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Permitting Procedures for Renewable Energy Projects in the European Union

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supervised by
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Vienna, 12.06.2024

Affidavit

I, **POLINA DANILOVA**, hereby declare

1. that I am the sole author of the present Master's Thesis, "PERMITTING PROCEDURES FOR RENEWABLE ENERGY PROJECTS IN THE EUROPEAN UNION", 59 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted the topic of this Master's Thesis or parts of it in any form for assessment as an examination paper, either in Austria or abroad.

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Abstract

Global energy demand is on the rise due to increasing consumption from various sources such as electricity and fuel, driven by population growth, economic development, and technological advancements. Renewable energy sources are expected to see significant growth in the future as countries aim to meet climate targets and reduce carbon emissions. Europe faces a significant energy challenge and encounters a pivotal moment in its energy transition. European Union, under directives such as RED II and the EIA, has committed to increasing its renewable energy capacity to mitigate reliance on fossil fuels and to align with the Paris Agreement and European Green Deal goals. This study examines the effectiveness and efficiency of current EU permitting procedures for renewable energy projects, which are often critiqued for their complexity and the delays they cause, hindering substantial investments in renewable energy.

The Master's thesis assesses the challenges of permitting processes across Member States and explores the best practices. Through a comprehensive analysis of regulatory frameworks and administrative processes, including environmental impact assessments, the research highlights significant discrepancies in the implementation of EU directives at the national level, regional, and municipal levels.

By exploring case studies from Denmark, Hungary, and Austria, this research identifies best practices and pinpoints the major hurdles that developers face, such as procedural complexity, lack of transparency, and extended timelines. The findings suggest that while some Member States have made progress in aligning with EU directives, others lag behind, resulting in a patchwork of regulatory environments.

This Master's thesis proposes targeted recommendations to streamline permitting processes, enhance inter-state cooperation, and leverage digital tools to improve transparency and reduce administrative burdens. These suggestions aim to accelerate the deployment of renewable energy projects, thereby supporting the EU's ambitious target of achieving carbon neutrality by 2050 and strengthening its leadership role in the global energy transition. The outcomes of this study are intended to inform policy adjustments and encourage a more unified approach to renewable energy development across the EU.

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List of Abbreviations

DEA	Danish Energy Agency
EAG	Erneuerbaren-Ausbau-Gesetz
	Austrian Renewable Energy Expansion Act
EIA	Environmental Impact Assessment
EU	European Union
GIS	Geographic Information Systems
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
NECP	National Energy and Climate Plan
NIMBY	Not in my backyard
OOTS	Once-Only Technical System
PV	Photovoltaic
RED	Renewable Energy Directive
RES	Renewable Energy Sources
RFNBO	Renewable Fuels of Non-Biological Origin
SEA	Strategic Environmental Assessment
SMET	Single Market Enforcement Taskforce
TSO	Transmission system operator
UVP-G	UmweltVerträglichkeitsPrüfungs-Gesetz
	Environmental Impact Assessment Act

I Introduction

Background of the study

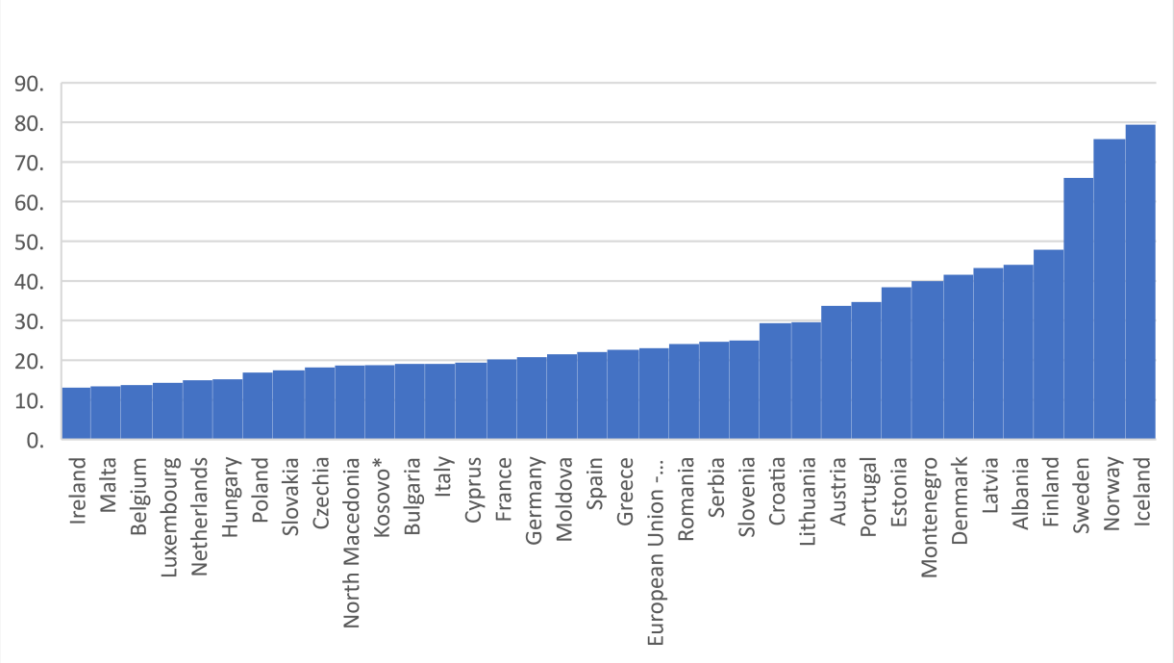
Worldwide energy demand is expected to continue increasing due to the rising global demand consumption for energy from various sources such as electricity, fuel, and other forms of power. This upward trend reflects the increasing energy needs of populations, economies, and technological advancements worldwide. In the future energy mix, the largest growth is expected to come from renewable energy sources as countries strive to meet climate targets and reduce carbon emissions. By 2050, renewable energy consumption is projected to rise significantly, reaching approximately 247 exajoules according to Statista's 2024 forecast. In contrast, the total consumption of renewable energy was 42 exajoules in 2000. Europe is facing a significant energy challenge, with energy demand projected to increase by 20% by 2050. The current energy mix in Europe is dominated by fossil fuels, with a significant reliance on imported oil and gas.

European initiatives to implement renewable energy sources have been driven by the commitments outlined in the Paris Agreement on Climate Change and the European Green Deal. Renewable energy sources also help achieve energy independence and decrease reliance on imported fossil fuels, a significance highlighted by events such as Russia's invasion of Ukraine. Within the framework of the European Green Deal, renewable energy stands as a cornerstone of the transition toward clean energy. The European Union aims to achieve carbon neutrality by 2050, necessitating a reduction of greenhouse gas emissions by at least 42.5% by 2030, with a target of 45%. This necessitates a substantial transition toward renewable energy sources like wind, solar, and hydropower. Based on MIX scenario from the impact assessments of the European Green Deal policy package it requires the installed capacity to grow from 204 GW in 2022 to more than 500 GW in 2030.

According to the Renewable Energy Directive of the European Union "'energy from renewable sources' or 'renewable energy' means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas means energy from renewable non-fossil sources,

namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas". Meeting the goal of climate neutrality by 2050 involves aligning renewable energy targets with broader decarbonization strategies that utilize other non-fossil energy sources. Member States are encouraged to utilize a combination of non-fossil energy sources, taking into account their individual national circumstances and energy systems, to achieve the aim of becoming climate neutral by 2050. The implementation of renewable energy projects plays a critical role in reaching this objective.

Figure 1 and Annex 1 show the latest data available for the share of renewable energies in gross final energy consumption across Europe.



Source: Eurostat

Figure 1. Share of energy from renewable sources in 2022

The process of obtaining permits acts as the gateway for renewable energy projects. The complexity of this process often arises from various factors, including strict regulatory requirements, assessments of environmental impact, public consultations, and the necessity to comply with numerous legal and administrative procedures. Moreover, the involvement of multiple stakeholders such as government agencies, local communities, environmental organizations, grid operators, and industry associations can further

complicate the permitting process. Lengthy and intricate permitting procedures can result in delays, higher expenses, and a lack of investment in renewable energy projects. Given the European Union's objectives and commitments to substantially increase renewable energy sources, there is a pressing need to significantly accelerate the current pace of deploying renewable energy projects.

The EU has implemented various initiatives to streamline the permitting process, such as the EU's Environmental Impact Assessment (EIA) Directive and the European Union's Renewable Energy Directive. However, more needs to be done to address the challenges faced by energy project developers.

There are considerable differences across Member States regarding the duration and complexity of their permit-granting regulations for renewable energy projects. This situation highlights a substantial opportunity for improvement and mutual learning. This Master's thesis identifies and discusses best practices from various Member States that aim to lessen the administrative load and enhance the predictability of planning for renewable energy projects, offering recommendations to expedite permitting procedures.

State of art

There have been numerous studies on accelerating permitting procedures at both the European and international levels, conducted by the European Commission, international organizations such as IRENA, International Energy Agency and the Global Wind Energy Council, as well as various institutions. There is a limited number of relevant academic articles and research due to the constant legislative changes and the overall dynamic framework environment in this area. To improve the current situation, governments often request research and look for best practices from more advanced countries. For example, the Sweden Commission on Offshore Wind Power conducted an inquiry on "Regulations and Procedures for Offshore Wind Power in Denmark, Finland, Germany, and the United Kingdom/England." This inquiry provides insights into the regulatory frameworks and permitting procedures for offshore wind power in these countries, identifying best practices of offshore wind energy permitting procedures.

On May 13, 2024, the European Commission issued “Recommendations on speeding up permit-granting procedures for renewable energy and related infrastructure projects”. These recommendations to Member States present best practices from EU member states

aimed at accelerating the process of obtaining permits, reducing delays and administrative burdens, and enhancing transparency in the permitting process.

The European Commission also created the RES Simplify project, which focuses on simplifying permission and administrative procedures for renewable energy installations. This project analyzes barriers and proposes solutions to overcome them, recommending amendments to current EU legislation. The most recent amendments to RED II were made through this project. A valuable resource for research and analysis is the "Technical Support for RES Policy Development and Implementation – Simplification of Permission and Administrative Procedures for RES Installations (RES Simplify)" report, issued annually. This report provides a comprehensive overview of the existing administrative procedures and permissions required for renewable energy installations across the EU, aiming to identify barriers and propose solutions to simplify these processes, thereby facilitating faster deployment of renewable energy projects.

The REPowerEU Plan is a comprehensive strategy introduced by the European Commission to accelerate the deployment of renewable energy across the EU. It aims to achieve the EU's ambitious renewable energy targets. Key aspects of the initiative include expediting the permitting processes for renewable energy projects, providing financial support for renewable energy projects, and enhancing regulatory certainty. The REPowerEU Plan also focuses on broadening energy sources, encourages cooperation among EU Member States and regions to leverage their respective renewable energy potentials and share best practices in promoting renewable energy development and overall hastening the implementation of renewable energy projects, with a particular emphasis on simplifying permitting procedures.

The Single Market Enforcement Taskforce (SMET) efforts indirectly contribute to the promotion of renewable energy projects in the EU through its coordination with national authorities and relevant EU agencies. By working together, SMET and these entities can facilitate the implementation of EU energy policies and regulations that aim to promote renewable energy. This collaboration can result in streamlined permitting procedures, enhanced regulatory certainty, and the resolution of legal or administrative challenges that may arise during the development of renewable energy projects.

During this research, national and local legislation for renewable energy projects was analyzed, including Denmark's regulations for offshore wind power, Hungarian regulations for geothermal energy projects, and Austria's regulations for PV energy projects. Specific Austrian legislations studied include the Renewable Energy Expansion Act (Erneubaren-Ausbau-Gesetz) and the Environmental Impact Assessment Act (Umweltverträglichkeitsprüfungsgesetz).

By examining the legal frameworks and administrative processes at both the EU and national levels, this thesis aims to contribute to the ongoing efforts to streamline permitting procedures and support the transition to a sustainable energy future.

