



**BARRIERS AND BEST PRACTICES
FOR WIND AND SOLAR ELECTRICITY IN THE
EU27 AND UK**

Final report | March 2022

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EXECUTIVE SUMMARY

The Paris Agreement set the target of limiting global warming to well below 2°C and preferably to 1.5°C. The fast decarbonisation of the electricity sector represents a key step towards achieving this commitment. To this end, the European Union (EU) has set ambitious plans to transition the continent to climate neutrality by 2050 as part of the 'European Green Deal' initiative. Plans include doubling the share of renewables in the energy mix to at least 40% by 2030, and increasing the amount of new renewable energy installed from 30–35 GW to 45–65 GW per year between 2020 and 2030. In the current context of the Russian Federation's invasion of Ukraine, reducing the EU's dependence on Russian gas appears even more crucial. President Putin's war has sent shockwaves through Europe, and led EU leaders to double down on their commitment to renewable energy¹, and even propose higher targets².

Higher renewable energy targets imply massive solar PV and wind energy deployment at a higher pace in the EU Member States and the UK.³ Yet, currently, no EU country has fully adequate policies that ensure the necessary deployment of solar PV and wind energy during the next decade and beyond. Across Europe, numerous barriers block, slow or hinder the development of these technologies.

This report, which is based on research conducted between April and December 2021, is the first major study into the barriers to the deployment of wind and solar PV projects in the 27 EU Member States and the UK, taking into account country-specific development estimates up to 2035. If European nations and the EU are serious about reducing dependence on Russian gas, then these are the barriers that will need to be overcome so that wind and solar PV projects can be built at a higher pace in the coming years.

The Barrier Index (BI) at the heart of this report, assesses the barriers to wind and solar PV deployment in four key areas: political and economic frameworks, markets, administrative processes, and grid regulation and infrastructure. The report also presents concrete best practices examples which are succeeding in bringing forward solar PV and wind energy projects at national level and which could serve as a model to other countries.

¹ Speech by President von der Leyen at the European Parliament Plenary on 16 February 2022: https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_22_1101

² <https://www.eppgroup.eu/newsroom/news/epp-group-aims-for-higher-renewables-targets>

³ Modelling study of Ember / Artelys on decarbonising the European power sector by 2035.

This report has been produced together with a RES Policy Monitoring Database, an online platform providing more detailed information about the barriers and best practices found as part of this research project.

Main conclusions of the report:

- Barriers related to **administrative processes** are now the biggest roadblock to developments in Europe. An overwhelming majority of countries face administrative issues blocking deployment, especially the high complexity, long duration and low transparency of administrative procedures. The integration of renewables in **spatial and environmental planning** represents another major challenge. These barriers are also amongst the most severely rated. In Hungary, Ireland and Poland barriers are rated so serious as to make project development nearly impossible – at least for wind energy.
- Barriers related to the **political and economic framework** are found all over Europe. While they are no longer as dominant as in the past, these barriers remain the most serious blocks in Hungary and Romania, and more recently in Lithuania and Italy.
- **Market structure** is still a block to development. While these barriers are generally less serious, they are especially problematic in Italy, Czechia, Germany, Finland, Spain, Poland, Hungary and France.
- Wind and solar PV projects also face issues dealing with the cost of **grid access** or the transparency of the grid connection procedure. Countries such as Hungary, Greece, Bulgaria, Austria or Belgium are strongly affected.

As shown in the figure below, there are high barriers to development in all 28 countries. This conclusion, and the large input on specific barriers identified in the accompanying [RES Policy Monitoring Database](#) illustrate the scale of the challenge Europe faces in deploying wind and solar energy at the scale needed to decarbonise Europe's power sector and reduce reliance on imported energy.

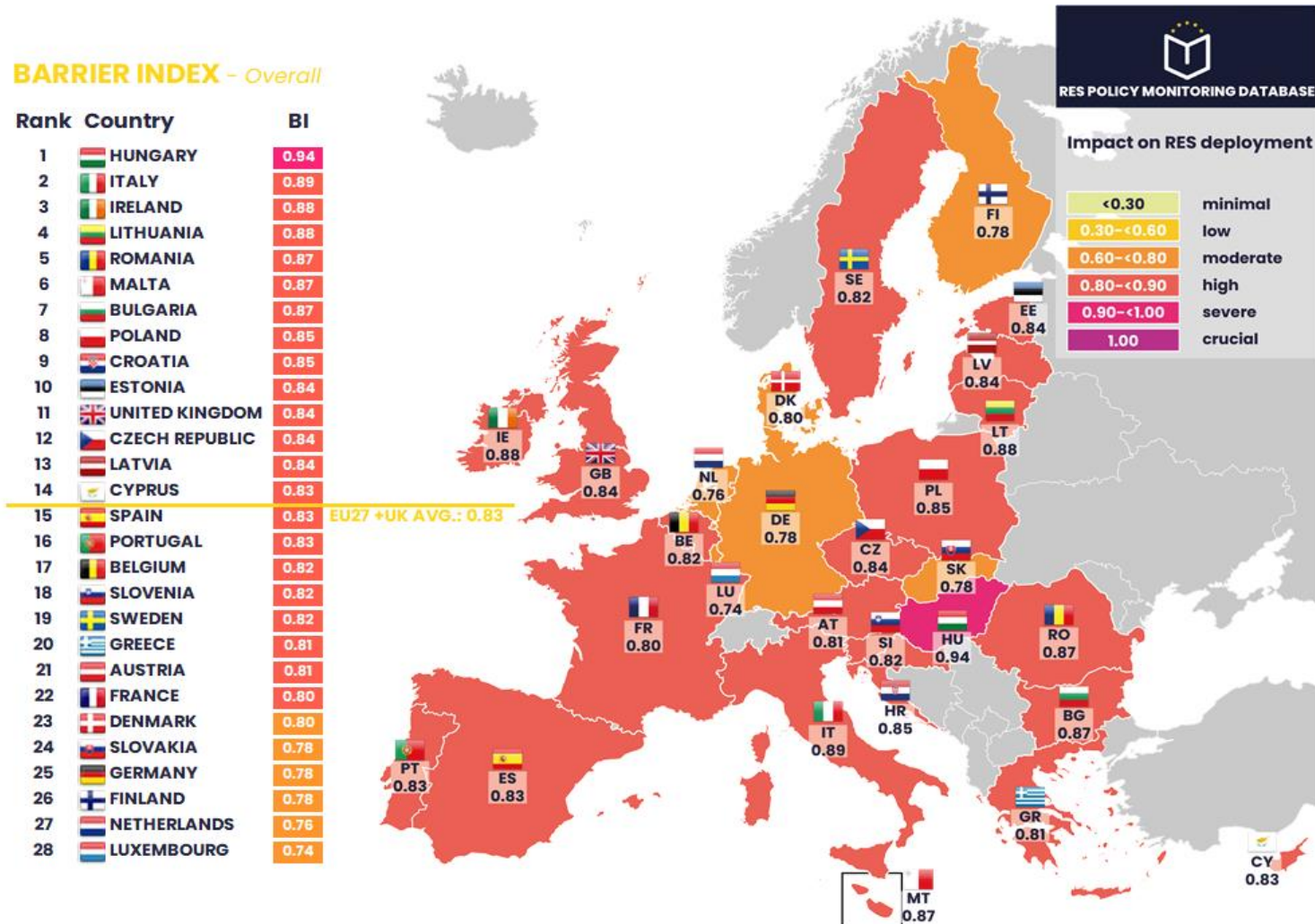


Figure 1: Overall Barrier Index, displayed as a ranking and as a map, showing the degree of severity of the barriers' impact on RES deployment in the EU27 and UK (source: eclareon GmbH)

INTRODUCTION

Recent positive international and European policy developments

Overall, there appears to be a growing political consensus on the need to achieve climate neutrality. Particularly in 2021, momentous steps were announced to limit global warming to well below 2°C and, preferably, to 1.5°C, as set in the Paris Agreement.

In April 2021, the President of the United States, Joe Biden, initiated the Climate Leaders Summit. The Summit gathered 40 government leaders and allowed for significant announcements from several countries on their national emission reduction targets. The United States announced an ambitious climate agenda, including the decarbonisation of the electricity sector by 2035. The European Union presented its newest proposal for a "Climate Law" and advocated for raising the target for renewables (RES) to 40% of the Union's gross final energy consumption by 2030.

In May 2021, the Environment Ministers of G7 countries announced that they would maintain the objective of limiting the increase in global warming to 1.5°C by achieving carbon neutrality by 2050 at the latest and setting 2030 targets that would be compatible with this trajectory. In addition, they committed to working towards the comprehensive decarbonisation of their electricity sectors in the 2030s.

The international climate "super year" found its culmination at COP26 in Glasgow, during or preceding which several countries either renewed or announced new climate pledges. The US, the UK, Canada and, more recently, Germany committed to decarbonising their electricity sectors by 2035. Despite these, one of the main outcomes of the COP26 is a global recognition that the World's governments are still falling short on emission reduction goals set under the Paris Agreement.

Apart from the aforementioned exemplary pledges, the global consensus on the urgency of climate neutrality has not been translated into concrete national policies and short-term measures. And yet, 2030-2035 targets are those that are needed to succeed in limiting global warming to 1.5°C. Climate Action Tracker's⁴ updated projections on global warming by 2100 highlight that those NDC targets which are defined by 2030 effectively contribute to

⁴ <https://climateactiontracker.org/climate-target-update-tracker/>

reducing the rise in global average temperatures by 2100 to +2.4°C instead of +2.9°C, as previously estimated.

As a follow-up to these assessments, it is of utmost importance that all countries, including the EU, agreed in the Glasgow Climate Pact “to revisit and strengthen the 2030 targets in their nationally determined contributions as necessary to align with the Paris Agreement temperature goal by the end of 2022”⁵. The faster decarbonisation of its energy sector and embracing renewable energy offers one of the options for the EU to achieve this.

Decarbonising the electricity sector by 2035 is a reachable goal that needs to be embraced by more governments all over the world. This position was confirmed by the International Energy Agency (IEA) in its “Roadmap to Net Zero by 2050” from May 2021 and further laid out in its report “Achieving Net Zero Electricity Sectors in G7 Members” from October 2021.

Decarbonising the power sector means massive wind and solar PV growth

According to the IEA’s Roadmap to Net Zero, solar PV and wind energy are expected to account for 70% of the global electricity generation by 2050. In order to achieve this, the roadmap estimates that 630 GW of additional solar PV and 390 GW of wind capacity should be deployed on a yearly basis by 2030 globally.⁶

As far as the European Union is concerned, the European Commission underlines that solar PV and wind are to play an essential role in achieving the new 2030 renewable energy target and thus their further deployment should be supported by further public and private investments.⁷ The European Commission presented the “Fit for 55” legislative package on 14 July 2021, adapting the existing energy and climate legislation to meet the EU’s new emission reduction target of 55% by 2030. On the renewable energy side, it proposes measures to facilitate the deployment of renewable energies and presents a revision of the RED II Directive. It aims to double the share of renewables in the energy mix as compared to 2020, reaching at least 40% by 2030, up from the previous EU-wide target of 32%. This entails that additional renewable energy capacity installed each year must increase from 30–35 GW per year to 45–65 GW per year between 2020 and 2030. This requires a considerable acceleration of the current pace of project development. In addition, the EU is also taking other steps, such as launching an EU solar energy strategy in the summer of 2022. It should be noted that whereas these are step in the right direction, the renewable energy target

⁵ https://unfccc.int/sites/default/files/resource/cma3_auv_2_cover%20decision.pdf (page 4)

⁶ <https://www.iea.org/reports/net-zero-by-2050>

⁷ https://ec.europa.eu/energy/sites/default/files/state_of_the_energy_union_report_2021.pdf

proposed by the European Commission is still not on par with the pace of decarbonisation required by the Paris agreement aligned scenario.

Yet none of the EU countries have adequate policies for renewables

European discourse and announcements do not match the situation at the level of Member States. The positive signs and goals from the international community described above are contrasted by worrying developments at the national level. The installation of wind power plants, for example, have dramatically decreased across EU Member States in the past. This has been the case in Austria, Croatia, Estonia, Germany, Lithuania, Portugal, Poland and the Netherlands, while their deployment has outright stopped in some countries, such as Bulgaria, Hungary, Latvia, Slovakia, Slovenia and Romania. In some cases, such as in Hungary, Slovenia or Slovakia, this can be attributed to the particular national RE strategies to not focus on wind power, as reflected in the NECPs. In most cases, however, there is a considerable gap between the rhetoric at the EU level and the actual development at national level. Moreover, the installation of new capacity is unevenly distributed. In 2019, new installed capacity for wind onshore was concentrated in just 5 countries: Spain, Sweden, France, Germany and Greece.⁸

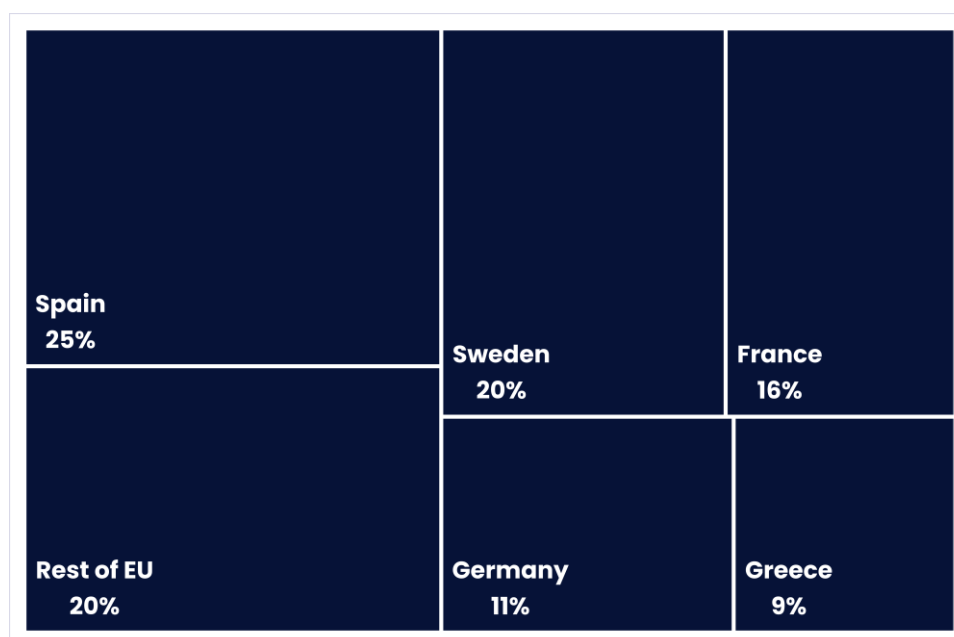


Figure 2: Countries with the highest share in total onshore wind deployment 2019 (Source: EurObserv'ER)

⁸ Source: Eurobserv'ER

Understanding the barriers that slow down the deployment of solar PV and wind energy in EU Member States and UK enables the implementation of adapted and efficient measures to tackle them. The reasons behind these barriers are multifold, complex and often overlapping. In this regard, the European Commission has identified permitting and other administrative bottlenecks as a common barrier to the deployment of renewable energy projects across all Member States. The regulatory complexity, the uncertainty and slowness of procedures delay projects and increases their cost, all of which deters investors. In order to remedy these barriers, the European Commission has launched a 12-week public consultation period until 12 April 2022 to gather feedback from Member States, stakeholders and citizens on permitting issues and good practices addressing them.

This report sets itself the target of gathering, structuring and systematising input on barriers to contribute to their removal. In addition, it aims at identifying best practices, which succeed in backing renewable energy diffusion.

OBJECTIVE OF THE REPORT

Decarbonising the electricity sector by 2035, based on a massive deployment of wind and solar PV technologies, appears to be an attainable milestone on the path to limiting global warming to 1.5°C. The full potential of these renewable technologies is yet to be harnessed. Numerous roadblocks hinder the deployment of wind and solar PV and no EU country has adequate policies in place. On the other hand, best practices exist, that need to be highlighted and serve as a guideline to how things can be done to succeed.

The objective of this report is to identify the barriers and best practices linked to renewables, which can subsequently inform policy decisions that support their diffusion. Its scope includes EU Member States and the UK. More concretely, this report:

- identifies and analyses the most severe barriers that hinder the deployment of wind and solar PV among all EU Member States and the UK. This is based on systematic in-depth research at the national level and takes into account country-specific capacity deployment estimates until 2035 provided by EMBER
- identifies and disseminates best practices for the enhanced deployment of wind and solar PV that can serve as an example for Members States and the UK
- provide input for the European Commission's public consultation period in spring 2022 by gathering detailed information from Member States, stakeholders and citizens on permitting issues and good practices
- maintains an awareness with regard to the barriers and best practices for wind and solar PV development as well as provides input for advocacy strategies
- triggers and substantiates discussions among stakeholders about how to improve the framework for wind and solar PV technologies at the national and EU level

METHODOLOGY

In order to measure and score the impact of barriers on the deployment of RES in the EU27 and UK, an indicator-based assessment index (so-called Barrier Index) was developed in consultation with representatives of NGOs, civil society organisations and think tanks. As a first step, barriers hindering the deployment of wind and solar PV were identified, categorised and rated by researchers. In a second step, the input on barriers was assessed against the technology-specific deployment of the past and projections through 2035. In addition to the analysis of barriers, best practices were identified across the EU27 Member States and the UK.

I. BARRIER RESEARCH

The barriers in the present report stem from the RES Policy Monitoring Database developed by eclareon. This database contains a comprehensive collection of barriers hindering the deployment of wind and solar PV technologies across all EU Member States and the UK. Best practices are presented in the database as well. The barriers are described in detail and classified according to qualitative (country, categories, sub-categories, technology) and quantitative criteria (severity and spread of barriers). The database structure allows for a comparative analysis and the benchmarking of barriers hindering the deployment of wind and solar PV across the EU27 Member States and the UK (more detailed information of the methodology is provided in the Annex's 'Barrier Factor' section below).

In-depth research was carried out for the EU27 Member States and the UK, including desktop research and expert interviews. The research took into consideration policy developments until December 2021 and identified barriers affecting the following technologies: onshore wind, offshore wind, PV rooftop and PV ground-mounted.

Barriers were grouped in 5 overarching topics, which then were further divided into 37 sub-categories. The overview of the topics and sub-categories is displayed below.⁹

⁹ Detailed definitions of the sub-categories are available in the Annex.

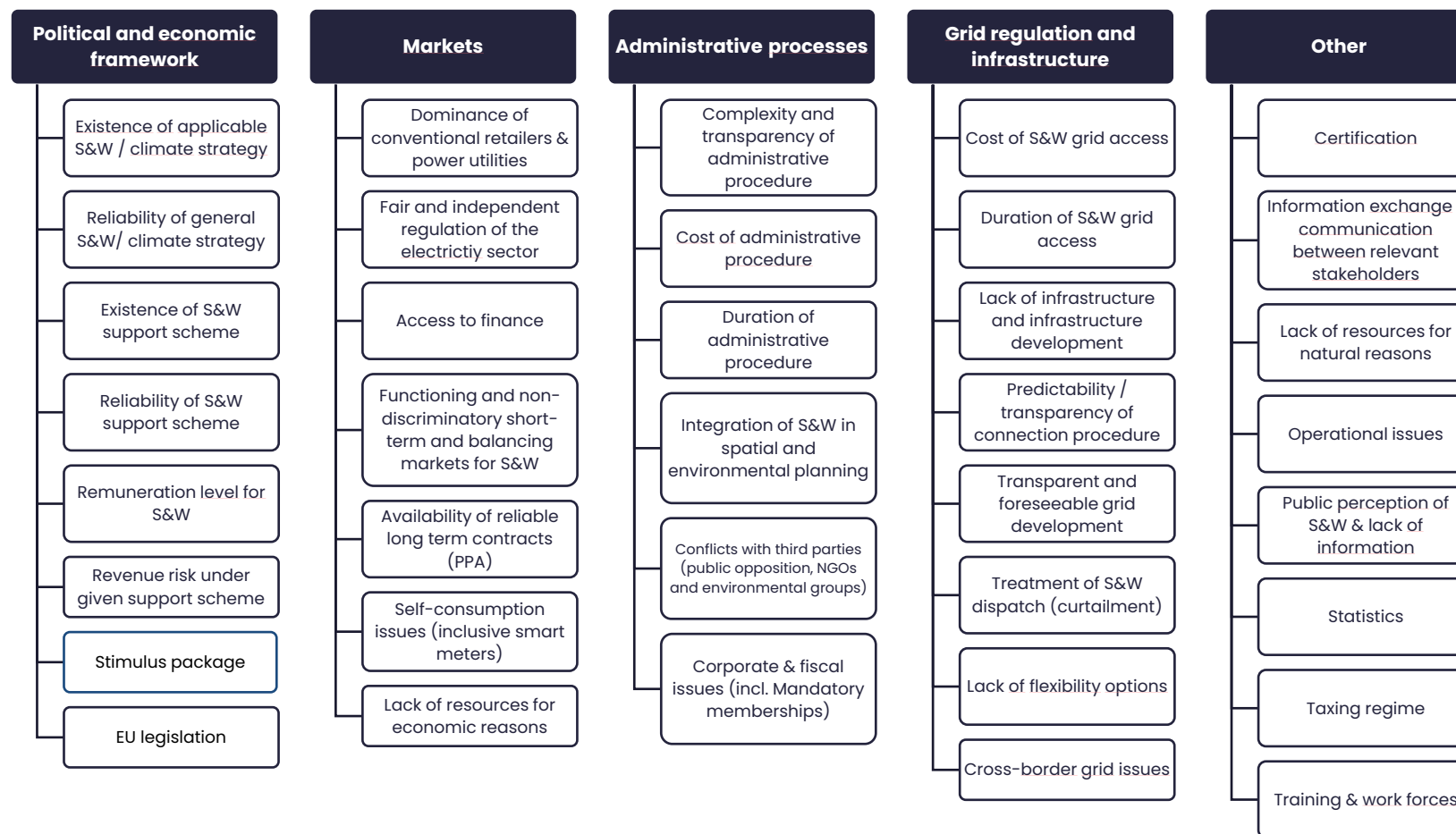


Figure 3: Overview of topics and sub-categories

II. RES CAPACITY DEPLOYMENT

Data on capacity deployment was retrieved from external sources and assessed against the gravity of the barriers, allowing one to rank the countries analysed.

1/ **Previous** capacity deployment figures for wind and solar PV (Eurostat) were compared to

2/ **projected** capacity deployment targets necessary to achieve the decarbonisation of the electricity sector **by 2035** for each EU27 Member State and the UK (Ember/Artelys).

Ember/Artelys modelling study:

Installed capacity figures for a 1.5°C pathway are taken from preliminary results for the “advanced scenario” of a forthcoming modelling study on decarbonising the European power sector by 2035 developed by Ember. An overview of this study is included below:

Objective: Create economically-optimal decarbonisation pathways for the European power sector by 2035, with detail at the country-level, considering the requirements of the Paris agreement and an increasing role for clean electrification.

