Technical assistance in realisation of the 5th report on progress of renewable energy in the EU

Task 1-2

Quantitative and a qualitative analysis of Member States' progress in deploying renewable energy sources. Furthermore it includes a projection at EU and Member State level of the expected 2020 renewable energy share in final energy consumption.

ENER/C1/2019-478

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Technical assistance in realisation of the 5th report on progress of renewable energy in the EU

Final report Task 1 & 2

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EXECUTIVE SUMMARY

Progress in deploying renewable energy sources in the EU and the Member States

At an EU-level, the shares of renewable energy sources (RES) in total, electricity (RES-E), heating and cooling (RES-H&C), and to a lesser extent also transport (RES-T) have been continuously increasing over the past years. In 2018, the EU reached a share of 18% of RES in gross final energy consumption, the target for 2020 being 20% as defined in the RES Directive 2009/28/EC (RED).

Up to 2018, the EU-28 has been comfortably above the indicative trajectory set in the RED, defined as the average values of 2011/2012, 2013/2014, 2015/2016 and 2017/2018, respectively. However, the EU as a whole is slightly below the more ambitious trajectory defined by the Member States (MS) themselves in their NREAPs. With regard to individual sectors, the RES-E and the RES-H&C sectors are well on track, resulting from the especially high contributions on the "higher than planned" generation of RES-E from photovoltaics and use of heat pumps in the RES-H&C sector. Meanwhile, the RES-T sector stays below the planned share (8.03% actual versus 8.50% planned) resulting from the "lower than planned" RES consumption for all energy sources.

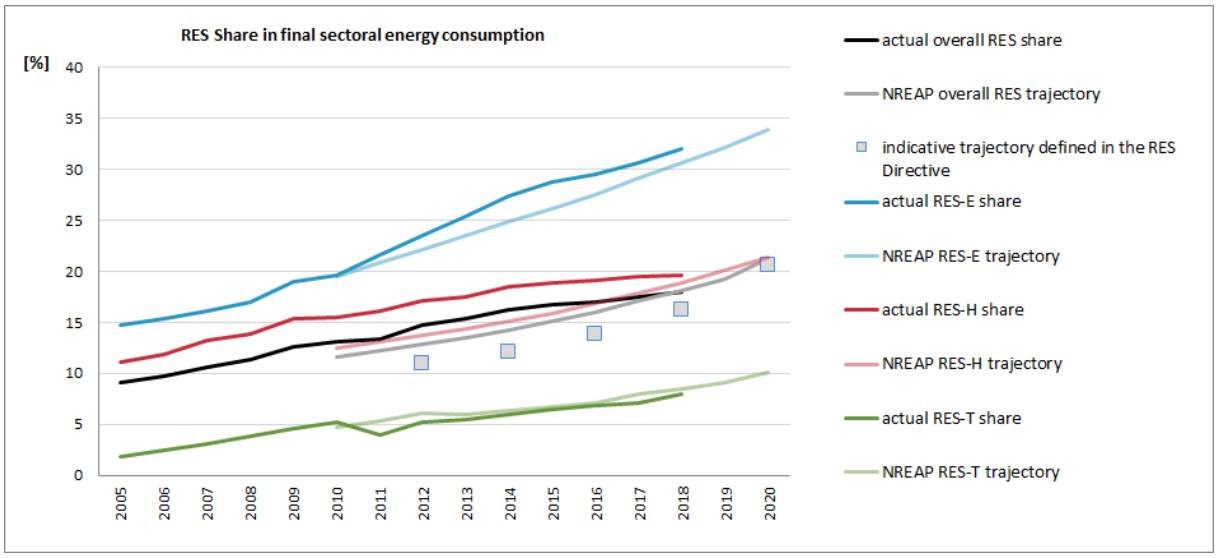

Figure 1. Actual and planned RES shares for the EU-28 (%). Source: Eurostat, NREAPs

23 MS are above their indicative RED trajectory for 2017/2018. Only Ireland, France, the Netherlands, Poland and Slovenia are below their indicative RED trajectories. The largest positive deviations from their indicative RED trajectories can be observed in Croatia, Bulgaria, Czech Republic and Italy.

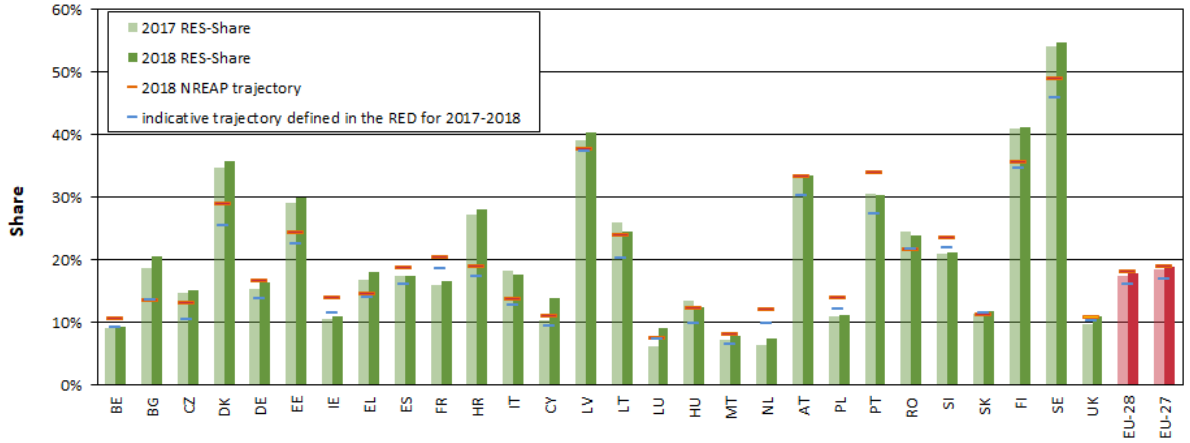

Figure 2. Actual renewable energy shares in 2017 and 2018 compared to indicative trajectories set in RES Directive and NREAP. Source: Eurostat[1]

For RES-E, in 2017 and 2018 the most common support schemes used by MS to stimulate RES deployment were premium and feed-in tariffs, the former often combined with tendering systems (auctions). However, also quota schemes, tax incentives, net-metering, investment grants and loans have been applied to support the development of renewable electricity generation. Almost all MS operate at least two support schemes to support different technologies, installation sizes and actors and provide needs-based support. In the period 2017/2018, the shift from administratively set feed-in tariffs to feed-in premiums continued. While many MS had already changed their remuneration for new installations between 2014 and 2016, Bulgaria and Slovakia followed in 2018 and 2019 respectively[2]. The most prominent trend in support schemes in 2017 to 2020 was the continuous shift towards RES auctions. By July 2020, 18 MS determine the support levels for (larger) RES-E installations in a competitive bidding process. Most MS chose to implement technology-specific auctions rather than technology-neutral or multi-technology auctions.

The most commonly applied form of support for RES-H&C are investment grants. This form of subsidy was available in 24 MS in 2017 and 2018. Other forms of commonly provided support for RES-H&C are tax deductions and feed-in premiums. The support instruments that are in place usually apply to a broad range of technologies. The most popular technology are biomass plants. In addition, commonly supported technologies are geothermal, aerothermal and hydrothermal heat pumps as well as solar thermal plants.

The predominant support scheme for RES-T in the EU is a biofuel quota obligation. By 2020, some form of obligation scheme has been the main RES-T policy measure in all MS. The only MS that did not use a quota as main support scheme for RES-T until 2018 were Sweden and Estonia. While Sweden relied on tax incentives, Estonia's main instruments in the past were subsidies for biomethane consumption and infrastructure. In addition to its tax incentives, Sweden introduced a biofuel quota in April 2018. Estonia followed in May 2018, but also kept its subsidies in place.

[1] Quantitative assessments for Malta in this report are based on the National Renewable Energy Action Plan submitted in 2012. Malta submitted a new NREAP in June 2017.
[2] Please note that in the case of Slovakia, the planned tender scheme has been introduced by the new RES Act in 2019. However, the auctions have been postponed due to the COVID19 pandemic.

Most of the schemes applied by MS have an increasing quota, often targeting a 10% share by 2020. Germany and Sweden do not impose an increasing share of biofuel content, but demand increasing GHG emissions reductions by fuel suppliers, which has a similar effect in the end. Several MS have adjusted their quota schemes after the implementation of the ILUC Directive in 2015 which had to be transposed by September 2017. This Directive introduced a cap on conventional[3] biofuels and a sub-target for advanced biofuels.

Feasibility of 2020 target achievement considering current progress

A comparison of expected with planned RES deployment by 2020 indicates that the EU would succeed in meeting its binding RED 2020 RES target: At EU-28 (EU-27) level a RES share of 22.1% to 22.4% (22.8% to 23.1%) can be expected with currently implemented RES policy initiatives[4]. The majority of MS is expected to perform well in meeting the indicative trajectory, not only in the past (2018) but also in meeting their binding RED 2020 RES targets. When not including the statistical transfers, 23 of the assessed 28 MS[5] , including Bulgaria, Czechia, Croatia, Denmark, Germany, Estonia, Greece, Spain, Croatia, Italy, Cyprus, Latvia, Lithuania, Hungary, Malta, Austria, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden and the UK, may succeed in (over)fulfilling their binding RED 2020 RES targets with implemented RES policies under the given special circumstances of today (2020) – i.e. the significant drop in energy consumption driven by the COVID-19 pandemic during the first half of 2020. For the remaining MS, Belgium, France, Luxembourg, the Netherlands and Poland, currently implemented RES policy initiatives appear insufficient to trigger the required RES volumes to reach the binding 2020 RES targets purely domestically, despite the strong decline in energy consumption.

Planned 2020 RES deployment as indicated in the NECP baselines are in the majority of MS higher[6] than their binding RED 2020 RES targets. The number of MS that are expected to meet their NECP planned contribution in 2020 is the same as above – i.e. 23 MS are expected to meet their NECP baseline. Belgium is expected to overachieve the NECP baseline which is however lower than the country's RED 2020 RES target.For Denmark might fall short in achieveing its own 2020 NECP baseline planning concerning overall RES deployment, which Denmark set significantly higher than its binding national RES obligation. Until now four cooperation agreements on the statistical transfer of renewable energy amounts were signed. Including the details from the agreed statistical transfers, the picture changes for all affected MS that are at risk of not reaching their 2020 RED target. The gap in meeting their binding national 2020 RES target is significantly reduced for both offtaker countries Luxembourg and the Netherlands. For Luxembourg it appears likely that the 2020 RES target can be met thanks to its proactive behavior in setting these political agreements with Estonia and Lithuania. For the Netherlands the projection appears less optimistic but still the 2020 RES target can be met under the assumption of strong cooperation with Denmark (i.e. a statistical transfer of 14,420 GWh) in combination with the low energy demand projection for 2020.

[3] Biofuels produced from from cereal and other starch-rich crops, sugars and oil crops and from crops grown as main crops primarily for energy purposes on agricultural land.
[4] Note that the range indicates the uncertainty related to key input parameter for the model-based assessment of future RES progress. Remarkably, this year's (2020) energy demand drop as a consequence of the COVID-19 pandemic, and corresponding (comparatively small) changes in RES supply play a decisive role in this respect.
[5] Including the UK
[6] Adding up planned performance as specified by MS's in their NECP baselines for 2020 leads to a RES share of 21.0% (21.7%) for the EU-28 (EU-27), similar to the binding RED 2020 RES target of 20% measured as RES share in gross final energy consumption.

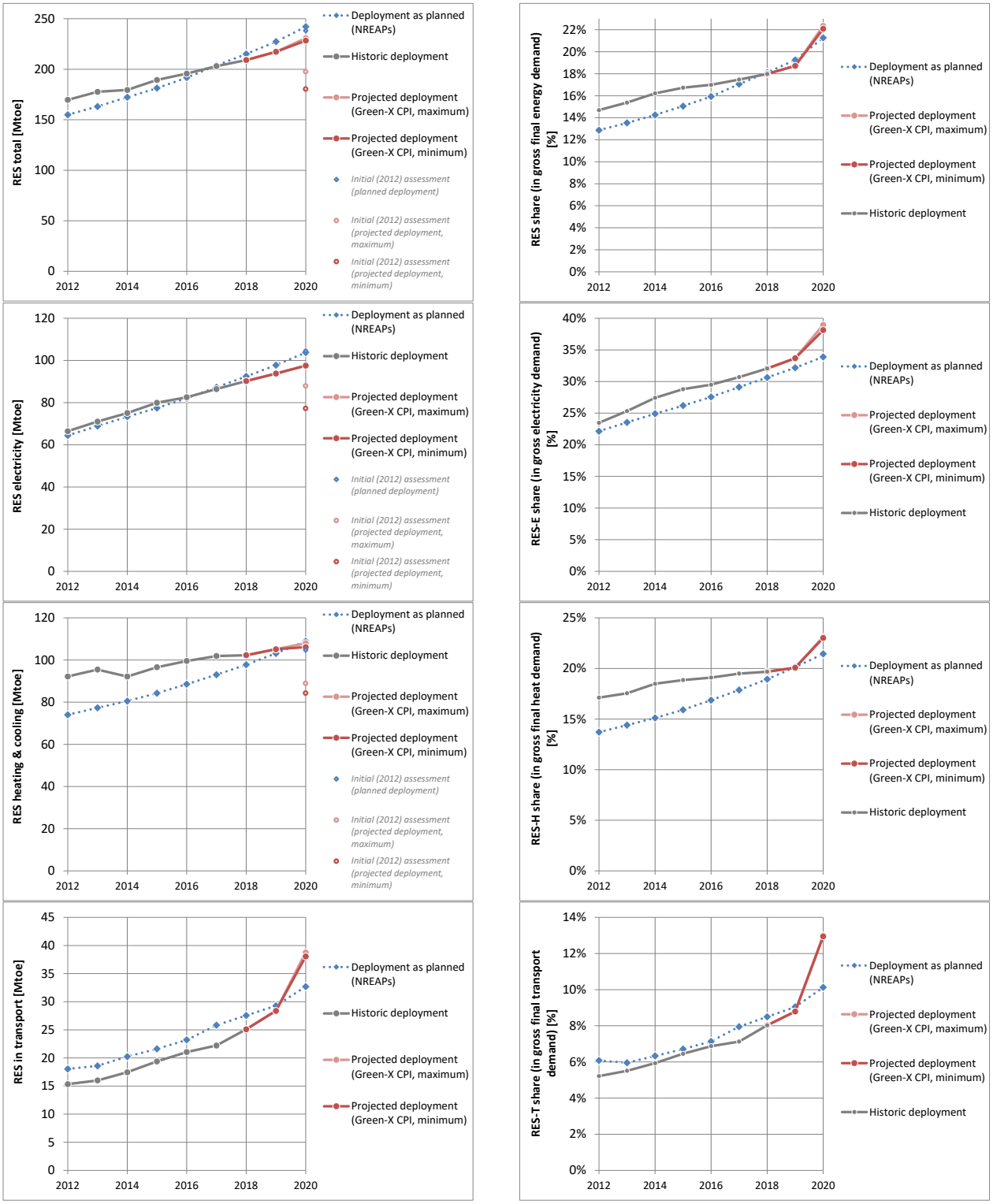

Figure 3. Historic, expected and planned sector-specific RES deployment at EU-level (EU-28) by 2018, 2019 and 2020 in absolute terms (Mtoe, left) and in relative terms (as RES share in corresponding demand, right)

By 2020, 14 MS (out of the 21 MS that have transparently specified their NECP baseline RES-E shares in 2020) will be able to meet (or exceed) their RES-E deployment as planned in the NECP sectoral trajectory under all assessed circumstances. Top of that list is Bulgaria, followed by Croatia, Ireland, Czechia, Slovakia, Estonia, Slovenia, Greece, Germany,

Romania, Poland, Sweden, Spain and Hungary. For Portugal, the NECP baseline RES-E share is only achieved in the low demand scenario.The remaining six MS that have also specified their planned baseline RES-E share can be classified as not successful in reaching their planned 2020 level with respect to renewable electricity. Top of that list (of negative ranking) is the Netherlands, followed by Lithuania, with deficits larger than 20%. The remainder of MS shows a smaller deficit in expected vs (NECP) planned RES-E shares for 2020.

The H&C sector shows a positive picture of already achieved deployment of renewables.. The large majority of MS (i.e 18 out of 19 MS that have specified their planned RES-H&C share for 2020) are on track or have even over-accomplished their NECP planned contribution, while only Luxembourg is lagging behind (around 11% below its NECP RES-H&C baseline).

In accordance with above, by 2020 the majority of MS will be able to meet (and significantly over-succeed) their planned deployment trajectory for RES-H&C. The strongest progress ahead of the trajectory is expected for Portugal and Malta, both showing a deviation of more than 30% when comparing expected and planned RES-H&C shares.

By 2020, 17 of 28 MS are expected to meet (and over-succeed) the binding RED RES-T sector target under all assessed circumstances. On the top of that list is Sweden, followed by Finland, the Netherlands, Ireland, the UK, Malta, Croatia and Portugal, all showing a surplus larger than 50% compared to the given sector target. Other MS where RES-T target achievement appears likely are Belgium, Germany, Greece, France, Italy, Hungary, Austria, Romania and Slovenia, and at EU-28 (EU-27) level a surplus of 29.5% to 30.0% (21.8% to 22.4%) can be expected. The remaining 11 MS can be classified as not successful in meeting their binding RED RES-T sector target. Top of that list (of negative ranking) is Estonia, followed by Cyprus, Luxembourg and Lithuania – all with deficits larger than 25%.

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ABBREVIATIONS

CHP	Combined Heat and Power
CPI	Current Policy Initiatives
DH	District Heating
DNI	Direct normal irradiance
DSO	Distributed System Operator
EC	European Commission
ETBE	Ethyl Tert-butyl Ether
EV	Electric Vehicle
FIP	Feed-in premium
FIT	Feed-in tariff
GC	Green certificates
GHG	Greenhouse gas
ILUC Directive	DIRECTIVE (EU) 2015/1513
LCOE	Levelised cost of electricity
MS	Member State(s)
NECP	National energy and climate plans
NREAP	National Renewable Energy Action Plan
PPI	Planned Policy Initiatives
RES Directive	Renewable Energy Directive (DIRECTIVE 2009/28/EC)
REDII	Recast of the Renewable Energy Directive (DIRECTIVE (EU) 2018/2001)
RES	Renewable Energy Sources
RES-H&C	Renewable Energy Share in Heating and Cooling sector
RES-E	Renewable Energy Share in Electricity sector
RES-T	Renewable Energy Share in transport sector
TSO	Transmission System Operator

1. INTRODUCTION

In 2009, the European Union adopted the first Renewable Energy Directive (the RES Directive, DIRECTIVE 2009/28/EC). This Directive established an overall renewable energy target of at least 20% in final energy consumption for the EU (which is broken down in national targets) and a 10% target of renewable energy in transport for 2020 (which is the same for each Member State (MS)). In accordance with Article 4 of RES Directive each MS has submitted an NREAP to the European Commission in 2010 or later. In its NREAP, each MS provides a detailed roadmap describing how it will meet its legally binding national 2020 RES target. In addition, most MS define slightly more ambitious non-mandatory 2020 NREAP targets. The roadmaps contain indicative sectoral trajectories and the technology mix they expect to use. Every two years, each MS has to submit a report on the developments in RES compared with the trajectories in its NREAP ("Progress Reports"). RES Directive Article 23 requires the Commission to report on the progress in renewable energy every two years.

The goal of this report is to provide technical assistance to the Commission in realisation of the 2020 Progress Report on renewable energy. The report provides the results from data collection, analysis and assessment of the progress in deployment of renewable energy, and national measures promoting such deployment, in the 28[7] EU Member States.

The report not only analyses past progress, but also models future progress as to identify sectors and Member States (MS) where action is required to ensure target achievement. This analysis is based on MS National Renewable Energy Action Plans (NREAP), renewable energy Progress Reports submitted in 2019/2020 by MS, SHARES and Eurostat statistics, other reports and studies, and additional research. The main focus of this report is on 2017/2018, but results presented are based on the policy landscape up to July 2020.

In Chapter 2, we present an overview of the past progress of the 28 MS and the EU on deployment of renewable energy, also split by the three sectors electricity, heating & cooling and transport. We also present trends in policy measures planned and implemented and end the Chapter with an overview of MS progress in relation to the 2018 indicative trajectories.

In Chapter 3, we assess how feasible the achievement of the 2020 nationally binding RES targets appears under two different scenarios. We not only model the projected future progress of the renewable energy share overall, but also by energy sector and MS.

In Chapter 4, we present a set of recommendations for the MS projected not to achieve their binding national 2020 RES target on possible actions that could be taken to alter this path. Finally, in Chapter 5 we present a summary and conclusions.

In the annexes we additionally present:

- Detailed quantitative progress of all MS per sector and per technology.
- Detailed assessments of planned and implemented measures and policies per MS.
- Detailed analysis of non-economic barriers per MS.

[7] Please note that the United Kingdom is included here due to the reporting period being 2017-2018.

2. PROGRESS IN DEPLOYING RENEWABLE ENERGY SOURCES IN THE EU AND THE MEMBER STATES

2.1 Introduction

Historic progress of RES from 2010 to 2018 per MS is based on the database SHARES of Eurostat[8]. Monitoring of progress by technology relies on database Eurostat Energy Balances[9], which includes data up to 2018.

In the following sections we provide main findings on EU-level and from the MS assessments on:

- Quantitative progress (overall, per sector and technology-specific findings).
- Trends in support schemes.
- Progress on policy commitments by the MS.

In the Annexes, we provide detailed descriptions of each MS and their progress, split over quantitative growth in sectors and technologies (Appendix A), policy measures (Appendix B) and non-economic barriers (Appendix C).

2.2 Quantitative progress (overall, per sector and technology-specific findings)

In this chapter, we present MS' progress in deploying RES up to 2018. We compare the progress achieved by MS in 2018 with two trajectories set out in the NREAP: the indicative 2017/2018 trajectory defined by the RES Directive and the 2018 trajectory planned in the NREAPs. This reporting covers EU-28, since the UK was a full member of the EU for the reporting period 2017 to 2018. In line with the Eurostat practices the EU-28 totals are complemented with EU-27 totals excluding the contributions from the UK.

2.2.1 Approach and data sources

To monitor the progress in RES, shares and trends of overall RES and RES in sectors are depicted, for the EU and by MS. Furthermore, data on the development of RES technologies is provided. Specifically, this includes illustrations as listed below:

(1) Two overview graphs indicating the trend in overall EU renewables shares.

(2) MS-specific overview of 2017 and 2018 actual shares versus 2018 NREAP trajectories and 2017/2018 indicative trajectories as set in the RES Directive.

(3) MS-specific deviation from 2018 indicative RED trajectory in %.

(4) Total generation, or consumption, and growth of RES by sector, technology and MS.

For the overall RES development, information is provided according to (1), (2) and (3). For each of the three separate RES sectors, i.e. RES-E, RES-H&C and RES-T, figures of type (2) and (3) are provided (shown in Appendix A), in addition to data tables on actual

[8] http://ec.europa.eu/eurostat/web/energy/data/shares
[9] https://ec.europa.eu/eurostat/data/database

deployment and growth (4). Furthermore, the development of individual technologies is presented in Appendix A. It includes technologies as listed in Table 1. For these individual technologies, figures of type (3) are shown.

Table 1. Overview RES technologies presented in Appendix A

Renewable electricity (RES-E)	Renewable heating and cooling (RES-H&C)	Renewable energy in transport (RES-T)
Offshore Wind	Solar Thermal	Bioethanol/Bio-ETBE
Onshore Wind	Solid Biomass	Biodiesel
Solid Biomass	Biogas	Renewable Electricity in Transport
Biogas	Heat Pumps	Other biofuels
Photovoltaics	Geothermal Heating	Hydrogen
Hydro	Bioliquids	
Mixed Hydro		
Geothermal		
Bioliquids		
Concentrated Solar Power		
Tide, Wave and Ocean Energy		

The report is based on the following six data sources:

- The targets and the indicative trajectories are derived from three sources:
  - **RES Directive:** the indicative trajectories up to 2020 are defined in the RES Directive.
  - **NREAPs:** The trajectories planned for each RES technology until 2020 have been taken from the NREAPs that MS submitted to the EC in 2010.[10]
  - **NECPs**: The share of renewables in gross final energy consumption in 2020 as planned in the NECP baseline.[11]
- The past progress in RES deployment has been analysed on basis of three data sources:
  - **Eurostat shares:** RES shares published by Eurostat for those graphs displaying RES overall shares or RES sector shares. The Eurostat shares are available for the EU-28. The latest shares are of 2018.
  - **Member State Progress Reports**: Used for comparison and verification purposes only. MS submitted their fifth Progress Reports to the Commission in early/mid 2020, to monitor compliance with their planned trajectories and measures. These latest reports cover the period 2017-2018.
  - **Eurostat energy balance, national data sources**: Eurostat technology data from energy balances and national data for selected MS, is used for those graphs and tables detailing technology-specific progress.

Any gaps or serious discrepancies between data sources are mentioned either in the analysis text or in a footnote below the respective figure.

[10] https://ec.europa.eu/energy/topics/renewable-energy/national-renewable-energy-action-plans-2020_en?redir=1
[11] https://ec.europa.eu/energy/topics/energy-strategy/national-energy-climate-plans_en

2.2.2 Overall trends EU

At an EU-level, the shares of RES in total, renewable electricity (RES-E) and renewables for heating and cooling (RES-H&C) have been continuously increasing over the past years. In 2018, the EU reached a share of 18% of RES in gross final energy consumption, the target for 2020 being 20%. Figure 4 shows a rise in shares since 2005 – with the exception of RES-T which decreased in 2011, due to the requirements on sustainability following from the transposition of the RES Directive[12]. The overall RES share increased by 0.5% from 2017 to 2018. On average, it has been increasing by about 0.6% per year since 2009.

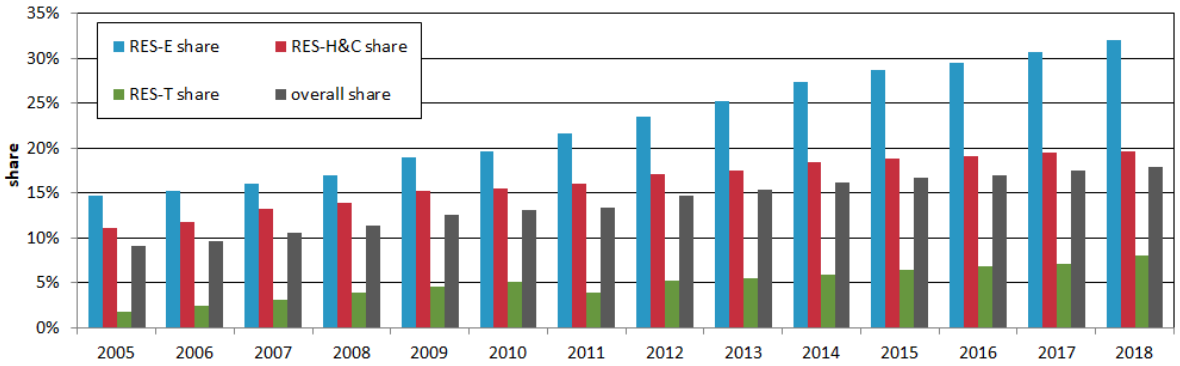

Figure 4. EU-28 RES shares from 2005-2018 (%). Source: Eurostat SHARES

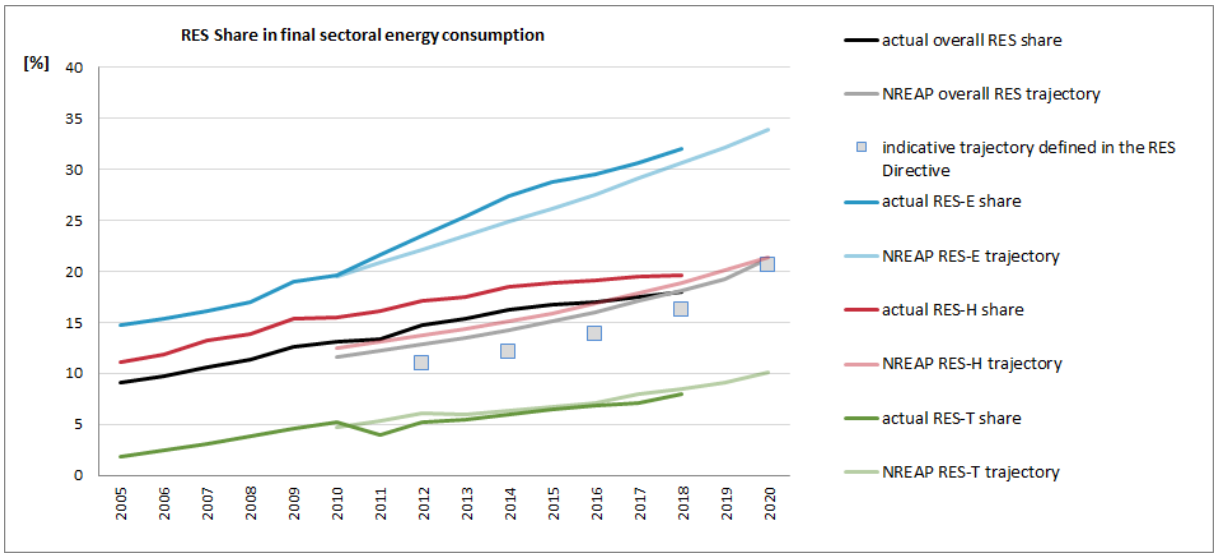

Figure 5. Actual and planned RES shares for the EU-28 (%). Source: Eurostat SHARES and NREAPs

Figure 5 compares historic shares up to 2018 to the trajectories set out in MS' NREAPs, as well as to the indicative trajectory defined in the RES Directive. Up to 2018, the EU-28 has

[12] Regarding the consumption of bioliquids and biofuels (as defined in Article 2 of RES Directive), there is a sudden decrease in consumption from 2010 to 2011, after which it rises again. This has an especially strong effect on the RES-T share. The issue is caused by a methodological break in the time series in statistics for biofuels due to the transposition and implementation of RES Directive by Member States, rather than by actual fluctuations in consumption: to be eligible for the RES target, biofuels and bioliquids must be compliant with sustainability criteria and verification procedures specified under Articles 17 and 18 of the RES Directive. This legislation was fully transposed only after 2010. Until then (until reference year 2010), all biofuels were counted towards the RES and RES-T shares. From 2011, Member States were allowed to report "as compliant only those biofuels and bioliquids for which compliance with Article 17 as well as Article 18 can be fully demonstrated". As Member States gradually improved the implementation of the RES Directive and also increased the quantity of compliant biofuels, the RES-T share rose again (and to smaller extent, overall RES also increased).

been comfortably above the indicative trajectory set in the RES Directive, defined as the average values of 2011/2012, 2013/2014, 2015/2016 and 2017/2018, respectively.

However, the EU as a whole is slightly below the aggregated more ambitious trajectory defined by the MS themselves in their NREAPs. With regard to individual sectors, the RES-E and the RES-H&C sectors are well on track, resulting from the especially high contributions on the "higher than planned" generation of RES-E from photovoltaics and use of heat pumps in the RES-H&C sector. Meanwhile, the RES-T sector stays below the planned share (8.0% actual versus 8.5% planned) resulting from the "lower than planned" consumption for all energy sources. It is thus the 'higher than planned' shares of the RES-E and RES-H&C sectors, which lead to the overall RES sector being slightly above the indicative trajectory of the RED and only slightly below the planned NREAP trajectory.

2.2.3 Overall trends by Member States

The RES shares in 2018 varied greatly among the MS, largely reflecting the different starting positions and national targets defined in the RES Directive of each MS. In 2018, Sweden held the highest RES share (55%), while the lowest RES shares were seen in the Netherlands (7%), Malta[13] (8%) and Luxembourg (9%). Despite the low overall RES shares, Luxembourg (+2.8), Malta (+0.7%) and the Netherlands (+0.9%) all showed higher increases in RES share than Sweden (+0.4%) from 2017 to 2018. Figure 6 depicts actual RES shares by MS and compares them to the indicative trajectory set in the RES Directive for 2017/18 and the NREAP trajectory for 2018. Figure 7 shows each MS' deviation from the 2018 indicative RED trajectory as percentage of the value.

A comparison of actual RES shares to the indicative trajectories set in the RES Directive and the NREAPs shows that:

- 23 MS are above their indicative RED trajectory for 2017/2018. Ireland, France, the Netherlands, Poland and Slovenia are below their indicative RED trajectories.
- The largest positive deviations from their indicative RED trajectories can be observed in Croatia, Bulgaria, Czech Republic and Italy.

[13] Malta adapted its NREAP in the year 2017 specifying targets regarding overall RES and sectoral shares. For RES-E, Malta's 2017 NREAP does not contain specific trajectories on technological level. For RES-E, Malta focusses entirely on PV setting all other technologies to 0%. Therefore, the 2017 NREAP is only used for figures containing sectoral data and technological data for RES. For RES-H&C and RES-T, data from the previous NREAP is used.

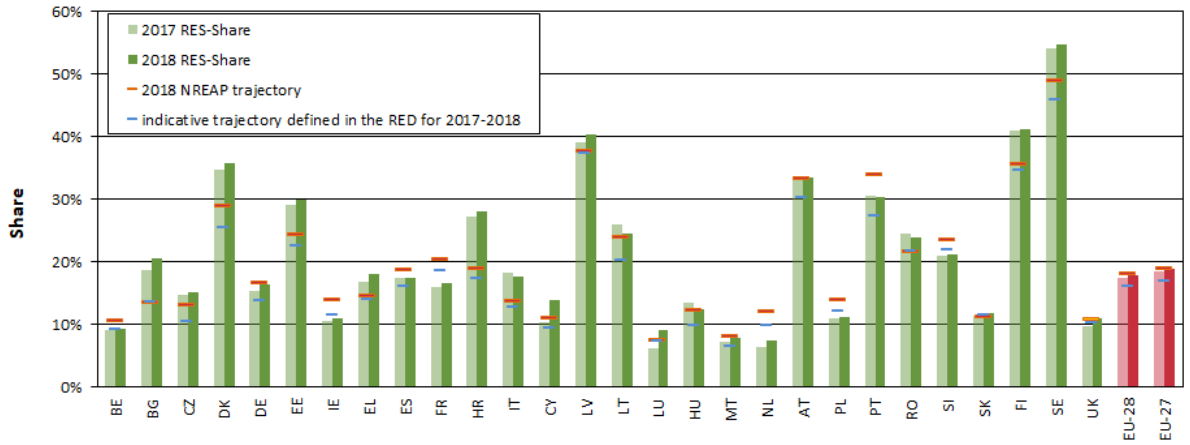

Figure 6. Actual renewable energy shares in 2017 and 2018 compared to indicative trajectories set in RES Directive and NREAP. Source: Eurostat[14]

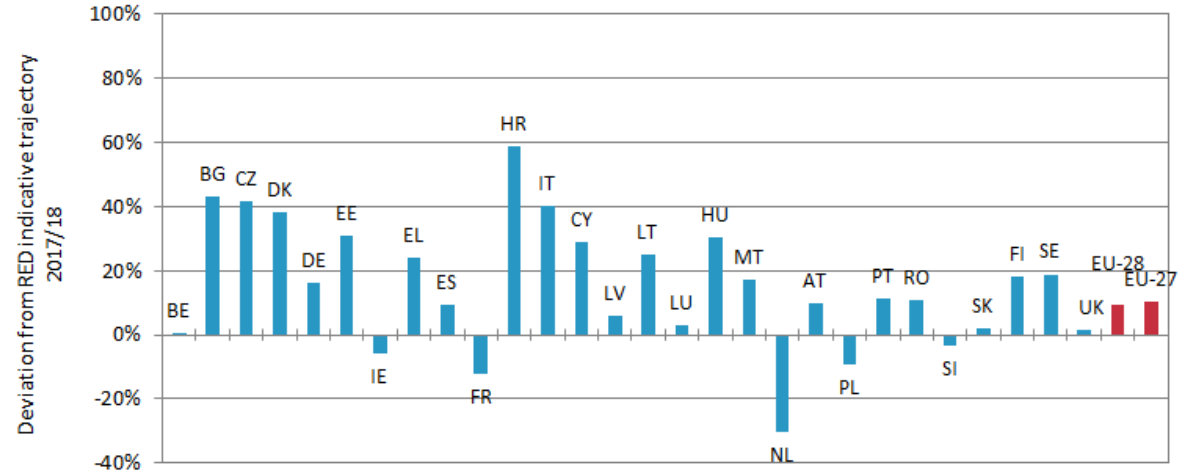

Figure 7. Deviation of actual RES shares in 2017/18 (two-year average) from 2017/18 indicative trajectory set in RES Directive [change in %]. Source: Eurostat

The Netherlands shows the largest gap, with an actual share of 7.4% for 2018 versus an indicative RED trajectory of 9.9%. The gap to their planned NREAP share of 12.1% RES in 2018 is even larger.

Table 2 summarises the results and shows the current and planned RES share according to the NREAP and the indicative trajectories from the RES Directive. In addition, Table 2 shows the 2020 targets of the MS according to the RES Directive, the NREAP as well as the 2020 baseline that was planned by the MS in their National Energy and Climate Plans (NECP), and thus allows a comparison among them.

[14] Quantitative assessments for Malta in this report are based on the National Renewable Energy Action Plan submitted in 2012. Malta submitted a new NREAP in June 2017.