Objective and research questions

This thesis aims to examine the permitting procedures for renewable energy projects in the EU. In this Master's thesis, the term “permitting procedures” refers to the process of obtaining the necessary administrative permits and licenses for constructing, repowering, and operating energy plants, along with the constructions required for grid connection and/or storage. This also includes acquiring grid-connection permits, conducting environmental assessments, and evaluating the duration of court proceedings during the permit acquisition process. It's noteworthy that the timeframe for resolving court disputes, as part of the permitting procedures, may not align with the updated definitions outlined in the RED II.

The research questions that will be addressed in this thesis are:

What are the current permitting procedures for energy projects in the European Union?

This research question aims to provide an overview of the current permitting procedures for energy projects, including the regulatory frameworks in the EU, administrative processes, and environmental impact assessments. The study will examine how these procedures impact the development of renewable energy sources, including the costs, timelines, and feasibility of projects. The findings will provide insights into the effectiveness of the current permitting procedures and discover areas for further improvement.

What are the main issues faced by energy project developers in obtaining permits for their projects?

This research question seeks to identify the key issues faced by energy project developers in obtaining permits for their projects, including the complexity of the permitting process, the lack of transparency and consistency, and the high costs and lengthy timelines associated with the process. The study will examine the impact of identified issues on the development of renewable energy sources and identify strategies for overcoming them.

How can the permitting procedures for energy projects in the European Union be improved to facilitate the development of renewable energy sources and achieve the EU's climate and energy targets?

This research question aims to provide recommendations for improving the permitting procedures for energy projects in Europe, based on case studies from Denmark, Hungary, and Austria.

This thesis will contribute to the existing body of knowledge on the permitting procedures for energy projects in the EU, providing insights into the challenges and opportunities faced by energy project developers. The discoveries made in this thesis will be relevant to policymakers, energy project developers, and other stakeholders involved in the energy sector.

Methodology

The research methodology for this study combines literature reviews, case study and comparative analysis, data collection, and interviews with experts in renewable energy projects. Notable experts involved include Dipl.-Ing. Dr. tech Ortner Mario, who consults for the World Bank, The European Bank for Reconstruction and Development, the European Investment Bank, and develops projects for renewable power plants, and Benedikt Kammerstaetter, who works in business management at ECOWIND Handels- & Wartungs-GmbH , affiliated with BayWa r.e. ECOwind developed and realized in Austria and Southeast Europe several multi-megawatt solar parks.

The primary focus areas are the permitting procedures for renewable energy projects across the EU, initiatives to streamline these processes, and detailed analyses of selected energy projects in Denmark, Hungary, and Austria. This also includes interviews with project participants.

In the initial part of this thesis, which deals with the legal and political framework, literature reviews scrutinize current legal texts such as EU directives and commission recommendations to evaluate existing regulatory frameworks and permitting procedures. Additionally, policy reports from governments, research outcomes, and reports from EU commissions and organizations have been consulted to provide supplementary insights. From this analysis, key areas for improving permitting processes were identified, along with recommendations to address observed weaknesses and bottlenecks. Best practices experiences were also highlighted.

The comparative analysis reviews the permitting procedures for renewable energy projects across various EU countries. This analysis aims to:

- Evaluate the framework linked to obtaining permits for renewable energy projects in different European countries.
- Identify patterns and variations in the duration of permitting processes.
- Highlight countries with notably efficient or lengthy permitting procedures.

The case study approach concentrates on conducting an in-depth analysis of country-specific legislation and best practices of selected renewable energy projects. This method facilitates a detailed examination of specific instances to understand the complexities and challenges of permitting procedures.

During the interviews with specialists, the discussions focused on the identified areas for improving permitting processes and the relevance of the proposed recommended solutions. The value of the thesis topic and the need for streamlining permitting procedures for renewable energy projects were emphasized. These discussions highlighted the overall importance of enhancing regulatory frameworks to accelerate the development of renewable energy across Europe.

This research acknowledges certain limitations due to the continuously evolving nature of this topic, with changes existing at both the European and national levels.

Developments up to May 13 have been considered in the analysis of the duration of permitting procedures across Europe.

II EU legal framework of renewable energy projects

The EU established a framework to achieve its 2030 renewable energy target through the "Directive 2018/2001 on the promotion of energy from renewable sources" (RED II). Implemented in 2018, RED II set guidelines for organizing and limiting the duration of the administrative processes involved in obtaining permits for renewable energy projects. This includes securing all necessary permits to build, repower, and operate plants, as well as their grid connections. Member States were required to incorporate RED II and its provisions into their national legislation by June 30, 2021, but none achieved full transposition by this deadline.

The 2018 directive specified that the administrative procedures for granting permits should not exceed two years for renewable electricity production plants and the assets necessary for their grid connection. This includes all relevant authorization, certification, and licensing procedures by competent authorities. A similar provision for simplifying the authorization process for hydrogen infrastructure. For renewable energy projects below 150 kW, repowering of existing plants, and co-located storage and grid connections, the administrative process should not exceed one year. The revised RED includes these deadlines while accounting for the time needed to comply with Union environmental legislation, excluding court proceedings, and allows for a six-month extension in extraordinary circumstances according to Article 16b. For offshore projects, the timeframe is extended to three years.

In designated renewables acceleration areas, these deadlines are even shorter: one year for most projects, but two years for offshore projects, and only six months for projects below 150 kW, repowering projects, co-located energy storage, and their respective grid connections. Member States must introduce a specific procedure with a rapid screening process completed within 30 days for projects in these areas.

In 2023, the EU revised its RED II with the new Directive EU/2023/2413, as part of its "Fit for 55" initiative. This amendment came into effect on November 20, 2023, initiating an 18-month timeframe for member states to integrate most of its directives into national law, with certain permitting-related provisions requiring faster implementation by July

2024. The revised directive introduces significant advancements aimed at accelerating the EU's clean energy transition.

The updated RED II raises the renewable energy target for the EU's energy mix to a minimum of 42.5% by 2030, with the potential to achieve up to 45% through an additional indicative top-up. This is a significant expansion from the previous target of 32%. The directive also specifies new targets for key sectors such as industry, transport, and building sectors, highlighting the role of district heating and cooling. For instance, the industry sector is now tasked with achieving a 1.6% annual increase in renewable energy use and ensuring that at least 42% of hydrogen used is sourced from renewable origins by 2030, with a target of 60% by 2035.

The next important point of the revised directive is the emphasis on Renewable Fuels of Non-Biological Origin (RFNBOs), including renewable hydrogen, which play a critical role in decarbonizing sectors difficult to electrify. Moreover, the directive incorporates robust measures to streamline the permitting processes for renewable energy projects, crucial for expediting the deployment of such projects across the EU.

The revised directive simplifies these processes by reducing barriers, which were previously significant impediments in several EU countries. This simplification aids in faster initiation of renewable energy projects while upholding environmental and public welfare standards. The directive has streamlined permitting by addressing several key areas: centralized procedures, digitalization of permitting processes, clear timelines for decision-making, integration of Environmental Assessments, overriding public interest and public participation and transparency.

- The revised directive promotes a Centralized Procedure that consolidates all necessary permitting steps into single applications or specific contact points. This effort significantly cuts down the bureaucratic challenges that developers often encounter, leading to faster project starts.
- The Digitalization of Permitting Processes has been a key focus, with the directive advocating for the use of digital tools and platforms for application management. This shift is designed to increase transparency, reduce the time required for process completion, and overall enhance the efficiency of the permitting operations.

- Clear Timelines for decision making have been established, setting more firm deadlines for authorities to respond to permit applications.
- The directive has included the Integration of Environmental Impact Assessments in the permitting workflow to ensure that environmental considerations are efficiently evaluated.
- Additionally, the directive underscores the importance of public participation and transparency in the permitting processes.
- Under the revised directive, renewable energy is recognized as an overriding public interest, which helps prioritize these projects while maintaining high environmental protection standards.

These changes are designed to enhance transparency, predictability, and cross-border cooperation in renewable energy development.

These streamlined processes under the revised RED II align with the broader REPowerEU plan, which includes additional measures to accelerate renewable energy projects, such as issuing new recommendations and guidance documents to improve permitting procedures and manage auctions for renewable energies more effectively. In 2024, significant refinements were made to these processes. Additionally, the creation of "renewables acceleration areas" facilitates the expedited permitting of projects in zones unlikely to cause significant environmental impacts.

In response to the need to reduce reliance on energy received from outside the EU and to quicken the adoption of renewable energy, the Commission has also proposed specific emergency measures. On October 20-21, 2022, the European Council called for expedited permitting procedures to streamline the deployment of renewable energy projects and grid infrastructure. Following a Commission proposal on November 9, 2022, based on Article 122 of the Treaty, the Council adopted a temporary emergency regulation on December 22, 2022. This regulation, which entered into force on December 30, 2022, for a period of 18 months, addresses the exceptional situation in energy markets and aims to accelerate the clean energy transition.

In Figure 2, the maximum duration of permitting procedures is presented. In the RED II permitting process, the time for EIA is not included. This was changed by the Council Regulation and revised RED II.

	RED II	revised RED II		Council Regulation
		renewables acceleration areas	outside renewables acceleration areas	
General renewable energy projects	2 years	1 year	2 years	-
Renewable energy projects with an electrical capacity of less than 150 kW	1 year	-	-	-
Offshore renewable energy projects	-	2 years	3 years	-
Solar energy renewable projects	-	3 months	3 months	3 months
Repowering	1 year	6 months	1 year	6 months
Repowering below 15% capacity	-	3 months	3 months	3 months
Ground source heat pumps	-	3 months	3 months	3 months
Heat pumps below 50 MW	-	1 month	1 month	1 month

Figure 2. Duration of renewable energy projects.

The emergency measures focus on shortening and accelerating the permitting procedures for projects, as well as for grid and infrastructure projects necessary for integrating renewable energy into the electricity system. On November 28, 2023, the Commission proposed extending certain emergency measures on permitting with additional targeted elements. These measures complement the permitting reforms that EU countries need to transpose by mid-2024 under the revised Renewable Energy Directive, alongside the market correction mechanism and gas solidarity measures. On December 19, 2023, EU Ministers agreed to extend the period.

The EIA procedure is a crucial component of environmental policy in the EU. It guarantees that the environmental consequences of projects are taken into account prior to making decisions. The EIA Directive (Directive 2011/92/EU, amended by Directive 2014/52/EU) establishes the framework for evaluating the environmental effects of public

and private projects that are likely to have significant effects on the environment. The EIA process involves several key steps, starting with screening, which determines whether a project requires an EIA based on criteria such as size, location, and potential environmental impacts. Projects listed in Annex I of the EIA Directive always require an EIA due to their significant effects on the environment, while projects listed in Annex II are subject to screening to determine if an EIA is necessary based on specific criteria and thresholds.

The next step is scoping, which points out the key environmental issues and impacts that require to be addressed in the EIA report. This phase involves consultation with stakeholders, authorities, and the public to describe the scope of the assessment. Following scoping, the project developer prepares an EIA report that estimates the potential significant environmental effects of the project. This report contains a description of the project, the baseline environment, potential impacts, mitigation measures, and alternatives considered.

After the EIA report is prepared, it is made available for public consultation. Authorities, the public, and other stakeholders are invited to provide their responses to the report. The competent authority, after reviewing the EIA report and the received feedback, decides on whether to approve the project and under what conditions, taking into account the EIA findings. If the project is approved, conditions may be added to ensure that mitigation measures are implemented. Monitoring is performed to ensure compliance with conditions and to assess the actual environmental impacts during and after project implementation.

Certain projects may be exempt from the EIA requirement under specific circumstances. These exemptions are outlined in the EIA Directive. For instance, projects primarily serving national defense or emergency purposes can be exempt from the EIA procedure if deemed necessary for national security. Additionally, projects with low probability of significant environmental effects may be exempt based on the screening process, considering criteria such as project size, location, and the nature of potential impacts.

