



Understanding EU's and Poland's Renewable Energy Goals

Based on the Fit for 55 package

Forum Energii is a European, interdisciplinary think tank based in Poland whose team consists of experts in the field of energy. Our team combines this with experience in fields such as public policy, business, academia, and media.

Forum Energii's mission is to initiate dialogue, provide solutions based on current scientific research, as well as foster actions towards a just and effective energy transition leading to climate neutrality. Our mission is fulfilled through the publishing of analyses and opinions and by facilitating discussions covering decarbonisation of the main sectors of the economy.

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CONTENTS

Introduction	
1. Key Takeaways	3
2. Background	4
3. EU RES goals	5
4. Renewables aren't just wind and solar	6
5. Biomass's limited potential	7
6. Detailed RES goals	8
7. Polish RES goals	9
8. How to fulfil RES goals in Poland?	13
8.1. The power sector versus other sectors	14
8.2. Transport	15
8.3. Heating (and cooling) production	17
8.4. Industry	20
9. Summary of the goals	21
10. Moving ahead	22
11. Summary and recommendations	24
Appendix 1. Assumptions for calculating RES targets in individual European Union countries	25
Appendix 2. Specific targets for the development of renewable technologies at the European Union level in the strategies and communications of the European Commission	26
Appendix 3. Specific RES targets in the European Union and Poland until 2030.	27
Bibliography	29

Introduction

RED III, which is a revision of the Renewable Energy Directive, promoting the development of renewable energy in the European Union (EU), was passed in October 2023. although Poland was one of the few countries that voted against it. The Directive sets challenging, defined and concrete goals that require significant changes that can only be met by substantive efforts from both organisational and political perspectives. These goals are shaped by the EU's ambitions to increase its energy independence and reduce greenhouse gas (GHG) emissions as well as cut the cost of imported oil, gas, and coal.

Changes that should happen in the wider energy sector must be fast-paced. According to the newest target for 2030, 42.5% of energy supply in the EU should come from renewable energy sources (RES), nearly double today's 22%. Based on Forum Energii's calculations, this EU-wide target means that Poland's overall energy consumption should contain 31.5% of RES by 2030. Having analysed Polish strategic documents prepared by the public administration, it is clear that the goal is achievable and that Poland's potential for RES is significantly higher than the target.

The new government (since late 2023) has stated that developing RES is a high priority. However, the state should also focus on analysing the costs and benefits related to increasing the use of RES. Now is the best time to put this to work, as the National Climate and Energy Plan for the years 2021-2030 and Poland's Energy Policy by 2040 are being updated.

Poland can become a model of how a state can develop its renewable energy potential. Surpassing the EU's goals is both tangible and necessary due to internal conditions. Doing so would also better prepare the country for the energy transition challenges that lie beyond 2030.

This report analyses how the new EU goals pertaining to the development of RES translate into the Polish reality. It also shows how following the pace of renewable energy deployment that the EU has laid out will affect various sectors and how quickly they must adapt.

I encourage you to read the report and invite you to discuss it.

Joanna Maćkowiak-Pandera, PhD,
President of Forum Energii

1. Key Takeaways

- Setting goals in the energy sector is crucial to mobilising investment, securing adequate generating capacity in the power and district heating sectors, and adapting the pace of grid infrastructure modernisation.
- The binding EU RES end-use target is 42.5% by 2030, while the indicative target is set at 45%¹. In 2021, EU's renewable energy consumption stood at 21.8%², which accounts for approximately half of the end-goal. Due to the distribution of efforts in meeting the goal among EU states, the Polish RES goal is set to be 31.5% by 2030.
- If Poland's energy transition followed the existing strategies (i.e., district heating strategy, the latest energy policy scenario, or hydrogen strategy)³, Poland's contribution towards the EU-wide goals would account for exactly 31.5% of its national energy use.
- Until now, RES have developed the fastest in the district heating and individual heat sectors. To meet the new targets, the pace of renewables development in these sectors needs to increase.
- One of the biggest challenges in meeting the RES goals will be the transition of the transport sector. In the last decade, GHG emissions generated by transport increased by as much as 27%⁴, while electrification is only in its early stages of development.
- To meet green hydrogen targets, there will need to be a swift development of the market and a support scheme will need to be introduced. Green hydrogen should be used primarily in the industrial sector as well as aviation.
- Development of RES within the Polish economy towards the 31.5% target will lead to:
 - lower use of fossil fuels in transport by 9% (equivalent of 2 million tonnes of oil) and lower use of coal in district heating, individual heating, and the power sector by 48% (circa 47 million tonnes);
 - maintaining the use of gas at 21 billion cubic meters (bcm) per annum with a simultaneous increase of its use in the power sector and district heating by 2.8 bcm and decrease in individual heating (by 2.6 bcm) and in the industry sector (by about 0.5 bcm).
- Larger RES use than predicted in the government's *Scenario 3 to the pre-consultation of the NECP and PEP 2040* (from 47% to 70%) would contribute to Poland reaching 40% of RES use in its economy by 2030. A faster transition of the power sector would allow for a larger reduction of GHG in all sectors, as well as a lower need for increasingly expensive emission allowances. Thanks to a larger RES share in the power sector, Poland could be better prepared for the upcoming 2040 goals.

¹ An indicative goal requires reporting. Not meeting the binding target may result in member states or EU institutions pursuing legal action.
² European Commission, *Renewable Energy Statistics*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics#:~:text=The%20EU%20reached%20a%2021.8,a%20role%20for%20this%20decrease.

³ In this report, we refer to the following documents published by the Ministry of Climate and Environment: *Polish Hydrogen Strategy to 2030* (PSW, 2021), *National Energy and Climate Plan 2021-2030* (NERP, 2019), *Scenario 3. for pre-consultation of the NERP/PEP2040 update* (Scenario 3, 2023), *Heat Strategy to 2030 with an Outlook to 2040* (2022), *Poland's Energy Policy to 2040* (PEP2040, 2021).

⁴ From 2011-2021. Source: National Center for Balancing and Emission Management (KOBiZE), *National Inventory Report 2023*, 2023, https://www.kobize.pl/uploads/materialy/Inwentaryzacje_krajowe/NIR_2023_raport_syntetyczny_PL.pdf.

2. Background

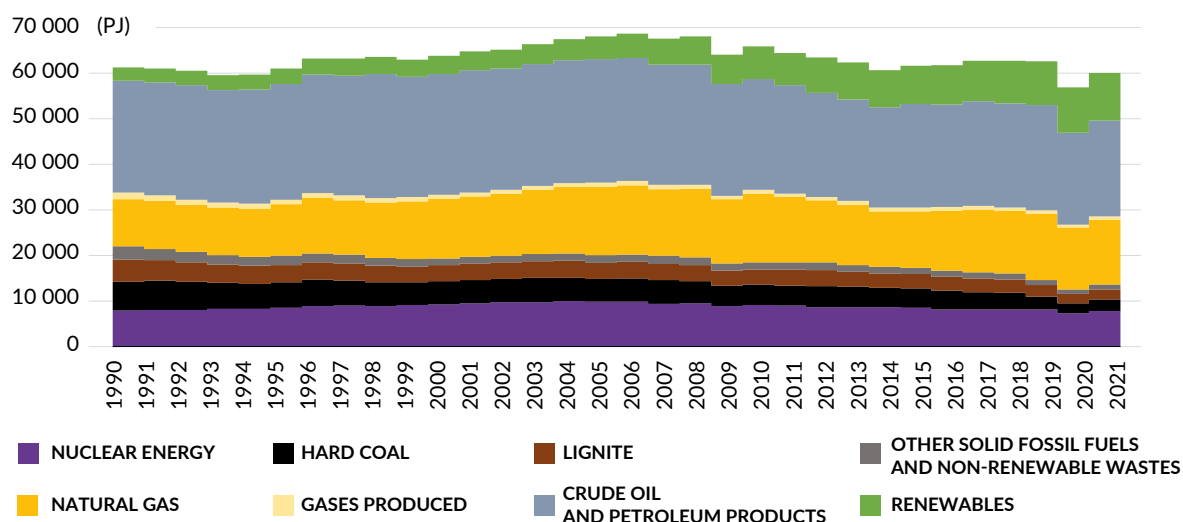
Currently, energy production in the European Union depends on fossil fuel imports. This brings about tangible consequences for the climate, EU's economy, and its finances. In 2021, the share of imported energy reached 55% within the Union (in Poland it was 40%⁵). In recent years, EU's average of imports of oil, coal, and natural gas was €300 billion per annum⁶. However, in 2022, due to Russia's attack on Ukraine, EU's energy bill rose to €720 billion⁷. This is comparable to the entire Polish GDP⁸. Poland's average energy expenses amount to around PLN 70 billion per year, but in 2022 it increased to PLN 200 billion⁹.

The revenue from fossil fuel sales supports economies competing with the European Union. Therefore, EU member states, including Poland, are exposed to geopolitical and financial risks. The energy and economic crises initially caused by the COVID-19 pandemic and later boosted by Russia's war in Ukraine showed the consequences of such risk exposure.

Simultaneously, coal, gas, and oil use results in 3.5 billion tonnes of CO₂ being emitted in the EU each year¹⁰ (approximately 7% of global emissions). Reduction GHGs has become a priority for the EU, as it lies within the EU's geopolitical, economic, and environmental interests. Thanks to EU climate policies already in place, Member States were able to decrease their emissions by 23% since 2004, which is the year when Poland entered EU.

Substituting traditional energy sources with RES is, however, taking much too long. In 2021, RES accounted for only 17% of primary energy within the EU economy¹¹.

Figure 1: Use of primary energy sources in the EU from 1990 to 2021



Source: Eurostat, *Energy flow – Sankey diagram data*, 2023, https://ec.europa.eu/eurostat/databrowser/view/NRG_BAL_SD__custom_7566251/default/table?lang=en.

⁵ Eurostat, *Dependence on Energy Imports*, 2023, https://ec.europa.eu/eurostat/databrowser/view/nrg_ind_id/default/table?lang=en.

⁶ European Commission, *Euro in Energy*, https://energy.ec.europa.eu/topics/markets-and-consumers/euro-field-energy_en.

⁷ Eurostat, *Imports of energy products from the EU – latest developments*, 2023, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_imports_of_energy_products_recent_developments&oldid=554503.

⁸ The World Bank, *GDP (current US\$) – Poland*, <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=PL>.

⁹ P. Kleinschmidt, J. Maćkowiak-Pandera, *How much do we pay for fossil fuel dependence?*, Energy Forum, 2022, <https://www.forum-energii.eu/ile-placimy-za-uzaleznienie-od-importu-paliw-kopalnych>.

¹⁰ Eurostat, *Greenhouse Gas Emissions by Source Sector (source: EEA)*, 2023, https://ec.europa.eu/eurostat/databrowser/view/ENV_AIR_GGE__custom_7181047/default/table?lang=en.

¹¹ Eurostat, *Energy flow – Sankey diagram data*, 2023, https://ec.europa.eu/eurostat/databrowser/view/NRG_BAL_SD__custom_7566251/default/table?lang=en.

Figure 1 shows that since 2012, renewables have been the source of more energy than hard coal and lignite within the EU. Since 1990, there has also been a 58% decrease in solid fossil fuels use (including coal and lignite) and a 14% decrease in oil use. However, the importance of natural gas has grown, as its use increased by 37% over the same period.