Table 2. Actual (Eurostat) and planned RES shares according to the NREAPs and indicative trajectories from the RES Directive from the RES Directive and the 2020 baseline in the NECPs of the Member State

Member State	2018 RES share [%]	2017/2018 RES share (average of 2017/18) [%]	2018 indicative RES trajectory according to NREAP [%]	2017/2018 indicative trajectory according to RES Directive [%]	2020 RES target according to RES Directive [%]	2020 RES Target according to NREAP [%]	2020 RES share according to NECP baseline [%]
Belgium	9.4	9.2	10.7	9.2	13.0	13.0	**11.2**
Bulgaria	20.5	19.6	13.7	13.7	16.0	16.0	20.18
Czech Republic	15.1	15.0	13.3	10.6	13.0	14.0	15.6[15]
Denmark	35.7	35.2	29.1	25.5	30.0	30.4	41.0
Germany	16.5	16.0	16.7	13.7	18.0	19.6	18.8
Estonia	30.0	29.6	24.5	22.6	25.0	25.0	25.0
Ireland	11.1	10.8	14.0	11.5	16.0	16.0	**12.9**
Greece	18.0	17.5	14.6	14.1	18.0	18.0	19.7
Spain	17.5	17.5	18.9	16.0	20.0	20.8	20.0
France	16.6	16.3	20.5	18.6	23.0	23.0	23.0
Croatia	28.0	27.7	19.1	17.4	20.0	20.1	28.6
Italy	17.8	18.0	13.8	12.9	17.0	17.0	19.0
Cyprus	13.9	12.2	11.2	9.5	13.0	13.0	13.0
Latvia	40.3	39.7	37.7	37.4	40.0	40.0	40.0
Lithuania	24.4	25.2	24.0	20.2	23.0	24.0	26.8
Luxembourg	9.1	7.7	7.5	7.5	11.0	11.0	11.8[16]
Hungary	12.5	13.0	12.3	10.0	13.0	14.7	13.2
Malta	8.0	7.6	8.3	6.5	10.0	10.0	**7.7**
Netherlands	7.4	6.9	12.1	9.9	14.0	14.5	**11.4**
Austria	33.4	33.3	33.3	30.3	34.0	34.2	34.3
Poland	11.3	11.1	14.1	12.3	15.0	15.9	15.0
Portugal	30.3	30.5	34.0	27.3	31.0	34.5	31.0
Romania	23.9	24.2	21.8	21.8	24.0	24.0	27.8
Slovenia	21.1	21.1	23.6	21.9	25.0	25.3	25.0
Slovakia	11.9	11.7	11.4	11.4	14.0	14.0	14.0
Finland	41.2	41.0	35.7	34.7	38.0	38.0	38.0
Sweden	54.6	54.4	49.0	45.8	49.0	50.2	58.2
UK	11.0	10.4	11.0	10.2	15.0	15.0	-
EU28 (calculated)	18.0 (Eurostat SHARES)	17.7 (Eurostat SHARES)	18.1	16[6]	20.7[7]	21.3	-
EU27 (calculated)	18.9 (Eurostat SHARES)	18.7 (Eurostat SHARES)	19.0	16.9[6]	21.4[7]	22.1	-

	Average 2017/2018 share is >1 percentage point above indicative RED trajectory
	Average 2017/2018 share is 0-1 percentage point above indicative RED trajectory
	Average 2017/2018 share is below indicative RED trajectory

Highlighted in **red**, if the 2020 NECP baseline value is below the 2020 target according to RES Directive

[15] The Czech NECP does not provide a baseline value for 2020. Chart 61 on page 209 provides the baseline values towards 2030. However, there is no value stated for 2020. As placeholder, the target value for 2020 from Table 14 on page 31 of the Czech NECP is used.
[16] The share of 11.8% includes cooperation mechanisms. Without cooperation mechanisms the value is 9.2%.

As shown in Table 2, Denmark, Bulgaria and Croatia have achieved their NREAP 2020 targets in 2018 and specified their planned 2020 baseline in their NECPs (+10.6%-, +4.2%- and +8.5%-points respectively) above their 2020 RES targets depicted in the RES Directive and their NREAPs. For almost all other MS the 2020 planned contribution according to the NECP (baseline) are in line with the 2020 RES Directive targets, except for Belgium which has set the NECP baseline for 2020 by 1.3%-points below their 2020 RES Directive target (see Table 2). Figure 8 shows the overall over- and underperformance with regard to the sectoral trajectories defined in the NREAPs for 2018. A comparison of actual RES shares to the indicative NREAP targets and trajectories shows that 12 out of 28 EU MS had already reached or surpassed the level of their 2020 NREAP RES targets at the time of 2018 (however, this does not mean that these countries will automatically achieve their 2020 targets). Another five MS were above their 2018 NREAP trajectories. Nine MS are below their 2018 NREAP trajectories but within reach, with deviations smaller than 10%. Seven MS were lagging behind their 2018 NREAP trajectories for the overall RES share.

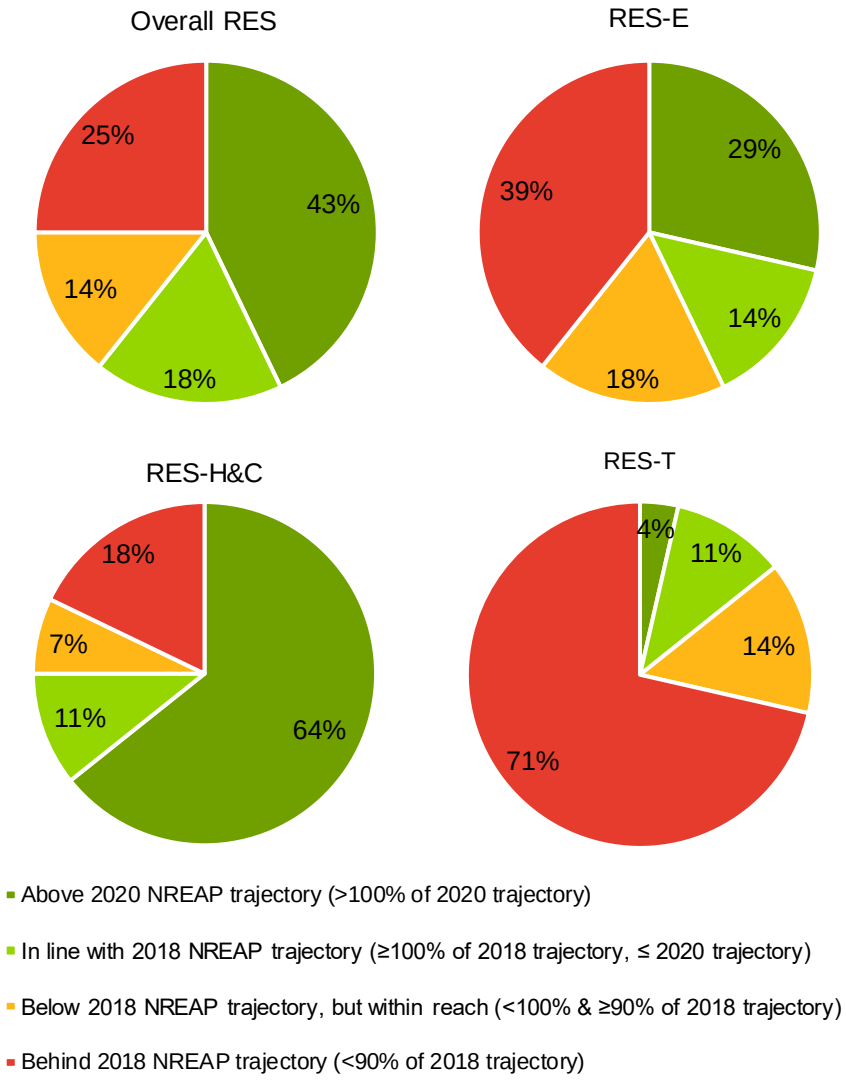

Figure 8. Overview of over- and underperformance compared to the 2018 NREAP trajectories

When looking at the different RES sectors, the picture becomes more differentiated:

Regarding RES-E, eight MS (29%) had already reached the level of the 2020 RES-E share planned in their NREAPs. Four MS were on track of their 2018 NREAP RES-E trajectory, while five MS were below, but within reach (deviations <10%). However, also 11 MS (39%) were not on track of their 2018 NREAP trajectory.

Regarding RES-H&C**,** 18 MS had already exceeded the 2020 RES-H&C share planned in their NREAPs, while three other MS were in line with their 2018 NREAP trajectory. Two MS are below but within reach of their trajectories and five MS were behind their 2018 NREAP trajectory.

The progress regarding RES-T is less advanced. Sweden is already above its 2020 NREAP trajectory and another three MS are on track of their 2018 NREAP trajectories, while four MS are below but within reach of their RES-T trajectories. However, a total of 20 MS (71%) is lagging behind their trajectories, in many cases substantially.

2.2.4 Estimated potential for cooperation mechanisms

In section 11 of the Progress Reports, MS are required to report on their actual and estimated excess and/or deficit production of energy from RES compared to the indicative RED trajectory which could be transferred to or imported from other MS. Table 3 shows these actual and estimated excess and/or deficit production of RES in ktoe as reported by the MS. Lithuania, France and the UK report the excess of energy from RES in %, not in ktoe. They are therefore listed in separate Table 4.

Overall, 12,177 ktoe excess production of RES are estimated for 2020 by the MS listed in Table 3. The main contributors to this excess are Germany, Italy, Finland and Sweden, each estimating an excess of more than 1,000 ktoe for 2020. Six MS (Belgium, Spain, Malta, Austria, Romania and Slovakia) report no excess or deficit production, thereby indicating that they estimate to exactly reach their target. Croatia, France, Latvia, Hungary, Lithuania, Netherlands, Portugal, Slovenia and the UK do not provide an estimation for 2020. A deficit production in 2020 is only estimated by Ireland (-366 ktoe).

Bulgaria, Cyprus, Denmark, Netherlands, Estonia and Romania indicate that they consider cooperation mechanisms as an option to transfer to other MS or from other MS to themselves. In addition, Slovakia reports it is discussing with other MS on statistical transfers and Hungary reports it is open to cooperating with other MS to transfer excess renewables production statistically and to establish common support schemes.

Currently, Sweden, Germany, Denmark, Luxembourg, Estonia, Lithuania, Netherlands and Malta are already making use of cooperation mechanisms. Sweden and Norway have agreed upon a joint support scheme for renewable electricity production by means of a common market for electricity certificates, which was introduced on 1 January 2012. In late 2016, Germany and Denmark held pilot calls for a tender for ground-mounted PV installations that were open to participation by both MS. PV installations in both Germany and Denmark were able to participate in these first cross-border tenders in Europe. In Germany, an open tender with a volume of 50 MW was conducted, in which five projects situated in Denmark submitted successful bids. Denmark tendered a total capacity of 20 MW, of which up to 2.4 MW were open for competition from bidders in Germany. Only Danish projects were awarded. In 2017, Luxembourg signed agreements for statistical transfer with Lithuania and Estonia. The agreements stipulate that Luxembourg will be provided statistical transfers for the period 2018 - 2020 in order to meet its 2020 RED target.

In 2020 both the Netherlands and Denmark as well as Malta and Estonia agreed on statistical transfers, to help the Netherlands and Malta to meet their respective 2020 RED targets.

According to the modelling performed for this report, the currently implemented RES policies of several MS appear insufficient to trigger the required domestic RES volumes to reach their minimum binding 2020 targets as defined in the RED (see chapter 3.2): Belgium, France, Luxembourg, Netherlands and Poland. Of these MS, Belgium and Poland give no indication as to whether they consider making use of statistical transfer in case they fall short of their 2020 target. France has not expressed any intention to make use of statistical transfer or other forms of cooperation mechanisms at this stage. The Netherlands agreed to a transfer with Denmark but this will probably still be insufficient to meet their 2020 RES target, see Table 10 in section 3.2.1.2.

Table 3. Actual and estimated excess and/or deficit production of RES in MS compared to the indicative RED trajectory which could be transferred to/from other MS and/or third countries (ktoe). Source: Table 7 of the Progress Reports

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Belgium			0	0	0	0	0	0	0	0	0	0
Bulgaria		362	348	520	630	593	602	638	579	767	411	341
Croatia												
Czech Republic		0	0	0	0	1,146	1,040	947	863	892	678	643
Denmark			694	834	1,123	1,106	833	928	552	619		63
Germany			9,236	11,831	9,816	1,066	7,967	8,069	3,945	6,141		3,065
Estonia			191	206	177	197	230	243	243	300	344	397
Ireland				93	-14	111	79	26	-142	-12	-239	-366
Greece		196	260	380	306	266	211	-81	-189	-377	683	529
Spain			2,026	2,866	2,704	3,326	2,040	3,106	1,323	1,220		0
Italy	8,324	8,613	7,405	10,011	10,936	9,344	9,456	7,803	7,555	5,148	3,805	2,462
Cyprus							29	29	4	72	18	51
Latvia[17]									-37	16		
Luxembourg	0	0	0	0	0	0	0	0	0	95		86
Hungary		968	1150	1213	1295	883	970	803	470	271		
Malta									3	4		0
Netherlands									0	0	-	-
Austria	0	0	0	0	0	0	0	0	0	0	0	0
Poland		543	729	929	530	93	174	-26,018	-544	790		345
Portugal												
Romania	1,207	1,296	824	974	1,114	1,210	1,091	1,122	858	684	439	0
Slovenia												
Slovakia									45	84		00

[17] Please note that Latvia is ahead of their indicative RED and planned NREAP trajectory for 2015/2016, but this is due to a lower energy consumption. They have (as indicated in their progress report) not reached the levels of gross RES consumption as planned, shown by the negative numbers in this table.

[18] Poland reported actual gross RES consumption negative compared to the planned value for 2016. Percentage wise they are also below their NREAP planned trajectory. However their achievement in percentages shows that they are above the indicative trajectory as specified in the RED for 2015/2016. A cause could be a lower overall energy consumption then planned.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Finland	0	0	0	0	0	0	0	0	1,179	1,420	1,420	1,420
Sweden[19]	2,407	2,141	2,482	3,318	3,214	3,335	3,347	3,475	3,215	3,610	3,428	3,241
Total sum	**11,938**	**14,119**	**25,345**	**33,175**	**31,831**	**22,676**	**28,069**	**27,108**	**19,922**	**21,744**	**10,987**	**12,177**

Table 4. Actual and estimated excess and/or deficit production of RES in MS compared to the indicative RED trajectory which could be transferred to/from other MS and/or third countries (in %)[20]. Source: Table 7 of the Progress Reports

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Lithuania		3.72%	3.23%	3.72%	3.95%	3.86%	4.77%	3.46%	2.04%	1.03%		
UK			0.20%	0.70%	0.60%	1.00%	1.50%	1.20%	0.9%	±0%		
France									-3.4	-4%		

2.3 Trends in support schemes

This chapter outlines the most important trends in the RES support schemes in all three sectors: electricity, heating & cooling and transport. For more detail on the individual MS' policies and support instruments, please see Appendix B.

Trends have been identified based on regulatory changes as well as the implementation of new support schemes as reported in the MS' 5th Progress Reports. Additional sources were taken into account to complement the information provided in each of the Progress Reports, for example official government websites and legal texts as well as assessments thereof. The analysis focused on the main support schemes in the individual sectors. As specific support volumes are often not reported, the analysis is rather qualitative than quantitative.

2.3.1 Policy trends RES-E

A variety of support scheme combinations for RES-E is implemented in the EU-28, see Figure 9. The most common schemes in 2017 and 2018 were premium and feed-in tariffs, the former often combined with tendering systems (auctions). However, also quota schemes, tax incentives, net-metering, subsidies and loans have been applied to support the development of renewable electricity generation. Almost all Member States operate at least two support schemes to support different technologies, installation sizes and actors more specifically and needs-based.

[19] The values still refer to the 4th Progress Report. Sweden didn't provide updated values in the 5th Progress Report, but only referred to the estimates of the Swedish Energy Agency.

[20] This table constitutes an addition to the previous table 3, as three Member States have not reported absolut values but percentage values.

Figure 9. Overview of the support schemes in the RES-E sector between 2015 and 2020. Source: Guidehouse elaboration on previous work

While the specific RES-E support landscape differs for each Member State, there are some general trends that can be observed. Among other developments, the shift from

administratively set feed-in tariffs to feed-in premiums continued. While many MS had already changed their remuneration for new installations between 2014 and 2016, Bulgaria and Slovakia followed in 2018 and 2019 respectively[21].

The most prominent trend in 2017 to 2020 was the continuous shift towards RES auctions. By July 2020, 18 MS determine the support levels for (larger) RES-E installations in a competitive bidding process, see Figure 10. The trend towards auctioning has multiple causes. With the implementation of competition-based schemes for the allocation of support, MS thrive to lower the costs of renewables support and to maintain an effective control either of the volume of new installations or the total budget spent. In addition, the implementation of auctions and premiums has been triggered by the European Commission's Guidelines on state aid for environmental protection and energy (2014/C 200/01) adopted in 2014.

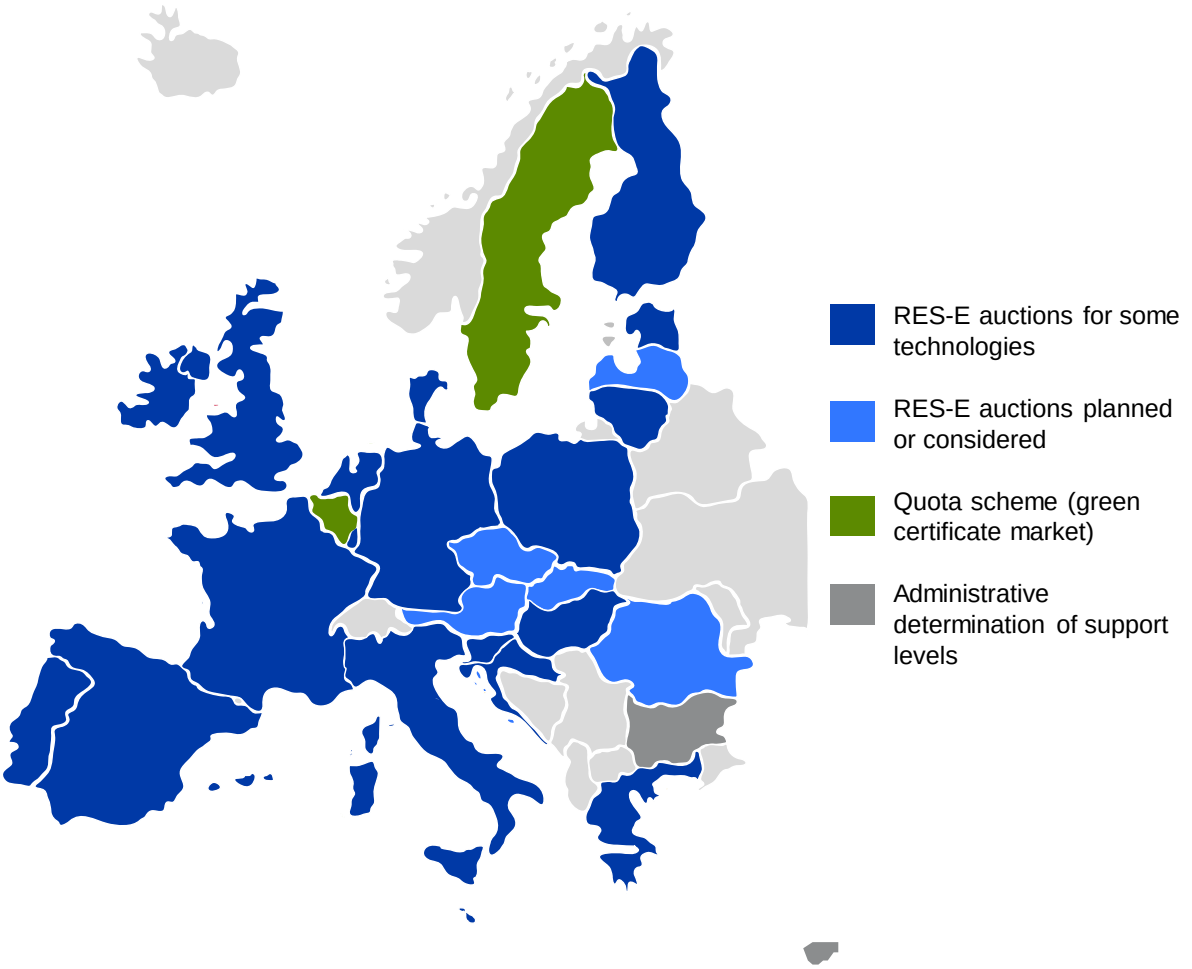

Figure 10. Overview of RES-E auction implementation status in the EU in 2020. Source: Guidehouse

Most MS chose to implement technology-specific auctions rather than technology-neutral or multi-technology auctions. Estonia's and Hungary's schemes feature technology-neutral auctions, while 8 MS operate technology-specific support schemes. This is the case in Germany, Greece, France, Italy, Lithuania, the Netherlands, Poland, Portugal and Finland. Other support schemes feature elements of technology-neutral auctions by applying multi-

[21] Please note that in the case of Slovakia, the planned tender scheme has been introduced by the new RES Act in 2019. However, the auctions have been postponed due to the COVID19 pandemic.

technology auctions partly with additional differentiating elements (Denmark, Germany, Ireland, Spain, France, Croatia, Malta, Poland, Slovenia, Slovakia and the UK).

Some MS are combining technology-specific with multi-technology auctions that have additional elements. This is, for example, the case in Germany, France, the Netherlands and Poland. In some MS, multi-technology auctions have a pilot character (e.g. Germany). The need for technology diversification was mentioned in most cases as reason to make an exception from the principle of technology-neutrality. It remains to be seen whether multi-technology auctions will be implemented at a larger scale and in more MS in the coming years.

During the reporting period, interruptions in the RES-E support occurred in several MS (e.g. Ireland, Greece, Croatia, Hungary and Latvia). Latvia's RES-E support has been on hold from 2011 to the end of 2019. Croatia introduced a new support scheme in 2016. However, necessary by-laws did not enter intro force until 2019 which led to an interruption of support in the reporting period. Hungary introduced a new support scheme in early 2017, however, no tenders for larger installations took place until November 2019. Ireland is a similar case. From January 2016 to June 2018 there was no support scheme available. Greece also faced challenges regarding its new support scheme and had to postpone tendering rounds that were planned for 2018[22]. On the other hand, the support in other MS (e.g. Spain, Portugal and Slovenia) was reestablished.

Regarding the evolution of support schemes, two development trends become visible. While some MS like Germany and France maintain a set of differientiated support formats tailored to support different technologies, installation sizes and actors, other MS like the Netherlands, Denmark, Estonia and Hungary merge and group their support. The extreme example for the merger of support are the Netherlands, who will replace the current support scheme SDE+ by the SDE++ in fall 2020. The SDE++ no longer focuses solely on the production of RES, but on the avoidance of CO_2 emissions, also allowing industrial decarbonisation technologies to compete for SDE++-budget.

In most MS that introduced auctions, support levels decreased, which reflects increased competitive pressure (with some exceptions) but also falling technology costs and low-interest rates (financing costs). For example, support levels for PV in Germany fell by almost 50% between 2015 and 2019. Offshore tenders in the Netherlands and Germany resulted in subsidy-free offshore bids. However, the downward trend in competitively determined support levels can also reverse as a result of changes in financing and technology costs, the competitive landscape as well as the auction design. Average bid levels in onshore wind auctions in Germany, for example, fell from 5.71 ct/kWh in May 2017 to 3.82 ct/kWh in November 2017 and increased again to 6.16 ct/kWh in August 2018. While the 2017 price decrease was mainly due to strong competition in a special setting in the first year of the German onshore wind auctions[23], the price increase in 2018 was caused by a lack of

[22] In Greece, the Ministry of Environment and Energy publishes each year the timeline of (maximum) capacities of RES to be auctioned in each year up to 2020. Based on those maximum capacities, as well as the current status of the market (e.g. estimate of eligible and developed projects), the auctioneer (the Greek regulator RAE) calculates the auctioned volume for each respective auction. This can deviate from the amounts foreseen in the Ministerial Decree which can/should be regarded as the main framework, while RAE decided on the "details". Therefore, RAE sometimes decides to not conduct certain auctions which were actually foreseen in the Ministerial Decree (such as the joint auction in 2018). As RAE does not publish any reasons for not conducting these auctions, it can only be speculated if it is due to the market environment or simply due to internal capacity issues. Nevertheless, RAE tries to use the non-auctioned capacities in the next years (e.g. instead of only auctioning 400 MW in the joint auction in 2019, RAE used 200 MW of capacity from the auction in 2018 that did not occur, thus auctioning 600 MW in 2019). Furthermore, it should be noted that the December 2018 auction for large-scale PV was cancelled, since several projects that were prequalified did not submit any bid in the dynamic auction procedure. As it can be assumed that those projects merely prequalified to circumvent the 75%-rule (which ensures enough competition in the dynamic auction procedure), RAE decided to cancel the auction, as sufficient competition could not be ensured in the auction.

[23] The German onshore wind auctions in 2017 provided preferential rules for community energy projects. Through special shareholder constructions, larger players were able to develop projects that fell under the EEG definition of community energy projects. The main preferential rules were the following:

competition resulting from missing bid volume. There were multiple reasons for the missing bids. A major factor was that the announced change of the support mechanism towards auctions which led to a peak in wind capacity additions at the end of the old administrative support scheme (5.5 GW in 2017 alone). Additionally, the onshore wind development in Germany faced challenges due to acceptance issues, delays in the land-use planning, emerging minimum distance rules on state level and lawsuits against wind projects.

There is a risk that the transition towards an auction-based RES-E support might temporarily slow down RES-E deployment in individual cases. Such an effect may only be visible in the coming years, depending on the transition phase towards the scheme. The deployment gap can occur for two reasons. First, in some MS, the transition phase itself – the time between closing the old scheme and implementing the new scheme – is taking time, which leaves investors with no possibilities to receive support for new installations and hence little incentive to finalize new installations in that period. Croatia is one of the MS in which RES-E support has been on hold for a longer time due to the policy switch. While a new support scheme was introduced with a RES ACT in 2016. the support scheme was not operational throughout this reporting period as most of the by-laws necessary to enforce the RES Act were adopted only several years after the publication of the RES Act. Second, bidders that succeed in an auction need time to realise the project (usually two or more years, depending on the technology and auction design). In addition, some MS have implemented an auction scheme but have not yet held auctions. Also, some MS do not publish an auction schedule that provides a clear outlook on auction volumes and thus deployment levels in the coming years.

The trend towards auctions as the main instrument of allocating support is expected to continue. However, quota schemes continue being the main support instrument in Sweden and Belgium, whereas Italy, Poland and the UK have closed their certificate scheme to the award of new capacities in 2016 and 2017 respectively.

Next to feed-in tariffs or premiums, some MS grant additional support options, e.g. in the form of net metering, which is in place in Denmark, Greece, Spain, Italy, Latvia, Lithuania, Cyprus, Hungary and Slovenia. Net metering is a billing arrangement that allows electricity consumers who also generate electricity, e.g. households with a solar PV installation, to 'virtually' consume their self-generated electricity at any time. This means, for example, that a household is able to feed excess solar power of the midday back into the distribution grid and receive a credit for it which is then offset with electricity consumed form the grid, e.g. in the evening when the own solar installation does not generate electricity. There are various sorts of net metering schemes which vary in the details.

- Lower material pre-qualification requirement: community energy projects did not have to submit a BImSchG permit at the time of bidding and could thus participate in the auction at earlier stages of project planning.
- A reduced penalty in case of non-realization (15 instead of 30 € per kW of installed capacity)
- A realization period increased by 24 months compared to other projects (54 months in total)
- Community energy projects are awarded with the highest awarded bid instead of their own bid price (uniform pricing rule)

More information on the topic can, e.g., be found in the *AURES II report* on *Auctions for the support of renewable energy in Germany*, available from: http://aures2project.eu/wp-content/uploads/2020/04/AURES_II_case_study_Germany_v3.pdf.

2.3.2 Policy trends RES-H&C

Figure 11 presents an overview of support schemes for RES-H&C in the EU-28 for the period of 2016 to 2020. In comparison with the electricity sector and its strong focus on operational support, the support in the heating & cooling sector is concentrated on investments. The overview also highlights the continuity of support schemes in the RES-H&C sector. Although additional support schemes have been introduced in some MS, 26 Member States have maintained their main support scheme. Furthermore, a concentration on fewer support schemes per MS compared to RES-E can be observed.

The most commonly applied form of support for RES-H&C are investment grants. This form of subsidiy was available in 24 MS during 2017 to 2018. In 8 MS investment grants were the sole RES-H&C support scheme, while 5 MS provided the option to choose between a grant or comparable loan. Other forms of commonly provided support are tax deductions and feed-in premiums. The support instruments that are in place usually apply to a broad range of technologies. The most popular technology are biomass plants. In addition, commonly supported technologies are geothermal, aerothermal and hydrothermal heat pumps as well as solar thermal plants.

While several MS (e.g. Belgium, Bulgaria, Ireland, Greece, Malta, Poland, Romania) implemented complementary support schemes, mostly investment grants, Spain and Croatia had no operational support scheme for RES-H&C in 2017 and 2018. Also in Portugal the support is very limited. Only one call for investment grants has been published in 2018. However, both Spain and Croatia, are above their 2018 RES-H&C NREAP sectoral trajectory. Also Portugal is only lagging slightly. In an increasing number of cases RES-H&C is already competitive to conventional solutions in these countries. Thus, a support scheme does not seem to be necessary for these countries.

Figure 11. Overview of the support schemes in the RES-H&C sector between 2015 and 2020. Source: Guidehouse elaboration on previous work

2.3.3 Policy trends RES-T

The RES-T sector stands out by a limited set of support instruments implemented by EU MS. As depicted in Figure 12, the predominant support scheme for RES-T in the EU is a biofuel quota obligation. By 2020, some sort of obligation scheme has been the main RES-T policy measure in all MS. Additionally, the majority of the MS is characterised by the longevity of their support schemes. The only MS that did not use a quota as main support scheme for RES-T until 2018 were Sweden and Estonia. While Sweden relied on tax incentives, Estonia's main instruments in the past were subsidies for biomethane consumption and infrastructure. In addition to its tax incentives, Sweden introduced a biofuel quota in April 2018. Estonia followed in May 2018, but also kept its subsidies in place.

The quota schemes differ in detail, but they generally oblige fuel suppliers to include a certain share of biofuels in their fuel. Most of the schemes have an increasing quota, often targeting a 10% share by 2020. The required shares for 2018 range from 2.4% in Cyprus to 15% in Finland. The minimum and maximum required shares in 2020 apply in the same countries, with 2.5% in Cyprus and 20% in Finalnd.

Germany and Sweden do not impose an increasing share of biofuel content, but demand increasing GHG emissions reductions by fuel suppliers, which has a similar effect in the end. Several MS are adjusted their quota schemes after the implementation of the ILUC Directive in 2015 which had to be transposed by September 2017. It introduced a cap on conventional biofuels and a sub-target for advanced biofuels.

Figure 12. Overview of the support schemes in the RES-T sector between 2015 and 2020. Source: Guidehouse elaboration on previous work

In addition to biofuel quota systems as main RES-T instruments in all MS, tax incentives and/or subsidies are the most common complementary support instruments, see Figure 12.

While five Member States (Spain, France, Cyprus, Luxembourg and Malta) rely soley on a biofuel obligation[24], 17 Member States also grant tax deductions or exemptions. The incentives are granted for various taxes, such as consumption tax, CO_2 tax, income tax (for biofuel producers), excise and environmental pollution taxes. Some MS also have subsidies in place to support the uptake of electric vehicles and the expansion of electric charging as well as biofuel infrastructure. Some MS also have subsidies in place to support biofuel infrastructure, such as Estonia, which provides support for the supply of biomethane in fuel filling stations. Denmark and Italy are the only MS having a premium tariff, which is paid for the use of biogas in transportation.

In addition to the instruments supporting the use of biofuels, MS are increasingly promoting e-mobility options or are currently planning to implement subsidies for e-mobility. Among those Member States that already have support instruments in place are Denmark, Germany, Ireland, Croatia, Italy, Latvia, Malta, Austria, Romania, Sweden and the UK. Most MS incentivise the purchase of electric or plug-in vehicles through grants or tax exemptions and support the development of charging infrastructure.

2.4 Overview of policy commitment of Member States

This section presents an overview of MS fulfilment of earlier policy commitments as well as an assessment of the long-term security of support instruments for each sector.

The overview in Table 5 indicates for each MS, whether it has adopted the planned measures as indicated in its NREAP and 1st, 2nd, 3rd and 4th Progress Report. The evaluation of the fulfilment of earlier commitments (yes/no/partial) is based on the implementation of measures, not on the progress made in terms of renewables deployment and thus likeliness of target achievement. The evaluation therefore deviates significantly from the assessment of target progress. Interestingly, the number of instances of fulfilling the policy commitments while still not meeting the sectoral trajectory has increased compared to the previous round of progress reporting in 2018, especially for RES-T.

Reasons for not or only partially fulfilling earlier commitments can be manifold, e.g. the non-implementation, non-enforcement, change or cancellation of related policies or allocated budget. Some MS are already overshooting their binding overall 2020 RES targets as defined in the RES Directive and have reduced their policy commitments (e.g. Bulgaria, Czech Republic and Croatia). More details can be found in Appendix B, which contains descriptions of each MS policy framework.

The evaluation of the long-term stability of the support instruments (High/Low/Moderate) reflects the continuity and reliability of support policies and budgets. More specifically it reflects whether MS provide a clear outlook for future deployment, e.g. by defining credible long-term policy goals and providing a schedule for the allocation of support over the coming years. Such schedules increase the planning certainty for investors. As a main source for this evaluation the measures described in the NECPs are considered. In order to provide ‘moderate’ or ‘high’ long-term security of support, a clear schedule for the allocation of support beyond 2020 had to be provided. ‘High’ also implies that there is some sort of longer-term support perspective towards 2030. In addition, it is taken into consideration whether MS RES support framework has seen many regulatory changes in the past, which

[24] Note: Out of these five only Luxembourg reached its RES-T NREAP sectoral trajectory. While France and Malta are only lagging slighty, Spain and Cyprus are significantly behind trajectory. However, also Member States with additional support schemes are lagging behind their trajectories.

can impact regulatory and market stability. In cases where retroactive changes occurred, investor confidence and long-term security of support schemes is significantly undermined.

The evaluation of policy commitments and long-term security for RES-T is largely based on the implementation of a quota scheme. By 2018, some sort of quota has been implemented in all MS, thus basically fulfilling their commitment. However, some MS only partially fulfilled their RES-T commitments as their implementation of the quota is either belated, ineffective (e.g. quota too low or lack of enforcement) or they have failed on the implementation of other RES-T policy commitments. Most MS define target quotas only until end of 2020, creating uncertainty for post-2020. However, MS should ideally publish blending obligations for several years in advance and provide clarity, especially in the surrounding system of options to demonstrate compliance and types of biofuel allowed to reach the quota in order to create a stable outlook to fuel suppliers.

Table 5. Overview of Member States' fulfilment of NREAP policy commitments and evaluation of long-term stability of support

	RES-E		RES-H&C		RES-T	
Country	Fulfilment of policy commitments	Long-term security of support	Fulfilment of policy commitments	Long-term security of support	Fulfilment of policy commitments	Long-term security of support
BE	Yes	Moderate	Yes*	Moderate	Yes*	Moderate
BG	Partial	Moderate	Yes	High	Yes	High
CZ	Partial	Moderate	Yes	Moderate	Yes*	Moderate
DK	Yes	High	Yes	High	Yes*	Moderate
DE	Yes	High	Yes	High	Yes*	Moderate
EE	Yes	High	Yes	Moderate	Yes	High
IE	No	High	Partial	Moderate	Yes*	High
EL	Partial	High	Yes	High	Yes*	Moderate
ES	No	Moderate	Partial	Moderate	Partial	Moderate
FR	Yes*	High	Yes*	High	Yes	High
HR	Partial	Moderate	No**	Low	Partial	Moderate
IT	Yes	High	Yes	Moderate	Yes*	High
CY	Partial	Moderate	Yes	Moderate	Partial	Moderate
LV	Partial	Low	Partial	Moderate	Partial	Moderate
LT	Yes*	High	Yes	High	Yes*	High
LU	Yes*	High	Yes	High	Yes	High
HU	Partial	Moderate	Partial	Moderate	Yes	High
MT	Partial	Moderate	Partial	Moderate	Yes	Moderate
NL	Yes*	Moderate	No	High	Yes	Moderate
AT	Yes	High	Yes	High	Yes	High
PL	Yes*	Moderate	Yes*	Moderate	Yes*	Moderate
PT	Partial	High	Partial	Low	Partial	Moderate
RO	Partial	Low	Partial	Moderate	Yes*	Moderate
SI	Partial	High	Yes	High	Yes*	High
SK	Partial	High	Partial	High	Partial	High
FI	Yes	Moderate	Yes	Moderate	Yes*	High
SE	Yes	High	Yes	High	Yes	High
UK	Yes	Moderate	Yes	Moderate	Yes*	High

*Fulfillment of policy commitments, but below NREAP sectoral trajectory
**No fulfillment of policy commitments, but above NREAP sectoral trajectory

3. FEASIBILITY OF 2020 TARGET ACHIEVEMENT CONSIDERING CURRENT PROGRESS

This chapter is provides a model-based assessment to what extent currently implemented RES policies (Current Policy Initiatives (CPI)) appear sufficient to trigger the targeted RES deployment in 2020 at the MS level. The scenario calculation is done by application of the Green-X model, a well-established simulation tool for policy instruments in the European RES market indicating consequences of policy choices on deployment and cost of RES technologies in a comprehensive manner. Additionally, within the analysis the RES contributions to/from MS based on the use of cooperation mechanisms, e.g. joint projects, joint support schemes and statistical transfers are incoporated to the extent that these are included in the MS current policies as of July 2020.

