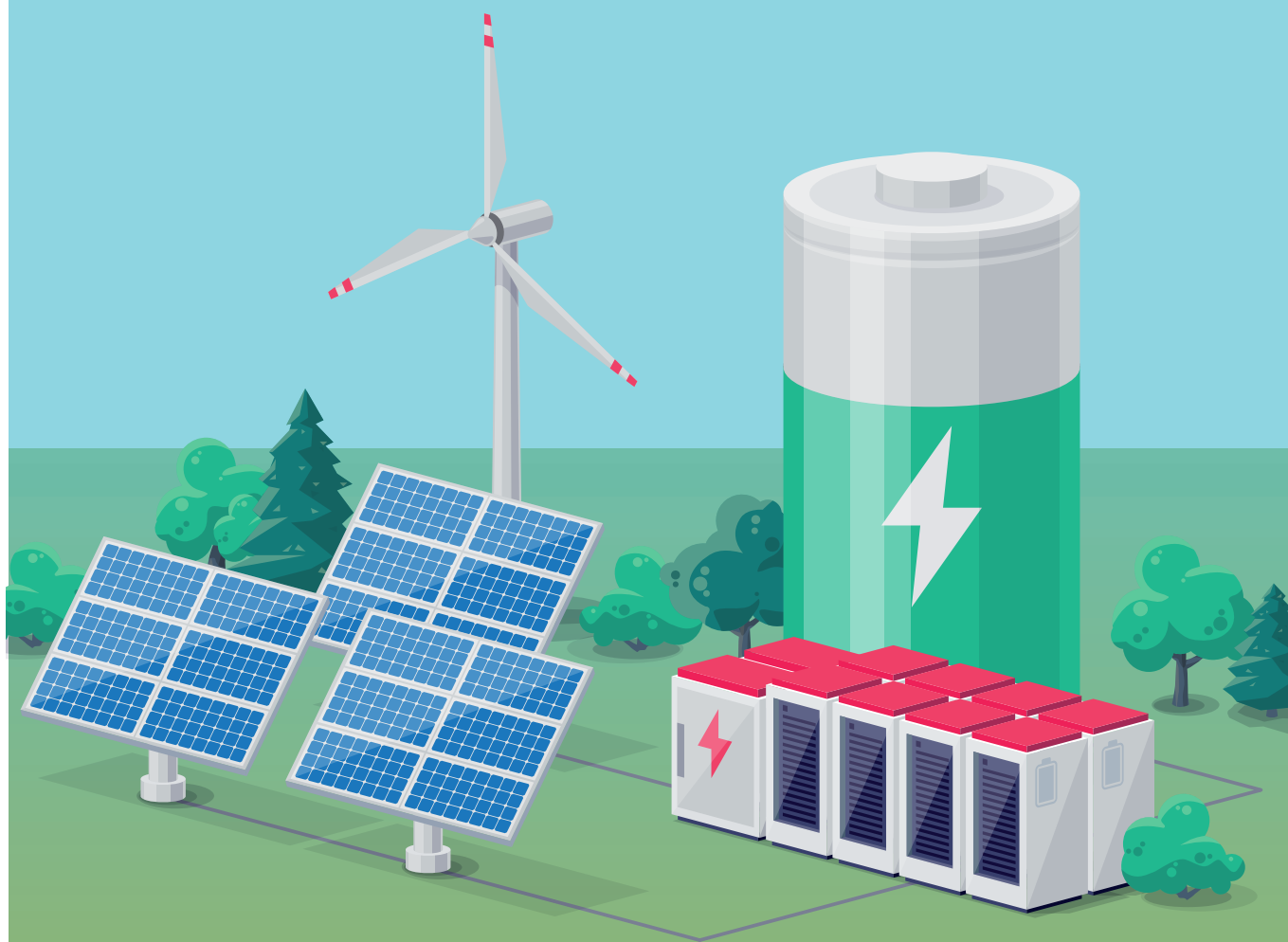


The 100% Renewable Energy Action Plan for the European Commission 2024-2029

Policy recommendations of the Expert Group on
100% Renewables in the EU

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Heinrich-Böll-Stiftung European Union and Environmental Action Germany (Deutsche Umwelthilfe) have convened a group of over 20 experts from academia, industry, civil society and policy-makers from EU institutions to identify the key challenges of the EU's energy transition. The expert group met five times in 2023 to develop proposals on how to achieve a 100% renewable energy-based EU economy.¹

The result is this **100% Renewable Energy Action Plan for the next European Commission, which builds on three key challenges:**

- 1. Accelerating renewable energy deployment**
- 2. Putting in place the right infrastructure and flexibility for 100% renewables**
- 3. Enabling local authorities to manage the transition to 100% renewables**

Introduction: why the EU should go 100% renewables

There is no safe alternative to 100% renewable energy

Russia's invasion of Ukraine has put the disadvantages of our current fossil-based energy system into sharp focus. It is clear: the transformation away from fossil fuels towards renewable energy is not just a climate protection measure, but a question of geopolitical security and economic stability. As gas power plants are the highest-cost power generation technology, they have been largely responsible for massive price hikes in recent years. This has affected all other sectors, such as heating, industry and food, leading to a cost-of-living crisis and the highest inflation Europe has seen since 1980.

While fossil gas prices stabilised in 2023, they remain at roughly three times pre-crisis levels² and will likely remain high as Russian pipeline gas is replaced by more expensive liquefied natural gas (LNG). As globally traded energy carriers, fossil fuels tend to have more volatile prices during major crises, thereby increasing the EU's exposure to price shocks and inflation.³ This presents a persistent threat to Europe's price stability and economic prosperity.⁴

