FEBRUARY 2022

GUIDE FOR THE DEVELOPMENT AND IMPLEMENTATION OF RENEWABLE ENERGY PROJECTS IN CROATIA

DISCLAIMER

This report was funded by the European Bank for Reconstruction and Development (EBRD) and produced by EnergoVizija Ltd. working with a team of experienced RES expert.

The report summarises the main steps for developers and investors in renewable energy projects in the Republic of Croatia. Nothing in this report should be taken as legal advice.

Neither the European Bank for Reconstruction and Development, nor the Renewable Energy Sources of Croatia, nor EnergoVizija Ltd. shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

CONTRIBUTORS:

Ivan Šimić, Expert on RES Projects Development,
Ivana Dominković Cecelja, Legal Expert in RES,
Mario Turković, Legal Expert in RES,
Vjeka Ercegovac, Financial Expert in RES,
Kamilo Vrana, Financial Expert in RES,
Petra Dropulić Vejin, Financial Expert in RES,
Dragutin Domitrović, Expert in Geothermal Energy,
Blaženka Leib, Communication Expert,
Jasmina Trstenjak Expert in RES Market Research and Analitics,
Ivan Komušanac, Project Coordinator.

DESIGN: **Filip Felbar**

CONTACT: info@oie.hr

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The sector of Renewable Energy Sources in Croatia is undergoing a constant process of change, adaptation, and improvement. There is a growing interest in the development of renewable energy projects, but there is not a central source for information that is important for potential developers and investors.

Therefore, this report has addressed the most common questions and provides relevant information about the Croatian renewable energy market. This report is intended to be a practical guide focused on Croatian legislation, environmental protection, permitting, financing, support schemes, and the operation of the electricity market. In addition, it proposes measures to accelerate the development of renewable energy projects in Croatia.

The European Green Deal set a goal to supply clean, affordable, and secure energy in order for the European Union to reach climate neutrality by 2050. Based on that, various Croatian documents (the Energy Strategy, the National Development Strategy, the Integrated National Energy and Climate Plan, the Low-carbon Development Strategy, etc.) aim to reduce greenhouse gas emissions mainly with the help of renewable energy.

According to the latest Eurostat figures, the Republic of Croatia reached 28.5% of energy from renewable energy sources in its gross final energy consumption in 2019, surpassing its 20% target for 2020. The current target for 2030 in the Energy Strategy is 36.6% and is likely to be increased as the European Union is currently in the process of increasing its 2030 renewable energy target in order to be on the path towards carbon neutrality by 2050.

The renewables sector in Croatia is regulated by several main acts, but there are also many other legislative acts relevant to the development of renewable energy projects. The most relevant ones are addressed in Chapter 3 - Legal Framework for Renewable Energy Sources.

There is a wide range and different levels of key participants and stakeholders in the development process of renewable energy sources in Croatia. In order to accelerate renewable energy deployment, some stakeholders will need to have a reduced role, while other stakeholders, such as local communities, should become even more engaged in order to encourage more local acceptance of renewable energy projects.

Permitting and administrative procedure are perhaps the biggest obstacles for renewable energy development in Croatia. Procedures are complicated, requiring a large number of permits, and very time consuming, which slows down the development of renewable energy projects and makes them more difficult and more costly.

The financing of renewable energy projects in Croatia encompasses traditional models of investment as well as innovative financing approaches. Project finance has emerged as the leading way to finance utility-scale projects in Croatia.

Given the relatively high cost of capital in Croatia, renewable energy projects need a support mechanism. Up until recently, administratively set Feed-in Tariffs were the main driver of the development of renewable energy projects.

Currently, there are 1,035 MW of renewable energy and high-efficiency cogeneration proj-

ects that are supported with an FiT under the previous support scheme. Wind energy was the technology that grew most in the previous support scheme, representing 69% of all renewable energy and high-efficiency cogeneration capacity, while photovoltaic made up only 5.1%.

Recently, the Croatian Government established an auction-based support mechanism in which it awarded: a Feed-in Tariff (for small plants of up to 500 kW) and a Feed-in Premium (for of above 500 kW). The first auction for small plants, biomass and biogas power plants has already been held, while the first auction for large plants is expected to take place in early 2022.

According to the database of the Croatian transmission system operator – HOPS, there are more than 11.30 GW of projects that are candidates for connection to the transmission grid. Most of the applications are for photovoltaic and wind power plants.

However, most of the renewable energy capacity installed today, as well as the capacity under development, is focused in the four most southern counties. This puts a lot of pressure on transmission and distribution system operators to ensure that new renewable energy capacity can be added to the power grid.

On the other hand, there is limited development of geothermal power and biomass projects, which are located in the other parts of Croatia, in areas which do not face such strong grid-congestion.

At the time of writing this report, there were 19 active geothermal projects in Croatia. Six projects are in the exploitation/production phase, out of which one produces electricity and five produce heat.

The Republic of Croatia has great resource potential for renewable energy sources. The cost-competitive potential of renewables in Croatia is several times higher than the current demand for electricity.

The big potential for the development of onshore wind farms, PV power plants, geothermal power, and biomass, is not being utilised enough. This could be addressed by implementing best practices from other EU countries such as introducing a one-stop shop, shortening lead times for developing renewable energy projects, and introducing long-term visibility in auctions for support mechanisms.

The Republic of Croatia should address the different barriers for the development of renewable energy projects by increasing transparency in its permitting process, continuing with digital transformation, and introducing additional regulatory changes.

LIST OF ABBREVIATIONS

Abbreviation	Full description
CHA	Croatian Hydrocarbon Agency
CIT	Corporate Income Tax
CO_2	Carbon Dioxide
DSO	Distribution System Operator
EC	European Commission
EEC	Electrical-Energy Consent
EIA	Environmental Impact Assessment
EOTRP	Study of the optimal technical solution for the connection to the grid
EU	European Union
FiP	Feed-in Premium
FiT	Feed-in Tariff
GCA	Grid-Connection Agreement
GTPP	Geothermal Power Plants
GW	Gigawatt
ktoe	Kilotonnes of oil equivalent
HEC	High-efficient cogeneration
HEP DSO	Croatian Distribution System Operator
HOPS	Croatian Transmission System Operator
HRK	Croatian Kuna[1]
LCOE	Levelised Cost of Electricity
MESD	Ministry of Economy and Sustainable Development
PV	Photovoltaic
RES	Renewable Energy Sources
RETT	Real Estate Transfer Tax
SPV	Special Purpose Vehicle
TSO	Transmission System Operator
VAT	Value-added Tax
WACC	Weighted Average Cost of Capital

1 HRK 1 = €0.13176 according to the currency calculator of the Croatian National Bank https://www.hnb.hr/temeljne-funkcije/monetarna-politika/tecajna-lista/tecajna-lista

1. INTRODUCTION

The European Union (hereinafter: the EU) has set a target to reach climate neutrality by 2050 as part of the European Green Deal. This will require a huge build-out of renewable energy sources (hereinafter: RES), which will play an essential role in energy transition from fossil fuels.

The Republic of Croatia will contribute to the common European target, but a lot of work still needs to be done. Long lead times and complex permitting procedures for developing RES projects need to be addressed.

In 2019, Croatia reached 28.5% of energy from RES in its gross final energy consumption in 2019, surpassing its 20% target for 2020. The current target in the Croatian Energy Strategy 2030 is 36.6% and is likely to be increased as the EU is currently in the process of increasing its 2030 RES target in order to be on the path towards carbon neutrality by 2050.

Until recently, Croatia encouraged the build-out of renewable energy through a Feed-in Tariff (hereinafter: FiT) regime. More than 1 GW of RES and high-efficiency cogeneration (hereinafter: HEC) projects have an FiT, with wind farms being the largest contributor with 718 MW. Other technologies such as photovoltaic (hereinafter: PV), biomass, biogas, and geothermal power played a much smaller role, although their potential in Croatia is very great.

The new support scheme for RES consists of 12-year contracts awarded through pay-as-bid auctions. Projects of up to 500 kW compete for a guaranteed purchase price (FiT), while larger projects compete for a Feed-in Premium (hereinafter: FiP).

The support scheme and the ambitious targets for renewable energy in Croatia have triggered a lot of interest from local and foreign developers in developing RES projects. Currently there are more than 11.30 GW of projects that are candidates for connection to the transmission grid, most of them being PV plants, followed by wind power plants and hybrid power plants.

In order to simplify the development process of RES projects, the European Bank for Reconstruction and Development funded this report to illustrate current administrative procedures and identify which need to be changed.

2. GENERAL STRATEGIC FRAMEWORK FOR THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES (RES)

2. 1. EU FRAMEWORK

The current targets of the EU regarding greenhouse gas emission reduction, the share of renewable energy in gross final energy consumption, and energy efficiency, have been set through the 2030 climate and energy policy framework (*European Commission, A policy framework for climate and energy in the period from 2020 to 2030, COM/2014/015*). The framework sets out goals that have been subsequently aligned in light of the *Paris Agreement*.

EU legislation in respect of Renewable Energy Sources comprises a part of the Clean Energy for All Europeans package (*European Commission, Clean Energy for All Europeans, COM/2016/0860*) – a set of eight legislative acts based on the EU's energy union strategy published on February 25, 2015 (*European Commission, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM/2015/080*).

A key piece of legislation regulating RES projects is Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources (recast), which introduced a binding EU renewable energy target of 32% for 2030. The recast directive includes provisions for enabling self-consumption of renewable energy, an increased 14% target for the share of renewable energy in transport by 2030, and strengthened criteria for ensuring bioenergy sustainability.

In addition, the European Green Deal (*European Commission, The European Green Deal, COM (2019) 640*) set as a goal to supply clean, affordable and secure energy in order to reach climate neutrality by 2050. It includes the following conclusions related to RES and their role in achieving the goals of the European Green Deal:

- renewable energy sources will have an essential role in the clean energy transition;
- increasing offshore wind generation is essential in the aforementioned transition;
- the smart integration of renewables, energy efficiency and other sustainable solutions across sectors will help to achieve decarbonisation at the lowest possible cost.

The European Green Deal also aims at ensuring undistorted, fair trade, and the investment in raw materials needed for the green transition. Amongst other things, it should help to remove administrative barriers in the renewable energy sector (e.g. lengthy and non-transparent administrative permitting procedures).

As a part of the European Green Deal, the European Commission (hereinafter: EC) presented legislative proposals aimed at setting the 2030 emission reduction target of at least 55% compared to 1990. At the time of writing this publication, the current key targets for 2030 were the following:

- at least 55% domestic reduction in greenhouse gas emissions compared to 1990;
- at least a 32% share of renewable energy consumed in the EU (to be increased to 40%);
- at least 32.5% improvement in energy efficiency (and a mandatory increase).

The EC has also published the EU strategy on offshore renewable energy (*European Commission, An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, COM (2020) 741*), which recognizes

offshore renewable energy as an important factor in reaching Europe's decarbonisation objective. The offshore renewable energy strategy is based on the EU's objectives to have at least 60 GW of installed offshore wind capacity by 2030, with a view to reaching 300 GW by 2050.

The EC has identified the main challenges regarding increasing the capacity of offshore RES projects and listed policy and regulatory proposals to address them:

- maritime spatial planning should provide for sustainable management of space and resources;
- a new approach to offshore renewable energy and grid infrastructure should include the possibility of so-called hybrid projects;
- the EC will provide a clearer EU regulatory framework for offshore renewable energy;
- mobilising private-sector investment in offshore renewables is required, with EU funds having a role in supporting the sector;
- boosting research and innovation is an important precondition for the large-scale deployment of offshore renewable energy;
- a stronger supply and value chain across Europe is required.

The EU's RES policy is also supplemented with the Guidelines on State Aid for Environmental Protection and Energy, which set out conditions under which national aid schemes for energy and the environment may be considered compatible with the internal market. The application of the Guidelines on State Aid for Environmental Protection and Energy 2014-2020 has been prolonged to December 31, 2021. At the time of writing this publication, the EC was working on a revision of the guidelines to align them with the EU's priorities under the European Green Deal. A public consultation was completed in January 2021, and the EC expects to adopt the revised guidelines in the fourth quarter of 2021, which will apply from January 1, 2022.

2. 2. CROATIAN STRATEGIES AND DOCUMENTS

The Energy Development Strategy

The most important strategic document for the development of RES projects in the Republic of Croatia is the Energy Development Strategy of the Republic of Croatia until 2030, with a view to 2050 (*OG, No. 25/2020*). The Strategy is a step forward towards achieving the vision of a low-carbon economy. It provides a wide range of energy policy initiatives that will strengthen the security of energy supply, gradually reduce energy losses, increase energy efficiency, reduce dependence on fossil fuels, and increase domestic generation and the use of renewable energy sources (Republic of Croatia, 2020).

The Strategy defines the transition pace of the energy sector in which the current technologies, devices, transport, energy consumption and other factors are expected to change. At the end of the period covered by the Strategy, energy will be generated, transported, transmitted, distributed, traded, and managed in a different way from today, which implies a gradual transition to a decentralised, digitalised and a low-carbon system.

The development of the energy sector was aligned with global requirements to reduce

the effects of climate change. The Strategy represents the contribution of the Republic of Croatia to global climate change mitigation, i.e., a global reduction of carbon dioxide (hereinafter: CO_2) and other greenhouse gas emissions in accordance with its international obligations.
Therefore, the Strategy defines appropriate scenarios in achieving the goals of reducing greenhouse gas emissions and increasing the share of renewable energy sources in gross final energy consumption. These scenarios refer to two time periods: long-term - until 2050, in which strategic goals are set by sectors, and short-term - until 2030, in which it is necessary to implement measures that will determine the path towards achieving these goals.

These scenarios are:

a) Scenario 0 (S0) or Scenario of development with the application of existing measures, which represents the continuity of the current policy of applying existing measures in changes in the energy sector.

b) Scenario 1 (S1) or Scenario of accelerated energy transition. According to this scenario, the expected reduction in greenhouse gas emissions will be about 38% by 2030, and 74% by 2050, compared to 1990. Also, according to the S1 scenario, the RES share in the gross final energy consumption is expected to reach 36.7% by 2030, and 65.6% by 2050, respectively.

c) Scenario 2 (S2) or Scenario of moderate energy transition. According to this scenario, the expected reduction in greenhouse gas emissions will be about 35% by 2030, or 64% by 2050, compared to 1990. Also, it is projected that the RES share in gross final energy consumption will reach 36.6% by 2030, and 53.2% by 2050In the long-term, the energy mix will change significantly in order to reduce the consumption of fossil fuels and to increase the use of renewable energy sources in Croatia.

In the long-term, the energy mix will change significantly in order to reduce the consumption of fossil fuels and to increase the use of renewable energy sources in Croatia.

In 2017, solid biomass was the most used renewable energy source in Croatia, representing 65% of all RES use. By 2050 the share of solid biomass is expected to decrease, while the biggest changes are expected in the share of wind and solar. Furthermore, a doubling of the use of biofuels (in transport) and an increase in geothermal energy (Figure 1 and Figure 2) are also expected.

In all scenarios, the Republic of Croatia aims to reach a target of about 37% of the share of RES by 2030, which will be higher than Croatia's contribution to the EU's overall target according to the Annex II of the Regulation on the Governance of the Energy Union (*Governance of the Energy Union and Climate Action, Regulation (EU) 2018/1999*). This will allow the Republic of Croatia to export some of its renewable energy as part of a statistical transfer to another EU Member State, as described in the Renewable Energy Directive II.

Table 1. Comparison of the main determinants of the considered scenarios; Source: (Republic of Croatia, 2020)

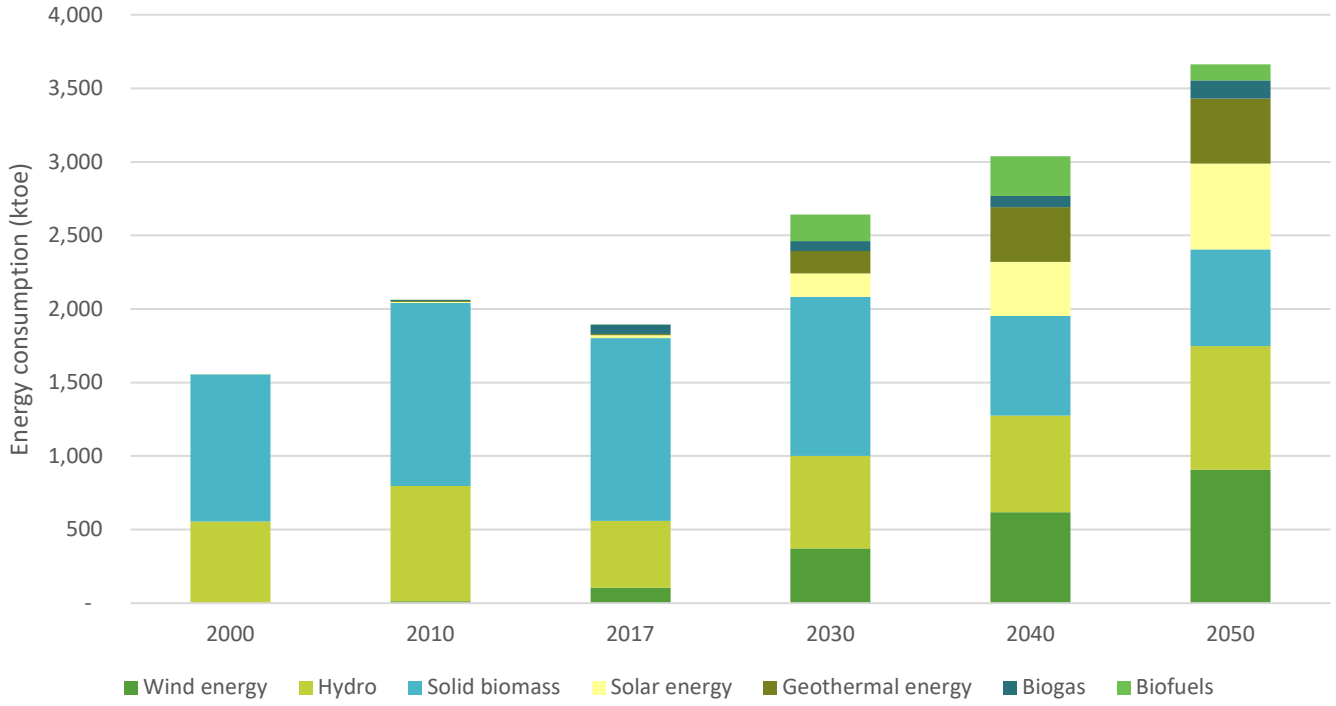
	Initial state	Scenario 0 (S0)		Scenario 1 (S1)		Scenario (S2)	
	2016/2017[2]	until 2030	until 2050	until 2030	until 2050	until 2030	until 2050
Expected reduction of greenhouse gas emissions[3]	21.8%	32.8%	49.3%	37.5%	74.4%	35.4%	64.3%
Change in direct energy consumption[4]	-7%	7.3%	-3.8%	2.6%	-28.6%	8.1%	-15%
Energy renovation of building stock	0.2%	in the present range	in the present range	3% per year	3% per year	1.6% per year	1.6% per year
Share of electric and hybrid vehicles in total road passenger transport activity	1%	2.5%	30%	4.5%	85%	3.5%	65%
Share of RES in gross final energy consumption	27.3%	35.7%	45.5%	36.7%	65.6%	36.6%	53.2%
Share of RES in electricity generation	45%	60%	82%	66%	88%	61%	83%

2 The figures refer to 2017, except for greenhouse gas emissions for which 2016 is taken as a reference

3 Compared to the 1990 emission level

4 Compared to consumption in 2005

Figure 1. Use of RES according to the scenario S1, Source: (Republic of Croatia, 2020)



The energy transition will require significant investments at all levels of the energy system. According to scenario S1, the total investments would be HRK 461.7 bn (€61 bn)[5] in the 2021-2050 period, which is an average of HRK 15.4 bn (€2 bn) per year. Investments in the energy renovation of buildings and the construction of nearly zero-energy buildings are estimated at HRK 239.5 bn (€32 bn), which is 51.9% of the total investments. The part of investments related to the power sector amounts to HRK 121.8 bn (€16 bn) or 26.4% of the total investments.

According to scenario S2, the total investments amount to HRK 378.9 bn (€50 bn) in the 2021-2050 period, which is an average of HRK 12.6 bn (€1.7 bn) per year. Investments in the energy renovation of buildings and the construction of nearly zero-energy buildings are estimated at HRK 183.7 bn (€24 bn), which is 48.5% of the total investments. The part of investments related to the power sector amounts to HRK 101 bn (€13 bn) or 26.7% of the total investments.

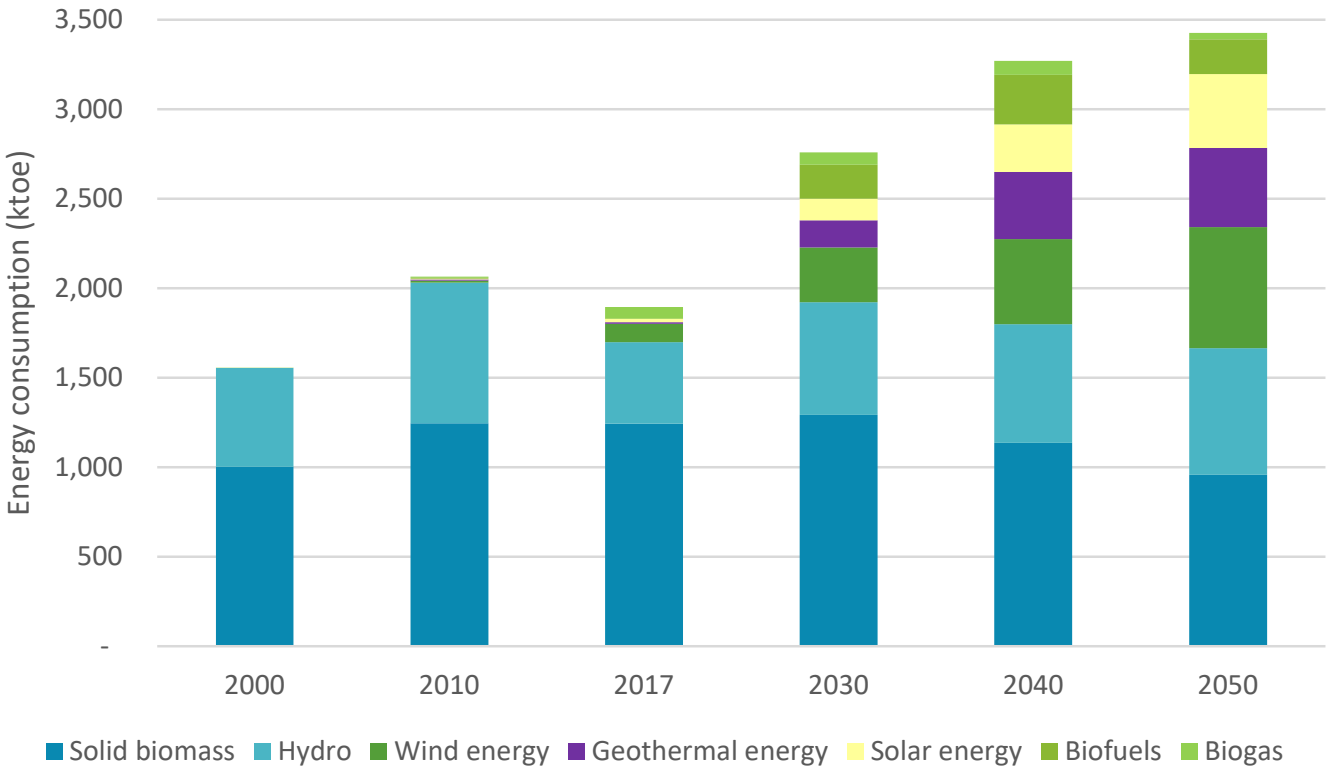
Other investments in both scenarios include investments in the transport infrastructure, advanced biofuels, district heating, solar thermal systems, and investments in the infrastructure of fossil fuels: gas, oil, and other petroleum products.

Integrated National Energy and Climate Plan

In December 2019, the Republic of Croatia submitted to the EC its integrated National Energy and Climate Plan for the 2021-2030 period as requested by the Regulation of the Governance of the Energy Union.

5 HRK 1 = €0.13176 according to the currency calculator of the Croatian National Bank https://www.hnb.hr/temeljne-funkcije/monetarna-politika/tecajna-lista/tecajna-lista

Figure 2. Use of RES according to the scenario S2, Source: (Republic of Croatia, 2020)



Low-carbon Development Strategy

The Draft of the Low-Carbon Development Strategy was prepared during 2017, when it was submitted for public debate, and refers to the sectors of energy, industry, transport, general consumption, agriculture, waste, and land use. The final adoption of the Draft of the Low-Carbon Development Strategy was postponed in order to align it with the Energy Development Strategy.

In April 2021 the Croatian Government approved the proposal for the Low-Carbon Development Strategy which was approved by the Croatian Parliament in early June 2021.

3. LEGAL FRAMEWORK FOR RENEWABLE ENERGY SOURCES (RES)

3. 1. ENERGY ACT

The most important act for projects in the energy sector is the Energy Act (*OG, No. 120/12, 14/14, 95/15, 102/15, 68/18*). According to the Energy Act, energy generation is a physical or chemical process of fuel or renewable energy transformation into electrical, thermal, or other energy forms.

An *Energy Entity* is a legal or a natural person performing one or more energy activities and having a license to perform energy activities. Energy activities in the Energy Act refer to:

- energy generation;
- energy transfer, i.e., transport;
- energy storage;
- energy distribution;
- management of energy facilities;
- energy supply;
- energy trade; and
- organising the energy market.

Legal and natural persons may perform energy activities only if they have a valid permit for that activity (i.e. license to perform electricity activity).

The permit can be issued to a legal or natural person:

- if it is registered to perform an energy activity;
- which is technically qualified to perform the activity;
- which has the required number of professionally qualified employees to perform the activity;
- which has at its disposal the financial resources necessary for the performance of the activity or proves that it can obtain them;
- which has not had its license to perform the energy activity for which it is requesting a license revoked in the last five years preceding the year of application;
- whose management board members, or other persons responsible to them in the legal entity, have not been convicted of a criminal offence against the economy in the last five years, or a natural person who has not been convicted of a criminal economic offence in the last three years.

The conditions for obtaining an electricity license and the period for which the license is issued as well as the form, content and manner of keeping the register of issued and revoked licenses are regulated by the Ordinance on licenses to perform energy activities and keeping the register of issued and revoked licenses to perform energy activities (*OG, No. 88/15, 114/15, 66/18*).

3. 2. ELECTRICITY MARKET ACT

The second important piece of legislation is the Electricity Market Act (*OG, No. 111/21*) that regulates the common rules for the production, transmission, distribution and storage of electricity, together with provisions on consumer protection, in order to create an integrated, competitive, flexible, fair and transparent electricity market of the Republic of Croatia as a part of the EU's electricity market.

According to this Act, a licenced electricity generator may generate electricity in a base or variable mode, including electricity to cover losses in the transmission and distribution network, as well as electricity to balance the electricity system (hereinafter: balancing energy) and provide ancillary services.

Exceptionally, legal or natural persons may perform the activity of electricity generation without a license to perform energy activ-

ities if they have provided the professional management and operation of power plants in accordance with technical regulations, requirements and conditions and exclusively for performing the activity of:

- electricity generation using generation facilities whose sum of installed capacities is up to and including 500 kW; or
- the generation of electricity exclusively for their own needs; or
- the generation of electricity during a trial operation of their generation facilities.

The most important change in the Electricity Market Act for RES and electricity storage facilities, is the energy approval, which is now awarded in a public tender at the very beginning of project development as explained in more detail in Chapter 5.3. Energy Approval. The energy approval is granted without conducting a public tender in the following exceptional situations:

- for the reconstruction and/or revitalisation of existing production or energy storage facilities; and
- for projects of geothermal power plants that have a contract for the exploitation of geothermal waters, in accordance with regulations in the field of research and exploitation of geothermal waters from which the accumulated heat can be used for energy purposes; and
- if the investor has resolved the ownership relations on the land on which he plans to build a production plant.

At the time of writing, the bylaws for the Electricity Market Act have not been adopted, especially the regulation that will regulate in more detail the public tender for issuing energy permits and new connection rules and methodologies for determining the fee for connection to the electricity grid of transmission and distribution system operators.

3. 3. ACT ON RENEWABLE ENERGY SOURCES (RES) AND HIGH-EFFICIENCY COGENERATION (HEC)

The basic legislation governing the area of renewable energy is the Act on RES and HEC (hereinafter: the RES Act), which was passed in December 2021.

The purpose of this RES Act is to promote the production of electricity and heat from RES and HEC, to promote the production of electricity and heat from RES and HEC at the point of consumption, to increase shares in total final consumption of energy from RES using regulatory mechanisms and regulatory framework for the use of RES and HEC, and to meet the objectives of the Republic of Croatia and contribute to the objectives of the European Union in accordance with the international obligations of the European Union for decarbonisation.

The RES Act states that the use of RES and HEC is of interest to the Republic of Croatia.

The RES Act prescribes deadlines for the adoption of bylaws from three to six months from its entry into force. Thus, for example, a new regulation regulating incentive quotas, a regulation on the method of acquiring and terminating the right to a FiP and a FiT, a regulation prescribing the use of RES and HEC, an ordinance governing the use of information, data, and documents entered in the RES Register, rules of the ECO balance group, etc.