The modelling work performed is closely linked to other parts of this study. Thus, the assessment of future progress builds on the analysis of past progress (Chapter 2) and reflects findings gained with respect to achieved progress in mitigating non-economic barriers (Appendix C). Obviously, this quantitative assessment is also closely linked to the overall qualitative RES policy assessment (Appendix B), building on the collected policy information and providing input to the overall policy analysis.

Apart from policy information a key determinant for the achievement of 2020 RES targets at EU and at MS level is the actual market development, both concerning RES supply and overall energy demand. A closer look at recent market data (as of July 2020) indicates that the current COVID-19 pandemic shows significant impacts on our overall society, the economy and, in consequence, also the energy system including renewable energy deployment.

***Impact of COVID crisis**: Our proposed (and exemplified) approach of how to incorporate the impact of the COVID crisis into our analysis is described in Box 1. Draft final results derived at this project stage demonstrate the application of this concept within our modelling practices, incorporating assumptions on this year's (2020) energy demand trends and the expected impacts on RES supply.*

Box 1. Incorporating COVID-19 impacts on the energy system into the 2020 RES progress analysis

The ongoing (as of July 2020) COVID-19 pandemic has shown severe impacts on society, the economy and the energy system globally and across Europe. Below we indicate approaches on how to cope with these impacts within the 2020 RES progress analysis, distinguishing between impacts on energy consumption and on RES supply. Generally, the uncertainty of projected RES deployment versus actual could increase, specifically concerning RES target achievement, accounted as RES share in demand.

Energy demand impacts: Energy demand in the EU declined by over 5% relative to Q1 2019 (IEA, 2020). The decline in activity and energy demand was concentrated in March after lockdowns were implemented in response to the COVID-19 pandemic. Economic output and the related energy demand are thus expected to decline even further in the first half of 2020, with most of the contraction taking place in the second quarter (European Commission, 2020). Demand fell most in regions that implemented lockdowns earlier, imposed more stringent lockdowns and where tourism represents a significant part of the economy. The energy demand is expected to pick up in the second half of 2020, assuming (i) containment measures will be gradually lifted, (ii) after these measures are loosened the pandemic remains under control, and (iii) the unprecedented monetary and fiscal measures implemented by MS and the EU are effective at cushioning the immediate economic impact of the crisis as well as at limiting permanent damage to the economic tissue (European Commission, 2020).

To reflect for this substantial change in energy demand and its dynamics, various sources were used to reflect for the exceptional situation. To start with, the energy demand for 2019 is derived by making use of the Eurostat early estimates (2020a). This estimates help to project the energy demand growth rates for 2019. As a second step, the IEA Global Energy Review 2020 is used to obtain growth rates for the EU28 region for the year 2020. It has expanded its coverage to include real-time analysis of developments to date in 2020 as well as possible directions for the rest of the year. The Global Energy Review tracked energy use by country and fuel until the end of April 2020 and provides full-year 2020 projections by energy carrier.The IEA (2020) projects a decline of energy demand for 2020 compared to 2019 by 10% to 12% for the European Union. The electricity demand is projected to diminish by about 8% compared to 2019 and the demand for transport fuels is projected to decline by around 11%. These projections combined deliver the following picture, provided in Table 6.

Table 6. Energy demand projections for different sectors for 2019 and 2020 in the EU28. (Eurostat, 2020a, 2020b; IEA, 2020)

	Historic	Projections			% change compared to previous year		
EU-27	2018	2019	2020 High Demand	2020 Low Demand	2019	2020 High Demand	2020 Low Demand
Energy demand sector	ktoe	ktoe	ktoe	ktoe	%	%	%
Electricity generation from all sources	251,732	249,075	229,791	224,809	-1.1%	-7.7%	-9.7%
All fuel consumed for heating and cooling	466,884	467,201	419,984	410,856	0.1%	-10.1%	-12.1%
Fuel used in transport (as defined in Article 3)	272,028	272,811	243,383	238,057	0.3%	-10.8%	-12.7%
Gross final energy consumption adjusted	1,029,360	1,027,683	927,798	907,604	-0.2%	-9.7%	-11.7%

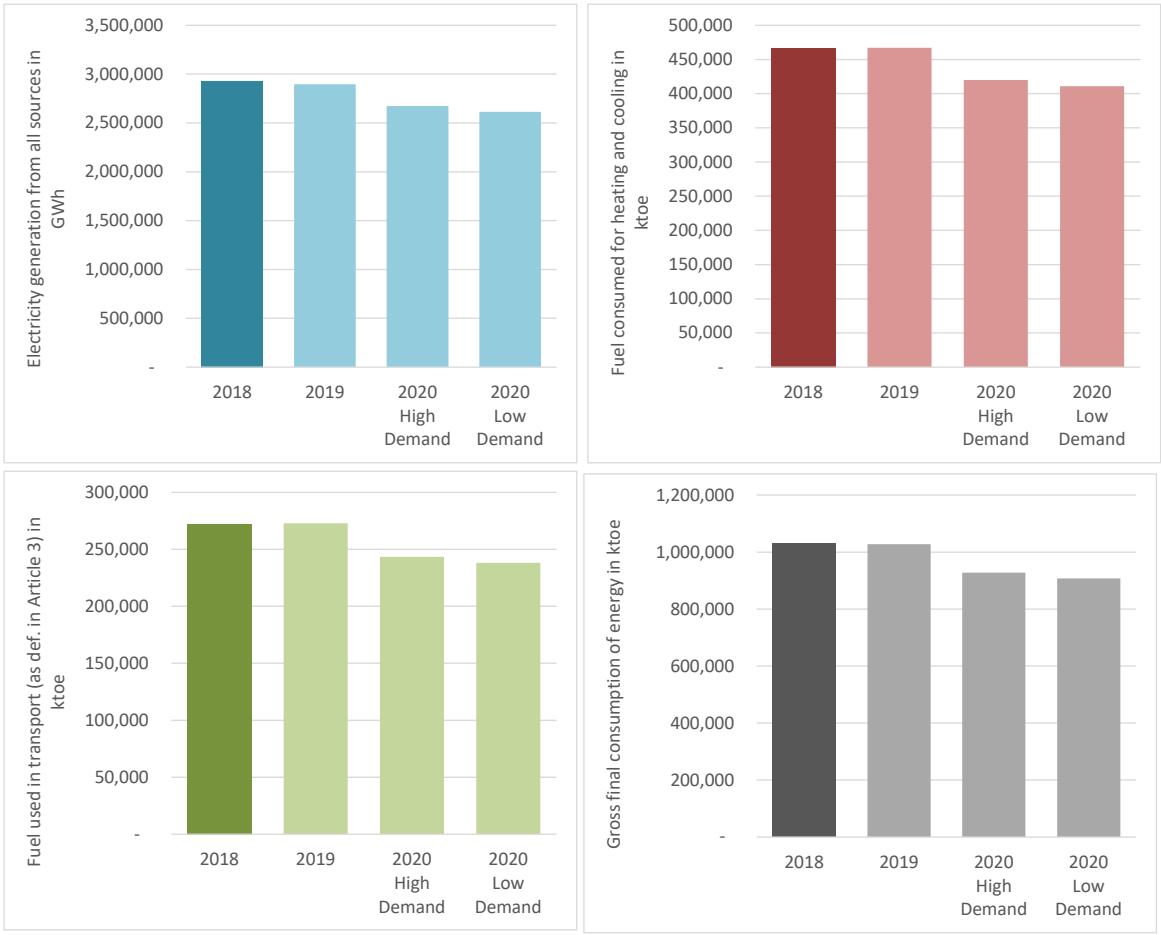

Figure 13. Energy demand projections for different sectors for 2019 and 2020 in the EU-28. (Eurostat, 2020a, 2020b; IEA, 2020)

More literature and data sources were consulted to downscale the energy demand projection from the EU to a MS level. For the electricity sector, the annual change per week was tracked at MS level using ENTSO-E data as done by Bruegel (McWilliam and Zachmann, 2020). Consequently, weekly change rates were used to approximate the expected reduction of annual electricity demand in 2020 at MS level. The European Economic Forecast, Spring 2020 (European Commission, 2020) provides economic forecasts which account for the impact of the COVID-19 pandemic for all EU MS. These forecasts were used to estimate the reduction of energy demand in the heating and cooling sector and in transport at MS level. To account for uncertainties in 2020 energy demand impacts, two distinct energy consumption scenarios have been derived: The 10% to 12% reduction of gross final energy consumption at EU level compared to 2019 is represented by a High and a Low Demand scenario. Table 8 (below, see section 3.1.3) shows derived energy demand projections for 2020 at MS level.

Impacts on RES supply: Generally, we expect that RES generation is less affected than overall energy demand. For RES plants that have been installed in previous years, it can be expected that their operation is hardly affected. This statement appears valid for variable RES like wind, solar and hydropower since their ability to generate electricity depends on weather and not on demand. Similarly, electricity production from dispatchable RES like biomass appears also to be hardly affected since their operation is largely driven by RES support (which has not been affected by the COVID-19 pandemic so far). For biofuels in transport or biomass used for heating purposes, however, one can expect certain impacts of the crisis that come along with the changes in demand.

3.1 Methodology and data sources

The method of approach and the related key assumptions for the prospective assessment undertaken are discussed in detail subsequently. As starting point, the modelling tool used for performing the quantitative assessment is described, followed by a clear characterisation of the approach applied for evaluating on RES progress. Finally, data sources and key assumptions are listed.

3.1.1 The applied energy system model Green-X

As in previous projects, such as FORRES 2020, OPTRES, PREBS 2012, PREBS 2014 or PREBS 2018, the Green-X model was applied to perform a detailed quantitative scenario assessment of the future deployment of renewable energies on country and sector level. The core strength of this tool lies in the detailed RES and technology representation accompanied by a thorough energy policy description, which allows assessing various policy options with respect to resulting costs and benefits. A short characterisation of the model is given below (cf. Box 2), while for a detailed description of the model and its database we refer to www.green-x.at.

A quick overview of all technologies covered is given in Table 7 which follows largely the same categorisation as in the assessment of past progress (Chapter 2). A few deviations were however necessary due to differences in accounting between the Green-X model and its database versus the historic record:

- "Bioliquids" are summarised under "Biomass", including solid and liquid fuels as well as the biodegradable fraction of municipal solid waste.

- For the transport sector, Green-X is only capable to model biofuel deployment but not electro-mobility. However, electricity in transport is included in the target achievement calculation as a subtask by statistical means. Regression techniques are used to estimate the impact of electro-mobility on the RES-T share by 2020.

Please note that for renewable heating, cooling and electricity, our final analysis of future progress will also incorporate to the extent necessary the possible contribution of the building sector in exporting renewable energy generated on buildings (as defined in article 13.4. of the RED) to the energy system.

Table 7. Overview on RES technologies in Green-X modelling

RES-E	RES-H&C	Biofuels in transport
Offshore wind	Solar thermal	First generation biofuels
Onshore wind	Biomass (i.e. solid and liquid, incl. biowaste)	Second generation biofuels
Biomass (i.e. solid and liquid, incl. biowaste)	Biogas	
Biogas	Heat pumps	
Photovoltaics	Geothermal	
Hydro		
Geothermal		
Concentrated solar power		
Tide, wave and ocean energy		

Box 2. Short characterization of the Green-X model

The Green-X model was developed by TU Wien within the research project "Green-X – Deriving optimal promotion strategies for increasing the share of renewable electricity in a dynamic European electricity market", a joint European research project funded within the 5th framework program of the European Commission, DG Research (Contract No. ENG2-CT-2002-00607). It allows for performing a detailed quantitative assessment of RE deployment until 2030 in a real-world policy context. This tool has been successfully applied for the European Commission within several tenders and research projects on renewable energies and corresponding energy policies, e.g. FORRES 2020, OPTRES, RE-Shaping, EMPLOYRES, RES-FINANCING and has been used by Commission Services in the "20% RE by 2020" target discussion. It fulfils all requirements to explore the prospects of renewable energy technologies and:

- Currently covers geographically the EU-28 (all sectors), the Contracting Parties of the Energy Community and Turkey as well as selected North African countries (limited to renewable electricity) and can in principle be extended to other countries or regions.
- Allows investigating the future deployment of RES as well as accompanying generation costs and transfer payments (due to the support for RES) within each energy sector (electricity, heat and transport) at country- and technology-level on a yearly basis up to a time-horizon of 2050.

The modelling approach to describe supply-side generation technologies derives dynamic cost-resource curves by RES option, allowing a suitable representation of dynamic aspects such as technological learning and technology diffusion (besides the formal description of potentials and costs). It is suitable to investigate the impact of applying different energy policy instruments (e.g. quota obligations based on tradable green certificates, (premium) feed-in tariffs, tax incentives, investment subsidies) and non-cost diffusion barriers.

Within the Green-X model, the allocation of biomass feedstock to feasible technologies and sectors is fully internalised into the overall calculation procedure, allowing an appropriate representation of trade and competition between sectors, technologies and countries. Moreover, Green-X was extended to allow an endogenous modelling of sustainability regulations for the energetic use of biomass.

Within Green-X a broad set of results can be gained for each simulated year on a country-, sector and technology-level:

- RES generation and installed capacity.
- RES share in total electricity / heat / transport / final energy demand.
- Generation costs of RES.
- Capital expenditures for RES.
- Impact of RES support on transfer costs for society / consumer (support expenditures).
- Impact of enhanced RES deployment on climate change (i.e. avoided CO_2 emissions).
- Impact of enhanced RES deployment on supply security (i.e. avoided primary energy).

3.1.2 General approach and scenario definition

The general approach used for this analysis of expected MS' future progress is to conduct a model-based quantitative assessment of future RES deployment in absolute (i.e. GWh produced, MW installed) and relative terms (i.e. RES shares on gross demands), reflecting assumptions also on future energy demand, comprising short-term trend expectations for 2020.

The assessed *Current Policy Initiatives (CPI) scenario* assumes a continuation of currently implemented RES support policies, commonly specified also as "business-as-usual" case. Note that it also reflects a "business-as-usual" world with respect to non-economic RES barriers as currently applicable in the different MS. In order to illustrate uncertainty adequately, a sensitivity analysis on key input parameters (and related uncertainties within these) is conducted.

***Remark**: At the project stage, we present draft final results for the default CPI scenario, complemented by a sensitivity analysis related to energy demand trends for 2020 – since for demand the uncertainty caused by (ongoing) COVID-19 impacts appears of key relevance.*

The sensitity analysis focuses specifically on the COVID-19 pandemic, and the uncertainty caused by that on the various parts of the (renewable) energy market. In this context we focus on the demand side, indicating the uncertainty in this year's (2020) energy demand caused by the pandemic and the corresponding impacts on the society and the economy. In practical terms, we show two distinct demand trends (low and high demand) that appear likely as lower and upper boundaries of what is classified as feasible concerning demand trends from today's (July 2020) perspective.

Complementary to the above, a brief sensitivity analysis is also performed concerning the stipulated use of cooperation mechanisms and its impact on 2020 RES target achievement by MS (cf. section 3.2.1.2). Based on the agreements taken at bilateral basis, two distinct scenarios are derived for the use of RES cooperation by means of statistical transfers: a "strong cooperation" and a "weak cooperation" scenario.

The results from the assessment of past and current RES progress (Task 2) have been combined with the outcomes of the projections done in this subtask (Task 3), as to present the total result, including a split per sector. For the historic part, the RES development for years 2010 to 2018 is generally consistent with the ESTAT shares tool as outlined in Chapter 2 of this report. Please note further that a cross-check of modelled RES deployment with recent draft statistics on early 2019 deployment estimates has been performed. For this purpose, provisional statistics provided by Eurostat have been used.

3.1.3 Data sources and key assumptions

The data sources as used in this assessment are the following:

- Information on *Current (RE) Policy Initiatives (CPI)* was taken from the RES-legal database and various national sources, especially the MS's Progress Reports from several reporting periods. This information was updated with the most recent information on the outcomes of auctions for renewable electricity (derived from the H2020 project AURES II[25]). Where necessary, this was complemented via the consortium's network of national experts with bottom-up policy information collected

[25] http://aures2project.eu/

at country level. The policy information and related background sources were retrieved in the period April to August 2020.

- In order to ensure maximum consistency with existing EU scenarios and projections, the key input parameters of the scenarios presented in this assessment have been derived from PRIMES modelling regarding fossil fuel price developments and from the Green-X database with respect to the potentials and cost of RES technologies.

- Assumptions on this year's (2020) energy demand trends are listed in Table 8 while the underlying assumptions are described in Box 1, informing on our approach taken to incorporate impacts of the COVID-19 pandemic.

Table 8. Projections of gross final energy consumption at MS level and for EU-28/EU-27. Source: Eurostat, 2020a

Gross final energy consumption adjusted (after reduction for aviation limit)	Historic values	Projections			% change compared to previous year		
	2018	2019	2020 High Demand	2020 Low Demand	2019	2020 High Demand	2020 Low Demand
Member State	ktoe	ktoe	ktoe	ktoe	%	%	%
Belgium	36,839	36,385	32,575	31,819	-1.2%	-10.5%	-12.5%
Bulgaria	10,864	10,858	10,043	9,846	-0.1%	-7.5%	-9.3%
Czechia	26,948	26,752	24,407	23,896	-0.7%	-8.8%	-10.7%
Denmark	15,944	15,762	15,131	14,890	-1.1%	-4.0%	-5.5%
Germany	223,305	224,088	206,458	202,787	0.4%	-7.9%	-9.5%
Estonia	3,295	3,212	2,976	2,915	-2.5%	-7.3%	-9.2%
Ireland	12,171	12,225	11,049	10,803	0.4%	-9.6%	-11.6%
Greece	16,681	17,029	15,250	14,893	2.1%	-10.4%	-12.5%
Spain	89,211	88,159	76,998	74,856	-1.2%	-12.7%	-15.1%
France	154,492	154,280	136,025	132,379	-0.1%	-11.8%	-14.2%
Croatia	7,131	7,194	6,314	6,141	0.9%	-12.2%	-14.6%
Italy	121,546	121,252	103,821	100,813	-0.2%	-14.4%	-16.9%
Cyprus	1,684	1,683	1,533	1,501	0.0%	-8.9%	-10.8%
Latvia	4,373	4,319	3,993	3,917	-1.2%	-7.5%	-9.3%
Lithuania	5,789	5,762	5,279	5,175	-0.5%	-8.4%	-10.2%
Luxembourg	4,049	4,050	3,738	3,675	0.0%	-7.7%	-9.2%
Hungary	19,119	19,149	17,533	17,196	0.2%	-8.4%	-10.2%
Malta	558	564	524	515	1.1%	-7.1%	-8.8%
Netherlands	50,494	50,214	45,502	44,634	-0.6%	-9.4%	-11.1%

Gross final energy consumption adjusted (after reduction for aviation limit)	Historic values	Projections			% change compared to previous year		
	2018	2019	2020 High Demand	2020 Low Demand	2019	2020 High Demand	2020 Low Demand
Austria	28,882	29,381	26,588	26,064	1.7%	-9.5%	-11.3%
Poland	75,000	75,015	70,428	69,405	0.0%	-6.1%	-7.5%
Portugal	17,675	18,021	15,996	15,594	2.0%	-11.2%	-13.5%
Romania	24,964	25,170	23,227	22,821	0.8%	-7.7%	-9.3%
Slovenia	5,177	5,032	4,558	4,469	-2.8%	-9.4%	-11.2%
Slovakia	11,342	10,618	9,517	9,294	-6.4%	-10.4%	-12.5%
Finland	27,020	27,125	25,499	25,031	0.4%	-6.0%	-7.7%
Sweden	34,808	34,383	32,833	32,275	-1.2%	-4.5%	-6.1%
United Kingdom	133,720	132,945	116,765	113,790	-0.6%	-12.2%	-14.4%
EU-27	1,029,360	1,027,683	927,798	907,604	-0.2%	-9.7%	-11.7%
EU-28	1,163,080	1,160,628	1,044,563	1,021,394	-0.2%	-10.0%	-12.0%

This year (2020) we have to cope with special circumstances since the currently ongoing (as of September 2020) COVID-19 pandemic has shown severe impacts on the society, the economy and on the energy system across all EU MS. Box 1 (above) indicates the approach taken to cope with these impacts within the RES progress analysis.

3.1.4 Approach for evaluating RES progress

Complementary to Chapter 2, this section indicates expectations on the MS progress in deploying RES-E, RES-H&C and RES-T in 2020. More precisely, we are comparing trend expectations for 2020 with two targets set out in the RED (i.e. binding national targets on RES overall and RES-T) and the baseline of planned contribution as specifieid in MS's NECPs.

For RES overall, two figures will be presented for 2020:

- Overview figure comparing MS' and the EU's expected RES deployment with binding RED 2020 RES targets and 2020 planned contribution as in the NECP baselines.

- MS' and the EU's deviation from planned deployment, comparing again expected 2020 RES deployment with both the binding RED 2020 RES targets and the 2020 planned contribution as in the NECP baselines.

All data on expected RES deployment stems from Green-X modelling, i.e. the "Current Policy Initiatives (CPI)" scenario. In order to illustrate uncertainty adequately, the policy variation is complemented by a set of sensitivity investigations as discussed above. For each of the three sectors, we present the deviation from the planned contributions as specified in the NECP baselines for 2020.

3.2 Results from the modelling of feasibility of 2020 targets

3.2.1 Projected future progress in RES overall

3.2.1.1 Cross-country comparison excluding cooperation mechanisms

Overview of expected 2020 RES deployment vs. binding 2020 RES target (set out in the RED)

Below we provide a comparison of the expected and the planned RES deployment by 2020, and we analyse the achievement of nationally binding RED 2020 RES targets. Please note that the impact of RES cooperation on RES target achievement is neglected in this section. Data on country-specific RES deployment indicates the default statistical accounting practices but ignores intergovernmental agreements taken between MS concerning (virtual) statistical transfers of RES volumes or other forms of RES cooperation. The impact of RES cooperation on RES target achievement is discussed in section 3.2.1.2.

Figure 14, indicating expected and planned RES deployment in relative terms (i.e. RES share in gross final energy demand), and Figure 15, showing the deviation of expected 2020 RES shares from the binding RED 2020 RES targets, provide a graphical illustration of the expected progress up to 2020 according to currently implemented RES policy initiatives. To address the uncertainty in this year's energy demand developments, impacted by the COVID-19 pandemenic, we analysed a low and high energy demand trend for 2020. Complementary to the graphical illustrations, Table 9 lists all data on expected and planned 2020 RES shares (presenting binding RED 2020 RES targets as well as planned contributions specified in the MS's NECP baselines).

Table 9. Expected, planned and required RES shares in 2020 excluding cooperation mechanisms

RES share in gross final energy demand by 2020 - without impact of RES cooperation	Expected RES share 2020 (CPI scenario)		RED target RES share 2020	NECP baseline share 2020	Deviation of expected from RED target RES share (CPI scenario)		Deviation of expected from NECP baseline share (CPI scenario)	
	Min.	Max.			Min.	Max.	Min.	Max.
Member State	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Belgium	12.0%	12.0%	13.0%	11.2%	-7.6%	-7.3%	7.3%	7.6%
Bulgaria	23.8%	24.0%	16.0%	20.2%	48.9%	50.1%	18.0%	19.0%
Czechia	17.6%	17.8%	13.0%	15.6%	35.7%	36.6%	13.1%	13.8%
Denmark	40.0%	40.3%	30.0%	41.0%	33.4%	34.3%	-2.4%	-1.7%
Germany	19.8%	20.0%	18.0%	18.8%	9.8%	11.1%	5.1%	6.3%
Estonia	36.1%	36.3%	25.0%	25.0%	44.3%	45.2%	44.3%	45.2%
Ireland	16.6%	16.9%	16.0%	12.9%	4.0%	5.5%	29.0%	30.9%
Greece	23.4%	23.8%	18.0%	19.7%	30.3%	32.2%	19.0%	20.8%
Spain	22.0%	22.4%	20.0%	20.0%	9.9%	11.8%	9.9%	11.8%
France	20.0%	20.3%	23.0%	23.0%	-12.9%	-11.8%	-12.9%	-11.8%
Croatia	34.6%	34.9%	20.0%	28.6%	72.8%	74.5%	20.8%	22.1%
Italy	22.3%	22.7%	17.0%	19.0%	31.3%	33.4%	17.5%	19.4%

RES share in gross final energy demand by 2020 - without impact of RES cooperation	Expected RES share 2020 (CPI scenario)		RED target RES share 2020	NECP baseline share 2020	Deviation of expected from RED target RES share (CPI scenario)		Deviation of expected from NECP baseline share (CPI scenario)	
	Min.	Max.			Min.	Max.	Min.	Max.
Member State	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Cyprus	15.9%	16.1%	13.0%	13.0%	22.3%	24.2%	22.3%	24.2%
Latvia	42.4%	42.6%	40.0%	40.0%	6.0%	6.5%	6.0%	6.5%
Lithuania	30.4%	30.4%	23.0%	26.8%	32.0%	32.4%	13.3%	13.6%
Luxembourg	7.5%	7.6%	11.0%	9.2%	-31.4%	-31.0%	-18.0%	-17.5%
Hungary	14.3%	14.4%	13.0%	13.2%	10.0%	10.5%	8.4%	8.9%
Malta	12.1%	12.2%	10.0%	7.7%	20.8%	22.3%	56.9%	58.9%
Netherlands	11.0%	11.1%	14.0%	11.4%	-21.6%	-20.8%	-3.7%	-2.8%
Austria	37.8%	38.2%	34.0%	34.3%	11.2%	12.4%	10.2%	11.4%
Poland	13.7%	13.8%	15.0%	15.0%	-8.7%	-8.3%	-8.7%	-8.3%
Portugal	35.9%	36.4%	31.0%	31.0%	15.8%	17.5%	15.8%	17.5%
Romania	27.8%	28.0%	24.0%	27.8%	16.0%	16.8%	0.1%	0.8%
Slovenia	27.7%	27.9%	25.0%	25.0%	10.6%	11.6%	10.6%	11.6%
Slovakia	14.7%	14.9%	14.0%	14.0%	5.3%	6.4%	5.3%	6.4%
Finland	48.6%	48.9%	38.0%	38.0%	27.8%	28.6%	27.8%	28.6%
Sweden	60.9%	61.6%	49.0%	58.2%	24.3%	25.7%	4.7%	5.8%
United Kingdom	16.2%	16.4%	15.0%	15.0%	7.9%	9.7%	7.9%	9.7%
EU-27	22.8%	23.1%	20.0%	21.7%	14.2%	15.5%	5.2%	6.4%
EU-28	22.1%	22.4%	20.0%	21.0%	10.4%	11.8%	5.4%	6.7%

*The NECPs of Czechia, Greece, France, Cyprus and Slovenia do not specify a basline share for 2020. For these MS we use the 2020 target share instead. For UK, which did not publish a final NECP, the RED target RES share 2020 is used.

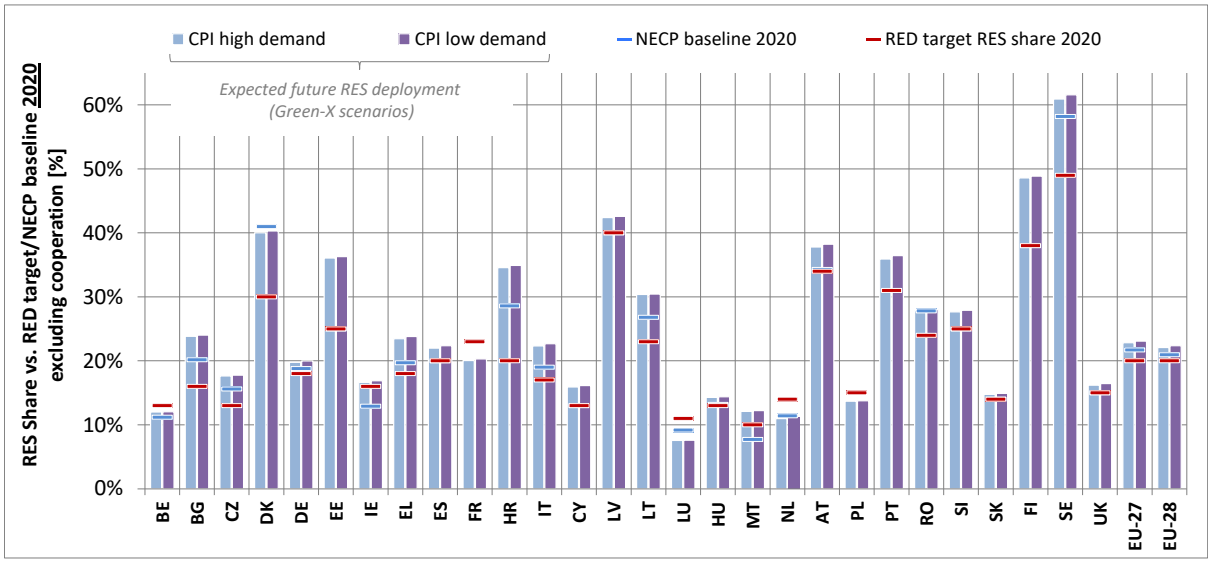

Figure 14. Expected RES share in 2020 vs. 2020 RED target RES share and 2020 NECP baseline (%) excluding cooperation mechanisms

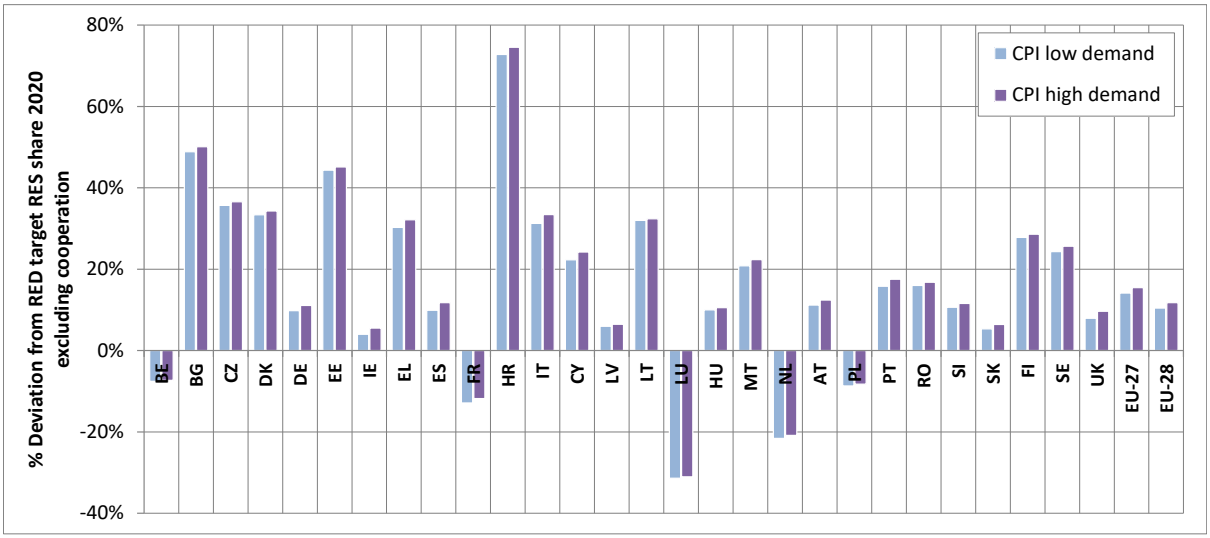

Figure 15. Deviation of expected RES shares (Green-X scenarios) from binding RED 2020 RES targets excluding cooperation mechanisms

A comparison of expected with targeted RES deployment by 2020 indicates that the EU is likely to succeed in meeting its binding RED 2020 RES target: At EU-28 (EU-27) level a RES share of 22.1% to 22.4% (22.8% to 23.1%) can be expected with currently implemented RES policy initiatives[26]. The majority of MS is expected to perform well with meeting the indicative trajectory, not only in the past (2018) but also in meeting their binding RED 2020 RES targets. 23 of the assessed 28 MS, including Bulgaria, Czechia, Croatia, Denmark, Germany, Estonia, Greece, Spain, Croatia, Italy, Cyprus, Latvia, Lithuania, Hungary, Malta, Austria, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden and the UK, may succeed in (over)fulfilling their binding RED 2020 RES targets with implemented RES policies under the given special circumstances of today (2020) – i.e. the significant drop in energy consumption driven by the COVID-19 pandemic during the first half of 2020. For the remaining MS, namely Belgium, France, Luxembourg, the Netherlands and Poland, currently implemented RES policy initiatives appear insufficient to trigger the required RES volumes to reach the binding 2020 RES targets purely domestically, despite the strong decline in energy consumption. The situation differs however from MS to MS: while results show that Belgium, Poland and France may have only a comparatively small deficit in relative terms of less than 15% (i.e. as percentage deviation to required RES deployment) even under pessimistic circumstances (i.e. high demand trend for 2020), MS like Luxembourg and the Netherlands may face a comparatively larger gap (i.e. larger than 15%) by 2020. Thus, initiating RES cooperation with other MS and/or third countries represents a viable option for them to meet their binding RED 2020 RES targets, assuming that domestic RES potentials are insufficient, comparatively costly or hardly to be mobilised in time.

Up to now (end of summer 2020) Luxembourg and the Netherlands, i.e. the two countries with the largest expected gaps in RES deployment as required for target achievement, as well as Malta have already signed treaties with Estonia, Lithuania and Denmark to close their expected gap in RES deployment by making use of cooperation mechanisms in the form of statistical transfers. The impact of RES cooperation on expected 2020 RES deployment is presented in section 3.2.1.1. Generally, the partially significant deficit in

[26] Note that the range indicates the uncertainty related to key input parameter for the model-based assessment of future RES progress. Remarkably, this year's (2020) energy demand drop as a consequence of the COVID-19 pandemic, and corresponding (comparatively small) changes in RES supply play a decisive role in this respect.

required RES deployment may however also reflect deficits in the financial support for RES and/or the required mitigation steps related to non-economic barriers that hinder an accelerated domestic RES diffusion. Complementary to targeted measures for an accelerated RES development, the success in improving energy efficiency and consequently reducing overall energy demand growth represents another important pillar for achieving the binding 2020 RES targets, since they are defined as RES shares, i.e. put in direct relation to demand (growth).

Deviation from 2020 NECP baselines

Next, a closer look is taken at the expected progress of MS in meeting the RES planned deployment as specified in NECPs for 2020. In this context, Figure 16 shows the deviation of expected 2020 RES deployment in relative terms from the NECP baselines. More precisely, this graph shows for 2020 the deviation in RES shares (in gross final energy demand) under default conditions for RES support, taking into account only currently implemented RES policy initiatives. Since energy demand developments (during 2020) play a decisive role, we show a lower and an upper boundary for the expected deviation in RES shares that refer to differences in underlying energy demand trends (i.e. a high and low energy demand trend for 2020).

Despite planned 2020 RES deployment as estimated in NECP baselines in the majority of MS being higher[27] than their binding RED 2020 RES targets, the number of MS that are expected to meet their planned NECP baseline in 2020 is the same as above – i.e. 23 MS are expected to meet their NECP baseline. Belgium is expected to overachieve the NECP baseline which is however lower than the country's RED target RES share. For Denmark might fall short in achieveing its own 2020 NECP baseline planning concerning overall RES deployment, which Denmark set significantly higher than its binding national RES obligation. For the majority of MS it can be expected that they succeed in meeting their 2020 NECP baselines. With deviations over 20%, most significant surpluses occur in Malta, Estonia, Ireland, Finland, Cyprus, Croatia, and Greece . At the aggregated EU-28 (EU-27) level a surplus of 5% to 7% (5% to 6%) can be expected when comparing expected and planned RES shares for 2020.

[27] Adding up planned performance as expressed by MS's in their NECP baselines for 2020 leads to a RES share of 20.8% (21.5%) for the EU-28 (EU-27), similar to the binding RED 2020 RES target of 20% measured as RES share in gross final energy consumption.

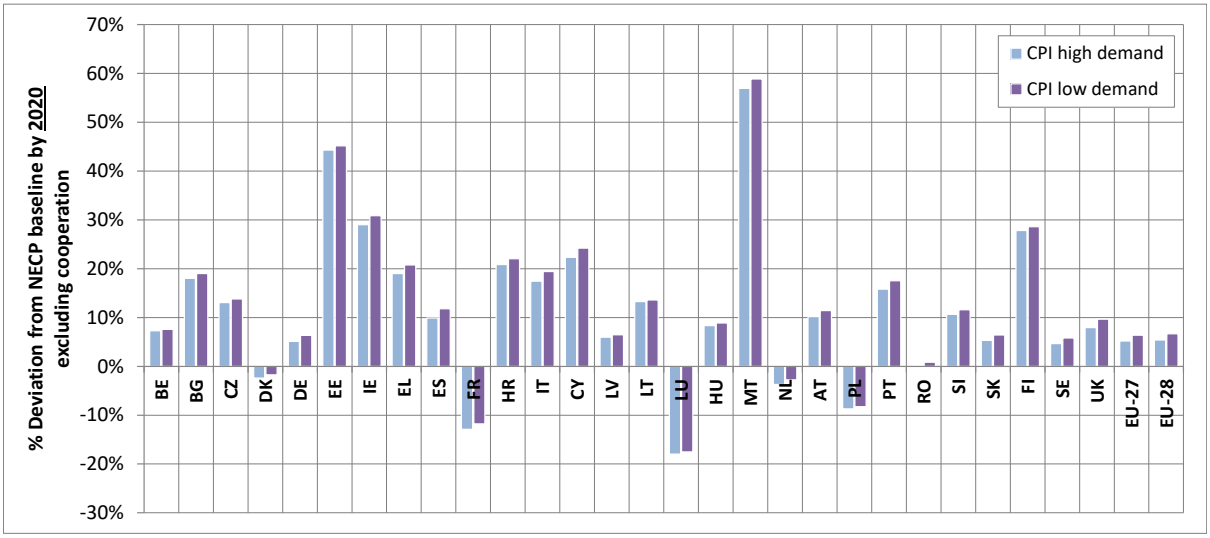

Figure 16. Deviation of expected RES shares (Green-X scenarios) from NECP baselines by 2020 excluding cooperation mechanisms

3.2.1.2 Projected future progress in RES overall including cooperation mechanisms

Until now four contracts on cooperation agreements on the statistical transfer of renewable energy amounts were signed. Two agreements help Luxembourg in achieving its binding national RES target for 2020 by receiving statistical transfers of a specified amount of renewable energy produced in Lithuania[28] and Estonia[29]. Both agreements refer to minimum values and also stipulate the possibility of transferring additional amounts, which Luxembourg could potentially use. They therefore make it possible for Luxembourg to cover the amounts foreseen in its NECP baseline. It should also be noted that Luxembourg was the first MS which uses the cooperation mechanism in order to meet its binding RED 2020 RES target and send a clear signal in the interest of closer European cooperation in the area of renewable energies (4th Progress Report of Luxembourg, Paragraph 11.1).