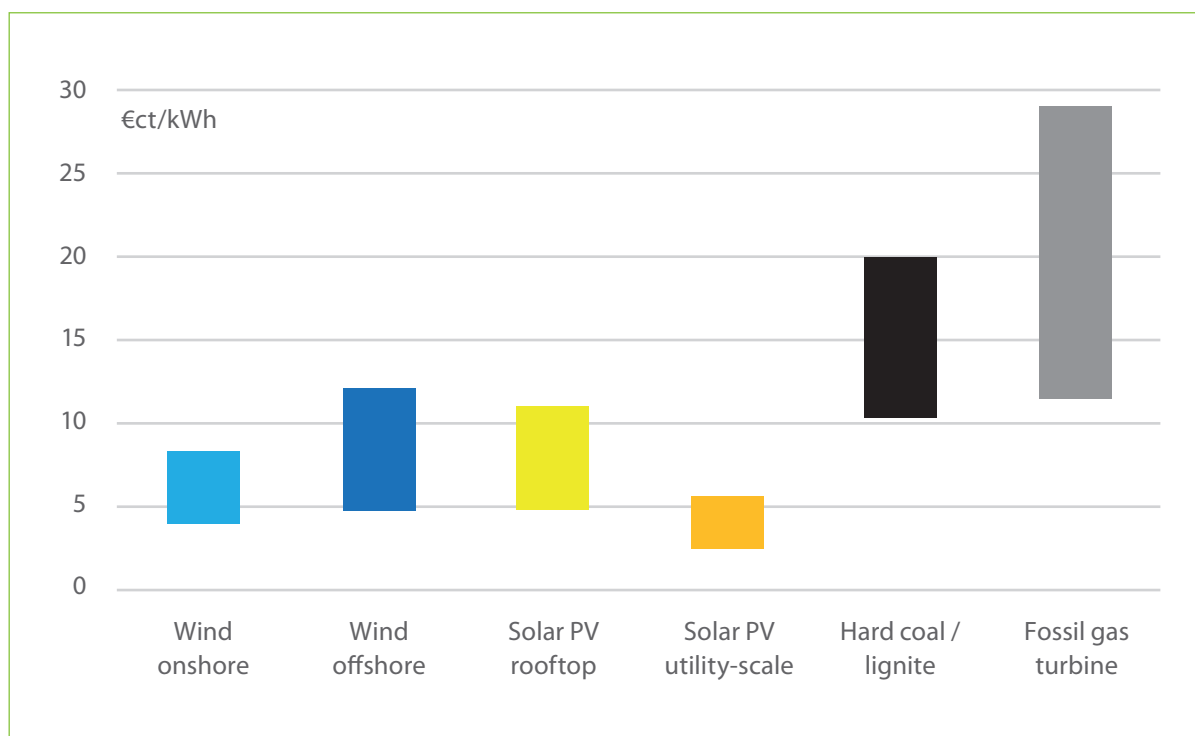
- 1** J. Schwartzkopff, J. Ott (2023). *Mind the gap: Addressing the deficits in the EU's green industrial agenda*. <https://eu.boell.org/en/mind-the-gap-interim-report>. (Report of first Expert Group meetings focusing on preserving Europe's cleantech leadership and industrial competitiveness while respecting the ecological boundaries of our planet.)
- 2** ACER, CEER (2023). *European gas market trends and price drivers. 2023 Market Monitoring Report*. https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER_MMR_2023_Gas_market_trends_price_drivers.pdf
- 3** I. Weber (2022). *Inflation in Times of Overlapping Emergencies: Systemically Significant Prices from an Input-output Perspective* https://scholarworks.umass.edu/econ_workingpaper/340/
- 4** K. Karlsson, L. Melodia (2023). *Fossil Fuel-Driven Price Volatility Demonstrates the Need for a Renewable Transition*. <https://rooseveltinstitute.org/publications/fossil-fuel-driven-price-volatility-demonstrates-the-need-for-a-renewable-transition/>

100% renewables pay off

Renewable energy, by contrast, has three big advantages that makes it the only viable basis for a resilient, affordable and future-proof European energy system:

1. Lowering our energy bill for power, heat and transport. Renewable energy has a price-dampening effect on wholesale power prices, as it is produced at near zero marginal cost (except for biomass as an energy source). The International Monetary Fund found that a 1% increase in renewable energy generation on average equalled a 0.6% power price decrease.⁵ This effect increases in size at higher renewable energy shares. The rapid expansion of renewable energy generation can thus contribute significantly to dampening the fossil-induced energy price shocks and inflation. This strengthens European industrial competitiveness and alleviates pressure on households. Overall, renewables have become the most competitive power generation technology for new investments and their cost advantages are set to increase even further.

Figure 1: Levelized cost of electricity from newly installed power plants in Europe 2021



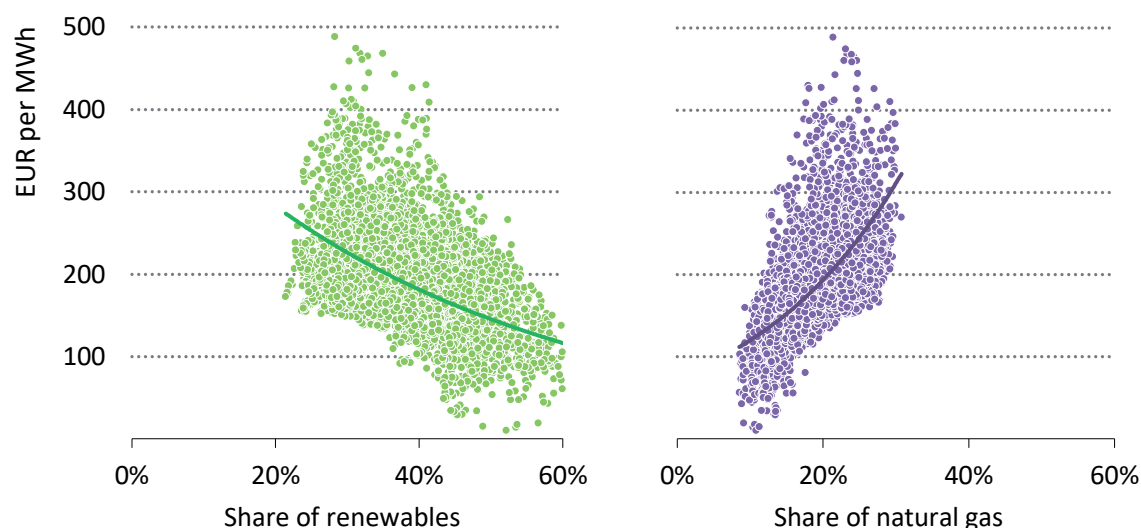
Source: Fraunhofer ISE: Levelized cost of electricity (LCOE) renewable energy technologies, June 2021.

5 IMF, S. Cevik, K. Ninomiya (2022). *Chasing the Sun and Catching the Wind: Energy Transition and Electricity Prices in Europe*. <https://www.imf.org/en/Publications/WP/Issues/2022/11/04/Chasing-the-Sun-and-Catching-the-Wind-Energy-Transition-and-Electricity-Prices-in-Europe-525079>

How it pays off

A 100% renewable energy-based pathway is by far the cheapest for society as a whole: according to one study, the annual social costs of moving to a 100% renewable economy are 89.5% lower in Europe than a business-as-usual pathway including fossil and nuclear energy.⁶ Renewables already cut the bills of EU households and businesses: high shares of renewables in the power generation mix literally squeeze expensive gas power plants out of the merit order. During the first half of 2022, a modest share of 23% renewables in final energy consumption already had a strong deflationary impact on sky-high gas prices. The cost of electricity supply to EU consumers would have even been €40 billion lower if the contribution of renewables had been as high as 40%.⁷ In 2023, renewables accounted for a record share of 44% of EU electricity generation, contributing to the stabilization of power prices observed in 2023.⁸

Figure 2: EU hourly wholesale electricity prices, first half of 2022



Source: IEA, World Energy Outlook 2022.