According to the RES Act, for the purposes of reporting and statistical processing, and the classification of production facilities, renewable energy sources are divided into the following categories:

1. solar energy;
2. wind energy;
3. hydropower;
4. geothermal energy;
5. biomass energy;
6. offshore energy; and
7. unspecified and other RES.

An RES Project is defined as a production project if it is registered in the Register of Renewable Energy Sources, Cogenerations and Privileged Electricity Generators (hereinafter: the *RES Register*). The RES Register provides a record on:

- RES and HEC projects;
- power plants using RES and HEC plants; and
- privileged electricity generators in the territory of the Republic of Croatia.

According to the Regulation on the Incentives of Electricity Generation from RES and HEC (*OG, No. 116/18, 60/20*)[6], based on the type of energy source, used technology and the installed power generation facilities are divided into the following groups:

a) PV power plants:
1. PV power plants with an installed capacity of up to and including 50 kW;
2. PV power plants with an installed capacity of more than 50 kW up to and including 500 kW;
3. PV power plants with an installed capacity of more than 500 kW up to and including 10 MW;
4. PV power plants with an installed capacity of more than 10 MW.

b) Hydropower plants:
1. hydropower plants with an installed capacity of up to and including 50 kW;
2. hydropower plants with an installed capacity of more than 50 kW up to and including 500 kW;
3. hydropower plants with an installed capacity of more than 500 kW up to and including 10 MW;
4. hydropower plants with an installed capacity of more than 10 MW.

c) Wind farms:
1. wind farms with an installed capacity of up to and including 50 kW;
2. wind farms with an installed capacity of more than 50 kW up to and including 500 kW;
3. wind farms with an installed capacity of more than 500 kW up to and including 3 MW;
4. wind farms with an installed capacity of more than 3 MW.

d) Biomass power plants:
1. biomass power plants with an installed capacity up to and including 50 kW;
2. biomass power plants with an installed capacity of more than 50 kW up to and including 500 kW;
3. biomass power plants with an installed capacity of more than 500 kW up to and including 2 MW;
4. biomass power plants with an installed capacity of more than 2 MW up to and including 5 MW;
5. biomass power plants with an installed capacity of more than 5 MW.

e) Geothermal power plants (GTPPs):
1. geothermal power plants (hereinafter: GTPPs) with an installed capacity of up to and including 500 kW;
2. GTPPs with an installed capacity of more than 500 kW.

f) Biogas power plants:
1. biogas power plants with an installed capacity up to and including 50 kW;
2. biogas power plants with an installed

6 This regulation will be replaced by a new regulation within three months from the date of entry into force of the new RES Act.

capacity of more than 50 kW up to and including 500 kW;
3. biogas power plants with an installed capacity of more than 500 kW up to and including 2 MW;
4. biogas power plants with an installed capacity of more than 2 MW up to and including 5 MW.
5. biogas power plants with an installed capacity of more than 5 MW.

g) Liquid biofuel power plants:
1. liquid biofuel power plants with an installed capacity of up to and including 500 kW;
2. liquid biofuel power plants with an installed capacity of more than 500 kW.

h) Power plants based on other RES:
1. plants based on environmental energy;
2. marine energy plants;
3. plants based on other unspecified RES.

i) Cogeneration plants using waste and other renewable fuels:
1. micro-cogeneration plants with an installed capacity of up to 50 kW;
2. small cogeneration plants with an installed capacity of 50 kW to 500 kW;
3. cogeneration plants with an installed capacity of more than 500 kW up to and including 2 MW;
4. cogeneration plants with an installed capacity of more than 2 MW.

j) Hybrid power plants (power plants that use two different primary energy sources or use one energy source to generate two forms of energy, while connected to the same metering point):
1. hybrid plants with an installed capacity of up to and including 30 kW;
2. hybrid plants with an installed capacity of more than 30 kW up to and including 500 kW;
3. hybrid plants with an installed capacity of more than 500 kW.

The above-mentioned generation facilities, considering the manner of connection to the network and the manner of using the generated electricity, may be plants that primarily deliver the generated electricity to the electricity network and use part of the generated electricity for the consumption of the generation plant itself.

PV power plants with regard to the construction site are additionally divided into:
1. integrated PV power plants;
2. non-integrated PV power plants.

Biogas power plants, with regard to the method of biogas preparation, are additionally divided into:
1. biogas power plants where the biogas is produced from agricultural crops and organic residues, waste of plant and animal origin, and biodegradable waste;
2. landfill gas power plants and gas from wastewater treatment plants.

Biogas power plants with regard to the location of biogas preparation are additionally divided into:
1. biogas power plants where the biogas production facility is built as a technological unit within the power plant;
2. biogas power plants using biogas produced at another location or as part of a separate biogas plant at the same location.

Cogeneration plants can also be considered as cogeneration plants if they use the waste heat generated in industrial processes.

In addition to the Energy Market Act, a privi-

leged electricity generator is regulated by the RES Act as well. A privileged electricity generator is an energy entity (and/or other legal or a natural person) that generates electricity from RES or in a single generation facility simultaneously generating electricity and heat in a highly efficient manner, uses waste or RES in an economically appropriate manner that is harmonised with environmental protection, and which has acquired the status of a privileged electricity generator of electricity in accordance with the provisions of the RES Act.

The status of a privileged electricity generator is acquired from the Croatian Energy Regulatory Agency based on a request from an electricity entity or other legal or natural person for a generation plant that meets the requirements of the Act and Regulation referred to in Article 41[7] of the RES Act (Regulation on the use of RES and HEC) which was not adopted at the time of writing of this guide.

The status of a privileged electricity generator of electricity may be acquired by an electric power entity (or another legal or a natural person) for a power plant:

1. in which RES and/or waste and RES are used or at the same time electricity and heat are generated in a highly efficient manner, regardless of the power of the power plant;
2. which is recorded in the RES Register;
3. for which a connection to the power network has been built and metering equipment has been installed so that the calculation of net delivered electricity is enabled;
4. which meets the appropriate efficiency requirements in the case of cogeneration plants;
5. for which the measuring equipment necessary for determining the fulfilment of efficiency conditions for plants that simultaneously produce electricity and heat is provided;
6. for which measuring equipment and fuel usage records system are provided for installations using fossil or renewable fuels and waste;
7. which is in accordance with the spatial plan and the necessary acts, according to the regulations governing construction, based on which the plant and the network connection can be used (i.e., put into operation);
8. on real estate owned by a legal or natural person who has requested the issuance of a decision on acquiring the status of a privileged electricity generator, or for which power plant the said natural or legal person has established the right to build, or an servitude or right to use real estate to build a power plant;
9. which meets other conditions in accordance with the regulation referred to in Article 41, paragraph 1 of the RES Act.

The status of a privileged electricity generator may also be acquired by a final customer with its own generation and the user of a self-consumption plant, whose power plant meets the above-mentioned conditions.

The status of a privileged electricity generator is a pre-requirement for RES and HEC if they wish to have incentives with a market premium (FiP) or a guaranteed purchase price (FiT). A privileged electricity generator may exercise the right to incentives and other rights under this Act for the net delivered electricity, determined by the transmission system operator and/or the distribution system operator

7 The regulation should be adopted within 3 months of the date of entry into force of the new RES Act.

(hereinafter: DSO)[8].

The incentives are elaborated in more detail in the *Chapter 10* - Support Mechanisms for Renewable Energy Sources.

One of the most significant novelties of the new Law is the introduction of the concept of Energy Communities, whereby renewable energy communities are defined as legal entities that meet the following conditions:

- are based in accordance with applicable national law, on open and voluntary participation;
- are independent and under the effective supervision of shareholders or members located in the vicinity of renewable energy projects owned or developed by that legal entity;
- whose shareholders or members are natural persons, small and medium-sized enterprises, or units of local or regional self-government; and
- whose primary purpose is to provide the environmental, economic, or social benefit to the community for its shareholders or members or for the local areas in which it operates, and not for financial gain.

Renewable energy communities have the right to:
1. produce, consume, store, and sell renewable energy, inter alia through renewable energy purchase agreements;
2. share, within the renewable energy community, renewable energy produced in generating units owned by that renewable energy community, subject to other requirements of this Article and retaining the rights and obligations of members of the renewable energy community as users;
3. access all relevant energy markets directly or through aggregation in a non-discriminatory manner.

3. 4. OTHER LEGISLATIVE ACTS

An important piece of legislation is the Act on Exploration and Exploitation of Hydrocarbons (*OG, No. 52/18, 52/19*), regulating the use of geothermal waters for the generation of energy.

Geothermal waters refer to waters from which the accumulated heat can be used for energy purposes, except geothermal waters used for medicinal, balneological or recreational purposes and other purposes, to which water regulations apply, as well as groundwater used through heat pumps for heating or cooling water in a low-temperature heat distribution system, to which building regulations apply. A developer who intends to use geothermal waters for energy purposes must obtain a permit for the acquisition of geothermal waters and enter into a contract with the relevant ministry for the exploitation of geothermal waters in accordance with the procedure defined in the said law.

Also, for the use of hydropower for the generation of electricity, it will be necessary to obtain a concession for the economic use of water in the procedure as defined by the Water Act (*OG, No. 66/19*) and the Act on Concessions (*OG, No. 69/17, 107/20*).

Besides the aforementioned legislation regu-

8 According to the Regulation on the share in net delivered electricity of privileged electricity generators which electricity suppliers are obliged to take over from the electricity market operator (OG, 119/2019), electricity suppliers are obliged to take over from the electricity market operator 40% of the net delivered electricity of privileged electricity generators. The Regulation will also be amended by a new one within 3 months from the date of entry into force of the new RES Act.

lating projects in the energy sector (in a more general sense) and the RES sector (in the stricter sense), there are other acts that are also important for the implementation of RES projects. They are indicated in Table 2.

Table 2. Other legislative acts relevant to the development of an RES project

Acts	Description
Act on Spatial Planning	Relevant for obtaining the location, construction and the use permit.
Act on Construction	
Act on Agricultural Land	Relevant for the use of state-owned agricultural land.
Act on Ownership and Other Real Rights	Regulates the right of land use based on a construction right.
Act on Concessions	Regulates the right of land use based on the use of a concession.
Act on Environmental Protection	Include provisions on the protection of the environment, nature and ecological networks and obtaining related permits.
Act on Nature Protection	
Act on Companies	Regulates how to establish a project entity that can be either a company or craft.
Act on Crafts	
Act on Civil Obligations	Regulates the provisions of contracts between legal and/or private parties.
Act on State Property Management	Regulates provisions on state property management, including real estate for possible project sites.

4. KEY PARTICIPANTS AND STAKEHOLDERS IN THE DEVELOPMENT PROCESS OF RENEWABLE ENERGY SOURCES (RES)

4. 1. LOCAL AUTHORITIES

Counties and Cities

Regional and municipal authorities play an important role in policy implementation through the development of regulations and issuance of permits. The local authority departments for construction, permits and planning provide information on allowed usage within a future project area, implement repurposing if needed (e.g., transforming an agricultural site to a construction site), define conditions that must be met during the construction of a plant, and issue location and building permits for projects.

Local offices of State Geodetic Administration (Cadastral offices)

The cadastral offices provide cadastral information for a future RES project, which is necessary during the initial design phase of the project. After the construction of an RES project is finished, certain elements of the project must be entered into the cadastral database.

Land registry offices

Information on ownership of the land is provided by the land registry offices, which are part of municipality courts. Rights over land (e.g., ownership or servitude) are obtained only after they are registered in the land registry. The Land registry is available via the Uređena zemlja platform if the parcel number and other details are known.

4. 2. STATE AUTHORITIES, AGENCIES, OPERATORS AND OTHER STATE-OWNED ENTITIES

Ministry of Economy and Sustainable Development (MESD)

Among other things, the Ministry of Economy and Sustainable Development (hereinafter: MESD) is in charge of all activities related to energy and environmental protection: the planning of renewable energy, development strategy and implementation, the issuing of Energy Approval, the registration of projects in the RES Register, issuing geothermal exploration and production licences, etc.

Ministry of Physical Planning, Construction and State Assets

The Ministry, among other things, conducts administrative and other affairs related to physical planning on the state level and spatial development harmonisation, the spatial planning information system, the issuing of location permits, the management of state assets (including state-owned land), and exercises ownership powers on behalf of the Republic of Croatia.

Ministry of Agriculture

The Ministry manages forests and forest land owned by the state, regulates legal relations on agricultural land (except for property-related legal affairs), initiates and conducts the procedure of conversion of agricultural land into construction land, etc.

Croatian Energy Regulatory Agency (HERA)

HERA is an independent and non-profit public institution that regulates energy activities in the Republic of Croatia. HERA's basic duties include issuance, prolongation, and the transfer of licences to perform energy activities, as well as the temporary and permanent revoking of licences, adopting methodologies (e.g., tariff systems, monitoring the transparency of functioning of the energy market, etc.). HERA also issues resolutions about the status of privileged energy generators for renewable energy projects.

Croatian Energy Market Operator (HROTE)

HROTE performs activities of organising the electricity market as a public service, under the supervision of HERA. HROTE is also responsible for awarding incentives through an auction process for projects in the FiT (projects below 500 kW) and the FiP (projects above 500 kW) regime. HROTE is responsible for organising auctions for the sale of Guarantees of Origin.

Croatian Hydrocarbon Agency (CHA)

Tenders for the exploration of geothermal waters for energy purposes and licensing process for exploration and generation are carried out by the Croatian Hydrocarbon Agency (hereinafter: CHA). The Agency is also in charge of monitoring activities during exploration and generation periods, and maintaining databases of subsurface data (e.g., seismic and well data) which are accessible in physical or virtual data room.

Croatian Transmission System Operator (HOPS)

The Croatian Transmission System Operator – HOPS, is responsible for the power system operation and maintenance, electricity transmission, as well as construction and development of the electricity transmission network (110 kV and above). The TSO is responsible for the Grid Study - EOTRP (Study on the optimal technical solution for connecting to the power network) for projects that connect to the transmission network. The TSO is also responsible for issuing electrical energy consent (hereinafter: EEC), which defines the conditions for connecting a power plant to the power transmission network.

HEP-Distribution System Operator (HEP DSO)

HEP-Distribution System Operator (HEP DSO) operates low and medium voltage (up to and including 35 kV) distribution systems to which power plants can be connected. The company conducts the distribution of electricity taken from the transmission network as well as the selling, metering, billing, and payment collection of delivered electricity. It is also responsible for the maintenance and operation of the distribution network and plants. The DSO organises the preparation of the Grid Study - EOTRP for power plants that connect to the distribution network. The DSO is also responsible for issuing EEC, which defines conditions connecting a power plant to the power distribution network.

Hrvatske šume (Croatian Forests)

Hrvatske šume is a state-owned company that manages forests owned by the State. If the project site is located in a forest area that is owned by the Republic of Croatia, project

developers must pay a certain compensation for the right to build in the aforementioned area. In that case, Hrvatske šume on behalf of the Republic of Croatia determines and collects forest land fees.

Hrvatske vode (Croatian Waters)

Hrvatske vode is a state-owned company for water management. The company is in charge of calculating and collecting water and utility fees related to water distribution and wastewater management, as well as defining water-related special conditions for location permits and participating in technical inspections of finalised power plants.

The water utility fees are charged to every RES project that receives a building permit and it depends on the building type and its dimensions.

4. 3. OTHER PARTICIPANTS AND STAKEHOLDERS

Engineering companies in charge of the design

A design company prepares project documentation that must be in the Croatian language, prepared according to Croatian standards, and in a format defined by the relevant legislation. The engineering company in charge of design and their employees must be certified according to Croatian regulations. A list of all databases of certified designers and supervisory engineers is available at the website of the Ministry of Physical Planning, Construction and State Assets).

Authorised companies for environmental protection studies

Only companies which are officially authorised by MESD are allowed to prepare a full environmental impact assessment (hereinafter: EIA) and preliminary assessments, which are an obligatory part of the permitting process. A list of these companies is available on the website of MESD.

4. 4. COOPERATION MECHANISMS IN THE REPUBLIC OF CROATIA

The EU Renewable Energy Directive allows the Member States to work together through cooperation mechanisms: statistical transfers, joint projects, and joint support schemes. The Republic of Croatia does not have any active cooperation mechanisms.

Statistical transfers

A statistical transfer is an accounting procedure where an amount of renewable energy is deducted from one country's progress towards its target and added to another's. Lithuania and Luxembourg are the first EU member states which have agreed on statistically transferring renewable energy amounts. Signing an agreement on October 26, 2017, Lithuania agreed to transfer part of its 2018-2020 surplus to Luxembourg and a minimum of 700 GWh, with an expected profit of around €10m (Euractiv).

Cooperation mechanisms in the Republic of Croatia

The Republic of Croatia has regulated Statistical Transfers with the Act of RES and HEC. Taking into account the fact that Croatia has achieved its goal for RES for 2020 and that

there is a certain surplus, Croatian representatives conducted informative talks with representatives of other countries, which did not achieve their goal. At the time of writing this publication, negotiations were still ongoing, so it is not possible to confirm the conclusion of a contract.

Union renewable energy financing mechanism

On September 15, 2020, the EC adopted an implementing Regulation (EU) 2020/1294 on the Union renewable energy financing mechanism that supports the introduction of energy from renewable sources. Its purpose is to support new renewable projects in the EU. During March 2021, Member States were able to express a non-binding interest in participating in the mechanism, and Croatia expressed an interest as a host Member State, i.e., a Member State that allows the construction of physical facilities in its territory for renewable energy generation financed by the mechanism. Renewable energy produced in installations supported by the mechanism is statistically distributed in the following order:

- 80% to contributing Member States; and
- 20% to host Member States.

At the time of writing this publication, the EC was working on an assessment of an expression of interest, after which more information on the continuation of the negotiations will be known. This mechanism will be applied from 2022.

5. ADMINISTRATIVE PROCEDURES FOR THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES (RES)

5. 1. SUMMARY

For an RES project to be bankable, it has to be in a ready-to-build status of development. This means that the project has to:

- obtained the energy approval;
- have secured a connection to the power network;
- be approved concerning its impact on the environment and the ecological network;
- have a building permit; and
- have land rights resolved for the land where the project will be constructed.

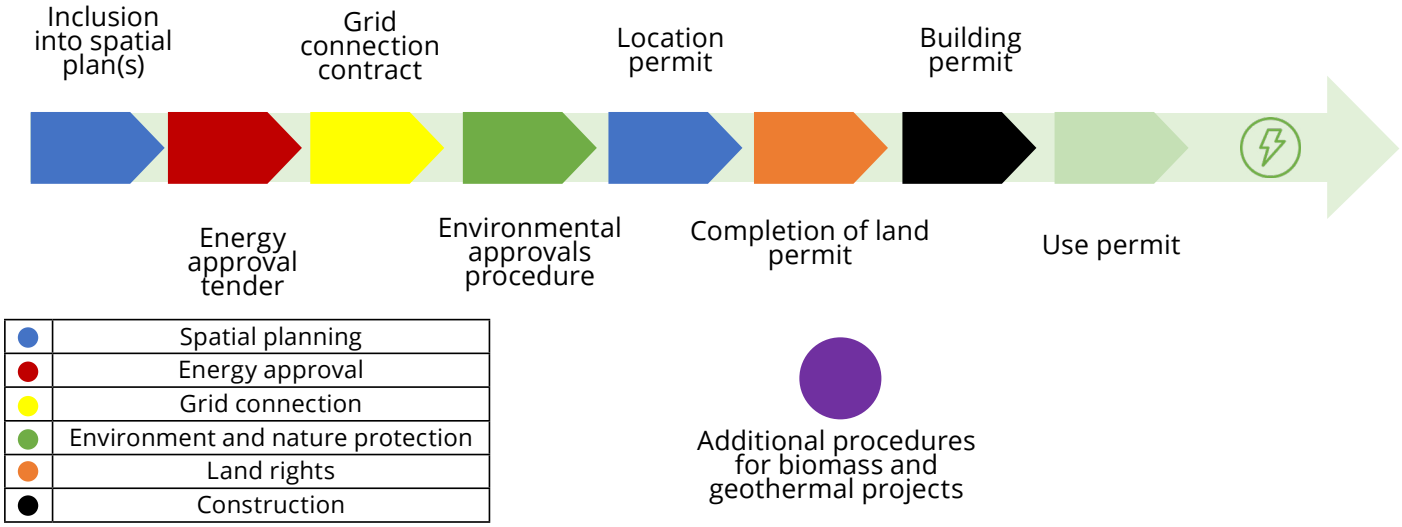
Certain types of RES projects will have to fulfil additional requirements (e.g., biomass or biogas plants will have to secure the contracts for the raw material).

GTPPs will have the most challenging administrative procedures, as they will have to obtain approval for the exploration of geothermal waters in a public tender. This approval is issued for a maximum of five years. Once the exploration program is finished and satisfactory results are obtained, the developer has to submit a notice of commercial discovery and a request for exploitation (production) rights, as well to initiate the process of defining the exploitation field. The production contract is issued by MESD for a period of maximum of 25 years. More information is available at 5.9 - Administrative procedures for geothermal power plants.

Biomass projects can participate in a tender for woodchips organised by Croatian Forests. The project which is awarded a wood supply contract has the number guaranteed for 14 years at a stable price. Bidders must indicate the quantity of wood chips, the expected date of commercial operation, the expected number of employees, and the expected plant efficiency. It is important to note that the tender provides a part of the wood supply and between 20-50% has to be secured on the market.

In this Chapter, we present the detailed steps in the permitting process from Figure 3, which are common to all utility-scale RES projects. This should not be interpreted as

Figure 3. Overview of the permitting for RES projects in Croatia



an exhaustive list of the procedures needed to complete an RES project, but rather as a high-level overview of the main steps.

The order in which the permitting steps are presented is a best-case scenario for a developer. However, given that the energy approval was previously granted after the location permit, and according to Electricity Market Act is awarded in a public tender at the beginning of the project development phase, there may be some deviations related to projects that have already progressed but did not obtain energy approval until the entry into force of the Electricity Market Act according to previous regulations.

5. 2. SPATIAL PLANNING

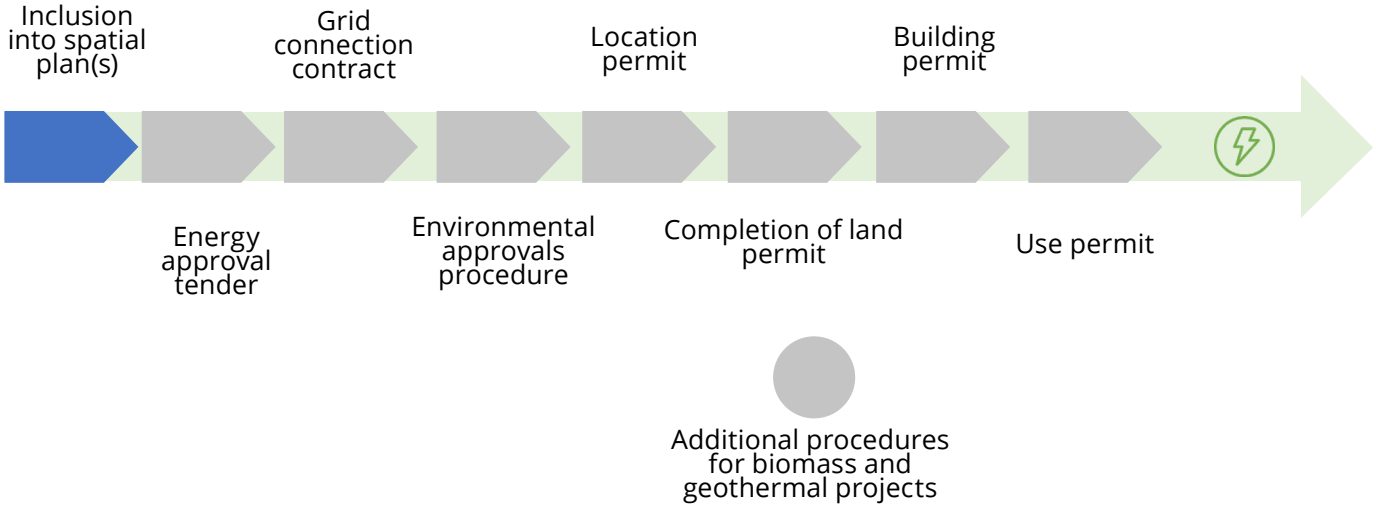
Inclusion in the spatial planning documents is a precondition for an energy approval tender.

Under the Spatial Planning Act, the main spatial planning documents are the National Spatial Development Plan, county spatial plans and municipal spatial plans. Spatial plans of lower rank must be in harmony with the spatial plans of the higher rank.

County spatial plans differ between counties – some regulate rather precisely the locations of wind, PV and other power plants, and give little discretion to the municipality, while others allow the municipality to freely assign certain areas for RES projects (e.g., for PV power plants).

The National Spatial Development Plan has been in the process of being drafted for a couple of years now, and there are no indications as to whether some of the locations currently approved by county spatial plans for RES projects will be removed. There is also no indication as to whether there will be additional criteria for adding locations for RES projects by county and municipal plans nor if the plan will be completed any time soon.

Under the Spatial Planning Act, everybody can propose amendments to the municipal spatial plans, but the municipality is not obliged to initiate the amendment procedure. County spatial plans are amended by county councils – proposals for their amendment may be communicated to the county, but there is no formal procedure for dealing with such proposals.



The planned amendment of a spatial plan must undergo a strategic assessment of the environmental impact and the (preliminary) assessment of impact to the ecological network, which includes a public consultation procedure (see further for more details).

Afterwards, the draft of the amendments undergoes consultation with other public bodies, for not shorter than 30 days, and another public consultation procedure, for not shorter than 8 days.

A municipality must obtain the prior opinion of the relevant county department on the final draft, while the county has to obtain consent from the relevant ministry. If the ministry refuses consent, the county may correct the draft within 90 days.

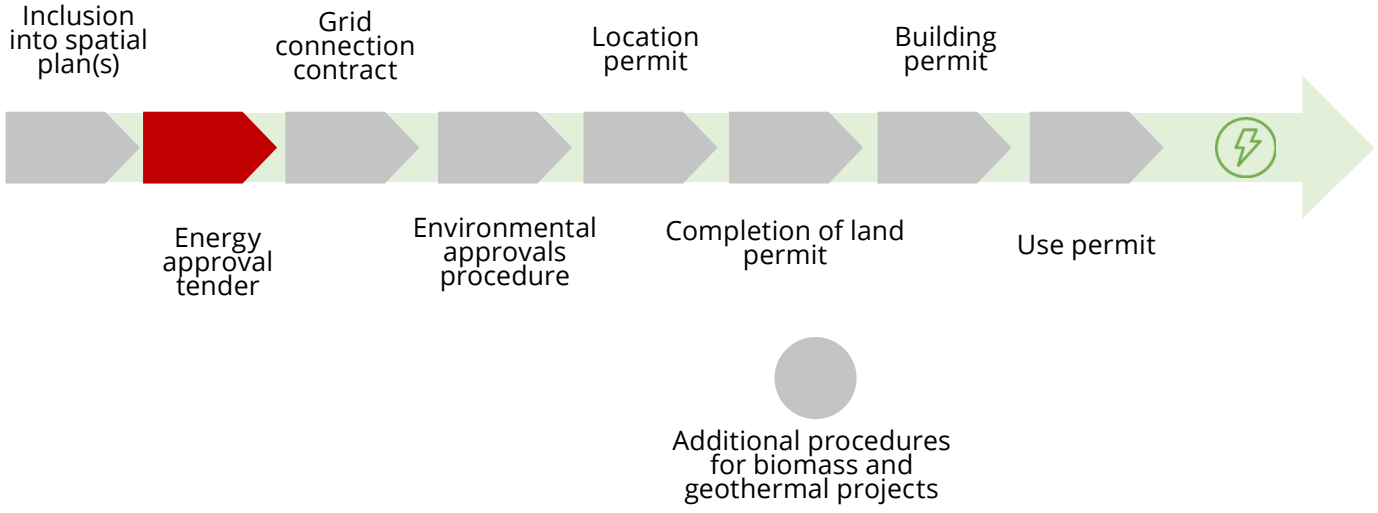
5. 3. ENERGY APPROVAL

Up until the Electricity Market Act changes, the energy occurred after the location permit. According to the new system it will provide earlier information to MESD about projects in development and thus managing this sector.

Energy approval is regulated by the Electricity Market Act and the regulation that should be adopted on its basis. It is a document issued by MESD for a project of a new production plant and/or energy storage plant or a project to increase the capacity of an existing production plant and/or energy storage plant. Energy approval enables developers to acquire the status of a developer in the legal sense and to be entered in the RES Register.

An interested party in the construction of a production plant or energy storage plant shall, in writing, express an interest to MESD for the construction at a specific location.

The Electricity Market Act prescribes the documents that must be submitted with the expression of interest, and these are:
1. proof that the location for which interest has been expressed is in the spatial plan i.e., location information;
2. conceptual design;
3. preliminary opinion of the transmission system operator and/or distribution system operator on the possibility of connection and on possible options for connection to the electricity transmission and/or distribution network;
4. statement of the authorised designer that the conceptual design is harmonized with the spatial plan;
5. feasibility study whose content is prescribed in the Electricity Market Act;



6. a graphic appendix on a topographic map which is also specified by the Electricity Market Act;
7. proof of payment of the guarantee or a bank guarantee, as a guarantee of the seriousness of the offer;
8. other evidence or information necessary for deciding on initiating the tender procedure for the award of energy approval requested by the Ministry.