As described in further detail below, the third cooperation agreement has been recently concluded between the Netherlands and Denmark, assisting the Dutch government in their attempt to meet its RES obligations.

In accordance with above, a list of RES cooperation agreements taken includes:

- **Luxembourg (buyer) – Lithuania (seller):** Luxembourg signed a statistical transfer agreement with Lithuania for 700 GWh, or more if needed, between 2018 and 2020[30, 31]. **Luxembourg (buyer) – Estonia (seller):** Sales will be carried out between 2018 and 2020, with 300 GWh of transfers planned for next year and 400 GWh for 2020.

[28] Agreement on statistical transfers of renewable energy amounts between Lithuania and Luxembourg. Source: https://ec.europa.eu/info/news/agreement-statistical-transfers-renewable-energy-amounts-between-lithuania-and-Luxembourg-2017-oct-26_en

[29] Second agreement on statistical transfers of renewable energy amounts between Estonia and Luxembourg. Source: https://ec.europa.eu/info/news/second-agreement-statistical-transfers-renewable-energy-amounts-between-estonia-and-Luxembourg-2017-nov-13_en

[30] Estonia to help Luxembourg meet 2020 renewables goal – report. Source: https://renewablesnow.com/news/estonia-to-help-Luxembourg-meet-2020-renewables-goal-report-590343/

[31] Additionally, in September 2020 the two countries signed a Memorandum of Understanding on opportunities for cooperation beyond 2020. The additional memorandum is a positive sign for cooperation. However, it does not affect the 2020 projections. Source: https://enmin.lrv.lt/en/news/luxembourg-and-lithuania-to-continue-cooperating-in-the-field-of-renewable-energy

Optional: 600 GWh for the renewable energy target in the year 2018, 2019 and 2020[32].

- **Netherlands (buyer) – Denmark (seller):** On 19 June 2020 Denmark and the Netherlands signed an agreement on statistical transfers of 8 TWh RES volumes for 2020. Accordingly, the Netherlands can receive an additional volume of up to 8 TWh if required for RES target achievement. It needs to inform Denmark by August 1, 2021 whether it would take advantage of that option in full or partially.[33]

  According to the results of our interim assessment, Denmark could transfer at least an additional volume of 8 TWh RES volumes to the Netherlands without falling short of their RED 2020 RES target under both demand projections for 2020. This additional amount would allow for the Netherlands to achieve its RED 2020 RES target (see Table 10, Figure 17 and Figure 18).

- **Malta (buyer) – Estonia (seller):** In January 2019, Malta and Estonia agreed on a statistical transfer of 100 GWh for a total amount of two million euros. The contract is flexible and Malta may either increase or reduce the amount to be purchased by 20 percent.[34]

In the following, outcomes for 2020 are presented that include the stipulated use of statistical transfer agreements. We thereby applied, based on the agreements taken at bilateral basis, two distinct scenarios for the use of RES cooperation by means of statistical transfers: a "strong cooperation" and a "weak cooperation" scenario. More precisely, at MS level the following assumptions were taken:

- In the "strong cooperation" case we assumed a statistical transfer of in total 1,700 GWh from Estonia (1,000 GWh) and Lithuania (700 GWh) to Luxembourg, a statistical transfer of 16,000 GWh from Denmark to the Netherlands, and a statistical transfer of 80 GWh from Estonia to Malta.
- In the "weak cooperation" case we assumed a statistical transfer of 1,100 GWh from Estonia (400 GWh) and Lithuania (700 GWh) to Luxembourg, a statistical transfer of 8,000 GWh from Denmark to the Netherlands, and a statistical transfer of 80 GWh from Estonia to Malta.

Please note that the statistical transfer from Lithuania to Luxembourg was held constant despite the option of a higher transfer in both cases, as the information on the exact optional volumes are not yet publicly available. Furthermore, in the case of Malta, acting as buyer, and Estonia as seller, we took the assumption that Malta would opt under both cases for the lower boundary of feasible transfer volumes (i.e. 80 GWh, implying a 20 percent reduction of the base volume of 100 GWh) since statistical transfers would not be required for Malta's 2020 RES target achievement according to the expected RES generation volumes and the assumed reduction in energy consumption in 2020, driven by the COVID-19 pandemic.

Figure 17 is indicating expected, required and planned RES deployment in relative terms (i.e. RES share in gross final energy consumption), including the use of cooperation mechanisms set-up under the RED. Figure 18 shows the resulting changes in deviations from binding RED targets for the overall RES shares by MS. Complementary to these graphs, Table 8 lists all data on expected and required RES shares (i.e.2020 RED targets),

[32] Agreement between the Republic of Estonia and the Grand Duchy of Luxembourg on the establishment of a framework for the statistical transfer of energy from renewable sources for target compliance purposes under the RES Directive. Source: https://www.riigiteataja.ee/aktilisa/2280/3201/8003/Lux_agreement.pdf

[33] https://renewablesnow.com/news/netherlands-to-pay-eur-100m-to-count-danish-renewables-towards-2020-goal-703888/.

[34] https://www.mkm.ee/en/news/estonia-will-sell-renewable-energy-statistics-malta

again including the use of cooperation mechanisms. Of interest, this table provides also an overview of deviations to binding RED 2020 RES targets in absolute terms, indicating lower and upper boundaries (min-max values) of surpluses or gaps by MS according to the scenarios assessed (i.e. low/high demand and weak/strong cooperation). MS like Italy, Sweden, Germany, Finland, Spain, Czechia, and Austria may consequently have significant surpluses in RES generation by 2020 that may facilitate RES target achievement for other MS like Belgium, France, the Netherlands or Poland. In this context, bilateral agreements on statistical transfers appear an appropriate instrument to allow for that exchange.

A comparison with the corresponding figures and tables in section 3.2.1.1 where in contrast to here RES cooperation is excluded, makes it clear that for all affected MS the picture changes: The gap in meeting their binding national 2020 RES target is significantly reduced or even closed for both offtaker countries Luxembourg and the Netherlands. Further insights on expected 2020 RES target achievement and corresponding surpluses or gaps in RES volumes according to the scenarios assessed (i.e. low/high demand and weak/strong cooperation) are provided by Table 11 for all MS affected by cooperation mechanisms. As applicable from this table, for Luxembourg it appears likely that the 2020 RES target can be met thanks to its proactive behavior in setting these political agreements with Estonia and Lithuania. For the Netherlands the projections appear less optimistic but still the 2020 RES target can be met under the assumption of strong cooperation with Denmark (i.e. a statistical transfer of 16,000 GWh). The host countries Denmark, Estonia and Lithuania can consequently benefit from the financial compensations that have been agreed upon while their own RES target achievement is not in danger.

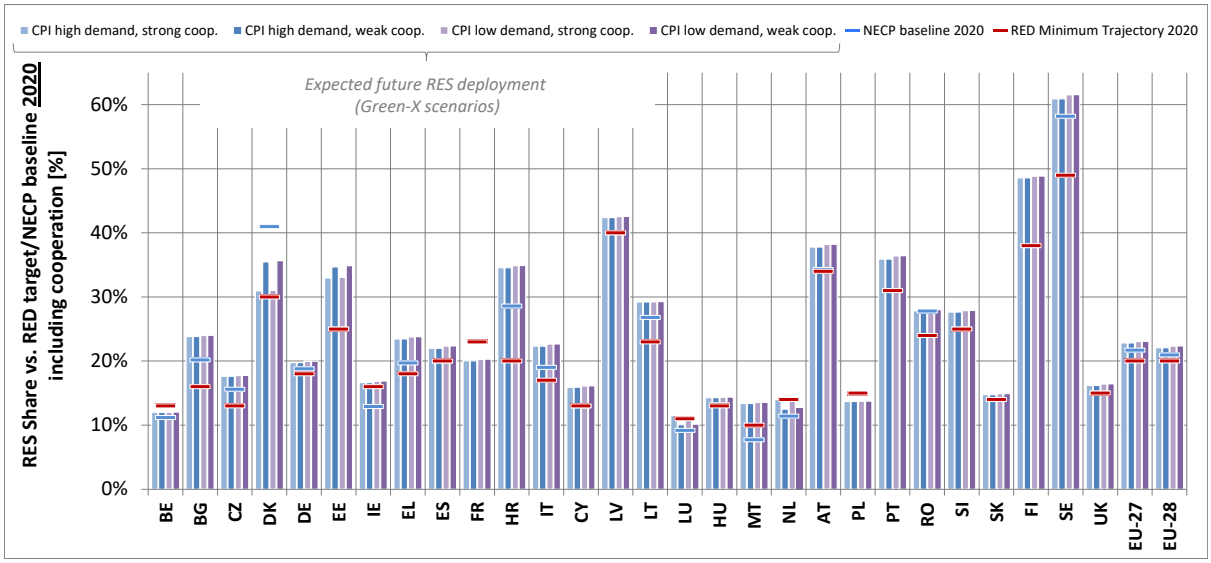

Figure 17. Expected RES share in 2020 vs. 2020 RED target RES share and 2020 NECP baseline (%) including cooperation mechanisms

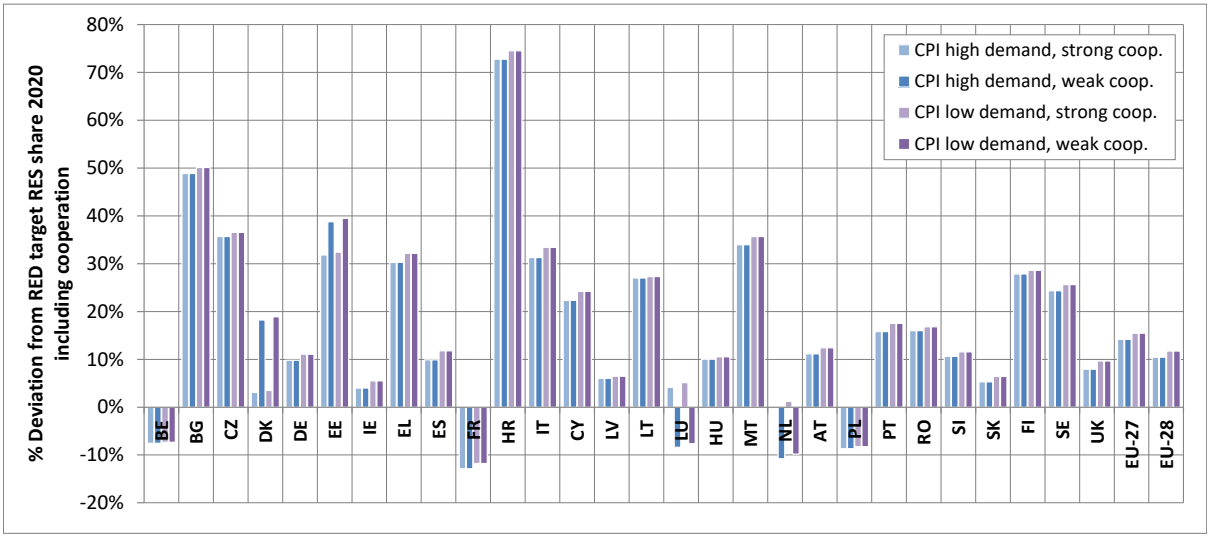

Figure 18. Deviation of expected RES shares (Green-X scenarios) from binding RED 2020 RES targets including cooperation mechanisms

Table 10. Expected and required RES shares in 2020 including cooperation mechanisms

RES share in gross final energy demand by 2020 - with impact of RES cooperation	Expected RES share 2020 (CPI scenario)		RED target RES share 2020	Deviation of expected from RED target RES share (CPI scenario)		Absolute deviation of expected from RED target RES share (CPI scenario)	
	Min.	Max.		Min.	Max.	Min.	Max.
Member State	[%]	[%]	[%]	[%]	[%]	[ktoe]	[ktoe]
Belgium	12.0%	12.0%	13.0%	-7.6%	-7.3%	-321	-303
Bulgaria	23.8%	24.0%	16.0%	48.9%	50.1%	785	790
Czechia	17.6%	17.8%	13.0%	35.7%	36.6%	1,132	1,136
Denmark	30.9%	35.7%	30.0%	3.1%	18.9%	140	844
Germany	19.8%	20.0%	18.0%	9.8%	11.1%	3,643	4,041
Estonia	33.0%	34.9%	25.0%	31.8%	39.5%	236	289
Ireland	16.6%	16.9%	16.0%	4.0%	5.5%	71	95
Greece	23.4%	23.8%	18.0%	30.3%	32.2%	831	862
Spain	22.0%	22.4%	20.0%	9.9%	11.8%	1,523	1,763
France	20.0%	20.3%	23.0%	-12.9%	-11.8%	-4,033	-3,585
Croatia	34.6%	34.9%	20.0%	72.8%	74.5%	916	919
Italy	22.3%	22.7%	17.0%	31.3%	33.4%	5,522	5,732
Cyprus	15.9%	16.1%	13.0%	22.3%	24.2%	44	47
Latvia	42.4%	42.6%	40.0%	6.0%	6.5%	96	101
Lithuania	29.2%	29.3%	23.0%	27.0%	27.3%	325	328
Luxembourg	10.1%	11.6%	11.0%	-8.4%	5.1%	-34	21
Hungary	14.3%	14.4%	13.0%	10.0%	10.5%	228	236
Malta	13.4%	13.6%	10.0%	34.0%	35.7%	18	18
Netherlands	12.5%	14.2%	14.0%	-10.8%	1.2%	-688	74
Austria	37.8%	38.2%	34.0%	11.2%	12.4%	1,009	1,099
Poland	13.7%	13.8%	15.0%	-8.7%	-8.3%	-918	-859
Portugal	35.9%	36.4%	31.0%	15.8%	17.5%	784	847
Romania	27.8%	28.0%	24.0%	16.0%	16.8%	892	921
Slovenia	27.7%	27.9%	25.0%	10.6%	11.6%	121	129
Slovakia	14.7%	14.9%	14.0%	5.3%	6.4%	71	84
Finland	48.6%	48.9%	38.0%	27.8%	28.6%	2,697	2,721
Sweden	60.9%	61.6%	49.0%	24.3%	25.7%	3,914	4,058
United Kingdom	16.2%	16.4%	15.0%	7.9%	9.7%	1,391	1,649
EU-27	22.8%	23.1%	20.0%	14.2%	15.5%	*19,751**	*21,661**
EU-28	22.1%	22.4%	20.0%	10.4%	11.8%	*21,142**	*23,309**

* The absolute deviations shown at EU-27 and EU-28 level represent the sum of the absolute deviations of the corresponding MS within a consistent scenario set of weak/strong cooperation and low/high energy demand. If absolute deviations at EU-27 and EU-28 are calculated in comparison to the EU RED target of 20% RES by 2020, higher surplus quantities would occur. This indicates that if all MS achieve their given RED 2020 RES target under assumed demand trends then at EU-28 level a higher RES share than 20.0% would occur, and a significantly higher one at EU-27 level. This is because the original projection of gross final energy consumption for the year 2020, created for the effort sharing calculation before adoption of the RED in 2009, deviates from todays projection. In addition, binding RED targets for MS have been rounded.

Table 11. Scenario-specific details for all MS affected by cooperation mechanisms – including cooperation mechanisms

RES share in gross final energy demand by 2020 - with impact of RES cooperation		Expected RES share 2020 (CPI scenario)				RED target RES share 2020	Absolute deviation of expected from RED target RES share (CPI scenario)			
		High Demand, Strong Coop.	High Demand, Weak Coop.	Low Demand, Strong Coop.	Low Demand, Weak Coop.		High Demand, Strong Coop.	High Demand, Weak Coop.	Low Demand, Strong Coop.	Low Demand, Weak Coop.
Member State		[%]	[%]	[%]	[%]	[%]	[ktoe]	[ktoe]	[ktoe]	[ktoe]
Seller	**Denmark**	30.9%	35.5%	31.1%	35.7%	30.0 %	140	828	156	844
Seller	**Estonia**	33.0%	34.7%	33.1%	34.9%	25.0 %	237	289	236	288
Seller	**Lithuania**	29.2%	29.2%	29.3%	29.3%	23.0 %	328	328	325	325
Buyer	**Luxembourg**	11.5%	10.1%	11.6%	10.2%	11.0 %	17	-34	21	-31
Buyer	**Malta**	13.4%	13.4%	13.6%	13.6%	10.0 %	18	18	18	18
Buyer	**Netherlands**	14.0%	12.5%	14.2%	12.6%	14.0 %	0	-688	74	-614

3.2.1.3 Technology overview

Complementary to above, in the following section the technology insights are presented. More precisely, Table 12 gives for each RES technology an overview of the status quo (2018) as well as the expected and planned (according to NREAP sectoral trajectories) deployment at EU-level by 2019 and by 2020. Additionally, also aggregates (by sector and for RES in total) as well as deviations (i.e. comparing expected and planned deployment) are indicated. Complementary to this, Figure 19 and Figure 20 provide a graphical illustration of the data, indicating the planned as well as the actual (2018) and expected future (2019, 2020) RES deployment by sector (Figure 19) and at technology level (Figure 20), using however aggregated technology clusters compared to the detailed technology breakdown shown in Table 12. Moreover, these graphs also allow for a comparison of this year's assessment of future progress with a previous one (seven years ago, (Ecofys, 2013)).

For 2019, aggregated RES deployment at EU-level is projected to stay below planned levels: in absolute terms as well as in relative terms (considering the RES share in gross final energy demand) energy volumes are expected to be below the planned ones (as stated in the NREAP trajectories). By 2020, the picture appears ambiguous: energy volumes of RES origin are expected to be lower than planned but the RES share in energy demand is above planning (and well above the binding EU target for 2020). This indicates that overall energy demand estimates underlying the NREAP projections were higher than actual developments. Here, the impact of the currently ongoing COVID-19 pandemic appears decisive, causing a significant decline in energy consumption during the first half of this year (2020). Additionally, concerning the supply side, energy produced from renewable fuels appears less affected by that crisis than the use of fossil fuels. Of interest, the situation differs by sector and also by technology as discussed below.

Generally, the heat sector appears most advanced among all energy sectors if one compares actual, expected and planned RES volumes in absolute terms. With 102.3 Mtoe current (2018) deployment of RES-H&C, this is about 5% higher than the planned one (97.8 Mtoe as reported by MS in their NREAP sectoral trajectories). By 2019 the surplus gets smaller – i.e. 105.1 Mtoe (expected) vs. 103.2 Mtoe (planned). By 2020, a small gap

between expected and planned RES volumes is expected to occur, causing a deficit in size of 0.8% compared to the planned volumes. Compared to an initial assessment as conducted throughout 2012, this represents the most significant change in perceptions: Previous scenarios have shown a 18% lower deployment for 2020. One key reason for changing expectations is that past progress in RES-H&C was far better than MS own expectations (as expressed in NREAPs or previous Progress Reports). In particular the developments in biomass heat and heat pumps have been remarkably strong in several MS. A higher than planned contribution from these technologies is also expected in 2020. In contrast to the above, one can identify a need for improvements in the sector of heating & cooling for technologies like biogas, solar thermal collectors and mid- to large-scale geothermal heating systems. These technology options may most urgently require additional initiatives for stipulating deployment as formerly planned. In relative terms, i.e. the RES share in corresponding sectoral demand, RES-H&C is expected to achieve a share of 20.1% by 2019 (the same as planned in the NREAPs), and this positive trend may hold well for 2020: here the expected RES share ranges from 23.0% to 23.1% (compared to 21.4% planned), depending on this year's (2020) demand developments.

In contrast to RES-H&C, RES-E shows a comparatively large gap in absolute terms, i.e. comparing actual (2018) or expected (2019, 2020) with planned electricity generation from renewables, over the whole assessment period. Apart from a strong increases of solar PV and wind in several MS, a slowdown of past strong progress is applicable across the EU. This leads to a deficit of about 2.2 Mtoe when comparing actual (90.2 Mtoe) with planned (92.4 Mtoe) RES generation volumes in 2018, and it is expected that this gap increases to 6.2 Mtoe until 2020 (i.e. with 97.5 – 97.6 Mtoe expected vs 103.7 Mtoe planned generation). If one takes electricity demand developments also into account the picture changes: here actual and expected RES shares in gross electricity demand are significantly higher than planned. In 2018, RES-E achieved a share of 32.1% in demand which is significantly higher than planned (30.6%). This positive trend is expected to remain until 2020. The significant decline of electricity consumption in 2020 let us expect that the RES-E share will range from 38.1% to 39.0% by 2020. This is significantly higher than the planned deployment (33.9%). At technology level, as shown in Figure 20 the strong (historic) uptake of solar PV is getting apparent. Consequently, actual (2018) and expected (2019, 2020) electricity generation from solar technologies are larger than planned. In contrast to solar (PV), a deficit is applicable for wind energy as well as for hydro and ocean technologies like tidal stream and wave power where planned progress was significantly higher than the acutal one. Table 12 indicates that for RES-E technologies like biomass and geothermal, planned deployment is higher than actual or expected, respectively, and in the case of biogas it can be seen that planning is in line with actual and expected market trends.

Regarding RES-T, recently implemented policy initiatives or changes in policy measures let us expect that the in the past negative performance can be changed. Actual data for 2018 confirms that the achieved RES-T share is only slightly below the planned one – i.e. 8.0% (achieved) compared to 8.5% (planned), and modelled prospective deployment indicates that the planned RES-T shares are in line (i.e. 8.8% expected compared to 9.0% planned in 2019) or can be oversucceeded (i.e. 13.0% expected compared to 10% planned/required in 2020). E-mobilitiy is responsible for this turn to the better while actual and expected deployment of biofuels in transport is significantly lower than the planned one. This is mainly a consequence of past policy changes related to first generation biofuels where sustainability concerns are decisive in lowering their required contribution to overall RES-T target achievement (the 'ILUC Directive'). A closer look at 2020 shows however also an increase in biofuel deployment in relative terms, i.e. compared to corresponding sectoral demand. Reason for that upward trend is that several MS have increased blending shares for biofuels by 2020.

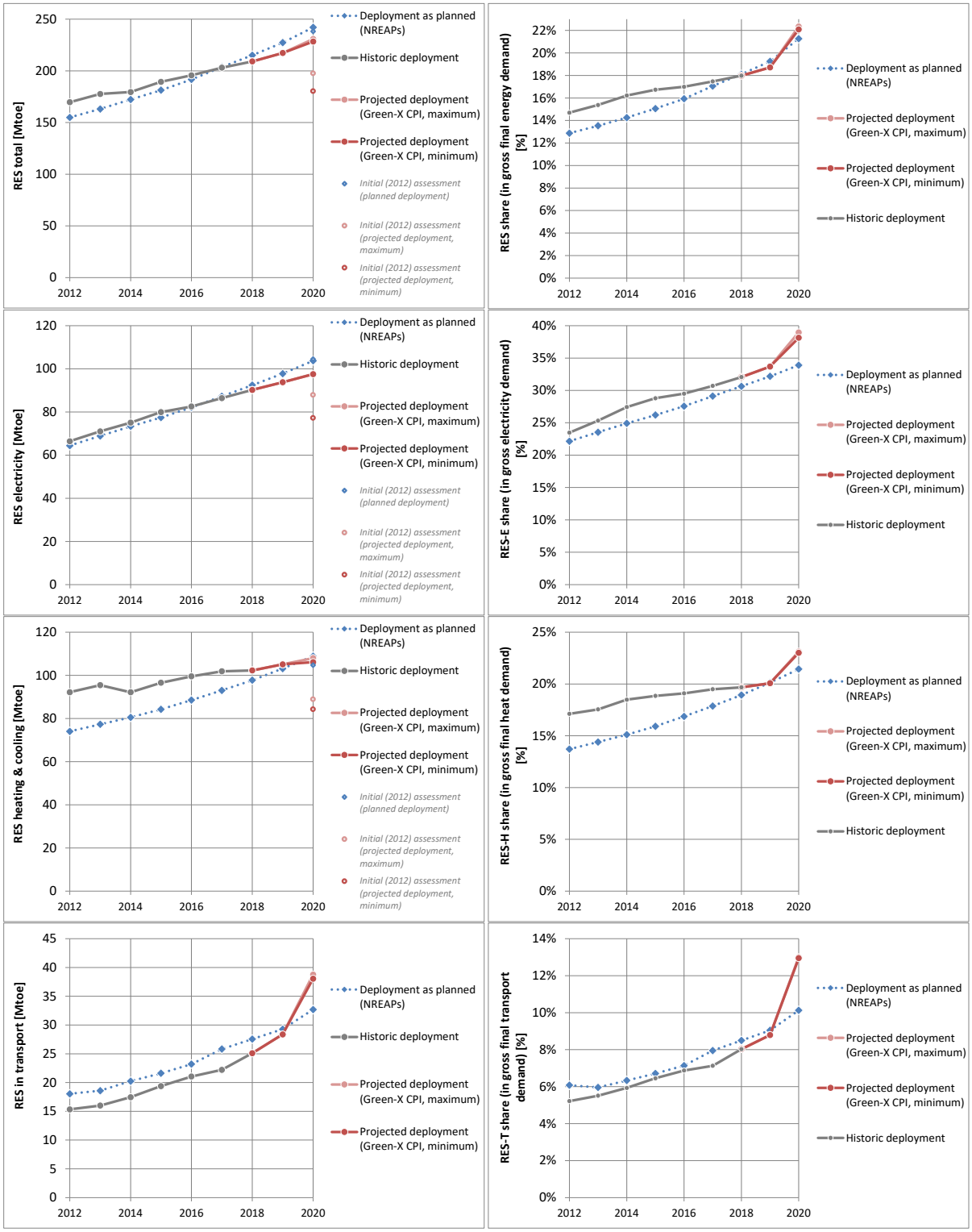

Figure 19. Historic, expected and planned sector-specific RES deployment at EU-level (EU-28) by 2018, 2019 and 2020 in absolute terms (Mtoe, left) and in relative terms (as RES share in corresponding demand, right)

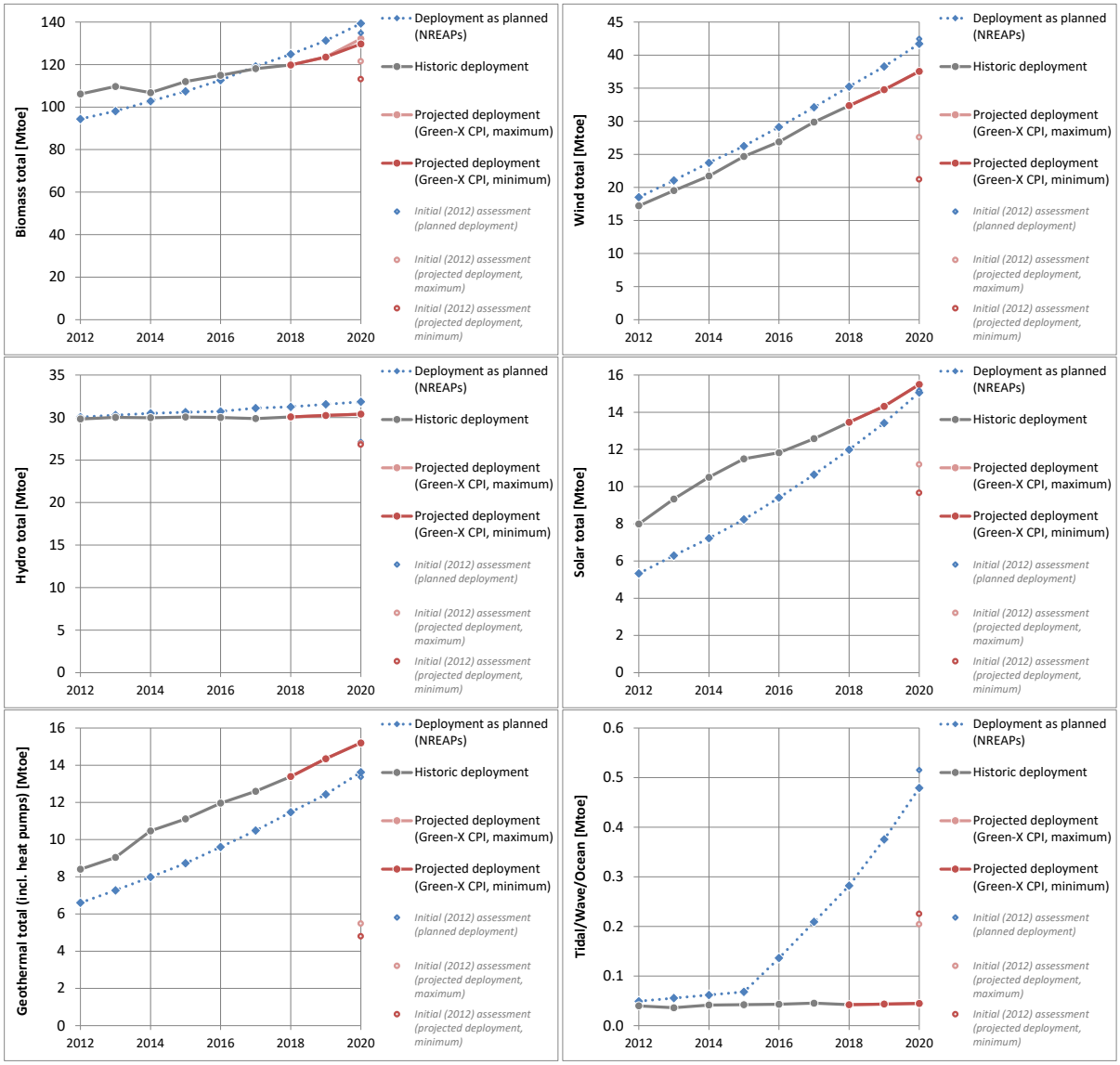

Figure 20. Historic, expected and planned technology-specific RES deployment at EU-level (EU-28) by 2018, 2019 and 2020

Table 12. Historic, expected and planned technology-specific RES deployment at EU-level by 2010, 2018, 2019 and 2020

Technology-specific RES deployment at EU level (EU-28)	Status Quo 2012	NREAP indicative target 2012	Status Quo 2018	NREAP indicative target 2018	Expected deployment 2019 (CPI scenario)	NREAP indicative target 2019	Expected deployment 2020 (CPI scenario)		NREAP indicative target 2020	Deviation of expected from planned deployment (and of actual deployment vs planned (2018))			
							High Demand	Low Demand		2018	2019	2020 Min.	2020 Max.
Technology category	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[Mtoe]	[%]	[%]	[%]	[%]
RES electricity	**66.4**	**64.4**	**90.2**	**92.4**	**93.8**	**97.8**	**97.6**	**97.5**	**103.7**	-2.4%	-4.1%	-6.0%	-6.0%
Biomass (solid and liquid)	8.64	8.89	10.95	13.05	11.24	13.86	11.18	11.16	14.67	-16.1%	-18.9%	-23.8%	-23.8%
Biogas	4.05	2.95	5.25	4.70	5.32	5.05	5.36	5.36	5.45	11.6%	5.5%	-1.7%	-1.7%
Geothermal	0.50	0.55	0.57	0.79	0.58	0.85	0.58	0.58	0.96	-27.4%	-32.0%	-39.8%	-39.8%
Hydro	29.84	30.05	30.07	31.26	30.25	31.56	30.40	30.40	31.85	-3.8%	-4.2%	-4.6%	-4.6%
Photovoltaics	5.83	3.00	10.58	5.93	11.16	6.47	12.03	12.03	7.05	78.3%	72.6%	70.7%	70.7%
Concentrated solar power	0.32	0.41	0.42	1.17	0.42	1.35	0.43	0.43	1.56	-64.3%	-68.9%	-72.6%	-72.6%
Wind	17.21	18.51	32.36	35.24	34.77	38.27	37.54	37.54	41.72	-8.2%	-9.2%	-10.0%	-10.0%
Tidal/Wave/Ocean	0.04	0.05	0.04	0.28	0.04	0.38	0.04	0.04	0.48	-85.1%	-88.4%	-90.7%	-90.7%
RES heating & cooling	**92.2**	**74.0**	**102.3**	**97.8**	**105.1**	**103.2**	**108.0**	**106.1**	**108.9**	4.6%	1.9%	-0.8%	-0.8%
Biomass (solid and liquid)	80.38	64.15	83.59	78.47	85.10	81.88	86.83	84.97	85.27	6.5%	3.9%	1.8%	1.8%
Biogas	2.06	1.92	3.42	3.72	3.47	4.09	3.50	3.50	4.50	-8.1%	-15.1%	-22.2%	-22.2%
Geothermal	0.61	0.90	0.87	2.11	0.91	2.35	0.95	0.95	2.63	-58.8%	-61.4%	-64.0%	-64.0%
Heat pumps	7.29	5.15	11.95	8.58	12.87	9.24	13.67	13.67	10.03	39.3%	39.3%	36.3%	36.3%
Solar thermal	1.84	1.92	2.47	4.88	2.74	5.60	3.04	3.04	6.45	-49.5%	-51.1%	-52.9%	-52.9%
RES transport (biofuels only)	**11.0**	**16.5**	**16.6**	**24.9**	**18.4**	**26.4**	**25.2**	**24.7**	**29.5**	-33.4%	-30.2%	-14.4%	-14.4%
First generation biofuels*	11.0	15.8	16.6	23.1	18.4	24.3	25.2	24.7	27.1	-28.2%	-24.2%	-6.8%	-6.8%
Second generation biofuels	0.00	0.65	0.00	1.79	0.00	2.10	0.00	0.00	2.38	-99.9%	-99.9%	-99.9%	-99.9%
RES total	**169.7**	**154.9**	**209.1**	**215.1**	**217.3**	**227.3**	**230.8**	**228.3**	**242.1**	-2.8%	-4.4%	-4.7%	-4.7%

Note: *the technology category “first generation biofuels” includes also all biofuel import from non-EU countries.

3.2.2 Projected future progress in RES-E

In this section, we provide more details on the projected future RES progress for the electricity sector.

3.2.2.1 RES-E sector overview

Overview of expected deployment vs. NECP baselines for 2020

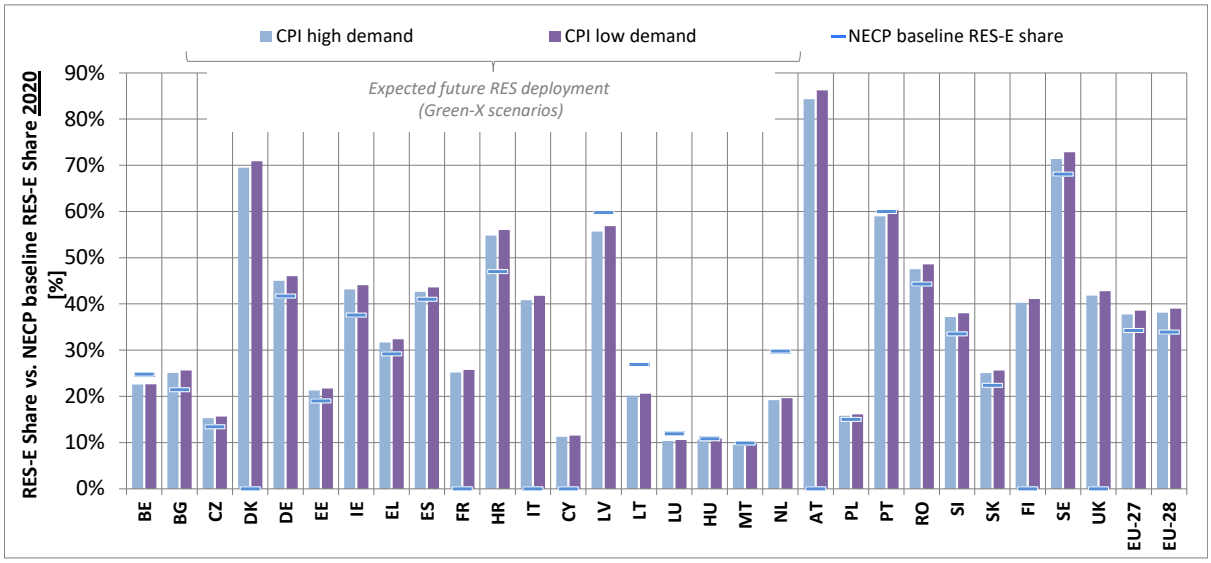

Figure 21. Expected RES-E share in 2020 vs. 2020 NECP baseline (%)

The expected (according to Green-X scenarios) and the planned (i.e. the baseline scenarios presented in the MS's NECPs) 2020 progress of RES in the electricity sector is compared in Figure 21, showing RES-E deployment in relative terms, that is the RES-E share in gross electricity demand. Please note that not all MS have reported in their NECPs transparently on their planned 2020 RES-E shares: for Denmark, France, Italy, Cyprus, Austria, Finland and the United Kingdom that information was not applicable.