Small-scale projects below certain thresholds may also be exempt if they are not expected to have significant environmental impacts. Member States have the discretion to set these thresholds and criteria in their national legislation. Furthermore, modifications or

extensions of existing projects that do not have significant additional environmental impacts may be exempt, based on whether the changes are likely to cause new or increased significant effects compared to the original project. In some cases, projects located in specific designated areas, such as urban development areas, may be exempt if comprehensive environmental assessments have already been conducted for the area which is a part of broader planning processes.

The EIA procedure remains a crucial component of EU environmental policy, ensuring that the environmental impacts of projects are thoroughly evaluated before any decisions are made. The EIA Directive outlines a detailed process for assessing the environmental effects of projects, which includes screening, scoping, public consultation, and decision-making. Specific exemptions are provided for certain projects based on their size, location, and potential environmental impacts.

Criticism of the current European EIA system is related to its complexity, long duration, lack of transparency and inconsistent application in Member States. Moreover, questions are raised regarding the effectiveness of public participation, insufficient attention to cumulative effects and insufficient harmonization with other planning procedures.

Additionally, the National Energy & Climate Plans (NECPs) play a vital role in achieving the EU's energy and climate goals. NECPs are integrated planning frameworks submitted by each Member State outlining how they intend to meet the EU climate and energy targets for 2030. These plans include detailed strategies and measures for improving energy efficiency, growing renewable energy production, and reducing greenhouse gas emissions. They also encompass national contributions to the EU's collective targets and ensure that Member States align their policies with the overall EU strategy. The NECPs are subject to regular monitoring and reporting, allowing the European Commission to assess progress and provide recommendations for adjustments if necessary. Overall, the EU's legislative framework for renewable energy projects, including the revised RED II and the EIA Directive, is both sufficient and appropriate. The focus should now shift to ensuring effective implementation and enforcement of European regulations at the national level and below. By addressing these challenges, Member States can significantly contribute to the EU's ambitious renewable energy and climate goals.

III Key areas for improving permitting processes

Based on research conducted with EU Commission documents and recommendations, RES technical reports from various years, suggestions from EU projects aimed at streamlining permitting for renewable energy projects, and interviews with specialists in renewable projects, the following key areas for improving permitting processes and related infrastructure were identified: administrative issues, lack of policy decision support, inadequate location planning for renewable energy projects and related infrastructure, and grid issues. However, these areas are mixed and interconnected, and they have been combined into six groups. These improvements incorporate best practices including case studies in three countries, providing practical examples of effective solutions.

1 Administrative issues

The most common barriers in the administrative process for renewable energy projects include bureaucratic burdens, non-transparent processes, and a lack of legal coherence. In addition, there is often an incomplete and vague framework and guidelines, leading to varying interpretations of existing legislation by competent authorities. EU laws and recommendations are frequently not fully implemented at the local level. For instance, the requirements set forth in 2018 by RED II to organize and limit the duration of the administrative processes involved in obtaining permits for renewable energy projects have not been fully incorporated into the national legislation of any member state.

These issues significantly affect the duration of the permitting procedures, which varies greatly between different renewable energy technologies and between Member States. For example, the reported duration for onshore wind project permits ranges from 3 to 9 years, with substantial variation not only between Member States but also within different regions of the same country. For ground-mounted solar projects, the duration varies from about 1 year to over 4.5 years, according to the "Technical support for RES policy development and implementation – Simplification of permission and administrative procedures for RES installations (RES Simplify)" report from 2021.

1 Recommended Solutions

The complex permitting framework, which often involves obtaining various permits from different authorities, should be streamlined into a "One-Stop Shop" system to remove significant barriers and enable faster, more efficient permitting processes. According to Article 16(3) of RED II, Member States must establish a single contact point, or "one-stop-shop," to assist applicants throughout the entire permitting process.

Denmark has unified the permit process under a single piece of legislation, covering permits for building, operation, and grid connection of renewable energy plants. The Danish Energy Agency (DEA) plays a central role in overseeing the development and construction of offshore wind projects in Denmark. When the project owner submits a project description and a plan for activities on the offshore site, The DEA then coordinates with relevant authorities to approve the license for these preliminary investigations. Upon completion of the preliminary investigations, the DEA circulates a detailed application for construction prepared by the developer among relevant authorities to secure the obligatory approvals for the construction license.

Some Member States have provided detailed conditions for extending deadlines and have required that responsible authorities work actively with project developers to ensure that agreed timelines are followed. For instance, in Finland, when a renewable energy power plant needs multiple authorizations or administrative approvals for construction, upgrades, connections to the grid, or operation, the involved competent authorities are required to collaborate to adhere to the time limits. Portugal is also setting up a digital one-stop shop that applies a 'positive silence' rule, where the absence of a response from the authorities within a specified timeframe is deemed acceptance unless a response is mandated by EU or national legislation. This approach is also included in revised RED II and aims to reduce delays and simplify the permitting process.

2 Lack of policy decisions support

This barrier arises from a lack of support or explicit opposition from public and/or private institutions and the general public. This resistance is often directed at specific renewable energy projects, but in some regions or Member States, it can target the overall

deployment of renewable energy. The motivations for such opposition vary widely, ranging from individual concerns by affected groups, such as neighbors or environmental organizations with specific issues, to organized groups that oppose certain technologies or renewable energy in general, for example, behaviour a NIMBY ("not in my backyard"). Although these groups are typically small, they are often disproportionately vocal and can significantly influence public opinion. Such opposition can also escalate to legal conflicts. Overloaded judicial systems can exacerbate these barriers, especially since the former Article 16(7) of RED II did not account for delays due to judicial proceedings when setting specific deadlines for administrative processes. This legal complexity can cause significant delays in project implementation.

2 Recommended Solutions

Often, local governments may prioritize local perspectives on renewable energy development, potentially overlooking broader national objectives. Instead, both renewable energy projects and grid infrastructure developments should be embraced at the local level rather than seen as external impositions. Engaging the public early in the planning stages of regional or local spatial plans is essential. Efforts should be undertaken to ensure that local communities derive tangible benefits from nearby renewable energy installations. A case in point is the geothermal heating system in the Szeged district of Hungary, which received extensive discussion, acceptance, and support from both citizens and the local government.

This strategy not only furthers social justice within the green transition but also enhances public support for such initiatives. Benefits might include the formation of energy communities, reductions in electricity costs, or the introduction of financial participation models like co-ownership or benefit-sharing programs, alongside plans for regional industrial development.

The revised RED includes a new Article 15d on public participation, requiring Member States to promote public acceptance of renewable energy projects by facilitating both direct and indirect participation of local communities in these projects. Renewable energy communities are powerful tools to enhance local population involvement and benefit from the energy transition. Croatia has developed a national one-stop-shop website for energy communities as part of the EU-funded SHAREs project (https://energetske-

zajednice.hr/). This platform is designed to streamline the process for establishing and managing energy communities, making it easier for groups to access information and support.

Regarding court processes, while it is essential to ensure access to justice, Member States have the flexibility to structure their national legal systems to speed up the handling of legal disputes for renewable projects. This can involve adopting single-instance procedures for nationally significant projects, establishing specific timelines for various stages of legal proceedings to prevent undue delays, or implementing rules to curb frivolous lawsuits.

The updated Renewable Energy Directive requires that both administrative and judicial reviews be conducted through the quickest procedures available at the appropriate national, regional, or local levels. For example, Austria has taken steps to streamline legal proceedings concerning permits. The country's revised Environmental Impact Assessment Act states that general, unsubstantiated complaints do not halt the progress of appeals. It also establishes firm deadlines for filing objections at the start of the process and for subsequent submissions by authorities and the Federal Administrative Court, thereby eliminating delays typically caused by strategically late submissions from project adversaries.

3 Lack of location planning for renewable energy projects and related infrastructure

A lack of planned locations for renewable energy projects and related infrastructure can present significant barriers. This issue arises when spatial plans do not designate land for renewable energy projects, forcing developers to undertake the lengthy process of changing land use designations, which extends the duration of the entire project. Another key issue occurs when authorities use zoning to prohibit certain technologies, such as wind power, through distance restrictions that can make deployment almost impossible in some regions. Additionally, poorly designed spatial plans can be legally contested by stakeholders aiming to prevent the projects, further impeding progress.

3 Recommended Solutions

The revised RED II has introduced new mapping and planning obligations for renewable energy projects as legally binding in Articles 15b and 15c. Article 15b requires Member States to “carry out a coordinated mapping for the deployment of renewable energy in their territory to identify the domestic potential and the available land surface, sub-surface, sea or inland water areas that are necessary for the installation of renewable energy plants and their related infrastructure, such as grid and storage facilities, including thermal storage, that are required in order to meet at least their national contributions towards the overall Union renewable energy target for 2030” . Article 15c mandates a more targeted mapping obligation. Starting from the areas identified under Article 15b, Member States must designate "renewable acceleration areas" where the deployment of specific renewable energy technologies is not expected to have significant environmental impacts. In this process, Member States must exclude Natura 2000 sites, national protection schemes for nature and biodiversity conservation areas, major bird and marine mammal migratory routes, and other sensitive areas identified through mapping.

To prioritize suitable locations, Member States should focus on artificial and built surfaces, like building facades and rooftops, transport infrastructure, parking areas, farms, waste sites, industrial sites, mines, artificial inland water bodies, lakes or reservoirs, and, where appropriate, urban wastewater treatment sites and degraded land not usable for agriculture. The relevant competent authorities must adopt plans designating these renewable acceleration areas by February 21, 2026.

Alongside a robust spatial planning system, digital resources like Geographic Information Systems (GIS) online databases and cadastres are instrumental in pinpointing appropriate sites for projects. These digital tools provide insights into various factors such as the potential for different technologies, restricted zones, degraded lands, grid connectivity, existing initiatives, available data or studies, and preliminary environmental evaluations.

In Denmark, an exemplary digital platform known as "The Danish Environmental Portal" (https://miljoeportal.dk) serves as a comprehensive public resource. This portal is designed to streamline the access and management of environmental information across the state, municipalities, and regions. It supports various stakeholders, including government bodies, private citizens, professionals, and companies by offering detailed environmental data. This information spans a range of topics such as soil contamination, water quality, and land use, facilitating effective environmental management and

planning. Key features of the portal include its ability to integrate data across administrative units, enhancing the efficiency of environmental governance. It provides tools like 'Area Information,' which visually represents environmental data on maps, and web services that enable real-time data exchange between different government IT systems. This arrangement not only enhances the speed of data access but also ensures that updates and management of environmental information are handled seamlessly. Private citizens benefit significantly from the portal, using it to access critical information about land use restrictions, environmental conditions related to their property, or potential contamination in areas of interest. Companies, particularly those in sectors like water management, waste disposal, and construction, rely on the portal to comply with environmental regulations and to adapt their operations based on current environmental data.

To enhance the deployment of renewable energy projects, Member States need to ensure that spatial planning frameworks are integrated with comprehensive environmental assessments. By leveraging digital tools and involving local communities early in the planning process, these strategies can streamline the permitting process, mitigate opposition, and promote the sustainable enlargement of renewable energy sources across the EU.

4 Lack of Digitalization

The lack of digitalized processes in the permitting system can create several significant barriers that affect the efficiency and transparency of regulatory frameworks. Without digitalization, the permitting process can be slower due to the need for manual handling of applications, physical document submissions, and face-to-face interactions. This often results in longer wait times for approvals, increased administrative burdens, and higher costs for both applicants and governing bodies.

Additionally, non-digital systems can lead to less transparent procedures, making it harder for applicants to track the status of their applications and for officials to manage or audit processes effectively. Such systems are also more prone to errors and inconsistencies, which can further delay the permitting process and impact compliance monitoring.

Depending on the Member State, project developers often have to navigate interactions with administrations at national, regional, and municipal levels and various departments or ministries. The permitting process for projects often encounters significant challenges due to multiple layers of sometimes conflicting national and regional legislation and procedures. These complexities are compounded by unclear divisions of competencies between various authorities, which can lead to delays. It is not always evident whether the involvement of certain authorities is mandatory or if their opinions are binding, adding to the uncertainty.

When multiple authorities are involved in the permit-granting process, there tends to be a lack of transparency concerning the status of a project approval process and the identification of where bottlenecks occur. This opacity can hinder efficient project progression and complicate resolution efforts.

