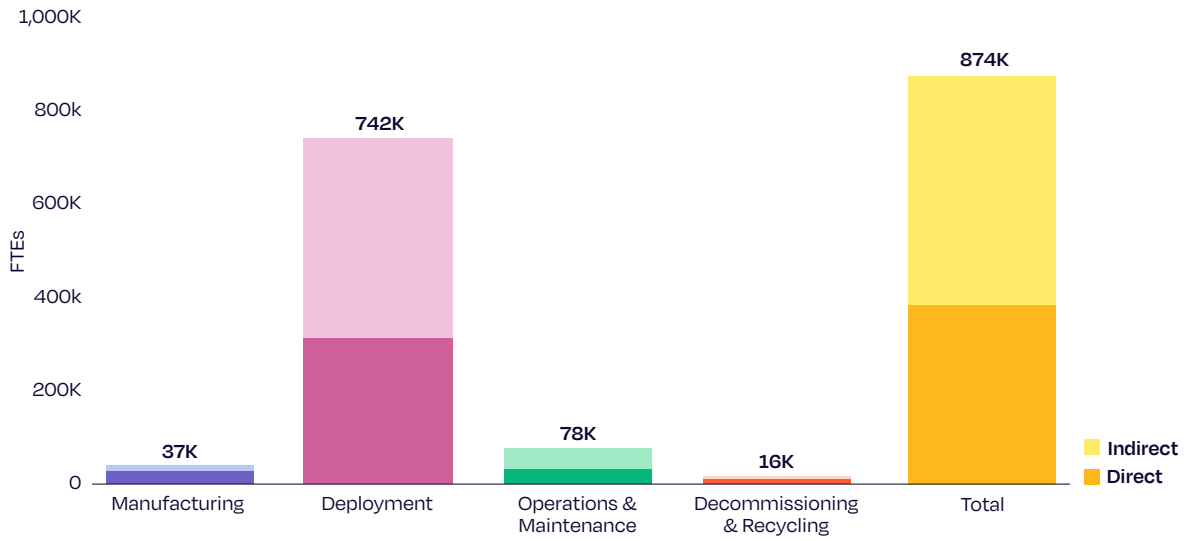
The EU solar sector employed 874,000 full-time equivalent workers in 2025, exceeding our previous forecast thanks to stronger-than-expected solar deployment. This represents a 1% increase from the 865,000 FTEs recorded a year earlier. Direct jobs accounted for 383,000 FTEs (44%), while the remaining 491,000 FTEs (56%) were indirect jobs (see Fig. 6).

Our prior report had projected solar employment to fall to 826,000 FTEs in 2025, based on the weaker market outlook available in June 2024. According to our latest market analysis[1], installations reached 69 GW, compared with an earlier estimate of 64 GW[2]. Employment was consequently 5.8% higher than previously forecast.

Figure 6

The EU solar sector supported 874,000 FTEs in 2025, heavily concentrated in the deployment phase

EU-27 SOLAR JOB MARKET IN 2025



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Solar employment remained heavily concentrated in the deployment segment, which accounted for 742,000 FTEs, or 85% of the total, broadly unchanged from the previous year (see Fig. 7). The continued expansion of the EU solar fleet also lifted O&M employment to a record 78,000 FTEs in 2025, equivalent to 9% of total solar employment.

Manufacturing employment, by contrast, remained under pressure. Factory closures, insolvencies, workforce reductions, intense international competition, and persistent global overcapacity continued to weigh on the sector. EU solar manufacturing supported around 37,000 FTEs at the end of 2025, equivalent to 4% of total solar employment and 3,000 fewer FTEs than in 2024.

1 SolarPower Europe (2026): EU Solar Market Update 2026 – Mid Year Analysis

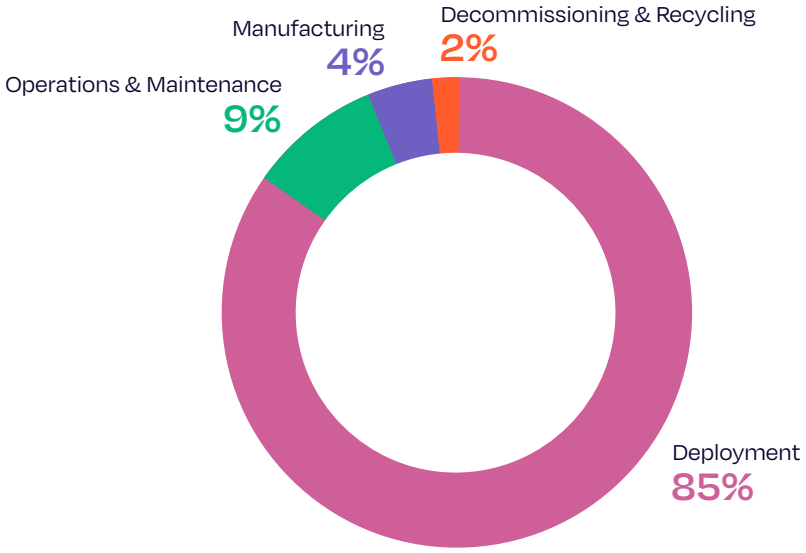
2 SolarPower Europe (2026): Global Solar Market Outlook 2026-2030

Decommissioning and recycling remained a relatively small source of employment, accounting for 16,000 FTEs, or around 2% of the total. Employment in this segment remains limited because large volumes of end-of-life PV waste have yet to emerge. Significant waste streams are not expected before around 2030, when the first major waves of installations begin to reach the end of their operating lives or are repowered with newer, more efficient modules. Moreover, there is very little waste that would need recycling from manufacturing due to its limited size.

Figure 7

Deployment accounts for 85% of total EU solar jobs

EU-27 TOTAL SOLAR JOBS BREAKDOWN IN 2025



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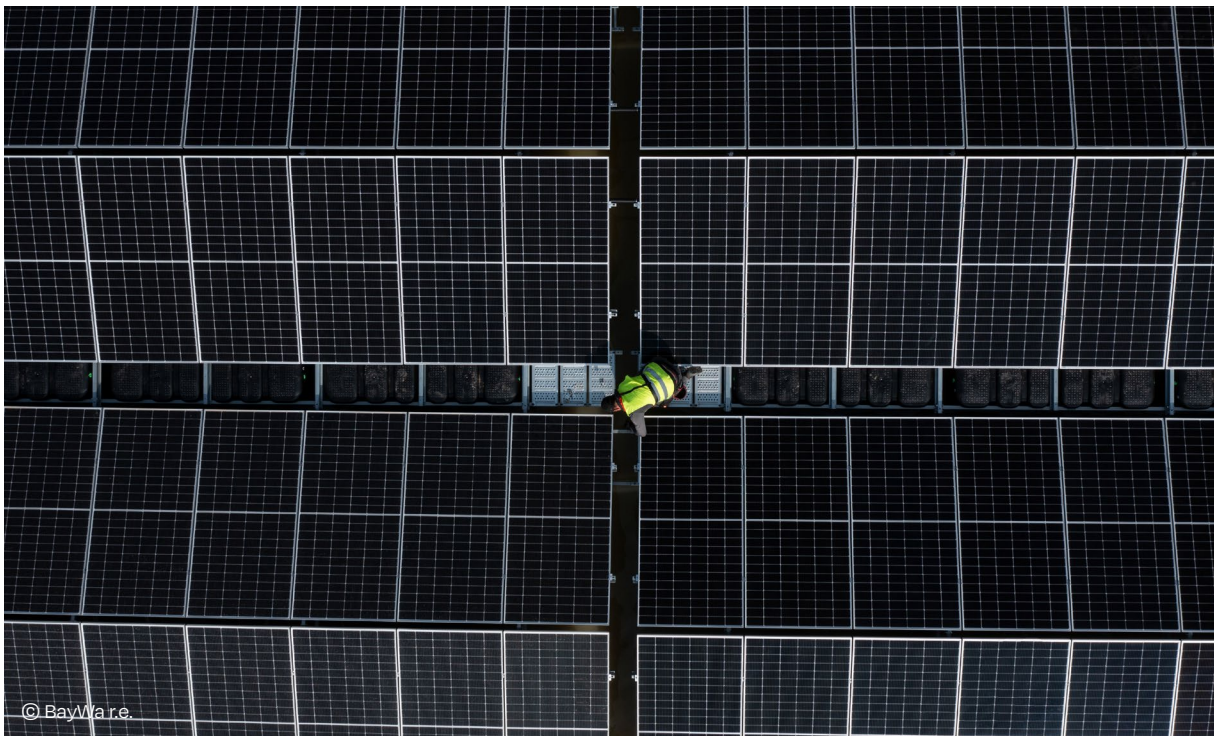


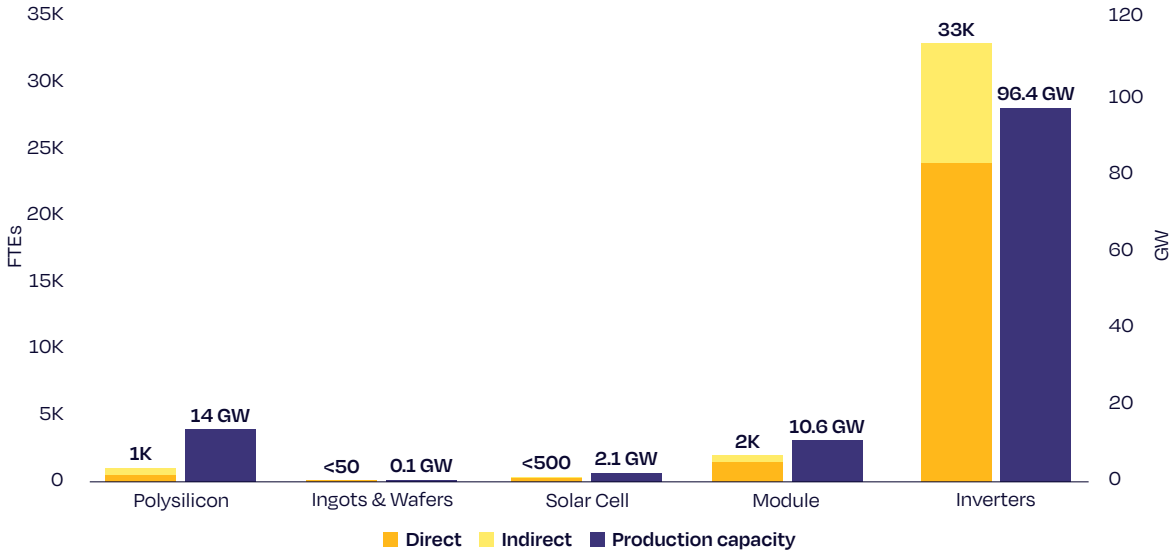
Inverters dominate EU solar manufacturing jobs as other segments shrink further

Within the manufacturing segment, employment remains closely linked to production capacity across EU Member States. Europe still accounts for only a small share of the global PV module supply chain and meets a limited share of domestic demand. Inverters remain the backbone of the EU solar manufacturing base. While polysilicon's share to the contribution of EU demand is decreasing, ingot and wafer production is basically non-existent. Cell and module manufacturing continues to struggle despite several announced expansion projects.