Deviation from 2020 NECP baselines (sectoral planned contributions)

Complementary to above, Figure 22 illustrates the deviation of expected RES-E deployment from the planned contribution for this sector (i.e. the planned progress as prescribed in the MS NECPs). More precisely, Figure 22 indicates the deviation under business-as-usual conditions for 2020, taking into account only currently implemented policy initiatives. The uncertainty related to the development of 2020 energy demand is reflected, illustrating lower (i.e. CPI min) and upper levels (CPI max) of expected RES-E shares caused by reverse trends in corresponding demands.

By 2020, 14 MS (out of the 21 MS that have specified their planned contribution for RES-E shares in 2020 in their NECP) will be able to meet (and over-succeed) their RES-E deployment as planned in the NECPs under all assessed circumstances. Top of that list is Bulgaria, followed by Croatia, Ireland, Czechia, Slovakia, Estonia, Slovenia, Greece, Germany, Romania, Poland, Sweden, Spain, and Hungary. For Portugal, the NECP baseline planned RES-E share is only achieved in the low demand scenario.The remaining six MS that have also specified their planned baseline RES-E share in their NECP can be classified as not successful in planning their 2020 progress with respect to renewable electricity. Top

of that list (of negative ranking) is the Netherlands, followed by Lithuania, with deficits larger than 20%. The remainder of MS shows a smaller deficit in expected vs planned RES-E shares for 2020.

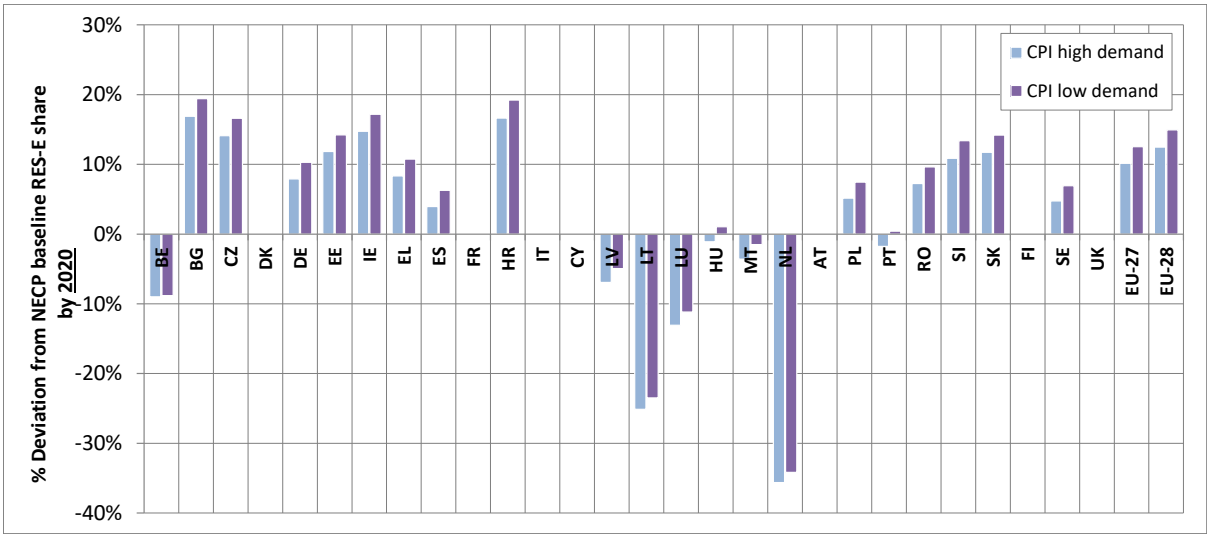

Figure 22. Deviation of expected RES-E Shares (Green-X scenarios) from NECP baseline by 2020

3.2.3 Projected future progress in RES-H&C

In this section we provide more details on the projected future RES progress for the heating & cooling sector.

3.2.3.1 RES-H&C sector overview

Overview of expected deployment vs. NECP baselines for 2020

Figure 23 shows a comparison of the expected (according to Green-X scenarios) and the planned (i.e. the NECP baseline) 2020 contribution with respect to RES in the sector of heating and cooling. This depiction is done in relative terms, expressing the RES-H&C share in gross final heat demand. Please note that not all MS have specified transparently their planned 2020 RES-H&C shares in their NECPs: for Denmark, France, Italy, Cyprus, the Netherlands, Austria, Poland, Finland and the UK that information was not specified.

Overall this figure shows a positive picture of past success in stipulating RES-H&C deployment. The large majority of MS (i.e 18 out of 19 MS that have specified their planned RES-H&C share for 2020) are on track or have even over-accomplished their planned 2020 RES-H&C share (as specified in their NECP baselines), while only Luxembourg is lagging behind (around 11% below its NECP RES-H&C baseline).

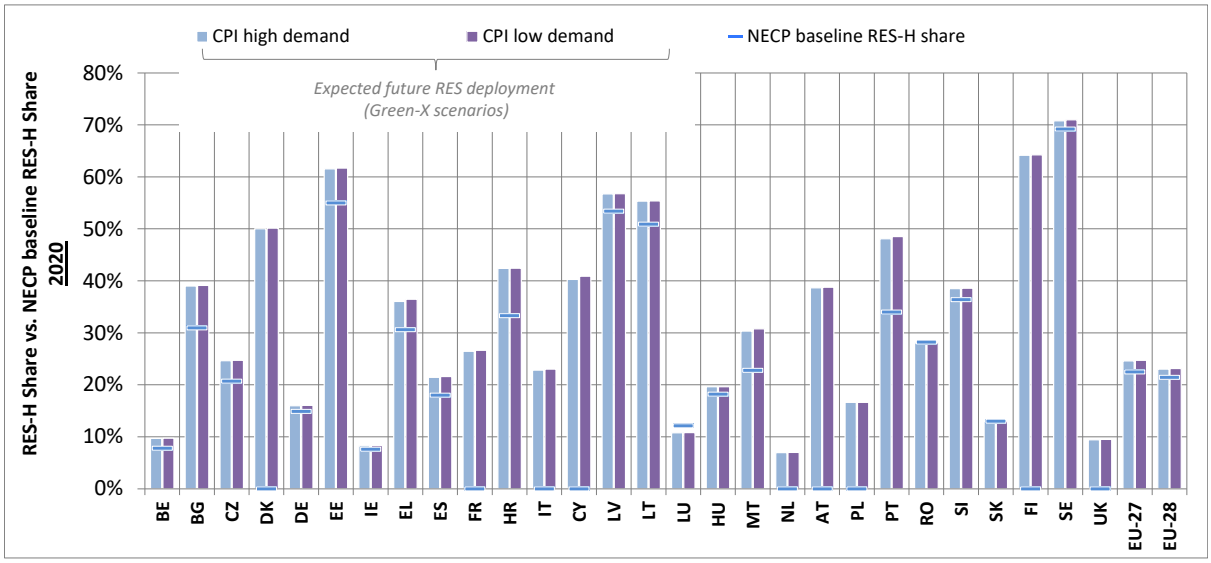

Figure 23. Expected RES-H share in 2020 vs. 2020 NECP baseline (%)

Deviation from 2020 NECP baselines (sectoral trajectories)

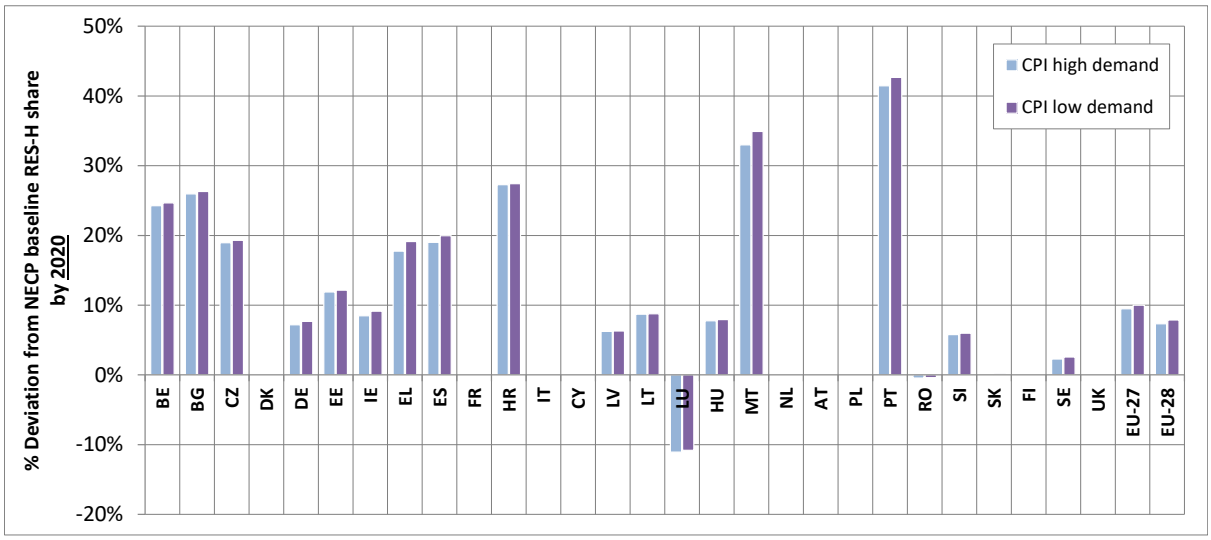

Figure 24. Deviation of expected RES-H shares (Green-X scenarios) from NECP baseline by 2020

Complementary to above, Figure 24 indicates the deviation of expected RES-H&C deployment from the planned contribution for this sector (i.e. the planned progress as prescribed in the MS NECPs) by 2020. More precisely, this graph shows the deviation under business-as-usual conditions, taking into account only currently implemented policy initiatives (CPI case). The uncertainty related to the development of 2020 energy demand is reflected, illustrating lower (i.e. CPI min) and upper levels (CPI max) of expected RES-H&C shares caused by reverse trends in corresponding demands.

In accordance with above, by 2020 the majority of MS will be able to meet (and significantly over-succeed) their planned contribution for RES-H&C. The strongest overachievement is expected for Portugal and Malta, both showing a deviation of more than 30% when comparing expected and planned RES-H&C shares. Other MS that clearly over-fulfil their plans (i.e. with a deviation higher than 10% but below 30%) are Belgium, Bulgaria, Czechia, Estonia, Greece, Spain and Croatia. The other MS (Germany, Ireland, Latvia, Lithuania,

Hungary, Romania, Slovenia, Slovakia and Sweden) have planned realistic 2020 RES-H&C shares in their NECPs – i.e. here deviations between expected and planned deployment are smaller than 10%, but not below the planned contribution (except for Romania where expected deployment is insignificantly (0.4%) lower than its NECP planned contribution).

3.2.4 Projected future progress in RES-T

In this section we provide more details on the projected future progress for the transport sector. Calculations of the RES-T share by 2020 take into account caps for first generation biofuels as well as multipliers as defined for second generation biofuels and for the contribution of electricity used in transport as originally specified in the RED (e.g. Annex IX) and, later on, partly revised in the Directive to reduce indirect land use change for biofuels and bioliquids (ILUC Directive).

3.2.4.1 RES-T sector overview

Overview of expected deployment vs. binding national RED RES-T sector target (10%) and NECP baselines for 2020

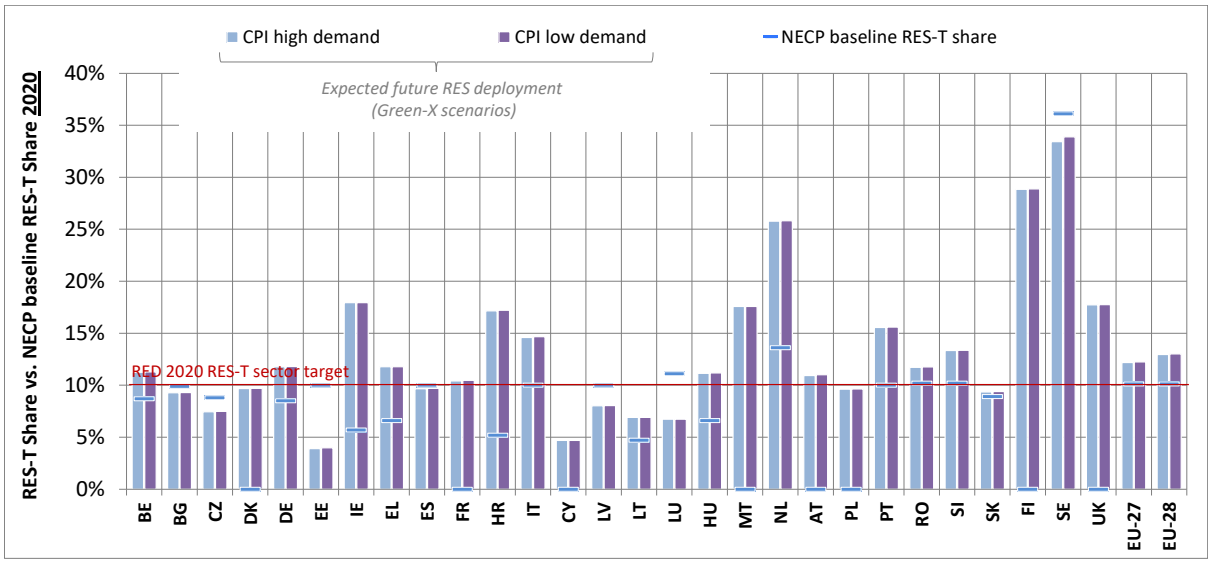

Figure 25. Expected RES-T share in 2020 vs. binding national RED RES-T sector target and NECP baseline (%)

The expected[35] and the planned (i.e. the planned contributions as specified in the NECP baselines) 2020 progress of RES in the transport sector is compared in Figure 25, showing RES-T deployment in relative terms. That is the RES-T share or, more precisely, the RES share in the final consumption of energy in transport. Please note that the calculation of RES-T share in the RED and the REDII differ, bringing an uncertainty in the comparisons presented in this section. Please see Article 3 (4) in the RES Directive for the detailed description of the calculation of the RES-T share (as applied for the modelling resulting in the values for the 'expected RES-T shares').

[35] Modelled RES-T deployment represents a combination of modelled biofuel deployment, done by use of the Green-X model, and an extrapolation of historic trends concerning electricity use in transport that builds on the historic record.

Deviation from 2020 RED RES-T sector target and NECP baselines (planned contributions)

Complementary to above, Figure 26 and Figure 27 illustrate the deviation of expected RES-T deployment from the required (i.e. the binding RED RES-T sector target of 10%, cf. Figure 26) or the planned one (i.e. the planned contribution as specified in the MS NECP baselines, cf. Figure 27).[36] More precisely, for 2020 both graphs indicate the deviation under business-as-usual conditions, taking into account only currently implemented policy initiatives. Uncertainty related to the development of 2020 energy demand is reflected, illustrating lower (i.e. CPI min) and upper levels (CPI max) of expected RES-T shares caused by reverse trends in corresponding transport consumption.

As applicable from Figure 26, by 2020 17 of 28 MS are expected to meet (and over-succeed) the binding RED RES-T sector target under all assessed circumstances. On the top of that list is Sweden, followed by Finland, the Netherlands, Ireland, the United Kingdom, Malta, Croatia, and Portugal, all showing a surplus larger than 50% compared to the given sector target. Other MS where RES-T target achievement appears likely are Belgium, Germany, Greece, France, Italy, Hungary, Austria, Romania and Slovenia, and at EU-28 (EU-27) level a surplus of 29.5% to 30.0% (21.8% to 22.4%) can be expected. The remaining 11 MS can be classified as not successful in meeting their binding RED RES-T sector target. Top of that list (of negative ranking) is Estonia, followed by Cyprus, Luxembourg and Lithuania – all with deficits larger than 25%.

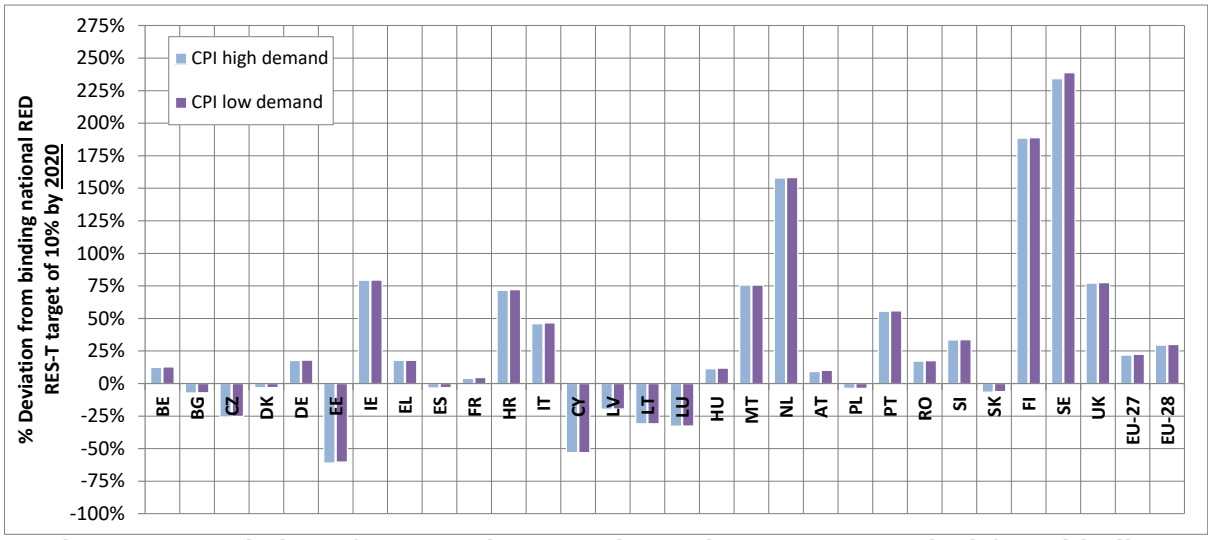

Figure 26. Deviation of expected RES-T shares (Green-X scenarios) from binding national RED RES-T sector target (10%) by 2020

[36] Please note that the RES-T shares are calculated in a slightly different manner in the REDII compared to RED, which could influence the comparison with the NECP baselines.

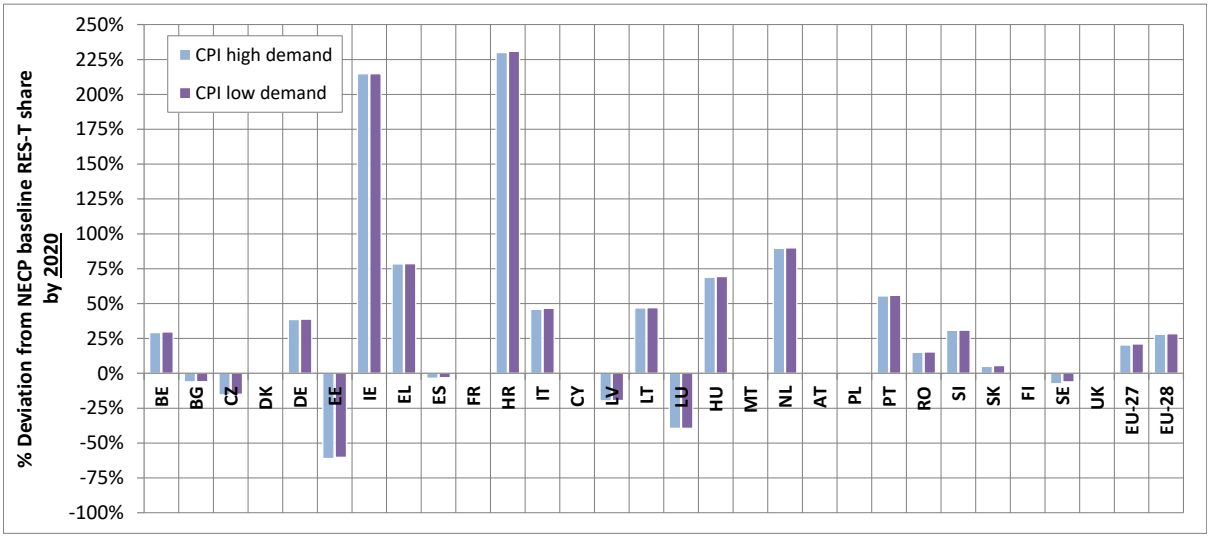

Figure 27. Deviation of expected RES-T shares (Green-X scenarios) from NECP baseline by 2020

The full references for the literature as referred to in this chapter can be found in Appendix D.

4. RECOMMENDATIONS

At the time of writing of this report, there are only a few months left in 2020. Thus, the options for MS to close potential gaps to 2020 RES target achievement are limited. Two short-term solutions are still theoretically available:

- **Make use of cooperation mechanisms**: MS that are at risk of missing their 2020 target should consider the use of cooperation mechanisms and in particular statistical transfers (i.e. buying renewable energy from MS that exceed their targets).

- **Increase the share of biofuels, especially of advanced biofuels**: Another possibility for MS would be to to increase the share of biofuels (although increasing a quota obligation might not be so quickly to transfer to fuel suppliers. Double-counting based on advanced biofuels could be an option to increase RES in transport.

Out of these options, statistical transfer seems to be most realistic.

In addition, it has been proposed that the **Renewable Energy Financing Mechanism** introduced in the Governance Regulation, which serves as a gapfiller for the national trajectories towards the EU 2030 RES target, may be used as gapfiller towards the 2020 baseline requirement. It is not clear whether this would include the 2020 target achievement. In the latter case, i.e. if the Financing Mechanisms could be used to close a 2020 target gap, this could be a third short-term solution for national 2020 RES target achievement. However, the related Implementing Act is still under consultation, so this option is still hypothethical.

Based on the 2020 projections displayed in Table 10 of section 3.2.1.2, Belgium, France and Poland are likely to miss their 2020 RES targets without the use of cooperation mechanisms statistical transfers) while Luxembourg and the Netherlands are expected to reach their targets in the high cooperation scenario. The reasons for the deficits vary. Judging from the 2018 trajectories, Belgium has only a small gap, but is lagging in RES-H&C as well as RES-T (although for the latter the projections suggest they will catch up for 2020 target. France has a substantial gap in RES-H&C, while Luxembourg is behind in RES-E. Netherlands are far behind in RES-E, but also lagging in RES-H&C. Poland is lagging behind in RES-E and has a substantial gap in RES-T.

The deviations to the overall RES targets set out in Directive 2009/28/EC range from 4.8% to 14.6% for the five MS, see Table 13 below. The combined gap of the five countries is estimated to be around 35,923 to 38,997 ktoe, while the total surplus in EU-27 is estimated to be around 71,068 to 80,522 ktoe (including the negative deviations). Thus, it is theoretically feasable for the five MS to reach their 2020 RES targets through cooperation mechanisms.

Table 13. Excerpt of Table 10 - Expected and required RES shares in 2020 including cooperation mechanisms

RES share in gross final energy demand by 2020 - with impact of RES cooperation	Expected RES share 2020 (CPI scenario)		RED target share 2020	Deviation of expected from RED target RES share (CPI scenario)		Absolute deviation of expected from RED target RES share (CPI scenario)	
	Min.	Max.		Min.	Max.	Min.	Max.
Member State	[%]	[%]	[%]	[%]	[%]	[ktoe]	[ktoe]
Belgium	12.0%	12.0%	13.0%	-7.6%	-7.3%	-321	-303
France	20.0%	20.3%	23.0%	-12.9%	-11.8%	-4,033	-3,585
Luxembourg	10.1%	11.6%	11.0%	-8.4%	5.1%	-34	21
Netherlands	12.5%	14.2%	14.0%	-10.8%	1.2%	-688	74
Poland	13.7%	13.8%	15.0%	-8.7%	-8.3%	-918	-859
Sum of deviation for the five MS						-5994	-4652
EU-27	22.8%	23.1%	20.0%	14.2%	15.5%	*19,751**	*21,661**
EU-28	22.1%	22.4%	20.0%	10.4%	11.8%	*21,142**	*23,309**

To ensure target achievement in 2020, we thus recommend to make greater use of the statistical transfer as short-term solution. This is especially relevant for Belgium, France and Poland. It is important to note that this does not serve as alternative to RES development in the mid- to long-term.

5. CONCLUSIONS

Progress in deploying renewable energy sources in the EU and the Member States

At an EU-level, the shares of renewable energy sources (RES) in total, renewable electricity (RES-E), heating and cooling (RES-H&C), and to a lesser extent also transport (RES-T) have been continuously increasing over the past years. In 2018, the EU reached a share of 18% of RES in gross final energy consumption, the target for 2020 being 20% as defined in the RES Directive 2009/28/EC (RED).

Up to 2018, the EU-28 has been comfortably above the indicative trajectory set in the RED, defined as the average values of 2011/2012, 2013/2014, 2015/2016 and 2017/2018, respectively. However, the EU as a whole is slightly below the more ambitious trajectory defined by the Member States (MS) themselves in their NREAPs. With regard to individual sectors, the RES-E and the RES-H&C sectors are well on track, resulting from the especially high contributions on the "higher than planned" generation of RES-E from photovoltaics and use of heat pumps in the RES-H&C sector. Meanwhile, the RES-T sector stays below the planned share (8.03% actual versus 8.50% planned) resulting from the "lower than planned" RES consumption for almost all energy sources except for "other biofuels".

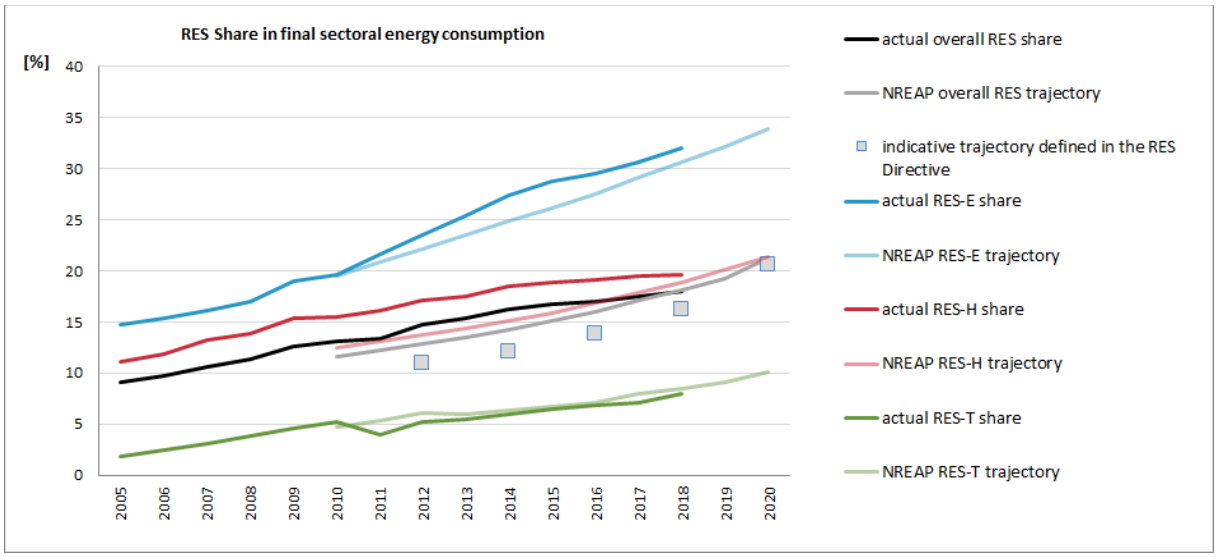

Figure 28. Actual and planned RES shares for the EU-28 (%). Source: Eurostat, NREAPs

23 MS are above their indicative RED trajectory for 2017/2018. Only Ireland, France, the Netherlands, Poland and Slovenia are below their indicative RED trajectories. The largest positive deviations from their indicative RED trajectories can be observed in Croatia, Bulgaria, Czech Republic and Italy.

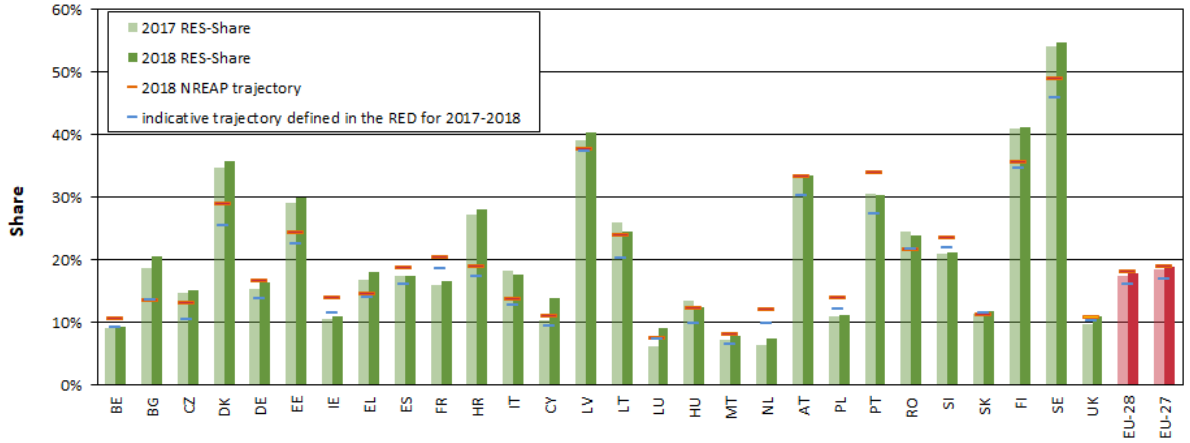

Figure 29. Actual renewable energy shares in 2017 and 2018 compared to indicative trajectories set in RES Directive and NREAP. Source: Eurostat[37]

For RES-E, the most common support schemes used by MS to stimulate RES deployment in 2017 and 2018 were premium and feed-in tariffs, the former often combined with tendering systems (auctions). However, also quota schemes, tax incentives, net-metering, investment grants and loans have been applied to support the development of renewable electricity generation. Almost all MS operate at least two support schemes to support different technologies, installation sizes and actors more specifically and needs-based. In the period 2017/2018, the shift from administratively set feed-in tariffs to feed-in premiums continued. While many MS had already changed their remuneration for new installations between 2014 and 2016, Bulgaria and Slovakia followed in 2018 and 2019 respectively[38]. The most prominent trend in support schemes in 2017 to 2020 was the continuous shift towards RES auctions. By July 2020, 18 MS determine the support levels for (larger) RES-E installations in a competitive bidding process. Most MS chose to implement technology-specific auctions rather than technology-neutral or multi-technology auctions.

The most commonly applied form of support for RES-H&C are investment grants. This form of subsidy was available in 24 MS during 2017 to 2018. Other forms of commonly provided support for RES-H&C are tax deductions and feed-in premiums. The support instruments that are in place usually apply to a broad range of technologies. The most popular technology are biomass plants. In addition, commonly supported technologies are geothermal, aerothermal and hydrothermal heat pumps as well as solar thermal plants.

The predominant support scheme for RES-T in the EU is a biofuel quota obligation. By 2020, some form of obligation scheme has been the main RES-T policy measure in all MS. The only MS that did not use a quota as main support scheme for RES-T until 2018 were Sweden and Estonia. While Sweden relied on tax incentives, Estonia's main instruments in the past were subsidies for biomethane consumption and infrastructure. In addition to its tax incentives, Sweden introduced a biofuel quota in April 2018. Estonia followed in May 2018, but also kept its subsidies in place.

Most of the schemes applied by MS have an increasing quota, often targeting a 10% share by 2020. Germany and Sweden do not impose an increasing share of biofuel content, but demand increasing GHG emissions reductions by fuel suppliers, which has a similar effect in

[37] Quantitative assessments for Malta in this report are based on the National Renewable Energy Action Plan submitted in 2012. Malta submitted a new NREAP in June 2017.
[38] Please note that in the case of Slovakia, the planned tender scheme has been introduced by the new RES Act in 2019. However, the auctions have been postponed due to the COVID19 pandemic.

the end. Several MS have adjusted their quota schemes after the implementation of the ILUC Directive in 2015 which had to be transposed by September 2017. This Directive introduced a cap on conventional[39] biofuels and a sub-target for advanced biofuels.

Feasibility of 2020 target achievement considering current progress

A comparison of expected with planned RES deployment by 2020 indicates that the EU would succeed in meeting its binding RED 2020 RES target: At EU-28 (EU-27) level a RES share of 22.1% to 22.4% (22.8% to 23.1%) can be expected with currently implemented RES policy initiatives[40]. The majority of MS is expected to perform well in meeting the indicative trajectory, not only in the past (2018) but also in meeting their binding RED 2020 RES targets. When not including the statistical transfers, 23 of the assessed 28 MS (including the UK), including Bulgaria, Czechia, Croatia, Denmark, Germany, Estonia, Greece, Spain, Croatia, Italy, Cyprus, Latvia, Lithuania, Hungary, Malta, Austria, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden and the UK, may succeed in (over)fulfilling their binding RED 2020 RES targets with implemented RES policies under the given special circumstances of today (2020) – i.e. the significant drop in energy consumption driven by the COVID-19 pandemic during the first half of 2020. For the remaining MS, namely Belgium, France, Luxembourg, the Netherlands and Poland, currently implemented RES policy initiatives appear insufficient to trigger the required RES volumes to reach the binding 2020 RES targets purely domestically, despite the strong decline of energy consumption.

Despite planned 2020 RES deployment as estimated in NECP baselines in the majority of MS being higher[41] than their binding RED 2020 RES targets, the number of MS that are expected to meet their planned NECP baseline in 2020 is the same as above – i.e. 23 MS are expected to meet their NECP baseline. However, Belgium is expected to overachieve their own final NECP baseline but only because it is lower than the country's RED 2020 RES target. On the contrary, Denmark might fall short in achieveing its own 2020 NECP baseline planning concerning overall RES deployment, which Denmark set significantly higher than its binding national RES obligation. Until now four cooperation agreements on the statistical transfer of renewable energy amounts were signed. Including the details from the agreed statistical transfers, the picture changes for all affected MS that are at risk of not reaching their 2020 RED target. The gap in meeting their binding national 2020 RES target is significantly reduced for both offtaker countries Luxembourg and the Netherlands. For Luxembourg it appears likely that the 2020 RES target can be met thanks to its proactive behavior in taking these political agreements with Estonia and Lithuania. For the Netherlands the projection appears less optimistic but still the 2020 RES target can be met under the assumption of strong cooperation with Denmark (i.e. a statistical transfer of 14,420 GWh) in combination with the low energy demand projection for 2020.

[39] Biofuels produced from from cereal and other starch-rich crops, sugars and oil crops and from crops grown as main crops primarily for energy purposes on agricultural land.
[40] Note that the range indicates the uncertainty related to key input parameter for the model-based assessment of future RES progress. Remarkably, this year's (2020) energy demand drop as a consequence of the COVID-19 pandemic, and corresponding (comparatively small) changes in RES supply play a decisive role in this respect.
[41] Adding up planned performance as expressed by MS's in their NECP baselines for 2020 leads to a RES share of 21.0% (21.7%) for the EU-28 (EU-27), similar to the binding RED 2020 RES target of 20% measured as RES share in gross final energy consumption.

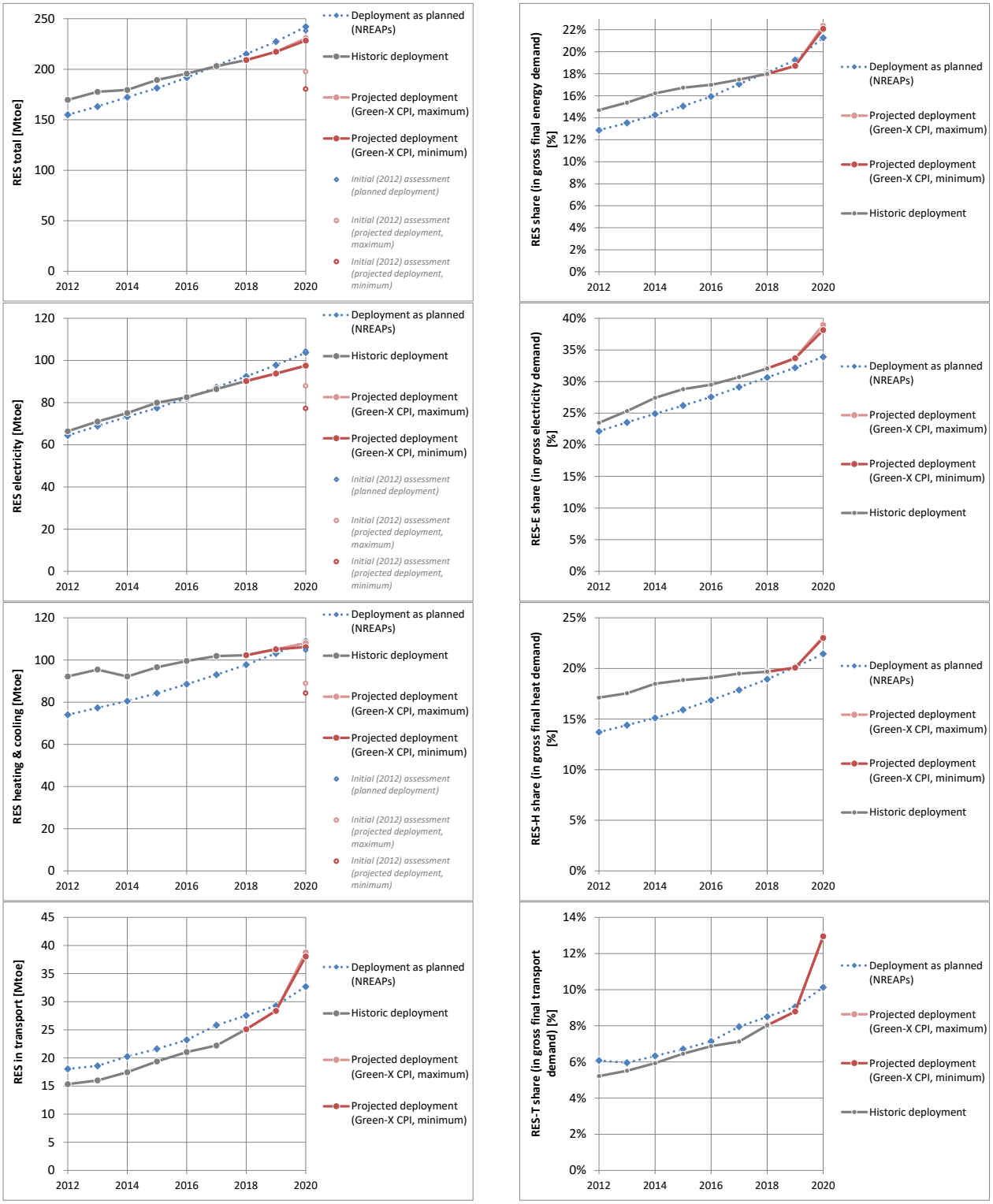

Figure 30. Historic, expected and planned sector-specific RES deployment at EU-level (EU-28) by 2018, 2019 and 2020 in absolute terms (Mtoe, left) and in relative terms (as RES share in corresponding demand, right)

By 2020, 14 MS (out of the 21 MS that have transparently specified their NECP baseline RES-E shares in 2020) will be able to meet (or exceed) their RES-E deployment as planned in the NECP sectoral trajectory under all assessed circumstances. Top of that list is Bulgaria, followed by Croatia, Ireland, Czechia, Slovakia, Estonia, Slovenia, Greece, Germany,

Romania, Poland, Sweden, Spain, and Hungary. For Portugal, the NECP baseline RES-E share is only achieved in the low demand scenario.The remaining six MS that have also specified their planned baseline RES-E share can be classified as not successful in reaching their planned 2020 level with respect to renewable electricity. Top of that list (of negative ranking) is Netherlands, followed by Lithuania, with deficits larger than 20%. The remainder of MS shows a smaller deficit in expected vs planned RES-E shares for 2020.