The integration of digital tools and solutions in administrative processes also varies widely across different administrations, which can exacerbate these challenges. Inconsistencies in digital adoption can prevent the smooth operation of permitting systems and further complicate interactions between applicants and authorities. Danish example was presented with a digital platform "The Danish Environmental Portal" (https://miljoeportal.dk).

Moreover, most EU countries have not fully digitalized their permitting processes, which means that applications still require substantial paperwork. This lack of digitalization adds to the administrative burden and slows down the permitting process.

4 Recommended Solutions

To effectively address the complexities in the permitting process for renewables projects, a coordinated effort is necessary to harmonize legislation and procedures, clarify the roles and responsibilities of authorities, enhance transparency, and standardize digital tools across various levels of government. These steps would significantly improve both the efficiency and predictability of the process.

Under the revised RED, specific provisions have been made to facilitate the permitting process. The directive requires that a contact point provide developers with a manual of procedures, accessible online, that is tailored to small-scale renewable energy projects,

self-consumer projects, and renewable energy communities. This manual ensures that developers are well-informed about the process. Furthermore, the RED mandates that all documentation relevant to permit applications be submitted digitally, and that the entire permitting process be conducted electronically by November 21, 2025, as stipulated in Article 16 of RED II.

Moreover, Regulation (EU) 2018/1724 establishes a single digital gateway to enhance accessibility to administrative procedures online. This regulation mandates the digitalization of procedures related to starting, running, and closing a project, including the integration of the Once-Only Technical System (OOTS) to streamline processes further. The shift to e-communication and digital platforms is designed to improve the efficiency with which authorities handle applications and to enable continuous monitoring and enhancement of the permitting procedures.

The digitalization of document transmission opens new avenues for incorporating advanced technologies like artificial intelligence (AI). AI can dramatically accelerate the processing of information and overall permit-granting procedures, increasing transparency for project developers about the status of their applications. It also enables all involved authorities to access a centralized project entry, ensuring a more streamlined and coordinated process.

These measures are crucial for promoting an effective and transparent permitting system, facilitating faster development of renewable energy projects, and contributing to the broader goals of energy transition and climate mitigation.

5 Conflicting public goods

This issue implies barriers where renewable energy projects conflict with other legitimate public goods. The most prominent issues include conflicting environmental regulations, such as those related to biodiversity, the protection of endangered species, and water bodies. Land use conflicts and military/air defense considerations are particularly relevant for wind power projects. For hydropower and geothermal energy projects, significant conflicts arise from the Water Framework Directive. Large-scale solar farms and wind turbines can cause visual and noise disturbances, which are often opposed by local communities. These conflicts can involve environmental groups, individual actors, and

public authorities at various levels, often leading to criticisms about how these public goods are balanced.

Many conflicts arise during an EIA, which may be carried out either as part of an individual project or as a part of a strategic environmental assessment (SEA) during the upstream planning process. The EIA originates from EU law, and the deadlines established by RED II must be adhered to without prejudice, according to Article 16(7). Since a complete EIA typically requires a census involving all seasons, it has become a primary reason for extended project realization periods.

5 Recommended Solutions

The solutions proposed are similar to the recommendations for previous issues Lack of Policy Decision Support and a lack of planned locations for renewable energy projects and related infrastructure, including centralized deployment, central spatial planning, and early-stage involvement in communication during the project planning process. Dual-use practices, such as agrivoltaics (combining solar PV with agriculture) or installing wind turbines in less productive agricultural fields, can be considerable effective practice. Reinforcing regulations that prioritize renewable energy development on degraded lands can alleviate these conflicts.

Multiple environmental assessments are often required for a single project, and national-specific requirements, such as land use conflicts, impact on wildlife and biodiversity, or cultural heritage, are frequently added to the permit process. An effective method to speed up the permitting process is to give authorization for the simultaneous submission of applications for various permits and related infrastructure projects, rather than handling them sequentially.

For example, in Austria, developers are permitted to apply simultaneous for several different permits—these include electricity production licenses and approvals under various laws such as nature conservation, aviation, forestry, water, occupational health and safety, and building regulations. Furthermore, site selection and grid connection applications can be processed at the same time. Advanced spatial planning by authorities in Member States facilitates this by incorporating environmental considerations into both renewable energy development and grid planning from the outset. This proactive

approach helps early identify significant environmental impacts and the determination of necessary mitigation measures to minimize, reduce, or compensate for these impacts as effectively as possible.

Environmental assessments at the planning level such as SEA are crucial. These assessments help streamline procedures to ensure compliance with environmental legislation and facilitate the selection of suitable sites by developers. Reducing conflicts with environmental groups, individual actors, and public authorities at all levels is crucial for the successful implementation of renewable energy projects.

For example, the integration of Geographic Information System tools in spatial planning can significantly aid in identifying potential conflicts early in the project development process. These tools can map out environmental sensitivities, land use patterns, and other relevant data, allowing for better-informed decision-making and reduced project delays. Additionally, fostering community engagement and ensuring transparent communication can help mitigate opposition and build local support.

6 Grid Issues

Grid connection issues and operational procedures can pose significant challenges for the integration of renewable energy into the power system. Renewable energy sources like solar and wind are variable, which can lead to instability in the power grid due to fluctuating power output. The primary grid connection problems often stem from inadequate grid capacities, leading to discussions and negotiations over connection logistics and costs, which in turn cause project delays. The solar thermal industry also faces challenges when connecting installations to district heating networks due to unclear regulations, which leave room for interpretation and discretion by district heating system operators. In many cases, renewable energy facilities are located in remote areas where existing grid infrastructure is insufficient to handle the generated power. Heat-based renewable sources encounter issues because the heat they produce cannot be transported over long distances, limiting flexibility in grid connections and exacerbating connection challenges.

To address these issues, a best practice is to fully utilize digitalization and ensure transparent processes. This involves facilitating grid connection permits through e-communication and the activities of single contact points, based on clearly defined roles and processes described in transparent guidelines. For instance, Denmark's centralized online platform, managed by the national transmission system operator Energinet, provides easily accessible information on all grid connection procedures for renewable energy projects and grid operation capacity map (Energinet, n.d.).

Allowing grid connection permits to be requested and granted in parallel with other authorizations, as seen in Austria, can also accelerate the overall permitting process. Considering the critical importance of infrastructure in the expansion of renewable energy, it's advisable for Member States and national regulatory bodies to support and promote early investments in energy infrastructure projects. This could involve constructing new transmission lines and enhancing existing ones to handle increased loads. Cooperation between government bodies and the private sector is essential to secure the funding necessary for these initiatives.

Energy storage systems, like batteries, can also be used to store excess energy during peak production and release it during low production periods.

Moreover, implementing smart grid technologies can improve the efficiency and flexibility of grid operations, allowing for better integration of renewable energy sources. To enhance the management of electricity distribution, smart grids can utilize digital communication technology to detect and response to local changes in usage. Enhanced collaboration between grid operators and renewable energy developers can also lead to the development of more robust grid connection frameworks.

Lastly, updating and standardizing technical regulations across Member States can reduce conflicts and streamline the grid connection process. Establishing clear, consistent guidelines will help all parties understand their roles and responsibilities, ultimately reducing delays and facilitating smoother project implementation.

The solutions proposed in this chapter to enhance the permitting process for renewable energy projects are grouped into six major categories. According to the analysis, the

majority of these decisions are already incorporated in existing European legislation or will be enacted next year, such as the revised RED II articles. However, their implementation at the national level has not always been fully executed or is yet to be implemented.

1. Establishing a "One-Stop Shop" or a single contact point system

   Simplify and accelerate the permitting process by consolidating all necessary permits under a single framework to reduce redundancy and administrative barriers.

2. Advanced Spatial Planning

   Integrate environmental considerations into renewable energy and grid planning processes in digital maps from the beginning, assisting in identifying and addressing environmental impacts at an early stage.

3. Streamline with Digital Tools

   Utilize digital platforms and e-communication to speed up processes and increase transparency. This includes establishing digital one-stop shops that apply rules like 'positive silence' where non-response within a set timeframe equals approval unless otherwise required by law and digital resources for Spatial Planning information.

4. Facilitate Grid Connection Approvals

   Streamline the process for grid connection approvals by reducing bureaucratic hurdles and simplifying procedures by introducing transparent guidelines. Establish clear regulations and guidelines for the calculation of grid connection costs to support planning and visibility of the process. This can be done through the same "One-Stop Shop" systems, ensuring that grid connection requests are processed swiftly and efficiently. Enhance coordination between grid planners and renewable energy developers to ensure that new projects can be integrated into the grid without compromising stability or performance.

5. Local Community Engagement

Engage local communities early in the process to ensure renewable energy projects are seen as beneficial rather than impositions. Promote public participation and ensure local benefits such as reduced energy costs or financial participation opportunities.

6. Enhance Inter-Agency Collaboration

   Require that all relevant authorities in national, regional and municipal levels work together to ensure adherence to timelines, especially when multiple permits are required, to prevent unnecessary delays. It also supports coordinating efforts across different levels of government to harmonize legislation and clarify the responsibilities and roles of authorities participated in the permitting process.

During my interviews, this list of solutions was discussed, asked for their relevance, and sought best practices and proposals to accelerate permitting procedures.

Benedikt Kammerstaetter, who works in business management at ECOWIND Handels- & Wartungs-GmbH, which is affiliated with BayWa r.e. ECOwind, agreed with the proposed solutions. ECOwind has developed and realized several multi-megawatt solar parks in Austria and Southeast Europe, including The ECOwind Grafenworth Solar PV Park. Mr. Kammerstaetter emphasized that the necessary spaces and locations should be agreed upon at the level at which the goals were set, thus requiring coordination between different levels of authorities to ensure the goals are realized. He pointed out that federalism, including the distribution of powers among the federal government, states, and municipalities, can obstruct permitting procedures.

Mr. Ortner also agreed with the list of solutions and confirmed their relevance. He mentioned that simplifying the EIA process would greatly support the acceleration of permitting procedures. He highlighted that grid connection issues are particularly severe in Austria, where grid operators are often reluctant to facilitate the permitting process for renewable projects, especially concerning grid connection approvals for PV projects

IV Case Studies on Permitting Procedures in Denmark, Hungary, and Austria

This chapter examines the best practices for permitting procedures in renewable energy projects in Denmark, Hungary, and Austria. These countries are noted for their innovative and effective approaches to streamlining the permitting process, which is important for the booming deployment of renewable energy technologies.

In Denmark, the Thor Offshore Wind Farm serves as an excellent example. Denmark has implemented comprehensive planning and regulatory frameworks to facilitate large-scale renewable energy projects. The use of a "One-Stop Shop" system simplifies the permitting process by providing a single contact point for all necessary permits, significantly reducing the time and complexity involved. Additionally, Denmark has embraced digital processes, allowing for efficient handling of permits and transparent tracking of project statuses.

The geothermal energy development in Szeged, Hungary, is a pioneering example of utilizing geothermal resources for urban heating. The project aims partial replacement of natural gas as the primary energy source of the northern circuits of the Szeged district heating system with geothermal energy which is a renewable and green source of energy. With a comprehensive capacity to supply heat to nearly 50% of the city's population, the project demonstrates effective cooperation at both local and national levels. Adherence to updated legal frameworks has facilitated this large-scale renewable energy initiative. The Szeged project illustrates how strategic regulatory planning and strong community support, can drive the successful implementation of significant renewable energy infrastructure.

Austria's floating-PV system in Grafenwörth highlights the national's commitment to renewable energy. The project showcases the strong involvement and cooperation of the Lower Austria authorities, who play a crucial role in streamlining the permitting process. Their commitment and coordination with project developers have been key to reducing administrative burdens and facilitating project approval. Advanced spatial planning and

a centralized digital system also contribute to the efficiency and effectiveness of Austria's permitting procedures.

This chapter provides a detailed analysis of these case studies, focusing on identifying best practices that can be replicated by other countries to improve their permitting processes for renewable energy projects. The results from these case studies will provide an understanding of how effective permitting procedures can accelerate the transition to renewable energy and achieve climate and energy goals.