Assumptions: input assumptions or the advanced scenario are taken from the [Paris Agreement Compatible \(PAC\) scenario](#), published by CAN Europe and the European Environmental Bureau. This study provides a top-down transition pathway for the whole energy system to reach net zero by 2040, with cumulative carbon emissions consistent with a 66% chance of limiting global heating to 1.5°C. From this study, Ember takes future electricity demand, and the characteristics of that demand (i.e. assumptions about demand flexibility). By 2035 in this scenario, power demand increases by 68%, while emissions fall by 90% compared to 2020. This is driven by a quick electrification of the economy, while phasing out coal from the electricity mix by 2030 and nearly all fossil gas by 2035. The scenario also assumes the most ambitious energy efficiency savings and highest levels of demand-side flexibility of all those in the Ember study, and hence results in the fastest CO2 emissions mitigation.

Approach: Hourly power system modelling was used, with optimised capacity expansion, in order to find cost-optimal solutions to decarbonise the European power system. Technical potentials for wind and solar were input from the [JRC ENSPRESO](#) database. The modelled power system is tested against real historical weather data - including years with extreme cold spells - resulting in a configuration that is both very low carbon and highly secure. As can be expected, the decarbonisation objective requires a rapid build-out of wind and solar capacities, sufficient to displace fossil generation, while also meeting increasing demand. The study also highlights the importance of increasing interconnections and utilising various sources of flexibility on both the demand and supply side. Without these complementary features, the need for generation and storage capacity at the country-level would be even greater.

III. BARRIER INDEX

As described above, the Barrier Index is an indicator-based assessment index which consists of two dimensions¹⁰:

- **Barriers hindering the deployment of RES**
- **Past and projected RES deployment**

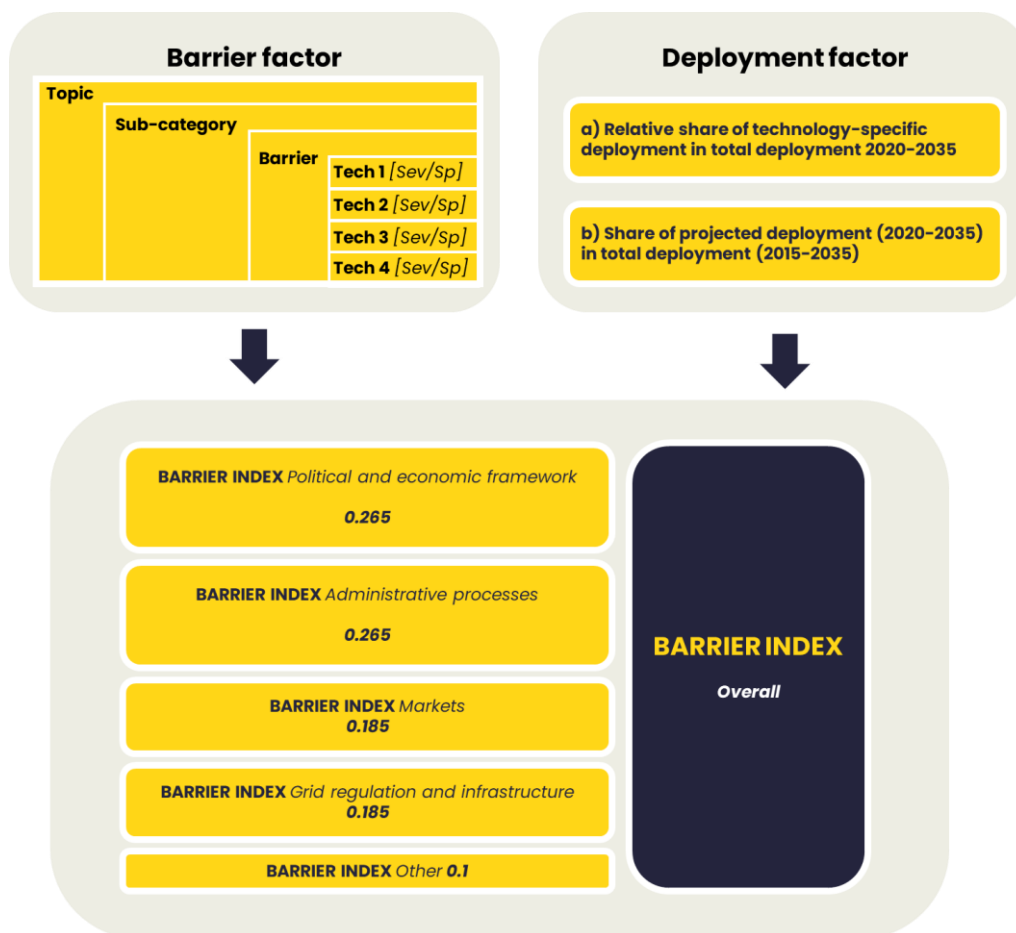


Figure 4: Barrier index calculation

¹⁰ Detailed information on the Barrier Index calculation method is available in the Annex.

BARRIERS AND BEST PRACTICES

1. POLITICAL AND ECONOMIC FRAMEWORK

1.1.1. Topic & Technology Analysis

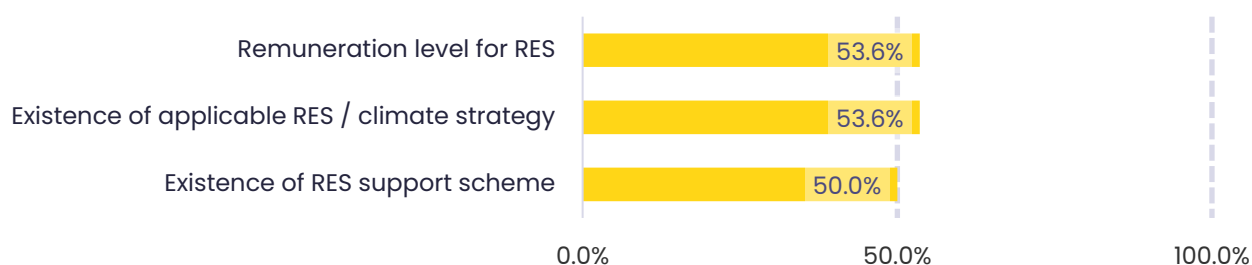


Figure 5: Most widespread barrier sub-categories in the "Political and economic framework" topic

Shortcomings in the political and economic framework are still one of the most important issues with regard to enabling – or preventing – the implementation of solar PV and wind energy projects. These shortcomings encompass a wide range of issues, such as the existence and reliability of an applicable RES or climate strategy, issues connected to support schemes as well as the overall remuneration level for RES. The common theme that connects these is that the political and economic framework in the country is not compatible with the pace and scope of renewable energy development necessary. A high share of the EU Member States and the UK face barriers caused by their national framework for renewable energies.

15 out of 28 countries pointed out issues that revolve around the **remuneration level** for wind and solar PV. A case in point is France, for instance, where the feed-in tariff (FIT) for PV installations below 100 MW installed on buildings is subject to a degressive revision every 3 months depending on the number of completed grid connections. This is perceived as a risk factor for project developers, since it offers very little stability regarding future revenue streams. In Italy, the issue with the remuneration level has more to do with those power plants that do not use renewable energy sources and still benefit from incentives, undermining the deployment of renewables.

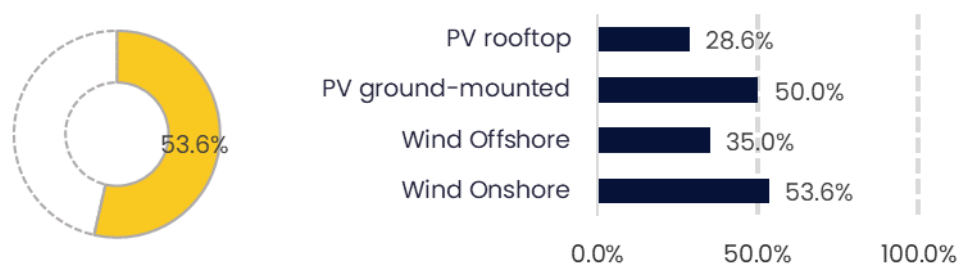




























Figure 6: Share of countries where barriers related to the existence of an applicable RES or climate strategy were identified (per technology)

Researchers flagged issues in **over half of the countries** with how the role of **wind onshore and ground-mounted PV installations are included in the applicable RES or climate strategy**. National strategies often do not include enough foresight with regard to these technologies. For instance, There is a lack of spatial planning provisions allowing for the deployment of area-intensive technologies, such as wind onshore and ground-mounted PV plants. These strategies may even outright exclude certain technologies from the energy mix, as is the case with additional wind installations in Hungary. It is paramount that existing national strategy provide stakeholders with a clear and detailed vision for renewable energies in the short and long-term future to ensure a stable framework for future operations. Last but certainly not least, half of the analysed countries experience barriers arising from the lack of a renewable energy support scheme, be that for solar PV, wind energy, or both.

1.1.2. Country analysis

The most severe barriers identified in the category of political and economic framework across all EU Member States fall into one of the highest ranges of the barrier index (BI), with values ranging between 0,95 and 0,99. As displayed in the chart below, the five countries with the highest barrier index were Bulgaria, Romania, Hungary, Italy and Lithuania.

BARRIER INDEX – Political and economic framework

Rank	Country	BI	Impact on RES deployment
1	 HUNGARY	0.99	<p>Impact on RES deployment</p> <p><0.30 minimal</p> <p>0.30-<0.60 low</p> <p>0.60-<0.80 moderate</p> <p>0.80-<0.90 high</p> <p>0.90-<1.00 severe</p> <p>1.00 crucial</p>
2	 ROMANIA	0.99	
3	 LITHUANIA	0.96	
4	 BULGARIA	0.95	
5	 ITALY	0.95	
6	 CYPRUS	0.87	
7	 LATVIA	0.87	
8	 POLAND	0.87	
9	 CZECH REPUBLIC	0.87	
10	 GERMANY	0.86	
11	 NETHERLANDS	0.86	
12	 UNITED KINGDOM	0.85	
13	 PORTUGAL	0.85	
14	 SWEDEN	0.84	
15	 FRANCE	0.84	
16	 BELGIUM	0.84	
<hr/>			
17	 FINLAND	0.83	EU27 +UK AVERAGE: 0.83
18	 DENMARK	0.76	
19	 ESTONIA	0.76	
20	 SLOVENIA	0.76	
21	 GREECE	0.76	
22	 IRELAND	0.75	
23	 AUSTRIA	0.74	
24	 SPAIN	0.74	
25	 SLOVAKIA	0.66	
26	 LUXEMBOURG	0.65	

No barriers detected:
CROATIA, MALTA

RES POLICY MONITORING DATABASE



Figure 7: Barrier index results for the topic "Political and economic framework"

The table below provides an overview of the top 5 barriers most significantly affecting political and economic frameworks. In the case of Lithuania and Italy, decisive support measures originally expected for 2021 are still pending which causes uncertainty among investors. These should be introduced soon, removing or at least reducing the severity of the barrier in the near future. In other countries, such as Romania or Bulgaria, the deployment of renewables are hampered by the unreliability of the support framework, either caused by frequent regulatory amendments or the lack of transparency in the support method. Finally, Hungary suffers from a more fundamental issue, whereby its general approach to energy policy planning revolves around nuclear energy, overshadowing all other considerations.

Rank	Country	Top 5 Barriers¹¹	B.I.
#1	HU	Government's focus on nuclear power	0,99
#2	RO	Frequent amendments to the main Renewable Energy Law	0,99
#3	LT	Incomplete legislative framework for offshore wind power	0,96
#4	BG	Unfavourable investment climate for large RES-E plants	0,95
#5	IT	Lack of consistency of incentive systems	0,95

¹¹ More detailed information on the barriers can be found on the RES Policy Monitoring Database at: <https://resmonitor.eu/en/>

In **Italy**, the Renewable Energy Decree (FER1) covers the period from 2019 until 2021. The Decree in force from 2022 is expected to be issued with a substantial delay at the beginning of 2022. This situation makes it more difficult for project developers to predict tariffs, which makes it difficult to develop their business plans. Overall, the history of stop and go policy regarding incentives for renewable energies in Italy, which is closely linked to the continuous changes in governments, has harmed confidence in the sector. However, stakeholders suggest that the relevance of incentives varies depending on the energy sources. While solar PV is economically viable even without incentives, wind power suffers the consequences of an unstable support system.

In **Lithuania**, the legal framework for offshore wind energy is incomplete. The Law on Renewable Energy Sources (RES Law) may have entered into force in 2011 and envisaged offshore wind energy production to start, but this is yet to materialise. This is an issue, considering that the estimated offshore wind power potential in the Lithuanian territory of the Baltic Sea amounts to 3,4 GW and by 2030, the Lithuanian Government plans to build 700 MW of offshore wind capacity. The first auctions for offshore wind plants in Lithuania are planned to start around 2024. In addition, the installation of networks connecting wind offshore power plants is estimated to take up to 8 years. The description of the procedure for organising auctions, the licensing and approved territories for offshore wind projects were approved by the Parliament in June 2020 and the amended RES Law entered into force in June 2021. Nonetheless, the legal framework for offshore wind energy is not finalised yet:

- In March 2021, the Ministry of Energy signed a contract with the winning tendering company 'Ardynas' that will perform the special territorial plan as well as the strategic environmental impact assessment – a part of territorial planning. The company plans to finish the territorial plan by mid-2022.

Best Practice: Attractive legal and economic framework for prosumers in Lithuania

From October 2019, prosumers in Lithuania have the possibility to use self-generated electricity at geographical locations other than where the electricity was generated. Lithuania is one of the first countries in Europe to implement such a green energy development model. As a result, "Ignitis gamyba" AB – Lithuania's largest electricity generation company – launched the world's first nationwide operating remote solar platform *Ignitis Saulės Parkai* (Ignitis Solar Parks) in April 2020. The 1 MW solar platform offers every single resident of the country the opportunity to purchase part of the solar power plant from solar parks and thus become a remote prosumer.

- Based on the contract signed in August 2021 between the Ministry of Energy and the Coastal Research and Planning Institute, the latter is preparing an Environmental Impact Assessment (EIA) programme for the assessment of an offshore wind park with installed capacity of up to 700 MW. The EIA procedure is thus still ongoing.
- On November 2021, an international tender was launched on the Central Procurement Portal to select a service provider to carry out technical measurements in the Baltic Sea area. Potential suppliers can submit bids until 12 January 2022. It is expected that the selected suppliers will have to carry out wind speed, water and meteorological measurements within 16 months, and the seabed (geophysical and geotechnical) surveys within 11 months. All research results have to be ready by 1 September 2023, which indicates that the first auction for offshore wind will not be launched sooner than this date.

In **Bulgaria**, RES producers with a total installed capacity of at least 4MW are entitled to feed-in premium agreements with the Energy Security Systems Fund (ESSF) since 2018. These agreements aim at compensating the difference between the old feed-in tariff and the reference market price, as determined by the Energy and Water Regulatory Commission (EWRC). However, the way the reference market price is calculated for the year ahead by the EWRC is not clear, thus creating unpredictability for RES producers. If actual market prices are lower than the one predicted by the EWRC, RES producers will accrue less revenue. Conversely, if the RES producers achieve a market price that is higher than the one referenced by the EWRC, they can keep the extra earnings. According to the current legislation, the regulator can revise the premium amount if the forecast deviates by 30%.

Best Practice: Stakeholder process for onshore wind site zoning in Austria

In the federal state of Burgenland, the zones suitable for the development of wind power plants are defined through a zoning process involving all relevant stakeholders: project developers, municipalities, environmental groups etc. Due to this comprehensive approach, there is a wider acceptance for wind power projects and less resistance. The aim of the zoning process is to provide 100% of electricity from RES. Therefore, the process is an ideal way to define a roadmap to a fully renewable electricity system. Even though stakeholders of the wind power industry welcome this zoning in principle and demand it throughout Austria, they assess the previous zoning models as not yet sufficient. This is because a planned project in a wind power zone can still be rejected in further approval steps. Zoning therefore does not offer planning security.

The wind energy producers consider this threshold too high, since they can suffer from financial issues long before the limit value is reached. For instance, the average market price on the Independent Bulgarian Energy Exchange (IBEX) in the period between 16–29 March 2020 amounted to €23.31 per MWh. For the same period in 2019, the day-ahead market price was €34.64 per MWh, representing a 31% drop. Due to the big difference between the actual market price and the reference price, estimates show that, on average, RES producers lost €23 per sold MWh during the two-week period.

In **Romania**, RES are mainly promoted through green certificates (GC). However, the frequent changes of the past years in the legislative framework for the quota system caused uncertainty among investors and project developers, hindering the development of RES projects. After a delayed introduction of the green certificates system in 2013, the mandatory acquisition of quotas was significantly reduced three years in a row between 2015 and 2017. In July 2018, Emergency Ordinance No. 24/2017 introduced prominent changes to the support policy, including a new calculation method for the acquisition of green certificates and a feed-in tariff for smaller installations. However, the necessary implementation decrees were not published, partly due to the frequent changes of the Government at the end of 2019 and beginning of

Best Practice: Technology neutral tenders for solar PV and wind in Denmark

In September 2017, the Danish Energy Agency (DEA) conducted two tenders where solar PV, onshore wind and open-door offshore wind would compete for the first time. It conducted the first of these technology neutral tenders in December 2018, resulting in contracts for 165 MW onshore wind and 101 MW solar PV, which was five times more than anticipated. The average subsidy rate for the contracts was € 0,0030 (kr. 0,0227) per kWh, which was six times lower than the rate in the previous subsidy scheme for onshore wind. The second tender was concluded in December 2019. The DEA received seven bids for 135 MW onshore wind and 136 MW solar PV, which was twice as much as anticipated. The average subsidy rate for the seven contracts expected to be signed is € 0,0021 (kr. 0.0154) per kWh, 30% lower than the record-low subsidy rate achieved in the previous tender. Authorities and stakeholders consider the two tenders a great success. In 2020, an amendment act was presented by the Danish Parliament and adopted, which authorises the Minister for Climate, Energy and Utilities to conduct additional technology-neutral tenders between 2020–2024. These will also include wave and hydropower technologies. In the Climate Agreement of 2020, the government parties agreed to reserve DKK 600 m. (EUR 81 m.) for future technology neutral tenders until 2024.

2020, and due to the public health crisis linked to COVID-19. In 2021, discussions on a potential contract for different legislation were initiated, but the latter stages of the COVID-19 public health crisis slowed down any developments.

In **Hungary**, the main political and economic issue blocking the deployment of renewable energies is the strong focus on nuclear power. The government's strategy for electricity from renewable energies has been developed in the shadow of the Paks 2 nuclear power plant. The Paks nuclear power plant, Hungary's only operating nuclear power station, currently accounts for over 40% of the country's electricity production. The government's plans suggest that it will be substituted with Paks 2 towards the end of the 2020s or the beginning of the 2030s, although delays seem likely. Renewables' development has consistently been subjugated to Paks 2, which thus yields impediments in policy and infrastructure design. Nonetheless, the government has voiced a strong role for PV in Hungary's future energy mix, which would comprise of nuclear providing baseload generation and solar used to meeting additional demand. So far, the diffusion of solar PV has been robust. However, if the focus on nuclear was not this strong, renewables could expand at an even greater pace. Wind energy faces even greater hurdles in the country, since regulation in force since 2016 forbids the installation of new wind turbines within a 12 km radius around inhabited, impeding the development of new wind power plants.

Best Practice: Municipalities' climate pledges foster RES deployment in Finland

In Finland, the Land Use and Building Act allocates significant amounts of power to municipalities to decide on whether RES installations can be located in their area and how they undertake the permitting process. This power can be used for advancing RES development in the municipalities. There is a wide consensus in Finnish society – and thereby municipalities – about the importance of timely emission cuts. According to a recent Sitra (2021) report, two thirds of Finnish municipalities have made a climate-related pledge. If the municipalities reach current targets, they would halve emissions by 2035 compared to 2018 levels. This would lower overall Finnish greenhouse gas emissions by 20 million tons, which would account for half of the national emission cut target necessary to reach climate neutrality by 2035. Municipal climate pledges do not directly dictate municipalities' RES policies, but the interviewed experts state that there is a clear correlation between RES-friendly policies and ambitious climate targets. In other words: an ambitious climate pledge is a very efficient way to promote RES development, especially onshore wind, but also different PV technologies.

2. MARKETS

1.2.1. Topic & Technology Analysis

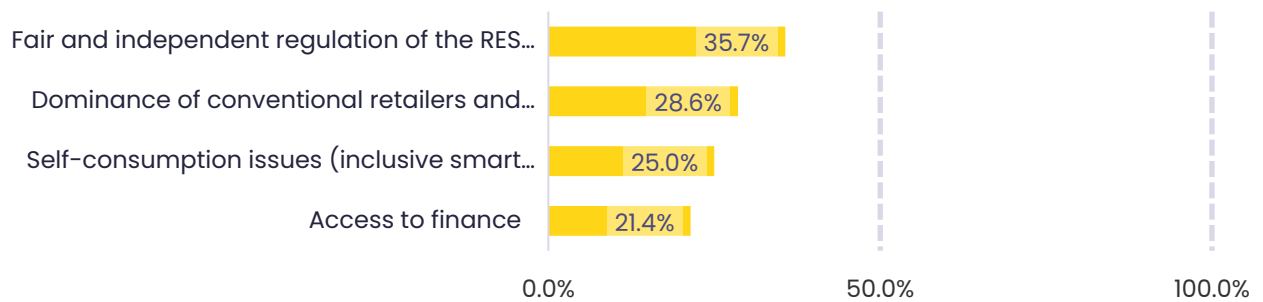


Figure 8: Most widespread barrier sub-categories under the topic "Markets"

Barriers categorised under markets are less common than barriers related to administrative processes or the political and economic framework. Nonetheless, they are also significant by posing a significant barrier to the expansion of renewable energy technologies. Barriers under this category deal with issues are related to how fairly and independently renewable energy markets function, how accessible finance is for wind and solar energy projects, as well as how dominant some established players are in the market that rely on fossil fuels, for instance.

Finally, issues related to self-consumption are covered in this section.

At a more general level, there is a Europe-wide shift away from support-scheme based wind and solar PV business models to private off-takers. These typically entail a move towards self-consumption (both at small and larger scales) or private power purchase agreements (PPAs). These models have great potential, but are still underdeveloped due to a variety of reasons. A lack of knowledge as well as legal and administrative barriers impede the move to self-consumption, while PPAs are hindered by historically limited demand for them and a lack of knowledge about their benefits. The rapidly declining costs for wind and solar PV technologies have made these much more economically over the course of the past decade. Yet, a number of market-related barriers still persist that hold back the deployment of wind and solar PV.

The most common issues are linked to the **fair and independent regulation of the RES sector**, which manifests in several ways across Europe. In several instances, the stakeholders blame the energy regulator for not being independent enough or point out the lack of transparency in its decision-making. The barriers under this sub-category also highlight the discrimination smaller players may face when entering the market, as has been noted in Spain and Lithuania. Whereas the barriers in this sub-category were noted in 10 countries, they do not have a high severity, apart from Poland. Thus, the issue hinders deployment to a certain extent, but does not block or seriously jeopardise project development more broadly. Moreover, the identified barriers seem to be of a more general nature and not technology-specific.