The H&C sector shows a positive picture of already achieved deployment of renewables. The large majority of MS (i.e 18 out of 19 MS that have reported their planned RES-H&C share for 2020) are on track or have even over-accomplished their planned contributions (according to NECP baselines), while only Luxembourg is lagging behind (around 11% below its NECP RES-H&C baseline).

In accordance with above, by 2020 the majority of MS are expected to meet (and significantly over-succeed) their planned deployment for RES-H&C. The strongest progress ahead of the trajectory is expected for Portugal and Malta, both showing a deviation of more than 30% when comparing expected and planned RES-H&C shares.

By 2020, 17 of 28 MS are expected to meet (and over-succeed) the binding RED RES-T sector target under all assessed circumstances. On the top of that list is Sweden, followed by Finland, Netherlands, Ireland, United Kingdom, Malta, Croatia, and Portugal, all showing a surplus larger than 50% compared to the given RED sector target. Other MS where RES-T target achievement appears likely are Belgium, Germany, Greece, France, Italy, Hungary, Austria, Romania and Slovenia, and at EU-28 (EU-27) level a surplus of 29.5% to 30.0% (21.8% to 22.4%) can be expected. The remaining 11 MS can be classified as not successful in meeting their binding RED RES-T sector target. Top of that list (of negative ranking) is Estonia, followed by Cyprus, Luxembourg and Lithuania – all with deficits larger than 25%.

APPENDIX A. QUANTITATIVE PROGRESS OF MEMBER STATES

This section displays the progress of the MS in RES deployment in quantitative terms. It is split into three sectors, RES-E, RES-H&C and RES-T, and provides for each sector an overall view as well as a detailed table on progress by technologies. The graphs depicting the progress by technologies, NREAP tables 10, 11, and 12, are compared to corresponding deployment data of Eurostat Energy Balances and Eurostat SHARES by technologies. In previous years, NREAP progress reports have been used, while this year the analysis relies solely on Eurostat data as they provide a consistent and complete overview and is more suitable to draw conclusions of the progress. Differences between these two data sources, which point out a different trend on the progress, are marked in the text or in footnotes.[42] Each graph also includes an EU-28 figure as well as an EU-27 figure. The EU-28 and EU-27 figures are obtained from summing the individual MS' commitments. Note that there is no formal separate commitment to 2018 NREAP RES targets or to 2017/2018 indicative interim trajectory on EU level.

A.1 RES-E sector overview

Figure 31 shows that the trend of the last years is continuing, and the deployment of RES-E technologies mainly relying on wind and solar energy as well as on solid biomass has further increased. In 2018, they contributed together significantly more than the established hydropower, accounting for roughly 623 TWh of electricity produced, compared to a total of 350 TWh for hydro (not normalised). Apart from hydro, onshore wind held the largest share in RES-E technologies with 319 TWh produced in 2018 (not normalised), followed by PV with 123 TWh, solid biomass with 122 TWh, biogas with 61 TWh, and offshore wind with 59 TWh. Geothermal electricity (7 TWh), solar CSP (5 TWh) and bioliquids (5 TWh) played minor roles in the RES-E mix.

[42] Note: In the figures showing the deviation of actual generation from NREAP indicative trajectory, those MS with 100% deviation have not yet reported any production/consumption for the respective technology, although it had been planned in the NREAP.

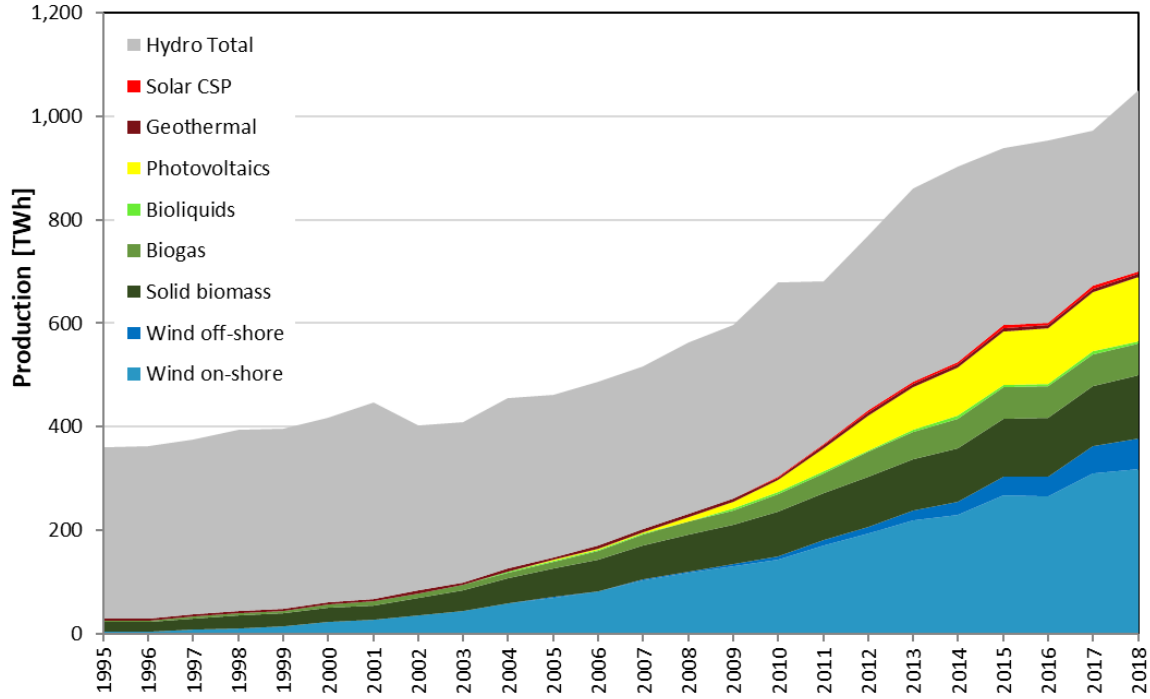

Figure 31. Production of electricity from RES-E technologies in the EU-28 for 1995-2018.[43] Source: Results are based on Eurostat Energy Balances

The following graphs display the progress in RES-E deployment of the individual MS. Sixteen MS had a RES-E share lower than envisaged in their NREAP indicative trajectories for 2018. In 2016 and 2012, a similar number of MS (15 MS), while in 2014 only 10 MS were below their NREAP indicative trajectories. Most of the MSwho display lower shares than their NREAP indicative trajectories, only lag behind their NREAP RES targets slightly. Therefore, both EU-28 and EU-27 as a whole exceed the share as planned in the NREAPs of the MS.

In 2018 as well as in previous years, Austria had the highest RES-E share of 73% among all MS, followed by Sweden (66%) and Denmark (62%). All of them stayed above their NREAP indicative trajectories (see Figure 32). On the contrary, Malta (7,7%), Hungary (8,3%), Luxemburg (9,1%) and Cyprus (9,4%) displayed shares below their NREAP indicative trajectories. Malta had the lowest RES-E share of all MS.

As shown in Figure 33, the largest positive deviation from its planned RES-E share as set in its NREAP can be observed in Italy (+38%), followed by Denmark (+26%), Croatia (+24%) and the UK (+24%). The largest negative deviations was reported in the Netherlands (-51%), followed by Cyprus (-25%) and Greece (-23%). The Netherlands have deviated even further from its NREAP trajectory compared to the previous year, which is a result of slow growth of wind generation, decreasing solid biomass and biogas production as well as no deployment of geothermal energy. Both at EU-28 level and at EU-27 level, there are positive deviations. Without the contribution of the UK, the EU-27 has a lower positive deviation (+2.8%) than the EU-28 (+4.6%).

[43] Data for wind and hydro are not normalised according to procedures in the RES Directive and may thus differ from the values shown in the table below. Hydro shown here is hydro non-pumped. Solid biomass includes primary solid biofuels and renewable municipal waste.

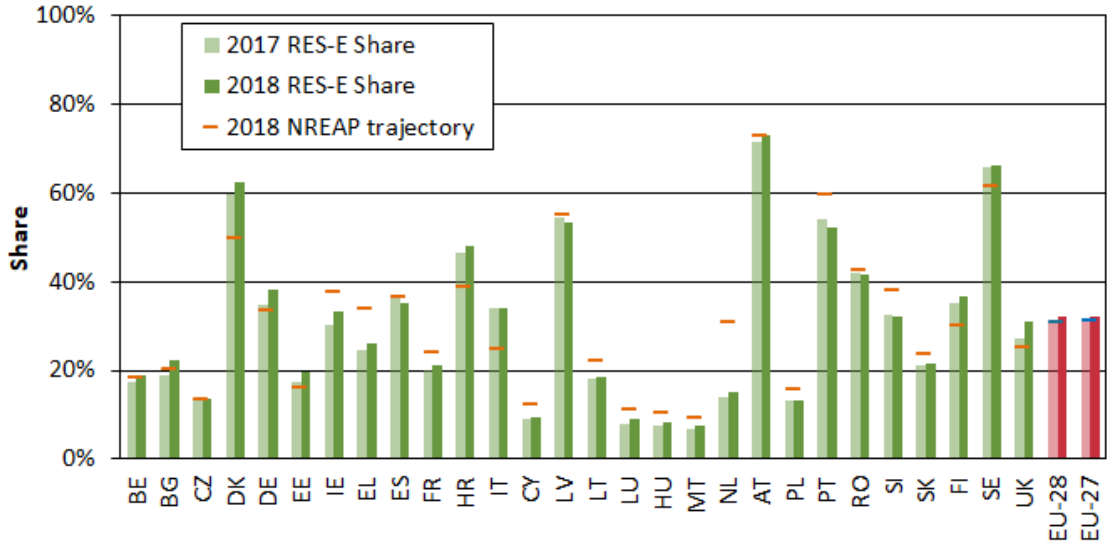

Figure 32. RES-E actual share vs. NREAP indicative sectoral trajectory in 2018 (%). Source: Eurostat SHARES and NREAPs

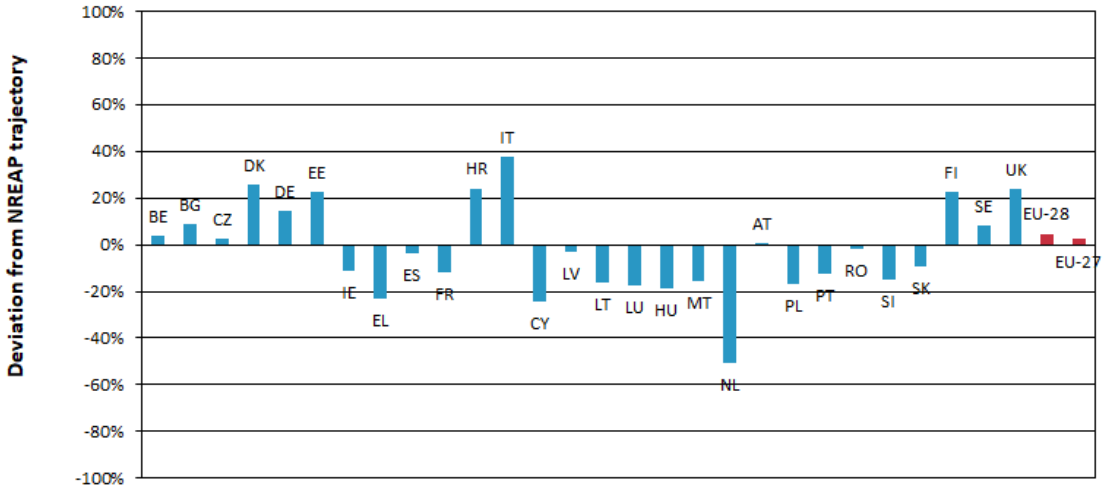

Figure 33. Deviation of actual 2018 share from 2018 NREAP indicative sectoral trajectory for RES-E. Source: NREAPs and Eurostat SHARES

The following two tables show the growth rate of major RES-E technologies from 2017 to 2018 as well as their absolute values in 2018. Wind onshore and PV showed the highest growth in absolute numbers between 2017 and 2018 both for the EU-28 and the EU-27 and together they are the largest RES source apart from hydropower on EU level. Offshore wind, however, was the fastest-growing technology in 2018, followed by PV. Solid biomass ranked third regarding its generation as part of total RES-E generation. For PV, very high growth rates can be observed in some individual MS since 2015, such as Ireland, Latvia, Poland or Finland, which have still low levels of PV deployment. Hydropower remains the largest source of renewable energy, mainly due to investments made before 2000, while growth over the last decade has been only minimal.

Table 14. Growth of RES-E technologies from 2017-2018. Source: Eurostat SHARES & Eurostat Energy Balances. Normalised data for wind and hydro

Member State	RES-E [%]	Offshore wind [%]	Onshore wind [%]	Solid biomass[%]	Biogas [%]	Bioliquids [%]	Photovoltaics [%]	Hydro [%]	Geothermal [%]	Concentrated solar power [%]	Tide, wave, ocean [%]
Belgium	9.31	32.13	11.23	-7.31	0.68	108.43	17.98	2.14	-	-	-
Bulgaria	14.71	-	-1.32	610.30	-1.61	-	-4.29	1.36	-	-	-
Czech Republic	0.49	-	6.97	-4.58	-1.21	-	7.55	0.35	-	-	-
Denmark	4.28	11.35	6.45	-7.09	6.51	21.83	26.81	-0.90	-	-	-
Germany	8.64	22.50	9.10	2.35	-1.37	8.47	16.20	-0.64	9.20	-	-
Estonia	20.84	-	-0.40	27.42	-8.99	-	112.54	3.15	-	-	-
Ireland	13.66	-	14.69	24.02	-8.30	-	54.21	0.96	-	-	-
Greece	2.79	-	10.21	21.95	0.63	-	-5.03	1.05	-	-	-
Spain	-3.12	-	-1.32	-3.13	-1.91	-	-7.48	-2.09	-	-17.27	-
France	5.64	-	12.97	5.78	11.46	-22.38	10.26	1.67	-2.55	-	-8.01
Croatia	4.81	-	9.52	45.07	14.59	-	-4.83	2.31	-	-	-
Italy	-0.60	-	4.21	-0.80	0.01	-3.87	-7.07	1.64	-1.54	-	-
Cyprus	5.12	-	-2.28	-	9.94	-	15.98	-	-	-	-
Latvia	0.67	-	1.41	8.43	-7.72	-	189.32	0.32	-	-	-
Lithuania	3.46	-	1.31	7.09	9.95	-	27.30	1.22	-	-	-
Luxembourg	14.66	-	12.12	43.45	4.07	-	10.38	0.57	-	-	-
Hungary	12.63	-	-3.27	8.58	-4.89	-	77.65	1.19	1100.00	-	-
Malta	15.54	-	-8.52	-	-8.05	-	16.86	-	-	-	-
Netherlands	11.13	1.77	2.19	-0.21	-3.94	-	67.29	0.02	-	-	-
Austria	1.97	-	5.89	1.20	-6.27	-58.62	13.29	1.24	162.64	-	-
Poland	1.02	-	0.63	0.54	2.84	-14.46	81.60	0.36	-	-	-
Portugal	-2.43	-	-1.12	-1.68	-5.29	-	1.45	-4.19	6.34	-	-100.00
Romania	0.61	-	0.73	-19.96	5.24	-	-4.56	1.57	-	-	-
Slovenia	0.35	-	-4.92	-5.62	-8.66	26.36	-10.18	1.48	-	-	-
Slovakia	-0.53	-	2.94	-1.45	-9.26	-	15.61	0.40	-	-	-
Finland	7.04	104.60	16.86	9.06	3.24	-17.89	85.98	1.67	-	-	-
Sweden	1.10	1.14	5.01	-1.47	-9.09	40.54	76.96	0.36	-	-	-
UK	12.72	24.91	10.21	13.26	-5.55	-	12.04	3.40	-	-	121.70
EU-28	**4.43**	**21.35**	**6.12**	**4.67**	**-1.10**	**-1.42**	**8.33**	**0.65**	**-0.85**	**-17.27**	**-6.97**
EU-27	**3.54**	**18.75**	**5.70**	**2.45**	**-0.62**	**-1.42**	**7.91**	**0.61**	**-0.85**	**-17.27**	**-8.01**

Table 15. RES-E generation in the EU-28 and in EU-27 in 2018 per technology. Source: Eurostat SHARES & Eurostat Energy Balances. Normalised data for wind and hydro

Member State	RES-E [GWh]	Offshore wind [GWh]	Onshore wind [GWh]	Solid biomass [GWh]	Biogas [GWh]	Bioliquids [GWh]	Photovoltaics [GWh]	Hydro [GWh]	Geothermal [GWh]	Concen-trated solar power [GWh]	Tide, wave, ocean [GWh]
Belgium	17,301	3,521	4,096	4,452	945	74	3,902	311	0	0	0
Bulgaria	8,583	0	1,409	1,280	212	0	1,343	4,339	0	0	0
Czech Republic	10,019	0	596	2,221	2,607	0	2,359	2,236	0	0	0
Denmark	22,145	5,524	9,749	5,278	620	1	953	20	0	0	0
Germany	226,587	20,198	88,759	16,990	33,416	474	45,784	20,788	178	0	0
Estonia	2,060	0	689	1,269	38	0	31	33	0	0	0
Ireland	10,261	0	8,677	660	184	0	17	724	0	0	0
Greece	15,476	0	6,100	12	302	0	3,791	5,272	0	0	0
Spain	99,530	0	50,557	4,976	923	12	7,877	30,317	0	4,867	0
France	108,746	0	28,690	5,970	2,365	0	10,569	60,542	130	0	479.93
Croatia	9,115	0	1,320	313	355	0	75	7,050	2	0	0
Italy	112,635	0	17,923	6,562	8,300	4,291	22,654	46,800	6,105	0	0
Cyprus	474	0	217	0	57	0	199	0	0	0	0
Latvia	4,084	0	150	570	374	0	1	2,989	0	0	0
Lithuania	2,322	0	1,241	403	140	0	87	452	0	0	0
Luxembourg	649	0	207	142	75	0	120	104	0	0	0
Hungary	3,838	0	680	1,961	331	0	620	234	12	0	0
Malta	199	0	0	0	9	0	190	0	0	0	0
Netherlands	18,757	3,553	6,862	3,668	887	0	3,693	94	0	0	0
Austria	54,033	0	6,326	4,301	628	0	1,438	41,339	0	0	0
Poland	22,839	0	13,656	5,418	1,128	2	300	2,335	0	0	0
Portugal	29,092	0	12,608	2,884	271	0	1,006	12,091	230	0	0
Romania	25,511	0	6,639	367	70	0	1,771	16,663	0	0	0
Slovenia	5,062	0	6	146	119	6	255	4,529	0	0	0
Slovakia	6,528	0	6	1,086	539	0	585	4,312	0	0	0
Finland	33,171	223	5,189	12,484	420	7	90	14,759	0	0	0
Sweden	96,776	627	17,448	11,851	10	52	407	66,381	0	0	0
UK	107,189	25,903	30,576	27,169	5,701	0	12,857	4,973	0	0	9.30
EU-28	**1,052,980**	**59,548**	**320,376**	**122,435**	**61,026**	**4,920**	**122,972**	**349,689**	**6,658**	**4,867**	**489.23**
EU-27	**945,791**	**33,645**	**289,800**	**95,266**	**55,325**	**4,920**	**110,115**	**344,716**	**6,658**	**4,867**	**479.93**

Offshore Wind

Offshore wind was a costly RES technology in 2010, which is why many MS did not foresee any deployment in their NREAPs. Fourteen MS had planned some offshore wind electricity production by 2018, namely Sweden, Greece, Estonia, Latvia, the UK, Denmark, Belgium, Germany, the Netherlands, Ireland, Spain, Italy, Portugal and France. Of these, six have reported actual production. Additionally, Finland, which originally had not planned any offshore wind capacity, reported production as well. In absolute values, the UK had the highest electricity production from offshore wind in 2018 (25,903 GWh), followed by Germany (20,198 GWh) and Denmark (5,524 GWh). In absolute terms, significant amounts were additionally produced by Belgium and the Netherlands, while Sweden's contribution was small but clearly larger than Finland's generation of offshore wind power. Sweden and Denmark were on track while other MS seem to face challenges in deploying this technology (see Figure 34). Although offshore wind generation in Germany and in the UK has increased, the growth of actual generation lagged slightly behind the planned NREAP trajectories. The needed lead time from policy planning to tendering, and from the tender to the installation of offshore wind power might have been underestimated, and thus explains partly the delay in some MS. Other challenges, which may explain the restrained deployment of offshore wind, are the competing uses of the sea as well as high uncertainties in planning and construction. In Greece there is currently neither any installed wind-offshore capacity nor a regulatory framework promoting the deployment of offshore. Reasons are very deep waters such that floating solutions are needed, which reveal quite some progress in recent years.[44] Collaborations have been taken off for studying the potential of floating offshore wind in Greece's sea area.[45] Portugal and Italy face similar problems with respect to the depth of water. So far Portugal has no regulatory framework for wind-offshore but has financially supported the installation of a first floating offshore wind park (25 MW in 2020), which is a first step towards the use of wind resources on sea.[46] Similar, due to high costs and technological uncertainties, Italy has started the development of a floating wind power park (250 MW in 2020)[47], and Spain is also testing offshore and floating turbines (2019)[48]. In France, although it shows a delay, many wind offshore projects have been initiated, e.g. a floating wind turbine has been launched (2 MW in 2018)[49], the installation of a 480 MW (2020) wind offshore park has started[50] and a floating turbine contract (28 MW 2020) was signed[51]. Overall, it has a total of six approved offshore projects (2020, 2.6 GW)[52] pointing to a strong deployment in the future.

Because of these delays, both the EU-28 and the EU-27 as a whole still lag behind the NREAP trajectories. However, due to technological progress and the decrease in technology costs of offshore wind turbines - they have halved within the last 6 years globally[53] - the offshore wind deployment is expected to take-up speed after 2020. The decrease in technology costs is mirrored in recent auction results, e.g. bids in the UK ranging around

[44] https://www.windpowermonthly.com/article/1678282/steady-outlook-wind-sector-record-year-greece
[45] https://www.offshorewind.biz/2020/03/04/greeks-studying-floating-offshore-wind-potential/
[46] https://www.windbranche.de/news/nachrichten/artikel-36876-schwimmender-offshore-windpark-vor-portugal-in-betrieb
[47] https://www.evwind.es/2020/06/19/italy-begins-the-first-floating-wind-power-plant-in-the-mediterranean/75240
[48] https://www.windpowermonthly.com/article/1691595/first-floating-turbine-online-off-mainland-spain and https://www.offshorewind.biz/2019/03/18/spains-first-offshore-wind-turbine-goes-operation/
[49] https://www.offshore-windindustrie.de/news/nachrichten/artikel-36258-offshore-windpark-in-frankreich-geht-in-die-nchste-runde
[50] https://www.offshore-windindustrie.de/news/nachrichten/artikel-36258-offshore-windpark-in-frankreich-geht-in-die-nchste-runde and https://www.offshore-windindustrie.de/news/nachrichten/artikel-36779-startschuss-fr-franzsisches-offshore-wind-grossprojekt-fcamp
[51] https://www.offshore-windindustrie.de/news/ticker/frankreich-mhi-vestas-erhaelt-zuschlag-fuer-schwimmendes-offshore-projekt-artikel1911
[52] https://www.offshore-windindustrie.de/news/nachrichten/artikel-36525-frankreich-schliesst-14-atomkraftwerke-und-setzt-auf-erneuerbare-energien
[53] BNEF 2018, Beyond the Tipping Point. Flexibility gaps in future high-renewable energy systems in the UK, Germany and Nordics.

40€/MWh in 2019.[54] Auction results in Germany, Denmark and the Netherlands underpin this development as well. The Netherlands had tendered offshore wind projects without subsidies, but the costs of the grid connection are covered by the government. Main drivers of this cost decline have been new developments of e.g. turbines, advances in offshore supply chain, new designs and business models and low capital costs. Furthermore, there is an increasing number of offshore developers in the (EU) market, giving evidence of a growing industry and market competition in this area. Therefore prices are expected to reduce under further pressure. Nevertheless, offshore wind technology risks are still considered high compared to onshore wind. In many MS, these risks are currently subject of debates as support systems are being adapted, e.g. in Germany.[55]

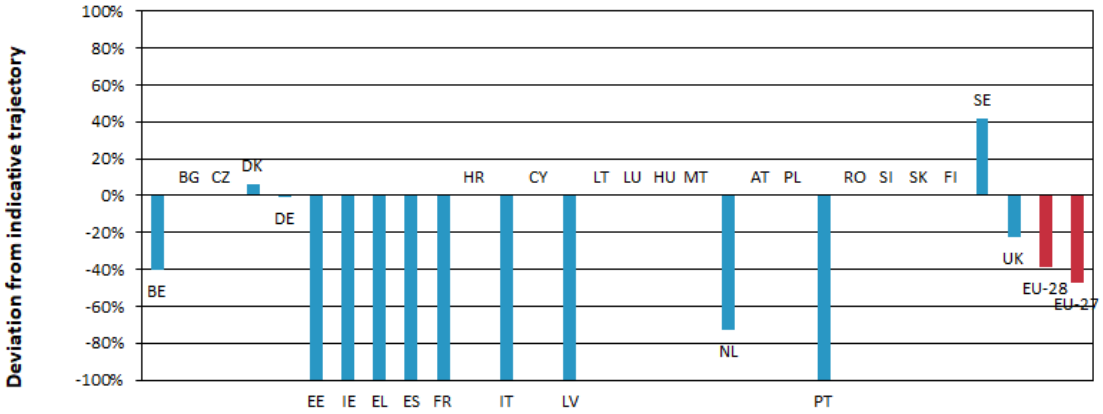

Figure 34. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for offshore wind.[56] Note: Those MS with 100% deviation have not yet generated any electricity from wind offshore – even though in some MS, e.g. France, projects are commissioned but not yet implemented[57]

Onshore Wind

Many MS planned significant deployment of onshore wind in their NREAPs. The EU-28 as well as the EU-27 are above the total planned production for 2018. The largest producers in absolute numbers in 2018 were Germany with 88,759 GWh, Spain with 50,557 GWh and the UK with 30,576 GWh. Despite the high absolute value of generation in Spain, the onshore wind generation has not increased as planned since 2016, which leads to increasing negative deviations from the NREAP trajectory. While onshore wind is seeing positive growth rates in 20 MS (see Table 14), actual development is lagging behind the NREAP trajectory in 15 MS. The largest negative deviations can be observed in Slovakia (6 GWh actual vs. 560 GWh planned) and in Slovenia (6 GWh actual vs 109 GWh planned). While delays in Greece are mainly due to the economic crisis, in Hungary[58], a combination well-established utilities and weak political support has slowed down the deployment of wind energy in the past. The highest positive deviations can be observed in Sweden and in Croatia, which have been increasing their generation steadily since 2011. An increasing positive deviation is also shown for Croatia, since the actual deployment increased continuously, although no expansion of onshore wind was planned after 2015.

[54] BEIS 2019, Contracts for Difference Allocation Round 3 Results, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/915678/cfd-ar3-results-corrected-111019.pdf
[55] Wind Europe 2019, https://windeurope.org/newsroom/press-releases/german-offshore-wind-can-deliver-more-legal-framework-for-at-least-20-gw-by-2030-required/
[56] Finland did not distinguish on- and offshore wind power in its NREAP. It is therefore assumed to be on track.
[57] EurObserv'ER Wind Energy Barometer 2020, https://www.eurobserv-er.org/wind-energy-barometer-2020/
[58] Antal 2019, How the regime hampered a transition to renewable electricity in Hungary in Environmental Innovation and Societal Transitions, https://doi.org/10.1016/j.eist.2019.04.004

There are many different reasons for slower uptake at national levels. Among others are past changes in policies and partly low or no support or uncertain revenues from sales (e.g. in Bulgaria, Cyprus, Hungary, Slovenia, Slovakia, Malta, Spain). In addition, non-cost barriers such as long lead times for administrative and grid access procedures, aviation safety and spatial planning and environmental issues still slow down the deployment of onshore wind. These challenges are also reflected in the latest auction results, e.g. in Germany, where the onshore wind auctions were undersigned and competition was less intense, which is probably due to the difficult and long permission processes.

Costs are still declining for onshore wind turbines, and investments in onshore wind projects dropped in the last year.[59] At the same time, the average size of turbines installed in 2019 reached a range of 2.3 to 4.3 MW (1.0 to 3.1 MW in 2017).[60] Thus, cost reductions and increased competition have made it possible to finance more capacity for less money.

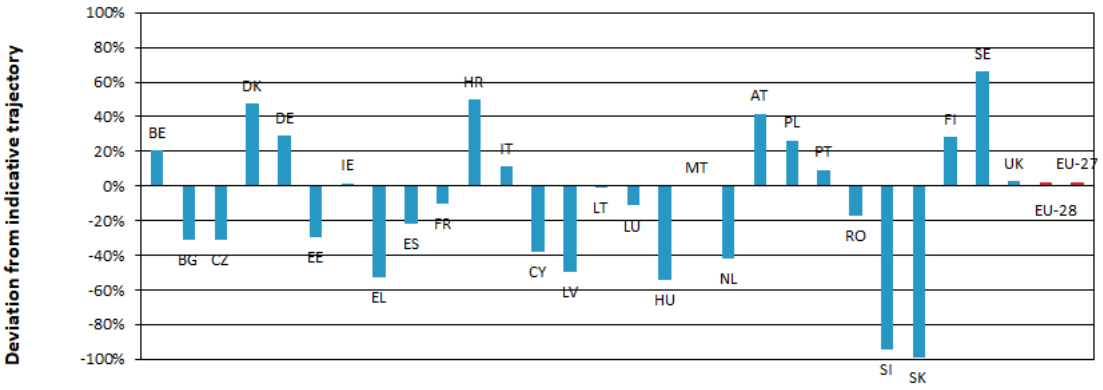

Figure 35. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for onshore wind

Photovoltaics

In many MS actual installations of PV plants and the resulting electricity generation have far surpassed national target figures, as system costs for PV have dropped much faster than was estimated by MS at the time of drafting the NREAPs. This trend had already become apparent in previous progress reports. Malta and Portugal were above their planned PV trajectory for 2018. Another 19 MS have even surpassed the production envisioned for 2020. Only Latvia, Cyprus, Spain and the Czech Republic remain below their planned production. The latter two MS have had phases of rapid PV deployment earlier in the decade, leading to an strongly increasing support costs at the time. After this, policy makers limited the support given to PV installations, which caused a break in growth. Latvia had only planned a small amount (4 GWh) for 2018 and reported only 1.3 GWh PV production. As a result, Latvia shows the largest negative deviation from NREAP trajectory. Denmark has only planned 4 GWh till 2020, while the actual generation in 2018 had reached 953 GWh. This leads to Denmark having the highest positive deviation among all MS. Estonia, Ireland and Finland had not planned any deployment until 2020, but they all produced small amounts. Germany continues to be the largest producer by far with 45,784 GWh, in 2018, followed by Italy with 22,654 GWh and the UK with 12,857 GWh. Given most MS were on track with their planned

[59] Wind Europe, Financing and investment trends 2019
[60] Wind Europe, Annual Statistics 2019

targets, both the EU-28 and the EU-27 as a whole are above the planned NREAP trajectories for PV deployment.

Due to increasing manufacturing capacities and concomitant competition and price decreases, PV has become one of the cheapest technologies for electricity generation worldwide.[61] Between 2009 and 2018, production costs fell by 75% while the EU market grew by 8 GW.[62] Prices for modules will most likely continue to decrease over the next few years. Due to the cost reductions, together with new business models and progress in system and battery technologies, PV will continue to grow in Europe. This is also expected in countries with lower solar radiation potential such as Latvia where also due to low-cost grid usage power parity is not yet given for solar PV[63]. Many MS have just started to install PV on a larger scale, making the PV market a great opportunity for the manufacturing industry.[64] Europe was leading the manufacturing of PV at the beginning of the 21st century and is still strong in the field of research and development.[65] The main support schemes for PV are, as for wind onshore, feed-in premiums or tariffs, often in combination with an auction. PV faced high competition which resulted in low bids in many auctions as well as small margins for developers and manufacturers (e.g. in Germany).[66] Overall, competition and price pressures will encourage more efficient manufacturing and ongoing innovation.

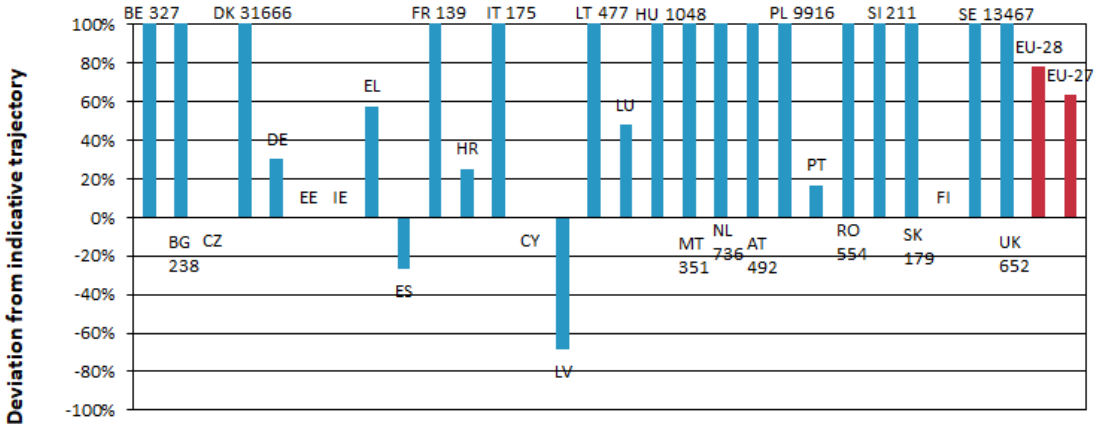

Figure 36. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for solar PV

Solid Biomass

Most MS planed significant amounts of electricity from solid biomass in their NREAPs, and the technology has made significant contributions to the RES-E sector throughout the last decade. The growth has been stronger between 2017 and 2018 (+4.67%) in comparison to the growth between 2015 and 2016 (-1.01%) in the EU-28. The number of MS who stayed below their NREAP-planned amounts has increased from 2014 (17 MS) to 2016 (20 MS) and decreased again in 2018 (19 MS). The highest positive deviation can be observed in Estonia. Bulgaria had the second highest positive deviation as well as the highest growth rate in biomass electricity generation among the MS, which was due to the increase in

[61] European Commission, Solar power, https://ec.europa.eu/energy/topics/renewable-energy/solar-power_en
[62] European Commission, Solar power, https://ec.europa.eu/energy/topics/renewable-energy/solar-power_en
[63] Antal 2019, How the regime hampered a transition to renewable electricity in Hungary in Environmental Innovation and Societal Transitions, https://doi.org/10.1016/j.eist.2019.04.004
[64] Fraunhofer ISE 2020, Sustainable PV Manufacturing in Europe, https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/ISE-Sustainable-PV-Manufacturing-in-Europe.pdf
[65] Fraunhofer ISE 2020, Sustainable PV Manufacturing in Europe, https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/ISE-Sustainable-PV-Manufacturing-in-Europe.pdf
[66] REN21, Renewables 2020, Global Status Report, https://www.ren21.net/gsr-2020/

installed capacity that grew by almost seven times (from 23 MW in 2017 to 158 MW in 2018) through the conversion of existing plants from conventional fuels to biomass between 2017 and 2018. The largest negative derivation is shown in Malta, followed by Greece. Malta has an abundance of solar intensity, but limited landmass, a difficult sea floor, small wave sources and only low-energy wind resources.[67] Consequently, Malta considers solar as their main renewable energy source and therefore puts less policy efforts into biomass deployment. Even though Greece displays a highly negative deviation from its interim trajectory, substantial growth in biomass electricity generation (+2.2 GWh) especially in installed capacity (+9.3 MW) was observed.

Eight MS were on track with their planned NREAP trajectories, while 19 MS lag behind (Cyprus did not plan any electricity generation from solid biomass in its NREAP). As a consequence, both the EU-28 and the EU-27 had lower shares in solid biomass use than envisaged. The UK was the largest producer in absolute terms in 2018 with 27,169 GWh, followed by Germany with 16,990 GWh as well as Finland with and Sweden (12,484 GWh and 11,851 GWh, respectively). With these amounts, these four MS contribute more than half of the EU-28's production of solid biomass electricity. Although absolute values in Germany and Sweden are high, these two MS did not show a substantial increase in actual production and therefore were behind their planned targets.