Regarding the preliminary opinion of the system operator, the Electricity Market Act prescribes clear deadlines for the submission of data by the operators and 30 days as a deadline for the preparation of the study of the possibility of connection by authorised bodies. Based on this study, system operators should issue this opinion. At the same time, the Electricity Market Act prescribes that system operators will prescribe the content of this study and opinion in the connection rules, which leaves the possibility that system operators will not act in accordance with the Electricity Market Act until they adopt new connection rules. This would cause a months-long delay in issuing energy approvals.

If the expression of interest covers an already approved project development area of another developer or an already built facility, that area may be approved if there are possibilities within the spatial and techno-economic criteria, and with the consent of the developer whose project was previously approved.

The decision on the implementation of the public tender for the issuance of the energy approval contains the text of the public call for tenders which is published on the Ministry's website, the Official Gazette, and the Official Journal of the European Union. The decision is made within 90 days of the expression of interest.

The criteria for selecting the most favourable bid in the public tender are as follows:

- for power plants of planned rated power <500 kW – lowest price;
- for power plants of planned rated power >500 kW – lowest price:

- price – 40%;
- competitiveness – 10%;
- participation of the local municipality – 15%;
- energy efficiency – 20%;
- construction deadline – 15%;

Until the adoption of a regulation that will regulate the tender in more detail, it remains unknown what exactly will be scored according to the above criteria and how it will be controlled that developers actually meet those criteria during the construction and operation of the plant.

The Electricity Market Act states that the energy approval does not guarantee its holder that he will be able to build a production plant, has no legal effects on property and other real rights to it and does not constitute a legal basis for entering into possession of real estate. On the other hand, it is considered evidence of legal interest in obtaining a location and construction permit.

The possibilities for changing the energy approval during its validity are limited: the rated power can be increased up to 25% provided that the project is within the approved scope and approved from the aspect of environmental and nature protection.

The energy approval has the following deadlines, counting from its enforceability:

- 3 years for obtaining a location permit, and the failure of the deadline leads to the revocation of the energy approval;

- 5 years (7 years for hydropower plants with an installed capacity of more than 10 MW) to obtain a building permit, and failure to meet the deadline results in termination of the contract on the establishment of easements or building rights;
- 7 years for the construction of the plant (10 years for hydropower plants with an installed capacity of more than 10 MW).

In addition to the mentioned exception for hydro power plants, projects for which a location permit has been obtained and/or a connection contract concluded and/or an EEC issued, or a previous EEC and/or a decision on the acceptability of the project for the environment and nature. They are issued an energy approval for a period of five years from the date of its execution. The developers are expressing their interest in these projects until January 20, 2022. Energy approval for these projects will be paid at a fixed price of 50 HRK/kW of connected power.

Energy approval is granted without conducting a public tender in the following exceptional situations:

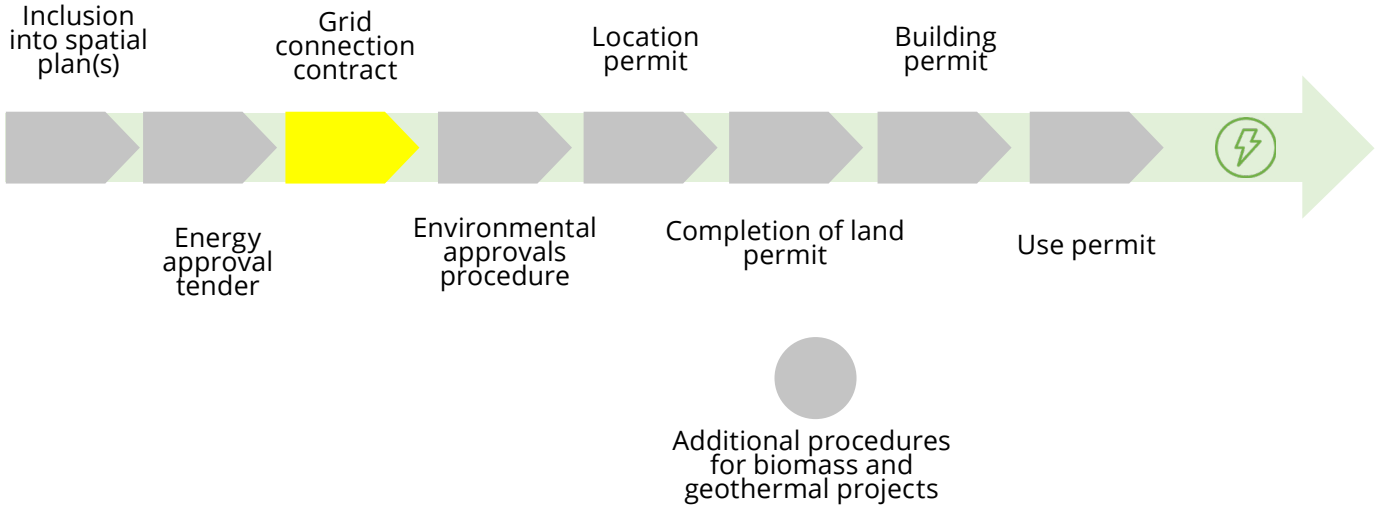
- for the reconstruction and/or revitalisation of existing production or energy storage facilities;
- for projects of geothermal power plants that have a contract for the exploitation of geothermal waters, in accordance with regulations in the field of research and exploitation of geothermal waters from which the accumulated heat can be used for energy purposes;
- if the investor has resolved the ownership relations on the land on which he plans to build a production plant.

An administrative dispute may be initiated against the decision on granting an energy approval within eight days of the public announcement. The High Administrative Court shall decide on the appeal within 30 days.

5. 4. GRID CONNECTION

The connection procedure described here is based on the bylaws in force at the time of writing. It is to be expected that they will soon be harmonised with the provisions of the Electricity Market Act, given that the deadline for the adoption of the majority of these regulations is January 20, 2022.

Depending on whether the project is connected to the transmission or distribution network, the grid connection is obtained



through the TSO or the DSO.
The grid connection process is commenced by a request to the network operator to prepare a *Grid Study*. The *Grid Study* is a network analysis study that uses the information of the existing and planned state of the power network, as well as the planned network users (customers and generators) and analyses security in all extreme states of generation and consumption. The result of the Grid Study is an optimal technical solution of connection to the grid which specifies the estimated cost of such connection.

The Grid Study is valid for 270 days as of its receipt by the developer. Within that deadline, the developer has to apply to obtain the EEC and enter into a Grid-Connection Agreement (hereinafter: GCA).

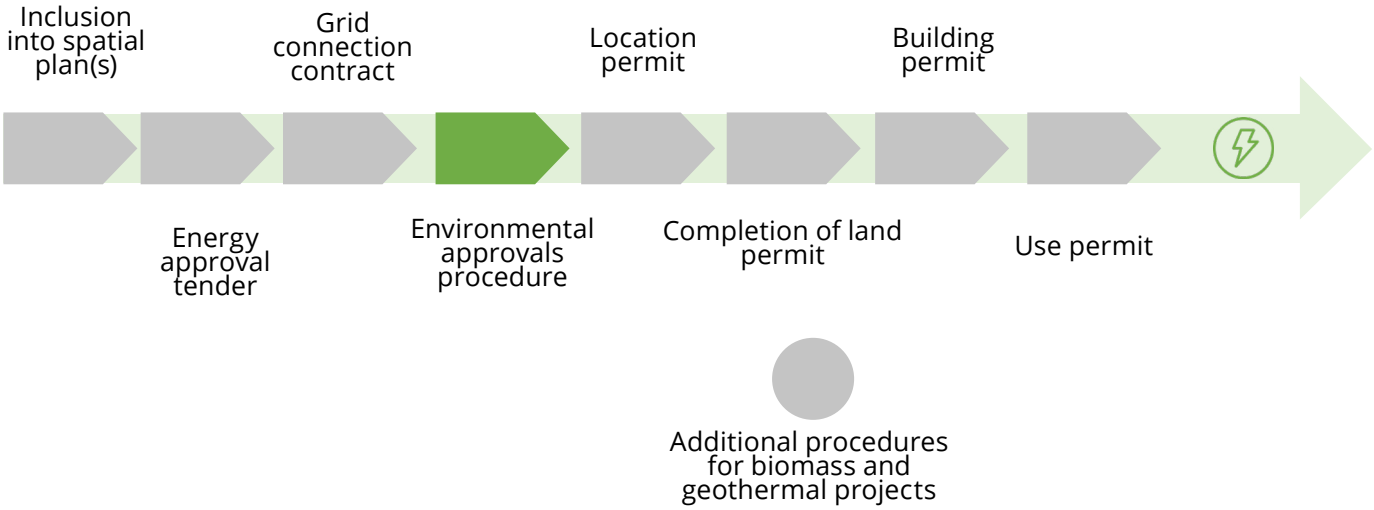
It is already clear that this can be applied to already issued EOTRPs, while the Electricity Market Act prescribes for new procedures that the developers themselves will hire companies authorised to develop the EOTRP. A list of these authorised companies is available on the system operator's website. Upon request, the system operator is obliged to submit data on the network situation required for the preparation of the EOTRP within 30 days from the day of submitting the request, and the authorised company shall prepare the EOTRP within 90 days. If the EOTRP is acceptable without modification, the system operator will decide on the eligibility of the EOTRP within 30 days.

For further details please refer to Chapter 7 - Network Connection Conditions.

5. 5. ENVIRONMENTAL APPROVALS PROCEDURE

Procedures for approving projects from the environmental and nature aspect take significantly longer than the legal deadlines prescribe. Given that significant funds will be raised from energy approvals, some may be spent on improving the service for developers in the form of employment and education in MESD as the responsible authority for these procedures.

Before applying for a location permit, the project developer has to obtain decisions on the acceptability of the project for the environment and the ecological network (Natura 2000) by MESD or other relevant authority (e.g., county department for protection of environment and nature). MESD is the responsible authority for the majority of RES proj-



ects, i.e., all hydropower plants, wind farms, PV power plants, and other RES generation facilities with a planned capacity higher than 10 MW or which require an environmental permit.

Both procedures – the EIA and the assessment of the impact on the ecological network, are run simultaneously and MESD decides on both assessments with a single decision. Only after the project has been declared acceptable both for the environment and the ecological network may the developer proceed with obtaining a location permit.

Due to the rapid technological improvements in the renewable energy technology industry, developers often decide to change their initial technology model during the project development (e.g., newer wind turbine models). This usually requires amendments to the location permit (and the building permit if already obtained). Usually, this will also trigger a new impact assessment procedure before the amendment of the location permit may be obtained. This may prove especially challenging in cases where the relevant environmental and nature data (e.g., monitoring of birds and bats) become outdated due to a lapse of more than 3-5 years from the data was originally obtained.

Environmental Impact Assessment (EIA)

Depending on the type of project and other criteria defined by the relevant legislation, the project may undergo either a full EIA or a preliminary EIA.

A full EIA is mandatory for:

- wind farms with a planned capacity higher than 20 MW and other generation facilities (including PV power plants) with a planned capacity higher than 100 MW;
- if the power plant requires an environmental permit;
- if MESD decides during a preliminary EIA that a full EIA is obligatory; and
- in other cases defined by the relevant legislation.

A preliminary EIA is obligatory for:

- all hydropower plants, wind farms and PV power plants, regardless of the planned capacity (unless a full EIA is mandatory as stated above);
- other RES generation facilities with a planned capacity higher than 10 MW; or
- in other cases defined by the relevant legislation.

Under the Environmental Protection Act, a preliminary EIA has to be approved within two months of the filing of a complete application. The deadline may be prolonged by the relevant authority, but the Environmental Protection Act does not define a final deadline in that case. The decision may be either that the project is acceptable for the environment or that a full EIA is needed.

If the possibility of a significant negative impact on the ecological network is not ruled out during the preliminary assessment, the main assessment will have to be conducted. Any mitigation measure should only be imposed during the main assessment.

Assessment of the impact on the ecological network

The ecological network assessment procedure is carried out for projects that can have a significant impact on the conservation objectives and integrity of the ecological network area (i.e. network of protected areas for habitats and species, so-called Natura 2000). It is not crucial that the planned project is located

inside or outside the ecological network area, but merely the fact whether it may have impact on it.

The first part of the procedure is a preliminary impact assessment, which should be approved by the relevant authority within 30 days of the filing of a complete application.

The relevant authority has to decide whether the project is acceptable for the ecological network, or whether a full assessment does not have to be conducted. Otherwise, if there is any doubt about whether the project could have a significant negative impact, the relevant authority must decide that a full assessment has to be conducted.

If obligated to conduct a full assessment, the developer has to file a new application for the full assessment. The application has to be accompanied by the EIA, proposed mitigation measures, and other defined documents. The complete application must undergo a public consultation procedure for 30 days. Afterwards, the decision on the acceptability of the project should be approved within 30 days of the closing of the public consultation procedure.

The relevant authority must accept the project if it determines that the proposed mitigation measures will not have a negative impact on the ecological network. In the case of a refusal, the developer may, within one year of the decision, apply for a decision on determining the prevailing public interest and the approval of compensatory measures for the project. Such decision can be adopted by the Croatian Government, with prior approval from the European Commission.

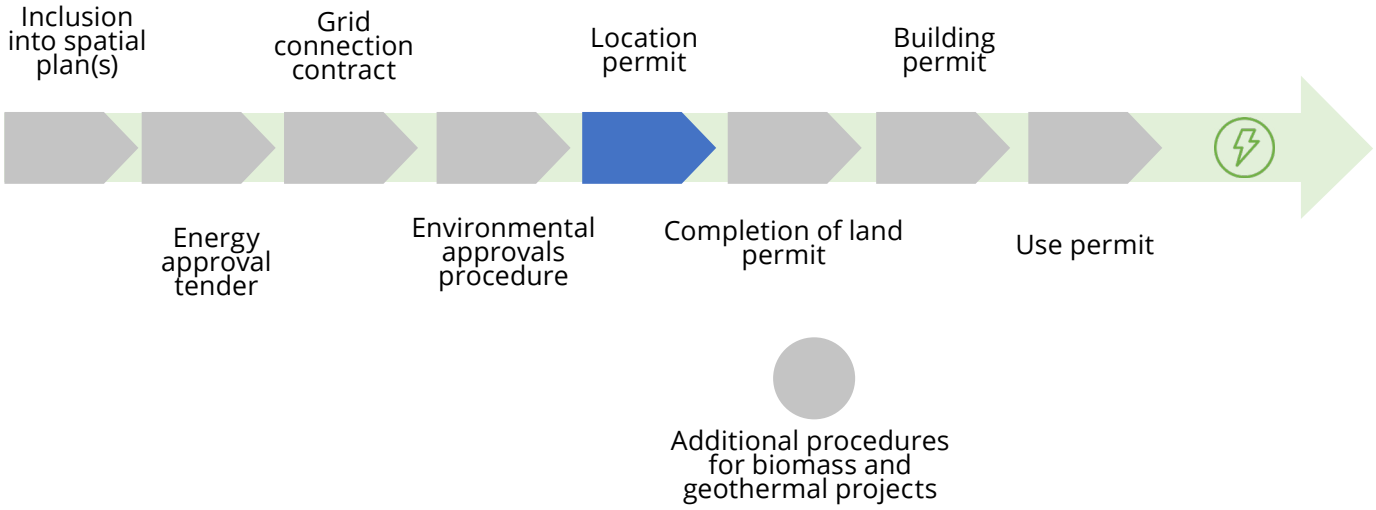
Until now there hasn't been a single decision on determining the prevailing public interest and the compensatory measures for any RES project.

5. 6. LOCATION PERMIT

A location permit is an extremely important step in project development after which the risk of project development is significantly reduced. A prerequisite for obtaining a location permit is an energy approval.

A location permit is a permit that sets out the spatial conditions of the construction of a power plant based on its initial design. It does not tackle land rights and does not give the right to build or possess.

The Ministry of Physical Planning, Construc-



tion and State Assets is the responsible authority for issuing a location permit for projects that are:

- included in the national spatial plan;
- projects designated to be of national interest (e.g., all power plans with a planned capacity of 20 MW and above); and
- projects planned in the territory of two or more counties.

In other cases, the relevant authority is the county in which the project is located (i.e., its department for spatial planning). Communication between a developer and the relevant authorities that issue the permits is conducted electronically through the *e-Permit* system.

During the process, the various public bodies, and relevant authorities (e.g., forest and water management companies, municipalities, other ministries, etc.) have to determine the specific conditions of the construction of a power plant. These public bodies should issue specific conditions within 15 or 30 days from the receipt of the request (depending on the type of the project). If they fail to issue special conditions within that period, their consent is presumed.

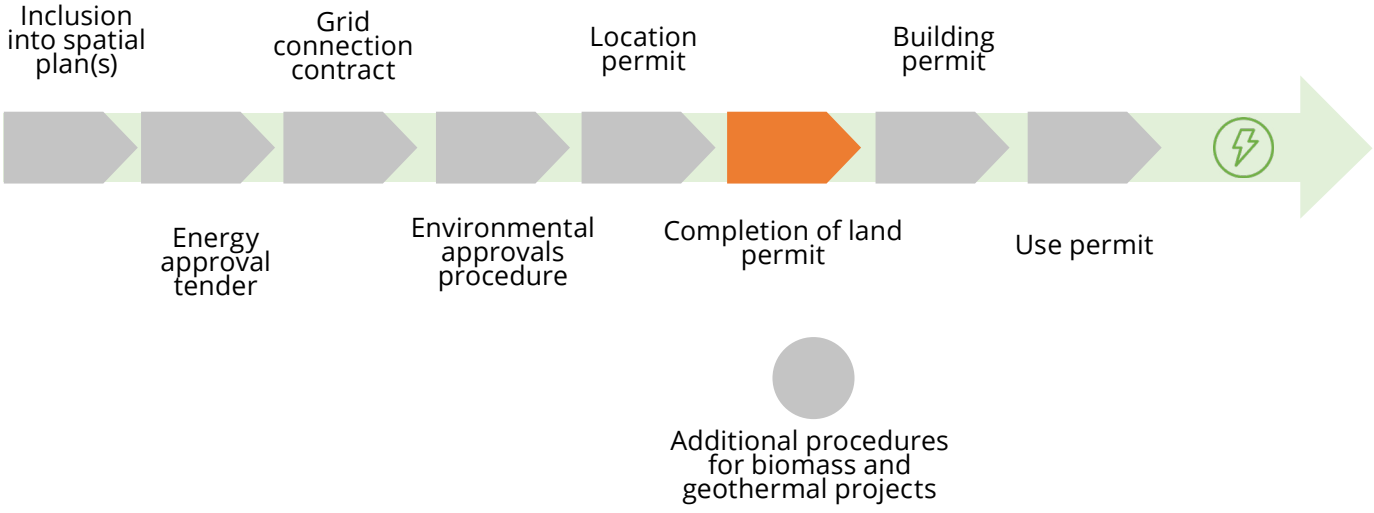
The location permit should be issued within sixty days of filing a complete application (i.e., after obtaining all special conditions, impact assessments, basic design, etc.).

A location permit is valid for two years. Within that period the developer should apply for expropriation, establishing land rights by a relevant authority, and for the issue of a building permit. The location permit's validity may be prolonged for another two years at the developer's request if the spatial conditions based on which the permit was issued have not changed in the meantime.

A location permit may be appealed against only by the owner of the land plot/holder of the other land rights over land/plots on which the project is situated. This provision helps to prevent unnecessary litigation by the owners of neighbouring land plots, but it also prevents the developer from appealing against location permits issued to a competing developer (i.e., for the same land plots).

5. 7. SECURING THE LAND RIGHTS

The RES Act prescribes that the right of servitude and/or the right to build on real estate owned by the Republic of Croatia is established on the



basis of the energy permit.

Securing land rights will largely depend on the type of the project. Biogas plants will usually be developed over the developer's land, while wind farms or (non-integrated) PV power plants will be developed on third parties' land by securing servitude (in Croatian: *služnost*) or the right to build (in Croatian: *pravo građenja*).

Servitude is established as an encumbrance on the relevant land plots, allowing the developer to use the land and have a temporary construction on it. Servitude is usually established for wind farms, solar power plants, roads, etc.

The right to build is established as a right to build a permanent building on the relevant land plot. It is registered both as an encumbrance on the relevant land and as a separate land registry sheet. It is usually established for the power station in favour of the TSO (which in the past sometimes requested that the right to build be established for both the TSO and the developer in equal proportions).

Depending on the ownership of the land where the RES project is located, different public bodies may be responsible for the regulation of land rights, as seen in Table 3.

Securing land rights on state-owned land usually consists of three subphases:

- procedure via the relevant authority which is completed by the adoption of the decision on establishing servitude or the right to build;
- signing the agreement on establishing servitude or the right to build; and
- registration of the land rights in the land register.

The procedure is complex due to the different bodies involved in this procedure, different deadlines settlement and the deadlines for which the servitude is obtained, given that it begins to run from the conclusion of the contract.

Tendering procedure via MESD

Under the RES Act in force since January 1, 2016 (i.e., its amendments in 2018), a new procedure is to be introduced, whereby MESD organises tenders for the allocation of state-owned property for RES projects. The most favourable bidder would thereafter be entitled to enter into land rights agreements with the relevant bodies.

Although expressions of interest were submitted to MESD, the tender procedure was never announced due to the lack of an implementing regulation. In practice, this was not an obstacle to resolving property and legal relations in agricultural and forest land but on construction land owned by the Republic of Croatia it was. Therefore, the RES Act envisages that the competent ministries must enter into contracts on the establishment of building rights and servitude with the developers that have obtained energy approval under previous regulations.

Procedure for securing state-owned land rights applied in practice

The procedure for establishing land rights is conducted through different authorities, depending on the type of the land.

The agreements for establishing servitude or the right to build are based on the provisions of the relevant legislation and developers are not able to negotiate their terms. Although the applicable legislation defines 60 days in

which to conduct the procedure, it is rarely observed, mainly because of the unresolved land registry situation. In such cases, the ministries usually wait for the procedure whereby the Republic of Croatia is registered as the owner in the land registry.

Required documents:

- most authorities require a location permit and a surveyor's study showing the exact area covered by the project, the land registry extract, and other documents obtainable from the public authorities;
- in addition to the above, different types of land will trigger other additional documents (e.g., for forest land Energy Approval granted by MESD and a certificate from the state forest management company that no damage was made to the forest land by the applicant).

Forests

The procedure is carried out in accordance with the Regulation on the Establishment of the Right to Build and the Right of Servitude on Forests and Forest Land Owned by the Republic of Croatia (*OG, No. 87/19*).

In addition to the usual documentation, it is necessary to enclose a certificate issued by Croatian Forests as the manager of state-owned forests, that there was no illegal appropriation, use and other illegal actions by the proposer of the construction right, i.e. that the fee for the use and illegal appropriation was paid.

Unlawful appropriation occurs as a rule during the construction of wind farms and PV power plants on state forest land. Namely, the right of servitude is obtained on the basis of the Expropriation Study, i.e. only the area in which the power plant will be built. Inevitably, a wider area is used during construction, which Croatian Forests treated as forest damage and, in addition to the basic fee, charge developers the market value of the land.

Agricultural land

The Ministry of Agriculture, Department for Agricultural Land is currently conducting all procedures under the Agricultural Land Ordinance. The Agricultural Land Ordinance does not define the relationship between the current procedure and the forthcoming tendering procedure.

Other state property managed by the Ministry of Physical Planning, Construction and State Assets

After the new legislation in 2018, the responsibility of the Ministry of Physical Planning, Construction and State Assets for land matters has been greatly reduced and it now usually deals only with land designated for building in spatial plans.

Public roads

Land rights on public roads (highways, national roads, county roads and local roads) are managed by Hrvatske ceste d.o.o. (Croatian Roads Ltd.) or the County Administration for Roads, depending on the type of the road. The procedure is not strictly regulated, and land rights are established by an agreement executed with the road administrator. The fee is set by a decision of the Croatian Government, in proportion to the occupied area – the roads are usually occupied only for laying down underground power lines.

Municipal property

Municipal property covered by the RES proj-

Table 3. Various public bodies responsible for the regulation of land rights

Owner	Type of land	Relevant body
Republic of Croatia	Forests and forest land	Ministry of Agriculture, Department for Forestry
	Agricultural land	Ministry of Agriculture, Department for Agricultural Land
	Public roads – national roads	Hrvatske ceste d.o.o. (Croatian Roads Ltd.)
	Public roads – county and local roads	County Administration for Roads
	Public waters domain	Hrvatske vode d.o.o. (Croatian Waters Ltd.)
	Other state property	Ministry of Spatial Planning, Construction and State Assets (MSPCSA)
Municipality	Unclassified roads	Municipal Council and mayor
	Other municipal property	
Private property	Real estate owned by private persons or legal entities	Direct agreement with the owner or expropriation procedure via the County

ects usually consists of unclassified roads which are owned by municipalities/cities. Such roads are usually unregistered with the land registry under their current status, area, etc., because the registration procedure triggers costs for the municipalities. Consequently, in cases when the municipalities confirm that the relevant land plots are their own under the applicable legislation and enter into a servitude agreement, such servitude cannot be registered before the road is properly registered.

It is not rare that old roads from the 19th century are still registered with the land registry and the cadastre, while they do not exist in reality. In such cases, the municipalities should declare that such roads are not used anymore and obtain registration as municipal ownership. However, municipalities are often reluctant to conduct such procedures.

Private land

Land rights over private land may be secured through a direct agreement with the owners. In such cases, developers and owners are not bound by special regulations regarding the conditions of their agreement.

Land rights may also be established through an expropriation procedure, which may be complete expropriation (to gain ownership) and incomplete expropriation (to establish servitude).

The procedure consists of two phases:

1. Preliminary procedure:

- during the preliminary procedure, certified evaluators inspect the respective land and assess its value (i.e., the land's reduction of value in the case of establishing the servitude).

2. Expropriation procedure:

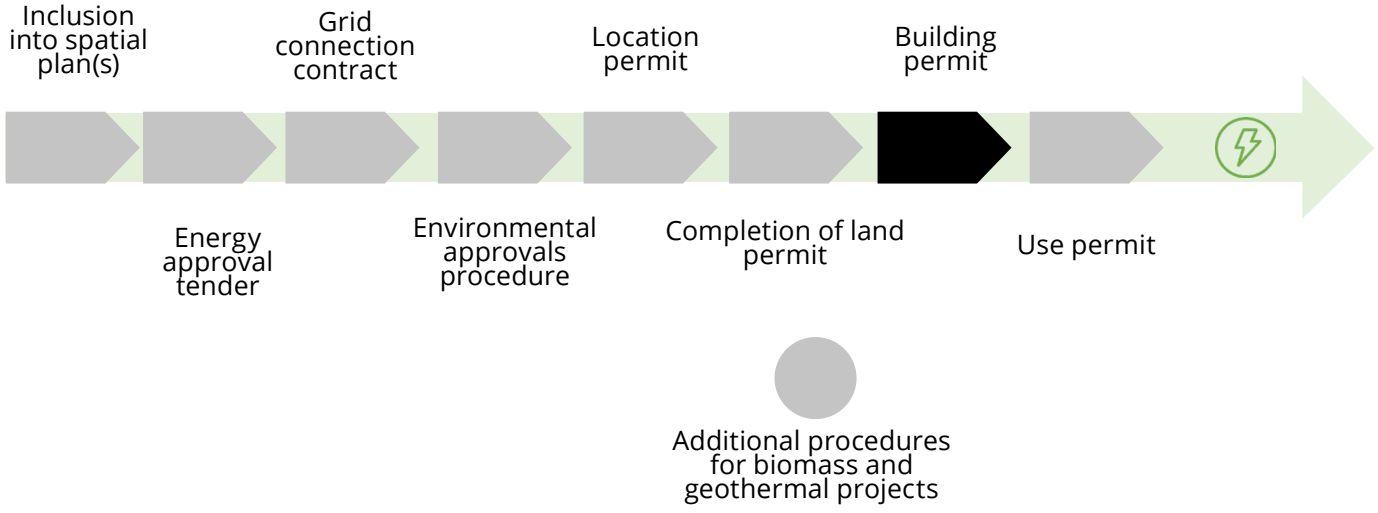
- after obtaining a compensation valuation from the certified evaluators, the developer can attempt to agree with the owners by sending them a proposal based on the obtained valuation. If there are more than 10 owners or more than 10 land plots, a proposal may be published in a newspaper and does not have to be delivered to every individual owner;
- the developer must deposit the funds for compensation and the costs of the procedure in a special bank account before applying for expropriation;
- the relevant authority afterwards holds hearings with the developer and the owners. If the owners cannot be determined or if there are disputes between more persons regarding ownership title, the developer may deposit the compensation in a special account held by the county to fulfil its obligation;
- if the expropriated areas are aligned with the obtained location permit, the owners cannot contest the decision on expropriation with success. However, in practice owners sometimes file appeals against the decision on expropriation because they are not satisfied with the valuation or because they disagree with the expropriation in principle. Although such appeals are not upheld, they prolong the procedure – the decision on expropriation cannot become legally valid and final, making the developer unable to register the land rights in the court register.