Despite stable demand for fossil fuels, EU member states have been decreasing their extraction. This is due to geological, economic, and environmental reasons. Renewables can substitute these energy sources.

3. EU RES goals

The first EU target concerning the development of renewable energy sources was set in 1997 during the Kyoto Protocol negotiations and amounted to 12% RES use **by 2010**¹². It was an indicative (non-binding) target, but it initiated the creation of supporting funds and reporting tools, which enabled tracking the energy transition.

In 2007, member states accepted the climate and energy package, which included an obligatory renewables target of 20% of final energy consumption, to be met **by 2020**^{13,14}. This is when the first Renewable Energy Directive (RED) was created. The target was met: RES use in the EU reached 22% in 2020 and 2021^{15,16}.

Initially, **the 2030 target** was set at 32% of RES use in final energy consumption. The target was part of the revised RED II, which was passed in 2018. However, it proved to be insufficient considering the upcoming challenges¹⁷.

In 2019, EU member states passed a long-term goal compliant with the Paris Agreement to reach climate neutrality by 2050 (European Green Deal). This was ratified in 2021 when the European climate law was passed¹⁸. This new challenge required adjusting the pace of decarbonisation and consequently, the growth of RES. Within the European Green Deal, the European Commission put forward a proposition stating that renewables use should reach 40% of energy consumption by 2030¹⁹.

When the 'Fit for 55' legislation, which implements the European Green Deal, was being negotiated, the EU faced an energy crisis initially caused by the COVID-19 pandemic, intensified by Russia's aggression against Ukraine. This had an immense impact on energy prices, which abruptly rose and forced government interventions to decrease energy costs and support investments related to resolving the power crunch. The answer to the crisis was the REPowerEU package prepared by the European Commission at the request of the member states²⁰. One of the main recommendations of the package was increasing RES use to 45% by 2030.

Eventually, the EU passed a binding 42.5% RES use target by 2030. As a political compromise between the Council of the European Union and the European Parliament, an indicative, aspirational target was passed that amounts to 45%. It aims to mobilise the member states to even faster growth of renewables. Changes to EU RES goals are shown in Figure 2.

¹² European Commission, *Communication from the Commission. Energy For The Future: Renewable Sources of Energy*, 1997, https://europa.eu/documents/comm/white_papers/pdf/com97_599_en.pdf.

¹³ Gross final energy consumption means energy commodities supplied for energy purposes to industry, the transport sector, households, the service sector (including those providing public services), agriculture, forestry and fisheries, as well as the consumption of electricity and heat by the energy industry for the production of electricity, heat and transport fuels, and losses of electricity and heat arising during distribution and transmission. Source: *Directive of the European Parliament and of the Council (EU) 2018/2001 of December 11, 2018 on the promotion of the use of energy from renewable sources* (Official Journal of the EU L 328/82).

¹⁴ EEA, *Share of renewable energy consumption in Europe*, 2023, <https://www.eea.europa.eu/ims/share-of-energy-consumption-from>.

¹⁵ European Commission, *Renewable Energy Statistics*, *op.cit.*

¹⁶ This is a higher ratio than the one shown in Figure 1, which relates to primary energy, because when counting the RES share of gross final consumption, multipliers are taken into account to obtain higher values than would result from actual energy consumption. For more information on multipliers, see Chapter 8.

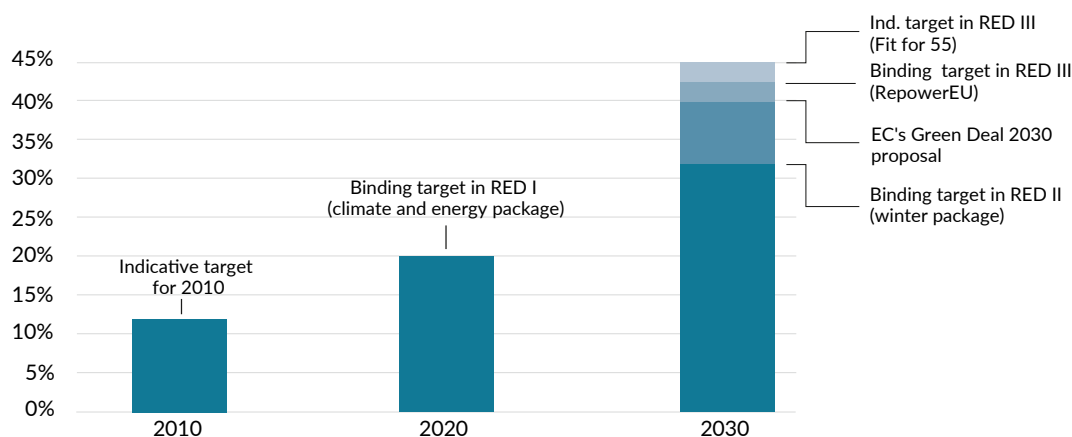
¹⁷ European Commission, *Renewable Energy Targets*, https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en.

¹⁸ *Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing a framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (European Climate Law)* (Official Journal of the EU L 243/1).

¹⁹ European Commission, *Implementing the European Green Deal*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en.

²⁰ European Commission, *REPowerEU*, 2022, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repower-eu-affordable-secure-and-sustainable-energy-europe_pl.

Figure 2. Historical and current targets for renewables development in the European Union



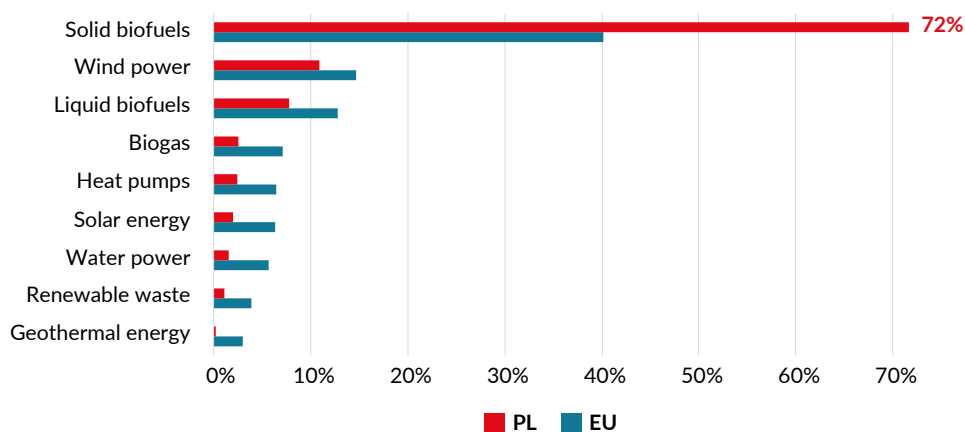
Sources: European Commission, *Renewable Energy Targets*, https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en; European Commission, *Communication from the Commission. Energy For The Future: Renewable Sources of Energy*, https://europa.eu/documents/comm/white_papers/pdf/com97_599_en.pdf.

4. Renewables aren't just wind and solar

The main renewable resource used in the European Union is dry biomass (solid biofuels), mostly wood and straw. Using biomass as a heat source in individual boilers is an easy way to fulfil RES targets; however, this approach is not particularly innovative. It contributes to smog and deforestation. Biomass accounts for as much as 72% of RES use in Poland, compared to 40% within the EU.

As seen in Figure 3, carbon neutral technologies, such as wind and solar energy, are not the main renewable energy sources in the EU. Liquid biofuels mixed with transport fuels are also considered to be renewable energy sources.

Figure 3. Share of individual technologies in final consumption of RES in the EU and Poland in 2021



Source: own compilation based on GUS, *Renewable Energy in 2021, 2022*, <https://stat.gov.pl/obszary-tematyczne/srodowisko-energia/energia/energia-ze-zrodel-odnawialnych-w-2021-roku,3,16.html>.

Despite their small contribution to RES production, photovoltaics and wind power plants are becoming increasingly important, as they form the basis of the energy transition. This is, first, due to the increasing electrification of various sectors, which entails systematic growth in demand for carbon neutral electricity (to supply electricity to heat pumps, electrolyzers and to charge electric vehicles). Second, the criteria for biomass use in energy are becoming more stringent. This applies to both dry and wet biomass.

5. Biomass's limited potential

There are several criteria for woody biomass to be considered as a renewable source for electricity or heat production in units 7.5 MW²¹ and larger:

1. Hierarchical approach—support systems must consider priority rules for using woody biomass. Before it is burned, biomass should be used in the following ways: first to make wood-based products, then to prolong the longevity of such products, later for reuse, and then for recycling.
2. No financial support for installations using logs, industrial grade round wood, tree stumps, and roots.
3. No financial support for new installations solely generating electricity from dry biomass and no possibility to extend support for older installations of this type²².
4. Ban on using biomass from primeval and old-growth forests, forests with high biodiversity, grasslands, peatlands, and moors.
5. Having to adjust the amount of biomass used to EU and national goals meant to increase GHG absorption capacities of forests²³.
6. From 2026 onwards, biomass use must lead to an 80% decrease in GHG emissions (70% by 2025), including indirect emissions (for example in transport)²⁴.
7. Having to use highly effective cogeneration for installations above 50 MW²⁵.

For first-generation biofuels used in transport, using food and pasture crops, the following restrictions were put in place:

1. They can be used to fulfil EU RES transport goals up to 7%;
2. They cannot be used to fulfil RES goals in transport in a bigger share than those set in 2020 plus 1% (for Poland this adds up to 5.6%²⁶);
3. Biofuels that contributed to deforestation and biodiversity degradation cannot be used to fulfil RES goals by 2030 (except for certified biofuels).

Therefore, the new renewables directive limits the use of biomass in meeting the 2030 goals. Fulfilling further goals will require deploying more innovative technologies.

²¹ And 2 MW in installations using gasified biomass. There are derogations from these rules that must be notified to the EC.

²² Unless they are plants equipped with BECCS (*Bioenergy with Carbon Capture and Storage*), that is, producing bioenergy with capture and storage of greenhouse gas emissions.

²³ European Commission, *Land Use Sector*, https://climate.ec.europa.eu/eu-action/land-use-sector_en.

²⁴ European Commission, *Biomass*, https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomass_en.

²⁵ Ibidem.

²⁶ Eurostat, SHARES, [https://ec.europa.eu/eurostat/web/energy/database/additional-data#Short%20assessment%20of%20renewable%20energy%20sources%20\(SHARES\)](https://ec.europa.eu/eurostat/web/energy/database/additional-data#Short%20assessment%20of%20renewable%20energy%20sources%20(SHARES)).

6. Detailed RES goals

RED III sets goals in specific industries of the EU economy. It also contains goals for district heating and cooling, which were set on both the EU-wide and member state levels (Table 1). Some of them are mandatory, while others are indicative.

- **Mandatory goals** – legally binding: not meeting them can become a reason for member states or EU institutions to pursue legal action. In practice, this can mean opening a case against a country for failing to meet the requirements to the European Court of Justice²⁷. Member states should also introduce laws that enable meeting these targets in order to receive EU funds (for example, conditionality for the use of Recovery funds)²⁸.
- **Indicative goals** – not mandatory: meeting these targets is not legally binding. Setting indicative goals, however, means that member states and the European Commission need to report on progress in reaching them. This increases transparency and in shaping future regulation.