The chapter underscores the importance of integrating environmental considerations early in the planning process, utilizing digital tools for efficient management, and fostering public participation to enhance transparency and acceptance. Furthermore, clear regulatory frameworks help reduce administrative burdens and facilitate smoother project implementation. These strategies show how well-structured permitting processes can significantly enhance the feasibility and success of renewable energy initiatives.

Denmark

Denmark's permitting procedures for offshore energy projects are noted for their efficiency and innovation. The country has implemented several best practices that streamline the development of renewable energy infrastructure.

Launched in 2007, The Danish Environmental Portal is a collaborative effort owned by the state, municipalities, and regions. It serves as an online resource providing detailed, localized information about the environment, water resources, natural habitats, and land use. The platform facilitates improved coordination and efficiency by enabling authorities to manage and share data across different administrative levels, sectors, and regions. Additionally, it offers private citizens and professionals access to crucial information regarding land use restrictions, including aspects of nature conservation, protected areas, building regulations, and specific planning details. The portal offers various digital solutions, including web services and user administration systems, providing access to environmental data and legacy archives. This platform enables authorities, companies, and private citizens to access and update environmental data, facilitating effective

monitoring, management, and safeguarding of natural and environmental resources. The portal supports planning, prioritization, and decision-making by municipal authorities, as it allows quick combination of different types of environmental data from various official sources.

A notable feature of Denmark's permitting process is the "One-Stop Shop" system managed by the Danish Energy Agency. This system coordinates all permitting decisions and acts as a single contact point, simplifying the process for developers by ensuring all necessary permits are obtained through one entity. This approach significantly reduces administrative complexity and project delays. The Danish Act on the Promotion of Renewable Energy outlines the roles and responsibilities within the Danish Energy Agency (DEA), as well as the criteria and processes for granting licenses for offshore wind power development. The DEA is tasked with both planning and issuing permits for offshore wind projects in the territorial sea and exclusive economic zone, with references to relevant legislation and conditions from other authorities incorporated. The DEA collaborates with other relevant authorities to grant comprehensive licenses that include all required conditions stipulated by various stakeholders.

Preliminary investigations of renewable project areas and SEAs early in the process before the Tender performed by DEA are designed to save time, create transparency, reduce risks for developers, and minimize costs.

The Promotion of Renewable Energy Act of December 27th, 2008 regulates the conditions for offshore wind farms. In Chapter 3 it is stated that the right to exploit energy from water and wind within the territorial waters and the exclusive economic zone (up to 200 nautical miles) around Denmark belongs to the Danish State. The EIA requirements for offshore wind farms is specified in Executive Order 68 of January 26th, 2012.

The permitting process begins with a rough screening of potential sites, performed by the DEA together with the Maritime Authority. The Ministry of Defence and Energinet, the transmission system operator (TSO), are actively engaged in this phase to evaluate potential opportunities and identify any potential barriers of territory. The screening process includes an economic ranking of potential sites, considering factors like wind conditions and sea depth.

Once potential sites are identified using the Danish Environmental Portal, they are submitted for consideration in the maritime spatial planning process, ensuring alignment with broader maritime and environmental policies. Preliminary investigations and a SEA, coordinated by the DEA and Energinet, follow. Consultancy services are employed to gather new data on environmental factors such as wind, waves, seabed conditions, and bird populations, to determine the suitability of the sites for offshore wind development.

For tendered projects, Energinet is responsible for providing a grid connection, typically 1 GW, and enhancing the grid infrastructure if necessary. They must ensure the grid connection is available on time, with provisions for developer compensation in case of delays. Denmark has adopted a parallel process where the tender process and preliminary investigations are conducted simultaneously, saving time and reducing risks and costs for developers.

Once a site is tendered, the developer gains exclusivity to conduct further investigations for a specified period. During this period, the developer must carry out an EIA for the wind farm. If the EIA and other investigations confirm that the project is compatible with relevant interests, the DEA can grant a license to establish and operate the wind farm. In addition to the main license, the construction and operation of the wind farm require several other permits from various authorities. While it is the developer's responsibility to secure these permits, the DEA continues to facilitate the process to ensure all mandatory approvals are received efficiently.

The permitting procedures for offshore wind projects in Denmark are structured to ensure efficiency, transparency, and cost-effectiveness, as outlined by the Swedish Government Inquiry Commission on Offshore Wind Power which was used for the above analysis.

Thor offshore wind project

Thor will be Denmark's largest offshore wind farm upon completion, slated for full operation in 2027. This offshore wind project is expected to generate clean electricity to power over one million Danish households. Thor offshore wind project covers an area of approximately 220 km² within a preselected 440 km² zone in the North Sea, west of Nissum Fjord, situated between 20 and 50 km offshore. The installation will feature 72

wind turbines, each with a capacity of 14 MW, a hub height of 145 meters above mean sea level, and a rotor diameter of 236 meters, leading to a total height of 260 meters.

Following the 2018 Energy Agreement, Denmark committed to building three new offshore wind farms by 2030. The first of these, named Thor, was selected on February 28, 2019, to be constructed in the North Sea, at least 20 km from the Jutland shore near Nissum Fjord.

The SEA for Thor was conducted under the DEA supervision, in cooperation with the TSO Energinet. The SEA covered all offshore and onshore installations. Based on the SEA report and related consultations, the planning area was confirmed, and recommendations were made regarding project-level environmental assessments, mitigation measures, and monitoring strategies. The SEA included studies on birds, sea mammals, benthic flora and fauna, fish populations, Natura 2000 sites, and visual impacts.

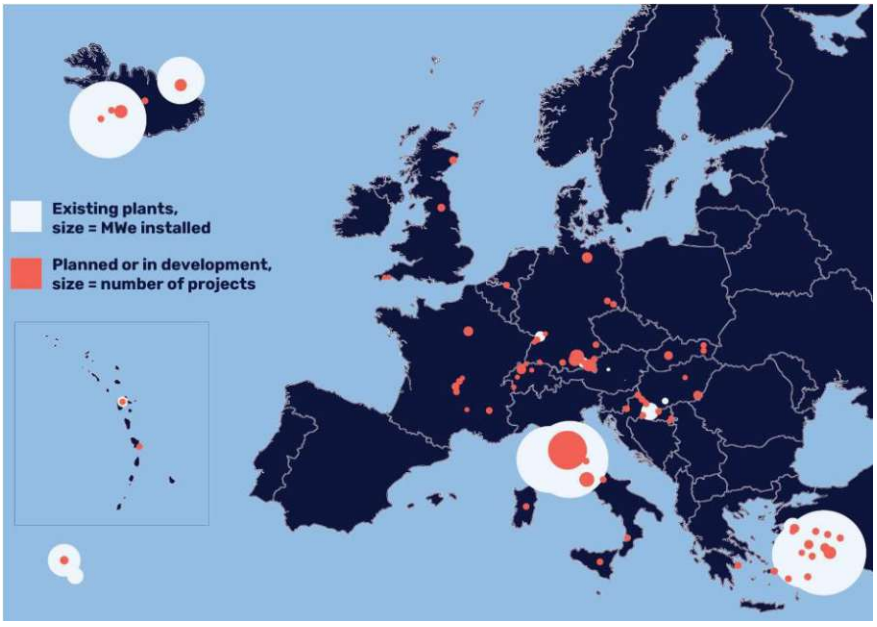
According to the Environmental Assessment Act, both the SEA and EIA processes involve two rounds of public consultation. The DEA initiated an eight-week public hearing from February 1 to March 29, 2021, involving approximately 5,000 local landowners, relevant organizations, and local authorities. Concurrently, an EIA for the land-based project was conducted, with results published in Spring 2021 by the Environmental Protection Agency.

The tendering process for Thor concluded with final bids in Q4 2021, and on December 1, 2021 was announced that RWE won the concession to build the wind farm. RWE signed a concession agreement with the DEA on January 25, 2022, granting the right to construct and operate Thor for 30 years, with a planned capacity of around 1,000 megawatts.

In June 2022 Danish Environmental Protection Agency released the construction permit after the offshore project's EIA was approved. The permit includes conditions to ensure good workmanship and measures to protect animals during construction. As of the latest update, the project is set to proceed with onshore cable works from mid-April to the end of October 2024, around the onshore substation south of Lemvig.

Hungary

Geothermal energy is renowned for its reliability, independence from weather conditions, and renewability. Geothermal energy is a renewable, clean, and virtually limitless energy source obtained by tapping into the heat found in the Earth's interior. It serves various purposes, including generating electricity, heating buildings, and supporting industrial processes. Unlike other renewable sources, geothermal energy provides continuous production, operating 24 hours a day, 365 days a year, without the need for storage facilities. It is a stable energy source unaffected by fluctuations in wind or sunlight. In 2023, the total production of geothermal energy in the EU reached 5,858 GWh, accounting for just over 0.2% of the EU's total electricity production, with Italy contributing over 90% of this output.



Source: Fraunhofer Institute for Energy Infrastructure and Geothermal Systems

Figure 3. Geothermal plans and projects in the EU

Hungary is particularly well-suited for geothermal energy production due to its significantly thinner Earth's crust compared to other regions in Europe. Geothermal energy in Hungary is primarily used for heating and supplying thermal water to baths. Geothermal energy as well as mineral resources are owned by the State in their natural locations, and the Hungarian Bureau of Mines acts as one of the licensing authorities. The development and utilization of geothermal energy in Hungary are regulated by several

laws, including the Mining Law (No. XLVIII, 1993), the Water Management Law (No. LVII, 1995), and the Concession Law (No. XI, 1991). The permitting procedures and overall regulations are complex. This complexity primarily stems from the involvement of multiple organizations in the licensing process and the need to obtain numerous licenses. Additionally, there are no dedicated and straightforward EIA guidelines for deep geothermal development.

In 2022, Hungary underwent significant legal changes regarding geothermal energy utilization, transitioning to a new legal framework and authorization process. A notable change was the inclusion of water carrying geothermal energy under the Mining Act, as stipulated by the 20/2022 (I.31.) SZTFH decree, replacing its previous regulation under the Water Management Law. Regulations for geothermal projects under the Mining Act are more consistent and simplify the process of obtaining licenses, ultimately speeding up the process. This shift was designed to stimulate geothermal energy projects and comply with the EU's RED II requirements and other EU legislation. The legal changes were further driven by significant shifts in the energy market from 2022 onwards. Since the new legislation was issued, there has been a notable increase in the number of geothermal project applications submitted to the mining authority. Publicly accessible web platforms offer current and reliable geological, hydrogeological, and geophysical data and information regarding Hungary's geothermal energy resources. These platforms are available in both Hungarian and English, providing comprehensive access to the latest information on Hungary's geothermal energy potential (https://map.mbfsz.gov.hu/ogre_en).

Szeged District Heating System

In 2011, the city of Szeged in Hungary started the first experience and established two geothermal cascade systems primarily to supply heat to a limited number of units. They were university buildings, as well as municipal and state buildings in the city center and Újszeged. These systems, built with modern technology and operated by experts, demonstrated favorable operational experiences, which encouraged the city to further explore the utilization of deep geothermal energy. This move towards geothermal energy

not only aimed to achieve energy independence and provide cleaner air but also targeted the modernization of outdated energy systems to reduce major pollutants.

On December 5, 2019, the General Assembly of Szeged held a public hearing on "Development Opportunities for District Heating in Szeged in the Field of Alternative Energy Management." This led to the launch of an ambitious geothermal heating project by the municipality's heating company, Szegedi Távhő Kft., in collaboration with GEO Hőterm Kft., which retrofitted the old gas-based system.

The project, considered a large-scale and ambitious initiative, involved extracting heat from geothermal water hosted at a depth of about 2000 meters, with water temperatures ranging between 92 and 93 degrees Celsius. Heat exchangers adjacent to the wells were used to transfer heat from the geothermal water, ensuring that the geothermal water itself did not circulate through the distribution network pipes.