5. 8. BUILDING PERMIT

By obtaining a valid building permit (if property relations have been resolved), the project is ready for construction. However, the developer may start construction at his own risk on the basis of an executive building permit.

The developer may apply for a building permit within the validity period of the location permit. The application has to be accompanied by the main design, proof of legal interest, and other defined documents. With the changes to the Electricity Market Act, energy approval will also be required.

According to the Croatian legislation, the construction of energy generation facilities is of interest to the Republic of Croatia. Thus, in order to prove legal interest it will suffice to accompany the application with proof that the request for expropriation (for privately



owned land) or establishing land rights with the relevant authority (for public land, e.g., forests, agricultural land) has been filed. On the other hand, a building permit does not give a developer the right to possess (or build) until the land rights are secured.

In the process of issuing a building permit, the public bodies that determined the specific conditions of construction will have to confirm that the main design is aligned with those specific conditions.

A building permit is valid for three years. The developer should start the construction within that period. The validity period does not run during the expropriation procedure or procedure for establishing land rights on state-owned land. The validity period may be prolonged at the developer's request for three years if the spatial conditions on which the permit was based have not changed in the meantime.

5. 9. USE PERMIT

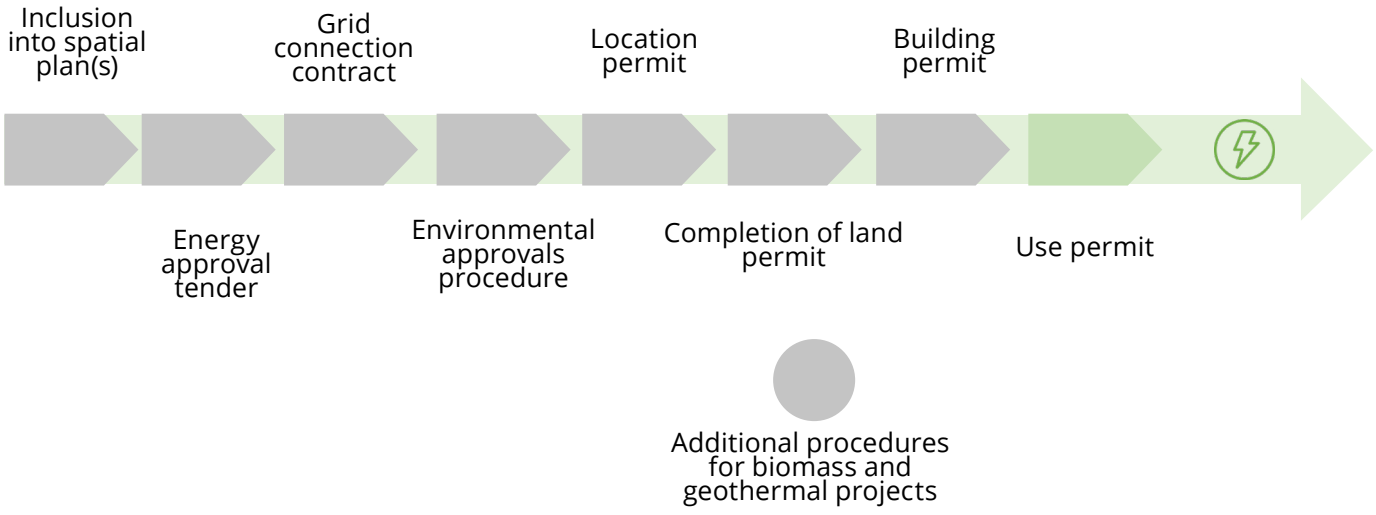
The use permit confirms that the project was built in accordance with the building permit.

The developer may apply for a use permit only after the completion of construction. Before applying for a use permit, the developer may conduct a trial run if required so by the specific conditions, in which case the trial run must be regulated by the main design for the project.

The relevant authority has to carry out a technical inspection within thirty days (for the ministry) or fifteen days (for the county) from the filing of the application. A use permit shall be issued within eight days of the technical inspection if there have been no documented problems with the project. A use permit is issued if construction was completed in line with the building permit.

5. 10. ADMINISTRATIVE PROCEDURES FOR GEOTHERMAL POWER PLANTS (GTPPS)

Developers of GTPPs in Croatia have to follow two administrative procedures, partially in parallel: one of them is the usual procedure for renewable energy projects presented earlier in this chapter, and the other is the procedure for geothermal resource exploration. The procedure for geothermal resource exploration needs to start earlier, as defined by the Act on Exploration and Exploitation



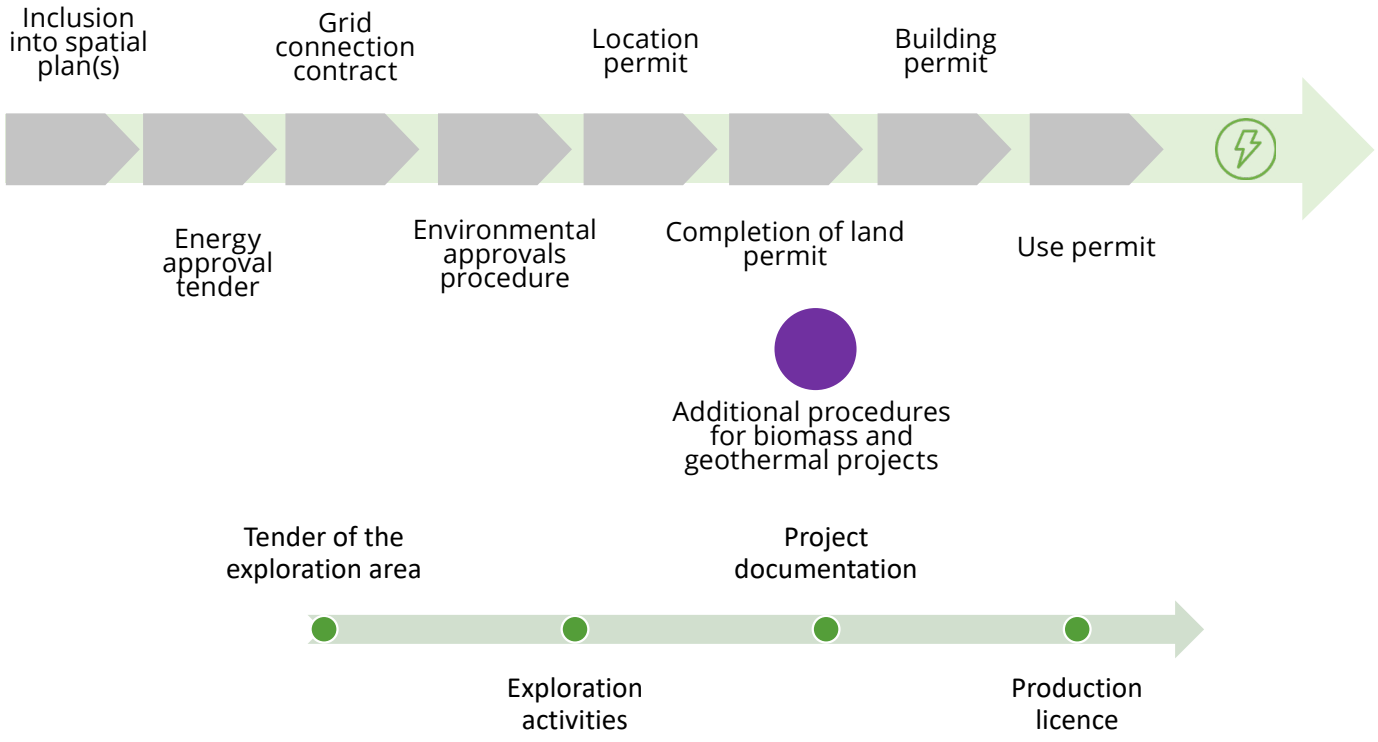
of Hydrocarbons (this act, regardless of its name, also covers underground gas storage, CO_2 sequestration and geothermal water used for energy purposes).

The exploration procedure can be triggered either by the CHA or by developers themselves. CHA can define one or several geothermal exploration areas, prepare the necessary initial documentation and open a public tender for those areas. Developers can investigate the existing seismic and well data, which are (for geothermal projects) available for free in physical or virtual data room at the CHA. After that, developers can identify the area of interest for exploration and then formally express an interest to CHA in exploring this area. CHA will then prepare and open a public tender for this particular exploration area, in which anyone can participate.

Exploration area tender

The tender participation fee is not high (usually HRK 10,000 or €1,318), and for this fee applicants receive the tender documentation and a complete well and seismic dataset related to the tendered exploration area. The tender documentation contains a fairly detailed description of the exploration area and its estimated geothermal potential, criteria for grading the submitted offers (i.e., allocating points per each offered exploration item), and all the special conditions that were already defined by the public bodies which the developer will have to follow during the exploration (e.g., particular details about environmental protection, avoiding already existing infrastructure, etc.). Until the defined deadline, all interested developers have to submit a bid containing all the necessary administrative documentation and their proposal of the exploration program, together with the timeline and the estimated budget of all the proposed operations. The bid also needs to contain a bid bond in the form of a bank guarantee to the level defined by CHA, depending on how attractive the exploration area is (in the most recent tenders it was in the range of €15,000 to €100,000). The bidder must be a company registered in Croatia (or abroad) for activities of exploration and

Figure 4. Development steps for geothermal power plants



the production of geothermal water (or petroleum).

All the collected bids are individually graded based on the content of the exploration program (more is better), its duration (maximum five years, shorter is better), offered royalty fee (minimum 3% of the production revenue, higher is better) and several other technical, financial, and experience-related criteria. The bid with the most points is declared the winner, and its bidder receives from the Ministry of Economy and Sustainable Development (MESD) a resolution on the exploration rights in the tendered exploration area (exploration license). Within 30 days, the winner is obligated to provide MESD with two bank guarantees:

- one at 10% of the value of the whole exploration program; and
- the other at the full estimated value of the exploration well(s) abandonment and remediation of exploration area in case of negative exploration results.

If these bank guarantees are not provided in time, MESD will cancel the original exploration license, disqualify the winner, and declare the bidder of the second-best offer the new winner of the tender - the new winner then has to provide the same bank guarantees within the same period.

Exploration activities

The exploration period starts with the date set by MESD and ends according to the duration of the accepted exploration program, and can be extended twice, each time for six months, to finish ongoing exploration activities.

The developer has to regularly share their annual budget and work program with the authorities, as well as regularly report exploration progress to them. If the exploration activities are not following the overall exploration program and the annual work program, the developer has to clarify the reasons for this delay (which can never be related to a lack of funds). In the case of unjustified and extreme delays, MESD can revoke the exploration license and activate the bank guarantees.

During the exploration, the developer must appoint a responsible head of activities with the required qualifications:

- university diploma in geology or petroleum engineering;
- passed Croatian state exam; and
- a minimum of two years of experience in a geothermal (or petroleum) project.

If this head of activities is not a full-time employee of the developer, then the developer must employ a geologist or a petroleum engineer without the state exam as a full-time employee.

Any exploration activities must be announced to the authorities 15 days prior to commencement. The results of each exploration activity and all data acquired during the operations have to be reported to the authorities within 60 days of the completion of the activity. All acquired data and their interpretations, as well as analyses or studies based thereon, will become the property of the Republic of Croatia.

The developer is responsible for the property rights (ownership, lease, rent, etc.) for all land used during exploration.

Project documentation

For any geophysical measurements (e.g.,

gravimetry, seismic, magnetotelluric) that are part of the exploration work program, the developer must prepare a conceptual design that needs to be accepted by MESD before the starting of the measurements.

The drilling and testing of new exploration wells, or the workover and testing of existing wells, require the following steps:

1. a preparation of the conceptual well design and its acceptance by MESD;
2. a preparation of the preliminary EIA based on the accepted conceptual design, and its approval by MESD;
3. a preparation of the basic construction design of the well site;
4. the obtaining of a location permit for the well site, which will include all the special conditions defined by public bodies; and
5. a preparation of detailed well design which then has to be approved by a committee of experts appointed by MESD.

The well site preparation can be started only after the detailed well design is approved. The expected duration of all of these steps can be 8 to 12 months, mostly depending on the approval of the environmental study (i.e., getting the confirmation that a full EIA is not required).

The designs have to be prepared by experts who hold a relevant university degree, and have passed the Croatian state exam, and have a minimum of two years of experience in their field of expertise. The chief responsible designer must be a petroleum engineer with the Croatian state exam and a minimum of two years of experience in geothermal (or petroleum) projects. The company preparing the designs must be registered in Croatia for this activity.

Exploration results, obtaining production license

Once all the exploration activities are finished, the developer must deliver the final report to the CHA within 3 months, including notice of a commercial discovery (if there is one). After that, within six months, the developer must prepare a report on reserves of geothermal water, which must be approved by the MESD-appointed committee. If there was no commercial discovery, the developer is obligated to abandon the well(s) and remediate all the areas impacted by the exploration activities.

The developer also has to start the process of entering a future exploitation field area into spatial plans. Once that process is completed, and MESD's resolution on the definition of an exploitation field is obtained, within 6 months the developer must prepare and submit to MESD a geothermal field development plan. After having this development plan approved, the developer must resolve the property rights for all the land that will be used in the development and production of the field. The developer will need to file a request for the approval for geothermal production, which MESD will approve within 30 days of the request and offer to the developer the signing of a production contract (license) for a maximum of 25 years.

The production license is the final step in the administrative procedure for the development of a GTPP related to the Act on Exploration and Exploitation of Hydrocarbons, and it is a prerequisite for obtaining the Energy Approval and registration of a GTPP project into the RES Register.

6. NETWORK CONNECTION CONDITIONS

The TSO and the DSO are facing an increased number of network-connection requests (see Chapter 12 - Overview of the RES Development Market for more details on the figures). Most of the requests are made for projects planned in the four most southern counties: Split-Dalmatia County, Šibenik-Knin County, Zadar County, and Dubrovnik-Neretva County.

Probably this is one of the reasons why the transitional and final provisions of the Electricity Market Act stipulate that the system operator is obliged, for projects for which it has concluded an EOTRP agreement until the entry into force of the Electricity Market Act, to request a supplement to the EOTRP application with a valid energy approval, which the investor is obliged to submit to the system operator within 90 days from the day of entry into force of the Electricity Market Act.

As the stated deadline did not pass during the writing of this guide, it is not clear what the consequences will be for developers when they fail to fulfil this obligation and it is clear that they will not because energy approvals will not be issued at all during this period.

Furthermore, according to the Electricity Market Act, system operators are obliged to adopt new bylaws within their competence, such as connection rules and network rules of transmission or distribution system, within 3 months (some within 12 months) of the entry into force of the Electricity Market Act. Due to the above, significant changes in the procedure and conditions of connection to the network can be expected.

Grid connection procedure

Regulated third party access to the electricity grid in the Republic of Croatia is obtained via TSO or DSO, depending on whether the production facility is to be connected to the transmission or the distribution grid.

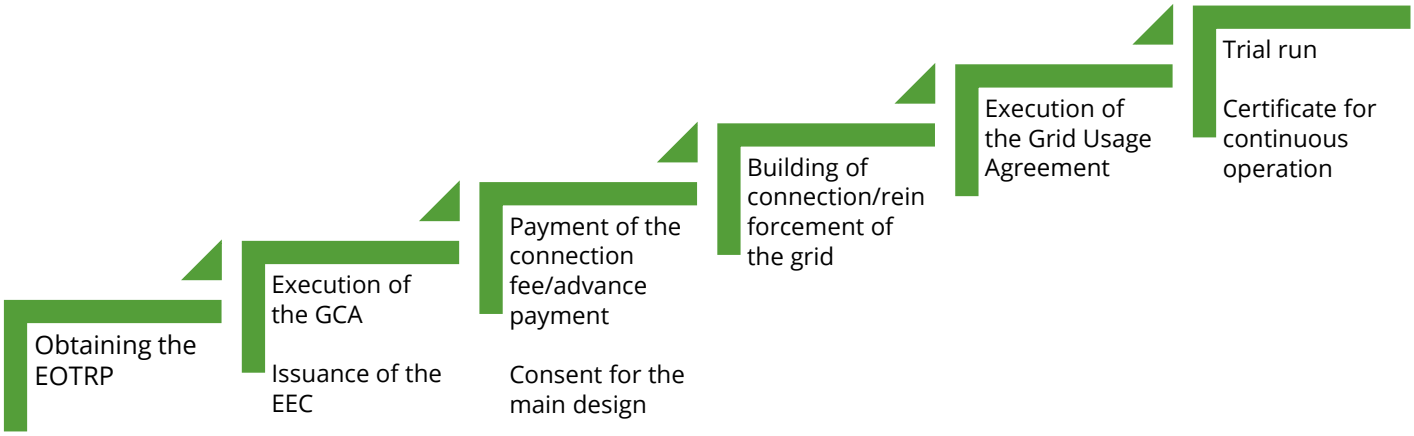
Under the current regulations, the connection costs for generation facilities connecting to the power grid in the Republic of Croatia consist of so-called 'deep costs'. In addition to paying for the infrastructure needed to connect to the power grid (lines/cables and other necessary equipment), developers must also pay the costs of reinforcements or extensions to the existing network. The Electricity Market Act regulates that grid reinforcement is the responsibility of the system operator, in accordance with the ten-year network development plan of the transmission and the distribution network and regulations governing network connection but does not specify at whose expense this obligation goes, or whether it will remain the responsibility of developers.

Activities related to reinforcements or extensions to the existing network cannot be outsourced to a developer or a third party, but may be undertaken only by TSO or DSO, while the investor bears the costs of those activities

County spatial plans regulate grid connections differently – some in more detail than to others. Some of the county spatial plans define that municipal spatial plans must regulate the routes of the connecting power lines/cables. Therefore, initiating amendments to the spatial plans may be required, depending on the location of the project. This may have a huge impact on the timing of projects as a change of spatial plans is a time-consuming activity and will take at least two years.

There are still a number of projects whose connection to the grid may differ from the

Figure 5. Steps for grid reinforcements or extensions



procedure described in this chapter. These are projects that were initiated before 2018, under former regulations.

In the case that reinforcements or extensions to an existing network are needed, the following steps, among others, will need to be followed:

The steps after Step 3 are after the building of the project commences, which is why they are not described in more detail.

EOTRP (study of the optimal technical solution for the connection to the grid)

EOTRP is a network analysis that uses the existing and planned state of the power network, as well as the planned network users (customers and producers) and analyses security in all extreme states of generation and consumption. The result of EOTRP is an optimal technical solution of connection to the grid which specifies the estimated cost of such connection.

The Electricity Market Act stipulates that the developer will hire the authorised companies to develop the EOTRP. A list of these authorised companies is already available on the system operator's website. Upon request, the system operator is obliged to submit data on the network situation required for the preparation of the EOTRP within 30 days from the day of submitting the request, and the authorised company shall prepare the EOTRP within 90 days. If the EOTRP is acceptable without modification, the system operator will make a decision on the eligibility of the EOTRP within 30 days.

In practice, when calculating the possibility to connect, TSO/DSO will take into consideration all adjacent projects under development, irrespective of how realistic it is that they will be connected.

Grid connection agreement (GCA)

The Electricity Market Act prescribes that the system operators will, within 30 days from the decision on the eligibility of the EOTRP, offer the developer a grid connection agreement.

According to the regulations valid on the day of writing this guide, the GCA regulates, among the other provisions, deadlines for the fulfilment of the parties' obligations, conditions for issuing the use permit, payment of costs for creating technical conditions in the grid (if required), activities which may be un-

dertaken by the investor on TSO/DSO's behalf (e.g., securing land rights, construction of a power station, etc.). A draft of DSO's GCA may be found on their website (HEP DSO).

The deadline for connection is set by GCA on a case-by-case basis and the clock starts ticking after the payment of the first instalment of the connection fee.

The DSO will usually require payment of the connection fee in three instalments, the first one becoming due and payable within 8 days from the signing of GCA.

The TSO will request a developer to pay an advance payment in the amount of 5% of the total connection fee determined by EOTRP, or provide a bank guarantee in the same amount, usually within the period of up to 30 days from signing. Part of the advance payment is used to pay the first instalment of the connection fee, in proportion to the instalment concerning the whole connection fee.

Although not explicitly defined by relevant legislation, the TSO tends to ask for additional bank guarantees for costs of reinforcements/extensions in the existing network (in practice in the amount up to 90% of estimated costs).

The prolongation of the deadlines for the construction of production facilities is not regulated by the relevant legislation, but the GCA may include provisions that deadlines for TSO/DSO or a developer do not run while their fulfilment cannot be realised due to circumstances outside of the relevant party's control. In practice, there are cases that TSO/DSO have agreed to amend the GCA signed under the former regulations and prolong the deadlines if they considered the delays to be justified.

Given the expected change in bylaws, developers will have to determine the regulations under which the connection agreement was concluded when taking over the project. This will be extremely important in the event of a change in the methodology used to calculate the grid connection cost and it remains questionable whether developers will be in a position to choose the application of new regulations if they are more favourable to them.

EEC (ELECTRICAL-ENERGY CONSENT)

After obtaining EOTRP the developer has to obtain special conditions for the location permit, which are issued as EEC. These include technical requirements that the facility has to meet before connecting to the grid. EEC has to be issued within 15 days as of applying, provided that the developer has entered into a GCA and paid the connection fee.

The EEC shall include, among other things, basic information on the production plant and technical conditions which have to be fulfilled before connecting the production plant to the grid.

Once the developer prepares the main design for the building permit, it will ask TSO/DSO to give its consent for the main design. Such consent confirms that the main design has been prepared following the EEC.

EEC's validity is equal to the term of the GCA. If EEC is incorporated into the location or building permit, its validity is equal to the validity term of those permits.

7. RULES OF THE ELECTRICITY MARKET IN THE REPUBLIC OF CROATIA

Introduction

Under the Energy Act and the Electricity Market Act in the Republic of Croatia, the basic preconditions for the establishment of an open electricity market have been created. The market participants in the Croatian electricity market are generators, suppliers, traders, and end/users. As already explained in the Chapter 3.1 - Energy Act, legal and natural persons may perform energy activities only if they have a license to perform an energy activity, issued by HERA.

Energy approval for the construction of a power plant is issued by MESD as explained in Chapter 5.

After obtaining Energy Approval, a power plant that uses RES or HEC can acquire the status of a privileged electricity generator as explained in the Chapter 3.3 Act on Renewable Energy Sources and High-Efficiency Cogeneration. The status of a privileged electricity generator is acquired on the basis of a decision issued by HERA issued on the basis of a request from an electricity entity or other legal or natural person for a generation plant that meets the requirements of this Act and the Regulation referred to in Article 41 (Regulation on the use of renewable energy sources and high-efficiency cogeneration)[9].

Biomass projects are cogeneration projects and, therefore, need to obtain a heat energy production license that is valid for five years, and a heat energy distribution license that is valid for three years. The licenses are a requirement for obtaining the status of a privileged electricity generator.

9 The Croatian Government shall adopt the regulation within three months from the day this Act enters into force

Related to the grid connection of a power plant, an electricity generator must obtain electrical-energy consent from the TSO or DSO following the conditions defined by the Decree on Issuing Energy Consents and Determining the Conditions and Deadlines for Connection to the Electricity Grid (*OG, No. 7/2018*).

The TSO and the DSO under the requirements for plant reliability and safety, ensure and control the takeover of the total electricity generated by privileged electricity generators according to the conditions specified in the Transmission System Grid Code (*OG, No. 67/17, 128/20*) and the Grid Code of the Distribution System (*OG, No. 74/18, 52/20*).

Another important stakeholder in the electricity market is HROTE – the Croatian Energy Market Operator. HROTE is responsible for organising the electricity market in the entire territory of the Republic of Croatia following the Rules for Organising the Electricity Market (*OG, No. 107/2019*).

An electricity supplier or trader from a Member State of the EU and the contracting parties of the Energy Community who wishes to participate in the electricity market in the Republic of Croatia is obliged to obtain a license from HROTE to perform the supply or trade of electricity. Exceptionally, for electricity trade exclusively through electricity exchange, a supplier or trader of electricity from a Member State of the EU and the contracting parties of the Energy Community is not obliged to obtain a license from HROTE to conduct energy trade, but it is obliged to act following the general rules regulating the operations of foreign companies and foreign individual traders in the Republic of Croatia.

Participating in the electricity market

An electricity generator may deliver electricity to the grid only if it is a participant in the electricity market or if it has a Power Purchase Agreement (PPA).

Participants in the electricity market in the Republic of Croatia (generators, suppliers, and traders) must obtain a license to perform energy activities from HERA, register in the Central European Register of Participants in the Energy Market and obtain the Energy Identification Coding (EIC) mark[10]. After fulfilling the stated conditions, they also need to conclude an agreement with HROTE on participation in the electricity market.

The electricity market includes the retail, wholesale, and other electricity markets. The wholesale electricity market includes:

- over-the-counter electricity market;
- electricity exchange market.

Over-the-counter electricity market is a market in which the purchase and sale of electricity is performed directly between participants in the electricity market on the basis of a bilateral agreement on the purchase and sale of electricity.

The electricity exchange market includes the electricity market in which the purchase and sale of electricity between participants in the electricity market is carried out through the electricity exchange which is responsible for it.

Retail electricity markets include electricity supply and aggregation.

Other electricity markets include the balancing market and the non-frequency ancillary services market.

Under the Rules for the Organisation of the Electricity Market, the generator may trade with another generator, trader, supplier, electricity exchange, and use trans-zone capacities for the electricity trade.

An electricity generator may trade electricity with the transmission system operator solely for providing system services, balancing services, energy for the exchange compensation plan, and covering losses in the transmission network. A generator may trade electricity with the DSO solely to provide ancillary services and to cover losses in the distribution network.

A privileged electricity generator whose generation facility is receiving a guaranteed purchase price sells its electricity exclusively to HROTE based on an electricity purchase agreement concluded with HROTE and may trade with the transmission system operator solely to provide system services.

A privileged electricity generator whose generation facility is receiving the FiP may trade on the electricity market in the same way as any other generator.

Balancing electricity market

Privileged electricity generators, regardless of whether they are in the support mechanism system or not, have equal rights and obligations regarding the supply of electricity to the grid and generation planning. Eligible producers participating in the incentive system must, and other eligible producers may be members of the ECO balance group led by HROTE. The costs incurred by calculating the balancing energy of the EKO balance group

10 EIC is a unique label for participants in the European energy market issued by the EIC label issuing office

are covered by HROTE from the funds for the payment of incentives and the monthly fee, which is adjusted annually and paid by members of the EKO balance group whose connected power of the production plant exceeds 50 kW.

The functioning of the ECO balance group, as well as the obligation to submit data necessary for planning electricity generation by members of the ECO balance group, are regulated in detail by the Rules of the ECO Balance Group adopted by HROTE (*HROTE 12/2018*)[11].

In the balancing electricity market, the TSO buys and sells electricity from participants in the electricity market to balance the electricity system. Participation in the balancing electricity market is regulated by a contract for the provision of balancing services concluded by HROTE with participants in the balancing electricity market, following the Rules on Balancing the Power System issued by the TSO (*HOPS, 11/2019*).

The electricity exchange and guarantees of origin

HERA and the TSO are responsible for organising the electricity exchange for the physical trade of electricity in the entire territory of the Republic of Croatia and connecting with other exchanges. For this purpose, the Croatian Electricity Exchange d.o.o. (CROPEX) was established.

At the beginning of 2019, HROTE started selling some of the produced electricity from RES generators that are a part of the ECO Balance Group on the electricity market through the CROPEX trading platforms.

The transition to the market sale of electricity by HROTE also opened the possibility of establishing a system of selling Guarantees of Origin for the electricity generated by privileged electricity generators that are receiving a support mechanism. Such guarantees of origin can be issued within the Croatian Register of Guarantees of Origin and sold to participants in the electricity market through auctions.

Under the agreement between HROTE and CROPEX, guarantees of origin of electricity are sold at auctions of guarantees of origin organised by CROPEX. The collected funds are transferred to the support mechanism fund, while the guarantees of origin sold at the auctions are transferred from HROTE's user account in the Register of Guarantees of Origin to the accounts of the auction winner.

11 HROTE will adopt new Rules within six months of the entry into force of the RES Act

8. FINANCIAL ENVIRONMENT, FINANCING OPPORTUNITIES AND EXPECTED TRENDS

8. 1. INTRODUCTION

Renewable energy projects are usually financed either in corporate finance structures ("balance sheet"), which is more common for traditional energy investments, or in project finance structures ("off balance sheet"), which prevails in RES projects. Utility-scale RES investments in Croatia are mainly financed in project finance structures.

Although not in the focus of this document, it is worth noting that there is a segmentation of the market into utility-scale and small-scale RES projects in which electricity generators are also consumers. In the small-scale market, technically and financially innovative financing mechanisms (e.g., energy cooperatives, crowdfunding, blockchain technology, etc.) are to be expected.

In a corporate finance structure, investment is shown in the balance sheet of the project sponsor, hence the owner(s) of the project and/or the developer (hereinafter in either meaning: the "sponsor"), with debt raised at a corporate level, and lenders with a recourse right to all the assets of the corporation in question.