- 6 Mark Z. Jacobsen et al. (2022). *Low-cost solutions to global warming, air pollution, and energy insecurity for 145 countries*. <https://web.stanford.edu/group/efmh/jacobson/Articles/I/145Country/22-145Countries.pdf>
- 7 International Energy Agency (2022). *World Energy Outlook 2022*. <https://www.iea.org/reports/world-energy-outlook-2022>
- 8 SolarPower Europe (2024). *2023: A milestone year for renewable energy in Europe – Unveiling Ember's Electricity Review*. <https://www.solarpowereurope.org/news/2023-a-milestone-year-for-renewable-energy-in-europe-unveiling-ember-s-electricity-review>

2. Adding local value by ending fossil and nuclear fuel imports. Domestic renewable energy generation can meet Europe's energy needs without relying on authoritarian foreign governments for a continuous supply of fuel. The EU has sufficient own sustainable potential of solar, wind, biomass, hydropower and geothermal energy within its territory to fully cover its energy demand.⁹ By switching entirely to domestically produced renewable energy, Europe will become more resilient to geopolitical crises, preventing its energy supply being weaponised by foreign governments, and build up local value chains.

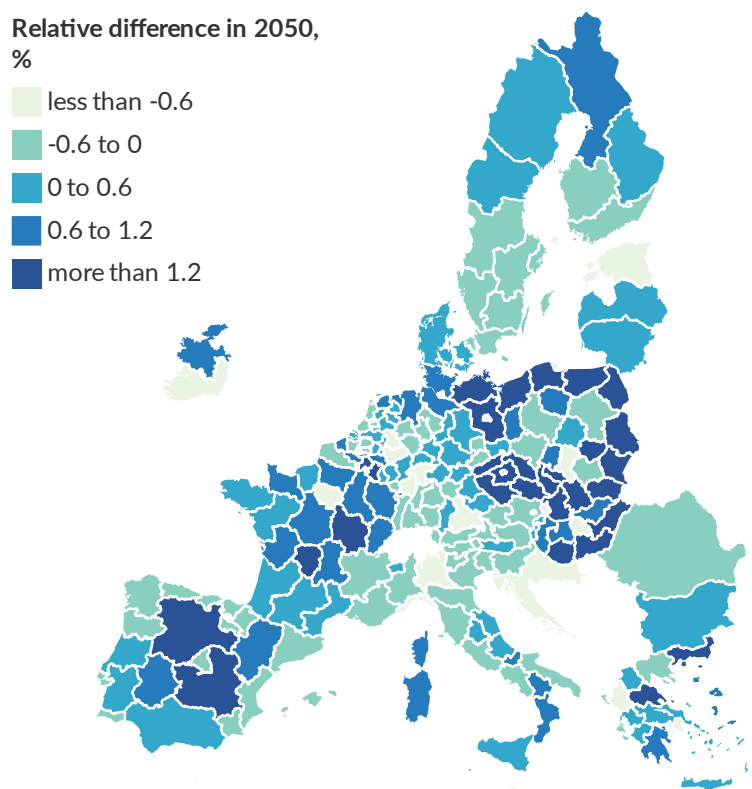
The renewables industry has become crucial for maintaining the EU's economic competitiveness as the bloc seeks to secure a relevant share of the global market for clean technologies, which the International Energy Agency estimates will reach \$650 billion by 2030.¹⁰ Maintaining competitiveness in key areas where European companies still have technology leadership, like wind turbine and heat pump manufacturing, rebuilding significant PV manufacturing capacities independent of Chinese imports, and claiming emerging fields like electrolyzers is also crucial to realizing the employment benefits that come with the energy transition.¹¹ While countries like the US, China and Japan are forging ahead with their own clean tech investment plans encompassing subsidies of hundreds of billions of dollars, the EU risks falling behind in the intensifying global cleantech race if it does not keep up the momentum generated by the European Green Deal.¹²

- 9 P. Ruiz et al. (2019), ENSPRESO – open, EU-28 wide, transparent and coherent database of wind, solar and biomass energy potentials. In: *Energy Strategy Reviews* 26 (2019) 100379, July 2019. <https://www.sciencedirect.com/science/article/pii/S2211467X19300720>
- 10 International Energy Agency (2022). *World Energy Outlook 2022*. <https://www.iea.org/reports/world-energy-outlook-2022>
- 11 J. Jansen, Hertie School (2023). *When Europe talks climate, it needs to think jobs*. <https://www.delorscentre.eu/en/publications/skilled-workers-in-the-green-transition>
- 12 T. Pellerin-Carlin, I4CE (2023). *Think house, not brick: building an EU Cleantech Investment Plan to match the US Inflation Reduction Act*. <https://www.i4ce.org/en/publication/think-house-not-brick-building-eu-cleantech-investment-plan-to-match-us-inflation-reduction-act-climate/>

How it pays off

There were 1.5 million EU citizens working in the renewables sector in 2021.¹³ Implementing current policies alone will at least triple employment in the sector.¹⁴ Modelling shows that most EU regions clearly benefit from replacing fossil fuels with their local renewable energy sources. Renewables keep the purchasing power in the region and increase regional wealth: the annual added value per capita of each inhabitant increases by up to €1,570 in those regions that are the best positioned. Phasing out all fossil fuels in EU regions by 2040 through a switch to local renewables leads to an increase of 0.5% both in value added per capita and in overall employment. Comparably poorer, rural and peripheral EU regions benefit most from a switch to 100% renewables, strengthening EU-wide economic cohesion. Some see their overall employment increase by up to 5.2%.¹⁵

Figure 3: Difference of employment growth comparing current policies and a decarbonisation pathway with local renewables



Source: GWS/Bertelsmann Stiftung 2023.

13 Euroobserver (2023). *The state of renewable energies in Europe 2022*.

<https://www.euroobserver.org/21st-annual-overview-barometer>

14 IRENA (2020). *Measuring the socio-economics of transition: Focus on jobs*.

<https://www.irena.org/Technical-Papers/Measuring-the-socio-economics-of-transition-Focus-on-jobs>

15 T. Schwab, Bertelsmann Stiftung/GWS (2023). *Energising EU cohesion. Powering up lagging regions in the energy transition*.