Figure 8

Inverters account for 90% of EU solar manufacturing employment

EU-27 SOLAR MANUFACTURING JOBS AND PRODUCTION CAPACITY IN 2025



Note: production capacity volumes are based on publicly available information, estimations and internal assumptions. More information on the methodology to assess job creation is available in the Annex.

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Inverter manufacturing remains by far the largest source of EU solar manufacturing employment, supporting approximately 33,000 direct and indirect FTEs, or 90% of the total (Fig. 8). EU inverter manufacturing capacities increased by 4% in 2025 compared to the year before and about 10-15 inverter manufacturers are active in Europe. The majority is based in Germany and led by SMA, which just inaugurated a new 20 GW factory with space for 60 GW at its headquarters in 2026. There are also plans from leading Chinese suppliers to expand in Europe – Sungrow has plans for a 20 GW factory in Poland. Despite this dominant contribution to employment, the sector is facing increasing competitive pressure. Several European inverter manufacturers have restructured, while others have reported weak financial performance for 2025 amid subdued residential and commercial demand and sustained price competition.

EU module manufacturing faced another difficult year in 2025 amid continued strong import competition, limited demand for higher-cost locally manufactured products, and persistently low margins. While total EU manufacturing capacities increased by 13% to 10.6 GW by end of 2025 – mainly driven up by the ramp-up of Enel's 3SUN factory in Italy – employment in module manufacturing continued to contract as many surviving producers also operated well below nameplate capacity. Total employment fell to around 2,000 FTEs, from 3,500 in 2024. Germany's Aleo Solar announced the closure of its module production facility, while France's Photowatt

permanently ceased operations. These developments followed an already challenging 2024, when several European manufacturers – including Meyer Burger, Solarwatt, Systovi, Exasun, Energetica, and RECOM Silia – closed facilities or entered insolvency. Despite this decline, module manufacturing has become the second-largest source of EU solar manufacturing employment in 2025.

This ranking change unfortunately does not reflect an improvement in the module segment, but rather a downward revision of **polysilicon** production following a more detailed assessment of the share of output dedicated to solar PV rather than semiconductor applications. As a result, polysilicon fell to the third-largest contributor to manufacturing employment, accounting for around 4%, or approximately 1,400 FTEs. The only active actor in the EU is Wacker Chemie based in Germany. However, the exact share of EU polysilicon production dedicated for solar rather than semiconductor applications remains uncertain. Unlike previous editions of this report, which assumed that most polysilicon production supported the solar PV value chain, this year's study applies a stronger allocation of the production towards semiconductor-grade silicon. Based on this methodology, the study currently assumes 14 GW of solar-grade silicon production in the EU, and a lower utilisation rate. Consequently, the estimated employment of polysilicon manufacturing has been revised downward compared to previous editions, causing the segment to fall behind module manufacturing.

Cell manufacturing also remained very limited, despite some positive developments. Enel's 3SUN Gigafactory in Italy continued its industrial ramp-up, reaching approximately 1.8 GW of operational manufacturing capacity in 2025 and becoming Europe's largest active solar cell producer. Germany also retains specialised and next-generation cell activities: Azur Space manufactures high-efficiency solar cells for space applications, while Oxford PV operates a pilot facility for perovskite-silicon tandem cells. At the same time, the insolvency of Meyer Burger's German operations dealt a significant blow to ambitions to rebuild an EU solar cell manufacturing base.

Ingot and wafer production remained virtually absent, although NexWafe has been developing its next-generation epitaxial wafer technology and building its first commercial-scale production facility in Bitterfeld, Germany. Combined, cell, wafer and ingot manufacturing supported fewer than 500 FTEs, or roughly 1% of EU solar manufacturing employment.

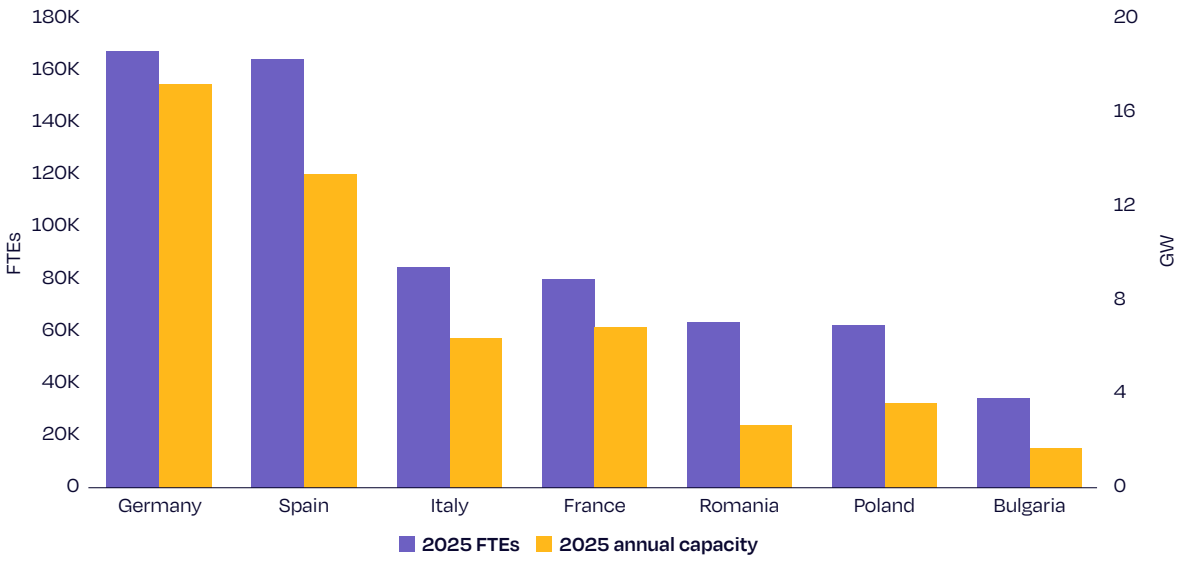
Europe's solar workforce concentrates in leading markets as utility-scale takes the lead

Germany remained the EU's largest solar employer in 2025, with around 165,000 direct and indirect FTEs, equivalent to 19% of total EU solar employment (Fig. 9). Spain ranked a close second with just under 165,000 FTEs. The narrow employment gap, despite Spain installing 3.9 GW less solar capacity than Germany during the year, reflects the methodology used to estimate employment.

Figure 9

Germany, Spain, and Italy account for almost half of EU solar employment

EU-27 TOP 7 FTE COUNTRIES AND ANNUAL INSTALLED SOLAR PV CAPACITY 2025



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Employment is estimated from total solar investment (CAPEX), with the labour component isolated and converted into FTEs using country-specific labour costs. Lower average wages in Spain mean that a comparable level of investment supports more jobs than in Germany. Spain also has a higher indirect-employment multiplier, so each direct solar job supports more jobs elsewhere in the economy. Germany therefore retained a clear lead in direct employment, with approximately 93,000 FTEs compared with 76,000 in Spain. Spain, however, supported 88,000 indirect FTEs, compared with 72,000 in Germany, bringing total employment in the two markets to similar levels.

Italy remained the EU's third-largest solar employer, with approximately 85,000 FTEs. Although annual deployment growth slowed from previous years, the country's large installed fleet and continued market expansion sustained employment across installation, O&M, and the wider supply chain.

As in previous years, the EU's largest solar markets were also its largest solar employers. **France** and **Romania** followed with approximately 80,000 and 64,000 FTEs, respectively. **Poland** (63,000 FTEs) and **Bulgaria** (35,000 FTEs) completed the top seven, despite being smaller solar markets than several other Member States.

Overall, the geographical distribution of solar employment continues to be shaped primarily by deployment volumes and labour costs. Markets combining high annual installations with lower

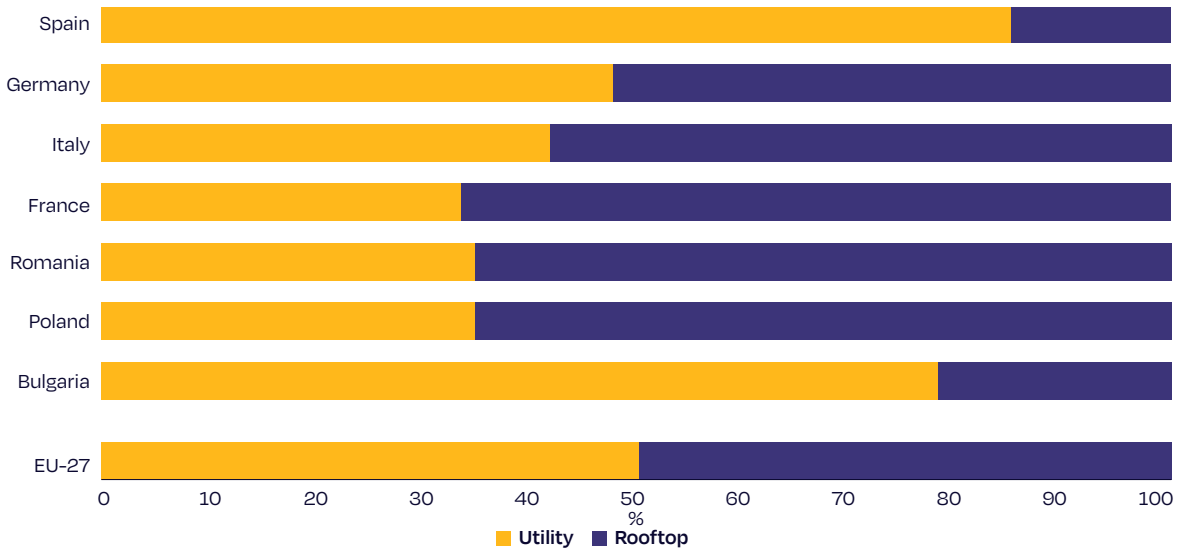
labour costs tend to support more FTEs, while higher-wage markets generate fewer jobs per unit of investment even when deployment remains strong.