The **dominance of conventional retailers and energy utilities** were noted in 8 out of 28 countries. The average severity and spread of the barriers under this sub-category is relatively high; thus, it can be one of the biggest issues in countries where issues related to conventional of retailers engaged in the coal, nuclear or oil shale sector were identified. A number of Central and Eastern European (CEE) countries, such as Poland, Bulgaria or Slovenia are affected, but this is not only a CEE issue. Some Western European countries are also affected, such as France and Belgium, where the traditional reliance on nuclear in the energy sector has an impact on wind and solar deployment. Here too, the barriers are more general and not pertinent to a specific technology.




















Self-consumption is also a market-related issue since the lack of supportive regulation can pose a market entry barrier. This can be seen as a predominantly rooftop solar PV matter, since it was flagged in 7 countries, as opposed to it being an issue in only 2 with regard to wind. Issues linked to self-consumption are typically connected to net metering (or the lack thereof, as is the case in the Czech Republic where separate metering for generation and consumption raise costs) and the tax system that does not benefit self-consumption, decreasing profitability. In some cases, such as in Germany, electricity storage capacities are taxed twice, as they are considered to be both energy producers and end users. In other countries (e.g. Latvia) there are no tax incentives for self-consumption. Finally, in some cases special self-consumption provisions are in place for prosumers of a certain size (adversely impacted large installations) or the location between the location of generation and consumption. Finland is a case in point of the former, where only self-consumption of electricity up to the generation of 800 MWh/calendar year is exempt from electricity tax. Meanwhile, in Spain there is a spatial limit of 500 meters between the RES generation units and the self-consumption point.

Access to finance is an issue predominantly in CEE countries, setting this apart from the rest of the market-related sub-categories covered so far, for which no distinct geographical patterns can be determined. With the exception of Italy, the 5 countries where access to finance has been marked as a barrier are located in Central and Eastern Europe. Looking at the root causes of such barrier lead one to posit that the difficulties in gaining access to finance are caused or exacerbated by other pre-existing issues, such as lack of a stable support scheme (Romania), near saturation of the market with solar PV projects due to the underdevelopment of other RES technologies, such as wind (Hungary), or uncertainty based on historical experience regarding administrative procedures and support schemes (Italy). Once again barriers related to access to finance can generally be seen as of general nature, as there are no major differences across technologies.

1.2.2. Country Analysis

As presented in the figure 9 below presenting the Barrier Index results for the category “markets”, 4 out of the 5 most severe barriers deriving from malfunctioning market conditions for RES reach a barrier index slightly under the maximum range of 0,90-1,00. The countries impacted are France, Poland and Italy. This means that overall, barriers related to market aspects are of comparatively lower gravity than for the other categories. This is with the exception of Spain, where the most severe barrier reached the maximal index value of 0,95, defined as severe.

BARRIER INDEX – Markets

Rank	Country	BI	
1	 SPAIN	0.95	
2	 ROMANIA	0.88	
3	 ITALY	0.87	
4	 POLAND	0.87	
5	 FRANCE	0.87	
6	 BULGARIA	0.77	
7	 HUNGARY	0.77	EU27 +UK AVERAGE: 0.77
8	 CYPRUS	0.76	
9	 ESTONIA	0.76	
10	 SLOVENIA	0.76	
11	 PORTUGAL	0.74	
12	 GREECE	0.74	
13	 AUSTRIA	0.74	
14	 BELGIUM	0.74	
15	 CZECH REPUBLIC	0.74	
16	 LITHUANIA	0.74	
17	 LATVIA	0.74	
18	 GERMANY	0.64	
19	 FINLAND	0.64	

Impact on RES deployment

<0.30	minimal
0.30–<0.60	low
0.60–<0.80	moderate
0.80–<0.90	high
0.90–<1.00	severe
1.00	crucial

No barriers detected:

CROATIA, DENMARK, IRELAND, LUXEMBOURG, MALTA, NETHERLANDS, SLOVAKIA,
SWEDEN, UNITED KINGDOM



RES POLICY MONITORING DATABASE

Figure 9: Barrier index results for the topic "Markets"

The table below displays the top 5 most significant market barriers reported among the EU27 and the UK. Spain suffers from the lack of grid development planning, leading to large overcapacities in electricity generation and thus blocking the further development of solar PV and wind projects. In other countries, we observe a misalignment between renewable potential and existing financial instruments to support them: In Italy, the restrictive legal provisions for PPAs practically exclude many market segments from using them, whereas in Romania, investors struggle in finding financing solutions for projects due to lower revenue streams generated by wind and solar PV projects. In certain countries, such as France or Poland, renewable energy actors face persistent conventional fuel lobbies, be that from nuclear (France) or fossil fuel (Poland) entities. This results in a two-fold challenge for RES projects: 1/ competing against established actors that rely on the exploitation of coal, gas or nuclear energy, often deemed reliable and cheap by decision makers; and 2/ becoming incorporated into a highly centralised electricity system.

Rank	Country	Top 5 Barriers¹²	B.I.
#1	ES	Overcapacities in the electricity market	0,95
#4	RO	Difficulty to obtain financing from banks	0,88
#2	IT	Barriers for Power Purchase Agreements	0,87
#5	PL	Conventional energy is supported by the Government	0,87
#4	FR	Lobbying from nuclear energy advocates impairs RES deployment	0,87

¹² More detailed information on the barriers can be found on the RES Policy Monitoring Database at: <https://resmonitor.eu/en/>

In **Spain**, the most severe issue affecting the functioning of electricity markets for renewable energies is overcapacity. The amount of grid-connected electricity generation plants has doubled between 2001 and 2014, with a large share of this new generation capacity coming from wind energy plants. At the same time however, the peak electricity demand has remained roughly constant over the years. This situation was aggravated in 2016 as the financial crisis decreased electricity demand. The issue of overcapacity became relevant again during to the COVID-19 pandemic, when the demand for electricity dropped again. The problem of overcapacities in Spain is mainly due to the lack of coherent planning in the energy system. The deployment of renewable energy plants was supported while conventional capacities were maintained, without the grid being reinforced or extended enough.

Power Purchase Agreements (PPA) can ensure the steady revenue and bankability of renewable projects. These can provide banks with the guarantees for financing. Yet in **Italy**, the RES market is composed mainly of small-to-medium plants supported by the net-metering scheme (*Scambio sul posto*) rather than PPAs. This is partly because Article 18 of the FER Decree (Decree 4 July 2019) only enable PPA's to have one final user, excluding many market segments such as commercial centres, airports, industrial parks, office buildings and multi-family houses. Currently, the Italian PPA market is in its infancy. In 2020, there were less than 0.1 GW of corporate PPAs in Italy and the tenure of PPAs was below the EU average with the majority falling between 0 to 5 years. Nonetheless, 2021 brought about significant corporate PPAs such as the 10-year contract signed between Telecom Italia (TIM) and ERG for the supply of 3.4 TWh of wind energy. Similarly, the 10-year contract between Ferrero and Falck Renewables for Sicilian solar power is promising.

Access to finance for renewable projects is very difficult in **Romania** mainly because there is no support scheme in place. Although some technologies are mature enough to compete with conventional energy sources, the lack of revenue predictability makes it very difficult to prove to banks the financial feasibility of a project. Additionally, the frequent amendments to the core law in the past years have destabilised the market. Many investors have decided to withdraw from the market or have had to file for bankruptcy. In many cases, loans issued had to be restructured and extended over a longer period of time. According to experts working in the wind sector, many investments will be paid off in 30 years, while the life expectancy of an installation is 20 years. Bank loans are only seldom awarded in such conditions. Banks are reluctant to provide financing, which they signalled by not

issuing guidelines on the financing of renewable projects in 2021, despite increasing demand from developers.

Coal is the major source of energy in **Poland**. Large state-owned facilities and grid companies shape the energy scene according to their dictums, leaving very little leeway for renewable energy stakeholders. Coal is still considered as the most important and reliable energy source in Poland, which is crucial to the country's energy security. While still heavily dependent on fossil fuels, the country aims to expand wind and solar power significantly. The Energy Policy of Poland until 2040 foresees an increase of the share of renewable energies (RES) to 32% in the electricity generation, while coals share will decline from 70%¹³ in 2020 to 56% of the total electricity output by 2030. Simultaneously, the government is planning to commission the country's first nuclear power plant power unit with a capacity of about 1-1.6 GW in 2033. Further units will be commissioned every 2-3 years, and the entire nuclear program assumes the construction of 6 units. Nuclear is an extension of Poland's energy policy, which has traditionally favoured centralised baseload generation and has remained sceptical of decentralised renewables that perceived to destabilise the electricity system.

France has conveyed a rather weak propensity to develop renewables, given the dominant role of nuclear in the electricity mix as well as the deep intertwinement of the state and the nuclear sector. Based on this, there is a widely held opinion that solar and wind energy is too expensive and inefficient. The Court of Auditors' reports from 2013 and, most recently, 2019, endorse this position to a varying extent, which has been critical in undermining renewables. There are many locations in France where the use of solar PV and wind plants would be more cost-efficient than other energy sources. In addition, the transmission system operator, RTE, claims that scenarios leading to climate neutrality by 2050 show that relying solely on renewables is less competitive than keeping existing nuclear energy plants in the electricity mix. The development of renewable energy in France is hindered by nuclear's importance, but the increased government's attention to green growth and executing an energy transition could present a good opportunity for higher RES penetration in the near future.

¹³ <https://www.iea.org/countries/poland#overview>

Best Practice: Clear and robust market for self-consumption and Renewable Energy Communities in Portugal

In October 2019, Portugal reformed the legal framework for distributed generation through Decree-Law 162/2019, which introduced a clear regulation for individual and collective prosumers. The new legislation introduces the following provisions:

- Under the previous regime, only individual self-consumption was allowed. The new legislation allows for collective self-consumption. In addition, under the new system it is possible to constitute legal entities (Renewable Energy Communities - RECs) for production, consumption, sharing, storage and sale of renewable energy.
- Collective self-consumers have to approve an internal regulation which, among other things, specifies at least the requirements for the entry of new members and the exit of existing members, the deliberative majority, rules for sharing the produced electricity and the destination of energy surpluses.
- Decree-Law 162/2019 does not impose any spatial limitations for collective self-consumption, as in the case of Spain, where the maximum limit of 500 m is set between the generation unit and the household using electricity produced. Instead, the legislation states that the General Directorate of Energy and Geology (DGEG) will evaluate, case by case, the proximity or neighbourhood of the project. It may also take into account: (a) the transformation substation to which the RE installation is connected; (b) the different voltage levels related to the project; c) any other element of a technical or regulatory nature.
- RECs are defined as legal entities, regardless of whether they are for-profit or not, based on an open and voluntary membership of its members, partners or shareholders, who may be natural or legal entities (public or private), including, in particular, small and medium-sized enterprises (SMEs) or local authorities, which are autonomous from its members or partners, but effectively controlled by them.
- RECs have broad faculties: a) to produce, consume, store and sell renewable energy, for example, through PPAs; b) to share among the members the renewable energy produced by the installations that they own, without prejudice to the REC members maintaining their rights and obligations as consumers; c) to access all energy markets, both directly and through aggregation, in a non-discriminatory manner.
- In addition, self-consumers (individual, collective, or REC) are fully responsible for their imbalances caused to the National Electric System, when deviating from the mandatory schedule.

3. ADMINISTRATIVE PROCESSES

1.3.1. Topic & Technology Analysis

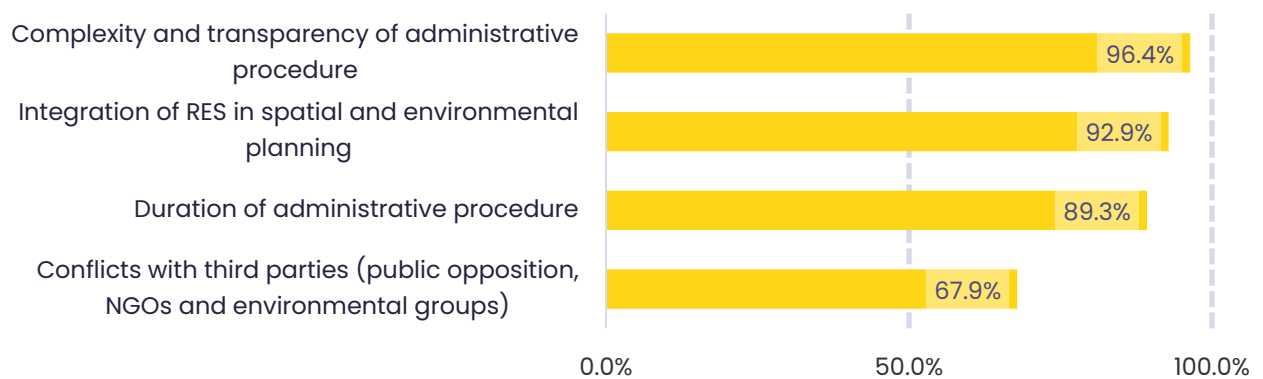


Figure 10: Most widespread barrier sub-categories under the topic "Administrative processes"

Issues to do with administrative processes have the biggest impact of wind and solar energy development in Europe: as the graph above showcases, these impact almost all countries. Under the administrative processes category, barriers deal with topics such as the complexity and duration of administrative procedures, issues related to spatial and environmental planning, conflicts with third parties as well as less common barriers, such as the costs of administrative permitting.

As the relative importance of several other type of barriers, such as availability of support schemes or relevant policy framework has slightly declined over the years, administrative obstacles have become an increasingly pressing issue for renewable energy development in Europe. Solving administrative issues thus becomes an even more pertinent matter to meet climate and renewable energy targets.

The most common issues related to the administrative processes with wind and solar energy are the **complexity and transparency of administrative procedure(s)**, which affect all technologies to a large extent and were noted in almost all countries surveyed. **Issues related to the complexity and transparency of administrative procedures were also the most common barriers flagged during the research project**, indicating the high importance of bureaucratic processes in playing a role in wind and solar energy

development. Wind onshore is the technology which is the most highly impacted by the complexity and transparency of administrative procedures, with all but four countries marking it as an issue. However, other technologies are deeply impacted as well, including rooftop PV, as can be seen on the chart below. Such issues effectively hinder all installations irrespective of size.

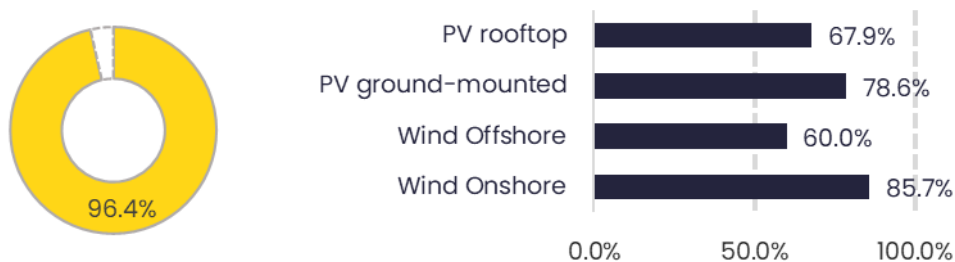


Figure 11: Share of countries where barriers related to the complexity and transparency of administrative procedures were identified (per technology)

The example of offshore wind shows that it is possible to implement measures which ease administrative procedures. Issues related to the complexity and transparency of administrative planning in the case of offshore wind were noted in 12 countries out of the 20 for which Ember data foresees deployment up to 2035, which represents a lower relative share than in the case of rooftop PV (19 of the 28 countries).

It is still somewhat unclear why offshore wind faces lower barriers than onshore wind from an administrative perspective, considering that it is still technically more challenging and project developers and especially public authorities have less experience in dealing with such projects. On the other hand, it seems that administrative processes for offshore wind were set up on the basis of lessons learnt from onshore wind permitting. Furthermore, the technical challenges with offshore wind (such as a need for more centrally planned grid development) in comparison to onshore can mean a more centrally planned administrative procedure, or a better functioning one stop shop (such as a best practice example in Denmark), which, in turn, could play a role in reducing complexity and enhancing transparency.

Duration of administrative procedures, which is closely related to complexity, has a high impact on both wind and solar energy deployment, but is largely an onshore wind and PV ground-mounted issue – it was marked as such in 24 countries. In some countries (e.g. Finland, Estonia and Slovenia), the duration of administrative procedures can be so long

that by the time these are concluded, the wind or solar project might not be economically viable any more, as the technology has become outdated or obsolete in the meantime. Finally, since more permits are required both for onshore wind and PV ground-mounted projects, it is also natural that they are most impacted by the duration of administrative procedures.

Integration of RES in spatial and environmental planning poses another major challenge for wind and solar energy development, especially impacting wind onshore and ground-mounted PV – such barriers were noted in 25 and 22 countries, respectively. These two technologies need space for their development and therefore are subject to conflicts with other public goods, such as the environment, military use or areas to inhabited. Offshore wind is space-intensive, but at sea there are a lower number of issue issues linked to spatial planning, owing to the smaller share of alternative usages and public goods.

The barriers dealing with the integration of RES in spatial and environmental planning showcase the intricate web of dynamics and interdependencies in spatial planning of wind and solar installations. For instance, distance rules in place force project developers to pursue projects further away from human settlements in the countryside. However, that can increase the conflicts with environmental protection objectives, the latter being very common all across Europe, especially in the case of onshore wind.

The integration of RES in spatial and environmental planning are not only wide-spread across Europe, but they also pose a serious challenge to wind and solar energy deployment in the countries. Thus, both spread and severity for barriers under this category are on average very high. For 4 countries – Ireland, Malta, Hungary and Poland – this constitutes an (almost) showstopper barrier for at least one technology. This makes it the only sub-category in this analysis to pose such a highly rated barrier.





























Another issue is the perceived mismatch between classification of agricultural/arable land and agricultural objectives vis-à-vis solar energy deployment. This was observed in a handful of countries, such as Germany, Bulgaria, Austria, and Poland. Dual-use approaches to renewable energy production, such as agrovoltatics, could pose an attractive alternative in such cases.

Barriers under the **conflicts with third parties, such as public opposition, NGOs and environmental groups** predominantly affect onshore wind. Barriers related to conflicts with third parties were noted in 19 countries, making it the third most wide-spread topic of barriers across all categories and sub-categories. Whereas both ground-mounted PV and onshore wind face barriers dealing with integration of RES in spatial and environmental planning, for ground-mounted PV this does not translate into many conflicts with third parties, as barriers for that have only been noted in 5 countries out of the 28 observed.

1.3.2. Country Analysis

As conveyed in the chart below, the five most severe barriers identified as administrative processes across all EU Member States fall into the highest ranges of the barrier index, with values ranging between 0,97 and 1,00. In Hungary, Ireland and Poland, the index value even reaches 1,00 which indicates that project development is nearly impossible in these countries, at least for wind energy. The category of administrative processes is the one with the largest number of barriers reaching the maximal value of 1,00 in this analysis. Therefore, administrative frameworks are the most significant source of concern for project developers and investors, as they potentially stall the deployment of RES technologies.

BARRIER INDEX – Administrative processes

Rank	Country	BI	Impact on RES deployment
1	 HUNGARY	1.00	<p>Impact on RES deployment</p> <p><0.30 minimal</p> <p>0.30-<0.60 low</p> <p>0.60-<0.80 moderate</p> <p>0.80-<0.90 high</p> <p>0.90-<1.00 severe</p> <p>1.00 crucial</p>
2	 IRELAND	1.00	
3	 POLAND	1.00	
4	 ESTONIA	0.98	
5	 PORTUGAL	0.97	
6	 MALTA	0.97	
7	 LITHUANIA	0.96	
8	 CZECH REPUBLIC	0.95	
9	 LATVIA	0.95	
10	 SLOVENIA	0.95	
<hr/>			
11	 SLOVAKIA	0.88	<p>EU27 +UK AVERAGE: 0.89</p>
12	 ROMANIA	0.88	
13	 CYPRUS	0.87	
14	 DENMARK	0.87	
15	 ITALY	0.87	
16	 GREECE	0.87	
17	 CROATIA	0.87	
18	 AUSTRIA	0.87	
19	 SPAIN	0.86	
20	 SWEDEN	0.86	
21	 UNITED KINGDOM	0.85	
22	 FINLAND	0.85	
23	 FRANCE	0.85	
24	 BULGARIA	0.84	
25	 BELGIUM	0.84	
26	 GERMANY	0.84	
27	 LUXEMBOURG	0.75	
28	 NETHERLANDS	0.74	



RES POLICY MONITORING DATABASE

Figure 12: Barrier index results for the topic "Administrative processes"

The table below displays the 5 most significant barriers dealing with administrative processes reported across the EU27 and UK. In Hungary and Poland, wind farms are subject to strong spatial restrictions in the vicinity of inhabited and protected areas, effectively halting the development of such endeavours. Spatial planning is also the main hindrance in Ireland, where the lack of updated planning guidelines for wind development prevents developers from selecting sites and launching construction. Another issue is the complexity and length of permitting procedures, such as in Estonia and Portugal, which heavily affect the development process of wind and solar PV projects.

Rank	Country	Top 5 Barriers¹⁴	B.I.
#1	HU	Spatial and technical restrictions effectively ban wind power plants	1,00
#2	IE	Revision of Wind Development Planning Guidelines delayed	1,00
#3	PL	Restrictions on building wind plants	1,00
#4	EE	Length of administrative procedures hinders full renewable energy potential	0,98
#5	PT	Slow administrative process due to the lack of a proper one-stop-shop approach	0,97

¹⁴ More detailed information on the barriers can be found on the RES Policy Monitoring Database at: <https://resmonitor.eu/en/>

In **Hungary**, the government introduced special restrictions for the construction of wind power plants in September 2016. These include limitations on where developers can construct wind turbines and restrictions on technical parameters. The most significant barrier is the modification of the regulation on national site planning and building requirements. This Government Decree states that wind turbines (or wind parks) cannot be constructed 12 km from the borders of inhabited areas. This rules out all of Hungary. Moreover, the wind power plant's capacity may not exceed 2 MW, the height of the installation may not exceed 100 m, shall not interfere with air traffic, radio communication or communication for military and defence purposes. Lastly, wind power plants would only be eligible for a green premium through tendering procedures, but no such tenders have been opened since 2009–2010. Thus, wind power plants are effectively banned in Hungary.

Best Practice: Reduction of military areas in France

Aviation-related security constraints represent a significant obstacle in the site selection procedure for onshore wind in France. In order to remedy this issue, the French Civil Aviation Authority (*La Direction générale de l'Aviation civile - DGAC*) re-evaluated areas that might be suitable for wind energy development. The DGAC is a national regulatory authority, but it also provides safety oversight as it is responsible for ensuring the safety and the security of French air transport, air navigation services and training. The re-evaluated areas included the 'Training sector at very low altitude' (*Secteur d'entraînement à très basse altitude - SETBA*) and 'Tactical flight sector' (*Secteur de vols tactiques - VOLTAC*). As a result, an additional 13.3% of the SETBA and VOLTAC areas, corresponding to approximately 9000 m², was made available for the development of wind power.