<https://www.bertelsmann-stiftung.de/en/publications/publication/did/energising-eu-cohesion>

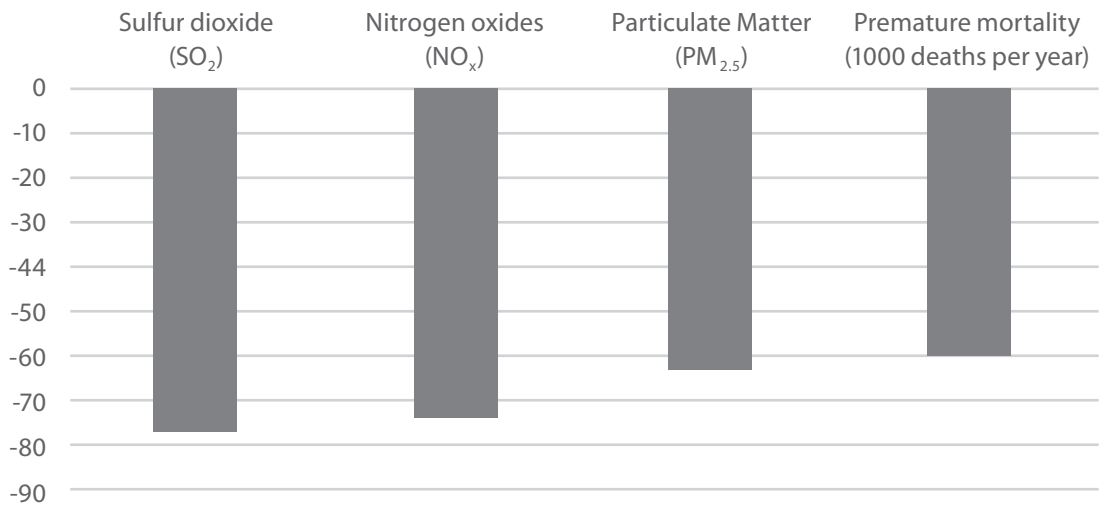
3.Avoiding the health and environmental costs of fossil and nuclear energy.

Renewable energy technologies are the essential technologies to fight the climate crisis as they can replace all fossil fuel supply. Renewable electricity can also substitute fossil fuel use for transport and heating with zero greenhouse gas emissions and much lower environmental impacts than fossil fuels. The immense societal costs caused by climate change, the health impacts of fossil fuel combustion and the risk of catastrophic nuclear accidents are often ignored in energy policy discussions, as they are less visible or immediate than impacts on energy prices.

How it pays off

Reducing greenhouse gas emissions by 90% until 2040 would lead to a considerable drop in air pollution. According to EU projections, this would prevent about 190,000 premature deaths and save over a trillion euros in health costs per year, with the primary driver being the switch away from combustion fuels to renewable energy sources.¹⁶ Moving to 100% renewables and electrifying all sectors will lead to even greater health benefits as polluting fossil power and heating plants, as well as combustion engines, are phased out.

Figure 4: Projected decrease in air pollution (2015–2040; %); LIFE scenario



Source: European Commission: Securing our future. Europe’s 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society. Impact assessment report, SWD(2024) 63, February 2024.

16 European Commission (2024). 2040 climate target: Reducing net emissions by 90% by 2040. https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2040-climate-target_en

Challenges of our transition to 100% renewables

Several scenarios and studies have shown that achieving climate neutrality by building a 100% renewable energy system is not only feasible, but cheaper, safer and cleaner than sticking with fossil and nuclear.¹⁷ One recent study puts the social, economic and health-related co-benefits of the EU adopting a 1.5°C-compatible economic pathway at €1 trillion by 2030, and the costs of inaction at up to €46,000 per capita.¹⁸ That is not to say that the transformation of the economy to run on 100% renewable energy will be easy. It must be managed carefully to avoid social ruptures and overcome the energy poverty caused by our fossil-based energy system. This requires forward-looking policies aiming at building an entirely renewable energy system. Yet, despite the European Commission's proposals for accelerating the switch to renewables since the beginning of its term in 2019, the EU has hit all-time highs in fossil fuel subsidies in 2022.

The 100% Renewable Energy Action Plan in detail

1. Accelerate renewable energy deployment

Renewable energy developers need a predictable regulatory framework to provide security for their investments. We welcome that the revision of the Renewable Energy Directive has raised the 2030 EU renewable energy target from 32.5% to **42.5%, with an aspirational target of 45%** in gross final energy consumption. However, a pathway on track with the Paris Agreement's objective of keeping the global temperature rise below 1.5°C would require between **55% to 58% renewable energy share by 2030**, and nearly **100% by 2040**.¹⁹

Several energy system scenario analyses point to the clear necessity to go beyond current energy efficiency policies and **lower EU energy demand considerably** to put the EU economy on a resilient and sustainable footing. The European Commission's own modelling

- 17** CAN Europe/EEB (2020). *Building a Paris Agreement Compatible (PAC) energy scenario. Technical summary of key elements.* https://caneurope.org/content/uploads/2020/06/PAC_scenario_technical_summary_29jun20.pdf; CLEVER (2023). *Climate neutrality, energy security and sustainability: A pathway to bridge the gap through sufficiency, efficiency and Renewables.* <https://clever-energy-scenario.eu>; Greens/EFA, M. Ram et al. (2022). *Accelerating the European Renewable Energy Transition.* https://www.greens-efa.eu/files/assets/docs/study_european_renewable_energy_transition.pdf; M. Jacobsen et al. (2017). *100% Clean and Renewable Wind, Water, and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World.* <https://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf>
- 18** CAN Europe, O. Vardakoulis, G. Nardi (2024). *Paris Pact payoff: Speeding up the Transition for Socio-Economic Co-Benefits.* https://caneurope.org/content/uploads/2024/01/CAN-Europe-co-benefits-of-climate-action_REPORT.pdf
- 19** W. Trio, Heinrich-Böll-Stiftung EU (2024). *Getting back on track with new EU climate and energy targets for 2035 and 2040.* <https://eu.boell.org/en/factsheet-eu-climate-energy-targets>

shows that a demand reduction of 34-36% is needed to achieve an emissions reduction of 90% until 2040.²⁰ More ambitious scenarios such as the CLEVER scenario²¹ and the PAC scenario²² conclude that an even larger energy demand reduction is needed to respect the Paris Agreement. Substantially lowering the energy demand has the massive upside of requiring much lower overall system costs, energy imports and resource consumption, making the transition to a 100% renewables-based system much easier to manage.

To achieve the 2030 renewables target of 42.5-45% in final energy consumption, up from 24.1% in 2023,²³ **existing renewables capacities in EU Member States need to at least double**. This equates to an average annual growth of 2.2%, which is three times the growth observed during 2005-2022.²⁴ It is likely that the needed growth in renewable energy capacities will increase even further beyond 2030 as the economy's demand for electricity increases across all sectors.

The good news is that the EU has already taken **significant strides to accelerate the build-up of renewable energy capacities** by targeting important bottlenecks:

- Accelerating permitting and planning with the 2022 Emergency Regulation²⁵ and the revised Renewable Energy Directive.²⁶
- Skills initiatives to respond to the increasing demand for qualified workers.
- Various other actions outlined in the EU Solar Strategy²⁷ and the Wind Power Action Plan.²⁸

Renewable energy investments are not on track

20 European Commission (2024). *2040 climate target. Reducing net emissions by 90% by 2040*. https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2040-climate-target_en

21 CLEVER (2023). *Climate neutrality, Energy security and Sustainability: A pathway to bridge the gap through Sufficiency, Efficiency and Renewables*. <https://clever-energy-scenario.eu>

22 CAN Europe (2022). *PAC scenario 2.0 in a nutshell*. <https://caneurope.org/pac-scenario-2-0-in-a-nutshell>

23 European Environment Agency (EEA) (2024). *Share of energy consumption from renewable sources in Europe*. <https://www.eea.europa.eu/en/analysis/indicators/share-of-energy-consumption-from>