Table 1 summarises historical RES shares and the newest EU goals based on the RED III. Detailed overview of RES goals with yearly and periodical breakdowns is available in Annex 2.

Table 1. EU RES share in 2020 and sectoral targets under the RES Directive

Sector	RES share in 2020	New RES targets for 2030	Indicative - I Obligatory - O
The entire EU economy	22.1%	45%	I
The entire EU economy		42,5%	O
Buildings	28.5%	49%	I
Heat and cold	22.9%	38.9%	I/O
District heating	31.6%	53.6%	I
Transport	7.7%	29%	O
Transportation - Advanced Biofuels* and RFNBO**	n.a.	5.5%	O
Transport - RFNBO	n.a.	1%	O
Air transport - SAF***	n.a.	6%	O
Air transport - RFNBO	n.a.	1.2%	O
Maritime transport - RFNBO	0%	1.2%	I
Industry	16.7%	32.7%	I
Industry - green hydrogen	n.a.	42%	O

Sources: own calculations based on Eurostat, SHARES, [https://ec.europa.eu/eurostat/web/energy/database/additional-data#Short%20assessment%20of%20renewable%20energy%20sources%20\(SHARES\)](https://ec.europa.eu/eurostat/web/energy/database/additional-data#Short%20assessment%20of%20renewable%20energy%20sources%20(SHARES)); European Council, Renewable energy: Council adopts new legislation, 2023, <https://www.consilium.europa.eu/en/press/press-releases/2023/10/09/renewable-energy-council-adopts-new-rules/>.

*Advanced biofuels – fuels of biological origin of second and third generation, not competing with food production.

**RFNBO – *Renewable Fuel of Non-Biological Origin*, i.e. liquid and gaseous fuels whose energy value is derived from renewable sources other than biomass, e.g. green hydrogen created by electrolysis using electricity from RES.

***SAF – *Sustainable Aviation Fuels*. These include aviation fuels using RFNBO, advanced biofuels or reused aviation fuels.

27 European Court of Auditors, *Special report 18/2023: EU climate and energy targets - 2020 targets achieved, but little indication that actions to reach the 2030 targets will be sufficient*, 2023, <https://www.eca.europa.eu/en/publications?ref=SR-2023-18>,

28 MFIPR, *National Recovery and Resilience Plan*, 2022, <https://www.funduszeuropejskie.gov.pl/media/109762/KPO.pdf>.

As Table 1 suggests, the European Union will aim to double its RES use relative to 2020 during this decade. The 'Fit for 55' package not only updates the targets relative to RED II but also introduces other areas and metrics such as:

- the overall indicative goal,
- the RES target in buildings,
- the RES target in industry,
- green hydrogen (RFNBO) in industry, aviation, and maritime transport.

Additionally, a target aiming to reduce the emissivity of transport by 14.5% by 2030 has been introduced.

However, the renewables directive does not set technology-specific goals regarding energy generation. These are found in separate strategic and sector-specific documents. They are mentioned in the directive's preamble and aggregated in Table 2.

Table 2: Targets for the development of RES technologies at the EU level in strategies and communications developed by the European Commission*

Sector	Target by 2030.
PV	600 GW
Offshore wind	60 GW
Wave energy	1 GW
Heat pumps	47 million installations
Green hydrogen	40 GW of electrolyzers
Biomethane	35 billion m ³
Innovative technologies	5% of all RES used

*Source documents and non-2030 targets are listed in Appendix 2.

7. Polish RES goals

The 2020 RES goal (15%)

EU legislation used to set RES goals for each country separately²⁹. In line with RED I, the share of renewables in Poland's energy mix was meant to be 15% by 2020. However, the very slow development of RES in Poland made reaching the goal unlikely.

- **Wind power** – the initial development of wind power was halted in the middle of the previous decade by the 'distance law'³⁰, which prevented siting wind power plants on over 99% of Poland's territory³¹ and increased taxes on them. Additionally, the government kept the value of green certificates, the financial support system for RES producers, at a low level³². Since 2016, the system supporting new wind power plants (and other RES) changed from green certificates to auctions³³. However, low reference prices (used to set the maximum value of financial support) and

²⁹ Directive 2009/28/EC of the European Parliament and of the Council of April 23, 2009, on the promotion of the use of energy from renewable sources amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Official Journal of the EU L 140/16).

³⁰ Act of May 20, 2016, on investments in wind power plants (i.e. Journal of Laws 2021, item 724, as amended).

³¹ Instrat Foundation, *Wind in the Sails*, 2021, <https://instrat.pl/wp-content/uploads/2021/05/Instrat-Wiatr-w-z%CC%87agle.pdf>.

³² B. Derski, *Oversupply of green certificates for 5 more years*, Wysokienapiecie.pl, 2017, <https://wysokienapiecie.pl/2460-nadpodaz-zielonych-certyfikatow-jeszcze-przez-5-lat/>; B. Derski, *Price of green certificates drops 50% after government decision*, 2023, <https://wysokienapiecie.pl/91134-cena-zielonych-certyfikatow-spada-o-50-po-decyzji-rzadu/>.

³³ Law of June 22, 2016, on amendments to the Law on Renewable Energy Sources and certain other laws (Journal of Laws of 2016, item 925).

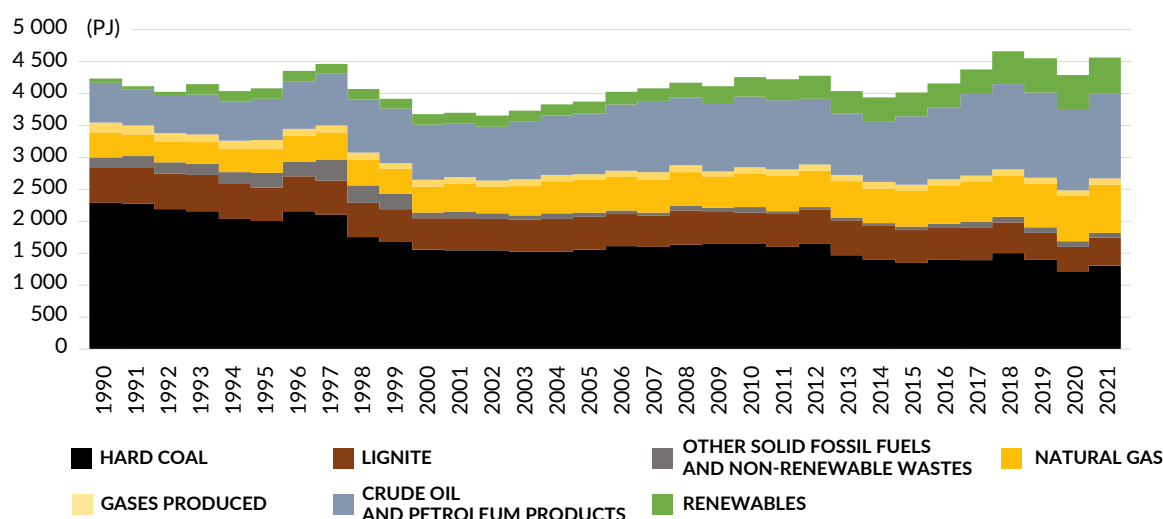
the unstable legal background have jointly contributed to a halt to the development of wind power towards the end of the 2010s. Further development of wind power plants resumed only after reducing taxes levied on wind installations and once better conditions were offered towards new investments within RES auctions in 2018³⁴. The '10H' rule became more lenient in 2023. Currently, the minimum distance between wind power plants and other buildings is 700m compared to the previous one of 1.5km (depending on the installation's height). The distance is still more than the previously announced 500m, which if in place would free up another 47% of capacity to expand wind energy on land³⁵, while the complicated planning process extends the investment period to even 10 years. For many years, the support system for offshore wind power was also hampered and only now does it have a chance for development.

- Solar power** – the development of this technology was also suppressed in its early days in the mid-2010s. In 2016, a feed-in tariff system for prosumers (consumers producing energy from renewables) was meant to come into force. However, before this happened the renewable energy law was updated, with the government introducing a net-metering system that, at first, did not encourage investing in microinstallations³⁶. Photovoltaic energy began to grow only in mid-2018 when additional support systems were created in such forms as subsidies and tax rebates ('Clean Air' and 'My Electricity' programmes). Thanks to updated auction rules, since 2018 the development of larger photovoltaic power plants has also become feasible³⁷.

Due to delays in the development of wind and solar energy, RES growth in Poland depended mostly on using biomass in the power sector, district heating, and individual heating. In 2021, the share of biomass in the Polish RES mix stood at 72%³⁸. As shown in Figure 4, the amount of energy from renewable sources rose slowly over time. The increase in renewables relative to other sources was about 0.5% year on year (y/y) since 2004.

10

Figure 4: Use of primary energy sources in Poland from 2004 to 2021



Source: own calculations based on: Eurostat, Energy flow - Sankey diagram data, 2023, https://ec.europa.eu/eurostat/databrowser/view/NRG_BAL_SD__custom_7566251/default/table?lang=en https://ec.europa.eu/eurostat/databrowser/view/NRG_BAL_SD__custom_7566251/default/table?lang=en.

³⁴ M. Skłodowska, *Investors miscalculated. They won auctions, power plants not built*, Wysokienapiecie.pl, 2019, <https://wysokienapiecie.pl/17909-inwestorzy-wygrali-aukcje-oze-ale-czesci-projektow-nie-zbudowali/>.

³⁵ Instrat Foundation, *Parliamentary amendment means loss of nearly half of wind turbine sites*, 2023, <https://instrat.pl/500-vs-700/>.

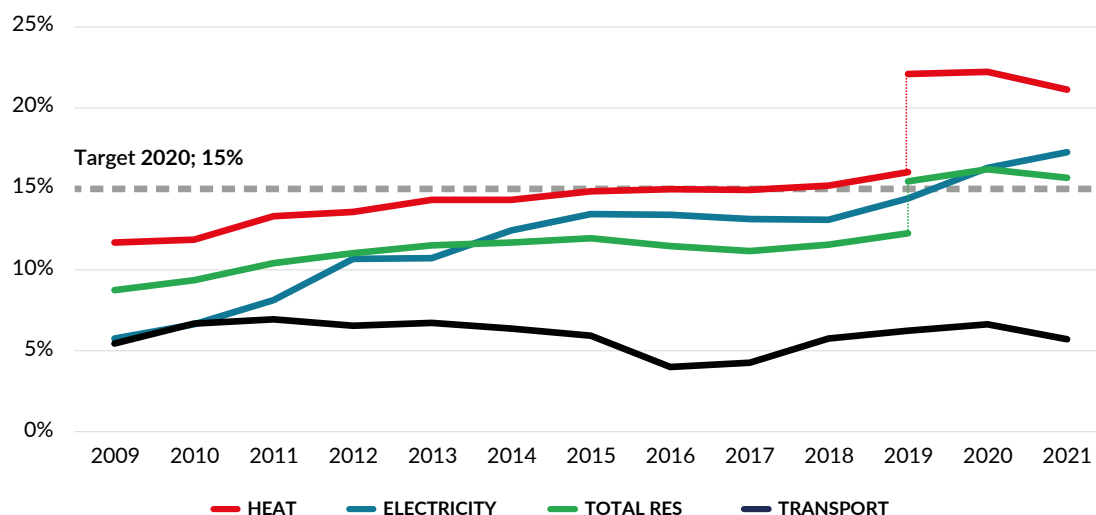
³⁶ The Energy Forum addressed this issue in its report *Microinstallations on the Corner. How to Ensure the Future of Distributed Energy in Poland 2021*, <https://www.forum-energii.eu/mikroinstalacje-na-zakrecie-jak-zapewnic-przyszlosc-energetyce-rozproszonej-w-polsce-3>.