There has been no indication by the government that it will overturn this measure.

In June 2016, the **Polish** Parliament adopted a new law aimed at protecting health and maintaining the standard of living of the citizens in the vicinity of wind farms. The new provisions make it illegal for new wind turbines to be located near homes, schools and natural reserves. In general, the construction of wind turbines is not allowed at a distance of at least 10 times their height (so-called 10H Distance Act and 10H rule). According to the wind power industry, this solution has stopped the development of onshore wind energy in Poland. According to experts, this rule led to 99% of Poland's surface becoming excluded from becoming the site for a

wind farm. The 10H rule also affects the repowering of existing wind installations. In May 2021, the Ministry of Development published and sent for approval a draft law which aims to ease the so-called 10H rule. The draft law provides for Local Spatial Development Plans to be able to freely define the reasonable distance between residential buildings and wind farms. A minimum distance of 500 m would be mandatory between residential areas and wind parks. As of the end of 2021, the law was not yet adopted.

In **Estonia**, the duration of administrative procedures for renewable energy – especially for wind (both onshore and offshore) – is very long and project realisation can take years. The issue is caused by the lack of human resources in some cases, such as limitations in the personnel and their know-how to deal with renewable energy procedures at the municipality level. In other cases, wide complaint rights as well as not in my backyard or municipality effects can hinder a project or slow it down for several years, especially when these are challenged in court. Recently, grid connections have faced severe delays due to the renewable energy (especially PV) boom. At the beginning of December 2021, more than 1000 connection applications were pending approval by the largest Estonian DSO, Elektrilevi, and the TSO, Elering. The total capacity of these adds up to 1300 MW, while installations with a combined capacity of more than 100 MW have already been constructed and are only waiting for a grid connection. Due to the fast development of the renewable energy market and technologies, the project might be less economically viable by the time the developer obtains all necessary permits. In addition to the length of administrative procedures, another issue in Estonia are the environmental restrictions imposed by municipalities for wind energy plants. The majority of municipalities in Estonia

Best Practice: Codes of conduct for RES technologies in the Netherlands

HollandSolar has drawn up sector binding Codes of Conduct for ground-mounted PV installations and onshore wind projects. HollandSolar is the Dutch association for photovoltaic and thermal solar energy with over 130 members, wielding substantial influence in the energy sector. The Codes of Conduct were drawn up in agreement with stakeholders and were co-signed and approved by environmental organisations. As a result, there is currently a good understanding between the project developers and potential opposing parties. Moreover, the code provided for a committee that's in charge of complaint procedures in the case of a breach of code. Committee members incorporate both sector representatives and environmental organisations for the sake of impartiality. As a consequence, resistance and the number of appeal procedures against ground-mounted PV installations and onshore wind projects has decreased.

are currently in the process of compiling comprehensive spatial plans, supervised by the Estonian Environmental Board. This raised the issue where the Estonian Environmental Board supports widening the buffer zones around areas with protected species or habitat, but wind energy development in such buffer zones is prohibited on environmental grounds. If the amendment continues as planned, it would block wind development in a very large share of areas with good wind conditions. The wind energy sector responded by pushing to have environmental assessments and surveys carried out in the buffer zones to determine their suitability for new installations on a site-specific basis. Currently, efforts are designed to have energy sector (both private and public sector) and Environmental Board representatives come to a compromise.

Best Practice: One-stop-shop for offshore wind farms in Denmark

Energistyrelsen (the Danish Energy Agency, DEA) serves as the main liaison between developers and the various other authorities involved with granting licenses for the development of offshore wind farms. Even though the number of required permits are not reduced, the authorisations processes are coordinated with other authorities through the DEA. Thus, the DEA can grant collective authorisation on behalf of several authorities, with conditions formulated by the individual authorities – it acts as a one stop shop. These joint authorisations do not completely exclude the need to obtain authorisations from other authorities. In these cases, the DEA relays information between the RES developer and other authorities. Once the relevant authorities have cleared the project to proceed, the system provides a high degree of certainty for investors that the project can be carried out.

In **Portugal**, one of the greatest difficulties for new RES-E projects is the complexity of the permitting procedures, which are time-consuming and financially costly. This is due to the high number of involved authorities: 5 different ministries, which do not cross-coordinate with one-other. The permitting procedures also involve deadlines that are difficult to comply with as well as discretionary decisions from members of the government responsible for the energy sector. In order to apply for an electricity production license, the developer first needs to obtain a construction permit, a declaration of the project's environmental impact (when necessary), and a capacity reserve title. After the electricity production license is issued, if the developer wants to change something in the project, such as the equipment they use, they must re-start the process from the beginning. The grid connection point allocated upon a connection request is reserved for 3 years,

granting the developer sufficient time to apply for a production licence. However, the progress of the production licence is not monitored in the interim, which can lead to it being retained in vain if the project stalls. This prevents other projects from being developed. Requirements for the Environmental Impact Assessment are complex. This procedure involves a wide and excessive range of measures, actions and demands, extending their length and making it difficult to meet deadlines. These factors burden developers with substantial financial costs and delay projects. RES producers associated with the Portuguese Renewable Energy Association (APREN) noted that the licensing process for a wind or solar power plant takes about 46 months on average.

In **Ireland**, one of the main problems standing in the way of wind deployment is the delay in updating the Wind Development Planning Guidelines introduced in 2006. Whilst this has begun, it is very slow and no finalised document has been published so far. This stands in the way of developers being able to select sites for wind energy, hampering or, on occasion entirely impeding the realisation of additional projects. Related discussions have recently focused on noise levels and shadow

Best Practice: Simplified administrative procedures in Belgium

In Wallonia, a region in Belgium, the environmental and urban permit were combined into the “*permis unique*” (single permit), saving RES developers administrative work. Projects are classified in three categories (1, 2, and 3). “Class 1” and “Class 2” projects can apply for single permits, while projects that are considered “Class 3” (less than 500 kW) are not required to submit a permit only an environmental declaration, which can be completed online. Similarly, a declaration suffices for rooftop installations as well. This saves time and money for individuals installing small rooftop panels or investing in a smaller RES system. Similar to Wallonia, Flanders has also implemented an integrated permit system, which reduces the number of simultaneous procedures that a RES developer has to go through before obtaining a permit. In this case, the environmental and urban development permits have been merged into one and it has to be submitted to a single entity (*Omgevingsloket*, Environmental Desk). The integrated procedure entails that different “elements” of the integrated permit are processed simultaneously and then returned to the *Omgevingsloket*, which then informs the applicant whether the request was granted or not. Additionally, rooftop PV installations and small wind turbine installations (with an output lower than 1.5 MW or fewer than four wind turbines) are exempt from both the environmental and urban planning permits.

flickering, the definition of which and their respective standards will significantly impact onshore wind by hiking costs by as much as 20%. In this regard, a new noise measurement system was developed by the Irish Wind Energy Association (IWEA) in collaboration with the Department of Communications, Climate Action and the Environment (DCCAE). Moreover, some standard requirements for wind energy plants are not aligned with leading technologies, making them unenforceable and not realisable. Last but not least, a lack of coordination and integration between local development plans adversely impacts project development as well. Considering the very slow pace at which Ireland is planning guidelines, it seems very unlikely that the 8000 MW of projects in the pipeline will be realised in the foreseeable future.

Best Practice: Hybridisation of power plants in Portugal

With the publication of Decree Law 76/2019 in Portugal, the government endorsed the hybridisation of power plants. This measure enables a higher flexibility and optimisation of permitting processes for already-existing power plants. By the time a project developer applies for an electricity production license for the installation of new units that use a different power source than the pre-existing one in the power plant (and maintaining the same installed capacity), the permitting authority informs him of the application documents that were previously submitted for that power plant, and are still valid. This prevents the project developer from having to unnecessarily go through the entire submitting procedure again.

4. GRID REGULATION AND INFRASTRUCTURE

1.4.1. Topic & Technology Analysis

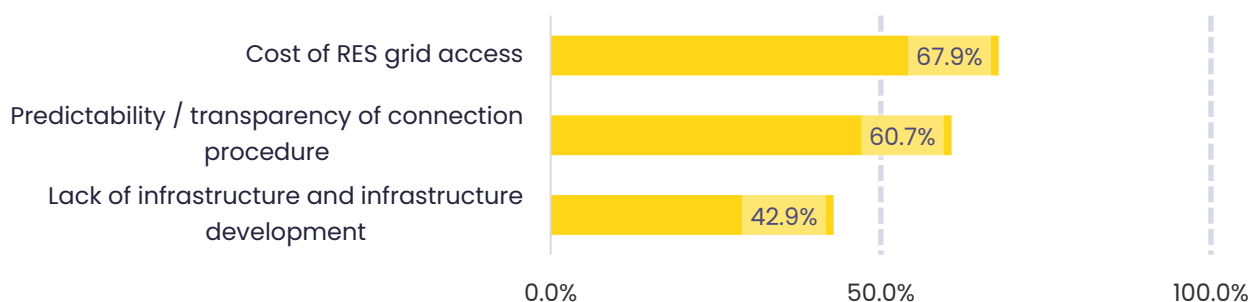


Figure 13: Most widespread barrier sub-categories under the topic "Grid regulation and infrastructure"

The core issue related to the electricity grid is insufficient grid infrastructure to transmit the electricity generated by solar PV and wind plants within and between Member States. Overall, the problem is well understood, but expanding grid capacities has remained painstakingly slow. Until grids are sufficiently reinforced, renewable energy plants will suffer the consequences, particularly in terms of grid connection costs or transparency of grid connection procedures.

68% of the countries analysed have reported the **cost of grid access** as being a hindrance for the deployment of solar PV and wind projects. In Austria, for example, grid connection costs for ground-mounted solar PV systems often account for more than 20% of total investment costs, whereas in France they amount to 10%, on average. Projects with connection costs exceeding 25% are most often abandoned. In other countries, renewable energy plants face costs higher than that of their conventional counterparts. In Flanders, Belgium the tariffs RES power plants have to pay to offload generation onto the distribution grid undermines a level playing field, because most conventional production units are connected to the transmission grid and avoid such costs. Meanwhile, solar PV and wind installations in Bulgaria are subject to a grid access fee that is twice as high as conventional power plants'.

Another widespread barrier-complex is the **predictability / transparency of connection procedures**, flagged in **60% of the analysed countries**. The reasons for this unpredictability differ from country to country. In some cases, clear grid connection requirements exist, such

as in the Czech Republic, but the allocation of grid connection permits remains unpredictable, DSOs often refer to technical issues or a lack of grid capacity to reject connection permits. In other cases, such as in Bulgaria, the lack of harmonised grid connection requirements among DSOs is confusing and decreases the diffusion of renewables. DSOs require different documents and sometimes their interpretation of the applicable legal framework differs. Some countries also reported a lack of information as key reason for opaque grid connection procedures. For instance, the Bulgarian TSO does not disclose information on available grid capacities by region, while Hungarian developers also face inadequate information on grid connection points.




Last, but not least, **12 of the analysed countries** reported that a **lack of grid infrastructure and infrastructure development** impedes the deployment of wind and solar PV. Those countries most severely affected are Austria, Belgium, Estonia, Croatia, Malta, the Netherlands and Slovenia.

Solar PV and wind technologies are equally affected by grid connection issues, underscoring that barriers related to grid infrastructure tend to be overarching issues.

1.4.2. Country Analysis

The most severe barriers dealing with grid regulation and infrastructure across all EU Member States fall into the highest ranges of the barrier index, with values ranging between 0,94 and 1,00. As the chart below shows, the five barriers with the highest barrier index were identified in Hungary, Bulgaria, Greece, Austria and Belgium.

BARRIER INDEX – Grid regulation and infrastructure

Rank	Country	BI	Impact on RES deployment
1	 HUNGARY	1.00	<p>Impact on RES deployment</p> <p><0.30 minimal</p> <p>0.30-<0.60 low</p> <p>0.60-<0.80 moderate</p> <p>0.80-<0.90 high</p> <p>0.90-<1.00 severe</p> <p>1.00 crucial</p>
2	 GREECE	0.98	
3	 BULGARIA	0.95	
4	 AUSTRIA	0.95	
5	 BELGIUM	0.94	
6	 ITALY	0.87	
7	 CROATIA	0.87	
8	 LUXEMBOURG	0.86	
9	 MALTA	0.86	
10	 IRELAND	0.86	
11	 UNITED KINGDOM	0.85	
12	 SPAIN	0.84	
<hr/>			EU27 +UK AVERAGE: 0.81
13	 SLOVAKIA	0.77	
14	 ROMANIA	0.77	
15	 LATVIA	0.76	
16	 DENMARK	0.76	
17	 ESTONIA	0.76	
18	 SLOVENIA	0.76	
19	 CZECH REPUBLIC	0.76	
20	 FRANCE	0.76	
21	 FINLAND	0.76	
22	 SWEDEN	0.75	
23	 LITHUANIA	0.75	
24	 NETHERLANDS	0.74	
25	 GERMANY	0.74	
26	 POLAND	0.65	
27	 PORTUGAL	0.65	

No barriers detected: CYPRUS



RES POLICY MONITORING DATABASE

Figure 14: Barrier index results for the topic "Grid regulation and infrastructure"

Shortcomings in grid capacity are one of the most serious grid-related issues preventing the deployment of wind and solar PV in several Member States. The table below shows an overview of the top 5 most significant barriers affecting grid regulation and infrastructure. The complete saturation of the electricity grid stalls further project development, but seems to be a local rather than a national issue in countries such as Hungary or Belgium. In Bulgaria or Hungary, project developers face a lack of transparency regarding available grid connection capacities, preventing the realisation of projects. In Greece, the high number of grid connection requests creates bottlenecks on the side of the TSO. The rising number of projects in the pipeline makes obtaining a grid connection a serious liability for project developers, especially in the wind energy sector. Furthermore, the slow pace of grid expansion in some countries, such as in Austria, jeopardises 2030 and 2040 national renewable energy targets.

Rank	Country	Top 5 Barriers¹⁵	B.I.
#1	HU	Limitations in grid access and grid capacity	1,00
#2	GR	Delayed management of connection requests by the Greek TSO and DSO	0,98
#3	BG	Lack of information about available capacities	0,95
#4	AT	Long distribution and transmission grid expansion times	0,95
#5	BE	Insufficient grid capacity for RES development	0,94

¹⁵ More detailed information on the barriers can be found on the RES Policy Monitoring Database at: <https://resmonitor.eu/en/>

In **Hungary**, grid infrastructure has and is expected to continue to pose a bottleneck for renewable deployment. The issue is two-fold: administrative and technical. The administrative issue is that developers have booked grid connection capacities for a number of projects that are unlikely to be realised or face substantial delays. This impedes the ability of other projects to connect to the grid. The technical dimension is the outright saturation of the grid. Hungary has not reached this point yet, but there are regions where investors cannot plan further projects due to such limitations. There are no concrete plans for the expansion of the electricity grid. In fact, the electricity grid's development is not a particularly attractive investment for DSOs, because they are not allowed to pass costs onto consumers. The matter has been acknowledged and is being addressed by relevant ministries, since the saturation of the grid's capacity has become evident. In addition, RES generators do not have transparent access to free grid connection points DSOs have to offer. There is no database publicly available that would allow for investors to acquire data. One of the reasons for this is that speculative investors used to request information on connection points which they would then book without consequences. This increased the administrative lag and impeded "real" investors from moving their projects forward, since speculators did not withdraw their bookings. This led DSOs to introduce costs for data queries. While this limits speculation, it also reduces access to information. The government has recently introduced a decree that would oblige the TSO and DSOs to announce free capacities every six months, allowing investors to subsequently book capacities for a fee. The efficacy of this measures is yet to be tested. The matter is primarily an issue for larger solar PV projects, it does not fundamentally impede rooftop PV, because those looking to install these have much better access to the grid and face fewer related bottlenecks.

Best Practice: Planning tool in France

The Grenelle II Law (*Schéma régional de raccordement au réseau des ENR - ENR'S3EnR*) introduced a Regional grid connection plan for renewable energies based three main goals in France. First, it develops a long-term vision of the for renewable energies, indicating necessary network developments in advance. Second, this planning tool supports the Regional Departments for the Environment, Development and Housing (*Directions Régionales de l'Aménagement et du Logement - DREAL*) and project developers in tracing the development of the electricity network, encouraging development by leading to greater predictability in terms of connection points. Finally, newly introduced cost-sharing ensures that early-stage RES projects do not exclusively bear all grid expansion-related costs.

In **Bulgaria**, the TSO, Electricity System Operator (ESO), refuses to disclose information about available network capacities by region. This puts future investors at a disadvantage. Investors may purchase a suitable plot of land and spend time preparing necessary paperwork, only to wait for a confirmation by ESO on whether the location has available capacities. The waiting times may be quite long and, if ESO rejects the location, the whole process must be restarted. This trial-and-error method can become rather costly and time-consuming. Capacities on a virtual map which updates with the currently available access by location marked by ESO would contribute to many more successful RES-E

projects, as well as a more even distribution of installations. This issue affects the deployment of both solar PV and wind energy technologies.

In **Greece**, the Independent Power Transmission Operator (IPTO), is experiencing trouble dealing with both grid connection requests for new wind power plants as well as revising connection offers for re-designed plants. The latter includes that have amended characteristics, with regards to capacity or materials use, for instance. This also applies to PV projects. Wind power projects is delayed due to this bottleneck. Considerable delays also exist in permitting procedure steps before grid connection requests, leading to further bottlenecks when IPTO and the Hellenic Distribution Network Operator (HDNO) are flooded with new requests. As of 2021, grid connection has been identified as the most fundamental hurdle to licensing in Greece. Wind power projects are particularly

Best Practice: TSO accommodating RES needs in Finland

Fingrid, the Finnish TSO, is highly supportive in enabling the fast-growing wind power sector to connect to the grid. The good communication between RES plant operators and developers as well as Fingrid has developed through years of mutually beneficial cooperation. The TSO seeks to stay up-to-date regarding future wind power prospects and is curious about projects that are still in their development or planning stages. Project developers have a good working relationship with Fingrid, enabling them to have conversations on grid development and grid access. In addition to smooth communication, Fingrid has also been supportive RES more generally. For example, it has often raised the need to solve compatibility issues between Defence Forces radar infrastructure and wind power development. It has undertaken the development the grid to ensure access for wind power plants, by expanding capacities from regions with a high amount of wind power production to the consumers in Southern Finland. It still faces a challenge in connecting the wind power generation-rich western Finnish coast with consumers. Unlike local grid operators, Fingrid also has a clear and consistent pricing system. The experts interviewed praise Fingrid for its cooperativeness and long-term planning.

hindered, as the duration for the licensing process cannot be estimated due to the uncertainty around the grid connection. Waiting times can reach two years for PV projects, if connected to the HEDNO-operated grid, or 9 months in the case of an IPTO-operated grid. The issue is worsened by the solar PV plants with an installed capacity of less than 1 MW, because they only need to participate in an accelerated procedure and can obtain a permit faster. While this accelerates the connection of small installations, it exacerbates existing bottlenecks for larger projects. The total capacity of these applications has now reached 10 GW and has now impacted the transmission system as well.

In **Belgium**, the biggest barrier to offshore wind is the connection to the grid. The operation of transmission and distribution fall under regional competence, entailing that Flemish authorities are responsible for accommodating the connection of offshore wind parks, since this is the only region with a coastline. Obtaining permits is time-intensive, due to the strong public resistance to grid expansion, which has impacted larger solar PV plants as well. New lines must be built underground, as the legal maximum threshold for total kilometres for above-ground grid poles has been reached. Every meter of line built above ground must be removed elsewhere, making the expansion of the network a tedious process. The transmission grid operator, Elia, received EUR 5 billion in 2020 from the federal government to further expand the transmission grid, but respective developments will play out during a time horizon of 10 years. Slow developments are a cause for concern since Belgium plans to expand offshore from 2 GW to 4 GW. Grid expansion to facilitate this are realistically planned for 2028, making it unclear how generation capacity can increase between 2020 and 2027. In addition, the transmission grid in the southern part of Wallonia (the provinces of Luxembourg, Liège and Namur) is severely underdeveloped. This is an

Best Practice: Approval of PV systems and components in Austria

In the Austrian state of Vorarlberg, the DSOs are very supportive of PV systems. Industry representatives assume this is because required lines are relatively short and connections can be realised with ease. Moreover, there is an intelligent system in place for the approval of technological components, which includes a so-called "listing" of these parts. If a manufacturer of a component is on this list, the project developer can be sure that it is authorised to build the system with these components. This is advantageous, as no new dialogues between the installer and the grid operator are required for the approval of every system component. This is appreciated by manufacturers, as it saves time and effort from one project installation to the next. Overall, the system offers greater planning security for project developers and streamlines the work of manufacturers.

issue, as this is the least populated area in Wallonia and very well suited for large scale RES developments (ground-mounted PV, wind farms and even hydro-power). However, such large-scale projects are not possible with the current grid infrastructure. Wallonia and the Federal Government have begun to address the matter by heavily investing in these distribution and transmission grids, to allow the delivery of large amounts of RES to more populated areas along the Meuse River and Flanders.

Austria aims to fully rely on electricity from domestic renewable energy sources (RES) by 2030 and achieve carbon neutrality by 2040. Grid capacity is, however, insufficient in certain parts of the country and its expansion is too slow to meet such targets. Approval times for distribution grid projects are long and projects such as the construction of overhead lines and substations can already take up to eight years before construction may commence. A number of laws (e.g. Nature Conservation Act, Heavy Current Routes Act) extend the lengthy approval process leading construction periods for 380 kV lines to reach 10 years, while it is estimated that 20 years elapse between from submission for approval to conclusion. The Salzburg line, one of Austria's most important infrastructure projects, took 20 years to complete. According to the transmission system operator, Austrian Power Grid (APG), 2030 and 2040 targets cannot be achieved due to the current duration of grid expansion. Standardisation and improving public participation are necessary to accelerate this process. At the political level, efforts are being made to shorten the duration of procedures that can help overcome bottlenecks, especially in eastern Austria. Limitations lead the grid operator to redispatch, meaning that renewable power plants can be turned off when grid bottlenecks form. Wind installations are particularly affected by this barrier.

Best Practice: Stealth wind turbines allowed in previously restricted radar areas in France

In France, a new turbine design (stealth wind turbines) were developed to avoid the obstruction of radar signals. This responds to a significant concern raised both by the French national meteorological service (Météo-France) and the French military sector: radar signal obstruction by wind turbines. This concern limits suitable areas for wind energy projects. To resolve the issue, Vestas Wind Systems, in collaboration with QinetiQ and the state-controlled utility EDF (Electricité de France), developed so-called stealth wind turbines. These were designed to minimise interference with radar systems, allowing their placement in previously restricted areas. As of October 2021, the first connection requests for wind turbines equipped with this new technology have been received by the Regional Departments for the Environment, Development and Housing (Directions Régionales de l'Aménagement et Développement Durable).