In 2022, heating projects commenced operations, providing residents in certain districts of Szeged with heating sourced from geothermal energy, which has been described as a model for other European cities. The Hungarian Ministry of Construction and Transport announced the full completion of the project in February 2024.

The new geothermal heating network comprises 27 wells, 16 heating plants, and a 250-kilometer distribution pipe network. This system replaces the old gas-only district heating system with a more sustainable solution, providing geothermal heat to 23 heating districts, serving 27,251 apartments and 469 institutions—nearly 50% of the city's population. The project displaces over 2.2 million cubic meters of natural gas annually, reducing Szeged's greenhouse gas emissions by 4,482 tons of CO_2 each year.

This project exemplifies successful municipal efforts in developing green technologies and renewable energy sources. Despite initial setbacks due to confusing legislation and a complex licensing system, the support of the local population and the commitment of city authorities played crucial roles in the project's development. Legislative changes that facilitated the speed and feasibility of geothermal projects in Hungary also contributed significantly to the project's success.

In summary, the Szeged geothermal heating project highlights the importance of municipal support, community involvement, and adaptive legislation in advancing renewable energy initiatives.

Austria

Austria has established a comprehensive framework for the permitting of renewable energy projects. This framework, regulated by both national and regional laws, ensures that projects are environmentally compliant and efficiently managed.

The Austrian government has acknowledged the critical role of renewable energy in reaching sustainability goals in 2021 issuing the Renewable Energy Expansion Act (Erneuerbaren-Ausbau-Gesetz). The government agreement for 2020-2024 sets ambitious targets of reaching 100% renewable electricity (national balance) by 2030 and climate neutrality by 2040. To achieve these targets, the government plans to expand annual electricity generation from renewable sources by 27 TWh by 2030, with contributions from photovoltaics (11 TWh), wind (10 TWh), hydropower (5 TWh), and biomass (1 TWh). With the current capacity of development renewable energy sources, the 2030 target of the legislation commitments cannot be implemented.

At the national level, the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), and the Federal Ministry of Agriculture, Forestry, Regions and Water Management are two key ministries primarily managing the permitting process. The main legislative framework is provided by the Renewable Energy Expansion Act (EAG), which incorporates the EU's RED II into Austrian law. EIA is controlled by the Environmental Impact Assessment Act (UVP-G 2000) along with several other laws about soil reform. Regarding the EIA's applicability, Annex 1 of the Environmental Impact Assessment Act 2000 details 88 different project types that require an EIA when specific conditions are met. These projects are those anticipated to significantly negatively affect the environment. Additionally, large-scale renewable energy projects must undergo an EIA to evaluate their potential environmental impacts and propose mitigation measures. This process involves public consultations and the involvement of various stakeholders to ensure transparency and environmental

protection. Compliance with building and zoning laws is also required to ensure projects are properly sited and constructed.

Additionally, the EAG establishes national guidelines for renewable energy financing, including mechanisms such as market premiums through tendering processes or investment grants. It also outlines a regulatory framework for renewable energy communities, introduces rules for energy origin certification, and presents a comprehensive plan for integrating Austria's network infrastructure.

The permitting of renewable energy projects in Austria is regulated by several laws, depending on how and where the energy is produced, transmitted, and distributed. Critical laws include the Environmental Impact Assessment Act (UVP-G 2000), the Water Act (WRG), the High Voltage Current Lines Act (StWG), the Forest Act (ForstG), the Trade Act (GewO), and respective provincial laws such as Building Codes (BauO), Electricity Acts (EIWG), Nature Protection Laws (NSchG), and Spatial Planning Laws (ROG). In Austria, there are no tendering processes for specific renewable energy sites.

The construction, assessment, and operation of renewable energy systems generally require multiple permits, which vary based on the type, size, and environmental impact of the project. Due to the distribution of competencies under federal law, there is no single universal permit for renewable energy facilities. Developers can also apply for multiple permits in parallel, allowing site selection and grid connection applications to be done simultaneously.

Austria's federal structure gives its provinces significant legislative power in areas such as building and regional planning. This leads to a decentralized approach in energy regulation, enabling each province to tailor the federal legislation to suit local conditions. This results in varied requirements for renewable energy projects across different regions.

In terms of permitting, renewable energy installations generally require construction permits, which are based on local building codes. The exact permitting requirements can vary significantly from one province to another—ranging from full exemptions to the need for comprehensive permits. All installations must comply with local planning regulations concerning zoning, development, and landscape protection.

Changes in land use status, such as reclassifying land from agricultural to construction purposes, should be authorized at the federal level. This ensures that such changes are consistent with national regulations and planning strategies and that they align with broader goals for land use and development.

Further, compliance with the provincial Electricity Act is essential, with specifics varying by province and depending on the installation's capacity. For certain types of energy installations, such as hydropower or those with significant environmental impacts, specialized permits like environmental impact assessments or additional approvals under water management laws might be necessary.

Each province in Austria not only adapts to federal law but may also introduce specific legislation to promote renewable energy, exemplified by laws in Burgenland to accelerate renewable energy expansion. In Lower Austria, Burgenland, supra-local zones for large greenfield PV plants have been defined by the provincial government, allowing local zoning by municipalities.

Based on information from the website "Raumordnung in Niederösterreich" regarding ground-mounted photovoltaic systems up to 2 hectares in size, the local municipality must designate the land as a "grassland photovoltaic system," with the Lower Austrian Provincial Government's Office overseeing the process. When the system exceeds 2 hectares, the zoning requirements involve both the local municipality and the Province of Lower Austria. These larger systems must be included in the sectoral spatial planning program for photovoltaic systems on grassland in Lower Austria. However, there is no mandatory requirement for municipalities to designate "grassland photovoltaics" within these predefined zones.

The sectoral spatial planning program for photovoltaics, outlined in the parent legislation (LGBl. No. 94/2022), identifies 116 locations where the construction of ground-mounted systems larger than 2 hectares is feasible. Typically, these systems can cover up to 5 hectares within the designated zones. To promote multiple uses beyond energy production, such as biodiversity areas, larger systems (up to 10 hectares) can be approved if an ecological concept is submitted. This approach is referred to as "Concept 5+".

The ecological concept must meet certain minimum standards, including soil quality preservation, ecological greening, and continuous habitat provision for small game. Additionally, it must incorporate measures related to biodiversity and nutrition.

Lower Austria has also implemented additional guidelines and support mechanisms to facilitate renewable energy projects. The Lower Austria Energy Strategy outlines regional goals for renewable energy expansion and includes specific targets for PV installations. Permitting in Lower Austria involves coordination with local municipalities and regional authorities to ensure compliance with regional planning and environmental protection laws. The region also offers support programs and incentives for renewable energy projects, such as financial subsidies, technical assistance, and expedited permitting procedures.

On January 13, 2023, the Austrian government announced a set of initiatives aimed at boosting solar power deployment across the country. These measures include streamlining the environmental permit process PV installations. Amendments to the Environmental Impact Assessment regulations will prioritize solar PV projects by recognizing them as of special public interest, allowing them to proceed more swiftly even when faced with unfounded complaints.

In the previous year, Austria achieved a significant milestone by installing 1.3GW of solar PV systems, which represented nearly a third of its total capacity, which stood at 3.8GW at the end of 2022 as reported by SolarPower Europe.

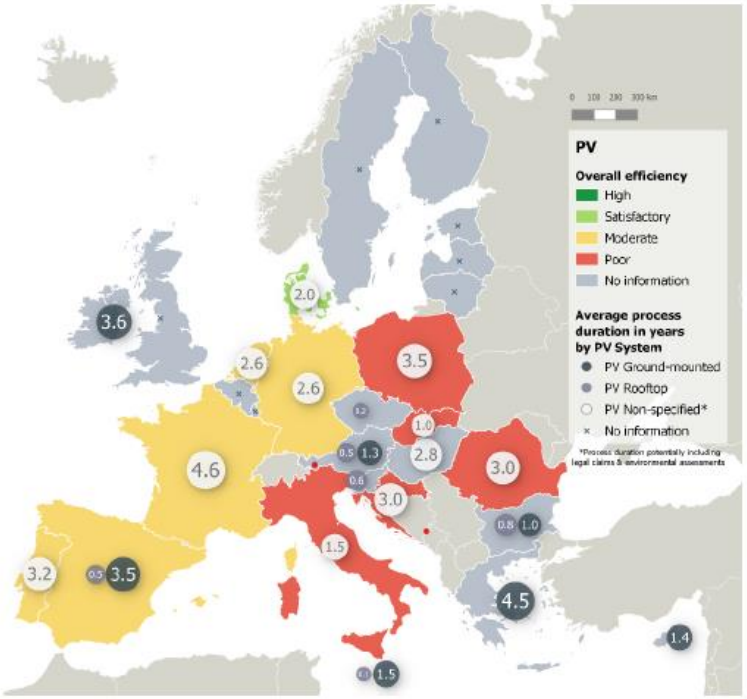
Additionally, the Austrian government is taking steps to counteract 'Not In My Backyard' attitudes, which have previously led to rejections of project applications based on their perceived impact on town and landscape aesthetics. Under the new guidelines, solar PV installations on sealed surfaces will no longer require approvals, facilitating a smoother development process.

Projects will need to undergo tests once, as it will be deemed adequate if the landscape considerations have already been accounted for in the zoning process. This allows for the potential to fast-track the environmental assessment procedure by obtaining consent from municipalities during the Environmental Impact Assessment (EIA) process.

Projects will not be required to carry the same tests twice, as it will be sufficient enough if the landscape has already been taken into account in the zoning, with the possibility to obtain consent from the municipalities during the EIA procedure to fast-track the environmental process.

Securing a grid connection agreement with the regional transmission system operator is crucial for PV projects. This agreement outlines the technical and financial terms for connecting the PV system to the electricity grid. Once all approvals are obtained, a construction permit is issued, allowing the developer to begin installation. Upon successful inspection, the system is commissioned and connected to the grid.

Overall, the permitting process for renewable energy projects in Austria involves a thorough evaluation by multiple authorities to ensure compliance with environmental, building, and grid connection standards. Specific regional regulations, such as those in Lower Austria, provide additional support and streamlined procedures to facilitate the development of renewable energy infrastructure. These procedures, combined with supportive regional strategies, spatial planning and incentives, position Austria as a model for efficient and effective renewable energy project deployment. According to the 2023 Technical Report by the EU RES Simplify Project, Austria has one of the fastest timelines for ground-mounted PV installations.



Source: RES simplify

Figure 4. Overall efficiency and average duration of PV project

ECOwind Grafenworth floating solar PV Park

The ECOwind Grafenworth Solar PV Park is a notable renewable energy project located in Lower Austria. This floating solar project covers 14 hectares and is a collaborative effort between ECOWIND Handels-& Wartungs-GmbH, a unit of the German renewables company BayWar.e. AG, and the Austrian power producer EVN AG, with each holding a 50% stake. The project produced 24,500 MWh of electricity annually, providing green energy to 7,500 households. It features 45,304 solar modules and is the largest of its kind in Austria and the fourth largest floating PV plant in Europe, following three similar projects in the Netherlands developed by. BayWar.e. AG.

The solar park was built on unused gravel ponds that were formed from sand and gravel extraction. After the extraction was completed, these pits were recultivated into ponds, which have never been used for recreational activities. The ponds are located outside the village center, surrounded by earth walls, making the PV installations less visible and well-integrated into the landscape. The project only covers about 42% of the water

surface, which helps reduce evaporation and algae growth, positively affecting the environment.

Johann Janker, Managing Director at EcoWind, highlighted the main challenges, including establishing a permitting procedure for this new PV technology in Austria and ensuring safe construction despite a seven-meter height difference between the mounting surface and the water. Benedikt Kammerstätter, Project Manager at ECOwind, also confirmed these challenges, emphasizing the difficulty in getting approval for the new floating PV technology and managing the site's unique conditions.

The project timeline began in 2020, and the permitting process took about two years. Construction started in October 2022, with the grid connection completed by January 2023, and the floating PV system becoming operational in February 2023.