Looking at PV system segmentation, the shift towards **utility-scale solar employment** accelerated further in 2025. Its share rose from 32% in 2023 to 41% in 2024 and reached 50.2% in 2025 (Fig. 10). For the first time since our annual solar jobs report series began 6 years ago, utility-scale employment marginally exceeded rooftop solar employment.

Figure 10

Utility-scale solar jobs marginally surpassed rooftop jobs for the first time in 2025

EU-27 TOP 7 FTE COUNTRIES – ROOFTOP VS. UTILITY-SCALE JOBS BREAKDOWN 2025



Note: Numbers only includes FTE in deployment and Operation & Maintenance.
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This shift towards utility-scale employment is particularly visible in some Member States. With more than 120,000 direct and indirect utility-scale jobs, Spain remained the largest contributor to this segment. Utility-scale activities accounted for 85% of the country's solar workforce, up 8 percentage points from 2024. Bulgaria, while much smaller in absolute terms, was the second most utility-scale-oriented market, with 78% of its solar workforce linked to large-scale projects.

Among the EU's largest solar markets, Germany recorded the strongest shift towards utility-scale employment, whose share rose from 39% in 2024 to 48% in 2025. Italy also saw a marked increase, from 33% to 42%, supported by the commissioning of auctioned projects and reduced rooftop incentives. France was comparatively stable: utility-scale jobs increased from 31% to 34% of solar employment, still the lowest share among the seven largest solar job markets. This reflects the continued importance of smaller installations supported by the S21 feed-in tariff scheme in 2025. Romania's rapid market expansion was increasingly driven by large-scale projects, lifting the utility-scale share of solar employment from 23% in 2024 to 35% in 2025.

As exceptions to this trend, France was comparatively stable: utility-scale jobs increased from 31% to 34% of solar employment, still the lowest share among the seven largest solar job markets. This reflects the continued importance of smaller installations supported by the S21 feed-in tariff scheme in 2025. Poland was the only major market where the share declined, from 42% to 35%, pointing to a relative strengthening of rooftop activity within the national solar workforce last year.

Stagnant solar market expectations drive a decrease in the EU solar workforce by 2030; three out of four jobs will remain in solar deployment

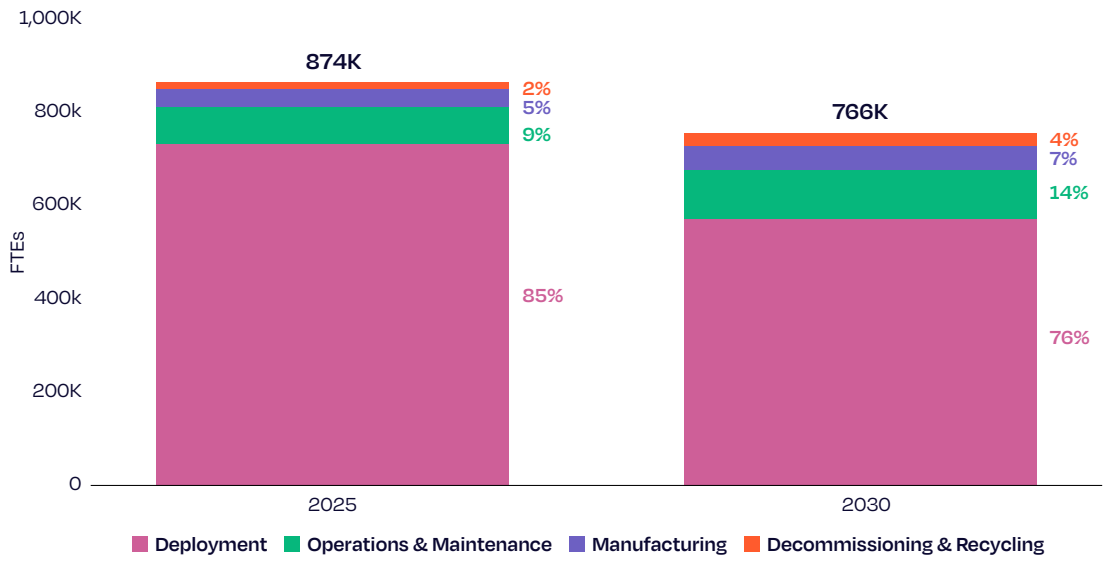
The EU solar workforce is expected to contract towards 2030 as the solar market is projected to decrease in the near term and, despite a subsequent recovery, remain broadly at 2025 levels by the end of the decade. Under the Medium Scenario of our Global Market Outlook from June 2026, annual installations reach around 70 GW in 2030, only marginally above the 69.1 GW installed in 2025. With investment broadly stable, rising labour costs and continued productivity gains in deployment and O&M are expected to reduce labour demand. Total solar employment consequently falls from 874,000 FTEs in 2025 to 766,000 in 2030, a 12% decline (Fig. 11).

The composition of the workforce will also somewhat shift. Deployment remains by far the largest source of employment, but its share falls by around 9 percentage points to approximately 76% in 2030. O&M rises from 9% to 14%, supported by growth in Europe's cumulative solar fleet from 411 GW at the end of 2025 to 739 GW by 2030. Manufacturing is also expected to gain a little share if announced factory projects are delivered. Decommissioning and recycling is projected to grow the fastest in relative terms, doubling its share from 2% to 4% as larger volumes of end-of-life modules enter the waste stream.

Figure 11

EU solar employment is project to decline by 2030 as market growth stalls

EU-27 SOLAR JOBS BREAKDOWN EVOLUTION 2025-2030



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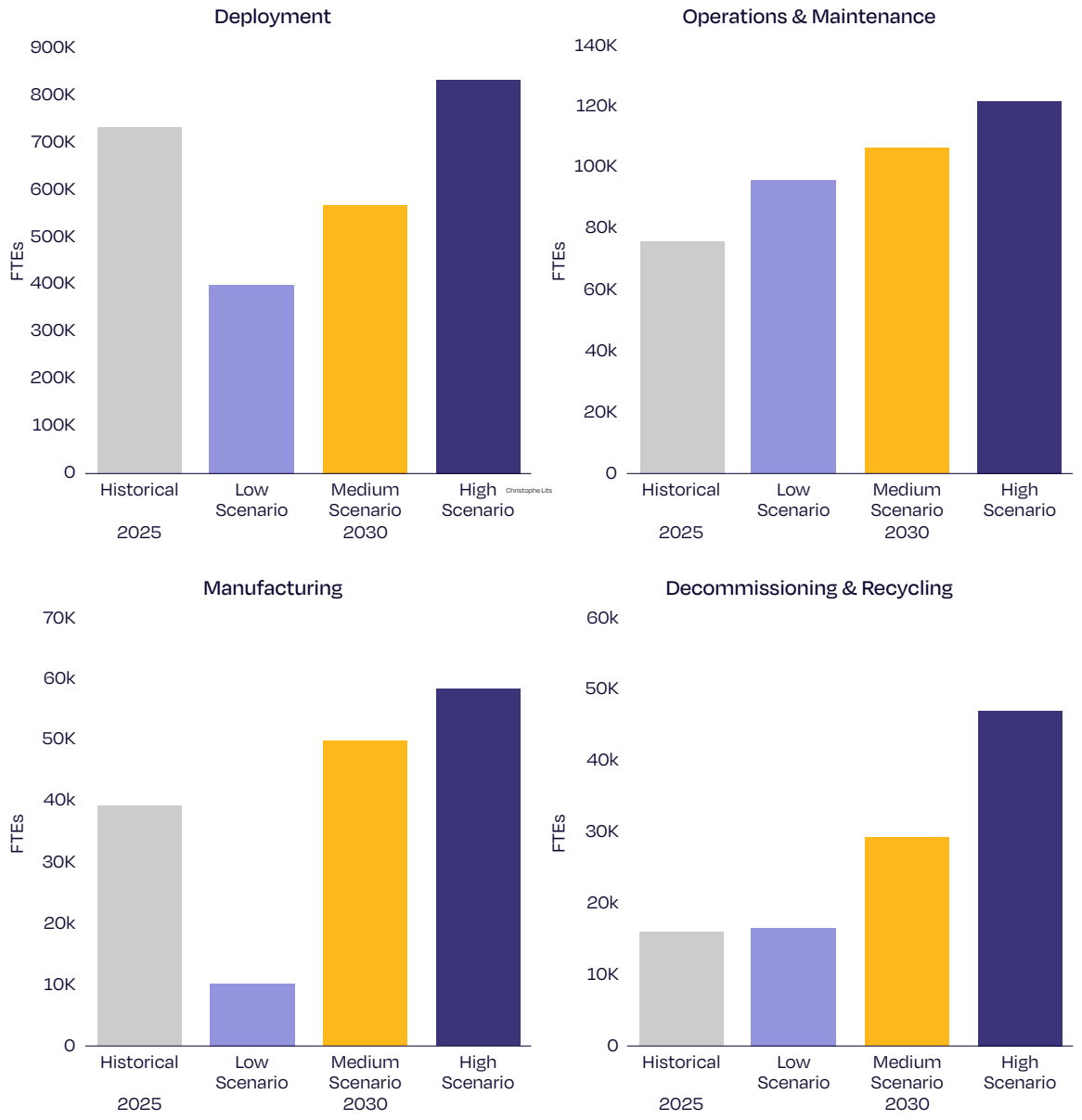
Looking at employment across the four value chain segments, deployment remains by far the largest source of solar employment in Europe, but it is the only segment projected to contract under our Medium Scenario. Growth slows in both rooftop and utility-scale markets. Several countries are scaling back support for residential and commercial systems, while negative electricity prices, rising curtailment, and lower capture rates are weighing on profits for utility-scale projects.