In project finance, the sponsor creates a company dedicated to implementing the RES project as a self-contained legal entity, a so-called special purpose vehicle (hereinafter: SPV), which holds all project assets (one or more RES), and the RES project is financed by SPV equity and debt. Repayment to equity investors and debt providers to SPV depends solely on future SPV cash flows, which means that project liabilities cannot have recourse to the sponsor's other assets.

Debt-to-equity ratios in project financed RES projects under a support mechanism depend on different factors, but in general for utility-scale RES projects would be 70-80% debt and 20-30% equity.

Furthermore, there are significant differences in risk, not only in respect of different RES technologies and risk profiles, but also between the individual phases of the same project:

1. **origination phase**, beginning with the selection of RES technology and project location, and including explorations yet to prove basic project preconditions, such as sufficient energy potential of RES and the like;
2. **pre-development phase** from the beginning of the formal project development procedure, until the obtaining of a building permit;
3. **development phase**, encompassing construction on the basis of obtaining a building permit (ready to build) until obtaining a usage permit; and
4. **exploitation phase**, encompassing regular operations from obtaining a usage permit for the entire project lifetime, until the end of the project lifetime.

The first two phases are the early preparation project phases (hereinafter jointly: preparation phases), entailing a high level of risk and consequently limited options in terms of funding sources, but usually with an expected high yield in the case of the successful completion of the phases, with results being the basis of the project's bankability. The last two phases are mature project phases, with a range of available funding options.

Wind energy-specific requirements

The level of investments and risks in the preparation phases depends on the RES

technology and are particularly significant in the case of the use of wind and geothermal sources.

For wind energy projects, the wind yield assessment is particularly important. The bank will request a minimum of one year of wind measurements, preferably two. A longer measurement period will result in a more accurate energy yield assessment, which will lower the production risk. Measurements usually start at the origination phase of the project, and are carried out throughout the preparation phases. Some projects continue with wind measurements through the construction and operation phases as well, to improve the project's generation planning.

For wind projects that aim to be financed by development banks, such as the European Bank for Reconstruction and Development, it is also important to prepare a one-year Birds and Bats Study and an Environmental and Social Impact Study, which must be conducted by one of the **companies licenced by the ministry responsible for environmental protection**. When financing through commercial banks, the requirements are dependent on each bank individually. When financing through development banks, the most important criteria are that the company has previous experience in similar projects and that the NatureScot guidelines are followed. Often the development banks ask for the overhead line to be included in the study too, although this is not required by local regulations.

Other requirements

Important constraints that need to be taken into account during the preparation phases, regardless of RES technology, are the following: land rights and environmental impacts, and risks associated with these issues.

It is crucial for a project's later bankability to secure land rights in the project locations, including corridors for grid connection, either through purchase, a long-term land lease, or rights of easement. It is also essential that any land rights are cleared of any encumbrances, because in order to secure project financing, it will usually be required to pledge any rights to land in favour of the bank as collateral for a nonrecourse loan.

Regarding the environment, if the preliminary EIA proves that a full EIA is necessary, the full EIA will also be needed for financing purposes.

8. 2. FINANCING OPPORTUNITIES

Once the building permit is obtained, the RES project enters the mature phases, which are generally considered to be bankable, and consequently, a range of financing sources is available, such as:

a) equity financing;
b) debt financing;
c) incentives from the cohesion policy programs of the EU and other programs, as well as recently established financial support funds under the provisions of the EU-ETS Directive, Modernization Fund, Innovation Fund; and
d) funds collected from the auctions of Guarantees of Origin organised through the IT auction trading platform by CROPEX.

Equity Financing

Private equity funds by default provide capital in exchange for an equity share, or a position at a strategic level. The debt and the

equity used to finance a project are paid back from the cash flow generated by the project, under the project financing scheme.

Until now, the main sources of equity funding in Croatia have been foreign investment funds, which have also provided convertible bonds to renewable energy projects in Croatia. Recently, however, several domestic venture capital funds, backed by joint investments from HBOR and the European Investment Fund, as a part of European Investment Bank, have started operating.

The Alternative Investment Fund Act (*OG, No. 21/18, 126/19*) laid down grounds for establishing alternative investment funds, to raise capital through public or private offerings and investing the collected capital, for projects based on provisions and structures related to alternative investments, such as RES projects. The act is regulated by the Croatian Financial Services Supervisory Agency (HANFA).

Debt Financing

Banks in Croatia play a key role in the debt structuring aspects of project finance, and determining financial structures for construction.

The most important documentation for project assessment would be: a company profile, audited financial statements, a management profile, and a project feasibility study, in addition to the documentation defined by regulations. Repayment for RES projects should be managed from the cash flow generated from the project, and secured by the project's rights and assets being offered as collateral.

However, if the project does not have a support mechanism such as an FiT or an FiP, it is unlikely that the project will receive debt financing, although development banks such as the EBRD are willing to explore financing projects outside of the support scheme. For more information on the relationship between support mechanisms and the cost of capital in Croatia see Chapter 10.5 - Key drivers for the development of renewable energy projects.

The financing procedure generally starts once the main permits are obtained, and main contracts are signed or about to be signed (e.g. GCA, construction right agreement, etc.).

Financial closure usually lasts between six to nine months, with the due diligence phase being the most time-consuming. The due diligence is conducted by independent third parties (both technical and legal), approved by the lender. Financing is usually timed to be completed by the commencement of construction.

Although not used in Croatia until now, debt financing through the issuance of bonds at the project level on behalf of SPV may also be expected in the years to come.

And lastly, financing by debt may also include loans from Export Credit Agencies.

8. 3. EXPECTED TRENDS

New investments in RES projects in Croatia will mostly be driven by the new support mechanism, which will allow project sponsors to access debt financing.

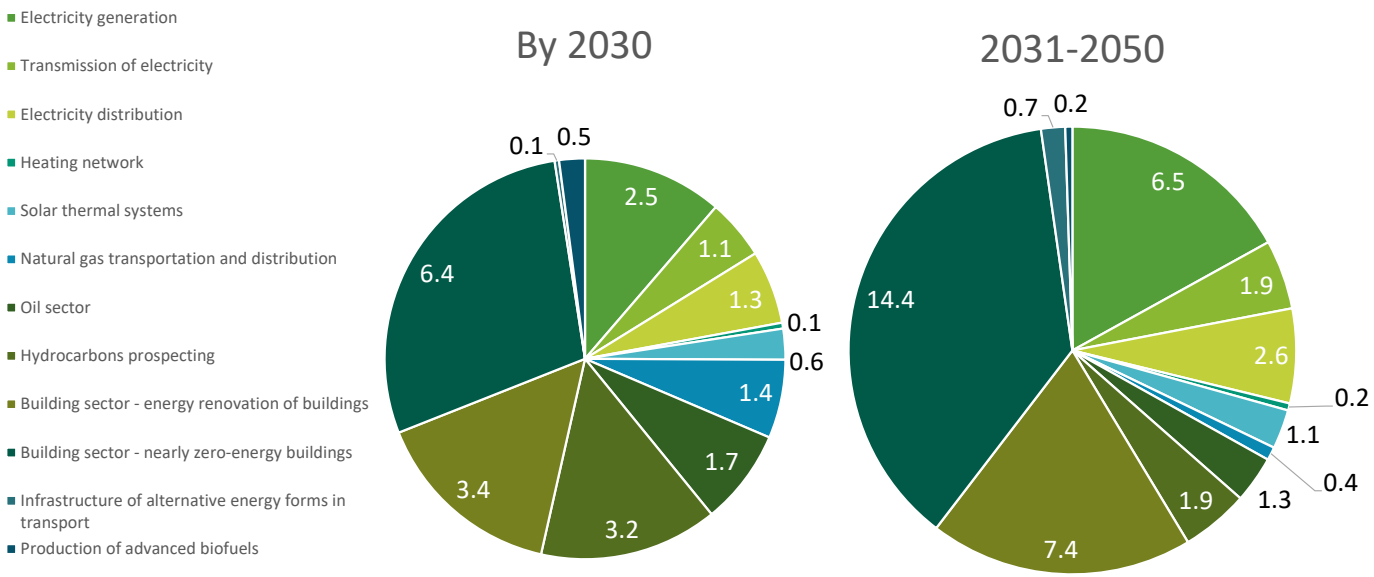
According to scenario S1 of the Croatian Energy Strategy, investments in electricity generation will be at least HRK 19 bn (€2.5 bn) by 2030 and HRK 49.7 bn (€6.5 bn) in the 2031-

2050 period. Most of these investments will be in RES projects.

According to scenario S2 of the Croatian Energy Strategy, investments in electricity generation will be at least HRK 16 bn (€2.1 bn) by 2030, and HRK 36.9 bn (€4.9 bn) in the 2031-2050 period.

With the revision of the 2030 RES target for the EU, investments in the RES sector in Croatia are expected to increase even more.

Figure 6. Investments (in € bn) in the energy sector from 2021 to 2050 in the S1 scenario (Republic of Croatia, 2020)



9. TAX SYSTEM

In Croatia there are the following key components of the taxation system to be considered:

- corporate income tax (profit tax);
- value-added tax (VAT);
- real estate transfer tax;
- local community fee;
- other taxes; and
- tax incentives.

Corporate Income Tax (CIT)

The income generated from RES energy generation is generally subject to the standard corporate income tax (hereinafter: CIT) rules at the country level. The Croatian CIT statutory rate is 18% for taxpayers with revenues in the tax period equal to or above HRK 7.5 mil (approximately €1mil), and 10% for taxpayers with revenues in the tax period below this threshold.

Non-resident companies are subject to the same tax rates as local business entities but only on their income derived in Croatia.

The taxable base is the accounting profit/loss in accordance with the applicable accounting standards, adjusted for CIT purposes for non-deductible expenses and non-taxable income. Losses may be carried back up to five years and set off against taxable profits, while the cumulated amount of older losses write-off and not reimbursed is subject to CIT. The carry back of losses older than five years is not permitted and there are no tax grouping provisions. The CIT taxable base is the accounting profit/loss adjusted for deductions and disallowed items. It also includes gains derived from liquidation, selling, change of the legal structure, and the division of the taxpayer if it is determined at the market values.

Croatian tax legislation defines maximum tax-deductible depreciation rates. In the case of using lower depreciation rates for accounting purposes, the taxpayer has to take into account that the same rates need to be used for tax purposes as well. In other words, tax depreciation cannot be higher than accounting depreciation. Maximum tax-deductible defined annual depreciation rates that might apply to RES companies are as follows:

- energy plants, gears, rotors, generators, measuring and control equipment – 25%;
- transformers and cables for connection to the power supply – 10%; and
- buildings and constructions – 5%.

The above-defined depreciation rates may be doubled and considered as tax-deductible provided the same rates are used for accounting purposes. The impairment of assets is generally non-deductible (i.e., it represents temporary difference for CIT purposes). Land and forests (renewable resources) are not subject to depreciation.

Value-added tax (VAT)

The Croatian value-added tax (hereinafter: VAT) system follows the provisions of the EU VAT Directive. The statutory VAT rate is 25%. However, a reduced VAT rate of 13% is applied on the supply of electricity.

Real Estate Transfer Tax (RETT)

The acquisition of real estate is generally subject to the VAT rate of 25% or the Real Estate Transfer Tax (hereinafter: RETT) levied at the rate of 3%.

In general, if the real estate has not been used or older for more than two years, and a supplier of real estate is VAT registered, a VAT

of 25% can be applied.

The acquisition of real estate on which the VAT is not paid is subject to the RETT. The RETT is charged on the market value of the real estate. Construction land ownership or the right to build fees are always subject to VAT of 25% rate.

Local community fee

Apart from participating in utility contributions and fees whose amounts depend on local government units' policies, energy subjects that own power facilities have to pay a fee to local governments (municipalities and cities), on whose territory they are located. The Decision on Compensation Fee Amount for Use of Land Plots by Electricity Generation Facilities (*OG, No. 84/13, 101/13 and 72/15*) determines the compensation fee amount for the use of the land, the manner of collected fees distribution, and the possible use of related funds. According thereto, privileged electricity generators from wind farms of installed power above 1 MW, solar power plants with installed power above 0.3 MW, and GTPPs with installed power above 1 MW, are obliged to pay to the local government units, i.e., municipalities and cities, a HRK 0.01/kWh (€1.3/MWh) fee based on the electricity supplied to the power network. The same fee will be paid in the case of generation from a hydropower plant with an installed power over 1 MW, except for specifically excluded cases in the attachment to the decree.

Geothermal water exploitation fee

Companies producing geothermal waters for energy purposes pay an exploitation fee which is defined by an Ordnance on Fees for Exploration and Exploitation of Hydrocarbons (*OG, No. NN 25/2020*). It consists of a fixed fee, which depends on the size of the exploitation field, and a variable fee that depends on the produced volumes and contracted sales value of the geothermal brine (or its product such as electricity).

The fixed fee is HRK 30,000/km^2 (approximately €4,000/km^2) per year for predominantly electricity producing projects with geothermal temperatures of above 100°C, and HRK 1,000/km^2 (€132/km^2) for predominantly heat-producing projects with geothermal temperatures below 100°C.

Other taxes

The Croatian social security system consists of three main branches: health, pension, and unemployment insurance. Mandatory social security contributions are payable by the employer in the amount of 16.5% of the employee's gross salary, which is not capped. Employers are not liable for payroll tax, but they are required to withhold a certain percentage of their employee's gross income. The rate of withholding is a progressive rate between 24% and 36%, depending on the employee's income level.

Employers pay a mandatory annual membership fee to the Croatian Chamber of Commerce, except for companies founded after the January 1, 2021, which are suspended from the obligation to pay membership fees for the first two years of operating. The amount of the annual membership fee varies between HRK 42 (€5.5) and HRK 3,973 (€524), depending on the size of the company.

In general, RES companies may be subject to many of about 440 different non-tax and parafiscal charges (such as forest contributions and cultural monuments contributions). In order to improve the business climate, the

Croatian Government has recently adopted an Action Plan for Reduction of Non-tax and Parafiscal Charges.

Tax incentives

The Investment Promotion Act (*OG, No. 102/2015, 25/2018, 114/18, 32/20, 20/21*), provides the legal framework that defines certain incentives to investors in order to stimulate a better investment climate in the Republic of Croatia.

Qualifying foreign companies may be eligible for a 50% or 100% tax-deduction in the income tax rate for a five to ten-year period, depending on the following criteria:

- enterprise category in terms of size;
- the investment amount and;
- the number of newly employed.

The Republic of Croatia has signed over 60 treaties of avoidance of double taxation

10. SUPPORT MECHANISMS FOR RENEWABLE ENERGY SOURCES (RES)

10. 1. INTRODUCTION

In Croatia, the use of renewable sources for electricity generation was encouraged via FiTs (lasting 12 or 14 years), which was in force from 2007 until the end of 2015. Thanks to this model, the installed capacity of generation capacities grew and based on the latest available data from HROTE, a total of 1,035 MW of projects had an FiT by December 31, 2020 (HROTE, 2021).

Due to the falling costs of renewable energy, but also to encourage competition in the sector, the EC presented the Guidelines on State aid for environmental protection and energy under which the Member States should award state aid through a competitive bidding process. That is why at the beginning of 2016, Croatia adopted the RES Act under which a support mechanism would be awarded through competitive pay-as-bid auctions.

The RES Act regulates two types of support mechanisms for RES:

- a guaranteed purchase price for power plants of a maximum output of 500 kW (FiT); and
- a FiP, i.e., payment available to a winning bidder under a contract made with HROTE for net electricity sold on the electricity market.

The RES Act stipulates that the Government will issue a new regulation on the manner of acquiring, realising and terminating the right to market premium incentives and incentives guaranteed by the purchase price within 3 months from the entry into force of ZOIE-iVUK. At the time of writing this guide is not available and changes are possible compared to the situation described here.

Both systems are prepared and conducted by HROTE by choosing the lowest bidder at an auction. Both support mechanisms will award a 12-year contract.

The FiT support mechanism was approved by the local regulator and the first auction for a FiT was announced at the end of 2020 while the FiP tender was announced only for biomass and biogas plants between 500 kW and 2 MW.

The new FiP support mechanism scheme received the approval by the EC due to state aid. By the time of writing this guide, neither the European Commission's decision nor the program is publicly available.

The Quota Regulation (Regulation on Quotas for Promotion of Electricity Generation from RES and HEC (*OG, No. 57/2020*)) has been published and is applicable for quotas for the period 2020 – 2022. The total output that is eligible for the support, the so-called quota, amounts to 2,265 MW and is distributed as outlined in Table 4.

Under the RES Act, the sliding FiP is calculated as the difference between the reference market price of electricity in the previous month and the bid price. If the calculated FiP is negative or the reference market price of electricity is negative, then there is no support.

The bid price in FiT and FiP auctions is indexed annually in accordance with the index of consumer prices published by the Croatian Bureau of Statistics.

Under the RES Act and the Incentives Regulation (Regulation on Incentivising Electricity Generation from RES and HEC (*OG, No. 116/18 and 60/20*)), HROTE publishes a call for auctions at least once a year following the avail-

Table 4. Quotas for 2020-2022 auctions

Facility type	Planned capacity	Quota (MW)	Auction conducted	Average winning price (HRK/MWh)	Average winning price (€/MWh)
Solar power plants	50 kW – 500 kW	210	Yes for 50 MW	586.19	77.24
	500 kW – 10 MW	240	No	N/A	N/A
	> 10 MW	625	No	N/A	N/A
Hydropower plants	≤50 kW	4	Yes for 4 MW	0 offers received	0 offers received
	50 kW – 500 kW	10	Yes for 5 MW	1050	138.35
	500 kW – 10 MW	10	No	N/A	N/A
Wind farms	> 3 MW	1,050	No	N/A	N/A
Biomass power plants	50 kW – 500 kW	6	Yes for 6 MW	1330	175.24
	500 kW – 2 MW	20	Yes for 8 MW	1120	147.57
	2 MW – 5 MW	15	No	N/A	N/A
Geothermal power plants	> 500 kW	20	No	N/A	N/A
Biogas power plants	50 kW – 500 kW	15	Yes for 7 MW	1130	148.89
	500 kW – 2 MW	30	Yes for 8 MW	1080	142.30
Innovative technologies supported by the EU		10	No	N/A	N/A

able quota. The public call for an auction has to be published two to four months before the start of the auction. The call for tenders should also define the planned start of FiP/FiT payment.

HROTE will determine the maximum reference values of electricity (ceiling price) once a year.

The RES Act further stipulated that if the market price on a monthly basis is higher than the reference price determined by the market premium agreement, the eligible producer is obliged to pay HROTE the difference between the market price and the reference price by the 25th of the month for the previous month. Although this is not the case for the program approved by the European Commission, it is to be expected that it will still apply to the aid granted under it.

10. 2. REQUIREMENTS FOR PARTICIPATION IN THE AUCTION

The Incentives Regulation requires that among other things, the auction participant must provide the following:

- A valid location or a building permit;

- The location permit is issued based on the

ideal design after the project has secured the connection to the grid and has been approved under nature and environmental protection regulations. The building permit is issued after the location permit (if the location permit is obligatory) and based on the main design.

- bid bond – bank guarantee or cash deposit in of HRK 50 (app. €6.60) per kW;

- the bid bond shall not be returned to the selected bidder if it fails to enter into the FiP/FiT agreement after the auction, if the bidder is rejected for providing false information or documents in the current auction procedure or any previous procedures, or if the bidder has colluded with other bidder/s to manipulate the procedure.

Only new plants and those regarded as new are eligible for support. The reconstructed plant may be regarded as new if the cost of reconstruction equals at least to the forecasted revenues over seven years and if the existing plant is older than 20 years, with the exception of hydropower plants that need to be older than 30 years.

10. 3. SELECTING THE WINNING BIDS

When concluding long-term contracts for the sale of electricity, developers should take into account that HROTE has the right of first refusal at the reference price from eligible electricity producers who have concluded a market premium agreement, which can be used until October 30 of each year.

Inside the facility group, the winners are sorted according to the provided bid price (from the lowest to the highest). In the case of the same bid price, the next criterion is the planned capacity of the bid (from the lowest to the highest).

If there are bids with the same price and the same capacity within a facility group under which the quota is exceeded, then none of the bidders is selected.

The winning bidders have to provide a guarantee for completion of the facility of HRK 300/kW (approximately €40/kW) in a form of a bank guarantee or a cash deposit. The guarantee is returned to the bidders after they obtain the right to payment of the FiT or the FiP and if they have built their plants and obtained the privileged electricity producer status within the following deadlines:

- within one year for power plants connecting to the power grid at low voltage levels;
- within three years for power plants connecting to the power grid at voltage levels of 10 kV or 20 kV; and
- within four years for power plants connecting to the power grid at voltage levels of 30 kV and above.

In the first FiP/FiT tender there were 7 FiP winning bids and 64 FiT bids. There were 33 invalid bids and there were four that were valid but were outside quota (2 for FiP and 2 for FiT).

10. 4. OBTAINING THE RIGHT TO RECEIVE FEED-IN TARIFF (FIT) OR FEED-IN PREMIUM (FIP) PAYMENTS

The FiT/FiP lasts for 12 years as of the day of obtaining the status of a privileged electricity generator. The developer obtains the right to receive FiT/FiP payments upon obtaining the final decision on obtaining the status of a privileged electricity producer.

A valid Energy Approval issued by MESD is a prerequisite for privileged electricity gen-

erator status. The Energy Approval may be obtained after obtaining the location permit and it is valid for two years as of its enforceability within which period an investor has to provide MESD with the building permit.

An FiP agreement shall be terminated if the investor fails to obtain privileged electricity generator status within the deadlines (one, three or four years). Furthermore, the agreement shall be terminated if the construction of the facility is not completed within the validity period of the building permit.

Exceptionally, during the trial period, an electricity market operator shall pay a privileged electricity generator 50% of the amount of the guaranteed purchase price determined by an electricity purchase agreement.

10. 5. KEY DRIVERS FOR THE *DEVELOPMENT OF RENEWABLE ENERGY PROJECTS*

The development of renewable energy projects is mostly policy and resource driven. Policy drivers can be direct and indirect policy instruments. Direct policy instruments aim to stimulate renewable energy development immediately, while indirect policy instruments aim to improve the development of renewable energy projects in the long term.

Direct policy instruments among others include tax credits, low-interest loans, and support mechanisms. The main direct policy instruments in the Republic of Croatia are the guaranteed purchase price system (FiT) and the FiP.

Indirect policy instruments among others include carbon taxes, ambitious energy strategies, and long-term RES capacity targets.

For the resource drivers see Chapter 13 - RES Market Potentials.

Support mechanisms and financing costs

Today there are 19 active auction-based support schemes in the EU in which bidders usually receive support in form of a fixed or a premium remuneration for the generated electricity (Đukan, et al., 2021). Winners in the FiT and FiP auctions in the Republic of Croatia will benefit from 12-year visibility on future revenues, otherwise, the project developer would be exposed to a high merchant risk because it would need to sell the electricity on the wholesale electricity market, which is very volatile.

Having a policy instrument such as the FiT or FiP lowers the Weighted Average Cost of Capital (hereinafter: WACC) compared to a situation where there is no revenue stabilisation. WACC is an aggregate indicator that includes the cost of equity and cost of debt. As seen in Figure 7, WACC in the Republic of Croatia is among the worst in the EU, causing extremely high financing costs in Croatia compared to the other EU Member States.

Capital-intense RES technologies such as wind farms and PV power plants depend a lot on financing costs. If WACC increases, it leads to a higher levelised cost of electricity generation (LCOE). As shown in Figure 8 if WACC would increase from 4% to 10% that would result in a 50% increase in the LCOE of a 20 MW onshore wind farm (AURES II, 2019).

In the example of the United Kingdom (which has a lower WACC than the Republic of Croatia), the two-sided Contract for Difference (CfD) scheme (similar to the Croatian FiP system but in a CfD scheme the generator pays

back the difference between the market price and the bid price if the market price is higher) could lower the WACC of an onshore wind project by between 140 and 320 basis points, which would lower the LCOE by between €7/MWh and €14/MWh (ARUP, 2018).

In recent years t**here has been a strong decrease in the Costs of Capital (WACC), Cost of Debt, and Cost of Equity for RES projects across the EU.** Certain factors were identified as possible drivers of change, specifically: the interest rates of the Eurozone, international capital spill overs, and stable revenue stabilisation mechanisms across European countries. Overall, lower Costs of Capital are a positive sign for further RES development and are necessary in order to achieve national energy and climate goals.

Figure 7. Weighted Average Cost of Capital in 2019 for onshore wind (eclareon, 2020)

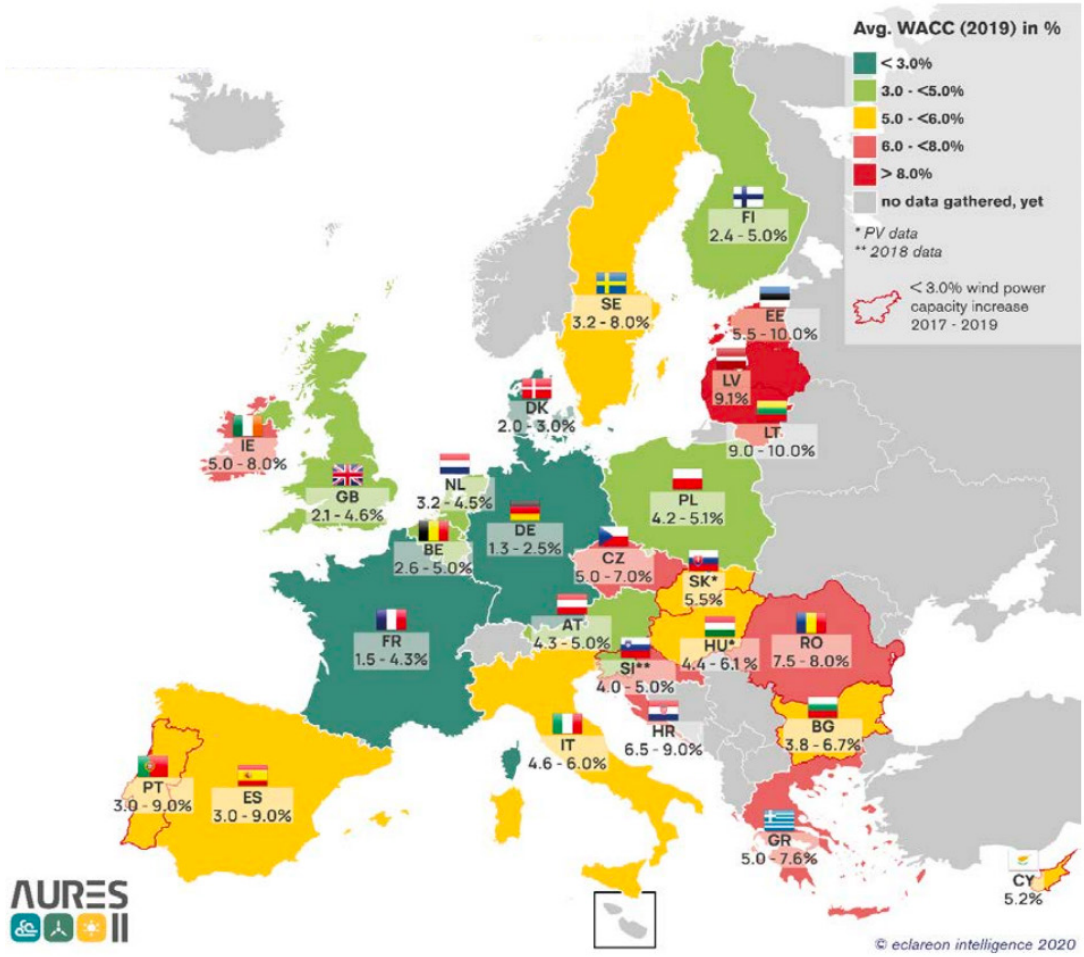
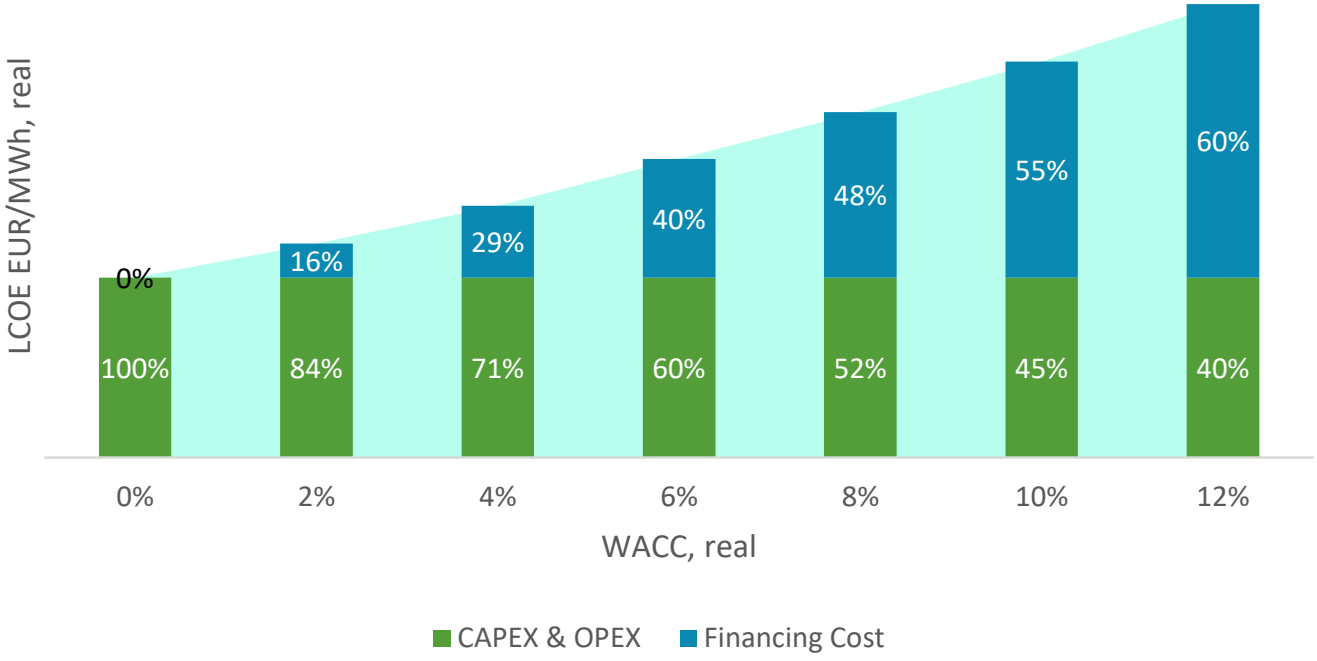


Figure 8. Impact of costs of capital on LCOE for an onshore wind farm (AURES II, 2019)



11. KEY RISKS AND OPPORTUNITIES

11. 1. SECTOR-LEVEL RES TARGETS

Current state of RES shares

According to the latest Eurostat figures, the Republic of Croatia reached 28.5% of energy from RES in its gross final consumption of energy in 2019 (eurostat, 2021). That is above the 20% RES target set for 2020. The strong surpassing of the target was due to the revised consumption of biomass. With the revised figures taken into account, Croatia had already an RES share of 23.4% in 2004.