³⁷ IEO, *Photovoltaic Market in Poland 2023*, 2023, <https://ieo.pl/pl/aktualnosci/1645-raport-rynek-fotowoltaiki-w-polsce>.

³⁸ Own compilation based on CSO, *Renewable Energy in 2021, 2022*, <https://stat.gov.pl/obszary-tematyczne/srodowisko-energia/energia/energia-ze-zrodel-odnawialnych-w-2021-roku,3,16.html>.

Despite the slow growth of renewables, Poland reached its 15% target of RES use by 2020. This was possible thanks to changes in the methodology for accounting for biomass use in individual heating³⁹. The COVID-19 pandemic also had an impact on the indicator as fossil fuel use dropped significantly during that period, especially in the transport sector. Thanks to this, RES use in Poland rose from 12.18% in 2019 to 16.11% in 2020.

Figure 5: Development of the RES share of individual sectors of the Polish economy in 2009-2021



Source: own compilation based on: CSO, *Renewable Energy in 2021*, Warsaw, 2022, <https://stat.gov.pl/obszary-tematyczne/srodowisko-energia/energia/energia-ze-zrodel-odnawialnych-w-2020-roku,3,15.html>.

11

According to EU regulations, by 2020 the Polish transport sector should have also seen a 10% share of RES. The goal was not met, as the share was only 6.58%⁴⁰. Despite that, due to reaching the overall goal and the growing controversy around first-generation biofuels, the failure to meet this target was not scrutinised.

The 2030 RES goal—first attempt (25%)

In line with the reform of the EU's climate energy law in 2018 and 2019 ('Clean energy for all Europeans' package⁴¹), the rules for setting RES use goals for EU member states was changed. Instead of setting a top-down target for each member state, a new mechanism for planning and reporting came into force, in line with the Energy Union Governance and Climate Action regulation. Under the new system:

- Member states create long-term strategies (30 years), which should set the trajectory for the economy's energy transition, including the power sector, to reach the goals set by the Paris Agreement. The Polish government has not yet created such a document despite the deadline passing in January 2020;
- Member states create national energy and climate plans (NECPs). In these documents, member states set goals for their economy's transformation, including RES growth, in a 10-year perspective. Poland passed its first NECP in 2019. The document is currently being updated⁴².

³⁹ Comparison of data on solid biofuel use (including wood and pellets) with data on wood supply and pellet production. In addition, data from the census, the National Forest Service, and new assumptions about own harvesting were used. Sources: CSO, *Energy from Renewable Sources in 2020*, op. cit.; M. Skłodowska, B. Derski, *Poland reached 2020 RES target by improving statistics*, 2021, Wysokienapięcie.pl, <https://wysokienapięcie.pl/43415-polska-osiagnela-cel-oze-na-2020-dzieki-poprawie-statystyki/>.

⁴⁰ CSO, *Renewable energy in 2021*, op.cit.

⁴¹ European Commission, *Clean Energy for All Europeans*, 2019, https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package_pl.

⁴² Ministry of Climate and Environment, *National Energy and Climate Plan 2021-2030*, 2019, <https://www.gov.pl/web/klimat/krajowy-plan-na-rzecz-energii-i-klimatu>.

Thanks to these planning documents, the European Commission can assess whether member states can jointly meet the EU's climate and energy goals.

Experience gained during the first round of NECP drafting shows that EU member states often underestimate their potential for renewables growth. Therefore, national goals are reviewed by the European Commission and the end-goals are re-negotiated before being accepted.

Since the Renewable Energy Directive does not directly assign targets to specific countries, the division of efforts is not as clear as it used to be in 2020. However, Annex 2 of the Energy Union Regulation provides a formula showing how countries should share their RES efforts based on:

- equitable distribution of deployment across the Union;
- economic conditions and potential, including GDP per capita;
- potential for cost-effective renewable energy deployment;
- geographical, environmental, and natural constraints, including those of non-interconnected areas and regions;
- the level of power interconnection between Member States;
- other relevant circumstances, in particular early efforts.

Based on these, the European Commission pointed out that Poland's RES goal for 2030 should be 25%⁴³. In line with the first Polish NECP preparation and after consulting European Commission, Polish renewables target was raised from 21% to 23%⁴⁴.

The 2030 RES goal—second attempt (31.5/33.4%)

After passing the 'Fit for 55' package, EU's renewable target increased from 32% to 42.5% (with a 45% indicative goal). By mid-2023, member states should have therefore put forward proposals for updating their national climate and energy plans in line with the current economic, climate, and geopolitical challenges.

This has not been done by the Polish government so far. In June 2023, the Ministry of Climate and Environment began preliminary consultations regarding the assumptions of the new document that should have been passed by mid-2024⁴⁵.

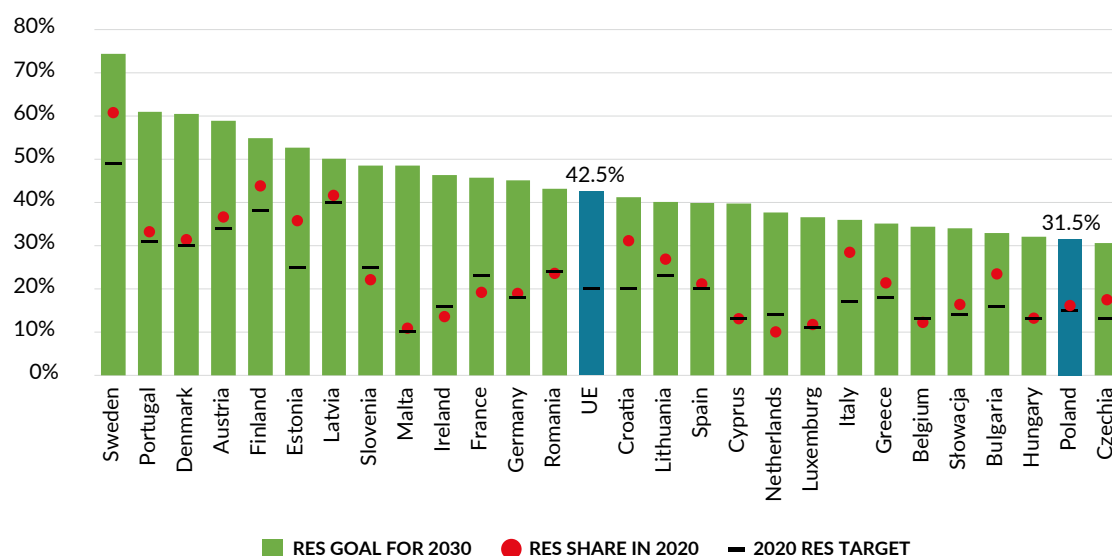
In line with the template attached to the regulation on managing the energy union and climate-related actions, Poland's RES goal for 2030 should be 31.5% (33.4% to fulfil the indicative goal). Calculations of the Polish RES goal can be accessed in Annex 1.

⁴³ European Commission, *Staff Working Document. Assessment of Poland's Final National Energy and Climate Plan*, 2020, https://energy.ec.europa.eu/system/files/2021-01/staff_working_document_assessment_necp_poland_pl_0.pdf.

⁴⁴ European Commission, *National Energy and Climate Plans*, https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en.

⁴⁵ Ministry of Climate and Environment, *Pre-consultation on updating strategic documents – NAPE/PEP2040*, 2023, <https://www.gov.pl/web/klimat/prekonsultacje-w-zkresie-aktualizacji-dokumentow-strategicznych-kpeikpep2040>.

Figure 6: Distribution of RES development efforts in EU countries by 2030



Source: Energy Forum based on assumptions and data sources in Appendix 1. Final targets for individual member states may vary slightly - depending on the European Commission's calculation assumptions.

According to Forum Energii's calculations, Poland has one of the lowest RES targets in the EU, scoring second to last among all member states. From a national perspective considerations regarding the division of efforts among member states should be secondary to the fact that the growth of RES is a chance to mitigate costs associated with fossil fuels imports, environmental and geopolitical problems. The next section of the report analyses how renewable sources of energy can develop in specific areas of the Polish economy, as of now, dependent on fossil fuels.

13

8. How to fulfil RES goals in Poland?

In recent years, the Polish administration (mainly the Ministry of Climate and Environment) prepared strategic documents that indicated growth of renewables in specific sectors (Table 3). Although not all of these documents were adopted, they can serve as a foundation for discussions on the energy transition of the Polish economy.

Table 3. Central administration documents indicating the development of RES in Poland by 2030

Document name	Abbreviation	Year	Status
National Energy and Climate Plan 2021-2030	NECP	2019	Adopted
Polish Hydrogen Strategy to 2030	PSW	2021	Adopted
Poland's energy policy until 2040 Appendix 2: Conclusions of forecasting analyses for the energy sector	PEP2040	2021	Adopted
A strategy for the heating industry until 2030 with an outlook to 2040.	SC	2022	Not adopted
Scenario 3. for the pre-consultation of the NECP/PEP2040 update	Scenario 3	2023	Not adopted

Source: own compilation.

In this chapter, we analyse the expected results stemming from the implementation the strategies listed in Table 3 relative to the new RES targets in RED III in the following sectors:

- power;
- transport (road, rail, aviation, and maritime);
- heating and cooling (individual, industrial, and district);
- industry.

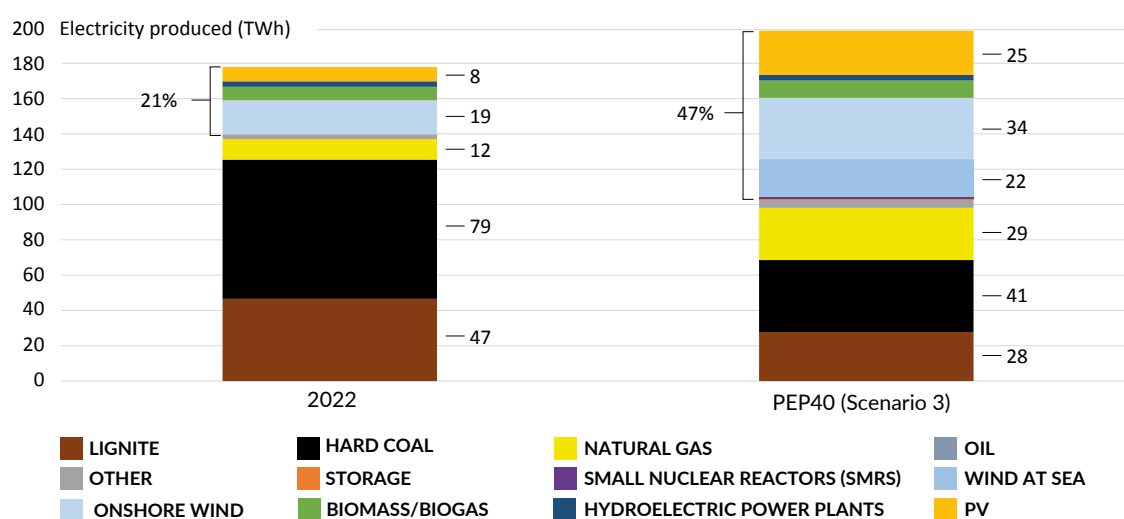
8.1. The power sector versus other sectors

The Renewable Energy Directive does not state specific goals for RES use withing the power sector. However, the sector will be crucial to fostering the growth of renewable and decreasing GHG emissions in the whole economy. An increasing amount of electricity from renewable sources is going to be needed for green hydrogen production and electrification of heating and transport sectors. The higher the share of RES in the electricity mix, the higher the share of renewable energy in the remaining sectors.