Deployment employment is projected to fall by 22%, from 742,000 FTEs in 2025 to 578,000 in 2030 under the Medium Scenario (Fig. 12). The decline is steeper in the Low Scenario, which assumes weaker policy support and insufficient deployment of flexibility solutions: annual installations fall to 49.4 GW by 2030, supporting around 404,000 FTEs. By contrast, the High Scenario assumes stronger policy ambition, faster electrification, and a rapid rollout of flexibility solutions such as battery storage and demand response, improving project economics. Annual installations reach 101 GW in 2030 in this scenario, supporting approximately 841,000 FTEs.

Figure 12

EU solar deployment jobs expected to fall by 22% by 2030, while all other segments expand

EU-27 SOLAR PV FTE SCENARIOS 2025-2030



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O&M is expected to remain one of the most stable segments of the solar value chain because employment depends primarily on the size of the installed fleet rather than annual deployment. With cumulative EU PV capacity projected to rise from 411 GW in 2025 to 739 GW in 2030, demand for monitoring, inspection, maintenance, and performance optimisation will continue to grow. Automation, digitalisation, and improved system reliability should reduce labour intensity over time, but not enough to offset fleet growth. O&M employment is therefore projected to increase from 78,000 FTEs in 2025 to 109,000 FTEs in 2030.

Manufacturing employment is projected to rise from 37,000 FTEs in 2025 to 49,000 in 2030 under the Medium Scenario. This outlook, however, highly depends on the successful delivery and ramp-up of several large industrial projects currently under development. Despite numerous announcements, Europe's solar manufacturing base remains fragile: domestic producers face intense international competition, while utilisation rates at existing factories remain below sustainable levels. Without stronger market and policy support, some planned projects may not materialise and existing manufacturers may struggle to remain operational. This uncertainty is reflected in the Low Scenario, which assumes project cancellations and continued underutilisation. Under these conditions, manufacturing employment could fall to around 10,000 FTEs by 2030, weakening Europe's ambition to rebuild a domestic solar industrial base. On the other hand, legislative measures to strengthen resilience, like Net Zero Industrial Act (NZIA) in combination with a strong Made in Europe provision in the IAA, and funding exclusion for solar and battery storage projects using inverters and PCS from high-risk countries could lead to a High Scenario of 59,000 FTEs.

Although relatively small today, the **decommissioning and recyclin**g segment is expected to be the fastest-growing solar employment segment. The first major cohorts of systems installed during Europe's early solar expansion are approaching the end of their operating lives, while more older systems will also be repowered with higher-efficiency technologies. This will increase demand for dismantling, material recovery, and recycling. Employment is projected to almost double from 16,000 FTEs in 2025 to 30,000 by 2030, making end-of-life activities an increasingly important part of a more circular European solar industry. Waste stream projections are based on the EVERPV Horizon project, which provides Low, Medium, and High scenarios for EU PV waste generation. The significant difference between Low and High Scenario FTEs reflects the wide range of possible end-of-life PV volumes projected by these scenarios, which directly impacts recycling employment estimates.

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Germany remains the largest solar employer while rooftop regains the lead by 2030

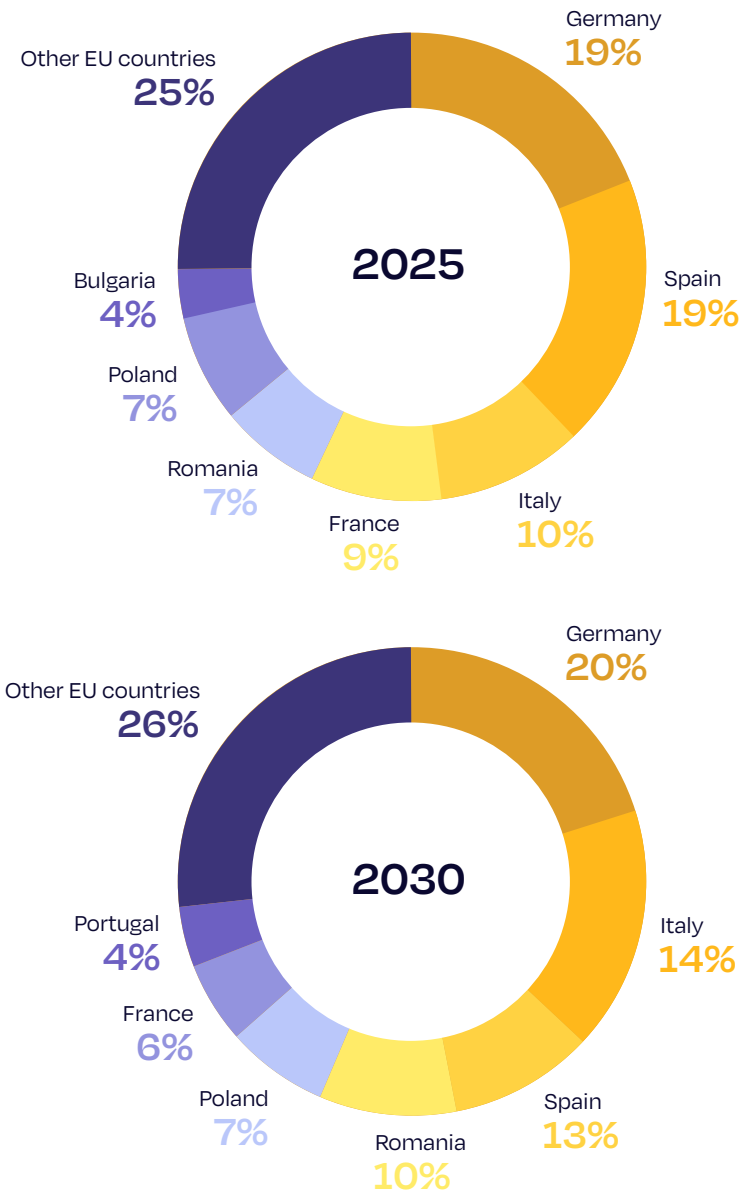
National employment trends are expected to evolve unevenly across the EU by 2030 (Fig. 13). Under the Medium Scenario, **Germany** is expected to remain the EU's largest solar employer in 2030, with 153,000 FTEs and a 20% share under the Medium Scenario. This is moderately below 2025 levels, but the country's large and diversified market keeps it in first place.

Italy records the strongest increase among the leading markets, with solar employment projected to rise by 24%, from 85,000 FTEs in 2025 to 105,000 in 2030. This would move Italy ahead of Spain into second place. The outlook is supported by the FER-X scheme and auction mechanisms, which are expected to sustain deployment and improve investor visibility through the decade.

Figure 13

Germany remains the largest solar employer in 2030, while Italy moves into second place

EU-27 TOP 7 FTE COUNTRIES 2030



Note: "Other EU countries" includes all the other EU countries which are not appearing on the graph.

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Spain follows closely with around 102,000 FTEs in 2030, down significantly from approximately 165,000 in 2025. The decline is driven primarily by weaker investment conditions in utility-scale solar. Lower capture prices, increasing solar cannibalisation and rising curtailment reduce project profitability and weaken the case for new investment, slowing deployment. Even so, Spain remains one of the EU's three solar employment markets above 100,000 FTEs in 2030.

Romania remains one of the EU's fastest-growing solar employment markets, with FTEs projected to rise from around 64,000 in 2025 to nearly 74,000 in 2030, making it the fourth-largest market. By contrast, employment in **Poland** and **France** is projected to contract to approximately 53,000 and 43,000 FTEs, respectively. France records the sharpest decline among the major markets, reflecting the weaker deployment outlook in the Medium Scenario.

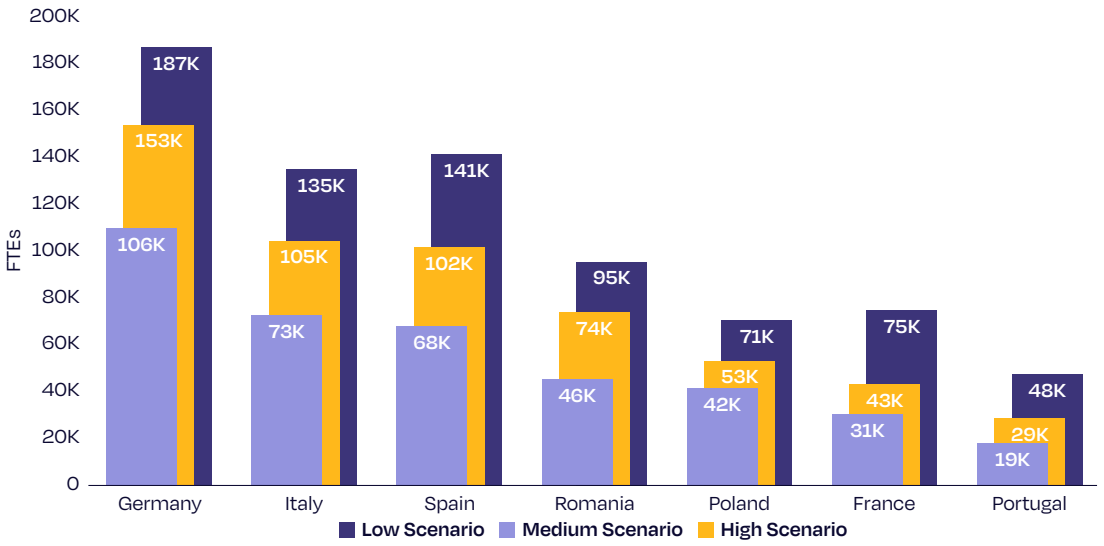
Beyond the largest markets, several smaller and emerging solar economies become more important contributors to the EU workforce. **Portugal** is projected to rank seventh by 2030, with around 29,000 FTEs under the Medium Scenario. **Greece** and **the Netherlands** follow with approximately 22,000 and 21,000 FTEs, respectively.