24 EEA (2023). *Trends and Projections in Europe 2023*. <https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2023>

25 Council Regulation (EU) 2022/1854 of 6 October 2022 on an emergency intervention to address high energy prices. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R1854>

26 Directive (EU) 2023/2413 of the European Parliament and of the Council. <https://eur-lex.europa.eu/eli/dir/2023/2413/oj>

27 European Commission (2022). *EU Solar Energy Strategy*. COM (2022) 221 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A221%3AFIN&qid=1653034500503>

28 European Commission (2023). *European Wind Power Action Plan*. COM(2023) 669 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0669&qid=1702455143415>

Analysts see the EU on track to reach a **50% renewable energy share by 2030**.²⁹ But while record amounts of wind and solar capacity were added in 2022 and 2023, the continued expansion of wind and solar energy cannot be taken for granted. The European Environment Agency (EEA) stated in a recent report that it is '*uncertain that the EU will meet its target unless a deep transformation of the European energy system takes place within this decade, encompassing all sectors*'.³⁰

While solar power is on track to surpass the REPowerEU target of **600 GW of solar energy capacity by 2030**, from a cumulative capacity of 263 GW in 2023,³¹ the solar industry is highly dependent on imports of ingots and wafers from China. It urgently needs to scale up its own manufacturing industry within the EU to reduce geopolitical supply risks.

The situation is different for the wind power industry, where Europe does have a strong manufacturing base. Most of the 220 GW of wind turbines currently installed in the EU were produced by European manufacturers. However, despite significant growth, the pace of the wind power expansion, with 16.2 GW of newly installed turbines in 2023,³² is well below the 37 GW per year needed to achieve the forecasted wind power contribution to the **2030 objective of 500 GW**.³³ There are also significant regional differences across Europe, with countries like Austria, Belgium, Denmark, Germany, Ireland, Italy, Lithuania, the Netherlands, Portugal and Sweden leading in expanding wind power capacities, while most Central and Eastern European countries are falling far behind.³⁴

While Member States are supposed to detail their contributions to the overarching EU targets through their National Energy and Climate Plans (NECPs), these plans are often incomplete and delayed, while also lacking consistency and ambition.³⁵ This is due to the non-binding character of the national contributions.

EU policies still undermine investment security

29 Ember, E. Cremona, C. Rosslowe, A. Candlin. *Fit for the future, not Fit-for-55*.

<https://ember-climate.org/insights/research/fit-for-the-future-not-fit-for-55/>

30 EEA (2023). *Trends and Projections in Europe 2023*.

<https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2023>

31 Solar Power Europe (2023). *EU market outlook for solar power 2023-2027*.

<https://www.solarpowereurope.org/insights/outlooks/eu-market-outlook-for-solar-power-2023-2027>

32 WindEurope (2024). *Wind energy in Europe. 2023 Statistics and the outlook for 2024-2030*.

<https://windeurope.org/intelligence-platform/product/wind-energy-in-europe-2023-statistics-and-the-outlook-for-2024-2030>

33 European Commission (2023). *European Wind Power Action Plan*. COM(2023) 669 final.

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0669&qid=1702455143415>

34 WWF (2023). *Blowing in the Wind. State of play and projections for offshore and onshore wind energy in the EU*. <https://wwfeu.awsassets.panda.org/downloads/wwf-blowing-in-the-wind-final.pdf>

35 CAN Europe (2023). *Time to step up national climate action. An assessment of the draft National Energy and Climate Plans updates*. <https://1point5.caneurope.org/necps-assessment-report>

In addition, the financing environment for new investments has worsened considerably during 2022 and 2023, with **rising interest rates and limited access to private finance** in certain EU Member States, difficult **access to raw materials, high inflation,** and **rising commodity prices**. The flurry of measures the EU and its Member States adopted in response to Russia's invasion of Ukraine and rising energy prices included a **large amount of fossil subsidies**, but lacked a clear focus. The recent investment report from the European Investment Bank (EIB) finds that the emergency interventions have exacerbated uncertainty about public commitment to the energy transition. This uncertainty now even outweighs the incentives for firms to invest in renewables.³⁶

It is therefore crucial that the EU and its Member States maintain the momentum on expanding wind and solar energy capacities through to 2030 and beyond by providing regulatory certainty on the future direction of travel. Backsliding on renewable energy commitments or new subsidies for nuclear energy or fossil power generation, for example through **capacity markets**, are to be avoided as they jeopardize Europe's energy security.

Policy recommendations

- **Strengthen the EU climate and energy target architecture by adopting binding renewable energy targets for 2035, 2040 and 2045** at the national and EU levels. The European Commission should also propose indicative fossil fuel phase-out dates for different sectors, considering different technological challenges, particularly in industry. This will give greater clarity and planning security to investors and help mobilize the necessary investments in the energy transition. Apart from the proposed 2040 climate target, the European Commission should put in place a process to set **intermediate climate targets for 2035 and 2045 to ensure coherence with international processes**. The EU Climate Law stipulates that climate policy cycles should be fully aligned with the five-year time frame of the United Nations Framework Convention on Climate Change (UNFCCC). The Energy Union Governance Regulation should fully integrate this cycle in its upcoming revision, with a corresponding regular update of climate and energy targets. In addition, national long-term strategies under the Governance Regulation should be mandatorily updated every five years in keeping with this cycle, instead of 'where necessary' as is currently the case.
- **Improve clarity on the decarbonisation pathways followed by EU Member States through reforming the Governance Regulation**. Against the backdrop of the poor effectiveness of current NECPs, its revision should **reintroduce binding national renewable energy targets**. To ensure clear guidance, the revised Governance Regulation should suggest sectoral emission reduction targets and nationally differentiated climate-neutrality targets. This should be accompanied by a strengthened delivery gap filler mechanism, in particular regarding the renewable

³⁶ EIB (2022). *Economic Investment Report 2022 – Resilience and Renewal in Europe*. https://www.eib.org/attachments/lucalli/20220211_economic_investment_report_2022_2023_en.pdf

energy targets, and a stronger monitoring and reporting process, including sanctions in case of late submission of NECPs.