In the process of updating the National Climate and Energy Plan in the summer of 2023, the Ministry of Climate and Environment published an updated scenario for the development of the power sector: *Scenario 3. to the pre-consultations of the NECP and PEP2040 update*⁴⁶. According to the document, by 2030 nearly half (47%) of produced electricity should come from renewable sources. This share is also used in calculating RES indicators in other sectors⁴⁷.

Figure 7: Poland's electricity generation mix in 2022 and 2030*

14



Source: own compilation based on: Ministry of Climate and Environment, Scenario 3. for pre-consultation of NAPE/PEP2040 update, 2023, <https://www.gov.pl/web/klimat/prekonsultacje-w-zkresie-aktualizacji-dokumentow-strategicznych-kpeikpep2040>.

* Data for 2022 are gross values. Converting the data to net values would involve assuming averaged efficiency factors for individual technologies, and would thus be subject to the risk of error.

⁴⁶ Ministry of Climate and Environment, *Scenario 3. For pre-consultation of the NAPE/PEP2040 update*, 2023, <https://www.gov.pl/web/klimat/prekonsultacje-w-zkresie-aktualizacji-dokumentow-strategicznych-kpeikpep2040>.

⁴⁷ It should be noted, however, that the amount of energy generated in the energy mix proposed in the scenario may not be sufficient to cover the demand resulting from the electrification of district heating systems in particular. In developing the new NAPE, this scenario will need to be revised for consistency.

The energy mix shown in Figure 7 means an increase in the share of RES from 22% in 2021 to 47% in 2030. To make this happen, 5.9 GW of offshore wind power must be installed. Onshore wind power (up to 13.9 GW) and photovoltaic installations (up to 27 GW) also need to be developed. Simultaneously, the flexibility of the power system must increase in order to meet challenges posed by the new RES technologies' dependency on climate conditions⁴⁸.

8.2. Transport

Transport is the most fossil fuel dependent sector in Poland: 95% of the oil used is imported⁴⁹. In 2019, the value of oil imports cost about PLN 40 billion (before the COVID-19 pandemic and the energy crisis). In 2022⁵⁰, the costs ended up rising to PLN 74 billion. Additionally, Poland's GHG emissions related to transport have doubled since the country joined the EU, from 34 million tCO₂ in 2004 to 68 billion tCO₂ in 2021⁵¹. To reduce import-related dependencies and emissions, RED III sets goals for RES and low-emission fuels in transport.

In line with the new directive, 29% of the energy used in transport in Poland should come from renewable sources by 2030. Alternatively, the emissivity of transport should be reduced by 14.5% relative to 2020. In line with the newest guidelines from RED III, the transition of the transport sector should be aided using the following technologies:

- **Electrification of road transport**
RED III does not set goals for the growth of electric vehicles. However, energy produced using wind or solar plants and used in transport counts as a renewable source in that sector. The share of energy from renewables used by an electric vehicle (EV) is calculated using the average energy mix used in two years prior (unless the car is charged directly using a renewable source). In order to promote EVs, energy from renewable sources is multiplied by four. For rail – by 1.5. Hence, the bigger the share of RES in the energy mix and the faster the growth of EV, the quicker the goal will be achieved.
- **Biofuels**
By 2030, 4.5% of the energy used in Polish transport should come from second- and third-generation biofuels, which do not compete with food production and do not contribute to environmental degradation. These include used food oils, biogas or biofuels produced from industrial grade algae, biowaste, or straw. In road transport, energy from such biofuels will count doubly towards RES goals. In aviation and maritime transport, the multiplier is 1.2⁵². At the same time, as mentioned in the biomass section of this report, RED III is going to phase out the inclusion of deforestation-related biofuels (e.g., the case of Borneo⁵³) to count towards national targets. Furthermore, the directive restricts the threshold for including older generation biofuels (rapeseed or corn) towards the RES goal. For Poland, the share of first-generation biofuels used in transport is restricted to 5.6%. To reduce environmental pressure, RES goals may be reduced by member states if consumption of first-generation biofuels is reduced.

⁴⁸ We discussed this issue in the report: Energy Forum, *Flexibility of the National Electricity System. Diagnosis, Potential, Solutions*, 2019, <https://www.forum-energii.eu/elasticznosc-krajowego-systemu-elektroenergetycznego-diagnoza-potencjal-rozwiazania>.

⁴⁹ CSO, *Energy 2022*, Warsaw, 2022, <https://stat.gov.pl/obszary-tematyczne/srodowisko-energia/energia/energia-2022,1,10.html>.

⁵⁰ M. Dusillo, *Energy Transformation in Poland. 2023 Edition*, Energy Forum, 2023, <https://www.forum-energii.eu/transformacja-energetyczna-w-polsce-edycja-2023>.

⁵¹ EEA, *GHG Inventory UNFCCC Submission 15.04.2023*, 2023, https://cdr.eionet.europa.eu/pl/eu/mmr/art07_inventory/ghg_inventory/envzckvq/POL_2023_2021_27032023_151032.xlsx/manage_document.

⁵² Biofuels using used vegetable oil and animal fats can be used to meet a maximum of 1.7% of the RES target for road transport and 3% for air transport. They do not receive a multiplier in maritime and air transport.

⁵³ CNN, *Borneo is burning*, 2019, <https://edition.cnn.com/interactive/2019/11/asia/borneo-climate-bomb-intl-hnk/>.

- **Green hydrogen**

The most recent RED proposes the development of green hydrogen, which would be used in the Polish transport sector by up to 1%. For maritime transport, the goal is 1.2% and is indicative⁵⁴. The directive also considers newly established aviation goals within the ReFuelEU Aviation initiative⁵⁵. Based on this initiative a new regulation was created that aims to promote the use of sustainable aviation fuels (SAF)⁵⁶. It sets out goals for the use of SAF at 2% in 2025 and 6% in 2030⁵⁷. One of the three identified sustainable fuels is synthetic aviation fuel created using green hydrogen. The others are fuel waste and advanced biofuels. In 2030, 1.2% of the fuels used in aviation should be synthetic fuels.

Electrification and use of advanced biofuels and green hydrogen in transport are technological solutions that have only recently been entering the Polish economy. Until September 2023, there were only about 88,000 electric vehicles registered in Poland⁵⁸, and in late-2021 only 0.1% of the fuels used in transport were new-generation biofuels⁵⁹. Using green hydrogen or sustainable aviation fuels have not been accounted for yet. To fulfil the new RES goals, the transformation of the transport sector will have to speed up.

In the next section of our analysis, we present assumptions regarding the potential growth of renewables in transport, based on the assumptions set out in strategic documents presented in Table 3.

- Electric vehicles—in line with the most recent scenario of the Polish Energy Policy, by 2030, there will be:
 - 1.7 million electric passenger vehicles (BEV) and hybrid vehicles (PHEV);
 - 7,200 electric buses in public transportation;
 - 2,900 electric light delivery vehicles.

This is an optimistic scenario. Global trends show an average 34% y/y increase in EV registration between 2016 and 2023⁶⁰. If this development pathway was applied in Poland, there would be about 800,000 electric vehicles by 2030. However, in countries where transport electrification began earlier and support systems have developed with it, the rate of growth is higher. There were 70% more EVs registered in Poland in September 2023 compared to September 2022⁶¹.

- Rail growth—Appendix 2 to the Polish Energy Policy assumes that 5,315 GWh of electricity will be used by rail by 2030 (compared to 3,220 GWh in 2021). Growth of railways will, on the one hand, reduce the demand for road transport and hence, reduce the demand for oil. On the other hand, this will increase the demand for power from RES.
- Biofuels—in line with the Polish Energy Policy, use of first-generation biofuels in Poland will drop from 1,100 ktoe in 2021 to about 1,000 ktoe (4.3% of used fuels) in 2030. Simultaneously, the share of next-generation biofuels, in particular those made from used food oils, will increase to 1.8% (418 ktoe).
- Green hydrogen—the Polish Hydrogen Strategy⁶² shows that in 2030, Polish road transport will be using 22,500 tonnes of green hydrogen. The strategy indicates that 7,000 tonnes of hydrogen will also be used in aviation as synthetic fuels, and 245 tonnes will be used by maritime transport.

54 Countries can also limit this target to 13% of energy in maritime transportation.

55 European Parliament, *By 2050 70% of EU airport jet fuels will have to be green*, 2023, <https://www.europarl.europa.eu/news/en/press-room/20230911IPRO4913/70-of-jet-fuels-at-eu-airports-will-have-to-be-green-by-2050>.

56 Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation) (Official Journal of the EU L 2023/2405).

57 Sustainable jet fuels are synthetic jet fuels (using RFNBO), jet fuels using advanced biofuels, or reused jet fuels.

58 PSPA, *Electromobility counter: number of fast charging stations in Poland exceeds 1,000*, 2023, <https://pspa.com.pl/2023/informacja/licznik-elektromobilnosci-liczba-szybkich-stacji-ladowania-w-polsce-przekroczyla-1-tys/>.

59 Eurostat, *SHARES*, *op. cit.*

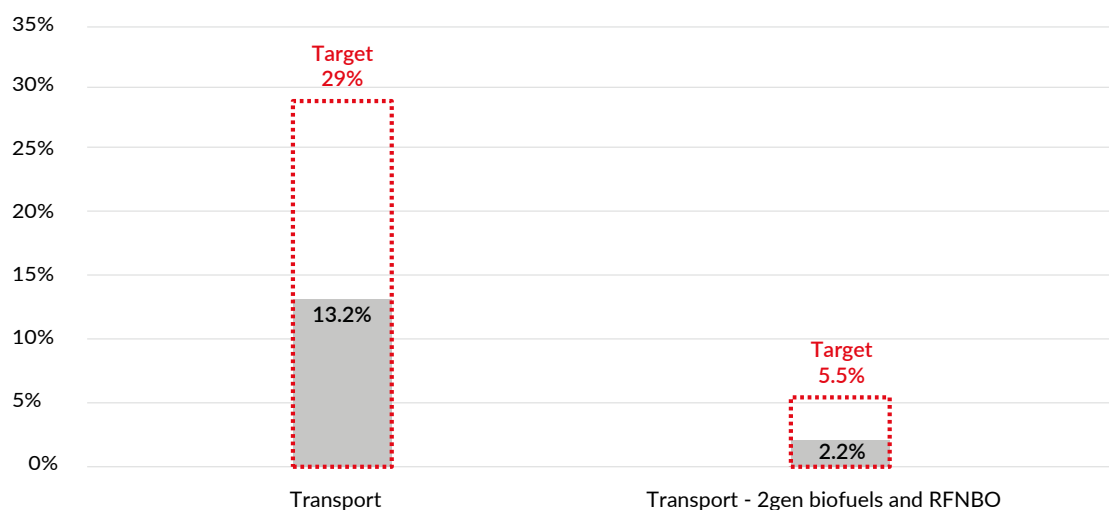
60 IEA, *Electric Vehicles*, <https://www.iea.org/energy-system/transport/electric-vehicles>.