5. OTHER

1.5.1. Topic & Technology Analysis

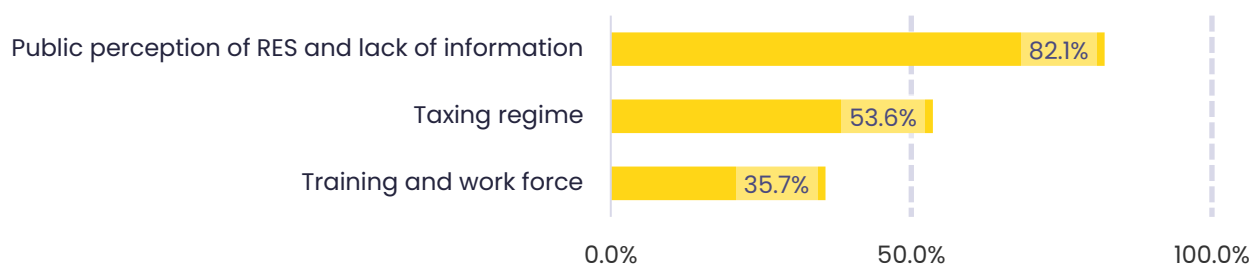


Figure 15: Most widespread barrier sub-categories under the topic "Other"

The final category *Other* encompasses barriers that do not directly fall under other categories, yet still have an impact on wind and solar energy deployment. The most noteworthy issues categorised under here have to do with the public perception of RES, tax issues as well as issues related to (a lack of) training and workforce.

The public perception of RES and lack of information regarding its use is by far the most wide-spread issue in the category *Other*. It is also the fourth most common issue after the complexity of administrative procedures, duration of administrative procedures, and the integration of RES in spatial and environmental planning (from the category *Administrative processes*). Research flagged issues arising from the negative public perception of RES in 23 of the 28 Member States. Overall, all technologies are quite largely affected. Barriers belonging to this sub-category were mentioned in 19 countries for onshore wind and 13 countries for offshore wind. For solar PV, the issue was flagged in 15 countries with regard to ground-mounted solar PV and 14 for rooftop.

Barriers dealing with public perception of RES and lack of information link to a historically reluctance or negative attitude in the media or society more broadly towards renewable energy in general – this does not impact specific technologies in an asymmetrical manner. Attitude can be traced to several reasons, a recent example is the 2021–2022 autumn and winter energy price hikes to renewable energy and the energy transition, such as in Bulgaria. Quite often, negative attitudes are attributed to mistakes in the implementation of support schemes first introduced in the 2000s and early-2010s. In some cases, the original tariffs

were too high and resulted in boom-and-bust cycles. This supported the public perception that renewable energy is costly, which was further badgered by rumours about corruption or foreign investors prioritising profit at the expense of citizen needs. To some extent, some versions of these narratives are still prevalent in Latvia, Slovakia, the Czech Republic or Bulgaria.

Finally, most barriers identified under this sub-category point to the prevailing negative public perception of renewable energy more generally, but there are a number of technology-specific issues as well, most often related to wind energy. Such accounts of not in my backyard attitude are a common throughout Europe.

Taxing regime encompasses another group of issues hindering the deployment of wind and solar in Europe. It includes cases where taxes imposed upon renewables or the tax system in general does not support the quick deployment of wind and solar necessary to meet climate and energy targets. It is possible that with the shift from support schemes to a market-based approach, these issues might wither away.

This research identified two major themes: a lack of incentives and indirect taxation. In many cases, the general tax regime does not offer any (or sufficient) tax incentives and benefits to encourage the deployment of renewable energy or specific provisions, such as self-consumption. Such is the case in Latvia, where households which have implemented measures to improve energy efficiency or installed emission-free renewable energy technologies are not granted any tax incentives or exemptions. Meanwhile, in the Czech Republic the tax exemption for electricity generated from RES was cancelled in 2016 (apart from prosumers with up to 30 kW in generating capacity).

The other major issue is the (hidden or indirect) tax burden on some renewable energy technologies or components of renewable energy projects, which has a negative impact on their competitiveness. In Portugal, for instance, RES installations are considered to be real estate projects that are subject to the Municipal Real Estate Tax, which, in the eyes of project developers, is unfair. Other examples include France, where wind and solar installations above a capacity of 100 kW are subject to a flat-rate tax on network businesses called IFER, which is much higher than for conventional energy sources. In Hungary, market-based solar PV projects (i.e. those that do not benefit from the state subsidy scheme) have to pay a 31% so-called Robin Hood tax.

Lastly, issues related to **training and workforce** have been mentioned in 10 out of the 28 countries. It mostly concerns onshore wind and ground-mounted solar PV technologies. The impact of the barriers related to this topic is minor to moderate in most cases, causing time and financial losses, but not acting as a detrimental barrier to deployment.

This does not mean that the issue should go unnoticed, on the contrary, the amount of wind and solar deployment needed in Europe in the next decade means that tackling this issue is of rising importance. Problems such as an insufficiently large labour force as well as lack of expertise are prevalent in both administrative public authorities well as for RES installers and technicians. The issue has been flagged in countries such as France, Croatia, Slovenia and Ireland, and weighs on the pace at which projects materialise. In addition, technicians working on the ground is insufficient nor are there enough training courses to meet rapidly rising demand. This has been brought up as an issue in Sweden, Estonia and the Netherlands, among others.

1.5.2. Country Analysis

The most significant barriers in the category “Other” fall into a wide spectrum, with values ranging between 0,88 and 0,98. As displayed in the chart below, the five barriers with the highest barrier index were identified in Estonia, Lithuania, Ireland, Hungary and Slovakia.

BARRIER INDEX - Other

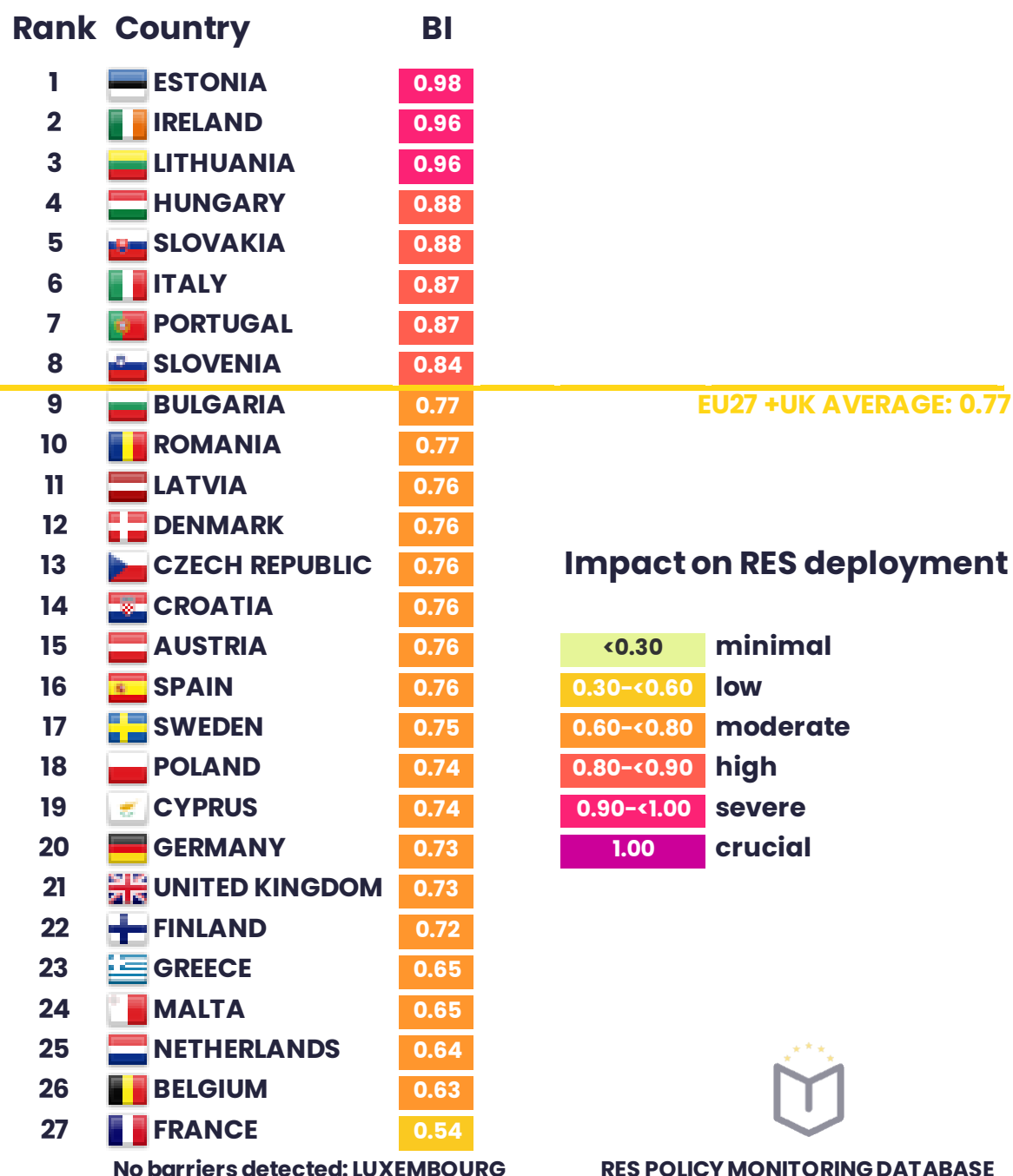


Figure 16: Barrier index results for the topic "Other"

The table below shows an overview of the top 5 most significant barriers hindering the deployment of solar PV and wind energy in the category “Other”. High taxation is by far the most recurrent issue undermining the development of wind and solar PV projects in several Member States. Those most seriously affected are Lithuania and Ireland. The specific tax-related issue is different in each country, ranging from a transportation tax in Lithuania to commercial property tax in Ireland. In addition to fiscal issues, the negative public perception towards wind energy projects represents a significant threat to the deployment of this technology in certain countries, such as in Estonia or Slovakia. Last but not least, the lack of skilled manpower in countries such as Hungary also hinder the completion of RES projects.

Rank	Country	Top 5 Barriers¹⁶	B.I.
#1	EE	Local level opposition to renewable energy development	0,98
#2	IE	Increase of commercial property tax rates	0,96
#3	LT	High transportation tax for large-size and heavy load transport	0,96
#4	HU	Lack of skilled workers in the renewable sector	0,88
#5	SK	Negative reputation of RES (especially PV)	0,88

¹⁶ More detailed information on the barriers can be found on the RES Policy Monitoring Database at: <https://resmonitor.eu/en/>

Best Practice: Official guidelines on marketing green electricity in Denmark

When marketing electricity, suppliers must comply with the Danish Marketing Act, which is in force to avoid consumers from being misled. This has become an issue with regard to electricity, since it was unclear under which conditions electricity suppliers can market electricity as “green”. On 10 January 2020, the Danish Consumer Ombudsman published a new set of guidelines, which clarify when and how producers may use the “green” and related labels. The aim is to provide electricity suppliers with a simple option to market electricity from renewable sources without misleading consumers, while also making it easier for consumers to choose such products. Guidelines will ensure fairer competition between suppliers through clear and uniform rules and discourage so-called “greenwashing”. The guidelines have been drafted in collaboration with consumer, environmental and business organisations, including representatives of the Danish energy industry. They took effect as of 1 June 2020 and are enforceable by fines against companies that are found to use misleading marketing techniques.

Local level opposition to renewable energy projects, particularly wind plants, is a rising barrier in **Estonia**. Both local residents and citizens as well as representatives of municipalities express such opposition. Opposition to wind and solar can be seen as slightly increasing in both groups. It is common for local communities to oppose renewable energy projects, reflecting the not in my backyard (NIMBY) effect. They argue that such projects disturb the natural landscape and negatively impact the quality of life in the region. Such strong opposition has made it increasingly difficult to have civilised and reasoned debate, leading public consultation to being incredibly strained. Due to the relative autonomy of municipalities, they tend to see renewable energy development solely from a local perspective, without taking into account national considerations, such as renewable energy target. In order to not upset local citizens and secure re-election, local council is hesitant to approve any projects. Meanwhile, developers often

attempt to override public opinion and not engage sufficiently with local citizens in a meaningful way. The problem is exacerbated by wind developments not necessarily benefitting the local community. Wind developers commonly offer some compensation to local municipality through NGOs, but this is not regulated by law. Given the breadth of the issue, the state is now working to establish an instrument to regulate the local community's compensation. This will apply to both onshore and offshore wind projects and is expected to be approved in 2022.

In **Lithuania**, project developers must pay high taxes for the transportation of large-sized and heavy loads. Developers must pay high taxes to transport parts of wind power plants from the Port of Klaipeda to the construction site. The Lithuanian Wind Power Association states that these taxes are 10-times higher than in neighbouring countries. The problem is even more evident when the tax that is calculated per kilometres driven, which amounts to a minimum of EUR 1.44 per 10 km. Mileage in other countries is not even considered, indicating the disadvantage project developers in Lithuania face. Other countries typically use a permit to collect specific fees, but these typically add up to less.

One of the most significant barriers to the diffusion of wind projects in **Ireland** is the taxing regime. This is due to an increase in commercial property tax rates, which, in some cases, tripled since 2016. The Valuation Office re-evaluated commercial property tax rates, leading to increases and the revaluation of wind projects. This nullified the decrease in capital costs. Commercial property tax rates have increased by up to 200–300%, creating additional development costs for wind projects. Tax rates change by jurisdiction, but, for instance, in the City of Limerick, it has increased two- to three-fold, as noted above. This tax increase was introduced after power plants were constructed and began operations in the feed-in tariff (FiT) system, which has led their economic viability to plummet. In contrast, fossil fuel plants saw a decrease of 50% in their property tax rates. The European Commission (EC) was informed about this issue by Irish wind energy stakeholders, which argued that the retroactive nature of property tax makes it an indirect form of state aid for fossil fuels (i.e. environmentally harmful subsidy). The EC did not side with wind stakeholders, leading them to launch a case against the EC at the European Court of Justice (ECJ). The wind sector also made its case at the High Court Ireland, but to no avail. Despite unsuccessful appeal, this unjustifiable increase is commonly seen as an indirect subsidy to fossil fuels, weighing on the competitiveness of renewables.

Hungary faces labour shortages. This has impacted the overall economy, but is also prevalent in the renewable energy sector. Many skilled workers have migrated to western European countries, leading to a lack of labour that especially hinders smaller projects' progress or has increased the costs of new installations. There is a deficit of RES-E training opportunities that further hamper the installation and efficient operations of RES-E plants. There is only one official training programme for RES installers in the National Qualification

Register. The programme 'Renewable Energy Installations' Operator' was introduced in September 2016, but meaningful vocational training usually takes place within a company.

In **Slovakia**, the general population holds a negative perception of renewable energy sources due to the so-called TPS fee, which increases household and commercial electricity prices. This fee is a key instrument for funding electricity generation from renewable energy sources (RES) and combined heat and power (CHP). It is a part of the final electricity price and is determined by the Regulatory Office for Network Industries (ÚRSO) each year. For the year 2021, it was fixed at approximately EUR 23.74 per MWh and represented only a minor increase compared to its 2020 value of EUR 23.62 per MWh. According to the latest data provided by the Slovak Short-Term Electricity Market Organiser (OKTE) – the national clearing entity – final power customers supported RES and CHP investments with EUR 467 million in 2020, about EUR 60 per household. The costs incurred are seen in negative light, especially with regards to solar PV plants put into operation mainly in the period of 2009–2011. At the time, guaranteed feed-in tariffs (FiTs) were rather generous and their price increasing impact is still prevalent. The Slovak Government has acknowledged this issue and has committed itself to find solutions to reduce the final price of electricity. Thanks to the ongoing national subsidy scheme ("Green to Households" programme) and no new large RES projects since the end of 2013, the citizens' negative opinion on RES only as a cost driver has gradually fizzled out. Nevertheless, it was emphasised in 2021 that more best practices and better communication should be deployed to improve the standing of renewables in Slovakia. This is envisaged to be done by the Slovak Innovation and Energy Agency (SIEA), which administers the Green to Households programme. It may also reduce not in my backyard (NIMBY) attitudes towards RES projects prevailing amongst the population.

Best Practice: PV-plant on local highways in Italy

The local administration of Isera, Italy supported the construction of a PV plant on the acoustic shelf of a local highway in 2009. The plant, realised by Far Systems and Codioli (a member of Industrial Group Tosoni) has a surface of 5.034 m² and an annual output of 760 MWh. The structure includes two sections with 60° degrees and 35° slopes that are 3.2 and 1.6 meters long, respectively. This configuration allows for high PV efficiency while maintaining good acoustic protection. The cost of the barrier was EUR 5.8 million and was supported by the the "V Conto Energia" national support scheme, with the investments returns expected in 17 years. This solution allows the construction of solar PV plants without the need to occupy land.

RECOMMENDATIONS

- 1.** A reliable and long-term strategy for renewables with clear sector and technology targets is key to investors' confidence and steady RES deployment. To this end, national 2030 renewable energy targets should be binding.
- 2.** Support scheme conditions for RES should be reliable and the remuneration level scheduled over a defined time period for investors to build their business plans. Depending on the support type, the defined support methodology needs to be aligned with market conditions and the pace at which installations are commissioned.
- 3.** Administrative procedures need to be streamlined and transparent. Setting deadlines for each project milestone is a useful tool (e.g. for consultation periods, EIA etc.). The competent administrative authorities should be allocated adequate resources to process permitting procedures, be equipped with an adequate number of skilled personnel and set up with state-of-the-art digital infrastructure.
- 4.** Project size does not automatically translate in more (severe) administrative barriers (as we for instance see in the case of offshore wind). More centralised, one stop shop planning can ease administrative barriers for bigger projects as well as facilitate the involvement of more diverse entities in developing renewable energy projects.
- 5.** Third parties such as local communities, municipalities, nature conservation organisations need to be involved upfront in RES projects to increase acceptance and avoid long appeal procedures. Their role, responsibilities and the advantages to their participation need to be clearly defined, leading project development to respect ecosystems and inhabited areas.
- 6.** Grid planning needs to be a part of a comprehensive strategic approach providing a clear vision on future energy infrastructure. This approach needs to include energy generation, sector coupling, demand management, storage solutions, etc. It also needs to be coordinated between transmission and distribution grid operators, as well as relevant stakeholders, such as local communities or nature conservation organisations. In addition, consistent grid planning needs to translate into fair grid access costs and transparent grid connection procedures.

ANNEX

DEFINITIONS OF SUB-CATEGORIES

Barrier category	Barrier subcategory	Description
Political and economic framework	Existence of applicable RES / climate strategy	Barriers within this subcategory are caused by the non-existence of a RES / climate strategy in the respective country, i.e. a document by the government or the parliament which lays out how to mitigate or adapt to climate changes at national or regional level and or deploy RES across all sectors. As a strategy, the document does not need to provide detailed rules such as on support schemes or other RES related issues but it should give some foresight for climate & RES actors. In a positive case, it sets a target which gives RES investors planning and investment security and creates a certain level of accountability.
	Reliability of general RES / climate strategy	The reliability of the general RES policy framework represents the risk associated with drastic and sudden changes in the RES strategy. In the worst case, this could imply a complete change or abandoning of the present RES targets.
	Existence of RES support scheme	For certain technologies and settings, support schemes are still necessary as they provide the required funding and investment security for an efficacious model. This is non-existent, if either there is no support scheme at all or if the current support scheme is existing on paper but is unattainable in reality, for example if it rules out certain technologies or if it is based on a tender but there are no tender rounds foreseen.
	Reliability of RES support scheme	The reliability of the general RES policy framework represents the risk associated with drastic and sudden changes in the support scheme. In the worst case, this could imply a complete change or abandoning of the present support scheme as well as retroactive changes of RES support. In a positive case, transparent adjustments could be made to improve RES support conditions.
	Remuneration level for RES	The remuneration level under the given RES support scheme defines the expected income for a RES project (under given resource conditions and technological performance parameters). In case of a

		quota or feed-in premium it comprises the overall remuneration available for RES, including certificate price/premium and final energy price.
	Revenue risk under given support scheme	The revenue risk refers to the lack of expected stability of the RES support level under the given support instrument. The remuneration level may be subject to fluctuations due to tariff adjustments as foreseen in legislation as well as due to risk factors inherent to the type of support scheme (such as risks associated with fluctuating certificate prices in a quota scheme as compared to the relative stability of a fixed FIT).
	EU legislation	This subcategory refers to the role and impact of State Aid Guidelines on the political and support scheme framework for RES at national level.
Market structure	Dominance of conventional retailers & energy utilities	This sub-category is looking at issues such as classical market designs under which conventional sources were used and conventional retailers & energy utilities had a strong market position. In addition, issues related to legal regulations, which were originally designed for the use of conventional sources, are also considered; thus, hindering or limiting the introduction, use and diffusion of RES technologies.
	Fair and independent regulation of the electricity sector	Fair and independent regulation implies that electricity market regulation ensures a non-discriminatory access of RES-producers to the market, without barriers such as legislation hindering participation of independent power producers (IPPs), incomplete unbundling or a lack of an independent regulatory body.
	Access to finance	The access to finance represents the maturity of the national financing environment and the ease to obtain attractive financing for RES projects. It includes availability of capital and the respective financing costs (including national risk surcharges), existence of soft loan schemes and willingness of local banks to cooperate with RES developers.
	Existence of functioning and non-discriminatory short-term and balancing markets for RES	The availability of liquid markets implies flexibility for RES developers to participate on even ground in wholesale, intraday and possibly balancing markets. For example, gate closure times may affect the integration of variable RES-E: Shorter gate closure times favour RES-E integration whilst longer gate closure times tend to discriminate RES-E compared to conventional technologies.