- **A quick and enhanced implementation of the Wind Power Action Plan.** The principles for auction design need to prevent a patchwork of national rules and instead ensure a level playing field for EU developers. Strong non-price criteria based on social and ecological justice are central to preserving the competitiveness of the European wind industry against price-based competition from international manufacturers. Social and labour standards are critical to ensuring attractive working conditions for skilled labour, helping to close the skills gap. The European Commission should also explore setting criteria on local benefit-sharing and public consultation, especially for onshore wind development, by providing benefits to local communities.
- **Update the EU Solar Energy Strategy to open up underused PV potentials,** particularly in urban areas. The timeline for introducing solar rooftop obligations for new residential buildings and roofed car parks under the Energy Performance of Buildings Directive (EPBD) should be advanced to 2027. For existing buildings, introducing a solar mandate for rooftop or attic renovations would allow for a cost-efficient roll-out of solar PV or solar thermal installations in the residential building stock. In this regard, the European Commission should develop guidance on adequate support for low-income homeowners. Developing an EU rooftop registry would enable property owners to make their roofs available to third-party developers, further increasing small-scale PV deployment on buildings. The updated strategy should include an action plan to facilitate the deployment of plug-in mini solar PV installations. Technical barriers and unfair network tariffs need to be removed so that consumers can share electricity from plug-in installations and reduce their metered consumption.
- **Scale up the EU response to the global clean tech race.** While the US, China and Japan are currently putting hundreds of billions in public funding on the table, the EU's Strategic Technologies for Europe Platform (STEP) and Net-Zero Industry Act (NZIA) show a much lower level of ambition. To maintain and rebuild its renewables and cleantech manufacturing industries, the European Commission needs to launch an ambitious **Renewable Energy Investment Plan**, which increases available public funding, for instance, by scaling up the Innovation Fund and introducing clean manufacturing calls. Another glaring gap concerns the capacity and financial resources of permitting agencies. Contrary to the approach taken with the US Inflation Reduction Act (IRA), the EU currently has no mandate to top up the administrative capacity and resources of permitting agencies. The EU budget should thus provide significantly more financial support, enabling permitting authorities to process more projects much faster. Otherwise, the new maximum time periods set for permitting will be difficult to respect without weakening pivotal environmental and social standards.

- **Hold Member States to account on the binding obligation to propose a phase-out timeline for fossil subsidies** under the 8th Environmental Action Programme as part of the NECP process. Fossil subsidies confer competitive advantages to environmentally harmful technologies over renewables, acting as a key impediment to the adoption of clean alternatives. Any NECPs submitted by Member States in the 2023-2024 revision that do not meet this criterion should not be accepted by the European Commission until fossil fuel subsidy phase-out timelines are provided. Member States' phase-out plans should ensure that targeted programmes to support vulnerable population groups are in place before the subsidy is phased out.
- **Propose an Action Plan for Energy Demand Reduction**, aiming to bring energy consumption in line with climate commitments and a resilient economic trajectory relying much less on energy imports. Alongside fostering further energy efficiency improvements, such as refocusing energy renovation subsidies on existing buildings, this plan should make concrete proposals to make sustainable lifestyle changes more attractive, for instance, by promoting a modal shift to public transport and rail infrastructure and increasing the repairability of products.³⁷

2. Put in place the right infrastructure and flexibility for 100% renewables

Direct electrification based on renewable energy is the most cost-effective pathway towards a carbon-neutral economy, as shown by a variety of studies.³⁸ The power grids of the future will have to be much more digitalised, to integrate millions of decentralised renewable energy installations and heat pumps while accommodating a growing share of electric vehicle charging points and hydrogen electrolyzers.

This places considerable demands on the power system, as electricity consumption is expected to increase by 60% until 2030.³⁹ **Grid development has already become a bottleneck**, generating rising congestion management costs,⁴⁰ with permits for grid reinforcements taking up to 10 years to be awarded and renewable energy projects facing long waiting periods to connect to the grid.⁴¹ In our integrated EU wholesale electricity market, more solar and wind power will have to be transported across the continent. The EU Agency for

³⁷ J. Schwartzkopff, J. Ott (2023). *Mind the gap: Addressing the deficits in the EU's green industrial agenda*. <https://eu.boell.org/en/mind-the-gap-interim-report>

³⁸ See footnote 17.

³⁹ European Commission (2023). *Grids, the missing link – An EU Action Plan for Grids*. COM(2023) 757 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023DC0757>

⁴⁰ IEA (2023). *Electricity Grids and Secure Energy Transitions*. <https://www.iea.org/reports/electricity-grids-and-secure-energy-transitions>

⁴¹ European Commission (2023). *Grids, the missing link - An EU Action Plan for Grids*. COM(2023) 757 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023DC0757>

the Coordination of Energy Regulators (ACER) estimates a **need for 350 GW of cross-country interconnection capacity** in 2050,⁴² compared to 93 GW today.⁴³

Overall, the European Commission estimates that grid operators will have to spend **€584 billion this decade** to make electricity grid infrastructure ready for rising renewable energy shares and a greater electrification of the economy.⁴⁴ The scale of this investment challenge may seem daunting, but it will be far cheaper to meet it than to do nothing. Business as usual is not an option: conservative estimates put the costs of inaction on climate change at 10-12% of gross domestic product by the end of the century. Another study finds that the annual social costs of a 100% renewable energy pathway are 89.5% lower than a business-as-usual pathway including fossil and nuclear energy.⁴⁵

Flexibility needs to improve massively

Against the backdrop of limited grid capacities, the rising share of variable renewables requires a better interaction between generators and consumers; they need to ramp up or down more often to ease the energy infrastructure. According to ACER, this **flexibility must double by 2030** to keep pace with rising shares of renewable energy.⁴⁶ Heating and cooling, batteries, and electric vehicles can all add significant flexibility under the condition that consumers get sufficient incentives, such as price signals through dynamic prices. This will allow for a better use of the available renewable energy during periods of surplus production and avoid curtailment. During production shortfalls, flexible consumers reduce their demand while generators increase their supply, for instance, from stored energy.⁴⁷ Flexibility also has the beneficial side effect of dampening electricity prices by reducing demand peaks during times of lower renewable power production.⁴⁸

42 ACER (2023). *Cross-zonal capacities and the 70% margin available for cross-zonal electricity trade (MACZT). 2023 Market Monitoring Report.* https://www.acer.europa.eu/sites/default/files/documents/Publications/2023_MMR_MACZT.pdf

43 ENTSO-E (2023). *System Needs Study. Opportunities for a more efficient European power system in 2030 and 2040.* <https://eepublicdownloads.blob.core.windows.net/public-cdn-container/tyndp-documents/TYNDP2022/public/system-needs-report.pdf>

44 European Commission (2022). *REPowerEU Plan.* SWD (2022) 230 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2022%3A230%3AFIN>

45 M. Z. Jacobsen et al. (2022). *Low-cost solutions to global warming, air pollution, and energy insecurity for 145 countries.* <https://web.stanford.edu/group/efmh/jacobson/Articles/I/145Country/22-145Countries.pdf>

46 ACER (2023). *Flexibility solutions to support a decarbonised and secure EU electricity system.* https://www.acer.europa.eu/sites/default/files/documents/Publications/EEA-ACER_Flexibility_solutions_support_decarbonised_secure_EU_electricity_system.pdf

47 While increased solar energy generation requires substantial daily flexibility, wind generation requires increased weekly flexibility. The increased electrification of heating requires more long-term seasonal flexibility.