61 PSPA, *op. cit.*

62 Ministry of Climate and Environment, *Polish Hydrogen Strategy to 2030 with an Outlook to 2040*, 2021, <https://www.gov.pl/web/klimat/polska-strategia-wodorowa-do-roku-2030>.

Based on these assumptions, the Polish RES goal for transport will not be met. This is due to delays in electromobility implementation and the low share of RES anticipated in the 2030 power mix.

Figure 8: Use of renewable sources and decarbonisation of transport in Poland in 2030



Sources: own calculations based on the strategic documents listed in Table 3 (NAPE, PEP2040, PSW, SC, Scenario 3).

If Poland fulfils the assumptions from its strategic documents, the share of RES in transport can reach 13% in 2030. This would reduce the use of fossil fuels by 2 million tonnes (9% of consumption in 2021).

17

8.3. Heating (and cooling) production

Until now, heating in Poland was mainly derived from coal, gas, and biomass. Burning these fuels, however, contributes to smog and GHG emissions as well as the need to import energy resources. Therefore, RED III set out goals connected to heating (and cooling⁶³) in:

- Buildings (individual, agricultural, commercial);
- District heating systems;
- Industry.

RED III indicates the required rate at which the use of renewable sources should grow in heating and cooling: by 0.8% annually between 2021 and 2025. Between 2026 and 2030, the rate should increase to 1.1% per annum. These goals are obligatory for all member states.

The newest version of the Renewable Energy Directive also contains indicative goals, which, when complementing obligatory goals, should lead to an increase in the share of RES in heating and cooling by 1.6%-1.8% annually. This should result in a share of 39.3% of RES in Poland in heating and cooling in 2030. In order for this to happen, heating and cooling methods need to change in specific sectors of the Polish economy.

63

In this study, we do not analyse in detail the production of cooling, which is largely driven by the need for room air conditioning.

- **Buildings**

By 2030, the national share of RES in this segment should be 36.3% (compared to 22.8% in 2021⁶⁴), considering an EU-wide division of effort. This new, indicative goal can be reached by, among others, replacing coal and gas boilers with heat pumps and through the transformation of district heating systems to the use of renewable sources⁶⁵. Changing the way buildings are heated and cooled must go hand in hand with their modernisation to increase energy efficiency. RED III in particular encourages installing heat pumps that draw energy from renewable sources. High efficiency pumps, according to the European Commission's calculations, result in 1 MWh of electric energy being transformed into 2.5-3.5 MWh of renewable thermal energy⁶⁶. Additionally, electric energy from renewable sources (such as wind or solar) used in heat pumps is also counted as RES in buildings⁶⁷.

- **District heating**

By the end of this decade, 29.4% of the heating from municipal heating plants in Poland should come from renewable sources (an indicative goal that also includes cooling). Currently, the share is 7.6%⁶⁸. Due to restrictions on biomass use (see Chapter 5) realizing this goal will require electrifying heating by installing large-scale heat pumps and electrode boilers. Both solutions need a rapid increase of renewable sources within the power mix. Simultaneously, these can help in managing the surplus from RES production if provided with heat-storage capacities (we explore these solutions in depth in our analysis *The power system needs heating*⁶⁹). The newest Renewable Energy Directive also encourages the heating industry to use residual heating from, i.e., industrial processes, waste, and data centres⁷⁰.

- **Industry**

Industry uses 15% of the heating produced in Poland. Increasing the share of RES in industrial heating will contribute not only to fulfilling goals in heating and cooling but also in the industrial sector.

In the next part of our analysis, we present assumptions regarding the growth of renewables in heating and cooling production in Poland, based on the strategic documents listed in Table 3.

- **Heat pumps in individual heating**

In line with the assumptions of *Scenario 3. To the pre-consultations of the NECP and PEP2040 update*, by 2030, there should be about 1.7 million functional heat pumps in buildings. By the end of 2022 there have been about 530,000 heat pumps installed, around 200,000 of which were installed in 2022⁷¹. Maintaining the current rate of installations by 2030 would enable exceeding the aforementioned assumptions.

⁶⁴ RES share calculated using methodology from the REDIII Directive based on statistics on primary energy consumption in the following sectors: households, services, agriculture, forestry, fisheries. Source: Eurostat, *Complete Energy Balances*, 2023, https://ec.europa.eu/eurostat/databrowser/product/view/nrg_bal_c.

⁶⁵ In the buildings section, the RED III directive limits the target to heat generated in or near a building, such as a boiler plant that supplies heat to an entire group of buildings. Connecting a building to a district heating system will exclude from the target the energy used in it.

⁶⁶ Between 2.5 MWh for air-to-water pumps and 3.5 MWh for ground-to-water pumps. Source: *Commission Decision of March 1, 2013, establishing guidelines for Member States on the calculation of renewable energy from heat pumps for different heat pump technologies pursuant to Article 5 of Directive 2009/28/EC of the European Parliament and of the Council* (Official Journal of the EU 2013 L 62/27).

⁶⁷ Counting electricity from RES used to generate heat and cooling can cover a maximum of 0.4 percentage points of the RES target for heat and cooling. Countries that choose to count electricity toward the heat and cooling target will have to increase their overall heat and cooling RES targets by half the value of that electricity, or a maximum of 0.2 percentage points year on year.

⁶⁸ Data for 2021. Source: Eurostat, *Electricity and derived heat production by fuel type*, 2023,

⁶⁹ A. Rubczynski. J. Maćkowiak-Pandera, *Electricity system needs heat*, 2021, Energy Forum, <https://www.forum-energii.eu/system-elektroenergetyczny-potrzuje-cieplownictwa>.

⁷⁰ Adding waste heat to meet the RES target in heat and cooling is limited to 20% of the target and will result in an increase in the target by half the value of waste energy. This may be due to the fact that the source of waste heat can be fossil fuels.

⁷¹ P. Lachman, *Heat pump market in Poland and Europe – what challenges will we face in 2023?*, 2023, PORT PC, https://portpc.pl/pdf/11Kongres/1.2_Pawel_Lachman.pdf.

- **District heating**

In 2022, the *Heating strategy up to the year 2030 with a 2040 perspective* draft document was published⁷². In the 'Fit for 55' scenario, the draft suggests that by the end of the decade, the role of RES is going to increase up to:

- 23% from biomass;
- 5% from biogas;
- 13% from system heat pumps and electrode boilers.

The remaining resources are gas (48%) and coal (1%). This scenario is optimistic considering the fact that electrification of heating has only just begun, and the potential of biomass is limited in line with the new restrictions. Nevertheless, there is an urgency to modernise The Polish heating systems as the existing installations are becoming old and increasingly costly due to rising prices of emission allowances⁷³.

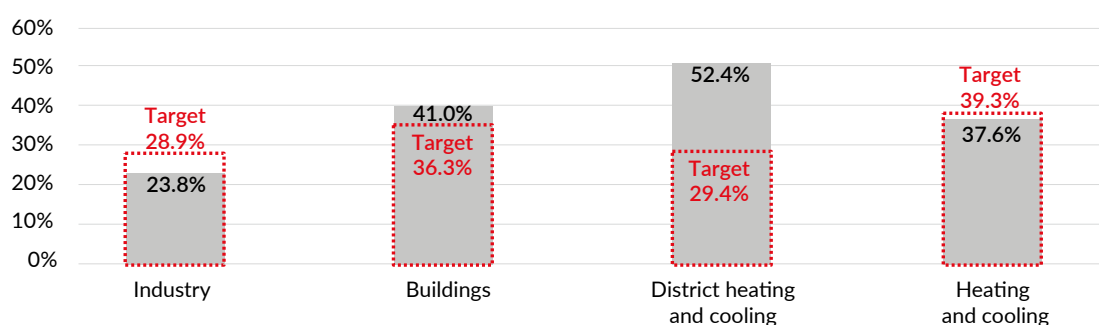
- **Industrial heating**

For the needs of this analysis, we assumed that the growth of the share of renewable heat will be the same as in district heating systems. An increased use of renewable sources in industry comes from the need to decarbonise supply chains, in line with the requirements of corporate social responsibility and financing policies induced by the taxonomy.

Thus far, Polish renewable targets have been met mostly through burning biomass. Due to new restrictions, the growth of renewables used in heating and cooling is going to require fast growth in new innovative technologies, especially smaller and larger heat pumps. Figure 9 illustrates how fulfilling these assumptions is going to impact meeting RES goals in buildings, district heating and cooling (heat plants and power plants), and heating and cooling in general (district heating, individual heating, industrial heating).

19

Figure 9: The use of renewable sources in industry, buildings and heating (including the renewable fraction of heat and electricity), and use of renewable sources for heating and cooling in total by 2030



Sources: own calculations based on data from the strategic documents included in Table 3 and own assumptions.

Implementing the plans set in the government's strategic documents should lead to the share of RES in heating and cooling in Poland to be 37.6% in 2030. This should contribute to a reduction in gas use by 0.2 bcm (15.5 bcm used in 2021) and coal by 21.4 million tonnes (compared to 27.5 million tonnes in 2021).

⁷² Ministry of Climate and Environment, *Heat Strategy to 2030 with an Outlook to 2040*, 2022, <https://bip.mos.gov.pl/strategie-planu-programy/strategia-dla-cieplownictwa-do-2030-r-z-perspektywa-do-2040-r/>.

⁷³ For more on the diagnosis and solutions for the Polish district heating industry, see the Energy Forum report, *The district heating company of the future. A New Business Model*, 2021, <https://www.forum-energii.eu/pl/analizy/nowy-model-biznesowy>.

8.4. Industry

The most recent RED introduces an indicative goal for the growth of renewables sources in industry of 1.6% annually, which translates to 29% in the EU by 2030. Introducing this indicative target will increase the transparency of fuel use within industry. In 2021, the share of RES in industry was 11.5%. Future growth of renewable sources according to RED III should be done through the following actions:

1. Greening heating and cooling;
2. Increasing the share of RES in consumed electricity (in the analysis we assumed the share to be 47%);
3. Substituting grey hydrogen (produced using natural gas and coal) with green hydrogen (produced using renewable energy and electrolysis).

The European Union set a target to increase green hydrogen use to 42% by 2030. By 2035, the target is set to 60%. EU member states will be able to decrease the targets to 33.6% and 48% as long as they can prove that their overall RES goal will be met and that hydrogen used in the economy is only partially (23% or less) derived using fossil fuels.

The requirement of greening hydrogen is not going to pertain to all sectors. Processes linked to traditional fuels production and biofuels will be excluded from the goal. Green hydrogen is also not supposed to substitute hydrogen created as waste from industrial processes (for example, in coking plants). The new targets are particularly applicable to fertilisers and food industries.

According to the analysis of the Energy Institute *Prognosis of demand for renewable hydrogen RFNBO in Poland by 2030*, 190,000 tonnes of green hydrogen should be used by Polish industry in order to meet the 42% goal.