Permitting Procedures

The permitting process for the Grafenworth Solar PV Park required four distinct permits: water law, nature conservation, electricity law, and shipping law. The entire process, from initial application to final checks and authorities' approval, took about two years. One unique challenge was developing the earthing concept for the floating PV system, as traditional earthing methods are not feasible with water. The solution involved creating a close-meshed network of components for potential equalization, developed in collaboration with the department responsible for plant law in the province of Lower Austria.

Environmental Impact Assessment

Although the law usually exempts PV projects from EIA assessments, the Grafenworth Solar PV Park project, due to its innovative technology and size, was required to conduct an environmental assessment. This measure was implemented to guarantee that new technologies, such as floating PV panels, would not negatively affect the environment. To ensure this, thorough surveys were carried out to examine the plant and animal life in and around the ponds. These surveys included detailed studies of fish, dragonflies, waterfowl, bats, amphibians, reptiles, grasshoppers, other species, and also the vegetation in the area. A significant environmental challenge was ensuring that the anchor ropes

were pressed under the water surface with weights to allow water birds to take off and land easily, minimizing disruption to local wildlife.

The insights from Benedikt Kammerstätter highlight the real-world challenges and solutions in overcoming regulatory and environmental hurdles in the renewable energy sector. This project demonstrates how effective planning and collaboration can lead to successful and environmentally friendly renewable energy developments.

The success of the ECOwind Grafenworth Solar PV Park can be largely attributed to the active cooperation and assistance from local authorities in Lower Austria. While detailed information on the project approval timeline is limited, data received from the project manager and analysis of relevant legislation and initiatives suggest that this collaborative approach played a crucial role.

The absence of all publicly accessible information on the project highlights as well as an issue with the digitalization of permitting processes in Austria. This absence of data transparency can hinder detailed analysis but also highlight the need for improved digital infrastructure in the permitting process.

One significant factor contributing to the project's relatively swift approval was its innovative in location of the PV panels at unused gravel ponds. That reduces the number of required approvals and EIA processes. In this case, obtaining project approval and completing EIA within two years is considered successful, especially since floating PV technology had not been previously used in Austria. This required authorities at both the national and local levels to develop new approaches and frameworks to accommodate the novel project.

The proactive involvement of local authorities, combined with the project's innovative aspects, significantly streamlined the approval process, setting a precedent for future renewable energy projects in Austria. This case demonstrates how effective collaboration and innovation can overcome regulatory and procedural challenges, leading to the successful deployment of advanced renewable energy technologies.

V Summary and Conclusions

This Master's thesis has thoroughly examined the current permitting procedures for renewable energy projects within the European Union, addressing the initial research question by providing an in-depth overview of the regulatory frameworks, administrative processes, and environmental assessments involved. The EU has set an extensive framework to accelerate permitting procedures for renewable energy projects and overall, through initiatives like RED II, the EIA Directive, and other legislation and initiatives, aims to achieve the 2030 renewable energy targets. Implemented in 2018, RED II set forth guidelines to streamline and limit the duration of administrative processes required for obtaining permits for renewable energy projects. This includes securing all necessary permits to build, repower, and operate plants, as well as their grid connections. RED II initially specified that administrative procedures for granting permits should not exceed two years for renewable electricity production plants, hydrogen infrastructure and their necessary grid connection assets. For smaller renewable energy projects and repowering of existing plants, the administrative process should not exceed one year. The revised RED II sets stricter deadlines and incorporates the duration of EIA performance into the administrative process deadline, excluding court proceedings, and allows for a six-month extension in extraordinary circumstances. For offshore projects, the timeframe extends to three years. Designated renewables acceleration areas are subject to even shorter deadlines: one year for most projects, two years for offshore projects, and six months for smaller projects and co-located energy storage. Member States must establish specific procedures with rapid screening processes completed within 30 days for projects in these areas. Therefore, significant improvements were made by revised RED II to facilitate permitting procedures streamline.

Although the EU has set comprehensive regulations, the main challenge is their implementation by individual Member States. For example, the RED II requirements from 2018, which aim to organize and shorten the administrative processes for receiving relevant permits and licenses for renewable energy projects, have not been fully adopted into the national laws of any Member State. Consequently, the effectiveness of renewable energy projects largely depends on how well each Member State adopts and applies these rules locally. Delays and inconsistencies often occur due to differences in national

regulations and administrative practices, as well as conflicts between national, regional, and municipal regulations.

The second research question highlighted the main challenges faced by energy project developers, such as the complexity of the permitting process, and issues with transparency and predictability, which lead to high costs and lengthy timelines. Research conducted using EU Commission documents, recommendations, RES technical reports, and suggestions from EU projects aimed at streamlining permitting for renewable energy projects identified 6 key areas for improvement: administrative issues, lack of policy decision support, inadequate location planning for renewable energy projects and related infrastructure, and grid issues.

To respond to the third research question on improving these procedures, the thesis proposes actionable strategies to streamline and enhance the permitting process.

1. Establishing a "One-Stop Shop" or a single contact point system to replace the current framework, which often involves multiple permits from different authorities.

2. Developing an advanced national spatial planning framework for energy projects, including area-related data on the environment, geological, water, climate, nature, and land use.

3. Digitalizing permitting procedures through a single digital gateway, enabling project developers and authorities to navigate interactions with numerous stakeholders at national, regional, and municipal levels.

4. Introducing transparent guidelines to facilitate grid connection permits through e-communication and the activities of single contact points, based on clearly defined roles and processes. Also, establish clear regulations and guidelines for the calculation of grid connection costs to enhance transparency.

5. Involving the public early in the process and spatial planning to ensure renewable energy projects are seen as beneficial rather than impositions. Promote public participation and ensure local benefits such as reduced energy costs or financial participation opportunities.

6. Enhance inter-agency collaboration across all governmental levels—national, regional, and municipal—ensuring that relevant authorities at each level work together effectively and adhere to established timelines. This coordinated approach is crucial, especially for projects that require multiple permits, to prevent unnecessary delays. The recommendation also emphasizes the importance of ensuring that agencies within the same level operate efficiently together to further streamline the permitting process.

Most of the proposed solutions align with the existing European regulatory framework, particularly in the revised RED II. Many Member States have begun implementing various facets of the permitting acceleration measures in practice, and others need to follow suit, including in their revised 2030 National Energy & Climate Plans. However, this needs to be applied not only at the national level but also at regional and local municipal levels, where approval bottlenecks often occur.

For the case-study analysis, Denmark, Hungary, and Austria with different renewable energy projects were examined.

In Denmark, the Thor Offshore Wind Farm exemplifies successful implementation. Denmark has established comprehensive planning and regulatory frameworks to facilitate large-scale renewable energy projects. The "One-Stop Shop" system simplifies the permitting process by offering a centralized contact point for all necessary permits, significantly reducing both time and complexity. Additionally, Denmark has embraced digital processes, enabling efficient handling of permits and transparent tracking of project statuses.

In Hungary, the geothermal energy development in Szeged is a pioneering example of utilizing geothermal resources for urban heating. This project aims to utilize geothermal energy as the primary energy source for the northern circuits of the Szeged district heating system, replacing natural gas previously used for heating the district. It showcases the effectiveness of municipal initiatives and the positive cooperation at both municipal and national levels. Adherence to updated national legal frameworks has facilitated these large-scale renewable energy initiatives in the geothermal energy sources area. The Hungarian case exemplifies municipal initiative and activity to overcome the complexity of national legislation, with support from citizens.

Austria’s floating-PV system in Grafenwörth highlights the country's commitment to renewable energy. This project showcases the strong involvement and cooperation of the Lower Austria authorities, who plays a crucial role in streamlining the permitting process. Their commitment and coordination with project developers have been key to reducing administrative burdens and facilitating project approval. Advanced spatial planning and a digital system also contribute to the efficiency and effectiveness of Austria’s permitting procedures.

Denmark is noted for the most innovative and effective approaches to streamlining the permitting process, which is essential for the fast and effective implementation of renewable energy technologies. Denmark's permitting structure is designed to save time, create transparency, reduce risks for developers, and minimize costs. By conducting preliminary investigations and Strategic Environmental Assessments early in the process and coordinating permits through a single point of contact, Denmark provides an efficient and developer-friendly framework for offshore wind energy projects. This approach supports the rapid development of renewable energy while ensuring environmental and social considerations are thoroughly addressed.

As mentioned, a major challenge in accelerating the permitting procedures for renewable energy is the application of EU laws and recommendations at national, regional, and local levels. Considering the revised RED II, there is an 18-month period for transposing most of its provisions into the national legislation system. It is crucial for countries to implement this new legislation promptly to significantly advance the permitting processes. Therefore, the effective implementation of EU rules is now key. By addressing these challenges comprehensively, Member States can create a more favorable environment for renewable energy projects, ultimately accelerating progress towards their ambitious climate and energy goals. This effort will not only help meet the energy targets of both the EU and its member states but also strengthen the overall energy security and sustainability of Europe.

References

Angelino, L., Dumas, P., Nádor, A., Kępińska, B., Torsello, L., Bonciani, D., Lorenzen, S., & Kujbus, A. (2016). *Regulatory frameworks for geothermal district heating: A review of existing practices*. Conference Peper.

Climate Action Network Europe. (2023). Guidelines to Faster and Fairer Permitting for Europe's Energy Transition. Available from: URL https://caneurope.org/content/uploads/2023/10/Fairer-and-Faster-permitting_CAN-Europe-Briefing.pdf.

Commission Recommendation (EU) 2022/822 of 18 May 2022 on speeding up permit-granting procedures for renewable energy projects and facilitating Power Purchase Agreements.

Commission Recommendation (EU) 2024/1343 of 13 May 2024 on speeding up permit-granting procedures for renewable energy and related infrastructure projects.

Commission Recommendation (EU) of 13 May 2024 on auction design for renewable energy.

Council Regulation (EU) 2022/2577 of 22 December 2022 laying down a framework to accelerate the deployment of renewable energy

Danish Energy Agency. (2019). Thor offshore wind farm tender for 800-1000 MW fact sheet. Available from: URL https://ens.dk/en/our-responsibilities/offshore-wind-power/ongoing-offshore-wind-tenders/thor-offshore-wind-farm

Danish Energy Agency. (2020). *The Danish Energy Agency as a one-stop-shop authority Report*.

Danish Energy Agency. (2021). *Environmental Assessment of Plan for Thor Offshore Wind Farm*. Available from: URL /https://ens.dk/sites/ens.dk/files/Vindenergi/environmental_assessment_sea_plan_for_thor_offshore_windfarm_report_1_non-technical_summary_overall_assessment.pdf.

Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources.

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.

EU Regulation 2018/1724 of 2 October 2018 on establishing a single digital gateway to provide information, procedures, assistance and problem-solving services. Official Journal of the European Union. URL /https://eur-lex.europa.eu/eli/reg/2018/1724/oj.

European Commission, Directorate-General for Energy, Falcan, I., Heidecke, L., Zondag, M., et al. (2022). S*tudy on the Central and South Eastern Europe energy connectivity (CESEC) cooperation on electricity grid development and renewables – Final report*. Publications Office of the European Union. Available from: URL /https://data.europa.eu/doi/10.2833/594432.

European Commission, Directorate-General for Energy, Tallat-Kelpšaitė, J., Brückmann, R., Banasiak, J. et al., *Technical support for RES policy development and implementation – simplification of permission and administrative procedures for RES installations (RES Simplify) – Final report*. Publications Office of the European Union, 2023. Available from URL /https://data.europa.eu/doi/10.2833/894296.

European Commission, Directorate-General for Energy, Tallat-Kelpšaitė, J., Brückmann, R., Banasiak, J. et al., *Technical support for RES policy development and implementation – Simplification of permission and administrative procedures for RES installations (RES simplify) – Interim report.* Publications Office of the European Union, 2022. Available from URL /https://data.europa.eu/doi/10.2833/239077.

European Commission, Directorate-General for Energy. (2024). Austria REPowerEU - 2 years. Available from: URL /https://energy.ec.europa.eu/document/download/9d3c38d9-eb36-41b5-9bcb-999a6712d142_en?filename=20_AT_REPowerEU_fiche_two_years_on.pdf.