48 ACER (2023). *Cross-zonal capacities and the 70% margin available for cross-zonal electricity trade (MACZT). 2023 Market Monitoring Report.* https://www.acer.europa.eu/sites/default/files/documents/Publications/2023_MMR_MACZT.pdf

Current regulation is not up to the job

The challenge of expanding and modernizing EU electricity grids is considerable, requiring forward-looking planning and regulation as energy infrastructure investments have an economic lifespan of 20 to 60 years. The current regulatory framework is **not up delivering the energy infrastructure needed for 100% renewables** at the required speed and in the most cost-effective manner, as it was not designed with distributed renewable energy generation in mind.

The planning and management of electricity and gas networks is still conducted in separate silos, with the applicable market rules being specific to heat, gas, power and (soon) hydrogen. System operators for gas and electricity grids are for-profit entities that earn rents on the transmission systems they own and operate, giving them an **inherent interest in proposing new subsidized infrastructure construction** as a solution to grid capacity issues. While electricity grids do need to expand, particularly at the distribution level, this leads to a **bias in favour of investments into fixed infrastructure**, rather than less capital-intensive 'non-wire' solutions like demand-side flexibility of electric vehicles, heat pumps and smart appliances.⁴⁹ Network pricing also currently incentivizes demand inflexibility through fixed fees. This system leads to inefficient infrastructure investments and thus prevents renewable energy sources from realizing their full potential.

Fortunately, the European Commission has proposed a number of actions that address these issues in its **EU Action Plan for Grids**.⁵⁰ Notable among these are provisions for the accelerated planning of grids, support for network planning of distribution system operators (DSOs), indicative national non-fossil flexibility targets, flexibility needs assessments, a revision of network codes and changes to network tariffs to better reflect operational expenditure and locational price signals, which strengthens incentives for non-wire solutions.

Policy recommendations

- **Prepare the gradual introduction of independent system operators (ISOs).**

Their key task should be the reduction of energy infrastructure costs by deciding on the use of market-based tools and infrastructure investments in view of bottlenecks. Moving to an ISO model removes conflicts of interest from infrastructure planning and management, as the current system operators are for-profit entities that earn rents on networks that they are responsible for planning. While the grid operators for electricity, gas and (soon) hydrogen each prepare separate Ten-Year Network Development Plans (TYNDPs), an ISO would ensure a more coherent, integrated planning for 100% renewables, for instance, by coordinating the decommissioning of fossil gas grids under the Gas Directive as renewable heating and hydrogen use in industry are ramped up.

⁴⁹ Regulatory Assistance Project (RAP) (2022). *Power System Blueprint*. <https://blueprint.raponline.org/>

⁵⁰ European Commission (2023). *Grids, the missing link – An EU Action Plan for Grids*. COM(2023) 757 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023DC0757>

- **Launch infringement procedures to accelerate the implementation of legislation for flexibility solutions by the Member States.** Many Member States still fail to implement reforms under the 2019 Clean Energy Package, hindering demand response services and energy storage to participate in the wholesale market.⁵¹ Similar delays regarding the revised rules of the 2024 Electricity Market reform must not be tolerated because they block renewable energy capacity and result in higher costs for all consumers.
- **Update both the 2020 Strategies on Energy System Integration and Hydrogen** to quantify the sector-specific use of renewable hydrogen and other e-fuels and e-chemicals only in those sectors that are the most difficult to decarbonise. While renewables-based e-fuels and e-chemicals will have to play an important part in decarbonising hard-to-electrify processes, it is extremely unlikely that the EU economy will need anything close to the amounts of hydrogen currently being planned for.⁵² It is therefore welcome that the European Commission's 2040 climate target proposal already revises down the unrealistic ambition of 20 millions tons of hydrogen supply by 2030. A realistic impact assessment is key to avoiding costly redundancies through over-investment in hydrogen networks paid for by gas consumers and taxpayers.
- **Provide guidance on how to make network tariffs fair and flexible.** While the increased focus on operational expenditure and anticipatory investments in the revised Electricity Market Regulation is welcome, provisions on time-of-use network tariffs are still weak. They would provide additional incentives for energy efficiency and flexible consumption. Reforming network tariffs should target the new flexible loads, such as those pertaining to electric vehicles and heat pumps, while relieving low-income households that often consume comparatively little energy but pay disproportionately more network tariffs for their energy consumption.
- **Revisit rules on capacity mechanisms to ensure that only 100% renewables-compatible capacity options are eligible.** The revised Electricity Market Regulation leaves the door open to fossil fuels, with new gas power plants meeting certain emissions limits being eligible to participate in capacity markets, and with existing fossil capacity even being granted a derogation from the requirement to comply with emissions limits. In the current situation, capacity mechanisms are already too fossil heavy, with 57% of support going to fossil gas and coal, as recently assessed by ACER.⁵³ Only 100% renewables-compatible technologies such as batteries, pumped storage, hydropower, geothermal energy, renewable hydrogen or sustainably produced biomethane should be eligible for capacity payments.

51 SmartEN (2022). *The implementation of the electricity market design to drive demand-side flexibility*. https://smarten.eu/wp-content/uploads/2022/03/The_implementation_of_the_Electricity_Market_Design_2022_DIGITAL.pdf

52 Agora Energiewende (2023). *Breaking free from fossil gas – A new path to a climate-neutral Europe*. https://static.agora-energiewende.de/fileadmin/Projekte/2021/2021_07_EU_GEXIT/A-EW_292_Breaking_free_WEB.pdf

53 ACER (2023). *ACER reports a lag in implementing the EU framework to assess and tackle electricity security of supply risks in a coordinated manner*. <https://www.acer.europa.eu/news-and-events/news/acer-reports-lag-implementing-eu-framework-assess-and-tackle-electricity-security-supply-risks-coordinated-manner>

3. Enable local authorities to manage the transition to 100% renewables

Local authorities play a crucial role in making the energy transformation happen on the ground. Achieving a substantial decrease in energy demand, scaling up renewable energy generation and enabling more sector coupling are important prerequisites for the transition to 100% renewable energy that all touch on local competences, for example spatial and infrastructure planning, permitting procedures, and own local investment. Municipalities also act as a **nexus for local stakeholders** like citizens, businesses and associations, which enables them to steer and coordinate the local energy transition.⁵⁴

EU policies do not always reflect diverging needs of local authorities engaged in energy transition

Local authorities are currently facing very different starting positions, with disparities in human and financial resources not only between countries, but also between regions within Member States.⁵⁵ A recent report by the EIB warns that **regional disparities in Europe are set to grow even wider**, as less affluent regions in Eastern Europe have become more exposed to economic and political stresses following Russia's invasion of Ukraine.⁵⁶

Despite the beneficial impact of developing a local renewable energy supply, in particular on poor rural regions (see introduction, page 7), some local authorities in regions with energy-intensive industries will have to deal with a declining value creation per capita. Big cities, with a high population density, business activity and industry, have a disproportionately high energy consumption compared to surrounding areas, but also greater income from local taxes and greater staff resources. What they lack is the renewable energy potential of rural areas. Collaborations like the underutilized Renewable Energy Partnerships under Interreg can result in win-win situations, where energy-intensive urban centres benefit from clean energy, while rural regions gain much-needed investment certainty.⁵⁷ EU cohesion policy still has to promote adequate schemes matching these specific disparities.