Availability of reliable long-term contracts (PPA)	Availability of attractive Power Purchase Agreements (PPAs) may mitigate risks associated with volatile electricity prices and provides long-term revenue certainty for RES developers. PPAs are of crucial relevance in support schemes where the electricity price is part of the overall remuneration, such as quota systems with tradable green certificates (TGC) or premium systems.	
Self-consumption issues (incl. smart meters)	Self-consumption issues hinder business models that are based on using the electricity for own consumption or providing it to a defined group of consumers (such as tenants, neighbours, etc.). The barrier can be that self-consumption is outright prohibited or made very difficult for example because of unproportionate taxes or fees. Positive cases are regulations that ease self-consumption for by broadening the scope of people that the self-produced electricity can be sold to or reduced bureaucratic efforts when selling electricity.	
Lack of resources for economic reasons	This sub-category refers to the resources that are necessary for PV and wind projects. On the one hand, this can be resources that are required for the power production (PV panels and wind power turbine) such as steel or rare metals. What is more is the availability of land, which is a particular problem in mature wind power markets. This category does not cover a lack of resources that is caused by state activities (such as import or building restrictions) but rather barriers that are caused by market dynamics (too much demand meeting too little supply). Positive cases are state-actions which anticipate and counteract such shortages, for example through a resource strategy or land plans that increase the availability of land.	
Administrative processes	Complexity and transparency of administrative procedure	The complexity of the administrative procedure determines the effort it takes for the developer to carry out the permitting process. A transparent process has clearly defined and manageable requirements in terms of number of permits, intermediate steps, and time limits for permit decisions. Moreover, options for online application could be provided, etc. Opposed to this would be an obscure process with a high number of required permits and a lack of time limits for permitting decisions. Also, the setup of the administrative authorities (e.g. number of authorities that have to be contacted directly or indirectly, communication & coordination between authorities, one-stop shop, etc.) plays a role for the complexity of administrative procedures.
Cost of administrative procedure	The cost of administrative procedure encompasses the expenses for obtaining all required building permits, environmental impact assessments as well as for paying administrative processing fees. It excludes costs for the equipment itself. Depending on the national	

		regulations and administrative practice, the administrative costs can constitute substantial extra cost in the overall project cost.
	Duration of administrative procedure	The duration of the administrative procedure refers to the time required for obtaining all permits and documents needed for starting the construction of the power plant. This can also be influenced by public resistance to RES projects. The administrative lead time can imply substantial delays in the whole project implementation process. Depending on the technology it can range from a few weeks up to far more than a year.
	Integration of RES in spatial and environmental planning	Spatial and environmental planning issues can cause additional delays in RES project development, e.g. due to conflicts of interest in land use. In the best case, suitable areas for RES development could be reserved to allow for the fast realisation of projects.
	Conflicts with third parties (public opposition, NGOs and environmental groups)	Conflicts with third parties go beyond apathy against RES by the general public and cover specific cases, in which a group of people takes concrete steps to prevent single projects (in court or in the streets) or prevent RES by changing relevant legislation. The motives of these peoples can differ (concern for species of animals, individual concerns as neighbours or general dislike of RES). Good cases cover state action that either win over concerned citizens (such as the option to financially participate in projects), clarify laws to prevent conflicts (for example list of animal species where environmental project shall (or shall not) prevail, and make legal proceedings more efficient and shorter.
	Corporate & fiscal issues (incl. Mandatory memberships)	Corporate and fiscal issues are particularly relevant for owners of smaller PV systems. Sometimes, such owners are regarded as businesses, regardless of the size of their PV systems. As such, they have to follow certain rules (register as a business, pay certain taxes or insurances or have to become member of a trade/ commercial chamber) that increase the administrative burden to an extent that prospective investors lose interest. In a good case, there are exemptions for small systems that relieve the investors from such duties.
Grid regulation and infrastructure	Cost of RES grid access	The cost of grid connection and grid reinforcement indicates how much additional cost the investor will have to face for connecting his project to the grid. Shallow (only for connection to nearest point) or even super-shallow costs (no cost for connection) imply low additional cost whereas deep costs (for connection and reinforcement) result in

possibly very high extra costs for grid connection. Mixed approaches are also possible.

Duration of RES grid access	The lead time for obtaining access and connection to the electricity grid can imply substantial delays of the whole project implementation process. Depending on the technology, it can range from a few weeks up to far more than a year.
Lack of infrastructure and infrastructure development	This sub-category is looking at issues regarding the lack of infrastructure as well as infrastructure development. It addresses all infrastructures, which are required for a further development and diffusion of RES-H&C, beside the district heating network.
Predictability / transparency of connection procedure	The transparency of the grid connection procedure is influenced by the predictability of the respective duration and the related cost until grid connection is established (variance in duration and cost).
Transparent and foreseeable grid development	The transparency and predictability of the future grid development can be relevant factors for the evaluation of potential RES project sites. Developers wanting to assess connection options to the grid depend on the respective information outlining the future development of new grid structures or reinforcements of the existing network. Barriers in this regard are referring to the unavailability of information on grid development plans to the general public or even to the general nonexistence of grid development plans.
Treatment of RES dispatch (curtailment)	The electricity dispatch regime represents the level of certainty that generated RES-electricity will be dispatched and remunerated. In positive cases, RES electricity can either be dispatched with priority or compensation payments could be guaranteed in case of grid-related curtailment. A less favouring option for RES-E would imply no priority dispatch and no foreseen compensation.
Lack of flexibility options	The flexibility options refer to 5 alternatives: <ol style="list-style-type: none"> 1. Demand-Side Flexibility: connecting or disconnecting flexible consumers or certain industrial processes. This option allows consumers to be actors in the management of the grid by adapting their electricity consumption to the needs of the grid. For example through time-of-use rates for reducing consumption during peak demand times. 2. Supply-Side Flexibility: this is traditionally the main flexibility option used in conventional electricity systems, e.g. using flexible renewables such as hydropower, pumped hydro

		<p>storage or thermal generators such as open-cycle gas turbines.</p> <ol style="list-style-type: none"> 3. Flexibility from storage and sector coupling: charging or discharging energy storage devices such as pumped storage, batteries, compressed air storage, power-to-gas (PtG), power-to-liquid (PtL). 4. Grid Flexibility: developing and transforming electricity grids to increase electricity transmission capacities and adjustment effects on a national and supra-national scale. Import electricity when the national residual load is positive and export electricity when it is negative. 5. Operational Flexibility: this option involves e.g. the use of modern forecast technologies, or the optimisation of intra-day and balancing markets thanks to improved market and regulatory frameworks.
	Cross-border grid issues	Cross-border grid issues describe regulatory issues which prevent a stronger deployment of grid infrastructure or the trade of electricity between two countries. Issues under this category cover slow development of interconnectors, the installation of phase shifters that reduce transmission or discrimination of foreign power. Good cases are enhanced development of interconnectors as well as regulations that ease cross-border transmission.
Other	Certification	Certification issues may result from a lack of appropriate certification schemes for RES installers or RES-installations itself. In addition, certification issues may also arise in regards to missing standards on which basis a certification could be executed. Finally, existing certification schemes may be not detailed enough to cover all required cases or they are too detailed to allow for an appropriate compliance with the regulation.
	Information exchange / communication between relevant stakeholders	Communication and information exchange between relevant stakeholder groups, i.e. project developers, administration, other involved administrative bodies, grid operators, regulators etc. influence the smoothness of RES development. Unavailability of required information, absence of competent stakeholders or a lack of communication channels between the involved parties might lead to substantial complications of both, the project implementation and operation.
	Lack of resources for natural reasons	This sub-category refers to the difficulty of deploying RES projects due to bad natural or geographical conditions. For examples, when the

		depth of coastal zones is too high to install offshore wind farms, or the altitudes are too low to develop hydropower plants.
	Operational issues	This sub-category is grouping issues, which occur in conjunction with the practical operation of RES installations, respectively in the course of their practical development. Identified barriers would include issues that are not necessarily under the control of the government, but which are the outcome of general structures, conditions and practices.
	Public perception of RES & lack of information	The lack of public awareness regarding RES technologies and their benefits may lead to the underestimation of their potential, thus triggering resistance to a wider implementation of RES-installations.
	Statistics	Barriers under this sub-category refer to a lack of available information and statistics on RES-E, affecting the assessment of costs and benefits as well as the assessment of the existing potential of RES-E technologies. The lack of statistical information also hinders the identification of the most appropriate sites for the development of RES projects.
	Taxing regime	Barriers under this sub-category refer to the complexity of the tax structure as well as to the various bureaucratic fulfilments necessary in order to benefit from tax incentives. Moreover, barriers may also refer to the high taxation rates or the mere inexistence of tax incentives and fiscal benefits for RES projects, thus leading to a lower profitability of such investments.
	Training & work force	RES installers require a profound theoretical background and an in-depth practical training to be able to properly install and certify RES installations. The unavailability of respective training schemes or a lack focus on technology specific requirements and practical skills in existing training schemes may hamper the diffusion of RES technologies.
Cross-cutting categories	Clean flexibility options	In this context of the reduction of CO ₂ emissions, wind and solar energy are set to become essential pillars of the energy system in the near future. However, due to their variable nature, it is a complex task to balance electricity production and demand at all times to preserve the stability of the electricity system.
	Impact of Covid-19	This sub-category refers to the direct or indirect consequences of Covid-19 on the development of RES projects. This includes market uncertainty, delayed administrative processes (particularly during the pandemic waves), but also the lack of availability of resources, as well as logistical issues arising during the economic recoveries between

	<p>pandemic waves. Good measures include proactive government action that calm the market environment.</p>
New business models	<p>This sub-category deals with new business models (e.g. peer-to-peer selling, new types of PPA, maybe in combination with digital currencies or Internet of Thing or demand side management services) that are built up to replace or enhance existing business models. Barriers are regulatory measures that prevent their spread, good practices are such that ease their introduction.</p>
Relevant for RES communities & cooperatives	<p>This sub-category refers to issues affecting the good-functioning of RES communities or cooperatives. In some cases even, legislative and financial limitations prevent such energy structures to exist.</p>
Digitalisation	<p>This sub-category covers cases, in which the deployment of wind and PV overlap with digitalisation of power systems. This can be both negative (for example in case of an inappropriate obligation to install smart meters or inadequate cyber security that increases the risk for RES installations) and positive (for example by creating new business cases).</p>

METHODOLOGY – BARRIER INDEX

The Barrier Index is an assessment index taking two dimensions into account: the barrier factor and the deployment factor.

Barrier factor

A barrier can affect one specific technology or several ones. Furthermore, the same barrier can affect different technologies with different degrees of gravity. In order to assess the gravity of a barrier for each technology, two parameters were considered – the severity and spread. The severity level of the barrier determines how critical the issue is for a single RES installation, whereas the spread level of the barrier indicates how widely the issue affects RES installations in an observed country. Both parameters are rated on a scale composed of 5 levels in order to define the degree of gravity of a barrier as precisely as possible.

Severity	
1	The identified barrier has minimal effects on the further development of RES installations. It causes no or negligible time loss and has no or negligible financial consequences.
2	The identified barrier has minor effects on the further development of RES installations. The completion of the installation may be slightly slowed down and financial consequences may (rarely) arise.
3	The identified barrier has moderate effects on the further development of RES installations, resulting into important time and financial losses.
4	The identified barrier has substantial effects on the further development of RES installations. The completion of the installation could be seriously jeopardised, resulting into substantial time and financial losses.
5	The identified barrier has severe effects on the further development of RES installations, leading to project abortion.
Spread	
1	The barrier impacts sporadic installations of the above-mentioned technologies.
2	The barrier affects a small fraction of installations of the above-mentioned technologies.
3	The barrier affects a moderate share of installations of the above-mentioned technologies.
4	The barrier affects a predominant share of installations of the above-mentioned technologies.
5	The barrier concerns almost all installations of the above-mentioned technologies.

The average value for the severity and spread indicators was calculated for each barrier, resulting in values on a scale between 1.0 and 5.0. In order to fit in the overall index range, these values were normalised to values between 0.0 (low) and 1.0 (high). Overall, a list of 1485 technology-specific ratings serves as a basis for the calculation of the barrier gravity.

The assessment of the barrier situation was made based on the highest rated barrier per technology, per sub-category and per country. The result of this procedure is a value between 1.0 (low) and 5.0 (high) for each sub-category, technology and country.

As described above, one of the main features of the present methodology is the analysis of barriers along 5 main topics. To this end, the highest barrier value per topic, resulting from a respective sub-category, was taken for further calculations. The overall result of the described calculations are five topic assessment values – the barrier factors.

Deployment factor

In order to set the barrier factor in relation to past and projected RES capacity deployments, a second factor called „Deployment factor“ was calculated. As basis for these calculations, annual technology-specific RES capacity data was collected for the period 2015 to 2035. Past data was gathered from Eurostat. In addition, projected capacities for the period 2020–2035 were selected from a modelling analysis conducted by Ember/Artelys (more details on the modelling methodology are provided on p.14 above).

Out of this time series of capacity data, the following two indicators were developed:

- a) *Relative share of technology-specific deployment in total deployment 2020–2035***
- b) *Share of projected deployment (2020–2035) in total deployment (2015–2035)***

The **first indicator** was developed in order to indicate the importance of technology in regards to reaching the net-zero target in 2035 in relation to the rest of observed RES technologies. If a certain technology's deployment has a huge share in the total RES deployment, the value for this technology is higher compared with the other technologies' values. It is calculated by dividing the technology-specific deployment between 2020 and 2035 through the overall RES deployment 2020–2035.

The **second deployment indicator** sets in relation the amount of projected RES technology deployment that is still ahead with the total RES technology deployment between 2015 and 2035. If a technology was not deployed in the period 2015 to 2020, but is projected to be

deployed to a large extent until 2035, the result is a high value. This indicator is calculated by dividing the technology-specific deployment between 2020 and 2035 through the technology-specific deployment between 2015 and 2035.

While the first indicator compares the different RES technologies' deployment with each other, the second indicator focuses on the progress already made in the deployment of the respective RES technology.

The value range for both indicators is 1.00 (low) to 1.05 (high). If no deployment is planned at all in a country, the value is 0.0. This concerns for example landlocked countries, where offshore wind deployment is not possible.

The overall deployment factor is generated through the multiplication of the two described indicators. It can reach a value range between 1.0 (low) and 1.1 (high). In cases of no planned deployment, it equals 0.0. In the end, the result is one deployment factor per technology and country, totalling in a list of 112 values.

Barrier index calculation

After having calculated the barrier factors for each technology, topic and country, these values are now set in relation with the technology-specific deployment factors by multiplying the two values.

The product of this multiplication is a topic-specific barrier index value:

$$\mathbf{Barrier\ index}_{Cat} = \mathbf{Barrier\ factor} \times \mathbf{Deployment\ factor}$$

The value range for this index is 0.0 (low) to 1.0 (max). In order to assess the impact of barriers on the RES deployment, the following classification was undertaken:

Impact on RES deployment

<0.3	minimal
0.3-<0.6	low
0.6-<0.8	moderate
0.8-<0.9	high
0.9-<1.0	severe
1.0	crucial

For each of the 28 analysed countries, a total of 5 topic-specific barrier indexes is calculated, provided that barriers have been identified in these topics. Out of these topic-specific values, an overall barrier index per country is calculated through the weighted average of these sub-indexes. The weights for the different topics are as follows:

	Topic	Weight
	Overall	1.00
1	Political and economic framework	0.265
2	Markets	0.185
3	Administrative processes	0.265
4	Grid regulation and infrastructure	0.185
5	Other	0.10

Political and economic framework and **administrative processes**, the two most decisive categories having an impact of wind and solar energy deployment comprise half of the weight. Both categories are valued at a total of 0.265, coming to a total of 0.53. This reflects their importance in determining the outcome and success of wind and energy deployment in European countries. This demonstrates the trend of growing importance of administrative processes in relation to political and economic frameworks. In the middle of last decade, political and economic issues comprised the biggest share of barrier hindering renewable energy deployment in Europe; however, this dynamic has started to shift in the recent years. With the European Green Deal and ambition growing with regards to European energy and climate policy, the relative importance of barriers deriving from political and economic frameworks has started to decline somewhat. For instance, even if insufficient, now all EU Member States are obliged to have a planning document covering renewable energy – the National Energy and Climate Plan (NECP) – and update this on a regular basis. In turn, the importance of administrative processes in hindering or complicating the deployment of wind and solar energy has grown over time.

The next two bigger categories in terms of decisiveness, **markets** and **grid regulation & infrastructure** have decidedly less importance than the political & economic framework

and administrative processes, yet together still comprise more than one third of the total. Both markets and grid regulation & infrastructure are valued at 0.185 each out of 1.00.

The remaining category **Other** is less decisive in importance. The category other, uniting all sub-categories ill-fitting elsewhere is valued at a total of 0.10, reflecting that whereas some of these issues might be important, they still wane in decisiveness to wind and solar energy projects implementation in comparison to other issues.

If no barriers were detected in a country for a specific topic, this topic is not taken into account for the calculation of the overall barrier index.

RES POLICY MONITORING DATABASE COUNTRY SHEET



HUNGARY

OVERALL RANK

#1



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.94	0.97		0.91	0.83
Political and economic framework	0.99	0.95		0.99	0.95
Markets	0.77			0.77	
Administrative processes	1.00	1.00		0.88	0.84
Grid regulation and infrastructure	1.00			1.00	0.63
Other	0.88			0.88	0.84

Impact on RES deployment

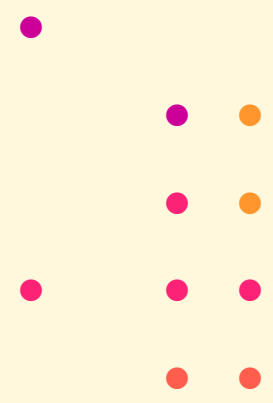
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

- 1 Wind power plants are effectively banned
- 2 Limitations in access to the grid
- 3 Lack of available information regarding connection points
- 4 Government's focus on nuclear power
- 5 Insufficient and unstandardised state-funded soft loan and investment programmes for RES-E projects

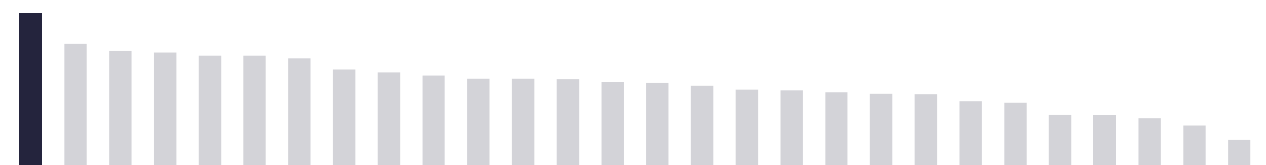
- Administrative processes
- Grid regulation and infrastructure
- Grid regulation and infrastructure
- Political and economic framework
- Political and economic framework

Wind onshore
Wind offshore
PV ground-mounted
PV rooftop



Full list of identified barriers: <https://resmonitor.eu/en/hu>

0.94



HU IT IE LT RO MT BG PL HR EE GB CZ LV CY ES PT BE SI SE GR AT FR DK SK DE FI NL LU

RES POLICY MONITORING DATABASE COUNTRY SHEET



ITALY

OVERALL RANK

#2



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.89	0.87	0.83	0.84	0.82
Political and economic framework	0.95	0.95	0.95	0.76	0.84
Markets	0.87	0.84	0.74	0.87	0.84
Administrative processes	0.87	0.84	0.84	0.87	0.84
Grid regulation and infrastructure	0.87	0.84	0.74	0.87	0.74
Other	0.87	0.84	0.84	0.87	0.84

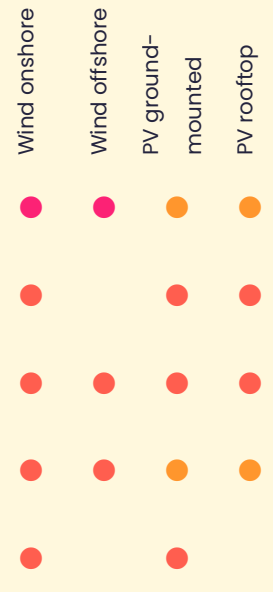
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

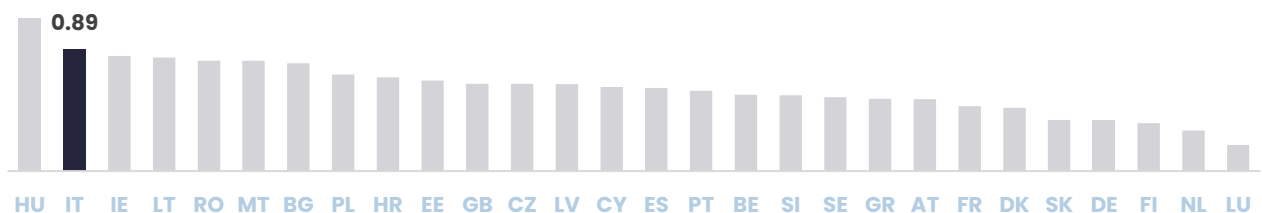
TOP 5 Barriers

- 1 Lack of consistency of incentive systems
- 2 Barriers for Power Purchase Agreements
- 3 Lack of clear and structured taxation measures
- 4 Lack of communication between public entities
- 5 Cost for the imbalance of production forecasts

Political and economic framework
Markets
Other
Administrative processes
Political and economic framework



Full list of identified barriers: <https://resmonitor.eu/en/it>



RES POLICY MONITORING DATABASE COUNTRY SHEET



IRELAND

OVERALL RANK

#3



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.88	0.88	0.81	0.75	0.68
Political and economic framework	0.75	0.75		0.75	0.63
Markets					
Administrative processes	1.00	1.00		0.64	0.63
Grid regulation and infrastructure	0.86	0.85	0.85	0.86	0.84
Other	0.96	0.96	0.74	0.86	

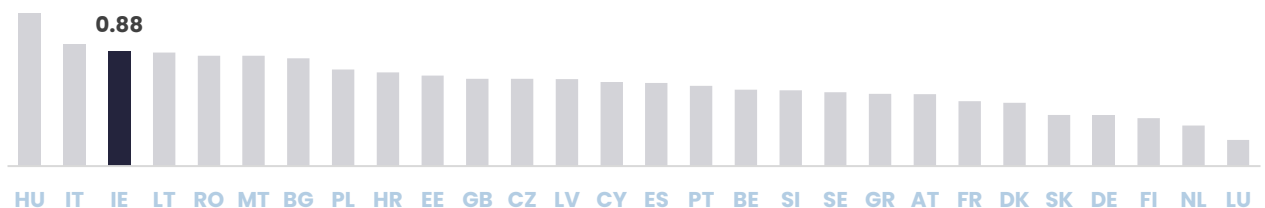
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

		Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Revision of Wind Development Planning Guidelines delayed	●			
2	Increase of commercial property rates	●		●	
3	Conservative grid development planning and substation construction for PV			●	
4	Limited grid capacity leads to increased constraint levels and project costs	●			
5	Route to market for offshore wind		●		

Full list of identified barriers: <https://resmonitor.eu/en/ie>



RES POLICY MONITORING DATABASE COUNTRY SHEET



LITHUANIA

OVERALL RANK

#4



BARRIER INDEX

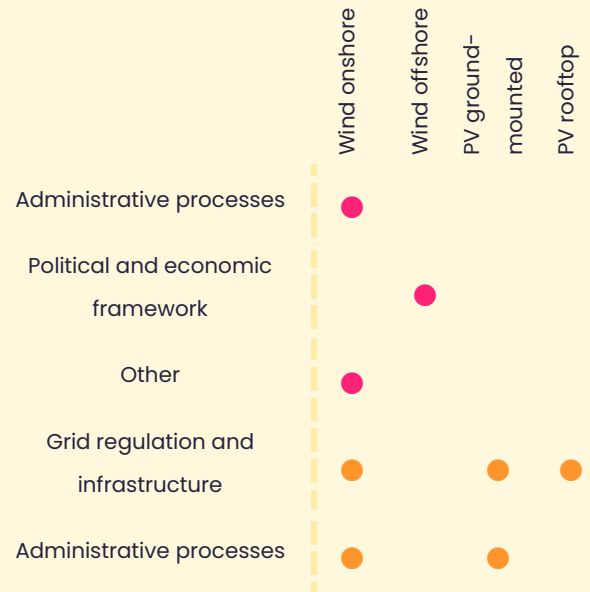
	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.88	0.71	0.96	0.63	0.53
Political and economic framework	0.96	0.53	0.96	0.64	0.32
Markets	0.74	0.43		0.42	0.74
Administrative processes	0.96	0.96		0.74	
Grid regulation and infrastructure	0.75	0.75		0.74	0.63
Other	0.96	0.96		0.53	