European Commission, Directorate-General for Energy. (2024). Denmark REPowerEU - 2 years. Available from: URL

/https://energy.ec.europa.eu/document/download/60e2b577-5cfb-4db9-bf3e-5fdf707b4520_en?filename=04_DK_REPowerEU_fiche_two_years_on.pdf.

European Commission, Directorate-General for Energy. (2024). Hungary REPowerEU - 2 years. Available from: URL /https://energy.ec.europa.eu/document/download/43975b36-338c-47ca-8b46-56216030bdac_en?filename=17_HU_REPowerEU%20fiche_two%20years_on.pdf.

European Commission. (2023). European Wind Power Action Plan. Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM/2023/669 final

Floating-PV system in Grafenwörth project site. Available from: URL /https://www.ecowind.at/references/floating-photovoltaic-plant-in-grafenworth/?lang=en

GeoEnviroN (2021). *Recommendations on environmental regulations*. Available from: URL /https://www.geoenvi.eu/wp-content/uploads/2021/03/D4.2-Recommendations-on-environmental-regulations.pdf

Gesamte Rechtsvorschrift für Sektorales Raumordnungsprogramm über Photovoltaikanlagen im Grünland in Niederösterreich. LGBl. Nr. 94/2022. Verordnung über ein Sektorales Raumordnungsprogramm über Photovoltaikanlagen im Grünland in Niederösterreich (NÖ SekRop PV). 20. Dezember 2022. Available from: URL /https://www.raumordnung-noe.at/index.php?id=667.

Global Wind Energy Council. (2022). *Global Offshore Wind Report 2022*.

Guidance on designating renewables acceleration areas of 13 May 2024. Commission staff working document. SWD(2024) 333 final.

Guidance to Member States on good practices to speed up permit-granting procedures for renewable energy and related infrastructure projects of 13 May 2024. Commission staff working document. SWD(2024) 124 final.

International Energy Agency. (2023). *Photovoltaic Power Systems Programme: Annual Report 2022*.

International Energy Agency. (2024). *Photovoltaic Power Systems Programme: Annual Report 2023*.

IRENA. (2023). *World Energy Transition Outlook report 2023*.

Lenhardt, L., GAUGL, R., Wogrin S.(2022). *Achieving 100% Renewable Electricity in Austria –Analysing the EAG-Goals*. Symposium Energieinnovation Technical University Graz. Available from: URL /https://www.tugraz.at/fileadmin/user_upload/tugrazExternal/738639ca-39a0-4129-b0f0-38b384c12b57/files/lf/Session_A3/133_LF_Lenhardt.pdf.

Nardini, I. (2023). *Fraunhofer Institution for Energy Infrastructures & Geothermal Systems Report*. Conference presentation.

Parlament, Republik Österreich, "Erneubaren-Ausbau-Gesetz," 16 09 2020. [Online]. Available from: URL /https://www.parlament.gv.at/PAKT/VHG/XXVII/ME/ME_00058/index.shtml.

Pinjung, Z., Szanyi, J., Kóbor, B., & Medgyes, T. (2017). District Heating System with Geothermal Energy Use in Szeged, Southern Great Plain Region, Hungary. doi:10.26649/musci.2017.003

Promotion of Renewable Energy Act no. 1392 of 27 December 2008. Denmark.

Renewable Energy Agency. (2023). *Annual Report on Energy Regulation in the EU*.

Schumacher, K. (2019). *Approval procedures for large-scale renewable energy installations: Comparison of national legal frameworks in Japan, New Zealand, the EU and the US*. Energy Policy Volume 129, June 2019, Pages 139-152. doi.org/10.1016/j.enpol.2019.02.013.

Thor offshore wind farm project site. Available from: URL /https://thor.rwe.com/Home/project-information

Tsagarakis, K. P., Efthymiou, L., Michopoulos, A., Mavragani, A., Anđelković, A. S., Antolini, F., Bacic, M., Bajare, D., Baralis, M., Bogusz, W., Burlon, S., Figueira, J., Genç, M. S., Javed, S., Jurelionis, A., Koca, K., Ryżyński, G., Urchueguia, J. F., & Žlender, B. (2020). *A review of the legal framework in shallow geothermal energy in*

selected European countries: Need for guidelines. Renewable Energy, 147(Part 2), 2556-2571. doi.org/10.1016/j.renene.2018.10.007

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Annex

Annex 1

Overall share of energy from renewable sources, 2004-2022
(% of gross final energy consumption)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
EU	9.605	10.182	10.778	11.749	12.552	13.850	14.405	14.547	16.002	16.659	17.416	17.820	17.978	18.411	19.096	19.887	22.038	21.926	23.020
Belgium	1.916	2.325	2.658	3.140	3.611	4.746	6.004	6.302	7.086	7.671	8.038	8.060	8.744	9.136	9.472	9.929	13.000	13.007	13.759
Bulgaria	9.231	9.173	9.415	9.098	10.345	12.005	13.927	14.152	15.837	18.898	18.050	18.261	18.760	18.695	20.581	21.545	23.319	19.447	19.095
Czechia	6.773	7.113	7.362	7.895	8.674	9.977	10.513	10.945	12.814	13.927	15.074	15.070	14.926	14.799	15.139	16.239	17.303	17.671	18.195
Denmark	14.839	15.955	16.332	17.747	18.543	19.948	21.888	23.389	25.465	27.173	29.310	30.469	31.715	34.387	35.159	37.020	31.681	41.009	41.601
Germany	6.207	7.167	8.466	10.039	10.072	10.851	11.667	12.470	13.549	13.757	14.381	14.901	14.885	15.472	16.660	17.266	19.090	19.395	20.796
Estonia	18.420	17.478	16.011	17.139	18.811	23.009	24.575	25.515	25.586	25.356	26.130	28.987	29.232	29.538	29.970	31.730	30.069	37.442	38.472
Ireland	2.378	2.822	3.073	3.497	3.979	5.243	5.755	6.605	7.029	7.521	8.516	9.083	9.189	10.520	10.942	11.979	16.160	12.376	13.107
Greece	7.161	7.277	7.458	8.249	8.183	8.731	10.077	11.153	13.741	15.326	15.683	15.690	15.390	17.300	18.001	19.633	21.749	22.017	22.678
Spain	8.345	8.444	9.156	9.667	10.744	12.958	13.782	13.176	14.239	15.081	15.879	16.221	17.015	17.118	17.023	17.852	21.220	20.736	22.116
France	9.319	9.272	8.936	9.426	11.188	12.215	12.671	10.813	13.239	13.880	14.362	14.803	15.451	15.847	16.384	17.174	19.109	19.204	20.259
Croatia	23.404	23.691	22.668	22.161	21.986	23.596	25.103	25.389	26.757	28.040	27.817	28.969	28.266	27.280	28.047	28.466	31.023	31.285	29.354
Italy	6.316	7.549	8.328	9.807	11.492	12.775	13.023	12.881	15.441	16.741	17.082	17.525	17.415	18.267	17.796	18.181	20.359	19.158	19.006
Cyprus	3.071	3.131	3.263	4.001	5.131	5.920	6.161	6.245	7.111	8.428	9.144	9.903	9.833	10.478	13.873	13.777	16.879	19.069	19.429
Latvia	32.794	32.264	31.141	29.615	29.811	34.317	30.375	33.478	35.709	37.037	38.629	37.538	37.138	39.008	40.019	40.929	42.132	42.098	43.316
Lithuania	17.221	16.768	16.887	16.482	17.824	19.798	19.639	19.943	21.437	22.689	23.592	25.748	25.612	26.038	24.695	25.474	26.773	28.166	29.599
Luxembourg	0.899	1.402	1.469	2.725	2.809	2.929	2.851	2.855	3.112	3.494	4.471	4.987	5.364	6.194	8.942	7.046	11.699	11.730	14.356
Hungary	4.364	6.931	7.433	8.575	8.564	11.673	12.742	13.972	15.530	16.205	14.618	14.495	14.377	13.556	12.548	12.634	13.850	14.134	15.190
Malta	0.102	0.123	0.149	0.177	0.195	0.221	0.979	1.850	2.862	3.760	4.744	5.119	6.208	7.219	7.914	8.230	10.714	12.672	13.404
Netherlands	2.030	2.478	2.778	3.298	3.596	4.266	3.917	4.524	4.659	4.691	5.415	5.714	5.846	6.507	7.394	8.886	13.999	12.988	14.972
Austria	22.553	24.353	26.276	28.144	28.788	31.039	31.205	31.552	32.734	32.665	33.550	33.497	33.370	33.136	33.784	33.755	36.545	34.573	33.758
Poland	6.882	6.867	6.859	6.903	7.686	8.676	9.281	10.337	10.955	11.452	11.605	11.881	11.396	11.059	14.936	15.377	16.102	15.613	16.873
Portugal	19.205	19.523	20.792	21.907	22.929	24.405	24.150	24.603	24.574	25.699	29.508	30.514	30.864	30.611	30.203	30.623	33.982	33.982	34.677
Romania	16.811	17.571	17.096	18.195	20.204	22.157	22.834	21.743	22.825	23.886	24.845	24.785	25.032	24.454	23.875	24.290	24.478	23.871	24.140
Slovenia	18.397	19.809	18.416	19.675	18.646	20.765	21.081	20.937	21.551	23.160	22.459	22.879	21.975	21.658	21.378	21.968	25.000	25.000	22.937
Slovakia	6.391	6.360	6.584	7.766	7.723	9.368	9.099	10.348	10.453	10.133	11.713	12.882	12.029	11.465	11.896	16.894	17.345	17.419	17.501
Finland	29.232	28.814	30.043	29.561	31.071	31.045	32.166	32.532	34.222	36.630	38.633	39.230	38.943	40.857	41.185	42.807	43.939	42.854	47.886
Sweden	38.427	39.982	41.734	43.224	43.922	47.024	46.099	47.632	49.403	50.153	51.151	52.220	52.597	53.390	53.916	55.785	60.124	62.686	66.002
Iceland	58.899	60.270	60.921	71.925	67.981	70.238	70.909	72.298	73.727	73.787	73.043	71.949	75.329	74.104	77.173	78.612	83.725	85.785	:
Norway	58.417	60.069	60.521	60.398	62.003	65.071	61.889	64.638	64.932	66.480	68.406	68.545	69.235	70.036	71.566	74.406	77.358	74.018	75.820
Montenegro	:	35.694	34.842	32.925	32.290	39.371	40.640	40.648	41.513	43.696	44.098	43.073	41.529	39.693	38.801	37.722	43.770	39.891	39.944
Serbia	12.724	14.257	14.542	14.327	15.888	21.024	19.763	19.118	20.790	21.095	22.864	21.989	21.147	20.287	20.320	21.443	26.297	25.255	27.077
Bosnia Herzegovina	:	:	:	:	:	:	:	:	:	:	24.873	26.607	25.358	23.241	35.972	37.454	39.835	36.562	:
Albania	29.620	31.367	32.070	32.657	32.448	31.437	31.867	31.187	35.152	33.167	31.856	34.913	36.953	35.776	36.572	38.042	45.015	41.389	44.076
North Macedonia	15.702	16.466	16.527	14.976	15.555	17.238	16.451	16.407	18.128	18.509	19.559	19.526	18.044	19.636	18.179	17.485	19.222	17.468	18.682
Kosovo*	20.541	19.773	19.511	18.812	18.429	18.230	18.230	17.598	18.625	18.823	19.544	18.484	24.472	23.082	24.616	24.215	24.401	22.140	18.779
Moldova	7.450	6.402	6.960	6.443	6.994	7.924	21.369	22.081	24.328	24.419	26.169	26.173	26.888	27.836	27.476	23.843	25.057	22.202	21.538
Georgia	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	22.313	21.151

Data until 2020 are calculated on the basis of Directive 2009/28/EC, while data from 2021 onwards follow Directive (EU) 2018/2001

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

Source: Eurostat (online data code: nrg_ind_ren)

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