Bioenergy continues to be the main source of renewable energy in the EU in terms of gross final consumption, despite the rapid growth of wind and solar power over the past decade.[68] In terms of end use, the largest sector where biomass is used, is heating and cooling, while electricity from biomass accounts for only 13%.[69] Biomass currently used in the EU includes wood from forests, agricultural crops and residues, byproducts from the wood and agricultural industry, herbaceous and woody energy crops, municipal organic wastes and manure, and could potentially integrate algae and marine biomass in the future.[70] The residential sector retains the largest share of solid wood energy consumption (27%), followed by the industrial use of wood chips (22%) and the small-scale use of woodchips (14%).[71] Pellet consumption in modern appliances is also growing fast, representing 6% of the EU's total wood energy consumption.[72]

The cost of electricity from biomass, in contrast to wind and PV, is mainly driven by the operating costs of the fuel. It is not expected that the technology costs will decrease significantly. With regard to support schemes, feed-in tariffs and feed-in-premiums are the dominant support schemes for the deployment of electricity from biomass.[73] Thereby, the focus in many MS is on large power stations, in particular combined heat and power (CHP) plants. A stable support showed the highest effectiveness in the past and remains the key factor for biomass deployment beyond 2020.[74]

[67] Energy Transition 2017, Malta's energy transition, https://energytransition.org/2017/04/maltas-energy-transition-a-slow-but-promising-start/
[68] EU Commission, Brief on biomass for energy in the European Union, https://publications.jrc.ec.europa.eu/repository/bitstream/JRC109354/biomass_4_energy_brief_online_1.pdf
[69] EU Commission, Brief on biomass for energy in the European Union, https://publications.jrc.ec.europa.eu/repository/bitstream/JRC109354/biomass_4_energy_brief_online_1.pdf
[70] Bioenergy Europe, https://bioenergyeurope.org/
[71] Bioenergy Europe, https://bioenergyeurope.org/
[72] Bioenergy Europe, https://bioenergyeurope.org/
[73] Banja et al. 2019, Biomass for energy in the EU – The support framework in Energy Policy, https://doi.org/10.1016/j.enpol.2019.04.038
[74] Banja et al. 2019, Biomass for energy in the EU – The support framework in Energy Policy, https://doi.org/10.1016/j.enpol.2019.04.038

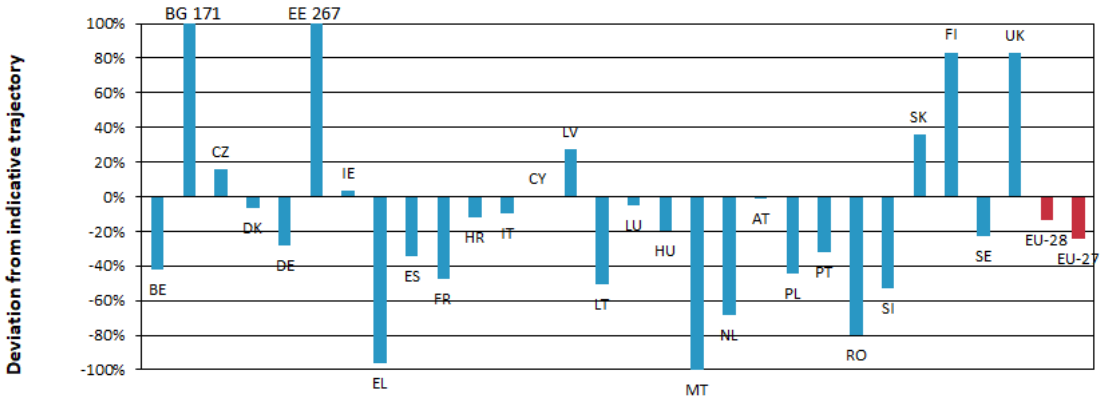

Figure 37. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for solid biomass

Biogas

The EU in total was on track regarding its electricity production from biogas in 2018. However, there is a large variation between MS. Finland has continuously been above its planned trajectory since 2010 and showed the largest positive deviation among all MS with 420 GWh actual production versus 70 GWh planned in 2018. In contrast, 21 MS stayed below their planned deployment. Among these MS, the largest negative deviation can be observed in Romania, with 70 GWh actual deployment and 865 GWh planned target for 2018. Romania has a high potential for biomass and biogas, and several ongoing projects focus on its utilisation. However, the use of biomass or biogas for electricity generation is affected by several aspects. There are competing uses of biomass between the heating and electricity sector, and it is well suited for sector coupling (via combined heat and power (CHP) plants). Further, it is partly considered as a transitory energy source due to its polluting emissions.[75] This mix of reasons may explain the negative deviation. In absolute terms, Germany was by far the largest producer in 2018 with 33,416 GWh, more than all other MS combined. However, growth in Germany has slowed after a support scheme change in 2014 aimed at limiting the development of biogas electricity. In contrast, despite relatively small absolute production in Lithuania (140 GWh), very high growth could be observed in recent years. This may be due to the Lithuanian Rural Development Programme 2014-2020, which is expected to support up to 30 new biogas plants with total capacity of 20 MW by the end of 2020.[76] The highest growth rates between 2017 and 2018 can be observed in Croatia, followed by France.

Overall, the deployment of biogas varies across MS and times, and costs depend less on the technology, but on operating costs, as in the case of solid biomass. The use of biogas electricity is currently mainly influenced by the shift in the regulative framework, the stage of the auctions and the feasibility of long-term objectives.[77] National targets were very supportive of the rapid introduction of biogas electricity in recent years. However, at the present time, in several MS, a clear picture of biogas after 2020 is still missing.[78]

[75] Cîrstea, Ş.D.; Martiş, C.S.; Cîrstea, A.; Constantinescu-Dobra, A.; Fülöp, M.T. Current Situation and Future Perspectives of the Romanian Renewable Energy. Energies 2018, 11, 3289., DOI: 10.3390/en11123289
[76] Lithuanian Energy Institute 2018, Biogas upgrading, https://www.beic.nu/resources/02_Andrius_Tamosiunas.pdf
[77] Banja et al. 2019, Support for biogas in the EU electricity sector – A comparative analysis in Biomass and Bioenergy, https://doi.org/10.1016/j.biombioe.2019.105313
[78] Banja et al. 2019, Support for biogas in the EU electricity sector – A comparative analysis in Biomass and Bioenergy, https://doi.org/10.1016/j.biombioe.2019.105313

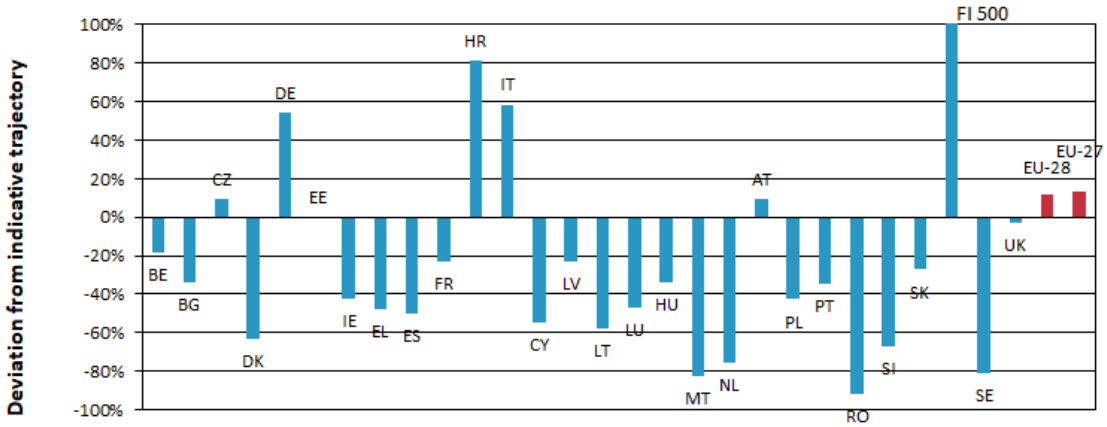

Figure 38. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for biogas

Hydro

This chapter on hydro combines the subcategories small hydro and large hydro from previous progress reports and includes installations of "<1 MW", "1-10 MW" and ">10 MW". On EU-28 level, the total hydro production is 349,689 GWh in 2018, of which Sweden had the largest contribution (66,381 GWh), followed by France (60,542 GWh), Italy (46,800 GWh) and Austria (41,339 GWh). Despite the high absolute values in these four MS, only Italy and Austria were on track with their planned NREAP trajectories. In 2018, only nine MS had higher actual deployment than planned. The highest positive deviation can be observed in Bulgaria. The largest negative deviation is shown in the Netherlands, which had set a constant NREAP target value of 184 GWh from 2013 to 2020, while the actual generation has been decreasing since 2014 from 102 GWh to 94 GWh in 2018. Similarly, the MS with the second largest deviation, Denmark, had set a constant target of 184 GWh for hydropower from 2013 to 2020, while the actual deployment is stagnating since 2016. Denmark is geographically small and relatively flat with only a few rivers suitable for hydropower, which might be one reason for a low deployment. By contrast, hydropower is far more common in the other Nordic countries, in particular in Norway and Sweden, where great amounts of water and height differences are available.[79] Denmark benefits from this hydropower potential as a source of storage[80] but in times of droughts a dependency on this potential becomes costly.

Large hydro is the most mature RES-E technology, with the majority of potentials already being exploited in most MS. Thus, most MS have planned only low growth rates in this technology. Although electricity production from wind onshore, offshore and PV combined has overtaken the production from large hydro installations, large hydro nevertheless remains, for the time being, the single most important RES-E technology, contributing the largest share to RES-E generation. Significant potentials for capacity expansion in large hydropower remain in France, Italy, Portugal, Greece, Romania, Austria, and Poland.

[79] Danish Energy Agency, https://ens.dk/en/our-responsibilities/wave-hydropower/facts-about-wave-power-and-hydropower
[80] Danish Energy Agency, https://ens.dk/en/our-responsibilities/wave-hydropower/facts-about-wave-power-and-hydropower

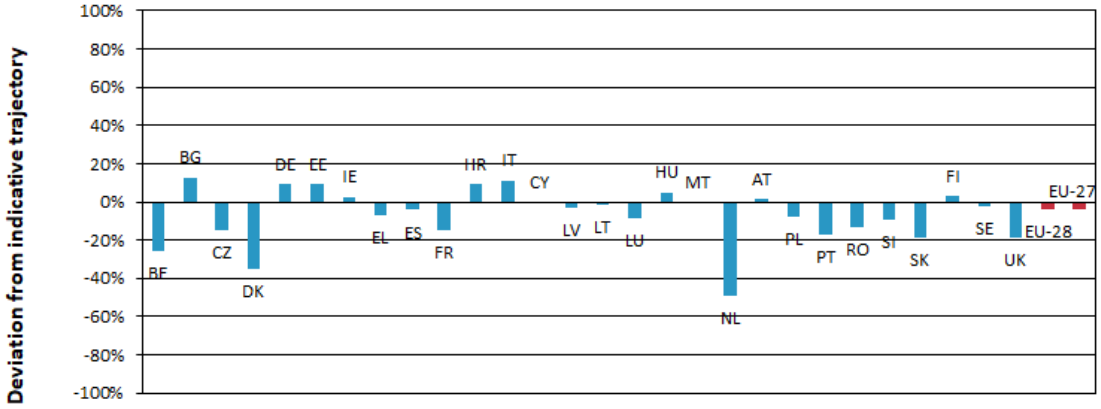

Figure 39. Deviation of actual 2018 deployment (Eurostat SHARES) from 2018 indicative trajectory (NREAP) for non-pumped hydropower[81]

Mixed Hydro

While Table 10 of the NREAP had only differentiated between the hydro subcategories "<1 MW", "1-10 MW", ">10 MW" and "of which pumped", the MS Progress Report template introduced a new category called "mixed", which - in accordance with the new Eurostat methodology - refers to the renewable portion of electricity produced in mixed (pumped and non-pumped) hydropower plants. Due to the absence of NREAP-planned figures, no comparison for this subcategory is provided here.

Bioliquids

The contribution of bioliquids to renewable electricity generation in 2018 is about 1% of wind energy or about 3% of biomass-based electricity and the targeted share of bioliquids in the RES-E mix is about 0.5% of all RES-E sources in the EU. Thus, the significance of bioliquids with respect to its magnitude is minor in RES-E. Only three MS had planned any significant amount of bioliquid electricity for 2016: Finland with 4,680 GWh, Italy with 4,240 GWh, and Germany with 1,450 GWh. Of these, Italy and Germany had noticeable deployment, with Italy even slightly above its NREAP trajectory, while Finland had only 6.9 GWh of electricity from bioliquids despite having the highest planned target of the three. Italy had planned an increasing trajectory till 2020, while the actual deployment has been decreasing since 2015. Sweden, Austria, Belgium and Denmark (in descending order) had planned very small amounts ranging between 6 and 65 GWh. Belgium, even though having planned only minor contributions, was the only MS considerably above track, with 74 GWh actual versus 27 GWh planned. On the contrary, Austria reported a deployment below 1 GWh, although 36 GWh was planned from 2010 to 2020.

[81] Note: We consolidated the categories small (< 1 MW), medium (1-10 MW) and large hydro (>10 MW) in one category.

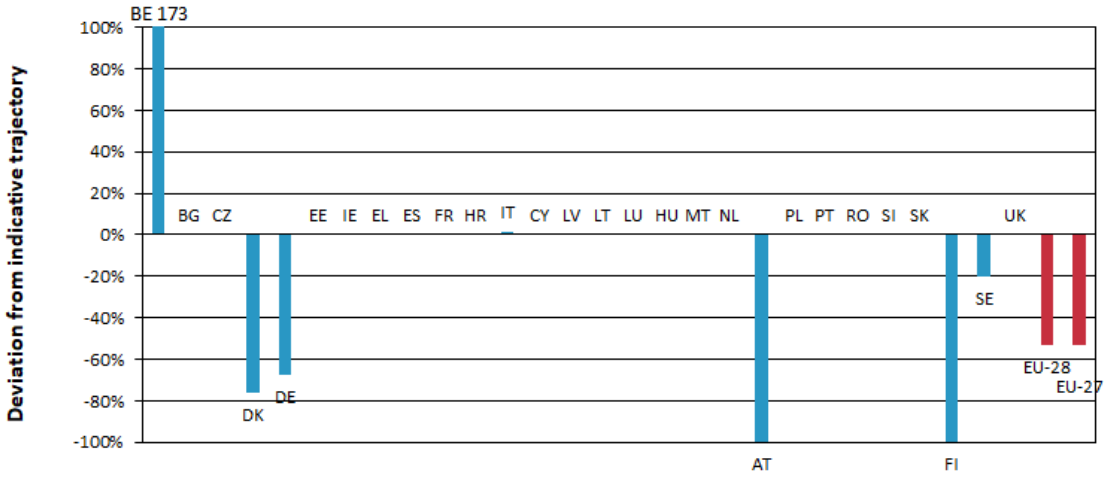

Figure 40. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for bioliquids

Geothermal

The planned contribution of geothermal based electricity to renewable power generation is with less than 1% of total RES-E sources, minor at the EU-level. Fifteen MS did not foresee any geothermal electricity production by 2018. Belgium and Spain planned to start geothermal electricity with 22 GWh and 60 GWh respectively in 2018. However, no actual deployment is observed in Belgium or Spain. Geothermal electricity production on the EU-28 level has been decreasing since 2016 from 6,733 GWh to 6,658 GWh in 2018. The highest contribution of 6,105 GWh came from Italy. Nevertheless, the production on Italy is decreasing since 2016 and Italy is therefore below their NREAP trajectory. Croatia, Hungary, France, Germany, Austria and Portugal, all with planned contributions between 58 and 976 GWh, reported small amounts of actual deployment between 0.2 GWh and 230 GWh, but all (except for Portugal) stayed well below plan. Greece and the Netherlands planned a generation of 123 GWh and 308 GWh respectively, but had no actual production. In the Netherlands the main support instrument for geothermal power is the SDE+ (feed-in premium), which has been improved in terms of remuneration and scope of the regulation. In addition, the government has increased the budget for guarantees on drilling risks while financing difficulties and slow permitting hampered a significant increases in geothermal power.[82] The Czech Republic and Slovakia reported zero production even though having foreseen some small contributions of 18 and 28 GWh respectively in their NREAPs.

Overall, limitations of geothermal resources in certain locations, the costly evaluation and associated risks as well as long lead times from initial project ideas to final installations, missing support policies and financing might explain some of the delays. In addition, geothermal based electricity faces acceptance problems in some MS, as the environmental impact of the technology is in some regions highly disputed.

[82] http://europeangeothermalcongress.eu/wp-content/uploads/2019/07/CUR-19-Netherlands.pdf

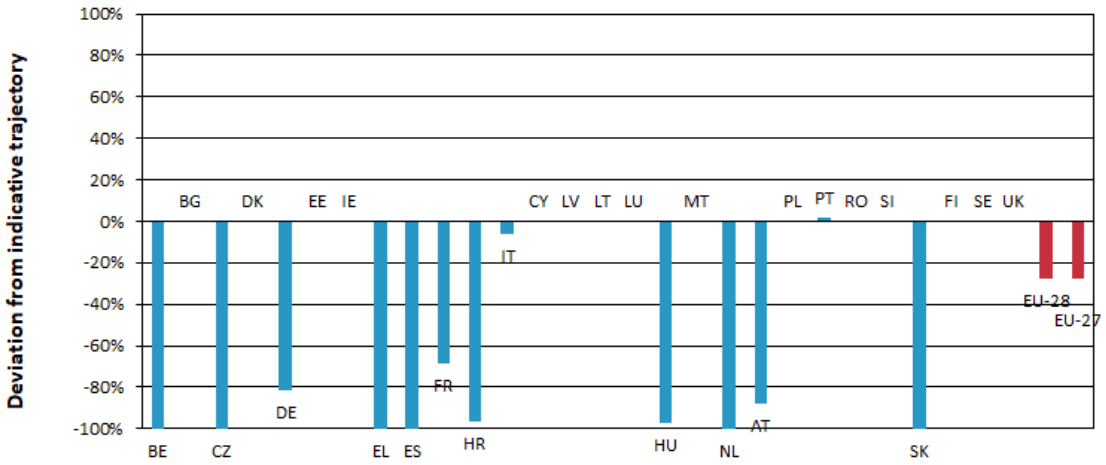

Figure 41. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for geothermal installations

Concentrated Solar Power

Concentrated Solar Power (CSP) deployment in the EU is significantly below planned amounts. Six MS had planned a total of 13,648 GWh of CSP electricity production for 2018 and have actually achieved around 36% of this. Most of this planned amount and all of the actually realised production of 4,867 GWh comes from Spain. The other five MS had planned only small amounts ranging between 68 and 729 GWh, but all reported a production of zero. In Spain, the total installed capacity has remained 2,304 MW from 2013 to 2018. However, the actual CSP electricity production in Spain has increased to the peak of 5,883 GWh in 2017 and decreased in 2018 to even less than in 2014. The deviation from the NREAP trajectory has thus increased in 2018 in comparison to in 2016. One reason for this delay is that the costs of installations remain comparatively high in Europe. It seems that only in Spain commercial investment in CSP are possible.

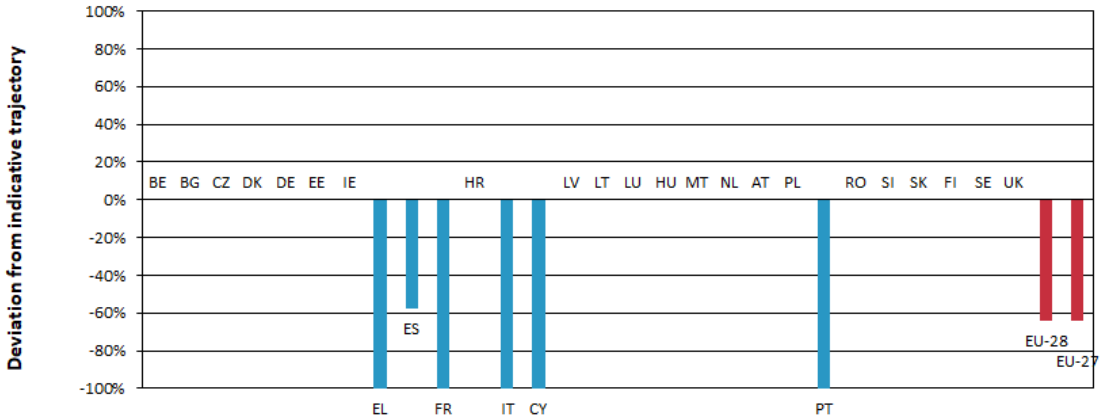

Figure 42. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for concentrated solar power

Tide, Wave and Ocean Energy

Tidal, wave and marine technologies are developing much slower than planned in the EU. It is also the technology with the lowest planned contribution to the RES-E mix. Of the six MS who had foreseen any production, only France (480 GWh) and the UK (9 GWh) reported electricity generation in 2018. Portugal has reported 0.01 GWh generation in 2017, which decreased to 0 GWh in 2018. The UK is the most ambitious MS with the highest planned NREAP trajectory of 2,070 GWh for 2018, but production is marginal although it has been increasing since 2016. However, currently 33 tidal energy projects are in the planning (2,860 MW), development (1,089 MW), construction phase (3 MW) or consented and awaiting construction (729 MW) in the UK.[83] The same, albeit on a smaller scale, applies to wave energy, with 16 projects in planning, development or construction, totalling approximately 463 MW.[84] It can therefore be assumed that UK's contribution to tidal and wave energy generation will be closer to planned levels in the coming years. Ireland had planned no electricity production from tide, wave and ocean energy till 2016. On the contrary, a small amount was planned for 2017 (42 GWh) and then almost doubled for 2018 (81 GWh). However, no actual deployment was reported. Besides these, other MS (namely Italy, Portugal, and Spain) have planned NREAP trajectories ranging between 2 and 110 GWh. Denmark had not planned any deployment, but currently three wave power plants have permissions to test in Danish seas and one developer has permission to do pre-investigations to prepare an area for future wave energy plants.[85]

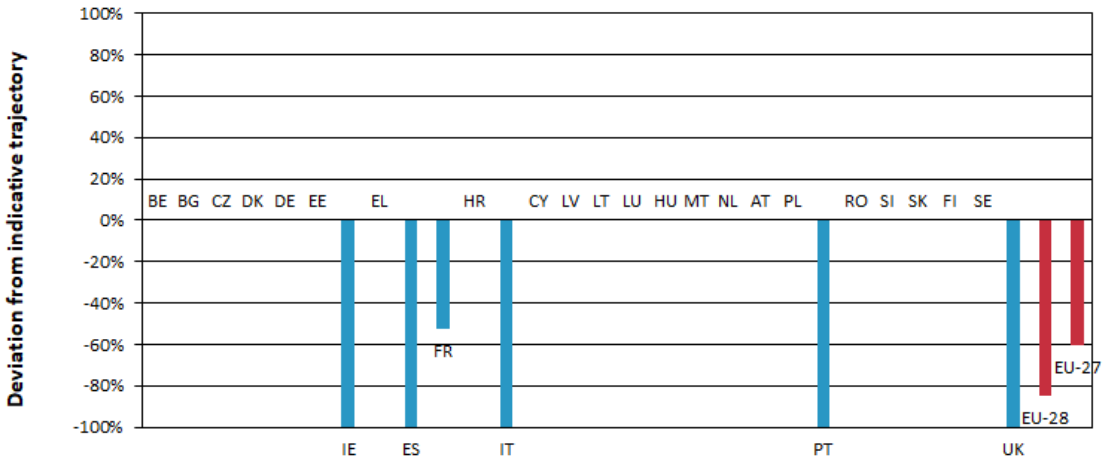

Figure 43. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for tide, wave and ocean energy

[83] RenewableUK Marine Energy, https://maps.esp.tl/maps/pages/map.jsp?geoMapId=19671&TENANT_ID=115744
[84] RenewableUK Marine Energy, https://maps.esp.tl/maps/pages/map.jsp?geoMapId=19671&TENANT_ID=115744
[85] Danish Energy Agency, https://ens.dk/en/our-responsibilities/wave-hydropower/facts-about-wave-power-and-hydropower

A.2 RES-H&C sector overview

Consumption of RES-H&C has increased gradually over the last decades. In 2018, RES-H&C consumption at EU-28 level reached 102,292 GWh (see Figure 44). Thereby, solid biomass contributed with 82,782 ktoe most to the sector. Heat consumption from heat pumps stood at 11,950 ktoe, biogas at 3,417 ktoe, solar thermal heating at 2,468 ktoe, geothermal heating at 868 ktoe and bioliquids at 806 ktoe. Most MS use financial and/or fiscal incentives to support RES in the heating and cooling sector.[86] In several MS, there is not yet a comprehensive approach to support RES-H&C, which might explain the relatively moderate growth in this sector compared to RES-E. However, the heating and cooling sector has become more prominent in several MS and has been addressed in the NECPs with new measures and policies to be implemented in the coming years (e.g. CO_2-prices for heating and transport, new support programs for the development of district heating and cooling or new information services and campaigns on building renovations). An increasing focus on heating and cooling is of great relevance, especially in light of the fact that in 2018 only 19% of heating and cooling in the EU was generated from RES.[87] More renewable energy sources still need to be integrated in the heating and cooling sector in order to achieve the EU climate and energy targets.

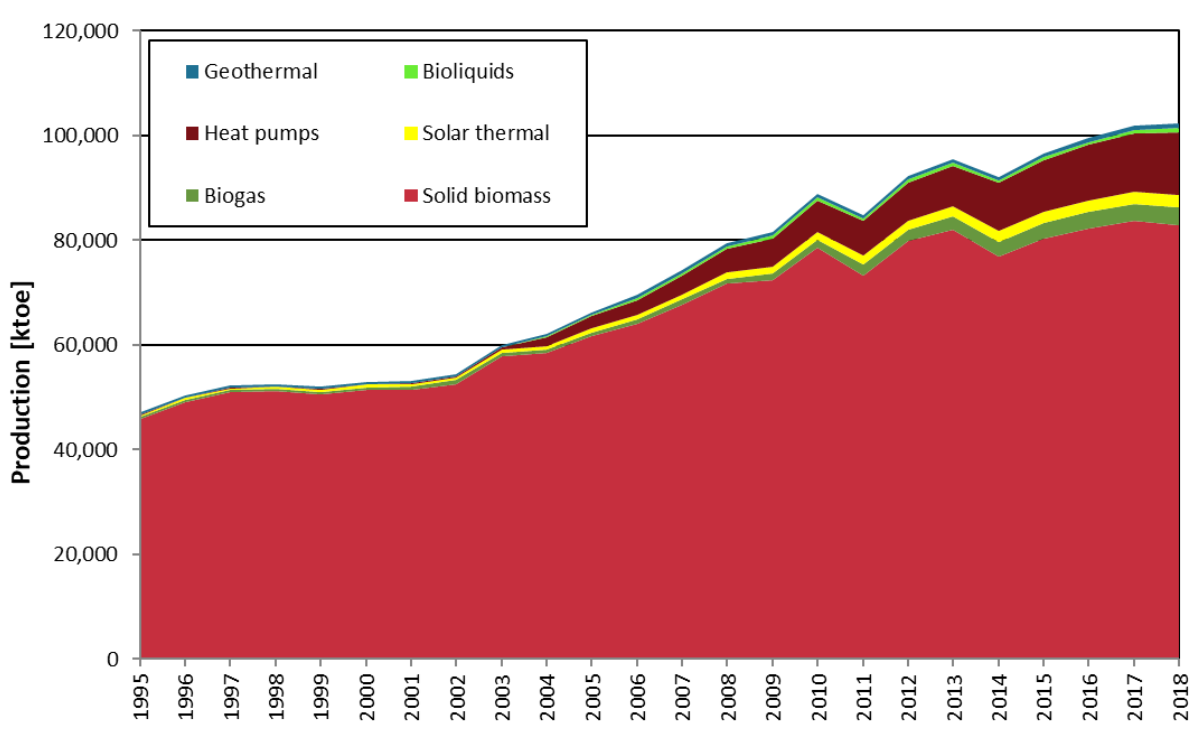

Figure 44. Production of heating and cooling from RES-H&C technologies in the EU-28 for 1995-2018.[88] Source: Results for heat pumps from 2004 to 2018 are based on Eurostat SHARES, other results are based on Eurostat Energy Balances

The following graphs and tables outline the developments in the RES-H&C sector for individual MS.

[86] JRC 2017, Renewables in the EU, https://e3p.jrc.ec.europa.eu/sites/default/files/documents/publications/kjna29100enn.pdf
[87] Eurostat, Share of energy from renewable sources in heating and cooling [nrg_ind_ren]
[88] Solid biomass includes primary solid biofuels and renewable municipal waste.

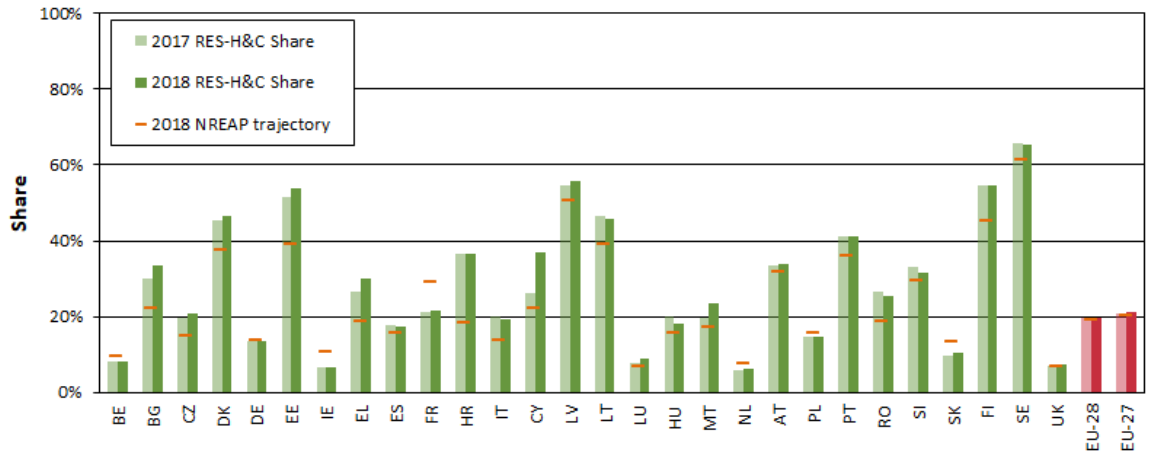

Figure 45. RES-H&C actual share vs. NREAP indicative sectoral trajectory in 2018 (%). Source: Eurostat SHARES and NREAPs

Seven MS, namely Belgium, Germany, Ireland, France, the Netherlands, Poland and Slovakia, stayed below their NREAP indicative sectoral trajectories envisioned for RES-H&C consumption in 2018. The remaining 21 MS were above. Both EU-28 level and EU-27 continued to be above the (aggregated) indicative trajectory. The largest positive deviation can be observed in Croatia, Cyprus and Greece, while the largest negative deviation can be observed in Ireland and France.

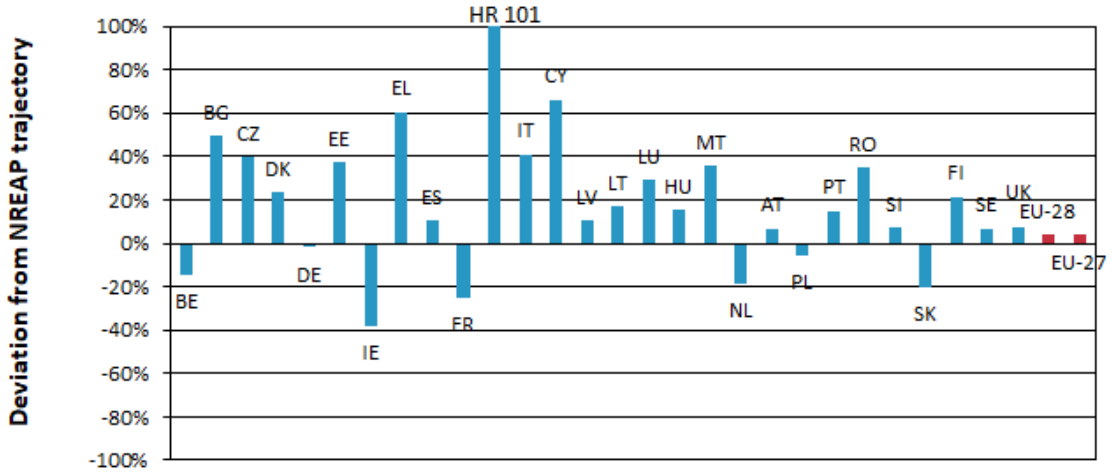

Figure 46. Deviation of actual 2018 share from 2018 NREAP indicative sectoral trajectory for RES-H&C. Source: Eurostat SHARES and NREAPs

The following tables show the growth rate of RES-H&C technologies from 2017 to 2018, as well as their absolute values in 2018. Growth rates for RES-H&C technologies are in general lower than in the RES-E and RES-T sectors due to the already large contribution of the well-established technology of solid biomass (which has slightly decreased in 2018). All other technologies showed positive growth rates between 2017 and 2018. Bioliquid heating was the fastest-growing technology although it contributed the least in absolute terms. Similarly, geothermal heating contributed very little in absolute terms but it has been growing steadily since 2014. Biogas, solar thermal and heat pumps all showed strong growth and were also significant in absolute figures.

Table 16. Growth of RES-H&C technologies from 2017-2018. Source: Eurostat Energy Balances and Eurostat SHARES

Member State	RES-H [%]	Solar thermal [%]	Solid biomass [%]	Biogas [%]	Heat pumps [%]	Geothermal [%]	Bioliquids [%]
Belgium	2.27	8.68	1.41	3.54	20.02	3.55	-13.65
Bulgaria	9.72	6.22	10.37	15.97	5.71	0.00	-
Czech Republic	2.16	5.20	1.61	-3.31	17.62	-	-
Denmark	2.48	16.99	1.46	5.76	13.12	-27.78	25.67
Germany	0.69	13.03	-1.57	4.83	9.03	6.16	3.47
Estonia	6.63	-	5.96	15.66	13.35	-	-
Ireland	3.64	7.14	1.94	0.38	13.69	-	-
Greece	1.46	2.13	-3.57	20.45	11.67	0.35	-
Spain	3.99	5.15	0.78	3.01	18.33	0.00	1998.68
France	1.37	5.21	-0.88	4.17	9.50	10.13	10.45
Croatia	-2.12	8.42	-2.48	46.98	-5.37	-7.22	-
Italy	-4.97	4.64	-6.41	-4.38	-2.04	-0.47	11.03
Cyprus	48.23	2.57	26.51	10.70	-	0.00	-100.00
Latvia	6.84	-	7.20	-7.76	0.00	-	25.81
Lithuania	-0.06	-	-1.65	7.66	-	-100.00	-
Luxembourg	13.29	9.19	13.15	13.65	16.43	-	-
Hungary	-12.17	6.90	-12.98	-15.93	20.91	-2.60	-
Malta	8.19	0.84	-1.24	-12.90	12.82	-	-
Netherlands	7.04	1.49	-3.51	13.63	19.30	22.45	302.23
Austria	-4.95	-0.81	-6.04	-20.26	10.12	-4.24	-1.48
Poland	0.13	4.51	0.01	-0.22	5.49	4.82	16.19
Portugal	1.98	7.32	1.07	-3.34	4.08	12.20	-9.30
Romania	-2.47	-0.85	-2.50	11.25	-	-3.53	-
Slovenia	-6.25	-0.22	-7.16	3.36	-	1.34	29.11
Slovakia	7.35	9.52	8.19	-2.54	-	2.84	-
Finland	1.75	10.67	1.41	11.73	5.46	-	-9.23
Sweden	-1.29	-1.51	-2.88	-19.86	5.21	-	16.71
UK	10.70	1.33	11.82	26.82	1.86	0.00	-
EU-28	**0.41**	**6.77**	**-1.02**	**4.07**	**6.82**	**4.09**	**28.66**
EU-27	**0.03**	**6.90**	**-1.47**	**2.94**	**7.09**	**4.10**	**28.66**

Table 17. RES-H&C consumption in the EU-28 in 2018 per technology. Source: Eurostat Energy Balances and Eurostat SHARES

Member State	RES-H [ktoe]	Solar thermal [ktoe]	Solid biomass [ktoe]	Biogas [ktoe]	Heat pumps [ktoe]	Geothermal [ktoe]	Bioliquids [ktoe]
Belgium	1,524	28	1,321	107	62	1	5
Bulgaria	1,345	25	1,181	13	92	35	0
Czech Republic	2,913	21	2,549	170	173	0	0
Denmark	3,447	66	3,092	64	218	1	5
Germany	14,707	763	10,807	1,681	1,152	107	197
Estonia	838	0	759	10	69	0	0
Ireland	310	14	242	10	44	0	0
Greece	1,466	277	827	21	324	9	8
Spain	5,285	324	4,104	55	742	19	41
France	13,033	181	9,793	263	2,601	187	7
Croatia	1,179	14	1,131	11	15	8	0
Italy	10,610	219	7,339	256	2,596	149	52
Cyprus	174	72	49	6	45	2	0
Latvia	1,375	0	1,343	30	1	0	2
Lithuania	1,183	0	1,154	11	18	0	0
Luxembourg	92	2	76	8	6	0	0
Hungary	1,862	13	1,701	17	8	124	0
Malta	18	5	1	1	11	0	0
Netherlands	1,587	28	1,025	129	216	89	99
Austria	4,565	181	3,953	45	334	26	28
Poland	5,589	57	5,343	104	60	24	1
Portugal	2,555	94	1,791	8	650	2	11
Romania	3,470	1	3,427	11	0	31	0
Slovenia	589	11	522	7	0	49	1
Slovakia	640	7	584	44	0	5	0
Finland	7,911	2	7,332	103	463	0	11
Sweden	9,975	11	8,137	37	1,451	0	340
UK	4,047	53	3,197	197	599	1	0
EU-28	**102,292**	**2,468**	**82,782**	**3,417**	**11,950**	**868**	**806**
EU-27	**98,245**	**2,415**	**79,585**	**3,220**	**11,352**	**867**	**806**

Solar Thermal

The consumption of heat from solar thermal energy only accounted for about 2% of the total RES-H&C consumption in the EU-28 in 2018. In absolute terms, the consumption of solar thermal energy reached 2,468 ktoe in the EU-28. Except for Estonia and Finland, all other MS had planned small amounts of solar thermal heating. Although the deployment has been increasing steadily and continuously, the technology showed a slower deployment in the last years than was expected at the time the NREAPs were drafted. Thus, the EU as a whole lags behind planned deployment. Only six MS reported a consumption of more than 100

ktoe for 2018, namely Austria with 181 ktoe, Spain with 324 ktoe, Germany with 763 ktoe, Greece with 277 ktoe, Italy with 219 ktoe and France with 181 ktoe. Nevertheless, all six of these MS remained below their planned amounts, as shown in the figures below. In total, 20 MS were below their envisaged trajectories. Lithuania and Latvia had planned 7 ktoe and 2 ktoe respectively but reported no production. Finland had planned no production, but reported 2 ktoe in 2018. Belgium, Denmark, Malta, the Netherlans, Sweden and the UK continued to be on track with their planned NREAP trajectories. Despite the relatively small absolute consumption (66 ktoe), the highest positive deviation can be observed in Denmark as only 15 ktoe was planned. Ireland was on track with its trajectory in 2016 but lagged behind in 2018.