An overview of sector-level targets for RES in the power sector (RES-E), RES in the heating and cooling sector (RES-H&C), and RES in the transport sector (RES-T), is provided in Table 5.

The share of RES in the power sector in Croatia is above the 34.1% average for the EU. This is mainly due to the large amounts of hydropower capacity (2.2 GW, including 1.5 GW of storage, 0.28 GW of pumped-storage, 0.4 GW of run-of-river and 0.03 of small hydropower) but also because of the installed capacity in wind, biomass, geothermal and PV power plants (Republic of Croatia, 2019).

In the heating and cooling sector, the Republic of Croatia has a share of renewable energy of 36.8%, far above the 22.1% average for the EU. This is driven mostly by the use of solid biomass.

In the transport sector, the EU agreed to set a common target of 10% for the share of renewable energy (including liquid biofuels, hydrogen, biomethane, renewable electricity, etc.) used in transport by 2020. The Republic of Croatia has a 5.9% RES share in the transport sector, far below the 8.9% average for the EU. In the transport sector, the share of alternative fuel vehicles in Croatia is still relatively small (less than 3%).

Table 5. Sector-level RES statistics and targets in the Republic of Croatia (eurostat, 2021), (AURES, 2016), (Republic of Croatia, 2020), (Republic of Croatia, 2019)

Sector	2019 statistics	2020 targets	2030 targets
RES	28.5%	20.1%	36.6%
RES-E	49.8%	39%	63.8%
RES-H&C	36.8%	19.6%	36.6%
RES-T	5.9%	10%	13.2%

Targets, measures, costs, and benefits until 2030

The 2030 targets set for the Republic of Croatia are established under the current revised Renewable Energy Directive (RED II) under which the EU-27 Member States need to reach a 32% RES share in the gross final energy consumption. At the time of writing this guide, the EU still had not agreed on the revised Renewable Energy Target for 2030, which would be in line with the European Green Deal. Based on the Impact Assessment of the newly agreed greenhouse gas reduction target of 55% by 2030 compared to 1990, the RES target for the EU-27 should be increased from 32% to 40% (European Commission, 2020).

The Republic of Croatia and other Member States will need to update their National Energy and Climate Plans (NECP) by the end of June 2023 in a draft form and by June 30, 2024, in a final form. The updated NECP will feature increased RES targets, including increased sector-level targets.

Under the current 2030 RES targets, electricity from RES would be the main driver in reaching the RES target of 36.6% in gross final energy consumption. There would also be an increase of thermal energy from RES, geothermal energy, liquid biofuels, and other sources.

Power sector

In the power sector, the strongest growth would be due to the doubling of wind power generation and large increases in solar power generation. There would also be increases in hydropower generation, geothermal energy, and thermal power generation from solid and gaseous biofuels. The increase of renewable electricity would be driven by the new auction-based FiP support scheme. Measures to promote the use of rooftop PV as well as the removal of any barriers and burdensome procedures, streamlined licensing, and the uptake of power purchasing agreements will enable the growth of renewables in the power sector.

Besides the increase in employment, the increase of renewables in the power sector will reduce greenhouse gas emissions. The emissions reduction for the generation and transformation of energy is estimated at 271 kt CO_2eq by 2030 (Republic of Croatia, 2019).

Furthermore, the power sector will benefit from an increase in the energy security of the system by reducing the amount of imported electricity, which is currently between 22% and 37% in the 2014-2018 period (Energy Institute Hrvoje Požar, 2020).

Heating and cooling sector

The heating and cooling sector would see increases in the use of geothermal energy, solid biomass, thermal RES, and solar energy. However, the RES targets for the heating and cooling sectors are lower than the requirements and indicative targets in the Renewable Energy Directive. Therefore, the EC has recommended that Croatia would need to provide further analysis, update relevant policies, and implement measures and quantify their projected impact (European Commission, 2020).

Transport sector

The transport sector would see a strong increase of biofuels by a factor of 2.3 compared to 2020 (most of them being advanced biofuels), while electricity on RES would double in the same period. The estimated contributions are the result of a simulation model run in the Croatian NECP. The thirteen existing and planned measures on alternative fuels' infrastructure, on support for electromobility and other alternative fuels, are listed in the Croatian NECP. Electrification of the transport sector is regarded as a key step in decarbonising and diversifying fuel supply. The underlying infrastructure for this is supported by a mix of regulatory and financial measures (Republic of Croatia, 2019).

The aggregated measures from the Croatian NECP provide for an emission reduction potential in the transport sector of 483 kt CO_2eq by 2030.

The annual evolution of sector-level RES

contributions expressed in kilotonnes of oil equivalent (ktoe) are presented in the figure below:

11. 2. KEY CHALLENGES, RISKS, AND OPPORTUNITIES FOR THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES

General

Although RES projects are identified as projects of interest in the Republic of Croatia, which should ensure their easier development, the administrative procedures of various stakeholders result in having a development procedure duration of approximately 8-10 years.

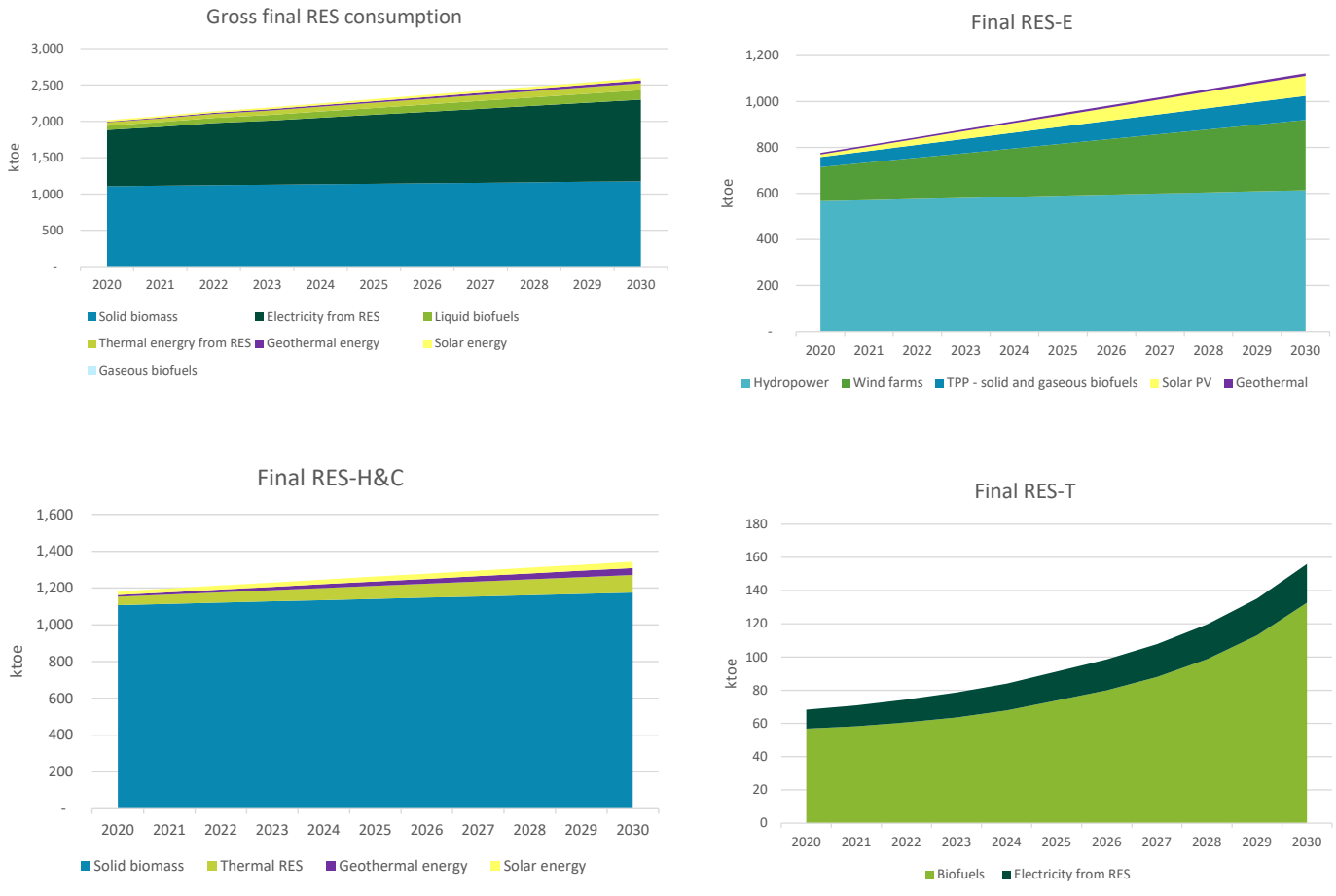
However, the new energy approval system will improve the assessment of the cumulative effects of RES projects on the ecological network as there will be up to date information on projects that should be taken into consideration while preparing underlying studies for assessment of the projects.

Grid congestion and costs

Due to the large number of RES projects that will be connected in the future, the grid-buildout will also need to increase. The construction of new power lines and power stations, as well as the reinforcement of the old infrastructure, may increase the cost of an RES project significantly, thus rendering it unfeasible.

In addition, there is uncertainty regarding

Figure 9. Estimated contributions of RES technologies by sector (Republic of Croatia, 2019)



the exact costs of grid reinforcements and the build-out of new grids in the existing network. In some cases, the developer depends on the completion of neighbouring projects to avoid an increased grid connection cost.

Changing legislation for securing land rights

Currently developing one project may require carrying out several procedures via different authorities, each of which may require different documents and have different operational practices. The planned tendering procedure of state-owned land has never been regulated by the relevant legislation, while some of the relevant authorities have stopped with pending procedures regarding state-owned property until the relevant legislation is adopted and the tendering procedure conducted. This has additionally triggered the relevant Ministries to decline the issuance of location permits for RES projects planned on state-owned land.

The new tendering scheme for the energy approval should relive pressure on the authorities involved who have to make decisions for all projects (e.g. environmental permits or grid connections in the same location) as only one project will be built.

State of land registry and property rights

In many locations, the land registry has not been aligned with the actual state of property rights, especially regarding the registration of roads, and municipal and state property. Such discrepancies may significantly prolong the procedures for securing land rights, because the status of land plots cannot be determined with certainty.

Uncertainty regarding a selected location

Currently, in most cases, a developer can be certain that other developers cannot take over its location merely upon completion of land rights procedures and signing a land rights agreement, which is a late step in the development stage of a project. As described above, the planned tendering procedure which would allow greater certainty to developers has still not been implemented.

According to the presentation of the MESD, the mentioned innovation in the Electricity Market Act should lead to the formal abandoning of tenders for land rights over state-owned land in the new RES Act, which is also planned to be enacted this year. Provided that other Ministries involved in granting land rights over state-owned land adapt their respective legislation and change administrative procedures swiftly, the two mentioned important obstacles for RES will be resolved and also a location could then be secured for one developer early on before substantial costs are incurred.

Financing of RES projects

A project in the pre-development phase is not bankable and therefore the developer bears the whole financial risk. However, after the pre-development phase, the key risks are the following:

- regulatory risks;
- design and technology risks;
- obsolescence risks (outdated technology);
- financial risks;
- counterparty risks; and
- performance risks.

From this list of risks, regulatory risks and obsolescence risks are the most important to address in RES development in Croatia.

Regulatory risk comprises risks of regulation changes during project development, or later during the operation phase. As Croatia is an EU Member State with an obligation to align its national regulations with EU legislation, this risk may be considered as low.

Obsolescence risks may be significant in the case of prolonged project development, which might make the permitted technology obsolete (i.e. newer wind turbines produce electricity at a cheaper price than their predecessors, making it a tough competition for older wind turbine models). If a developer wants to modernise its already permitted technology, a new EIA is usually required.

Necessary engagement of local design companies

Croatian authorities require a particular format of designs, the usage of the Croatian language, and there are some regulations that are different from those in the rest of the EU. Therefore, providers of technological solutions cannot simply prepare their own designs and ship them to Croatia along with the equipment; instead, they have to work together with certified Croatian design experts in order to prepare designs which will be acceptable to Croatian authorities and will guarantee the seamless permitting, construction, testing, inspection and final acceptance of the power plant before its commercial operation.

Local acceptance

There can still be resistance to the development of RES projects by local populations. The reasons can be various: noise, fear of poisoning and radiation, and concern regarding potential induced earthquakes (e.g. in geothermal projects). It is, therefore, necessary to establish open and transparent communications with the local community from the very beginning of a project.

Long-term RES quota targets

Besides the RES installations targets set out in the Croatian Energy Strategy and the NECP, there is little visibility regarding the quotas for RES projects that would be eligible to participate in the auction-based support mechanism. In the case of geothermal power, there is only 20 MW available for tendering until the end of 2022, and nothing yet defined for subsequent years.

Geothermal projects

The development of geothermal projects is characterised by high initial investment and the non-bankability of the exploration period. In addition to these challenges, and current RES development challenges and risks in Croatia, geothermal developers should also consider that geothermal brines in Croatia usually contain significant quantities of dissolved CO_2, some H_2S and potentially even hydrocarbons (methane, ethane, etc.). Due to their presence and the high concentration of corrosive salts (e.g., NaCl), corrosion inhibition or the usage of corrosion-resistant materials is mandatory.

12. THE DEVELOPMENT MARKET OF RENEWABLE ENERGY SOURCES (RES)

12. 1. INTRODUCTION

In addition to the 1,035 MW of RES and HEC projects that already have an FiT under the previous support scheme, there are 23 MW more that await connection under the same scheme. The growth from 109 MW in 2011 to more than 1 GW in 2020 resulted from 1,356 projects as seen in Figure 10.

Most of the capacity is installed in the four most southern counties, with Split-Dalmatia County, Šibenik-Knin County, Zadar County, and Dubrovnik-Neretva County having 688 MW installed as seen in Figure 11.

Out of all the renewable energy technologies, wind energy was the technology that grew the most in the FiT support scheme. In 2020, 718 MW of wind farms was under the FiT support scheme and represented 69% of all RES and HEC capacity. Biomass is the second largest RES technology, with 8.3%, followed by PV power plants (5.1%), biogas (4.4%), and geothermal power (1%) as seen in Figure 12.

Merchant utility-scale power plants

In addition to the FiT projects, there is some limited development of merchant projects. The Croatian state-owned power utility HEP connected its 58 MW Korlat wind farm in late 2020, which is the first wind farm in the Republic of Croatia to be constructed without a support mechanism. HEP announced that it will build 1.5 GW of new power generation capacity by 2030, out of which 750 MW will comprise new wind and PV power plants (HEP, 2020).

The largest merchant RES project in the Republic of Croatia that is under construction is the 156 MW Senj wind farm. The project is led by China's Norinco International Co. Ltd, and is scheduled to start generating electricity in 2021. The wind farm has 39 wind turbines from the Chinese turbine manufacturer Shanghai Electric.

Figure 10. Renewable energy projects under the old FiT support scheme (HROTE, 2021)

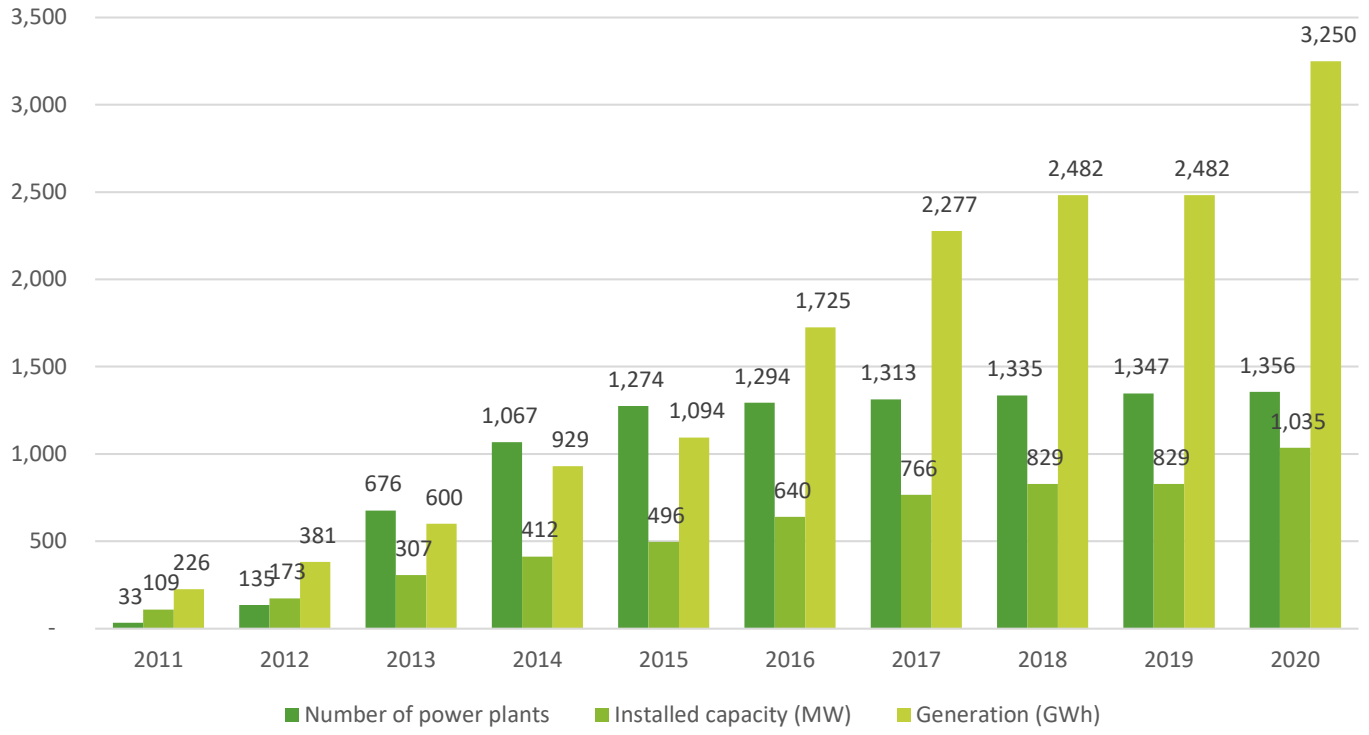


Figure 11. Installed capacity and number of RES projects per county under the old FiT support scheme (HROTE, 2021)

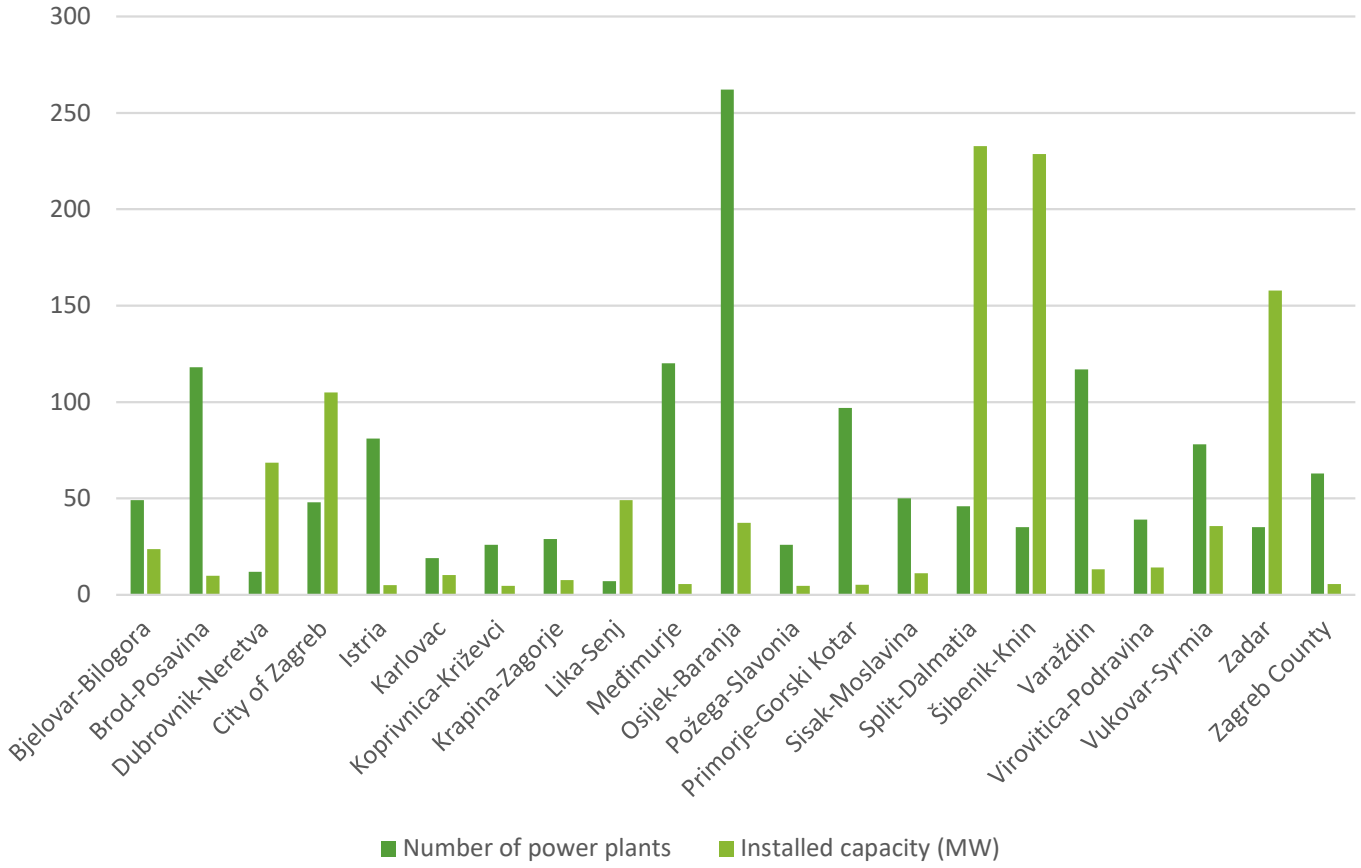
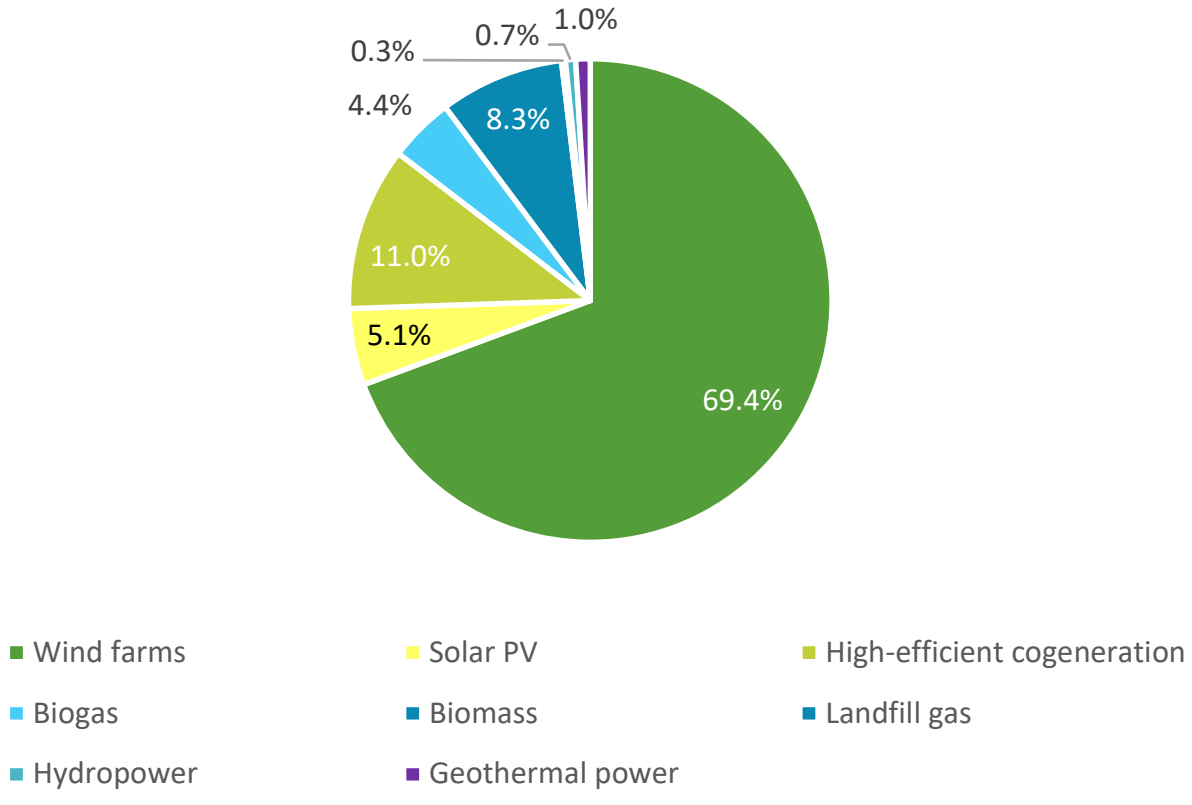


Figure 12. Installed capacity per technology under the old FiT support scheme (HROTE, 2021)



The Slovenian energy group Petrol also has a merchant wind farm in Croatia – the 30 MW Ljubac wind farm will be commissioned in 2021.

In PV there is also a limited number of utility-scale merchant projects. In 2020, HEP put into operation the largest PV facility in the country - the 3.5 MW Vis PV power plant. HEP plans to commission six additional PV power plants: the 1 MW Marići power plant; the 2 MW Kaštelir 2 power plant; the 6.5 MW Cres power plant; the 5.5 MW Obrovac power plant; the 2.1 MW Vrlika Jug power plant; and the 2.5 MW Stankovci plant (HEP, 2021).

12. 2. RES REGISTER

As explained in Chapter 3.3**.** - Act on Renewable Energy Sources and High-Efficiency Cogeneration**,** an RES Project is defined as a project if it is registered in the RES Register. The RES Register provides a record on:

- RES and HEC cogeneration projects;
- power plant is using RES and HEC plants; and
- privileged electricity generators in the territory of the Republic of Croatia.

According to the data from the RES Register on May 7, 2021, there were 5.5 GW of projects in the RES register. Most were wind power plants, followed by hydropower and cogeneration as seen in Figure 13.

There are 379 MW of PV power plants, out of which 49 MW are integrated PV power plants. Furthermore, there is 1.6 GW of thermal capacity. Most of the thermal capacity is from biogas power plants, followed by biomass power plants, and cogeneration power plants.

According to the database of the transmission system operator, as of September 15, 2021 there are 11.30 GW of projects that are candidates for connection to the transmission grid (HOPS, 2021). Almost half of the capacity is for PV power plants, followed by wind power plants and hybrid power plants, as seen in Figure 14.