Impact on RES deployment

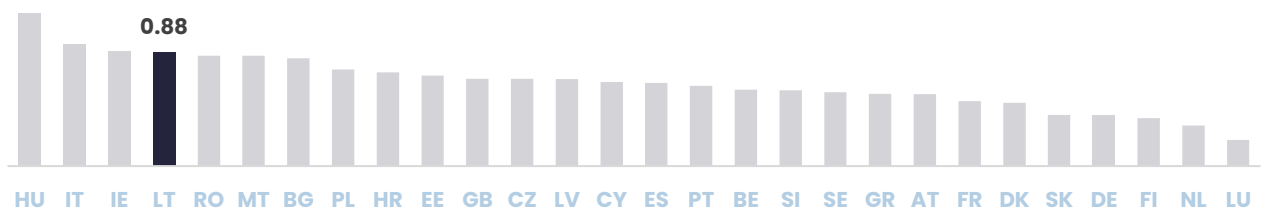
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

- 1 Long and unreasoned EIA for the repowering of wind power turbines
- 2 Incomplete legislative framework for offshore wind power
- 3 High transportation tax for large-size and heavy load transport
- 4 Lack of regulatory stability when planning the grid development investments
- 5 Complexity of special territorial planning



Full list of identified barriers: <https://resmonitor.eu/en/lt>



RES POLICY MONITORING DATABASE COUNTRY SHEET



ROMANIA

OVERALL RANK

#5



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.87	0.84	0.83	0.87	0.72
Political and economic framework	0.99	0.95	0.95	0.99	0.95
Markets	0.88	0.84		0.88	0.63
Administrative processes	0.88	0.84		0.88	0.63
Grid regulation and infrastructure	0.77	0.74		0.77	0.63
Other	0.77	0.74	0.53	0.77	0.74

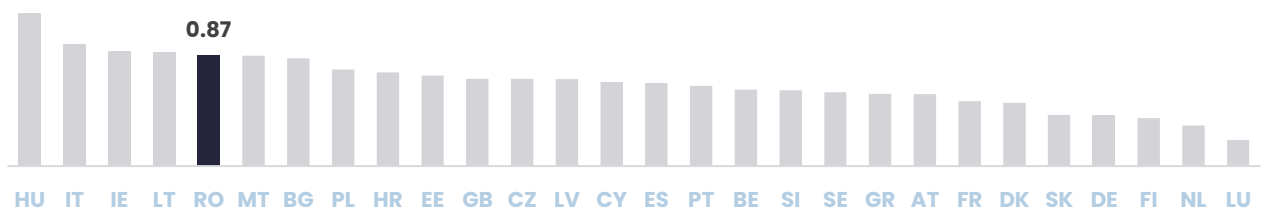
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

1	Frequent amendments to the main Renewable Energy Law	Political and economic framework	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
2	Long administrative procedure	Administrative processes				
3	Difficulty to obtain financing from banks	Markets				
4	Increasing duration of grid access	Grid regulation and infrastructure				
5	Lacking communication between project developers, investors, local authorities and the local community	Other				

Full list of identified barriers: <https://resmonitor.eu/en/ro>



RES POLICY MONITORING DATABASE COUNTRY SHEET



MALTA

OVERALL RANK

#6



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.87			0.87	0.75
Political and economic framework					
Markets					
Administrative processes	0.97			0.97	0.74
Grid regulation and infrastructure	0.86			0.86	0.84
Other	0.65			0.65	0.63

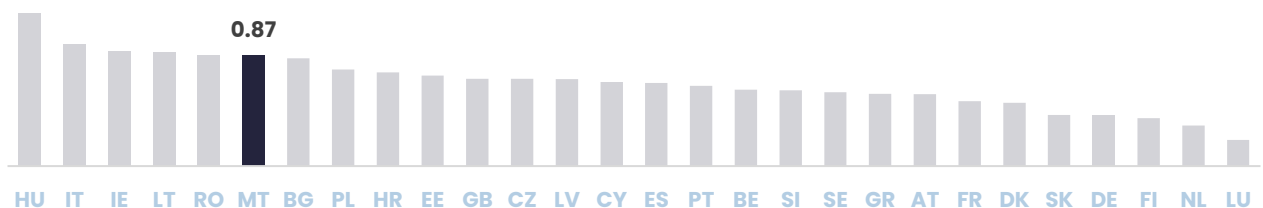
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1 Planning conflicts due to space limitations			●	
2 Small sized electricity grid limits the deployment of RES			●	●
3 State aid rules complicate FiT application procedure				●
4 Conduction of a study requested by the DSO for PV installations exceeding 16A/phase				●
5 Public perception of urgency of RES too low			●	●

Full list of identified barriers: <https://resmonitor.eu/en/mt>



RES POLICY MONITORING DATABASE COUNTRY SHEET



BULGARIA

OVERALL RANK

#7



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.87	0.86	0.76	0.79	0.75
Political and economic framework	0.95	0.95	0.95	0.88	0.84
Markets	0.77	0.74	0.63	0.77	0.74
Administrative processes	0.84	0.84		0.66	0.63
Grid regulation and infrastructure	0.95	0.95	0.63	0.88	0.84
Other	0.77	0.74		0.77	0.74

Impact on RES deployment

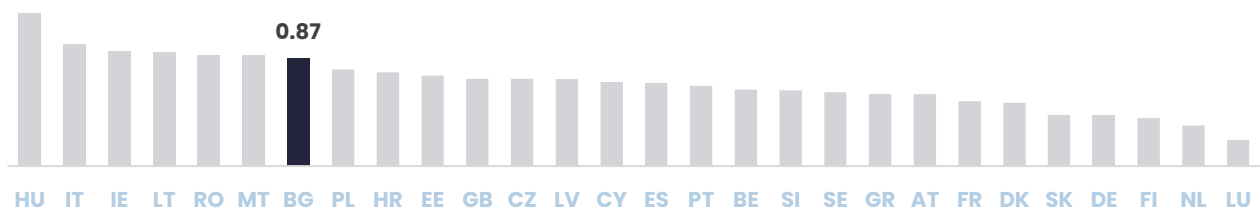
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

- 1 Uncertainties related to the EWRC's methodology for determining premiums
- 2 Unfavourable investment climate for large RES-E plants
- 3 Lack of information about available capacities
- 4 Lack of investor confidence due to a cap on the quantity of electricity purchased at feed-in tariff
- 5 Delays with the EIA approvals

	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
Political and economic framework	●	●	●	●
Political and economic framework	●	●	●	●
Grid regulation and infrastructure	●		●	●
Political and economic framework	●		●	●
Administrative processes	●		●	

Full list of identified barriers: <https://resmonitor.eu/en/bg>



RES POLICY MONITORING DATABASE COUNTRY SHEET



POLAND

OVERALL RANK

#8



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.85	0.83	0.74	0.75	0.72
Political and economic framework	0.87	0.84	0.84	0.87	0.84
Markets	0.87	0.84	0.84	0.87	0.84
Administrative processes	1.00	1.00	0.63	0.65	0.63
Grid regulation and infrastructure	0.65	0.63	0.63	0.65	0.63
Other	0.74	0.73	0.74	0.65	0.63

Impact on RES deployment

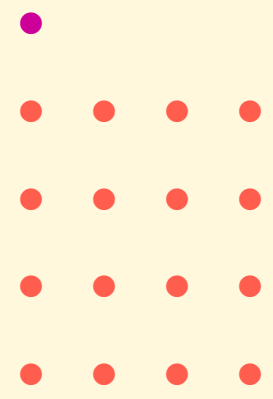
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

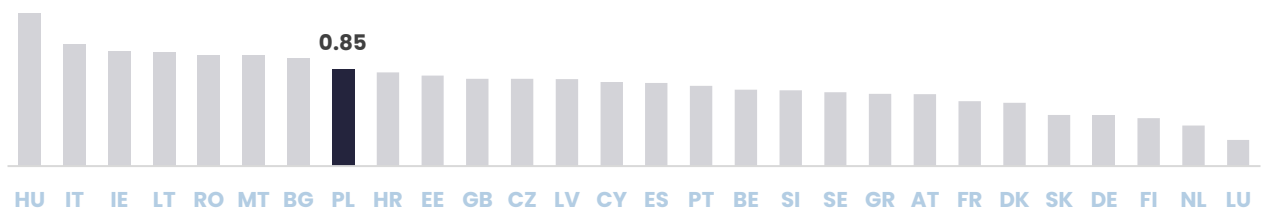
- 1 Restrictions on building wind plants
- 2 Unfair treatment of RES
- 3 Conventional energy is supported by the Government
- 4 Regulatory instability due to numerous legislative amendments affecting RES
- 5 Energy strategy is not in favour of sustainable development

Administrative processes
Markets
Markets
Political and economic framework
Political and economic framework

Wind onshore
Wind offshore
PV ground-mounted
PV rooftop



Full list of identified barriers: <https://resmonitor.eu/en/pl>



RES POLICY MONITORING DATABASE COUNTRY SHEET



CROATIA

OVERALL RANK

#9



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.85	0.83	0.78	0.85	0.74
Political and economic framework					
Markets					
Administrative processes	0.87	0.85	0.84	0.87	0.74
Grid regulation and infrastructure	0.87	0.85		0.87	0.74
Other	0.76	0.74	0.63	0.76	0.74

Impact on RES deployment

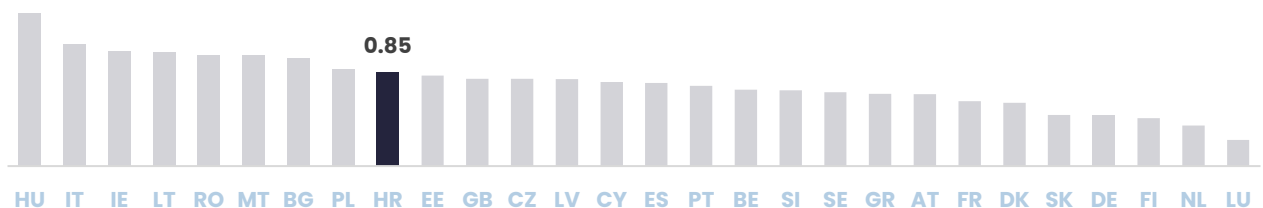
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

- 1 Long time for administrative authorisations
- 2 Problems with grid capacity
- 3 Considerable and insufficiently transparent costs of administrative procedures
- 4 No tax incentives for RES-E renewable energy projects and equipment
- 5 Complex legal framework

	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
Administrative processes	●	●	●	●
Grid regulation and infrastructure	●		●	●
Administrative processes	●		●	●
Other	●		●	●
Administrative processes	●		●	●

Full list of identified barriers: <https://resmonitor.eu/en/hr>



RES POLICY MONITORING DATABASE COUNTRY SHEET



ESTONIA

OVERALL RANK

#10



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.84	0.84	0.74	0.69	0.55
Political and economic framework	0.76	0.76	0.74	0.73	0.73
Markets	0.76	0.76	0.53	0.63	0.42
Administrative processes	0.98	0.98	0.95	0.73	0.63
Grid regulation and infrastructure	0.76	0.76	0.53	0.73	0.31
Other	0.98	0.98	0.95	0.52	0.52

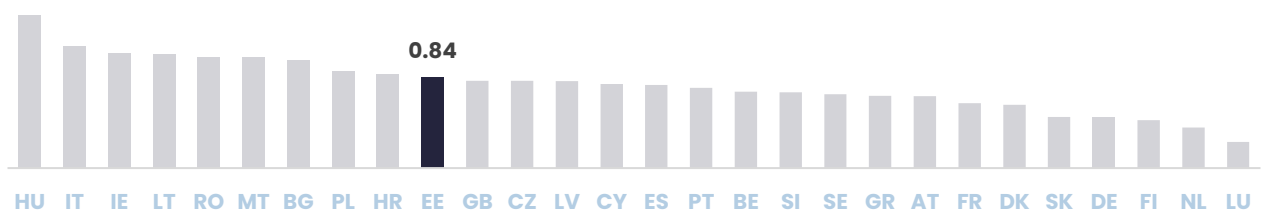
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

1	Length of administrative procedures hinders full renewable energy potential	Administrative processes	●	●	●	●
2	Local level opposition to renewable energy development	Other	●	●	●	
3	The administrative processes take too long and are too complex	Administrative processes	●	●	●	●
4	Conflicts between national security reasons and wind energy development	Administrative processes	●			
5	Lack of available grid capacity	Grid regulation and infrastructure	●	●	●	●

Full list of identified barriers: <https://resmonitor.eu/en/ee>





UNITED KINGDOM

OVERALL RANK

#11



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.84	0.74	0.79	0.77	0.73
Political and economic framework	0.85	0.74	0.75	0.85	
Markets					
Administrative processes	0.85	0.74	0.85	0.64	
Grid regulation and infrastructure	0.85	0.74	0.75	0.85	
Other	0.73				0.73

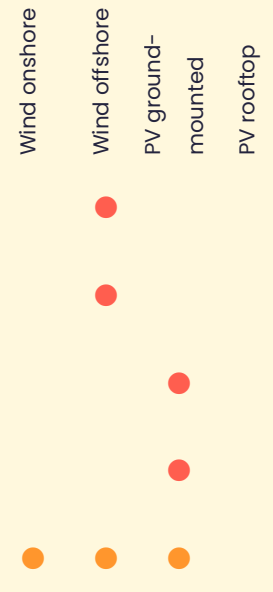
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

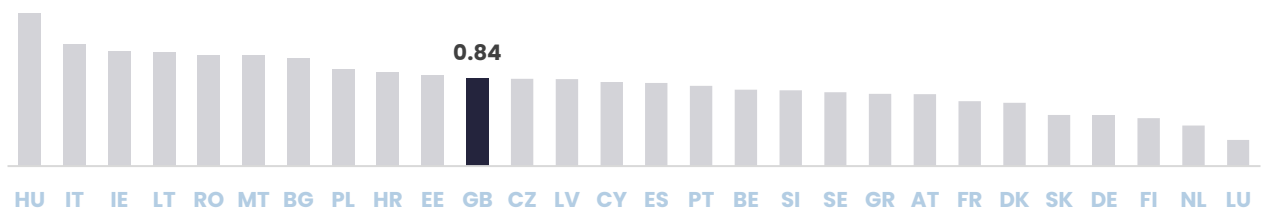
TOP 5 Barriers

- Ownership and maintenance of offshore transmission grid
- Offshore wind sites difficult to obtain
- Lengthy duration and cost for PV grid access
- Offensive stance against PV
- New charges due to RES reform

- Administrative processes
- Administrative processes
- Grid regulation and infrastructure
- Political and economic framework
- Grid regulation and infrastructure



Full list of identified barriers: <https://resmonitor.eu/en/gb>





CZECH REPUBLIC

OVERALL RANK

#12



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.84	0.85		0.80	0.75
Political and economic framework	0.87	0.85		0.87	0.84
Markets	0.74			0.65	0.74
Administrative processes	0.95	0.95		0.87	0.74
Grid regulation and infrastructure	0.76	0.74		0.76	0.74
Other	0.76	0.74		0.76	0.63

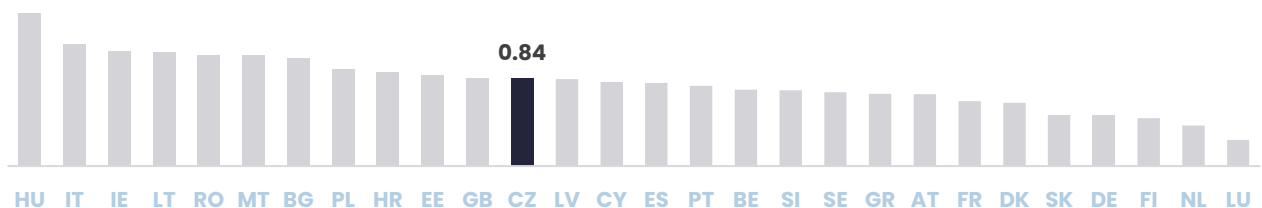
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

Rank	Barrier Description	Barrier Category	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Complexity of zoning and construction permitting procedure	Administrative processes	●		●	●
2	Support for renewable energy abolished since 2014	Political and economic framework	●		●	●
3	Unambitious RES share 2030 target set by the NECP	Political and economic framework	●		●	●
4	Unpredictability of DSO's decision	Grid regulation and infrastructure	●		●	●
5	Diverse interpretations of the Building Code and related regulations	Administrative processes	●		●	●

Full list of identified barriers: <https://resmonitor.eu/en/cz>



RES POLICY MONITORING DATABASE COUNTRY SHEET



LATVIA

OVERALL RANK

#13



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.84	0.84	0.82	0.70	0.77
Political and economic framework	0.87	0.84	0.87	0.84	0.84
Markets	0.74			0.42	0.74
Administrative processes	0.95	0.95			
Grid regulation and infrastructure	0.76	0.74	0.76	0.74	0.74
Other	0.76	0.74	0.76	0.74	0.74

Impact on RES deployment

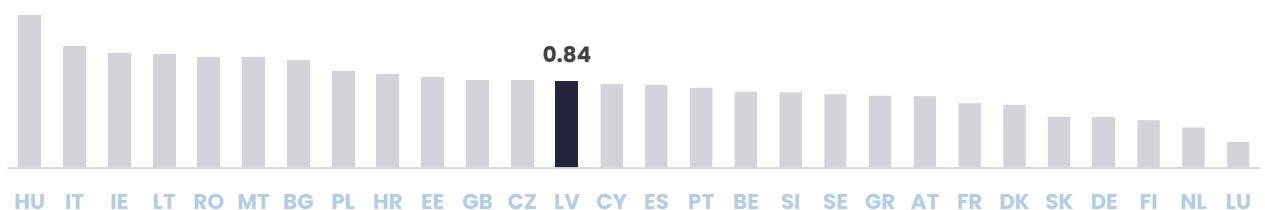
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

- 1 Local opposition to wind projects (NIMBY) impedes project completion
- 2 Lack of long-term predictability
- 3 Limited wind power development due to spatial planning regulations and administrative issues
- 4 Imbalanced distribution of grid connection costs
- 5 Wrong signals to society and lack of information

	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
Administrative processes	●			
Political and economic framework	●	●	●	●
Administrative processes	●			
Grid regulation and infrastructure	●	●	●	●
Other	●	●	●	●

Full list of identified barriers: <https://resmonitor.eu/en/lv>



RES POLICY MONITORING DATABASE COUNTRY SHEET



CYPRUS

OVERALL RANK

#14



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.83	0.78		0.82	0.79
Political and economic framework	0.87	0.84		0.87	0.84
Markets	0.76	0.63		0.76	0.74
Administrative processes	0.87	0.84		0.87	0.84
Grid regulation and infrastructure					
Other	0.74	0.74		0.66	0.63

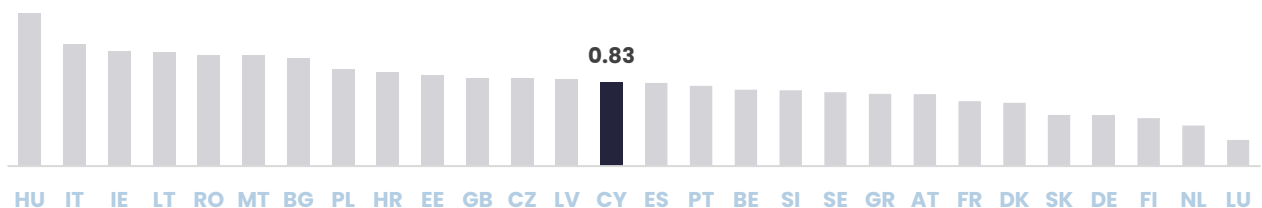
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

		Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Long and complex administrative processes delay investments in RES				
2	Environmental protection issues hinder RES development				
3	Difficult bureaucracy of the licencing procedure				
4	Unreliable RES-E strategy				
5	Less ambitious RES targets due to technical shortcomings				

Full list of identified barriers: <https://resmonitor.eu/en/cy>



RES POLICY MONITORING DATABASE COUNTRY SHEET



SPAIN

OVERALL RANK

#15



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.83	0.76	0.79	0.78	0.78
Political and economic framework	0.74	0.64	0.63	0.65	0.74
Markets	0.95	0.85	0.95	0.86	0.84
Administrative processes	0.86	0.85	0.84	0.86	0.84
Grid regulation and infrastructure	0.84	0.74	0.84	0.76	0.74
Other	0.76	0.74	0.74	0.76	0.74

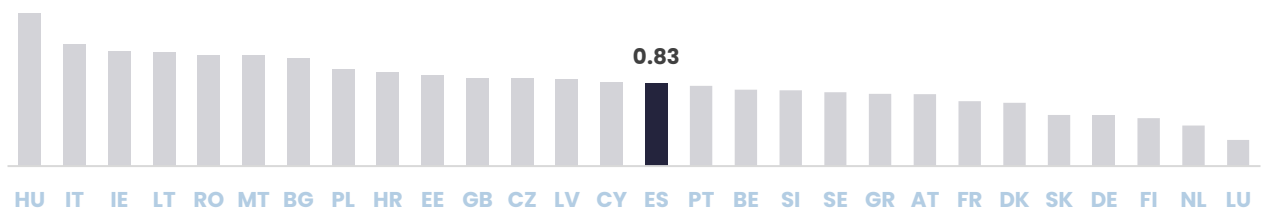
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

1	Overcapacities in the electricity market (mainly from conventional power sources)	Markets	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
2	Legal dispersion and lack of harmonisation	Administrative processes	●	●	●	●
3	Long environmental impact assessment (EIA) previous to authorization	Administrative processes	●	●	●	●
4	Complexity of administrative procedures for RES-E	Administrative processes	●	●	●	●
5	Speculation with access and connection permits	Administrative processes	●	●	●	●

Full list of identified barriers: <https://resmonitor.eu/en/es>





PORTUGAL

OVERALL RANK

#16



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.83	0.82	0.77	0.80	0.72
Political and economic framework	0.85	0.85	0.84		
Markets	0.74	0.74	0.73	0.65	0.63
Administrative processes	0.97	0.95	0.94	0.97	0.95
Grid regulation and infrastructure	0.65	0.64	0.42	0.65	0.42
Other	0.87	0.85	0.84	0.87	0.85

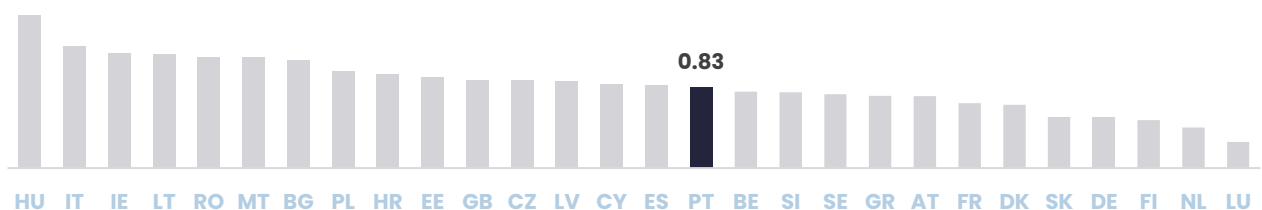
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

		Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Licensing procedures may jeopardize new projects	●	●	●	
2	Slow administrative process due to the lack of a proper one-stop-shop approach	●	●	●	●
3	Complexity of the authorisation process especially concerning offshore technologies		●		●
4	Long-lasting and expensive environmental impact assessment procedure	●	●	●	
5	Lack of transparency about the costs of supporting renewable energy	●	●	●	●

Full list of identified barriers: <https://resmonitor.eu/en/pt>



RES POLICY MONITORING DATABASE COUNTRY SHEET



BELGIUM

OVERALL RANK

#17



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.82	0.77	0.82	0.77	0.77
Political and economic framework	0.84	0.73	0.84	0.74	0.74
Markets	0.74	0.73	0.73	0.74	0.74
Administrative processes	0.84	0.84	0.84	0.84	0.84
Grid regulation and infrastructure	0.94	0.84	0.94	0.74	0.74
Other	0.63	0.63	0.63		

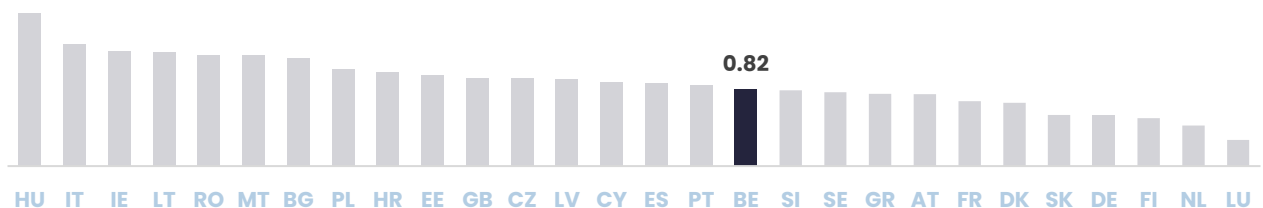
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1 Flanders: Insufficient grid capacity for off-shore wind and large PV plants	●	●	●	●
2 Federal: Significant delays and higher realisation costs for renewable installations due to legal procedures	●	●	●	●
3 Wallonia: Complicated procedures and regulations	●		●	●
4 Federal: Aeronautical constraints for wind turbine installations	●			
5 Wallonia: Abusive curtailment clauses	●		●	●

Full list of identified barriers: <https://resmonitor.eu/en/be>



RES POLICY MONITORING DATABASE COUNTRY SHEET



SLOVENIA

OVERALL RANK

#18



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.82	0.80		0.73	0.70
Political and economic framework	0.76	0.74		0.76	0.74
Markets	0.76	0.74		0.76	0.74
Administrative processes	0.95	0.95		0.65	
Grid regulation and infrastructure	0.76	0.74		0.76	0.64
Other	0.84	0.84		0.76	0.64

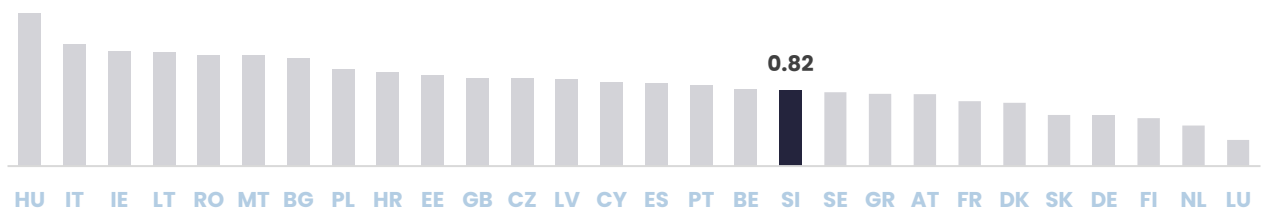
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

1	Difficult RES-integration process in spatial and environmental planning	Administrative processes	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
2	Negative public perception of wind and bigger solar energy projects	Other	●		●	
3	Powers of main actors in the Slovenian energy arena	Markets	●		●	●
4	Lack of coordination and consistency between ministries	Other	●		●	
5	Limited ESCO market	Political and economic framework	●		●	●

Full list of identified barriers: <https://resmonitor.eu/en/si>



RES POLICY MONITORING DATABASE COUNTRY SHEET



SWEDEN

OVERALL RANK

#19



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.82	0.79	0.81	0.73	0.73
Political and economic framework	0.84	0.75	0.84		
Markets					
Administrative processes	0.86	0.86	0.84		
Grid regulation and infrastructure	0.75	0.75	0.74	0.73	0.73
Other	0.75	0.75	0.74		

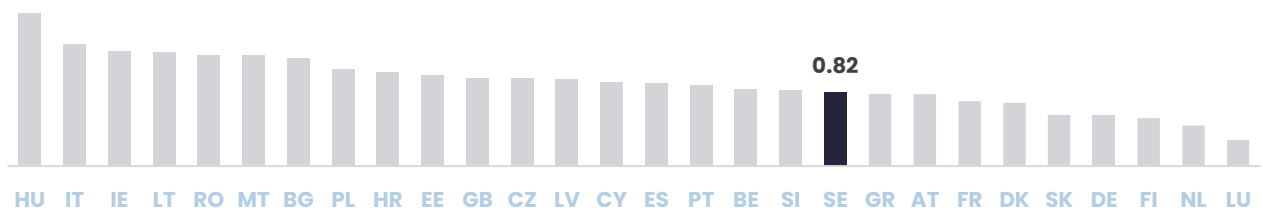
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

		Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Lengthy processes complicate wind power projects	Administrative processes	●	●	
2	Required municipal approval for the establishment of larger wind projects	Administrative processes	●	●	
3	Unnecessary costs for small-scale wind power producers	Administrative processes	●	●	
4	Lengthy administrative procedures for wind power projects	Administrative processes	●	●	
5	Military resistance to wind turbines too broad and not well communicated	Administrative processes	●	●	

Full list of identified barriers: <https://resmonitor.eu/en/se>



RES POLICY MONITORING DATABASE COUNTRY SHEET



GREECE

OVERALL RANK

#20



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.81	0.80	0.63	0.76	
Political and economic framework	0.76	0.74		0.76	
Markets	0.74	0.74		0.43	
Administrative processes	0.87	0.85		0.87	
Grid regulation and infrastructure	0.98	0.95		0.98	
Other	0.65	0.63	0.63	0.65	

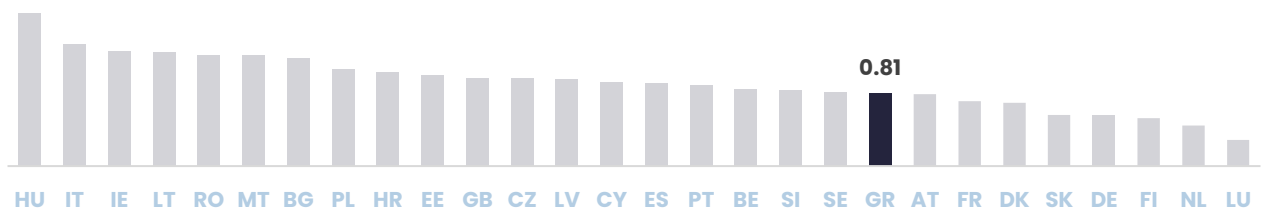
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

1	Delayed management of connection requests by the Independent Power TSO & Hellenic DSO	Grid regulation and infrastructure	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
2	Administrative barriers towards the permitting procedure	Administrative processes	●		●	
3	Long reviews of the Integrated Environmental Impact Assessment	Administrative processes	●			
4	Sustainability of the Special Account for RES	Political and economic framework	●		●	
5	Amendment to the Spatial Planning Framework may hinder the development of RES	Administrative processes	●		●	

Full list of identified barriers: <https://resmonitor.eu/en/gr>



RES POLICY MONITORING DATABASE COUNTRY SHEET



AUSTRIA

OVERALL RANK

#21



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.81	0.82		0.78	0.70
Political and economic framework	0.74	0.74		0.65	0.53
Markets	0.74				0.74
Administrative processes	0.87	0.84		0.87	0.85
Grid regulation and infrastructure	0.95	0.95		0.87	0.85
Other	0.76	0.74		0.76	0.42

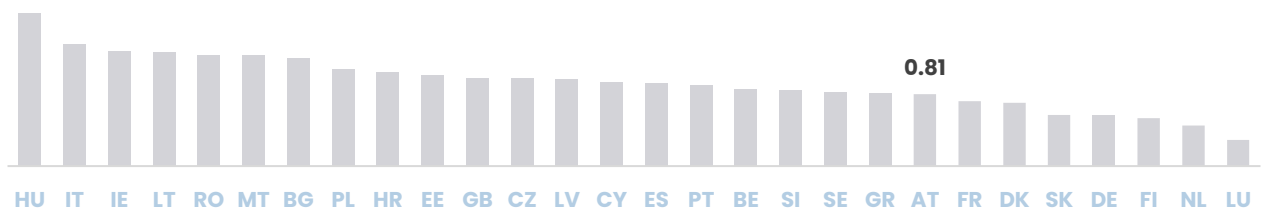
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

Rank	Barrier Description	Category	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Long distribution and transmission grid expansion times	Grid regulation and infrastructure	●		●	●
2	Long administrative procedures	Administrative processes	●		●	●
3	Lack of legal certainty for wind power project developers	Administrative processes	●			
4	Wind power expansion is hindered by a lack of zoning in individual federal states	Administrative processes	●			
5	Permitting system for PV installations not uniform	Administrative processes			●	●

Full list of identified barriers: <https://resmonitor.eu/en/at>



RES POLICY MONITORING DATABASE COUNTRY SHEET



FRANCE

OVERALL RANK

#22



BARRIER INDEX

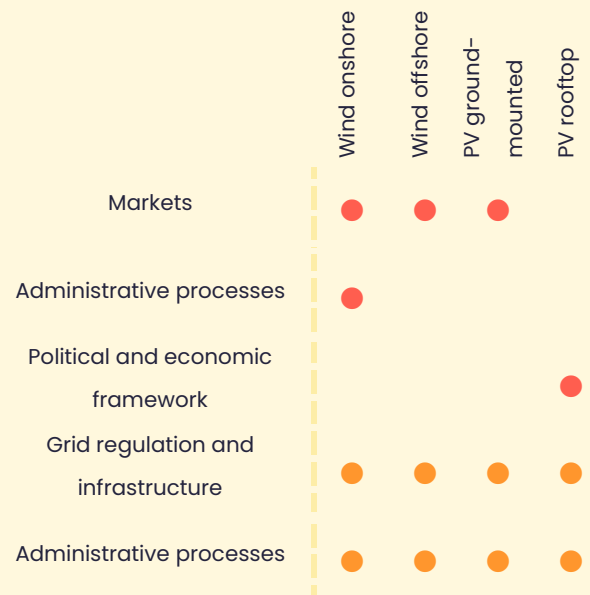
	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.80	0.78	0.69	0.72	0.72
Political and economic framework	0.84				0.84
Markets	0.87	0.85	0.84	0.87	0.74
Administrative processes	0.85	0.85	0.74	0.65	0.63
Grid regulation and infrastructure	0.76	0.74	0.74	0.76	0.74
Other	0.54	0.53	0.21	0.54	0.53

Impact on RES deployment

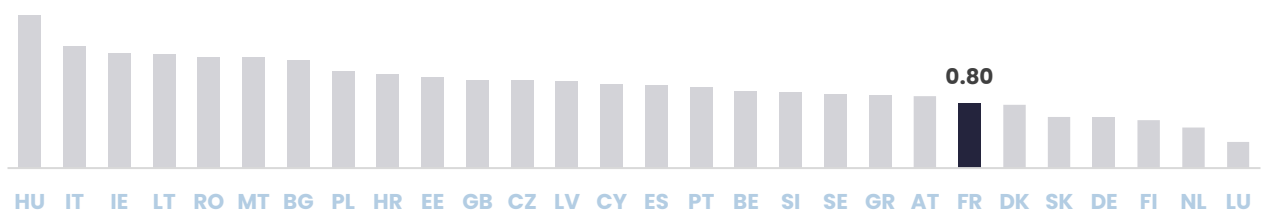
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

- 1 Lobbying from nuclear energy advocates impairs RES deployment
- 2 Restrictions of the Regional Wind Plans
- 3 Degressive revision of the feed-in tariff for PV on buildings
- 4 Lack of transparency regarding the cost-sharing of grid development costs during connection procedure
- 5 Lengthy administrative procedures



Full list of identified barriers: <https://resmonitor.eu/en/fr>



RES POLICY MONITORING DATABASE COUNTRY SHEET



DENMARK

OVERALL RANK

#23



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.80	0.73	0.80	0.62	0.62
Political and economic framework	0.76	0.62	0.76	0.42	0.42
Markets					
Administrative processes	0.87	0.83	0.87	0.73	0.73
Grid regulation and infrastructure	0.76	0.73	0.76	0.73	0.73
Other	0.76		0.76		

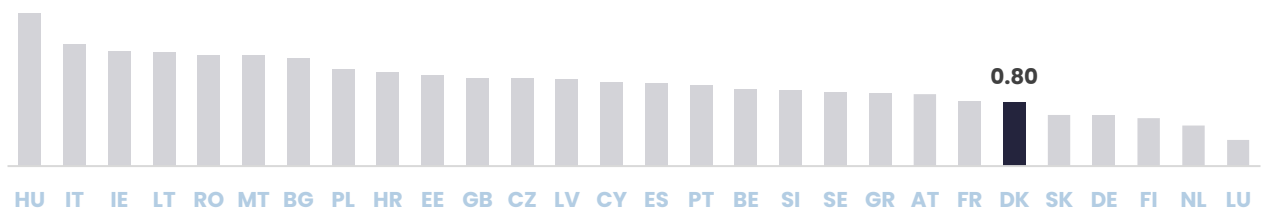
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

Rank	Barrier Description	Barrier Category	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Prolonged appeals	Administrative processes	●	●	●	
2	Lengthy planning process	Administrative processes	●		●	
3	Income regulation impedes cost-efficient upgrade of electricity distribution grid	Grid regulation and infrastructure	●	●	●	●
4	Lack of planning for RES in municipal planning	Administrative processes	●		●	
5	Insecurity among investors in nearshore wind energy	Other		●		

Full list of identified barriers: <https://resmonitor.eu/en/dk>



RES POLICY MONITORING DATABASE COUNTRY SHEET



SLOVAKIA

OVERALL RANK

#24



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.78	0.74		0.78	0.64
Political and economic framework	0.66	0.63		0.66	0.63
Markets					
Administrative processes	0.88	0.84		0.88	0.63
Grid regulation and infrastructure	0.77	0.74		0.77	0.63
Other	0.88	0.74		0.88	0.74

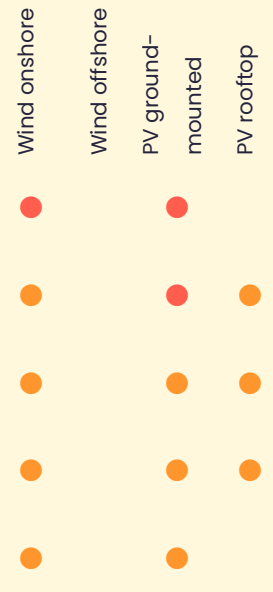
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

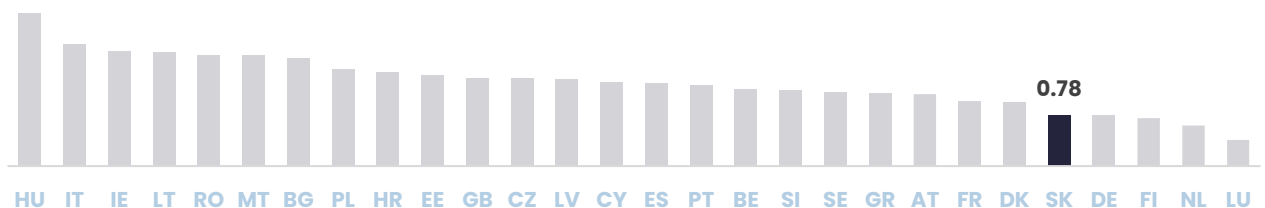
TOP 5 Barriers

- 1 Diverse entities prolong the EIA process
- 2 Negative reputation of RES (especially PV)
- 3 Almost no tax incentives or fiscal benefits for RES-E plants
- 4 Non-transparent selection criteria for new large-scale RE projects
- 5 Construction proceedings severely delayed due to one entity

- Administrative processes
- Other
- Other
- Grid regulation and infrastructure
- Administrative processes



Full list of identified barriers: <https://resmonitor.eu/en/sk>



RES POLICY MONITORING DATABASE COUNTRY SHEET



GERMANY

OVERALL RANK

#25



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.78	0.77	0.76	0.71	0.63
Political and economic framework	0.86	0.84	0.84	0.86	0.63
Markets	0.64	0.63	0.63	0.64	0.63
Administrative processes	0.84	0.84	0.84	0.64	0.63
Grid regulation and infrastructure	0.74	0.73	0.74	0.64	0.63
Other	0.73	0.73	0.63		

Impact on RES deployment

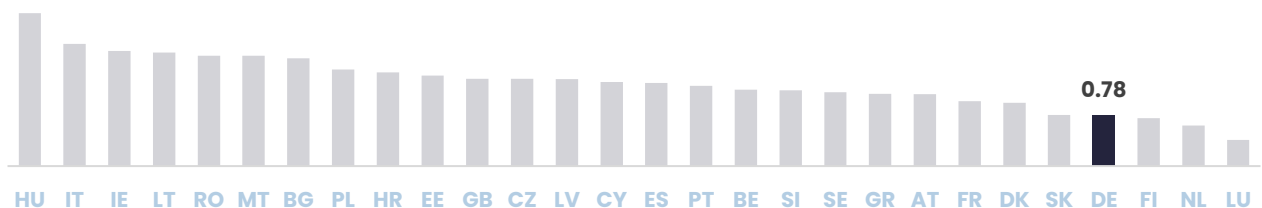
<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

- Lack of uniform height and distance restriction rules for onshore wind
- High share of lawsuits against wind installation permits
- Complex administrative procedures for offshore wind
- No premium tariffs in case of negative prices
- Investment risks related to the tendering system

	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
Administrative processes	●			
Administrative processes	●	●		
Administrative processes		●		
Political and economic framework	●	●	●	●
Political and economic framework	●	●	●	●

Full list of identified barriers: <https://resmonitor.eu/en/de>



RES POLICY MONITORING DATABASE COUNTRY SHEET



FINLAND

OVERALL RANK

#26



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.78	0.68	0.67	0.60	0.66
Political and economic framework	0.83	0.64	0.65	0.83	0.72
Markets	0.64	0.64	0.54		0.62
Administrative processes	0.85	0.85	0.76	0.41	0.62
Grid regulation and infrastructure	0.76	0.64	0.76		0.62
Other	0.72	0.53	0.54	0.52	0.72

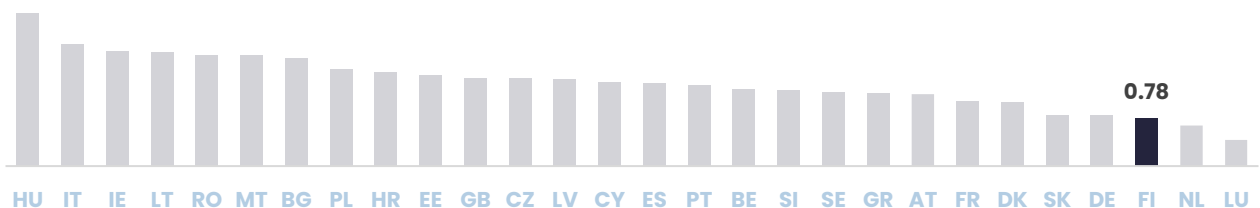
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

		Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
1	Defence Forces blocking wind power development in large parts of the country	●	●		
2	Unsubstantial complaints by third parties leading to delays or higher costs	●	●		
3	Need for a support scheme for innovation and energy storage		●	●	
4	Administrative regulations react too slowly to progressing windpower technology	●	●		
5	Limited grid access affects offshore wind development		●		

Full list of identified barriers: <https://resmonitor.eu/en/fi>





NETHERLANDS

OVERALL RANK

#27



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.76	0.76	0.71	0.72	0.72
Political and economic framework	0.86	0.84	0.86	0.83	0.83
Markets					
Administrative processes	0.74	0.74	0.64	0.62	0.62
Grid regulation and infrastructure	0.74	0.74	0.64	0.73	0.73
Other	0.64	0.63	0.64	0.62	0.62

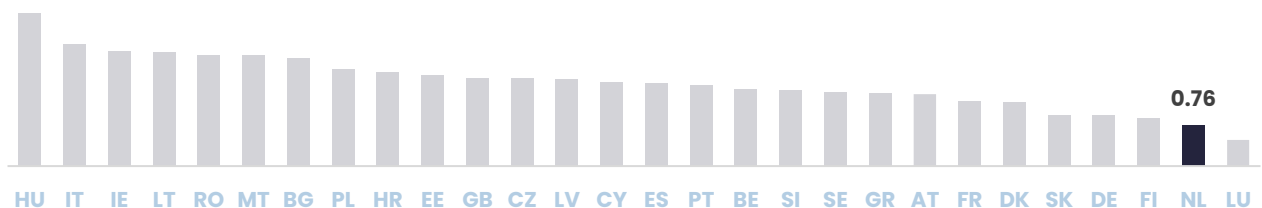
Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

1	Renewable target 2030 on land is insufficient	Political and economic framework	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
2	Rentability and financing of wind power plants	Political and economic framework	●	●	●	●
3	Realisation period for PV	Grid regulation and infrastructure			●	●
4	Insufficient grid capacity for the growth of wind energy and PV installations	Grid regulation and infrastructure	●	●	●	●
5	Provincial elections heavily influence destination plans	Administrative processes	●			

Full list of identified barriers: <https://resmonitor.eu/en/nl>





LUXEMBOURG

OVERALL RANK

#28



BARRIER INDEX

	OVERALL	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
OVERALL	0.74	0.72		0.74	0.72
Political and economic framework	0.65			0.65	0.64
Markets					
Administrative processes	0.75	0.63		0.75	
Grid regulation and infrastructure	0.86	0.84		0.86	0.85
Other					

Impact on RES deployment

<0.30	minimal
0.30-<0.60	low
0.60-<0.80	moderate
0.80-<0.90	high
0.90-<1.00	severe
1.00	crucial

TOP 5 Barriers

1	Unforeseeable grid connection problems lead to high grid connection cost	Grid regulation and infrastructure	Wind onshore	Wind offshore	PV ground-mounted	PV rooftop
2	No active promotion of ground-mounted PV installations	Administrative processes				
3	Low focus on self-consumption schemes	Political and economic framework				
4	Eligibility criteria for wind power plants not transparent to the public	Administrative processes				
5	Citizen protests against wind energy	Administrative processes				

Full list of identified barriers: <https://resmonitor.eu/en/lu>