Despite these shifts, solar employment remains concentrated in a relatively small number of countries. Under the Medium Scenario, Germany, Italy, and Spain together account for around 361,000 FTEs, equivalent to 47% of total EU solar employment in 2030 (Fig. 14). The seven largest employment markets would represent almost three-quarters of the EU total, underscoring the continued importance of a small group of leading countries in shaping Europe's solar workforce.

Figure 14

The three largest EU solar employment markets are each projected to exceed 100,000 FTEs in 2030

EU-27 TOP 7 COUNTRIES SCENARIOS 2030



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At EU level, employment is expected to remain broadly balanced between **rooftop and utility-scale** solar (Fig. 15). Utility-scale activities accounted for 50.2% of solar jobs in 2025, compared with 49.8% for rooftop. By 2030, rooftop employment is projected to regain a modest lead, representing 52.7% of solar jobs versus 47.3% for utility-scale. The shift reflects increasing challenges for large-scale projects in some of Europe's leading solar markets.

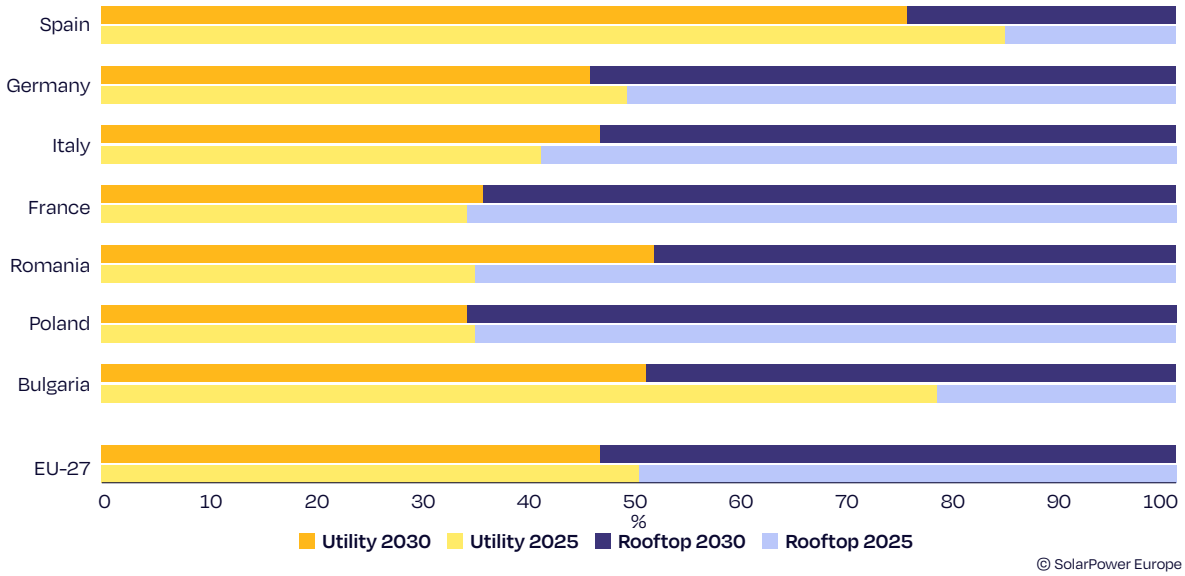
National trends differ considerably. Spain remains by far the most utility-scale-oriented market, although the utility-scale share of employment falls from 85% in 2025 to 76% in 2030. Romania records the largest shift, moving from a predominantly rooftop workforce towards a more balanced structure, with utility-scale activities accounting for 52% of solar jobs by 2030. Italy also becomes more utility-scale-oriented, with the segment's share rising from 42% to 47% as large-scale deployment continues to grow.

Germany, France, and Poland retain a strong rooftop focus. Rooftop employment is projected to increase from 52% to 54% in Germany, account for 64% of solar employment in France by 2030, and edge up from 65% to 66% in Poland.

Figure 15

The rooftop segment is expected to provide again the majority of solar jobs by end of the decade

EU-27 TOP 7 COUNTRIES - ROOFTOP VS. UTILITY-SCALE JOBS BREAKDOWN 2030



Box 1

From the coal mine to the clean energy classroom

How former miner Sebastian Tirintică became a renewable energy trainer and what his journey teaches Europe about a just transition.

Europe's energy transition is often described through gigawatts, targets and investment plans. In the Jiu Valley, Romania's historic coal heartland, it is also measured through individual decisions. After eight years underground, Sebastian Tirintică now trains people for work in solar and wind energy at RenewAcad.

A profession inherited across generations

For Sebastian, mining was never simply a job. His father and grandfather had worked in the industry, which shaped both his family and the wider region.

Between 2014 and 2022, he gained experience across several demanding roles. He worked in maintenance, operated extraction machinery, and later progressed to an engineering position, coordinating teams and helping oversee safety procedures in an environment requiring discipline, technical judgement and responsibility.

Those capabilities became the foundation for a new career. Following rigorous procedures, understanding equipment, assessing risk and working in a team are highly relevant to renewable energy. Sebastian's story shows why reskilling should recognise what workers already know.

The first offer was not the right offer

In 2019, Sebastian was offered a place in a pilot programme that would train him as a wind turbine installer and lead to work in Germany. Accepting it would have meant moving away from his wife and two daughters, so he declined.

The decision shows that training and a theoretical job opportunity are not enough if the pathway conflicts with family life, geography or financial security. A credible just transition therefore needs local training, visible employers and realistic routes into work.

In 2021, Sebastian completed one month of training in solar PV installation and wind turbine maintenance fundamentals, including work-at-height safety and first aid. The courses made a different professional future tangible.

> *"It's hard to detach yourself from something you've done your entire life."*

Leaving mining and returning as a teacher

In 2022, after eight years in mining, Sebastian left the industry. Since 2023, he has worked as a renewable energy trainer with RenewAcad and others, delivering technical and safety-focused courses while developing his own expertise as an instructor.

His role gives the transition a powerful multiplier effect. He is not only a former miner who changed careers; he now helps others acquire the confidence and competences to do the same. Trainees meet someone who understands the routines, pride and apprehension associated with mining, giving him credibility grounded in as much lived experience as in certification.

A European workforce challenge with a human face

Sebastian's journey is personal, but the challenge is European. SolarPower Europe reports that the EU solar sector supported a record 874,000 jobs in 2025, with Romania among its seven largest solar workforces. The EU solar workforce is projected to decrease to around 754,000 jobs by 2030 as solar PV growth slows.

Europe must ensure enough people can design, install, operate and maintain solar safely and to a high standard. SolarPower Europe calls for stable and accessible training funding, stronger vocational pathways, portable competence frameworks and inclusive access to solar careers, highlighting RenewAcad as a best-practice example.

From individual courage to regional capacity

RenewAcad has worked with companies and partners to bring reskilling closer to workers in carbon-intensive regions. In one OMV Petrom-supported programme, 214 technicians and miners trained for green professions, showing both what collaboration can achieve and the scale of the task ahead.

A just transition requires more than closing one industry and advertising vacancies in another. It needs accessible career guidance, modular training, recognised qualifications, local infrastructure, clear links to employment and respect for decisions affecting entire families.

Europe needs systems that make such transitions ordinary rather than exceptional. When training is local, relevant and linked to opportunity, the energy transition can preserve the dignity of existing skills while opening new paths. Sebastian's journey shows how knowledge and skills can be transferred from one energy era to the next.

Sebastian Enache
RenewAcad Director

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EU Battery Storage Jobs

The EU battery value chain has expanded substantially over the past decade. In 2025, battery energy storage systems supported around 108,000 FTEs, with employment concentrated in deployment. Manufacturing employment attributable to stationary storage remained comparatively small. The wider EU battery manufacturing base continues to be dominated by EV and other non-BESS applications.

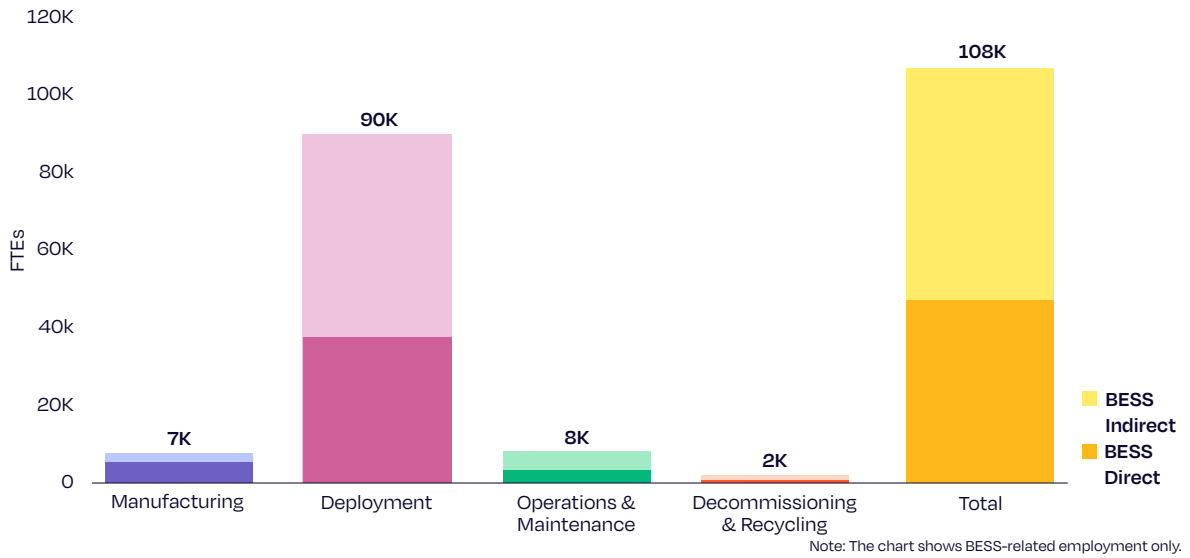
The EU battery storage sector supports over 100,000 jobs, with employment concentrated in deployment activities

The EU lithium-ion battery ecosystem has expanded rapidly over the past decade. Although the industry is still at an early stage development, it already supports a sizeable industrial base across the value chain. In 2025, BESS activities in the EU supported around 108,000 FTEs across manufacturing, deployment, O&M, and decommissioning and recycling. Direct employment accounted for approximately 48,000 FTEs (44%), while around 60,000 FTEs (56%) were indirect (see Fig. 16).