Figure 13. Power (left) and thermal (right) capacity of projects in the RES Register (Ministry of Economy and Sustainable Development)

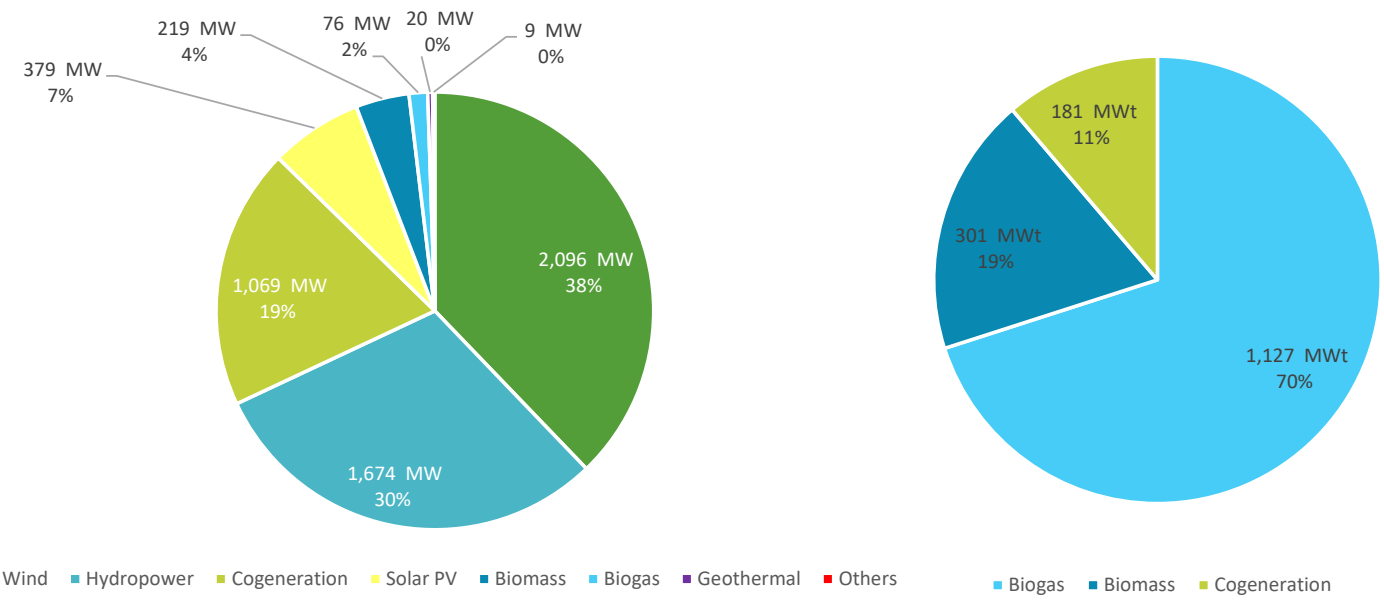
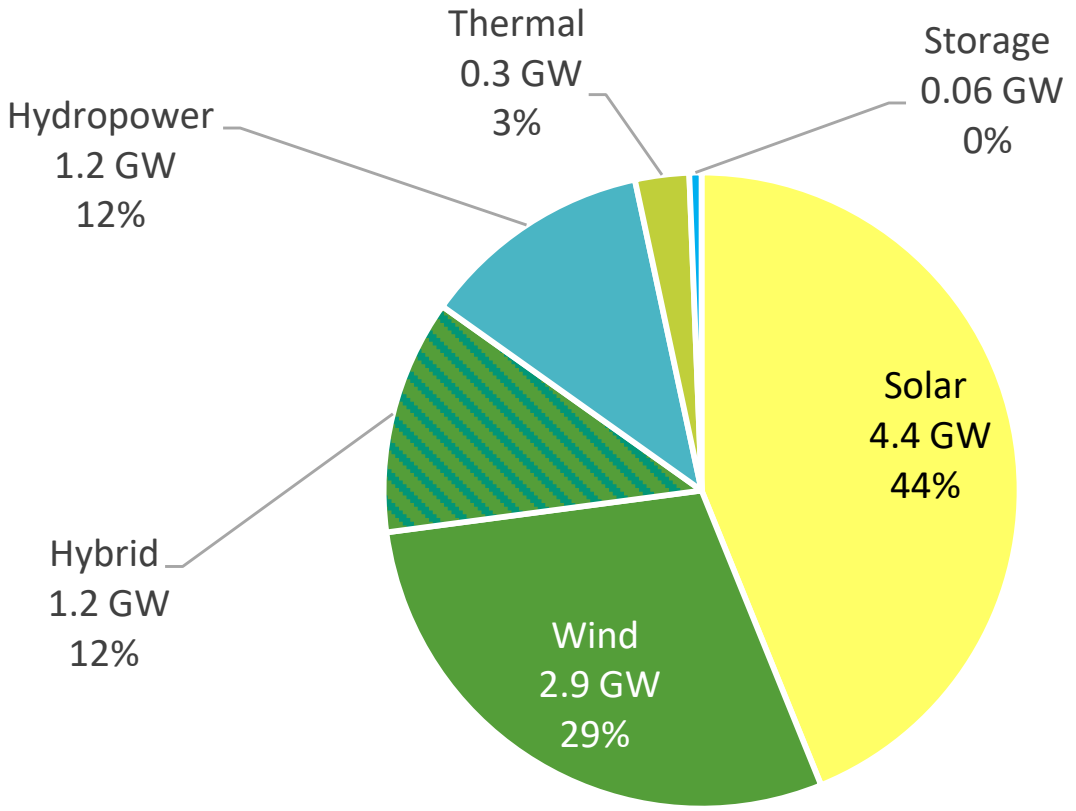


Figure 14. Electricity generation projects waiting to be connected to the transmission grid (HOPS, 2021)



12. 3. GEOTHERMAL PROJECTS UNDER DEVELOPMENT

At the time of writing this report, there were 19 active geothermal projects in Croatia. Six projects are in the exploitation/generation phase, out of which one project produces electricity (10 MW net) and five are producing heat (91 MW_{th}) as seen in Table 6.

The two heat-based projects, Bošnjaci sjever and Sveta Nedelja are heating greenhouses for tomato production, while the other three are heating buildings.

There is also one hybrid project (Draškovec) combining geothermal energy with natural gas, which administratively-speaking should be in the exploitation phase, however, is *de facto* still in the development phase.

At the time of writing this report, there were 12 projects in the exploration phase, out of which seven projects are solely for electricity generation, three projects for thermal energy, and two have expressed interest in the combined generation of electricity and heat. The list of projects in the exploration phase is shown in Table 7.

Projects that are currently targeting only electricity generation can also additionally utilise the waste heat of their electricity generation process, this is not a legal requirement however.

Table 6. List of geothermal projects in the exploitation (production) phase (Croatian Hydrocarbon Agency)

Exploitation field	Location (county)	License holder	Ownership	Type
Bizovac	Osijek-Baranja	INA-INDUSTRIJA NAFTE d.d.	Private / Public	Heat
Bošnjaci sjever	Vukovar-Syrmia	RURIS d.o.o.	Private	Heat
GT Ivanić	Zagreb County	INA-INDUSTRIJA NAFTE d.d.	Private / Public	Heat
Sveta Nedelja	Zagreb County	EKO PLODOVI d.o.o.	Private	Heat
Velika Ciglena	Bjelovar-Bilogora	GEOEN d.o.o.	Private	Electrical
GT Zagreb	City of Zagreb / Zagreb County	GPC INSTRUMEN-TATION PROCESS d.o.o.	Private	Heat
Draškovec	Međimurje	AAT Geothermae d.o.o.	Private	Electrical / Heat

Table 7. List of geothermal projects in the exploration phase (Croatian Hydrocarbon Agency)

Exploration area	Location (county)	License holder	Ownership	Type
Babina Greda 1	Vukovarsko-srijem-ska	GEJZIR d.o.o.	Private	Electrical
Babina Greda 2	Vukovar-Syrmia	GEOTERMALNI IZ-VORI d.o.o.	Public	Electrical
Ernestinovo	Osijek-Baranja	ENSOLX d.o.o.	Private	Electrical
Karlovac 1	Karlovac	GeotermiKA d.o.o.	Public	Electrical / Heat
Korenovo	Bjelovar-Bilogora	TERME BJELOVAR d.o.o.	Public	Heat
Križevci	Koprivnica-Križevci	KOMUNALNO PO-DUZEĆE d.o.o.	Public	Heat
Legrad 1	Koprivnica-Križevci	Terra Energy Gen-eration Company d.o.o.	Private	Electrical
Lunjkovec - Kutnjak	Varaždin / Koprivni-ca-Križevci	BUKOTERMAL d.o.o.	Public	Electrical / Heat
Merhatovec	Međimurje	ENSOLX d.o.o.	Private	Electrical
Slatina-2	Virovitica-Podravina	Geo Power Zagocha d.o.o.	Private	Electrical
Slatina-3	Virovitica-Podravina	EES DRAVACEL EN-ERGETIKA d.o.o.	Private	Electrical
Virovitica 2	Virovitica-Podravina	POSLOVNI PARK VIROVITICA d.o.o.	Public	Heat

13. MARKET POTENTIAL FOR RENEWABLE ENERGY SOURCES (RES)

13. 1. RESOURCE POTENTIAL FOR RENEWABLE ENERGY SOURCES (RES)

The Republic of Croatia has a vast technical potential for the development of renewable energy sources. However, the biggest RES potential is in southern counties. The PV potential is higher in the coastal areas compared to the rest of the country as seen in Figure 15.

As seen in Figure 16, the wind potential is also very high in coastal regions but there is also potential for wind development in inland parts of Croatia. However, wind speed increases with height and new wind turbine models have higher hub heights than the measured data, therefore an even higher wind potential should be assumed.

Croatia is well-positioned for the utilisation of

Figure 15. Photovoltaic (PV) power potential in Croatia (World Bank)

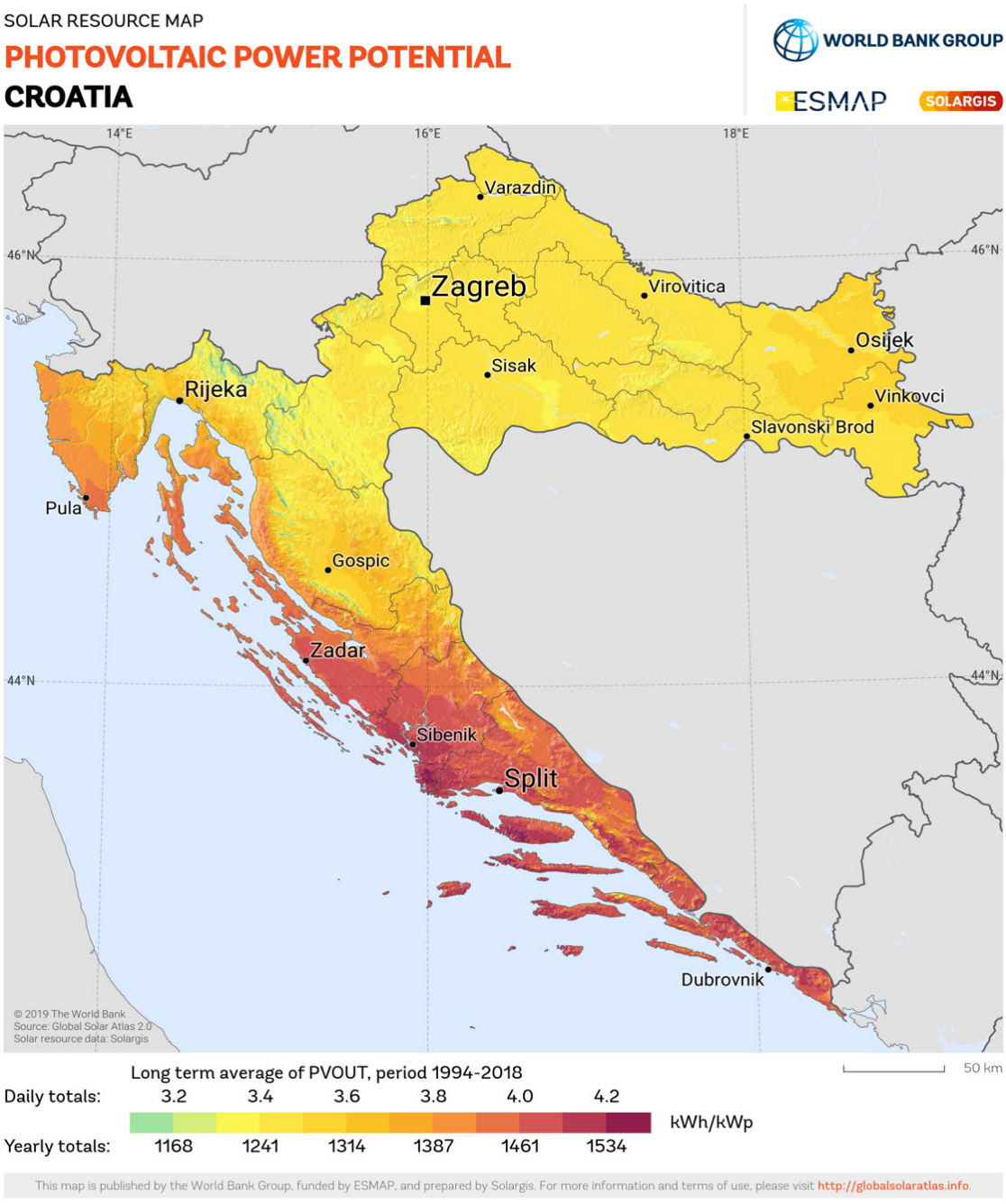
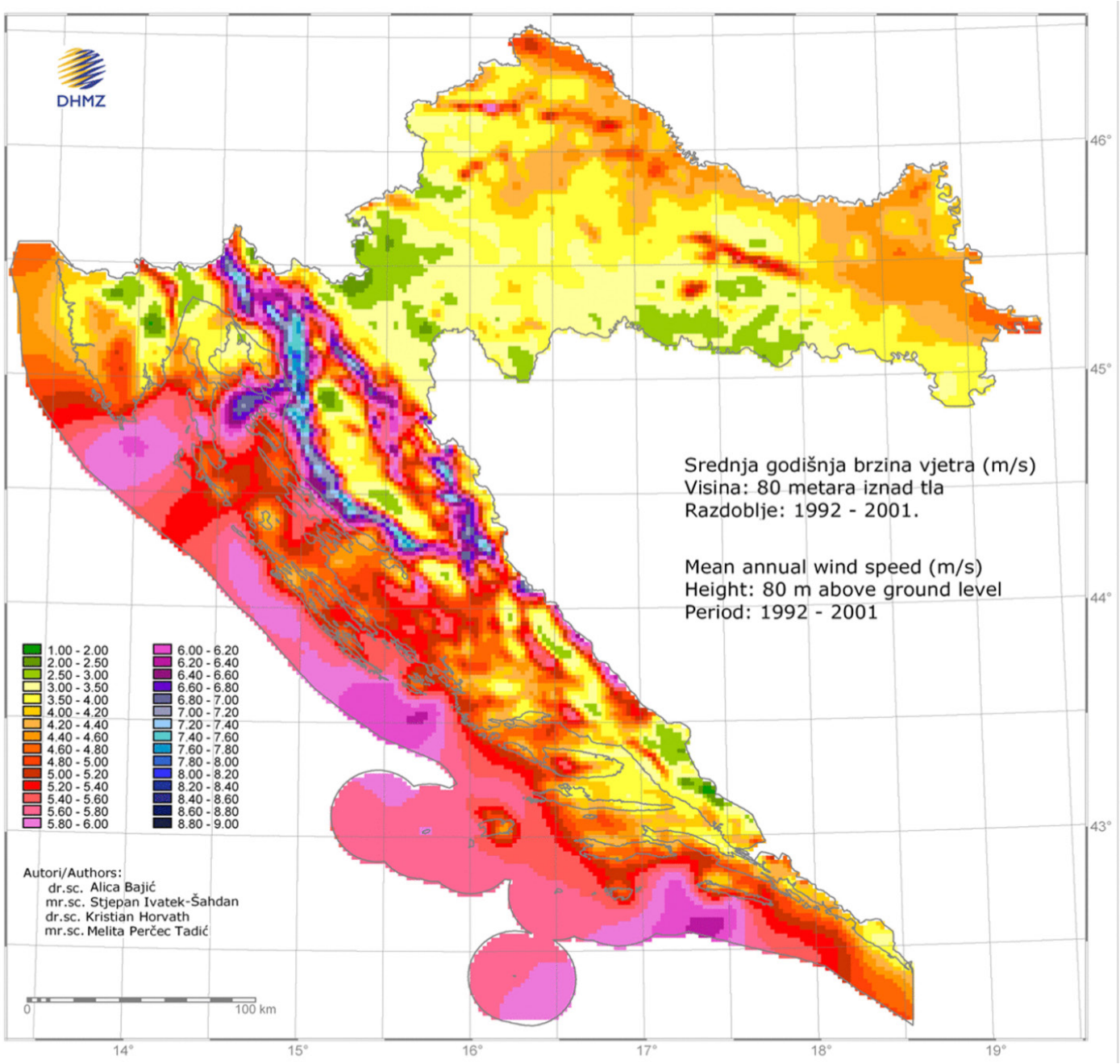


Figure 16. Mean annual wind speeds in Croatia (Croatian Meteorological and Hydrological Service)



geothermal energy. The high geothermal gradient in the continental part of Croatia is illustrated in Figure 17. It is 60% higher than the European average, and this translates into high temperatures in deep aquifers, approx. 100°C at the depth of 2,000 m, and 150°C at the depth of 3,000 m.

Furthermore, an 80-year history of oil and gas exploration and production has left a legacy of data from more than 4,000 exploration and development wells, as well as tens of thousands of kilometres of seismic lines. Due to such a large amount of data, the subsurface is very well known and geological risks are therefore significantly decreased.

The biomass potential is high in continental Croatia and one of the highest in the EU, as seen in Figure 18.

Figure 17. Geothermal gradient in Croatia (°C/100 m) (after Jelić et al., 1995)

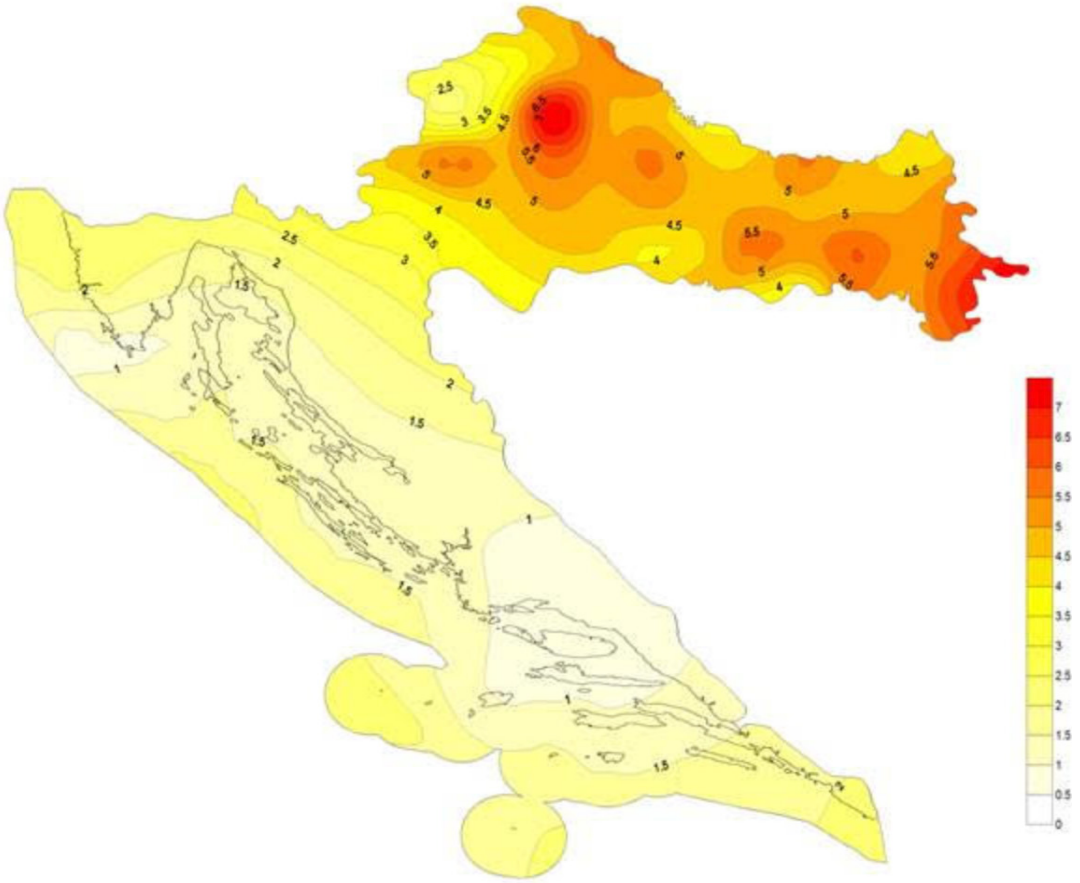
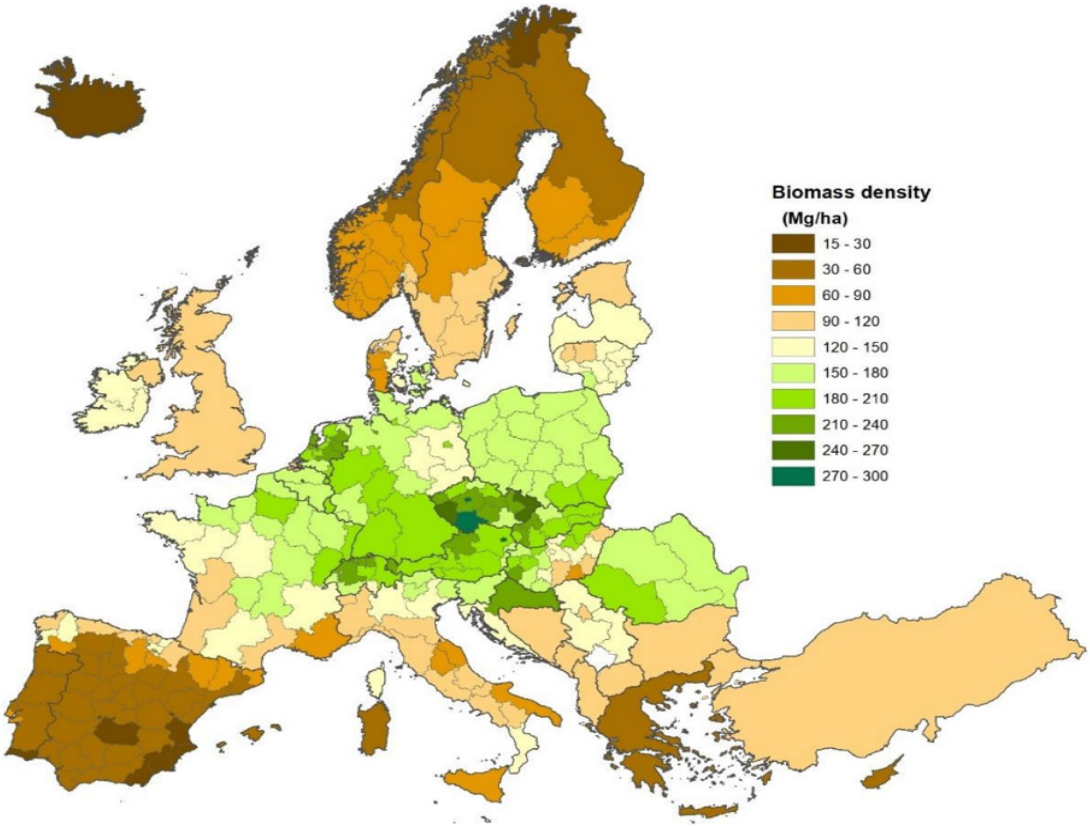


Figure 18. Biomass density of the forest area in Europe in Mg/ha (European Commission, Joint Research Centre , 2020)



13. 2. TECHNICAL POTENTIAL FOR RENEWABLE ENERGY SOURCES (RES)

In addition to the planned RES installations that were shown in Chapter 2.2 - Croatian Strategies and Documents, there is a significantly larger RES potential than that which is expected to be built in the 2020's.

Joint Research Centre of the European Commission (EC)

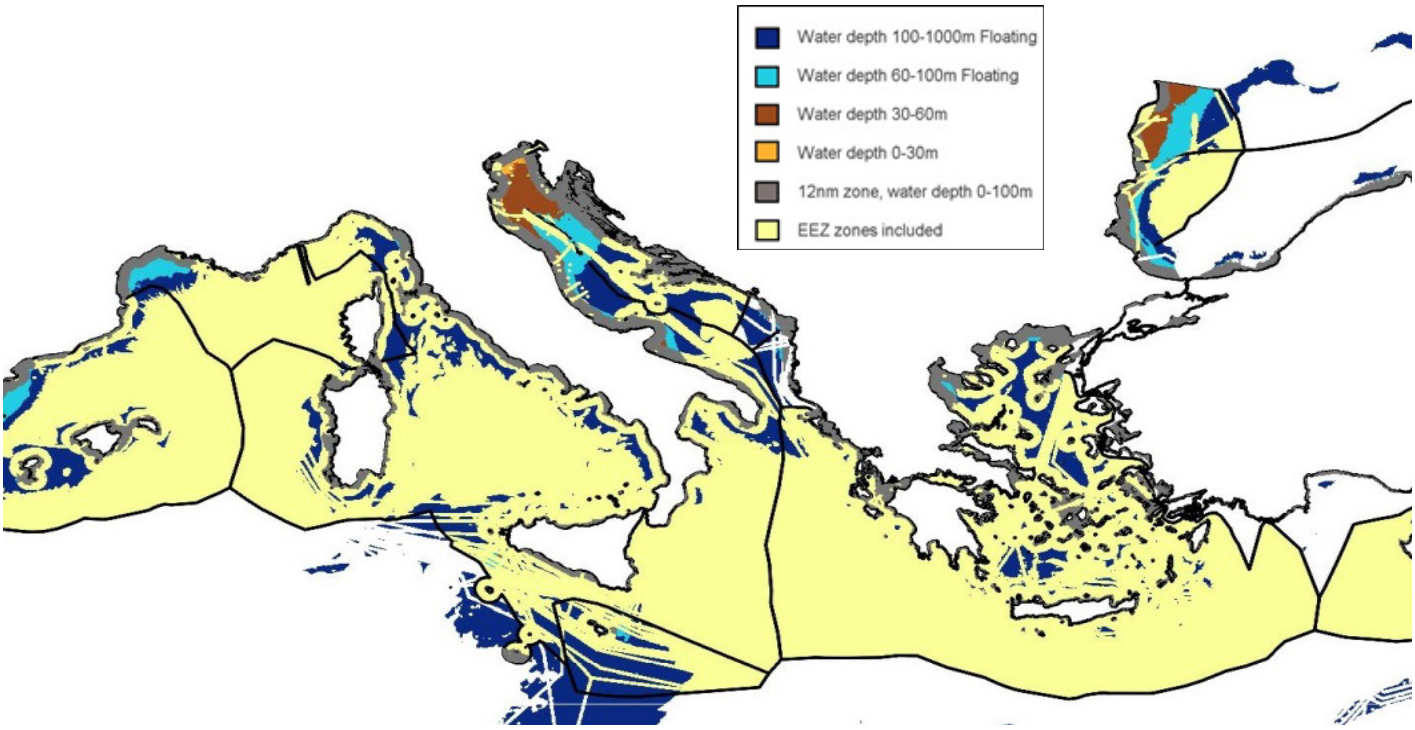
According to the *EU-Wide low restrictions scenario* from the Joint Research Centre of the European Commission, the Republic of Croatia has a potential of 61 GW of onshore wind capacity and 179 GW of offshore wind capacity, out of which 106 GW represents potential for floating offshore wind (European Commission, Joint Research Centre, 2019).

If the 12 nautical miles zone is excluded from offshore wind development due to landscape preservation concerns, the potential for offshore wind is still great – 95 GW, out of which 72 GW would be floating offshore wind due to water depth of more than 60 meters. The various offshore wind development zones are presented in Figure 19.

The Joint Research Centre of the EC also presented the potential for PV capacity in the Republic of Croatia, which would be between 50 GW and 175 GW in a scenario where 3% of the available natural areas is used for PV power plants (European Commission, Joint Research Centre, 2019). In those figures, the residential PV potential is estimated at between 2.6 GW and 9 GW.

The Joint Research Centre of the EC identified a biomass potential of 166 PJ by 2050 (European Commission, Joint Research Centre, 2019). The potential for the Republic of Croatia included current and future land use and livestock patterns paired with several con-

Figure 19. Map of the offshore wind potential in the Adriatic and Mediterranean Sea (European Commission, Joint Research Centre, 2019)



straints depending on the scenario specifications.

International Renewable Energy Agency

According to a 2017 study from the International Renewable Energy Agency, the RES in the Republic of Croatia have a technical potential of 22 GW. Onshore wind energy has the highest technical potential in both capacity and electricity generation (14.8 GW and 29.2 TWh), while PV has a technical potential of 3.2 GW (International Renewable Energy Agency, 2017).

The International Renewable Energy Agency identified already in 2017 a very large cost-competitive potential of renewable energy capacity, depending on the cost of capital.

The cost-competitive onshore wind potential ranged between 1.9 GW and 11.7 GW, while PV potential was up to 3.2 GW. The hydropower cost-competitive potential was identified as rather low, because many rivers are already used for power generation. Table 8 shows the technical and cost-competitive potential for the different renewable energy technologies.

Energy Institute Hrvoje Požar

In the White Book for the preparation of Croatia's Energy Development Strategy, the Energy Institute Hrvoje Požar identified the technical potential of various RES (Energy Institute Hrvoje Požar, 2019).