According to the *Polish Hydrogen Strategy up to 2030*, 138,200 tonnes of green hydrogen will be used in Polish industry by 2030.

Figure 10 shows how the development of green hydrogen will impact the Polish industry's RES target by 2030.

Figure 10: Use of renewables and green hydrogen in the Polish industry in 2030



Source: own calculations based on data in the strategic documents included in Table 3 and own assumptions.

Should the targets set in Polish strategic documents be met, the share of RES in the Polish industry will reach 23.8% in 2030. Switching grey hydrogen for its green alternative will contribute to a reduction of around 500 million cubic metres of natural gas. Additionally, there will be a reduction in coal use, which was not estimated in this report.

9. Summary of the goals

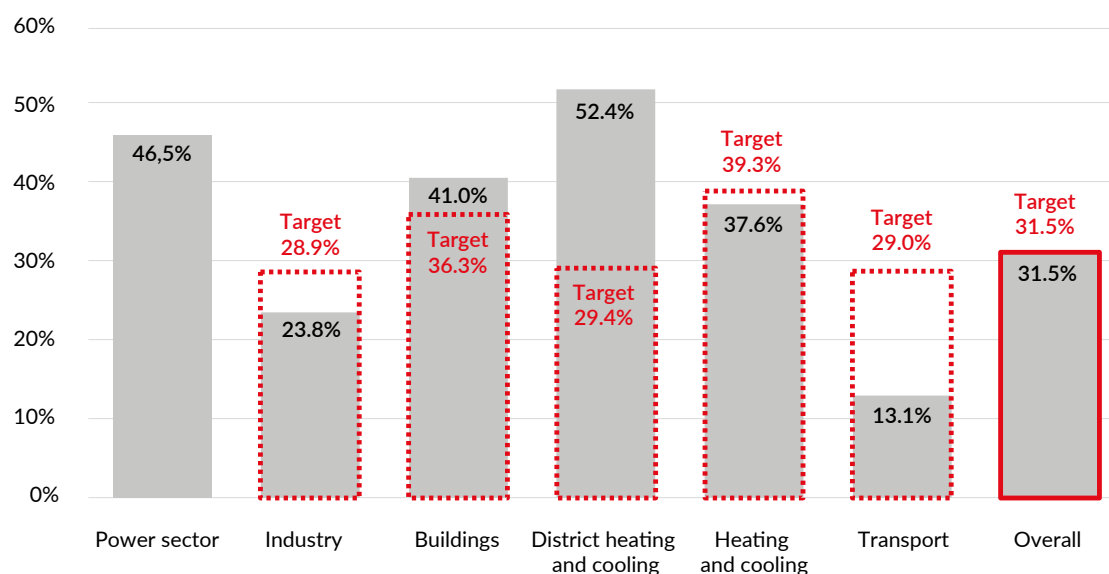
If the transformation goals set out in Polish strategic documents (listed in Table 3) are met, the share of renewables in Poland will reach 31.5% in 2030. In order for this to happen, the following conditions must be met:

- The development of renewables in the power sector must increase, leading to at least 47% of electricity production by 2030;
- The pace of electromobility growth must be maintained (at least 50% of new EVs being registered in Poland year on year);
- The district heating sector must start investing in modern technologies, especially large-scale heat pumps, electrode boilers, and heat storage;
- The pace of building renovations must increase and the pace of heat pump installations must be maintained;
- The use of green hydrogen in industry must grow rapidly.

Meeting all of these goals will be a challenge. While RES development in the power sector recently sped up, quicker transformation is needed in the remaining sectors.

Figure 11 summarises the prognosed share of RES in specific areas of the economy in 2030 (based on strategic administrative documents) and compares it with the proposed growth of RES based on RED III targets.

Figure 11: Share of RES in individual areas of the Polish economy and targets under the RED III directive



Source: own calculations based on data derived from strategic documents listed in Table 3 and own assumptions.

10. Moving ahead

In such sectors as: industry, transport and heating, the energy transition will require electrification and development of decarbonised fuels (especially biomethane and green hydrogen). The Polish administration has been working on these topics since the end of the previous decade. Based on strategic and technical documentation prepared by, among others, the Ministry of Climate and Environment (Table 3), the pace of growth compliant with RED III is within Poland's reach.

While creating a new decarbonisation strategy for the Polish economy (NECP), public administration should consider a scenario in which the power system transforms at a quicker rate than previously assessed. The most recent scenario on the changes within the Polish power sector points to a 47% RES share by 2030. The scenario merely the implementation of ongoing investments that have grid connection permits⁷⁴. This means that additional RES projects could be developed, if the following conditions were met:

- Availability of more grid capacity to connect new investments;
- Lower minimum distance for placement of wind turbines (500m instead of 700m);
- Easier permitting for renewables and grid development;
- Increase in the flexibility of the energy system, to enable better energy management in times of surplus and deficiency;
- Predictable and investor-friendly legislation.

A quicker transformation of the power sector than appears in the *Scenario 3* strategic document is feasible. In the referenced *Scenario 3* document, coal-based electricity production remains at a high level (69 TWh)⁷⁵ because the analysis assumes unrealistically high gas prices and unrealistically low CO₂⁷⁶ and coal⁷⁷ prices. Maintaining the mix presented in *Scenario 3* exposes Poland to high costs and a gap in emission allowance allocation versus demand (which we explored in more detail in *The Spectre of the ETS Gap*⁷⁸). This is why a higher share of renewables in the power sector should be sought after.

An increased share of RES in the power mix will have an impact on all other sectors. This correlation has been analysed below with the following assumptions:

- renewables account for 60% or 70% of produced electricity;
- The development of green hydrogen is in line with targets set by the Polish Hydrogen Strategy or RED III.

Results of this analysis are presented in Figure 12.

⁷⁴ PSE, *Development Plan for Meeting Current and Future Electricity Demand for 2023-2032*, 2022, https://www.pse.pl/documents/20182/21595261/Dokument_glowny_PRSP_2023-2032.pdf/291785a3-7832-4cb6-a5ae-971d29024b82?safeargs=646f776e6c6f61643d74727565.

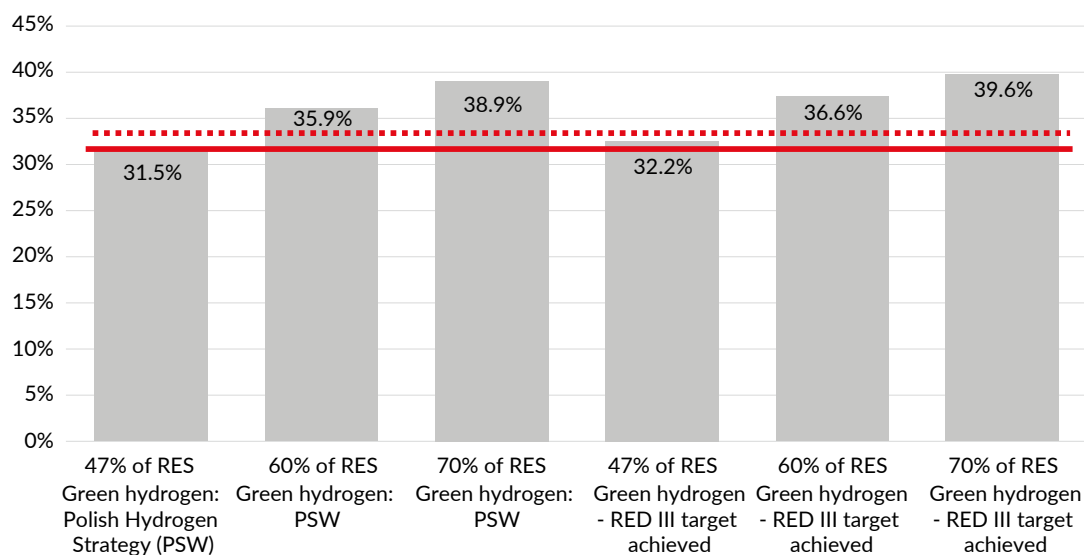
⁷⁵ Ministry of Climate and Environment, *Scenario 3. For pre-consultation of the NAPE/PEP2040 update*, op.cit.

⁷⁶ Assumed price of €80/ton CO₂ vs. forecasts of €128/ton CO₂. Source: Carbon Pulse, *UKA and EUA ANSWER: Analysts cut UKA forecasts, leaving EUA outlook unchanged*, 2023, <https://carbon-pulse.com/215065/>.

⁷⁷ ERBEIK, *Council Position on Electricity Sector Forecasts in PEP2040*, 2023, <https://rada-energetyczna.pl/stanowisko-radybeik-pep2040>.

⁷⁸ T. Adamczewski, J. Maćkowiak-Pandera, *Spectrum of the ETS Gap*, 2021, Energy Forum, <https://www.forum-energii.eu/widmo-luki-ets>.

Figure 12: Comparison of scenarios for meeting the RES target, with higher shares of renewables in electricity and with greater use of green hydrogen



Source: own compilation based on data in the strategic documents included in Table 3 and own assumptions.

As shown in Figure 12, a 60% share of RES in the power mix would increase the share of reported renewables in the Polish economy up to 37%⁷⁹. Increasing the share of RES in the energy mix by 2030:

- compensates for the delays of Poland in implementing electromobility and green hydrogen growth,
- reduces the need to purchase EU ETS allowances,
- enables Poland to reach its RES indicative goal of 33.4%.

23

Poland's and the EU's energy transformation will not stop at 2030. According to long term strategies, the EU should reach climate neutrality by 2050. The trajectory for further reductions is analysed by the European Scientific Advisory Board on Climate Change created by the EU climate law⁸⁰. In June 2023, the Council issued a recommendation for EU's net emissions to fall by 90-95% by 2040⁸¹. Setting future targets is on the European Commission's agenda⁸². A quicker implementation of renewable sources in Poland will make it easier to commit to future decarbonisation goals.

⁷⁹ By demonstrating to the European Commission that the overall RES target will be met in Poland, the rate of green hydrogen deployment in Polish industry could be reduced by 20%.

⁸⁰ Regulation (EC) No 401/2009 of the European Parliament and of the Council of April 23, 2009, on the European Environment Agency and the European Environment Information and Observation Network (Official Journal of the EU 2009 L 126/13).

⁸¹ ESABCC, *Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030-2050*, 2023, <https://climate-advisory-board.europa.eu/reports-and-publications/scientific-r.-advice-for-the-determination-of-an-eu-wide-2040>.

⁸² Politico, *EU climate chiefs back radical new 90 percent emissions target*, 2023, <https://www.politico.eu/article/eu-climate-chiefs-back-radical-new-90-percent-emissions-target-2040/>.

11. Summary and recommendations

If Poland implements its transformation strategies, created over the recent years by the Polish administration, it will meet the 31.5% renewables target set by RED III. Fulfilling this goal will require a coordinated effort of all sectors of Polish economy.

A dynamic growth of RES translates into higher energy security, reduced costs of fossil fuels imports, and subsequently lower GHG emissions. Simultaneously, more dynamic changes, possible in the power sector, will make it easier for Poland to reach its goals in the following decade.

The pace of the transition, however, must be based on a thought-through and realistic plan. Currently, a new National Climate and Energy Plan is being prepared; this should set transformation pathways for specific sectors of the Polish economy. At the same time, there is a need for a comprehensive package of new legislation, which would decrease barriers to the transition and increase investment in the green transition.