Figure 16

The EU battery storage sector supported more than 100,000 FTEs in 2025, most of them in deployment

EU-27 BESS JOB MARKET IN 2025



Note: The chart shows BESS-related employment only.
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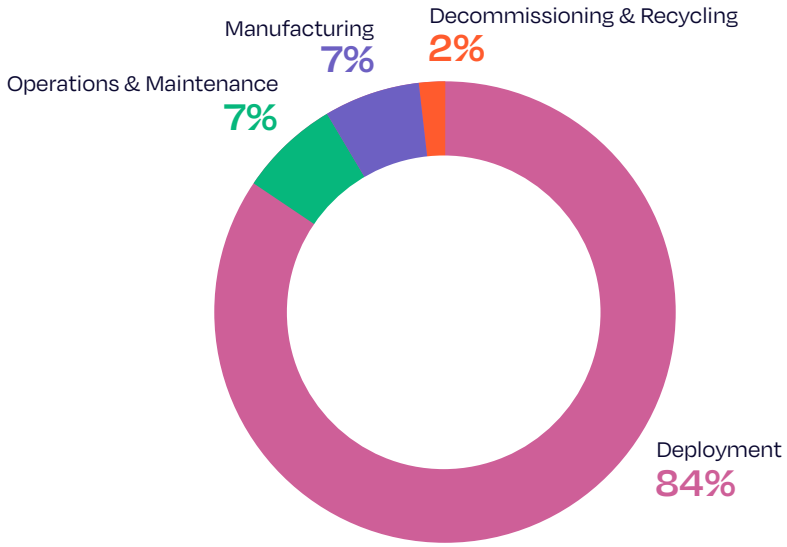
The contributions across the value chain segments mimic the trends seen in solar jobs. Deployment accounted for the clear majority of BESS employment, with around 90,000 FTEs, or 84% of the total (see Fig. 17). O&M supported about 8,000 FTEs (7%), while decommissioning and recycling accounted for around 2,000 FTEs (2%). Together, downstream activities represented 93% of the 108,000-FTE BESS workforce. Manufacturing attributable to stationary storage remained comparatively small at around 7,000 FTEs, or 7% of the total.

Figure 17

BESS deployment accounted for 84% of battery storage jobs in 2025; manufacturing, O&M, and end-of-life activities together represented 16%

EU-27 BESS JOBS BREAKDOWN IN 2025



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BESS only takes a minor share of the broader EU battery manufacturing landscape, which remains dominated by the EV sector

In the manufacturing segment, battery storage employment is closely linked to production capacity across Member States, which currently meets only a limited share of EU battery demand. Less than a decade ago, Europe had essentially no battery manufacturing industry. EU policy support and national funding programmes have since driven a rapid build-out of production capacity.

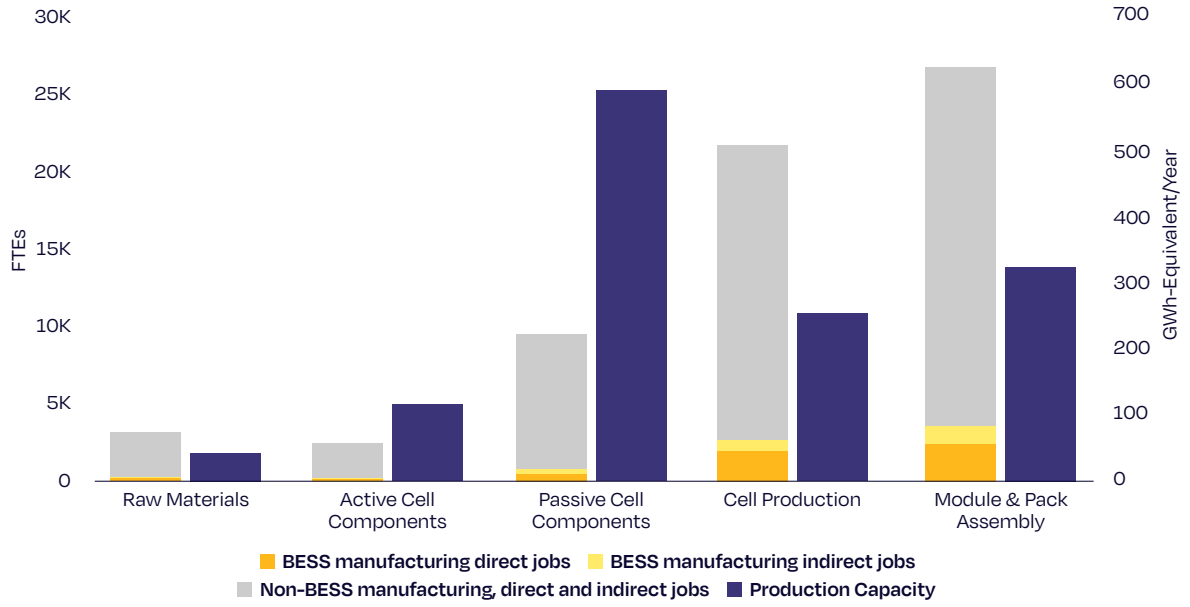
Manufacturing for stationary storage applications supported around 7,000 direct and indirect FTEs. The broader battery manufacturing ecosystem, however, is much larger, because the same value chain also serves electric vehicles and other applications. Across all battery applications, EU-27 manufacturing supported approximately 64,000 FTEs in 2025, most of them linked to EV batteries (Fig. 18). Our reported total of 108,000 FTEs supported by the BESS sector excludes employment attributable to EVs and other non-BESS applications.

Of the 64,000 manufacturing FTEs across all battery applications, around 47,000 were direct and 17,000 indirect. BESS accounted for only a minority of this workforce; EV and other applications dominated, particularly in cell production.

Figure 18

Battery manufacturing employment is concentrated in cell production and module and pack assembly; BESS represents only a small share

EU-27 BATTERY MANUFACTURING JOBS & PRODUCTION CAPACITY IN 2025



Note: Non-BESS manufacturing jobs include direct and indirect employment related to EV and other non-BESS applications. Production capacity covers the entire battery value chain and includes all applications.

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Battery manufacturing employment spans raw material processing, active and passive cell components, cell production, and module and pack assembly. Cell production and module and pack assembly together account for more than 80% of BESS manufacturing employment, supporting over 6,000 FTEs.

Employment is substantially lower in other parts of the value chain: passive cell components account for around 10% of BESS manufacturing jobs, while active cell components and raw-material processing each represent about 3%. Across all battery applications, this distribution broadly reflects the EU's industrial development strategy. Domestic mining and refining have expanded only marginally, while policy and investment over the past decade have focused more heavily on downstream manufacturing. Gigafactory projects in Germany, Hungary, Poland, and Spain have become important industrial and employment hubs.

Significant plans exist to expand cell and module production capacity across the EU, but persistent global overcapacity has pushed battery prices to record lows and intensified pressure on European producers. Higher energy and labour costs further weaken competitiveness. Many facilities consequently operate at low utilisation rates, while several companies have scaled back or suspended production.

Across all battery applications, passive cell components represent the largest manufacturing segment by annual production capacity, at 595 GWh-equivalent. This includes electrolyte and separator manufacturing, much of it serving EV batteries. Active cell component capacity totals approximately 116 GWh-equivalent per year, while employment in this stage remains comparatively limited. The pattern highlights the scale of Europe's component base, but also the continued dominance of EV-oriented demand relative to the smaller BESS market.

The EU also has 256 GWh/year of cell manufacturing capacity, where active and passive components are assembled into battery cells, and 326 GWh/year of module and pack assembly capacity. Europe has therefore built substantial downstream manufacturing capacity and a strong passive-component base, but remains comparatively weak in active materials. This imbalance leaves the value chain dependent on imported upstream battery materials.

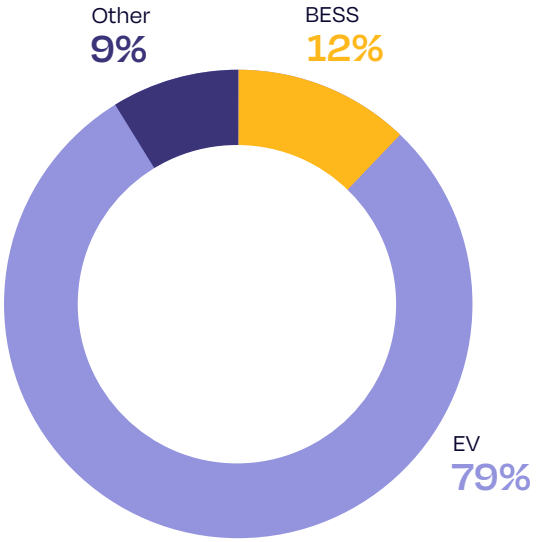
The project pipeline nevertheless points to further investment across several Member States. Planned expansions in active-material production could add capacity particularly in Germany, Hungary, and Poland. Announced lithium extraction and processing projects in France, Portugal, Spain, Czechia, and Austria could also strengthen Europe's upstream battery value chain and improve supply resilience. Delivery, however, will depend heavily on whether projects receive sufficient support through their early years of operation, when financial risks are typically highest.

Direct employment in cell production and module and pack assembly remains overwhelmingly driven by the EV sector (Fig. 19). Around 29,000 jobs, or 79% of direct employment across these two stages, serve EV applications. BESS accounts for approximately 4,000 jobs (12%), while other applications – including industrial vehicles, power tools, robotics, and medical equipment – represent around 3,000 jobs (9%). This application mix is also reflected in battery chemistries: around 96% of European battery production is nickel-based (NMC and NCA). That share is expected to decline as LFP gains ground, driven by faster BESS deployment and its growing adoption by global automakers seeking lower-cost battery options.