54 L. Schmieder, D. Scheer (2023). *Municipalities as change agents? Reconsidering roles and policies in local energy sector-coupling*. <https://www.sciencedirect.com/science/article/pii/S2214629623002700>

55 European Commission (2022). *New Cohesion Report reveals the impact of the coronavirus pandemic*. https://ec.europa.eu/regional_policy/information-sources/cohesion-report_en

56 EIB (2022). *Economic Investment Report 2022 – Resilience and Renewal in Europe*. https://www.eib.org/attachments/lucalli/20220211_economic_investment_report_2022_2023_en.pdf

57 T. Schwab, Bertelsmann Stiftung/GWS (2023). *Energising EU cohesion. Powering up lagging regions in the energy transition*. <https://www.bertelsmann-stiftung.de/en/publications/publication/did/energising-eu-cohesion>

Municipalities need help to realize the benefits of the energy transformation

Energy communities are key to taking ownership of the energy transformation and enabling local benefit sharing. This is essential for **fostering local acceptance** of renewable energy projects.⁵⁸ Community energy projects tend to distribute profits locally, thus generating two to eight times more local revenue than projects carried out by external actors.⁵⁹ However, the **potential of energy communities to mobilize citizen investment is vastly underutilized** in the EU. A survey has shown that a potential **€176 billion could be obtained from citizens willing to co-finance** community-administered wind farm developments.⁶⁰ However, the uneven transposition of energy community definitions across EU Member States,⁶¹ as well as funding shortfalls and encroachment by external commercial actors, are all threatening the future development of renewable energy communities.⁶²

While local authorities would be the key players to facilitate renewable energy communities, they unfortunately face a variety of barriers in mobilizing the necessary public investment and conducting the forward-looking planning of their transport, heating and electricity infrastructure. Insufficient funds, lengthy regulatory processes and regulatory uncertainty are the largest problems in attracting local investment, particularly in Central and Eastern Europe. Lacking technical knowledge is a related problem, with **69% of municipalities saying they lack environmental and climate assessment skills**, with digital and other technical skills coming close behind in an EIB survey.⁶³ According to one study, the heating transition alone requires the creation of **214,000 new local administration jobs**, or an additional 2.5 full-time positions per municipality per year over the next nine years.⁶⁴

Insufficient resources pose a challenge for many municipalities in acquiring the necessary technical personnel, which hinders their capacity to comprehensively plan their local energy transformation. While there are already several country-level support programmes, as well as EU-level initiatives like the Covenant of Mayors, these are not yet reaching all municipalities, leading to a deficit in knowledge sharing and collaborative efforts.⁶⁵

58 Community Energy for Energy Solidarity (CEES) (2023). *Are renewable energy communities a vehicle to mitigate the energy crisis and lift people out of energy poverty?*

<https://www.energysolidarity.eu/renewable-energy-communities-alleviate-poverty/>

59 REScoop (2023). *The social impact of energy communities: ten benefits they bring*. <https://www.rescoop.eu/news-and-events/news/the-social-impact-of-energy-communities-ten-benefits-they-bring>

60 C. Pons-Seres de Brauwer, J.J. Cohen (2020). *Analysing the potential of citizen-financed community renewable energy to drive Europe's low-carbon energy transition*.

https://backend.orbit.dtu.dk/ws/portalfiles/portal/219142809/Pre_print_version.pdf

61 REScoop (2023). *Transposition tracker*. <https://www.rescoop.eu/transposition-tracker>

62 REScoop (2023). *Leveraging European Public Funds to Support Energy Communities*.

<https://www.rescoop.eu/toolbox/leveraging-european-public-funds-to-support-energy-communities>

63 EIB (2022). *Economic Investment Report 2022 – Resilience and Renewal in Europe*. https://www.eib.org/attachments/lucalli/20220211_economic_investment_report_2022_2023_en.pdf

64 EnergyCities (2022). *Human capacity in local governments. The bottleneck of the building stock transition*. https://energy-cities.eu/wp-content/uploads/2022/05/EnergyCities21_PolicyPaper_CapacityNeeds_EN_FINAL-2.pdf

65 G. Laguna Benet (2023). *Energy transition plans: How municipalities face the energy transition*. <https://doi.org/10.56367/OAG-041-11159>

Policy recommendations

- **Widen the access to the Just Transition Fund to all regions that want to engage.** Local actors are often more interested in implementing renewable energy projects than their national governments as many of the benefits accrue locally, especially in energy communities. The Just Transition Fund is one of the most appropriate financial tools for enabling local authorities to kick-start the investments that are key for their energy transition but economically not yet viable. However, it has been limited so far to regions where carbon-intensive industries are located. At the occasion of preparing the next Multiannual Financial Framework, the geographical scope of the Just Transition Fund, as well as its financial volume, should be expanded so that all local authorities that plan eligible investments can apply.
- **Refocus EU cohesion policy on delivering the energy transition and realizing its benefits for less affluent regions.** To realize synergies across regions, it is important to increase funding allocations to instruments fostering interregional cooperation, such as the Renewable Energy Partnerships and Interregional Innovation Investments under the European Regional Development Fund. Finally, EU Member States still spend significant portions of cohesion funds on gas infrastructure, especially in heating, which hinders the energy transition and builds up potential stranded assets and fossil lock-in.⁶⁶ This could be addressed by raising the climate spending quotas applicable to cohesion funds and applying the Do No Significant Harm principle to all EU cohesion policy spending.
- **Improve the financing available to local authorities through the Energy Communities Facility,** unlocking billions of euros in investments from European citizens. Despite eligible EU funds being available, only few Member States have set up dedicated support schemes for energy communities, and these are typically quite small compared to the need for co-financing. To remedy this, the European Commission should set up the announced Energy Communities Facility as soon as possible, encourage Member States to earmark greater funding from their Recovery and Resilience Facility (RRF) plans for local authorities' engagement in energy communities and make concrete recommendations on energy communities as part of the assessment of National Energy and Climate Plans.

⁶⁶ CEE Bankwatch Network (2024). *Bankwatch cohesion policy database*.
<https://bankwatch.org/europeangreendead>

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The 100% Renewable Energy Action Plan for the European Commission 2024-2029

Policy recommendations of the Expert Group on
100% Renewables in the EU

The Heinrich-Böll-Stiftung European Union and Environmental Action Germany (Deutsche Umwelthilfe) have convened a group of over 20 experts from academia, industry, civil society and policy-makers from EU institutions to identify the key challenges of the EU's energy transition. The expert group met five times in 2023 to develop proposals on how to achieve a 100% renewable energy-based EU economy. The result is this 100% Renewable Energy Action Plan for the next European Commission, which builds on three key challenges: Accelerating renewable energy deployment, putting in place the right infrastructure and flexibility for 100% renewables and enabling local authorities to manage the transition to 100% renewables.

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