Recommendations:

- The Polish government should prepare a new National Climate and Energy Plan in collaboration with relevant stakeholders so that transition goals reflect the potential and needs of specific branches of the Polish economy. The new NECP should show, in a complex way, the interconnectedness of changes in specific sectors of the economy.
- There is a need to strengthen analytical centres (for example, Centre for Climate and Energy Analysis) for the Polish government to proactively analyse the impacts of proposed climate and energy policy before it becomes a binding law on an EU level. Thanks to this approach, Poland would be able to actively and constructively participate in discussion about the next (2040) goals in the EU Council.
- The government should create a support system for green hydrogen production for industry. Financial support should only be directed where electrification is not technically viable, for example in aviation fuels, fertilisers, and steel production. Support for green hydrogen in transport should be limited to aviation and maritime shipping fuels. Spending public funds should be used to decrease the amount of green hydrogen imported in the future to avoid creating a dependency on another energy source.
- Plans for RES development in the power sector should be updated and the role of coal should be limited to balancing the system in case of lack of investment in new technologies. The higher share of RES in the power sector will help other sectors undergo the energy transition faster.
- There is a need for a comprehensive analyses of biomass potential in Poland. The biomass volumes shown in the draft Heating Strategy seem to be overly optimistic.
- In order to increase the pace of growth of renewable resources in the power sector, the following actions should be taken:
 - The minimal distance rule between wind power plants and buildings should be decreased to 500m to allow for wind power to grow to 19 GW by the end of the decade, compared to 12 GW with the 700 m limit⁸³;
 - Government guarantees should be created for investments linked to direct-wire investments, so that investors do not have to acquire connection permits, which currently creates obstacles for investments;
 - The flexibility of the power system should be increased along with investments to create new connection capacities.

Appendix 1. Assumptions for calculating RES targets in individual European Union countries

The formula to calculate effort-sharing towards the RES target can be found in Annex II of the Regulation on the Governance of the Energy Union and Climate Action.

Table 4. Data used to calculate the overall RES targets for individual EU member states

State	2020 target ^a	C _{Flat} ^b	C _{GDP} ^c	C _{Potential} ^d	C _{Interco} ^e
Luxembourg	11%	1	150%	0%	109%
Ireland	16%	1	150%	8%	7%
Denmark	30%	1	128%	7%	51%
Netherlands	14%	1	131%	4%	18%
Austria	34%	1	130%	5%	15%
Sweden	49%	1	125%	5%	26%
Germany	18%	1	124%	7%	9%
Belgium	13%	1	119%	3%	19%
Finland	38%	1	111%	0%	29%
Malta	10%	1	95%	15%	24%
France	23%	1	106%	5%	9%
Slovenia	25%	1	83%	3%	84%
Estonia	25%	1	77%	7%	63%
Lithuania	23%	1	75%	-1%	88%
Italy	17%	1	98%	3%	8%
Spain	20%	1	90%	4%	6%
Czech Republic	13%	1	88%	2%	19%
Cyprus	13%	1	85%	9%	0%
Slovakia	14%	1	75%	3%	43%
Portugal	31%	1	77%	11%	9%
Hungary	13%	1	68%	2%	58%
Croatia	20%	1	61%	4%	52%
Latvia	40%	1	64%	-3%	45%
Greece	18%	1	69%	3%	11%
Poland	15%	1	68%	3%	4%
Romania	24%	1	58%	5%	7%
Bulgaria	16%	1	48%	4%	7%

25

Data sources:

- Annex I. Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (Official Journal of the EU 2018 L 328/82).
- Annex II. Regulation (EU) 2018/1999 of the European Parliament and of the Council of December 11, 2018. on Governance of the Energy Union and Climate Action, amending Regulations (EC) No. 663/2009 and (EC) No. 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No. 525/2013 of the European Parliament and of the Council, (Official Journal of the EU L 328/1).
- Eurostat, GDP per capita in PPS, 2023, <https://ec.europa.eu/eurostat/databrowser/view/tec00114/default/table?lang=en>.
- European Commission, Commission staff working document impact assessment, A policy framework for climate and energy in the period from 2020 up to 2030, 2014, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0015>.
- European Commission, Communication on strengthening Europe's energy networks, 2017, https://energy.ec.europa.eu/system/files/2017-11/communication_on_infrastructure_17_0.pdf.

Appendix 2. Specific targets for the development of renewable technologies at the European Union level in the strategies and communications of the European Commission

Table 5. Specific targets for the development of renewable technologies at the EU level in European Commission strategies and communications

Sector	Year	Target	Source
Wave energy	2030	1 GW	EU strategy to harness the potential of offshore renewables for a climate-neutral future, 2020, https://eur-lex.europa.eu/legal-content/PL/TXT/HTML/?uri=CELEX:52020DC0741
	2050	40 GW	
Offshore wind	2030	60 GW	
	2050	300 GW	
PV	2025	320 GW	EU Solar Energy Strategy, https://eur-lex.europa.eu/legal-content/PL/TXT/HTML/?uri=CELEX:52022DC0221
	2030	600 GW	
Heat pumps	2027	27 million installations	European Commission, <i>Heat Pumps</i> , https://energy.ec.europa.eu/topics/energy-efficiency/heat-pumps_en#:~:text=The%20objective%20is%20to%20install,them%20hydraulic%20(including%20hybrids)
	2030	47 million installations	
Green hydrogen	2024	6 GW of electrolyzers	European Commission, <i>Hydrogen Strategy for a Climate Neutral Europe</i> , https://eur-lex.europa.eu/legal-content/PL/TXT/HTML/?uri=CELEX:52020DC0301
	2030	40 GW of electrolyzers	
Biomethane	2030	35 billion m ³	European Commission, <i>Biomethane</i> , https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomethane_en#:~:text=The%20Biomethane%20Industrial%20Partnership%20(BIP,of%20its%20potential%20towards%202050.
Innovative technologies	2030	5% of all RES used	European Commission, <i>Strategic Energy Technology Plan</i> , https://energy.ec.europa.eu/topics/research-and-technology/strategic-energy-technology-plan_en
Sustainable aviation fuels	2025	2%	European Parliament, <i>Sustainable aviation fuels: transport MEPs give green light</i> , https://www.europarl.europa.eu/news/en/press-room/20230626IPR00829/sustainable-aviation-fuels-transport-meps-give-green-light
	2030	6%	
	2035	20%	
	2040	34%	
	2045	42%	
	2050	70%	
Synthetic aviation fuels	2030	1,2%	European Parliament, <i>Sustainable aviation fuels: transport MEPs give green light</i> , https://www.europarl.europa.eu/news/en/press-room/20230626IPR00829/sustainable-aviation-fuels-transport-meps-give-green-light
	2032	2%	
	2035	5%	
	2050	35%	

Appendix 3. Specific RES targets in the European Union and Poland until 2030.

Table 6. Detailed RES shares in the EU and Poland in 2020 and the new RES targets from RED III

Sector	Share of RES in 2020 in the EU (%)	Share of RES in 2020 in PL (%)	EU target (%)	EN target (%)	EU target for the sector by 2030 (%)	PL target for the sector by 2030 (%).	Obligatory - O Indicative - I	Indicator	Period
The entire economy	22.1	16.1	45	33.4	45.0	33.4	I	In final energy consumption	2030
The entire economy			42.5	31.5	42.5	31.5	O	In final energy consumption	2030
Buildings	28.5	22.2	49	36.3	49.0	36.3	I	In final energy consumption	2030
District heating	31.6	7.4	2.2		53.6%	29.4%	I	YoY growth in final energy consumption	2021-2030
Heating and cooling	22.9	22.2	0.8		38.9	39.3	O	YoY growth in final energy consumption	On average in 2021-2025
Heating and cooling			1.1				O	YoY growth in final energy consumption	On average between 2026 and 2030
Heating and cooling			1.0	0.8			I	Additional y/y growth in final energy consumption	On average in 2021-2025
Heating and cooling			0.7	0.5			I	Additional y/y growth in final energy consumption	On average between 2026 and 2030
Total transportation - advanced biofuels*, biogas and RFNBO	n.a.	0.2	1.0		1.0	1.0	O	In final energy consumption	2025
Total transportation – advanced biofuels, biogas and RFNBO**	n.a.	n.a.	5.5		5.5	5.5	O	In final energy consumption	2030
Total transport – RFNBO	n.a.	n.a.	1.0		1.0	1.0	O	In final energy consumption	2030
Maritime transport – RFNBO	n.a.	n.a.	1.2	1.2	1,2	1.2	I	In final energy consumption	2030
Transport – aviation (SAF***, including RFNBO**)	n.a.	n.a.	2.0		2.0	2.0	O	In final energy consumption	2025
Transport – aviation (SAF***, including RFNBO**)	n.a.	n.a.	6.0		6.0	6.0	O	In final energy consumption	2030
Transport – RFNBO aviation	n.a.	n.a.	1.2		1.2	1.2	O	In final energy consumption	2030
Transport – total	7.7	5.8	29.0		29.0		O	In final energy consumption	2030
Transport – emissivity			14.5		14.5		O	CO ₂ intensity reduction	2030
Industry	16.7	12.9	1.6		32.7	28.9	I	YoY growth in final energy consumption	On average in 2021-2025; 2026-2030
Industry – RFNBO	n.a.	n.a.	33.6-42.0		33.6-42.0		O	In the hydrogen consumed	2030
Industry – RFNBO	n.a.	n.a.	48.0-60.0		48.0-60.0		O	In the hydrogen consumed	2035

*Advanced biofuels - fuels of biological origin of second- and third-generation, not competing with food production.

**RFNBO - Renewable Fuel of Non-Biological Origin - liquid and gaseous fuels whose energy value is derived from renewable sources other than biomass, e.g., green hydrogen created by electrolysis using electricity from renewable sources.

***SAF - Sustainable Aviation Fuels: aviation fuels using RFNBO, aviation fuels using advanced biofuels, reused aviation fuels.

Sources: own calculations and data based on: Directive (EU) 2023 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC with regard to the promotion of energy from renewable sources and repealing Council Directive (EU) 2015/652; Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation).

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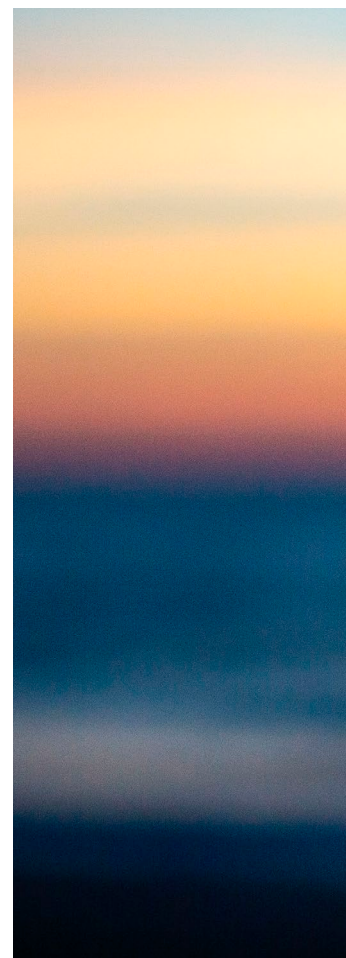
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Notes

32

Understanding EU's and Poland's Renewable Energy Goals



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