Figure 19

Stationary storage accounts for a small share of direct employment in EU battery cell production and module and pack assembly, with most jobs linked to EVs

EU BATTERY MANUFACTURING DIRECT FTEs 2025, MIDSTREAM BREAKDOWN



Note: Midstream refers to cell production and module and pack assembly, between raw-material processing and downstream battery deployment and use. The chart combines direct employment from these two stages by application. Jobs are allocated to EV, BESS and other applications using publicly available employment data and each active EU-27 plant's estimated production capacity. "Other" applications includes industrial vehicles, power tools, robotics and medical equipment.

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Understanding the relationship between production capacity and employment across the European battery value chain is important for workforce planning and industrial policy. Based on the assumptions used in this study, the EU battery industry currently supports:

- 69 jobs/GWh in raw materials processing
- 50 jobs/GWh in active cell component manufacturing
- 26 jobs/GWh in passive cell component manufacturing
- 115 jobs/GWh in cell production
- 139 jobs/GWh in module and pack assembly

Differences in labour intensity across the European battery value chain reflect production processes, automation levels, and capacity utilisation. Raw-material processing and cell-component manufacturing can support large production volumes with relatively limited workforce requirements, while midstream stages are considerably more labour intensive.

Passive cell-component manufacturing has the lowest employment intensity in this comparison, at 26 jobs per GWh of production capacity. Active cell components support 50 jobs/GWh and raw-material processing 69 jobs/GWh. These stages are relatively capital intensive and highly automated, with significant economies of scale, allowing capacity to expand without a proportional increase in employment.

Labour intensity is substantially higher in midstream manufacturing. Cell production supports 115 jobs/GWh, while module and pack assembly supports 139 jobs/GWh. Module and pack assembly is the most labour-intensive stage, reflecting greater requirements for integration, testing, quality assurance, logistics, engineering, and facility support. Cell production also requires specialised operators, maintenance teams, and stringent quality control. These ratios cover all battery applications. EVs remain the main source of manufacturing employment because most European capacity serves the automotive market, while BESS represents a smaller but growing and strategically important share.

Employment creation is therefore concentrated in the stages closest to the final battery product. Relative to installed production capacity, investment in cell manufacturing and module and pack assembly generates the largest direct employment impact. This helps explain why gigafactory projects are associated with substantial workforce creation and remain central to European industrial policy.

Lower labour intensity, however, should not be interpreted as lower strategic importance. Raw-material processing, cathode and anode manufacturing, and separator production are critical to supply-chain resilience and strategic autonomy. Although these activities generate fewer jobs per unit of capacity, they provide essential inputs to the wider battery ecosystem and reduce Europe's dependence on imported materials and components.

Overall, future battery workforce demand will depend more on the scale of manufacturing expansion than on labour intensity alone. As production capacity grows, employment should increase across the value chain even as automation gradually improves productivity.

Deployment remains the engine of BESS employment, while O&M and recycling are still emerging segments

As shown in Fig. 16, **deployment** generates the largest share of BESS labour demand. Distributed installations require project management, engineering, site preparation, installation, and administrative services. Utility-scale projects add substantial requirements for project design, permitting and legal work, construction, and commissioning. These activities mobilise large workforces over relatively short periods, resulting in high FTE requirements relative to installed capacity. Roles include engineers, electricians, construction workers, commissioning specialists, logistics providers, and project developers.

EU BESS deployment has expanded rapidly. In 2018, the EU battery storage fleet had only just exceeded 1 GWh, most of it installed by early residential solar adopters in Germany. Eight years later, the fleet has grown to almost 80 GWh, including a twelve-fold increase over the past four years.

In 2025, the EU added 27 GWh of BESS, more than half in the utility-scale segment. Residential and C&I systems accounted for the remaining 13.5 GWh. Utility-scale projects consequently generated nearly half of deployment-related employment, despite requiring fewer jobs per GWh than residential installations.

Within the distributed segment, residential battery installations supported 42,000 FTEs, or 41% of deployment employment, while C&I projects supported fewer than 10,000 FTEs, equivalent to 11%.

A smaller but growing share of BESS jobs comes from the **operation and maintenance** segment. Once commissioned, BESS are highly automated assets, typically monitored remotely through energy management systems, battery management systems, and SCADA platforms. Relatively small teams can supervise large project portfolios, carrying out preventive maintenance, inspections, performance monitoring, and occasional corrective work. Despite rapid recent growth, the EU battery fleet remains young, so employment is still dominated by new installations rather than the servicing of mature assets.

O&M employment stood at around 8,000 FTEs in 2025, with more than half linked to the residential fleet. Residential systems dominated installations until recently and still represented 55% of installed battery capacity at the end of 2025. This older and more fragmented fleet requires more labour-intensive O&M than newer C&I and utility-scale projects.

Decommissioning and recycling currently supports only a limited BESS workforce. Most EU battery storage installations are less than ten years old and remain far from the end of their operating lives. Around 2,000 FTEs are associated with decommissioning and battery-waste recycling. Systems may be decommissioned because they reach end of life, are repowered, contain faulty equipment, or suffer weather-related damage. At this stage of market development, replacement is more often driven by technical failure or damage than by age-related degradation. Residential systems account for the largest share of decommissioned capacity, reflecting both the size and age profile of the fleet.

Significant volumes of BESS waste are not expected before around 2030, when the first large-scale systems installed in Europe begin to reach the end of their operating lives. Recycling employment attributable specifically to BESS therefore remains negligible today. Most battery waste currently comes from the EV industry, particularly manufacturing scrap, and is generally exported outside Europe for treatment.

Over the coming decade, decommissioning and recycling should become more important sources of employment. As larger cohorts of batteries reach the end of their useful lives, workers will be needed to dismantle systems, transport and process battery waste, recover valuable materials, and reintegrate secondary raw materials into the supply chain. This could support a sizeable circular-economy workforce alongside employment in manufacturing and deployment.

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Box 2

Beyond representation: what actually keeps women in Solar+

Most discussions about women in renewable energy begin with representation: how many women work in the sector, the roles they occupy and how far they progress. These figures matter, but they offer a static picture. They cannot explain why women choose a career in solar and its connected sectors (Solar+), what persuades them to stay or what quietly pushes them towards the exit. This section presents new evidence from Women in Solar+ Europe (WiSEu), based on a survey of women in its network, primarily in solar PV.[3]

WiSEu's survey explores this missing layer by comparing attraction, retention and progression through the experiences of women working across the Solar+ industries. It reveals a significant shift: women are strongly drawn to the sector by its purpose and the opportunity to contribute to climate action, but their decision to stay is increasingly shaped by their everyday workplace experience. Leadership quality, career development opportunities, genuine flexibility, organisational security, sponsorship, and visible women in senior decision-making roles become decisive. This changes the question the industry needs to ask. Recruitment alone cannot create a sustainable talent pipeline. The real challenge is whether organisations can turn women's commitment to the energy transition into careers where they feel supported, recognised, and able to progress.

IRENA's Renewable Energy: A Gender Perspective (2025) provides the wider context. Women hold 32% of full-time renewable energy jobs globally, unchanged since IRENA's first gender analysis in 2019. This compares favourably with fossil fuels, where women hold 23% of roles, but remains below the 43% average across the global economy. Europe and North America have the lowest female representation of any region tracked, at 27%, particularly relevant because all respondents to the WiSEu survey work in Europe. Solar PV is a bright spot: women hold 40% of its full-time roles, the highest proportion among the renewable subsectors IRENA tracks. Yet this is still short of parity, and the headline figure reveals little about what happens after women enter the industry.

IRENA finds that the barriers are not primarily about skills or interest, but entrenched cultural and organisational norms. Women hold 28% of STEM roles across renewable energy, yet only 19% of senior leadership positions. Representation narrows as seniority rises. WiSEu's findings help illuminate why, not by questioning whether women can do the job, but by showing how workplace cultures and leadership practices shape whether they stay, progress, and ultimately reach the rooms where decisions are made.

3 Findings of this article are based on a four-week WiSEu Network survey. Respondents cover 22 European countries and work mainly in solar, with a smaller adjacent group from storage, grids, EV charging and solar thermal. Results describe the full self-selected, network-based sample and are not statistically representative; segments below 30 responses are directional. All findings are aggregated.

What draws women to solar: one motivation stands above the rest

Across the women surveyed, one motivation dominates all others: contributing to climate action and the energy transition. 55% of survey respondents name it as their main motivation and 86% place it in their top three (Fig. 20). A meaningful minority, 21%, entered through opportunity rather than deliberate choice, showing that the sector also attracts talent that had not initially targeted Solar+.

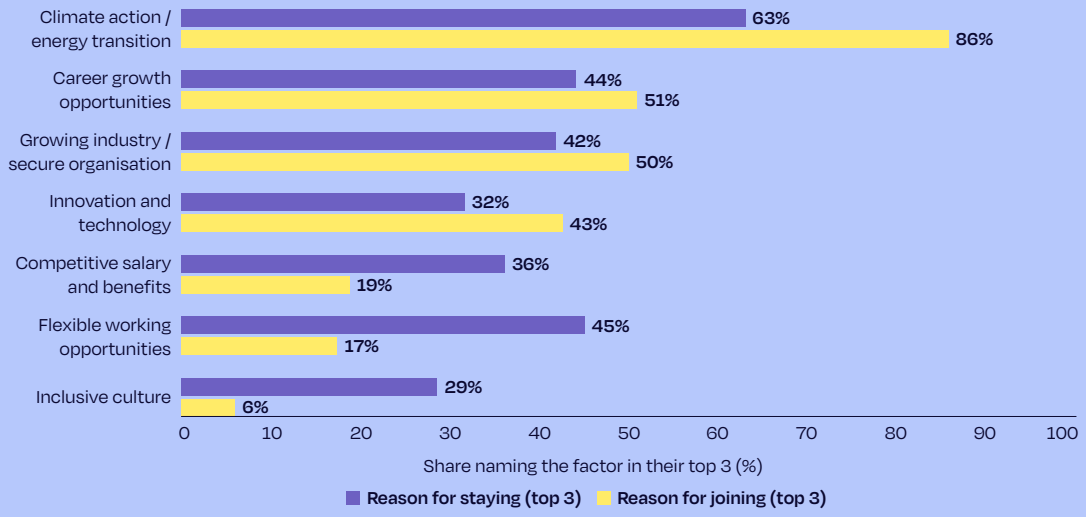
Reasons for staying are more balanced. Climate mission remains important, but its top-three share falls from 86% at entry to 63% for retention. Flexible working rises from 17% as a reason to join to 45% as a reason to stay, alongside career growth (44%), organisational security (42%), and competitive pay (36%).