Table 8. The technical and cost-competitive potential of RES in the Republic of Croatia (Energy Institute Hrvoje Požar, 2020) (International Renewable Energy Agency, 2017), (Croatian Hydrocarbon Agency)

Technologies	2005	2018		Additional cost-competitive potential			Technical potential	
	MW	MW	GWh	MW		GWh	MW	GWh
Solar PV*	6	68	75	2030	3,174	4,309	8,000	9,120
				2050	3,174	4,309		
Wind	-	586	1,335	2030	12,549 - 14,298	25,570 - 28,220	14,807	29,153
				2050	14,357 - 14,385	28,289 - 28,317		
Hydro	2,083	2,200	7,785	989		2,528	3,316	9,400
0-10 MW	27	33	114	n.a.		n.a.	281	900
>10 MW	2,056	1,891	7,212	989		2,533	3,035	8,500
Pumping	n.a.	275	458	n.a.		n.a.	n.a.	n.a.
Biomass	2	115	668	26 - 542		152 - 3,379	930	5,743
Biogas	-	51	355	26 - 235		152 - 1,512	261	1,700
Solid Biomass	2	65	313	0 - 307		0 - 1,867	332	2,021
Biowaste	-	n.a.	-	-		-	337	2,022
Geothermal	-	10	n.a.	0 - 64		0 - 505	500	3,942
Total	2,091	2,979	9,863	2030	16,738 - 19,154	32,559 - 38,941	27,553	57,358

*2018 data for Solar PV refers to grid-connected systems

For onshore wind power plants, the technical potential, including the environmental constraints and other criteria, was estimated as between 7 and 9 GW.

The PV technical potential was estimated as 8 GW, 5.3 GW being from utility-scale power plants and 2.7 GW from integrated PV power plants.

The White Book estimates that by 2017 there were 227,000 m^2 of solar thermal collectors installed and that currently, fewer than 30,000 households are using this technology.

The technical potential for biomass was estimated at 74-159 PJ per year, almost half of it being for solid biomass. Biogas and biomethane potential was estimated at from 5.8 to 11.5 PJ.

The technical hydropower potential was estimated at 12.4 TWh, out of which 49% is currently being utilised.

Other sources

In a recent study of the EC on the offshore grid potential in the Mediterranean region, *Guidehouse* identified a 129 GW potential of floating offshore wind capacity in Croatia and 10 GW of bottom-fixed wind capacity by 2050. Furthermore, *Guidehouse* identified 4.7 GW PV potential capacity on Croatian islands (4.4 GW utility-scale and 0.3 GW residential). In the same study, *SWECO* estimated that, in the ambitious scenario, offshore wind capacity in the Republic of Croatia would reach 1.9 GW by 2050 (European Commission, 2020).

Having a geothermal gradient 60% higher than the European average, the continental part of Croatia has a significant potential of electricity generation from GTPPs, with a conservative estimate of 500 MW (Croatian Hydrocarbon Agency).

The temperature of geothermal reservoirs in Croatia can be expected to be in the range of up to 200°C, and therefore geothermal electricity generation in Croatia will be limited to Organic Rankine Cycle technology.

Data from 593 exploration wells, as well as 9.850 km of 2D seismic lines and 1.710 km^2 of 3D seismic data, are available in the CHA data room. Access to the data, either physically by visiting the premises of CHA or virtually via the online database, is free of charge for geothermal developers.

13. 3. ENVIRONMENTAL CONSTRAINTS ON THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES (RES)

EU Member States have a network of nature protection areas called Natura 2000, covering over 18% of the EU's land area and more than 8% of its marine territory. Natura 2000 aims to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the Birds Directive and the Habitats Directive (European Commission).

The Republic of Croatia has a large Natura 2000 network compared to other EU Member States. As seen in Figure 20, it covers 36.67% of Croatia's land area and 16.26% of marine territory, making a total of 29.34% of Croatia's territory (Ministry of Economy and Sustainable Development).

A large part of the Natura 2000 network is in areas suitable for wind development. However, there are certain misunderstandings in

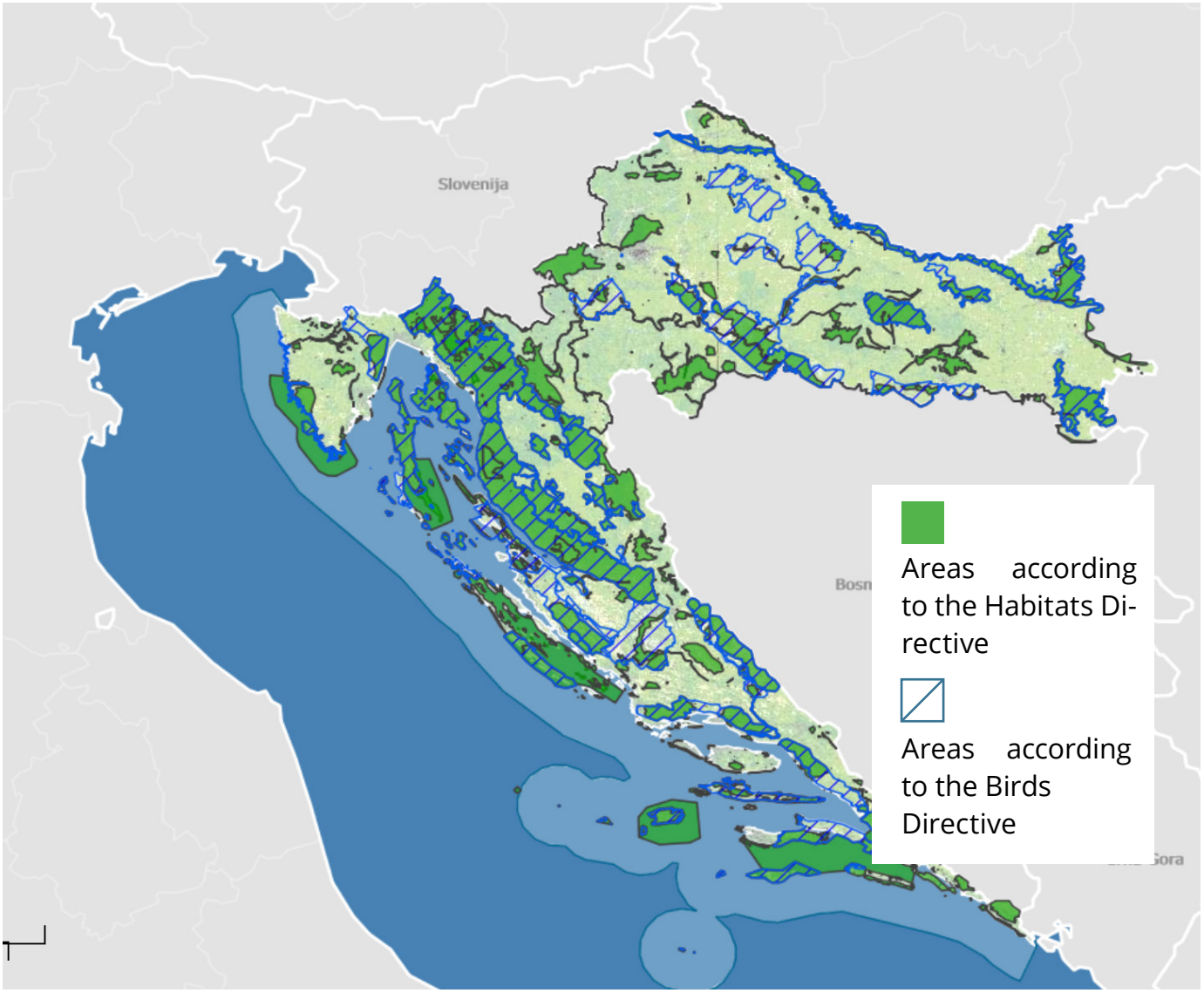
the public domain concerning the development of wind farms in Natura 2000 zones, causing longer lead times for project developers. Some non-governmental organisations believe that Natura 2000 zones mean "no-go zones" for wind energy development.

The EC's Guidance document on wind energy developments and EU nature legislation clearly states: "The Habitats Directive does not, a priori, exclude wind farm developments in or adjacent to Natura 2000 sites. These need to be assessed on a case-by-case basis." (European Commission, 2020)

13. 4. ENVIRONMENTAL CONSTRAINTS ON THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES (RES)

The basic law regulating energy efficiency in the Republic of Croatia is the Energy Efficiency Act (*OG, No. 127/14, 116/18, 25/20*). In April 2021, the Act was discussed in the Croatian Parliament in light of the energy efficiency targets for 2030. The energy efficiency targets will reflect the targets presented in the National Energy Climate Plan, where the primary energy consumption target was set at 344.4 PJ (8.23 Mtoe) and the final energy consumption was set at 286.9 PJ (6.85 Mtoe) (Re-

Figure 20. Natura 2000 ecological network in Croatia (Ministry of Economy and Sustainable Development)



public of Croatia, 2019).

The energy efficiency policies include an energy efficiency obligation scheme for energy suppliers, building renovation, improvements to district heating and transmission and distribution networks, and awareness and training campaigns.

In December 2020, the Croatian Government adopted a Long-Term Strategy for the Renovation of the National Fund of Buildings until 2050, which aims to renovate the National Fund of Residential and Non-Residential Buildings, public and private, and the transformation of the existing building stock into an energy-efficient and decarbonised building stock by 2050. In the strategy, electrification in households and the service sector is identified as one of the main drivers of reduced energy consumption.

Therefore, the current energy efficiency targets, policies, and measures are in line with the existing RES targets. Although energy demand will decrease, the strong electrification rates will not limit the build-out of RES but will create more demand for renewable electricity.

However, with the EU aiming to increase its greenhouse gas emission target in 2030 from 45% to 55%, it will need to increase the 2030 targets for both renewable energy and energy efficiency. The current 2030 RES target for the EU is 32%, and is likely to be increased to 40%, while the energy efficiency target will need to be increased upwards from the current 32.5%. In the EC's Impact Assessment on Stepping up Europe's 2030 climate ambition, the final energy savings in 2030 could be 36-37% (European Commission, 2020).

Once the targets are accepted at the EU level, the Republic of Croatia will have to revise its current targets for energy efficiency upwards. The measures to achieve the increased energy efficiency targets will most likely increase the rate of buildings renovation and promote stronger electrification measures, resulting in lower fossil fuel consumption and a higher uptake of RES.

13. 5. ENERGY EFFICIENCY TARGETS

One of the most important areas to which the Energy Efficiency Act applies is the energy renovation of buildings, primarily publicly owned buildings. The energy renovation of a building entails the application of energy efficiency measures to improve the energy performance of the building or part of it and to introduce efficient energy management and heat conservation, however energy efficiency measures may also include the use of RES.

The technical regulation on the reasonable use of energy and thermal protection in buildings (*OG, No. 128/15, 70/18, 73/18, 86/18, OG 102/20*) stipulates that a building must be designed and constructed in such a way as to meet requirements related to the mandatory use of RES.

Nearly zero-energy buildings are obliged to have at least 30% of the annual energy required for the operation of technical systems in the building covered by RES. The share of RES is considered satisfied even when at least 60% of the annual energy required for the operation of technical systems in the building is provided from an efficient centralised heating and cooling system, which uses at least: 50% of renewable energy, or 50% of waste heat, or 75% of heat obtained by cogeneration, or 50% of the combination of these energy sources and heat, unless achieving

these defined conditions is not economically, technically or functionally justified.

Existing buildings undergoing significant energy renovation are obliged to have at least 10% of the annual energy required for the operation of technical systems in the building covered by RES, which may include an efficient district heating and cooling system using at least: 50% of renewable energy, or 50% of waste heat, or 75% of the heat generated by cogeneration, or 50% of a combination of these energy and heat sources, unless achieving these defined conditions is not economically, technically or functionally justified.

Buildings heated to a temperature higher than 12 ° C and lower than 18 ° C are not subject to the statutory obligation to meet the requirements regarding the use of RES.

The energy renovation rate of buildings should increase from 0.7% in 2014-2020, to 1% in 2021, 1.5% in 2023, 2.0% in 2025, 2.5% in 2027, 3% by 2029, 3.5% in the 2031-2040 period, and 4% in the 2041-2050 period (Republic of Croatia, 2020).

With such a rapid increase in the energy renovation of buildings, paired with the requirements to use RES, the share of renewable energy in both the power and the heating and cooling sectors is set to increase.

Geothermal energy in buildings

Geothermal energy for heating or cooling in buildings can be utilised by installing a geothermal heat pump. Such systems are well known and available in the market, and their application is supported by technology providers which are designing, installing, and maintaining them.

However, applying such systems in Croatia is not different from applying them in any other area of the world, as shallow geothermal resources have nothing to do with the very large potential of Croatia in deeper geothermal reservoirs.

Geothermal heat from medium-depth and deep geothermal reservoirs can be used in two ways:

- directly, so that heat from lower-to-medium temperature geothermal brine (up to approximately 100°C) is extracted straight from the brine into the second circle heat transfer fluid in a heat exchanger, or the brine (if it is not too corrosive) is circulated through the heating system without the use heat exchangers;
- as waste heat from the process of generating electrical energy in a GTPP.

14. BEST PRACTICES IN OTHER EU COUNTRIES

One-stop shop

Croatia's administrative procedures for RES development are complex and involve a number of stakeholders as explained in Chapter 4 - Key Participants and Stakeholders in the Development Process of Renewable Energy Sources.

As defined by the revised Renewable Energy Directive, Croatia is expected to introduce a form of a one-stop-shop. Lessons can be learned from Denmark, Finland, and Italy, all of which have already implemented a similar structure, at least to some extent.

Denmark

The Danish Energy Agency has been designated as a single contact point (one-stop-shop) for the development of offshore wind farms. The agency coordinates issuing required permits with the relevant authorities.

Finland

In 2020, Finland adopted an act design to speed up and simplify permitting procedures and other related administrative procedures regarding RES projects. The act will enter into force on June 30, 2021.

Under the act, a single contact point has been designated (Centre for Economic Development, Transport and the Environment for South Ostrobothnia), through which all communication regarding administrative procedures may be conducted electronically.

The act also introduced time limits for the completion of all designated administrative procedures, calculated from filing an original application to the delivery of a final permit. The procedures include: EIA, the protection of habitats, building permits, permits under the electricity market act, etc. In principle, the total duration of all administrative procedures may not exceed two years, or one year if the planned capacity is less than 150 kW.

Italy

According to legislation adopted back in 2003, renewable energy projects in Italy exceeding specific thresholds (i.e., solar plants under 20 kW; wind plants under 60 kW; and hydroelectric plant under 100 kW) are subject to a single authorisation (the AU) granted by relevant region or, if applicable, by the provinces which have been delegated by the regions. The AU is issued based on a simplified procedure including all public entities and relevant authorisations and clearances required for the building and operation of the relevant renewable energy plant and relevant interconnection facilities.

Shortening lead times for the development of RES projects

Judicial control over administration is an indispensable instrument for enhancing the quality of administrative action and ensuring good governance. **However, it can substantially prolong the process of RES development** to the point that it makes the project unfeasible. In Croatia, judicial control over administrative decisions made in the process of RES projects development is made at two levels of the administrative court, first instance and appeal. In some other legal areas, like public procurement, the first instance is skipped, and the final decision is made by the administrative court of appeal.

A similar solution is provided in the case of onshore wind in France.

France

In 2018 France introduced legislation with the aim to reduce the lengthy administrative procedures for the development of onshore wind turbines. The legislation aimed to simplify and clarify environmental law, amongst other things specifying that in respect of environmental authorisations the administrative courts of appeal are competent in the first and final resort to make decisions.

The legislation was challenged at the French Conseil d'Etat by several associations, but the court dismissed the arguments that the legislation was contrary to the non-regression principle in environmental law.

Financing of RES support mechanisms

IIn Croatia, each electricity consumer pays an RES incentive fee to raise funds to encourage the construction of renewable electricity sources. Suppliers are obliged to forward the collected funds from the RES incentive fee to HROTE, who uses these funds to pay the incentive price to RES generators.
As such, the mechanism is perceived by electricity consumers as something of an additional burden to finance RES generators. Some mechanisms, e.g. a carbon tax system imposed on the CO_2 content of some resources, could have better reception in the public.

France

In 2014 France introduced a national carbon tax system in a form of excise duty. It is imposed on households and businesses on their purchase of carbon, natural gas, and energy products according to their CO_2 content. In 2014 the carbon price was set at €7/tCO_2, rising to €14.50 in 2015, €22 in 2016, €30.50 in 2017, and €44.60 in 2018.

The carbon tax brings more than €5 bn of annual revenue to France, and part of it is being used to fund renewable energy.

Long-term auction visibility

As defined by the revised Renewable Energy Directive, Croatia is expected to present a five-year schedule for FiT and FiP auctions. Two very good examples of providing the amount of auctioned capacity per technology can be seen in German and Spanish legislation.

Germany

In the recently approved Renewable Energy Act, Germany presented indicative timing and the planned capacity allocation per RES technology for the 2021-2028 period.

15. ACTION PLAN

Simplify process for obtaining land rights for wind and PV projects

Wind and utility-scale solar are usually developed on the basis of a servitude right. There are several bodies that decide depending on the type of land (forest, agricultural, construction, roads, water) and the owner (state land, land of local governments or private land). It is necessary to simplify the procedure and significantly speed up the procedures for state construction land:

- the only criterion for the duration of the servitude should be as much as necessary for the project (as in the case of expropriation of private land), and accordingly should be the payment;
- any potential discrimination under already concluded contracts should be eliminated. For example, developers who concluded a servitude agreement before the entry into force of the Decree on the Establishment of Building Rights and Easement Rights on Forests and Forest Land Owned by the Republic of Croatia (*OG, No. 87/19*) when the easement was granted at 20 or 25 years compared to the current 30, the duration of the same can be extended to the maximum term of their privileged generator status. Taking into account that the status of a privileged producer was awarded since 2013 for 25 years, and before that for 12 or 14 years, it is evident that older projects are in a much worse position.

Better visibility of auction volumes

The long-term visibility of future auctions gives more planning and investment security to developers. The Government should publish at least a five-year auction quota per technology and an indicative reference price. This would increase the attractiveness of the Croatian RES market for investors and developers.

Increased transparency of various fees and parafiscal charges

There are numerous fees and parafiscal charges that developers must consider. The Government should make publicly available and regularly update a detailed list of all non-tax and parafiscal charges businesses are required to pay, as well as the purpose of their payments. The Government should also define one account for the payment of all parafiscal charges.

Expand the scope of the RES register

The RES Register should be harmonized with the provisions of the Electricity Market Act. The RES Register should contain accurate information on ongoing projects, the timing of their development and thus help to identify delays in licensing procedures. Also, it should be placed on a modern platform and allow greater transparency in a way that much more data is publicly available, such as various dates for the start of the licensing process. In this way, developers could monitor the transparency of the work of the various stakeholders.

Improve the speed of the network connection process and optimising grid development planning

Energy approval according to the Electricity Market Act will allow developers a fixed deadline for construction of 5 (projects under transitional and final provisions, i.e., existing projects) or 7 years (new projects) for obtaining a use permit. In order to enable this, it is necessary to shorten the deadlines for the construction of the connection and the creation of technical conditions in the network.

Furthermore, when determining network parameters, data on actual and probable loads should be used, and not on loads resulting from data on installed power of power plants, which would significantly reduce the high costs of grid reinforcements that make projects uncompetitive.

Acceleration of (preliminary) environmental and nature impact assessment procedures

Currently, these procedures take longer than the deadlines provided by law. The procedures are necessary to shorten as regulated through the legal framework, because otherwise the impact of the energy approval reform will be marginalised, which is awarded according to the Electricity Market Act in a public tender with a fixed validity period, which will be impossible to achieve.

One-stop-shop for key participants and stakeholders

An online one-stop-shop would allow stakeholders to have a single point of reference, increase the transparency of the administrative process, accelerate the permitting process, and allow local communities a better overview of projects under permitting. The Government should aim to create an online one-stop-shop as defined by the recast Renewable Energy Directive.

Accelerated digitalisation of public bodies

Although there are positive developments in digitalising some permitting processes, more needs to be done to address the slow lead times for developing RES projects. The Government should aim for a full digital transformation of public bodies so that they can offer better and faster services to developers.

Translation of the relevant legislation into English

Other investor-friendly countries offer an official translation of the relevant legislation (e.g. laws, regulations, spatial plans, forms, etc.). The Government should start officially translating the relevant legislation into English and make it publicly available to international developers.

Encourage the uptake of corporate Power Purchase Agreements (PPAs)

The corporate sourcing of renewable electricity via Power Purchase Agreements (PPAs) has been growing steadily since 2015 in Europe but not in Croatia. The Government should identify regulatory and administrative barriers for PPAs and remove them as defined by the recast Renewable Energy Directive. This would help the expansion of renewables outside of the FiT and FiP support scheme.

Organising regular finance dialogues and workshops

In order to lower the cost of capital for RES projects, the financing environment should be improved. Therefore, the Government should organise annual finance dialogues and workshops on project assessment and financing models. Such forums for financial institutions and the RES industry would help in lowering the financing costs of RES projects in Croatia.

Stronger institutional support for venture capital funds

The early development of RES projects is considered as high-risk. The Government should provide stronger institutional support for venture capital funds through seed investment. One way to do this is to enable the investment of pension funds and other institutional investors in such venture capital funds on the basis of an issued Energy Approval.

Organising regular dialogues and workshops on the environmental issues

In order to ensure that RES projects maintain a low environmental impact, it is important to involve the various stakeholders in open discussions. Therefore the Government should organise annual RES and environment dialogues and workshops. Such events would gather the RES industry, environmental groups, and the authorised companies that carry out EIAs. The dialogues could be used to address environmental concerns for RES projects in Croatia.

Modifying the spatial planning rules for geothermal power plants (GTPPs)

Under the current spatial planning standards, geothermal exploitation fields are expected to be entered into spatial plans in their entire area. The surface facilities of GTPPs, including the well site and pipelines, which are the only part of the plant to impact the general use of the land and space, comprise only 1% of this total area. The Government should change the spatial planning rules for GTPPs so that only the surface facilities need to be included in the spatial plans.

Setting up EU-funded exploration of geothermal resources

Recent legislative changes allow the CHA to perform exploration in respect of geothermal waters or to establish an operational company to do so. CHA should start the exploration of geothermal waters and apply for EU funding for this through the Multiannual Financial Framework 2021 to 2027. This would remove the non-bankable exploration stage from the list of activities to be performed by the developer, shorten the project development process, and reduce the total costs of the project.

16. BIBLIOGRAPHY

eclareon Trends and evolution of the Costs of Capital in RE Financing [Online]. - 2020. - http://aures2project.eu/wp-content/uploads/2020/11/9_AURES_II_5RW_eclareon_WACC_financing.pdf.

ARUP Onshore Wind Financing [Online]. - 2018. - http://aures2project.eu/wp-content/uploads/2020/11/9_AURES_II_5RW_eclareon_WACC_financing.pdf.

Đukan Mak and Kitzing Lena The impact of auctions on financing conditions and cost of capital for wind energy projects [Online]. - 2021. - https://www.sciencedirect.com/science/article/pii/S0301421521000665.

HEP [Online]. - 2020. - https://www.hep.hr/solar-power-plant-vis-the-largest-solar-power-plant-in-croatia-put-into-operation/3550#:~:text=HEP%20will%20build%20new%201%2C500,is%20worth%20750%20million%20kuna..

HEP [Online]. - 2021. - https://www.hep.hr/projekti/obnovljivi-izvori-energije/neintegrirane-suncane-elektrane/3422.

HOPS [Online]. - 2021. - https://www.hops.hr/lista-redoslijeda-projekata.

Ministry of Economy and Sustainable Development RES Register [Online]. - April 2021. - https://mingor.gov.hr/o-ministarstvu-1065/djelokrug/uprava-za-energetiku-1999/registar-oiekpp/5332.

Croatian Meteorological and Hydrological Service Wind atlas [Online]. - April 2021. - https://meteo.hr/klima_e.php?section=klima_hrvatska&param=k1_8.

World Bank Global Solar Atlas 2.0, Solar resource data: Solargis [Online]. - April 2021. - https://solargis.com/maps-and-gis-data/download/croatia.

European Commission, Joint Research Centre ENSPRESO - BIOMASS. European Commission, Joint Research Centre (JRC) [Dataset] [Online]. - 2019. - April 2021. - http://data.europa.eu/89h/74ed5a04-7d74-4807-9eab-b94774309d9f.

European Commission, Joint Research Centre ENSPRESO - SOLAR - PV and CSP. European Commission, Joint Research Centre (JRC) [Dataset] [Online]. - 2019. - April 2021. - https://data.jrc.ec.europa.eu/dataset/18eb348b-1420-46b6-978a-fe0b79e30ad3.

European Commission, Joint Research Centre ENSPRESO - WIND - ONSHORE and OFFSHORE. European Commission, Joint Research Centre (JRC) [Dataset] [Online]. - 2019. - April 2021. - http://data.europa.eu/89h/6d0774ec-4fe5-4ca3-8564-626f4927744e.

International Renewable Energy Agency Cost-competitive renewable power generation: Potential across South East Europe [Online]. - 2017. - https://www.irena.org/publications/2017/Jan/Cost-competitive-renewable-power-generation-Potential-across-South-East-Europe.

European Commission, Joint Research Centre The Biomass of European Forests [Online]. - 2020. - April 2021. - https://ec.europa.eu/jrc/en/publication/biomass-european-forests.

European Commission Study on the offshore grid potential in the Mediterranean region [Online]. - 2020. - April 2021. - https://op.europa.eu/en/publication-detail/-/publication/91d2091a-27bf-11eb-9d7e-01aa75ed71a1/language-en#document-info.

Energy Institute Hrvoje Požar White Book for the preparation of Croatia's Energy Development Strategy [Online]. - 2019. - April 2021. - https://mingor.gov.hr/UserDocsImages/UPRAVA%20ZA%20ENERGETIKU/Strategije,%20planovi%20i%20programi/BIJELA%20KNJIGA%20--%20Analiza%20i%20podloge%20za%20izradu%20Strategije%20energetskog%20razvoja%20Republike%20Hrvatske.pdf.

Republic of Croatia Integrated National Energy and Climate Plan for the Republic of Croatia [Online]. - 2019. - April 2021. - https://ec.europa.eu/energy/sites/ener/files/docu-

ments/hr_final_necp_main_en.pdf.
European Commission Impact Assessment - Stepping up Europe's 2030 climate ambition [Online]. - 2020. - April 2021. - https://ec.europa.eu/clima/sites/clima/files/eu-climate-action/docs/impact_en.pdf.
Republic of Croatia Long-Term Strategy for the Renovation of the National Fund of Buildings until 2050 [Online]. - 2020. - April 2021. - https://ec.europa.eu/energy/sites/default/files/documents/hr_ltrs_2020.pdf.
Republic of Croatia Croatian Energy Strategy [Online]. - 2020. - April 2021. - https://narodne-novine.nn.hr/clanci/sluzbeni/2020_03_25_602.html.
AURES II Effect of auctions on financing conditions for renewable energy [Online]. - 2019. - http://aures2project.eu/wp-content/uploads/2019/06/AURES_II_D5_1_final.pdf.
Euractiv [Online]. - April 2021. - https://www.euractiv.com/section/energy/news/luxembourg-buys-up-surplus-energy-to-hit-renewable-target-in-eu-first/ .
HROTE Annual report [Online]. - 2021. - May 2021. - https://files.hrote.hr/files/PDF/OIEIK/GI_%202020_HROTE_OIEIK%2020210304-potpisano.pdf.
eurostat [Online]. - 2021. - May 2021. - https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics.
AURES [Online]. - 2016. - May 2021. - https://auresproject.eu/pfid/160#:~:text=Croatia's%20National%20Action%20Plan%20for,-goal%20of%20the%20European%20Union.
Energy Institute Hrvoje Požar [Online] // Energy in Croatia 2018. - 2020. - May 2021. - http://www.eihp.hr/wp-content/uploads/2020/04/Energija2018.pdf.
European Commission Assessment of the final national energy and climate plan of Croatia [Online]. - 2020. - May 2021. - https://ec.europa.eu/energy/sites/ener/files/documents/staff_working_document_assessment_necp_croatia.pdf.
Croatian Hydrocarbon Agency [Online]. - May 2021. - https://www.azu.hr/en/geothermal-projects/.
HEP DSO [Online]. - April 2021. - https://www.hep.hr/ods/UserDocsImages/dokumenti/Obrasci/Pristup_mrezi/PM_2.2.2._Ugovor_o_prikljucenju_stvarni_trosak.pdf.
European Commission Natura 2000 [Online]. - May 2021. - https://ec.europa.eu/environment/nature/natura2000/index_en.htm.
Ministry of Economy and Sustainable Development Natura 2000 in Croatia [Online]. - May 2021. - https://mingor.gov.hr/o-ministarstvu-1065/djelokrug/uprava-za-zastitu-prirode-1180/ekoloska-mreza-natura-2000/ekoloska-mreza-natura-2000-u-republici-hrvatskoj/1211.
Ministry of Economy and Sustainable Development Bioportal [Online]. - May 2021. - http://www.bioportal.hr/gis/.
European Commission Guidance document on wind energy developments and EU nature legislation [Online]. - 2020. - https://ec.europa.eu/environment/nature/natura2000/management/docs/wind_farms_en.pdf.
after Jelić et al. Temperatures and Thermal Flow of Soil in Croatia [Report]. - 1995.

17. LIST OF TABLES

LIST OF TABLES

18. LIST OF FIGURES

LIST OF FIGURES