Put simply: women join Solar+ for the mission. They stay, or leave, for the employer. The industry's pull is doing its job at the recruitment stage. What happens next depends entirely on what individual organisations offer once someone's through the door.

Figure 20

Women join Solar+ for the mission. They stay for the employer

Share of women naming each factor in their top 3 reasons to join or stay in the solar+ industry



© SolarPower Europe. Source: Women in Solar+ Europe

That gap matters because retention looks genuinely uncertain. Just under two in five respondents, 38%, say they're likely or very likely to actively look for a new role in the next 12 months, against 42% who say they're unlikely or very unlikely and 20% who are unsure. Likely-to-leave and likely-to-stay sit within a few points of each other, a meaningful flight risk in an industry that, on paper, should have some of the most engaged, mission-driven talent in the economy.

Being heard is still the harder problem

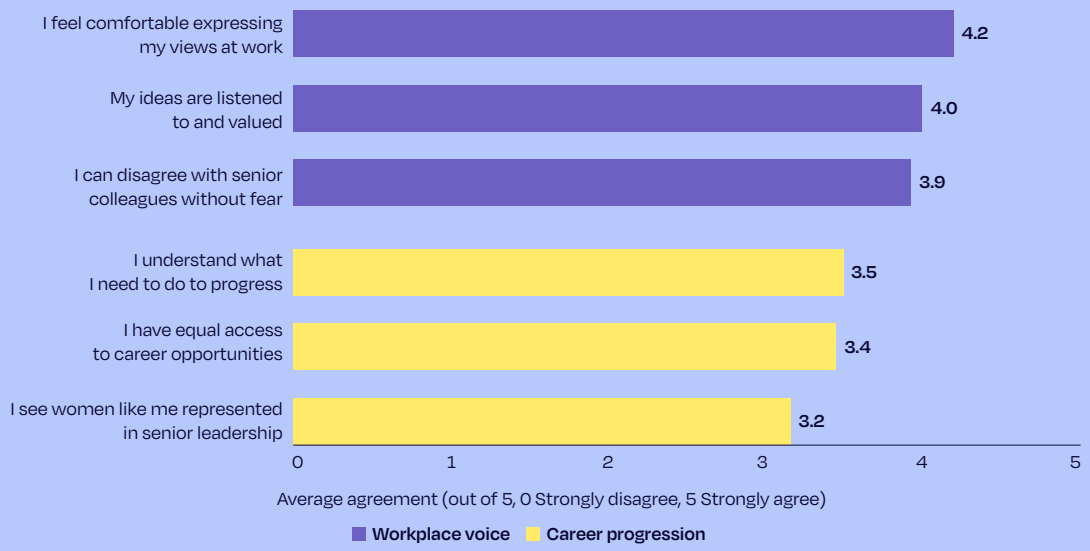
Women in the solar sector generally feel able to contribute: comfort expressing views scores 4.21 out of 5, feeling that ideas are valued 3.97, and confidence in disagreeing with senior colleagues 3.94 (Fig. 21). The sharper concern is not voice in current roles, but access to advancement.

Progression scores are notably weaker: understanding the path to advancement and equal access to opportunities score 3.45 and 3.44, while seeing women like oneself in senior leadership falls to 3.15, the lowest of the six workplace statements. This mirrors IRENA's leadership data and respondents' calls for more visible women in senior and technical roles.

Respondents also described a "motherhood penalty", whereby maternity leave or visible parenthood can slow career momentum. Policies therefore need to be matched by a culture that does not penalise employees for using them.

Figure 21

Women feel heard. They're less confident they'll be promoted into a room that looks like them



© SolarPower Europe. Source: Women in Solar+ Europe

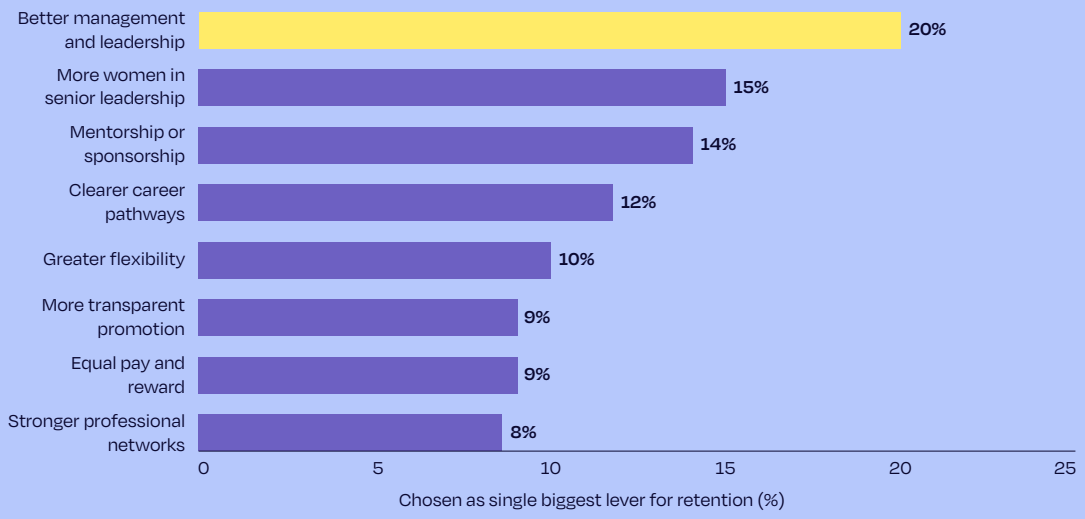
What would actually move the needle?

Asked which single change would most improve retention and progression, respondents prioritise better management and leadership (20%), more women visibly in senior roles (15%) and senior mentorship or sponsorship (14%) (Fig. 22). Flexibility ranks lower as a single top choice (10%), despite its broader importance. The top three responses all concern leadership: its quality, women's visibility in senior roles and access to mentorship or sponsorship. Together, they account for 49% of respondents' first-choice measures.

Figure 22

What would actually move the needle

Single biggest lever for retention (top pick)



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The industry doesn't have a recruitment problem - It has a "what happens next" problem.

Together, the evidence shows that Solar+ attracts women through its mission but loses representation higher up organisations. Respondents connect this drop to whether flexibility is genuine, leadership is visible, progression is credible, and major life stages carry a career penalty. The response is to treat retention and progression as deliberately as recruitment: track who stays and advances, design flexibility around outcomes rather than presence, strengthen leadership and sponsorship, and make senior career paths visibly attainable.

Women in Solar+ Europe (WiSEu)

Annex and methodology

This study employs a hybrid approach to calculate full-time equivalent 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 and storage activities, such as manufacturing, deployment, O&M, and decommissioning & recycling. These jobs are generated directly through the expenditures and services made by consumers and producers on solar PV and energy storage 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 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. For manufacturing, factory utilisation rates, which represent the ratio between actual production output and the theoretical production capacity, were also applied to better reflect actual activity levels.

For battery manufacturing, production capacities were standardised to GWh/year for every part of the supply chain. Direct nameplate disclosures are used first; otherwise, capacity is derived from unit output and allocated vehicle or product output. Cell component output is converted to GWh-equivalent using 1.00 GWh/kt for electrolyte, 0.10 GWh per million m^2 for separators, 0.50 GWh/kt for LFP CAM, 0.79 GWh/kt for NMC CAM and 1.00 GWh/kt for AAM. Nameplate jobs/GWh is calculated as adjusted facility employment divided by nameplate production capacity; utilisation-adjusted labour intensity is calculated separately by dividing the nameplate ratio by the assumed utilisation rate.

To prevent double counting, employment is assigned once to the value-chain stage supported by the underlying source. Where cell production and module or pack assembly take place at the same vertically integrated facility, the workforce is retained on one facility record and excluded from the overlapping record unless separate employment figures are available for each activity.

The EV, BESS and other estimates allocate each facility's jobs and production capacity across its recorded applications. Unless a documented production split exists, mixed-use plants were split proportionally.

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 and storage 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.

Furthermore, in order to assess the indirect impacts of solar PV and energy storage 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.

Methodology table 1

Methodology overview

Value chain step	Methodology for direct jobs		Methodology for total 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

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.

Methodology table 2

Scope of solar PV chain for calculation of direct FTEs

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
Operations & 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.

Changes from previous EU Solar Job Reports

A methodological improvement was introduced in the estimation of utility-scale PV CAPEX breakdowns. In previous editions, a single EU-average CAPEX breakdown was applied across all countries. In the current edition, country-specific utility-scale CAPEX breakdowns were used and sourced from the IRENA Renewable Power Generation Costs database wherever available. This allows the model to better reflect national cost structures in utility-scale and provides a more realistic representation of national utility-scale solar markets and employment effects.

The change had only a marginal impact on total EU utility-scale employment, increasing it by 0.38%, but improved the representation of national markets. Compared to using a single EU-wide average CAPEX breakdown, the largest country shifts include a 2% decrease in estimated utility-scale employment in Romania and a 1.8% increase in France.

CAPEX Assumptions

Solar PV and distributed storage CAPEX data were sourced from Wood Mackenzie.
Utility-scale BESS CAPEX data were sourced from Rystad Energy.

NACE codes for each sector and employment factors for solar manufacturing are showed in the tables below.

Methodology table 3

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

Category	Employment type	NACE CODE	NACE SECTOR
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.

Methodology table 4

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: Industry survey.

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BATTERY STORAGE EUROPE PLATFORM

The Battery Storage Europe Platform brings together industry leaders representing the battery storage value chain to advance the business case and regulatory frameworks for battery storage across the EU. Together, we urge a tenfold increase in battery storage by 2030 to ensure Europe's energy transition, security, and competitiveness.

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