The market development of solar thermal energy is highly dependent on prices of electricity and gas as well as on funding opportunities. In the majority of MS, neither the funding opportunities nor the avoided costs from using gas or electricity for heating seem to be sufficient to incentivise the planned deployment of solar thermal heat. Growth in Belgium is still slow, although an income tax reduction of the investment costs of a solar thermal system and low-interest loan are in place.[89] Uncertainties continue to have an impact on the deployment level. In North-East Europe, especially in Latvia and Lithuania, there are only a few hours of sunshine, resulting in low incentives for solar thermal energy deployment. In Southern Europe the potential is higher and so are the trajectories.

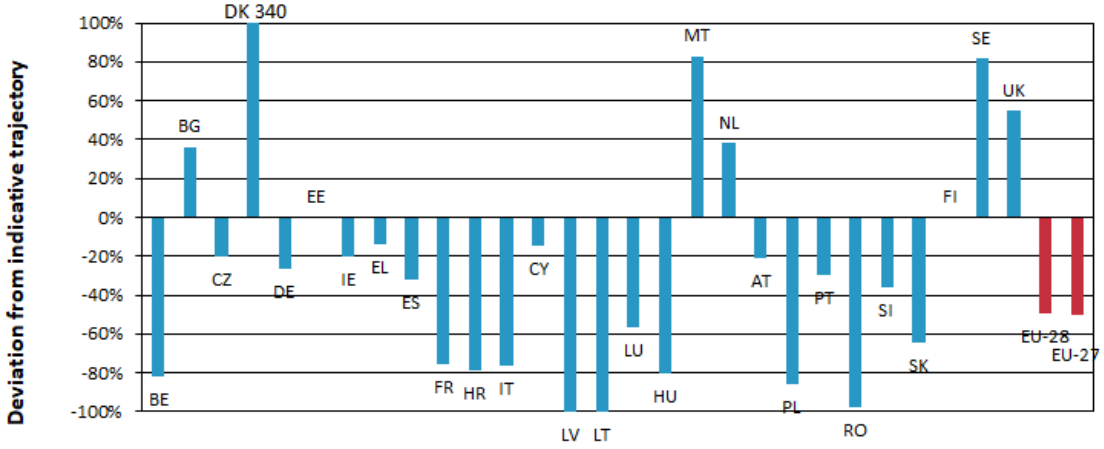

Figure 47. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for solar thermal installations[90]

Solid Biomass

The largest contribution to RES-H&C consumption was provided by biomass with 82,782 ktoe in 2018 at EU-28 level (81%). In absolute terms, the largest consumers of heating and cooling produced from solid biomass were Germany with 10,807 ktoe, France with 9,793 ktoe, Sweden with 8,137 ktoe, Italy with 7,339 ktoe and Finland with 7,332 ktoe. The use of solid biomass had already been well established in some MS before 2010, who did, thus, not foresee any large net increases of solid biomass use in their NREAPs. The focus is rather on replacing traditional biomass installations with newer, more efficient ones. Finland had planned increasing trajectories from 2,710 ktoe in 2010 to 3,940 ktoe in 2020, which was lower than the NREAP baseline of 5,450 ktoe in 2005. However, the actual deployment has generally been increasing with higher consumption than the baseline and reached 7,332

[89] Solarthermalworld, Belgium: Ambitious Targets for Solar Thermal, https://www.solarthermalworld.org/news/belgium-ambitious-targets-solar-thermal
[90] MT changed its NREAP in 2017 stating new solar thermal energy targets for the year 2020. However, as the updated NREAP does not contain a trajectory for solar thermal, data from its previous NREAP is used.

ktoe in 2018. Nineteen MS have surpassed their 2018 planned consumption, 16 of which are even already above their indicative sectoral trajectory for 2020. These are Bulgaria, Croatia, Cyprus, Finland, the Netherlands, Italy, Hungary, Estonia, Lithuania, the Czech Republic, Poland, Austria, Luxemburg, Denmark, Germany and Slovenia. Moreover, Malta had planned no deployment at all until 2020 but actually reports 1.3 ktoe. Almost all MS performed similarly to 2016 and the EU-28 and the EU-27 continued to be above the aggregated NREAP indicative trajectory in 2018. The highest positive deviation can be observed in Croatia with 1,131 ktoe actual consumption from solid biomass, while only 388 ktoe was planned for 2018. Ireland continued to be the MS with the largest negative deviation from its NREAP trajectory although it has introduced a new support scheme for biomass in 2017, called the "Support Scheme for Renewable Heat". This scheme incentivises the installation and use of biomass and anaerobic digestion heating systems. In 2018, the support scheme provided €7 million for the initial stage of the programme.[91] Currently the scheme is open for applications.[92]

Solid biomass consumption has been a traditional form of heating especially in rural areas of e.g. Romania, Bulgaria and Poland. Its use depends on policies but also on weather conditions.[93] In 2018, the demand for heat from solid biomass in the EU fell slightly (-0.3%), probably due to a milder winter.[94]

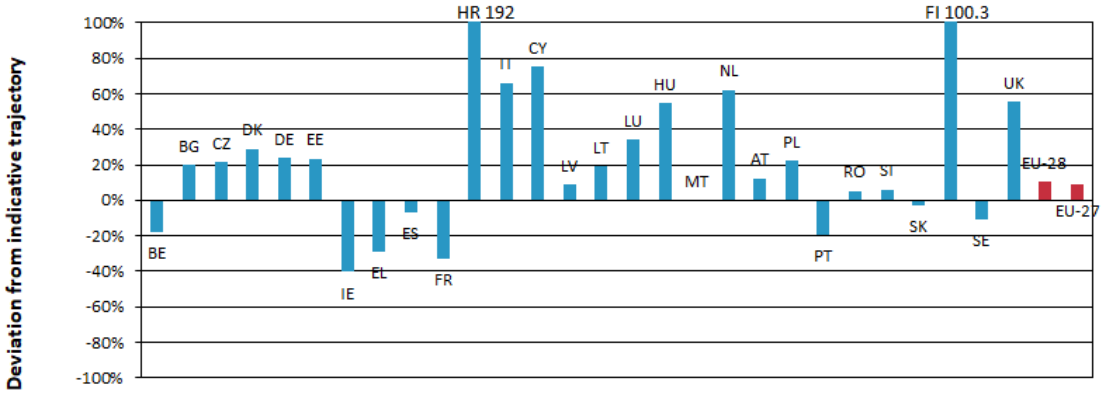

Figure 48. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for solid biomass

Biogas

Biogas was the third largest technology in RES-H&C, after solid biomass and heat pumps, with a consumption of 3,417 ktoe in 2018 on EU-28 level. Germany was the largest consumer of biogas for heating with 1,681 ktoe, almost half of the EU-28 total. It was followed by the France with 263 ktoe, Italy with 256 ktoe, the UK with 197 ktoe and the Czech Republic with 170 ktoe. Sixteen MS consumed less biogas for heating in 2018 than they had been planned for in their NREAPs. The largest negative deviation was observed in Lithuania, with 11 ktoe actual deployment versus 41 ktoe planned for 2018, followed by Poland, with 104 ktoe actual and 364 ktoe planned deployment. Other MS such as Finland, Sweden, Austria, Croatia and Belgium showed significant overachievement. Estonia, Greece, Cyprus and Slovenia had not foreseen any production for 2018, but all report small amounts of biogas heating (ranging between 6 ktoe and 22 ktoe). However, in total, the EU-

[91] Sustainable Energy Authority of Ireland, Support Scheme for Renewable Heat, https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/
[92] Sustainable Energy Authority of Ireland, Support Scheme for Renewable Heat, https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/
[93] EurObserv'ER, Solid biomass barometer 2019, https://www.eurobserv-er.org/solid-biomass-barometer-2019/
[94] EurObserv'ER, Solid biomass barometer 2019, https://www.eurobserv-er.org/solid-biomass-barometer-2019/

28 and the EU-27 are below the aggregated NREAP indicative sectoral trajectories for biogas heating.

Denmark, Germany and Italy have supported biogas technologies and developed support schemes to facilitate their large-scale deployment for more than a decade. Denmark has a clear interest in making biogas and biomethane central parts of its future energy system, given the depletion of its gas fields in the North Sea.[95] Germany has pursued a robust development of combined heat and power (CHP) plants using biogas. In Italy, the high availability of agricultural raw materials in particular was a strong argument in favour of biogas production.

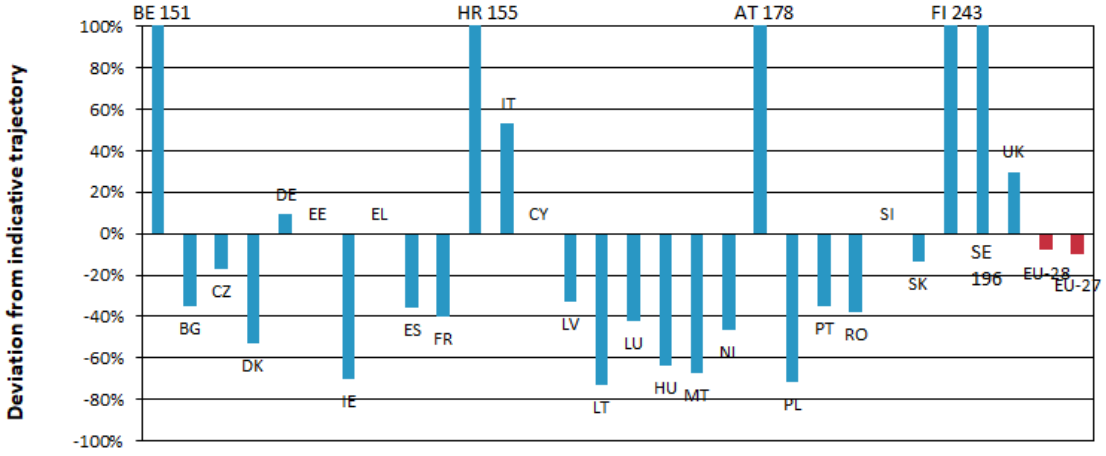

Figure 49. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for biogas

Heat Pumps

The EU-28 consumed in total 11,950 ktoe of heat from heat pumps in 2018, making this technology the second-largest contributor to RES-H&C after solid biomass. Ten MS contributed with a positive deviations from their NREAP trajectories to the achievement of the indicative sectoral trajectory at the EU level. The highest positive deviation can be observed in Cyprus with 45 ktoe actual deployment versus 2 ktoe planned target. Spain had the second highest positive deviation with a planned target of 41 ktoe in its NREAP versus an actual consumption of 742 ktoe in 2018. France overtook Italy and became the biggest consumer of heat from heat pumps with 2,601 ktoe, while Italy reported 2,596 ktoe. They were followed by Sweden and Germany with 1,451 ktoe and 1,152 ktoe respectively. In addition, heat pumps are being deployed in MS, which previously saw little to no development in this field. Latvia reported small amounts of actual deployment of 0.7 ktoe in 2017 and 2018. Lithuania reported 18 ktoe consumption for 2018. Some MS were still below their indicative trajectories, for example Finland where a clear trend towards large geothermal heat pumps can be observed while the domestic systems are still growing the fastest.[96] Romania and Slovenia continued to report no deployment of heat pumps, although small amounts were planned in their NREAPs. Except for these two MS, the largest negative deviations can be observed in Hungary, Croatia and Belgium.

[95] Energypost 2019, Biogas and Biomethane in Europe: Denmark, Germany, Italy lead, https://energypost.eu/biogas-and-biomethane-in-europe-denmark-germany-italy-lead/

[96] http://europeangeothermalcongress.eu/wp-content/uploads/2019/07/CUR-10-Finland.pdf

In Hungary, aerothermal heat pumps have higher market share than ground source heat pumps and a rising sales of aerothermal heat pumps can be observed between 2017 and 2018.[97] This is also reflected in the Eurostat statistics[98] on installed thermal capacity of heat pumps. It reveals an increase of aerothermal heat pumps from 71 MW in 2017 to 108 MW in 2018 as well as an increase of 1 MW for ground source heat pumps and constant capacity in hydrothermal heat pumps. However, it also reveals a decrease in time usage of aerothermal heat pumps (254 hours less in 2018) and hydrothermal heat pumps (269 hours less in 2018) in comparsion to 2017. Although 53 hours more of groud source heat pumps were used in 2018 than 2017, the deployment of heat pumps in general in Hungary has been slowed down. In Belgium, the installations of heat pump has sped up in 2018 due to several reasons, including mandatory efficiency standards of buildings (making the use of heat pumps more efficient) and mandatory RES shares in heating. However, the ratio of gas to electricity was – as in many other countries - unfavourable for the use of heat pumps.[99] Overall, the deployment of heat pumps in Hungary and Belgium has increased, but more moderately than planned. For Romania, great difficulties are reported with respect to legislative and regulatory acts for shallow geothermal sources.[100]

The installation of heat pumps has specific requirements regarding the heating system (e.g. radiators) as well as the insulation of the building. Badly isolated buildings with conventional heating systems often reguire high temperature heat, that makes running heat pumps at a rather inefficient level. Installations of heat pumps in such building stocks might entail significant replacement costs. Moreover, the regional climate influences the application of the heat pump technology. In regions with moderate winters, air-heating pumps are more economic while in colder regions geothermal heat pumps become more competitive but also entail higher investment expenditures. These factors combined with a missing policy support and an unfavourable gas-electricity price ratio, could contribute to a slower adoption rate of heat pumps in some countries.

In total, the EU heat pump market has achieved double-digit growth for the fourth year in a row and reached 12% in 2018.[101] The significance of heat pumps has grown in line with the energy transition. With their thermal and demand-side flexibility potential, heat pumps are a crucial cross-sectional technology, which is required for the transition of the energy system and the achievement of the 2050 climate targets.[102] At present, heat pumps provide heat for slightly less than 10% of all buildings, but there is still a huge potential that remains to be exploited.[103] Several EU policies affect the deployment of heat pumps and thus contribute to enhance the installed capacity of heat pumps. Beyond that, national support schemes of institutional or financial nature can accelerate the deployment of heat pumps, which has been proven by successful schemes in Sweden, Germany and France.[104] Sweden is supporting all building renovation efforts. In Germany the level of support varies between new and renovated buildings and includes several activities from energy-efficient measures in builings to the installation of heat pumps. In France support schemes include a direct income tax reduction or direct payment based on the investment cost of the heat pump.[105]

[97] EurObserv'ER, 19th annual overview barometer, https://www.eurobserv-er.org/19th-annual-overview-barometer/
[98] https://ec.europa.eu/eurostat/databrowser/view/NRG_INF_HPTC__custom_10724/default/table?lang=en
[99] http://europeangeothermalcongress.eu/wp-content/uploads/2019/07/CUR-03-Belgium.pdf
[100] http://europeangeothermalcongress.eu/wp-content/uploads/2019/07/CUR-23-Romania.pdf
[101] EHPA 2019, Market data, https://www.ehpa.org/market-data/
[102] EHPA 2019, Market data, https://www.ehpa.org/market-data/
[103] EHPA 2019, Market data, https://www.ehpa.org/market-data/
[104] European Copper Institute 2018, Heat Pumps, https://www.ehpa.org/fileadmin/user_upload/White_Paper_Heat_pumps.pdf
[105] European Copper Institute 2018, Heat Pumps, https://www.ehpa.org/fileadmin/user_upload/White_Paper_Heat_pumps.pdf

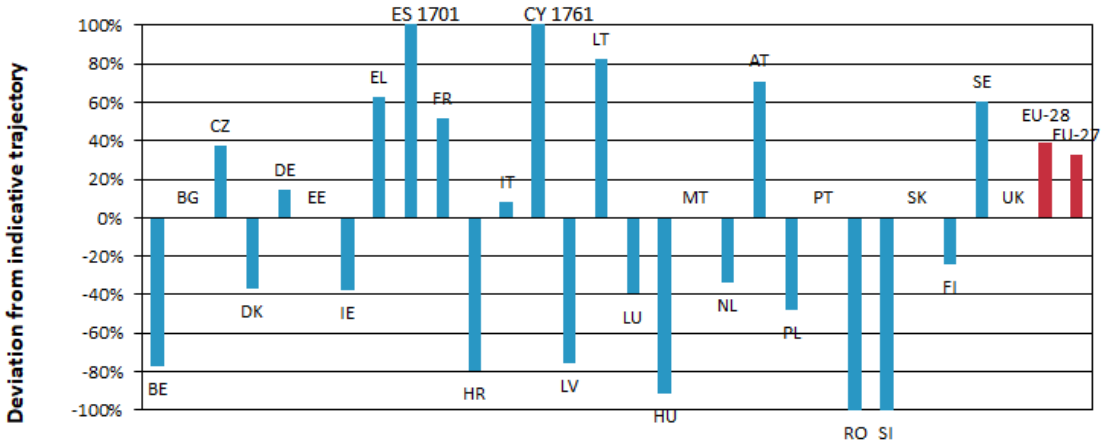

Figure 50. Deviation of actual 2018 deployment (Eurostat SHARES) from 2018 indicative trajectory (NREAP) for heat pumps[106]

Geothermal Heating

Geothermal heat has been growing steadily since 2010, but still plays a marginal role in RES-H&C sector. Ten MS had not planned any consumption of geothermal heating in 2018. Nevertheless, of these MS, Denmark, the UK and Cyprus reported some small amounts of actual consumption (less than 2 ktoe). Fifteen MS underachieved their planned deployment, putting the EU-28 and the EU-27 in total below the aggregated indicative trajectory. In absolute numbers, the largest consumers are France (187 ktoe), Italy (149 ktoe), Hungary (124 ktoe) and Germany (107 ktoe) in 2018, while all other MS reported a consumption of less than 100 ktoe. Bulgaria and Spain remained MS with positive deviations, although no consumption increase was observed in both these MS. The Czech Republic reported no deployment, although 15 ktoe were planned in its NREAP. Lithuania also planned small amounts of consumption of geothermal heating in its NREAP, however, heating from geothermal technology has been decreasing since 2012 from 2 ktoe to zero in 2018. There is only one geothermal plant installed in Klaipėda City in the west of Lithuania, but due to problems with injection of the used geothermal water the plant is currently not operating.[107] Besides the Czech Republic and Lithuania, the largest negative deviation can be observed in Slovakia, whose deployment remained to be 5 ktoe from 2016 to 2018, although a consumption of 50 ktoe to 70 ktoe was planned in its NREAP.

The use of geothermal energy can scale up very rapidly with the right policies and market conditions such as a stable policy framework, appropriate insurance schemes, a comprehensive research and innovation policy, a carbon price and ending support for fossil fuels.[108] The Netherlands is an example of how the geothermal sector can grow strongly given the right policies. Despite the fact that the Netherlands had not achieved its NREAP trajectory in 2018, it is still the driving European market for deep geothermal heating and cooling with six new plants commissioned in 2019.[109] In Belgium, the contribution of geothermal energy is still low, but there are promising initiatives such as new decree on geothermal projects and implementation of an insurance system covering geological risks, as well as two ongoing geothermal projects.[110] In the Czech Republic, no geothermal power

[106] MT changed its NREAP in 2017 stating heat pump targets for the year 2020. However, as its updated NREAP does not contain a trajectory for heat pumps, data from its previous NREAP is used.
[107] European Geothermal Congress 2019, Geothermal Energy Use, Country Update for Lithuania, http://europeangeothermalcongress.eu/wp-content/uploads/2019/07/CUR-17-Lithuania.pdf
[108] EGEC Geothermal market report 2019, https://www.egec.org/media-publications/egec-geothermal-market-report-2019/
[109] EGEC Geothermal market report 2019, https://www.egec.org/media-publications/egec-geothermal-market-report-2019/
[110] http://europeangeothermalcongress.eu/wp-content/uploads/2019/07/CUR-03-Belgium.pdf

is produced and two projects - in the pipeline - have been stagnating for a long time as government support is missing and feed-in tariffs for electricity from geothermal sources are low.[111]

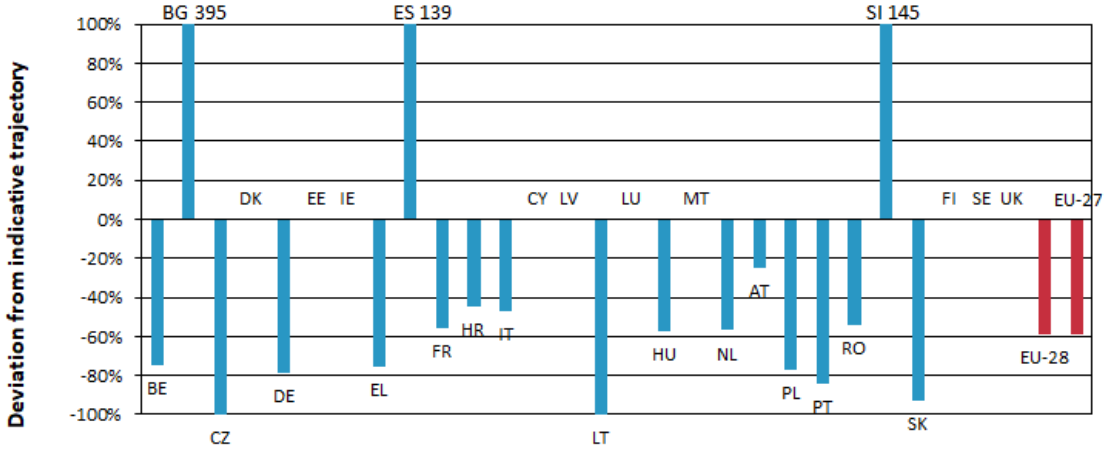

Figure 51. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for geothermal heating installations

Bioliquids

Bioliquids had the lowest share of RES-H&C consumption, but the category's growth rate was the highest in the EU-28 as well as in the EU-27. Only eight MS planned heating and cooling from bioliquids in 2018. Sweden was the largest consumer in 2018 with 340 ktoe, followed by Germany with 197 ktoe, the Netherlands with 99 ktoe, Italy with 52 ktoe, Spain with 41 ktoe, Austria with 28 ktoe and Portugal as well as Finland with 11 ktoe each. Belgium, Denmark, Greece, France, Latvia, Poland and Slovenia have reported small amounts of consumption (lower than 10 ktoe). Seven MS display a negative deviation from their indicative trajectory, of which only Romania reported no deployment at all. In total, the EU-28 and the EU-27 were below the envisioned indicative sectoral trajectory for bioliquids.

[111] http://europeangeothermalcongress.eu/wp-content/uploads/2019/07/CUR-08-Czech-Republic.pdf

Figure 52. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative trajectory (NREAP) for bioliquids[112]

A.3 RES-T sector overview

While both sectors, RES-E and RES-H&C, featured shares above the (aggregated) NREAP trajectories on EU level, the RES share in the transport sector was slightly below the trajectory in the year 2018 (8.0% actual, whereas a share of 8.5% was planned). Overall, the consumption of RES-T on EU-28 level has reached 18,766 ktoe in 2018.[113] Biodiesel continued to be the dominating renewable energy source in the transport sector in 2018. It had the highest growth rate between 2017 and 2018 (25.6% on EU-28 level), followed by bioethanol and renewable electricity. Although the usage and development of renewable electricity in the transport sector is still limited, its deployment is growing (e-mobility).

The development of biofuels and renewable electricity consumption in transport since 1995 is shown in Figure 53. Use of renewable electricity for transport and biofuels have been growing since 2010, while the consumption of biodiesel and bioethanol had stagnated between 2014 and 2016 and has been increasing since then. Due to the high contribution of biodiesel and bioethanol to the RES-T sector, the development of these biofuels has led to a growth in biofuel consumption in total since 2016. The most widely used fuel in 2018 was biodiesel, with 13,664 ktoe. "Other biofuels", a category, which includes primary solid biofuels, biogas and other liquid biofuels, has been on a growth track again since 2010 and stood at 154 ktoe in 2018. The use of renewable electricity grew slowly but steadily since 2006, standing at 1,961 ktoe in 2018.

[112] For SE, it was stated in the Progress Report that "there are some sustainable bioliquids, in the form of bio-oils that are used in Sweden in the year 2018. There are no statistics available, however, with regard to where they are used and whether they are used in industry or for electricity and heat production." However, 340 ktoe was recorded according to Eurostat Energy Balances. Furthermore, the historical values for SE differ a lot between the ones provided in the Progress Reports (0 ktoe from 2011-2016) and by Eurostat.

[113] Due to an update of the MS Progress Report template since 2017 as well as adaptations regarding the Eurostat Energy Balances terminology, discontinuities were observed in some MS and between data sources (Eurostat Energy Balances and Progress Reports). These observations are noted as footnotes below the affected figures.

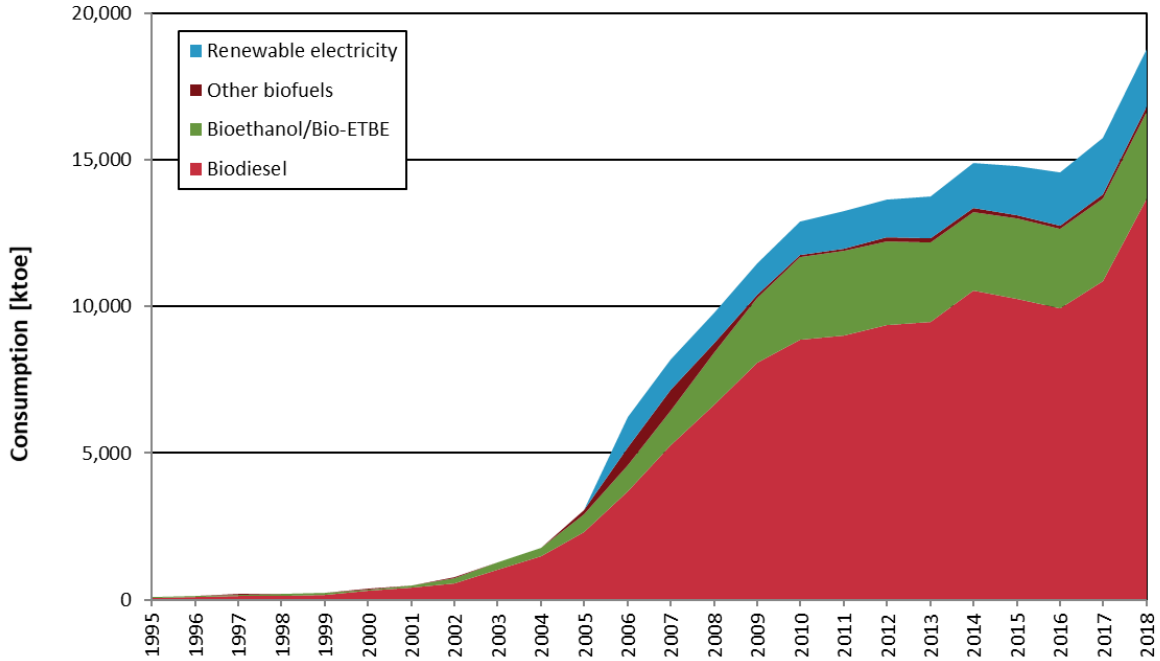

Figure 53. Consumption of energy in transport (RES-T) in the EU-28 for 1995-2018.[114] Source: Results of renewable electricity are based on Eurostat SHARES, other results are based on Eurostat Energy Balances

The following graphs and tables display the developments in the RES-T sector for individual MS.

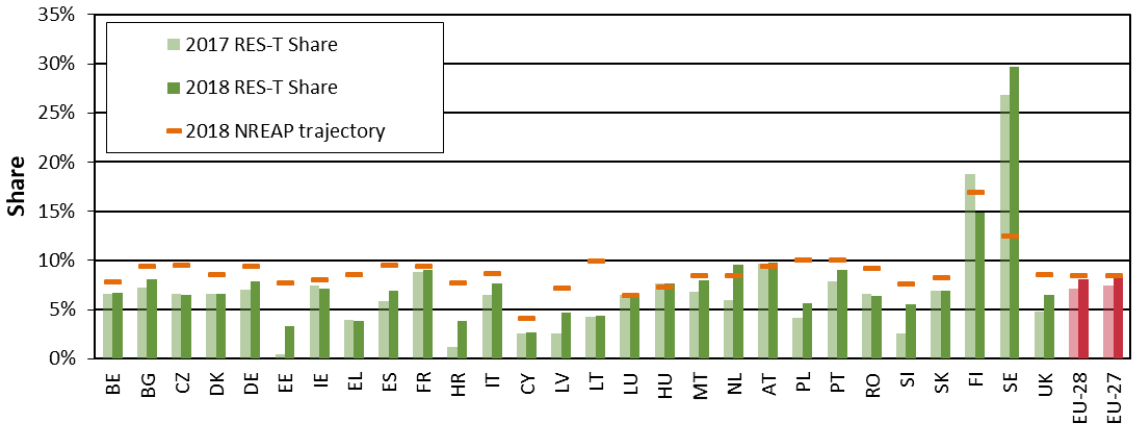

Figure 54. RES-T actual share vs. NREAP indicative sectoral trajectory 2018 (%). Source: Eurostat SHARES & NREAPs

In comparison to previous years, the RES-T sector has grown faster especially in 2018. The RES-T growth rate between 2017 and 2018 was even higher than the growth rates in the RES-E and the RES-H&C sectors. Nevertheless, a total of 23 MS are below their NREAP trajectories for RES-T for 2018. Thereby, Estonia, Greece, Croatia and Lithuania achieved less than half the share they were planning for in their NREAP indicative sectoral trajectories. This leads to a lower RES-T share than the NREAP indicative trajectory at EU-28 level. The highest share, as well as the highest positive deviation can be observed for Sweden, where the RES-T share stands at around 30%, which surpasses by far the 14%

[114] The category other biofuels includes primary solid biofuels, biogas and other liquid biofuels.

foreseen for 2020 in their NREAP sectoral trajectory. The Netherlands' share of RES-T (9.6%) is almost at the level of the binding national RES-T 2020 target (10%). The Netherlands, thus, slightly overachieved its 2018 indicative sectoral trajectory. Besides Sweden and the Netherlands, Luxemburg, Hungary and Austria have surpassed their 2018 indicative sectoral trajectories. Among all MS lagging behind their 2018 NREAP RES targets, Estonia, Croatia and Slovenia display the highest increase in their share of RES-T, while Finland shows the largest decline from 2017 to 2018 of RES in the transport sector.

In 2017, Finland had a RES-T share of 19%, which was higher than the trajectories both in 2017 and in 2018. However the share dropped to 15% and therefore Finland was below its trajectory in 2018. The fluctuation mainly results from the decreased consumption in biodiesel and the increased total fuel consumption in the whole transport sector in 2018 in comparison to 2017. In general, the RES-T share in Finland is expected to grow, since the support scheme to improve the electric transport infrastructure and the use of biogas in the transport sector has been updated for 2018-2021.[115] Moreover, Finland plans (as specified in its NECP) to increase the share of renewable energy to 30% of the final energy use in road transport and increase the number of electric and gas vehicles to 250,000 and 50,000 respectively by 2030.[116]

The Netherlands shows a high increase in the RES-T share from 6% in 2017 to 9.6% in 2018. This was due to the high growth rates of all biofuels as well as renewable electricity in transport, especially of biodiesel consumption in the transport sector. This is the result of an increased annual obligation in 2018 on fuel delivered to road- and rail transport as well as non-road mobile machinery.[117]

Regarding reasons for the slow uptake in e-mobility, there are on the one side economic, market, geopolitical challenges in battery supply for e-mobility as well as slow structural changes on the manufacturers' side and uncertainty about the most promising future energy source/mobility technology. Nevertheless, being far more efficient (in terms of tank-to-wheels efficiency) than combustion engine vehicles[118], electric vehicles are increasingly subsidised by national support schemes and thus experienced rising growth rates in 20 MS.

[115] Intelligent Transport 2020, Finland updates infrastructure support for EV network and biogas transport, https://www.intelligenttransport.com/transport-news/103051/finland-updates-infrastructure-support-for-ev-network-and-biogas-transport/

[116] Finnland Ministry of Economic Aairs and Employment, NECP, https://ec.europa.eu/energy/sites/ener/files/documents/fi_final_necp_main_en.pdf

[117] Dutch Emissions Authority, https://www.emissionsauthority.nl/topics/reports---energy-for-transport/summary-yearly-report-energy-for-transport-2018

[118] EU Commission, Electric vehicles, https://ec.europa.eu/transport/themes/urban/vehicles/road/electric_en

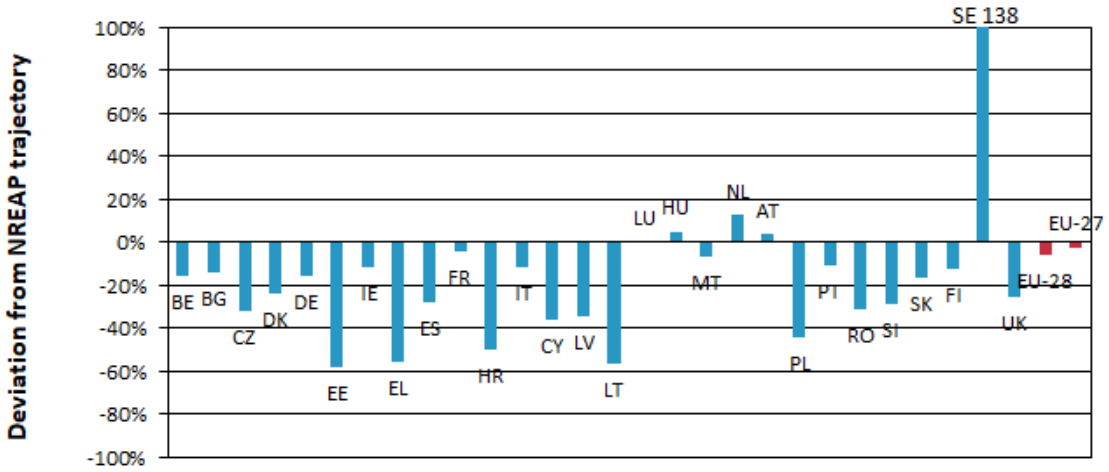

Figure 55. Deviation of actual 2018 share from 2018 NREAP indicative sectoral trajectory for RES-T. Source: Eurostat SHARES and NREAPs

Table 18. Growth rates in RES-T consumption in the EU-28 from 2017-2018 per technology. Source: Eurostat Energy Balances and Eurostat SHARES

Member State	RES-T [%]	Bioethanol/ Bio-ETBE [%]	Biodiesel [%]	Renewable electricity [%]	Other biofuels [%]	Hydrogen [%]
Belgium	0.37	17.20	-4.32	4.34	-	-
Bulgaria	-2.13	7.30	-3.27	-11.94	-	-
Czech Republic	-0.72	3.26	-2.78	6.12	-	-
Denmark	-0.37	-1.53	-0.50	3.70	-	-
Germany	3.94	1.99	4.84	5.64	-14.66	-
Estonia	432.62	406.65	826.65	-3.96	-	-
Ireland	2.17	15.52	-0.47	19.34	-	-
Greece	-3.84	-	-4.24	10.45	-	-
Spain	547.81	11.41	10409.96	0.55	-	-
France	1.46	9.06	0.33	-2.02	-	-
Croatia	250.33	137.90	7973.25	8.38	-	-
Italy	14.25	-1.36	18.31	3.06	0.00	-
Cyprus	4.44	-	4.44	-	-	-
Latvia	203.43	6.93	2053.65	-2.85	-	-
Lithuania	8.56	-3.13	10.03	10.35	-	-
Luxembourg	8.23	48.86	5.81	4.52	-51.21	-
Hungary	15.22	8.22	21.21	2.40	-	-
Malta	33.29	-	33.29	-	-	-
Netherlands	55.82	31.63	86.27	9.16	-	-
Austria	-0.38	2.81	-1.88	1.83	37.40	-
Poland	45.60	-1.88	72.50	7.17	-	-
Portugal	7.68	90.00	7.04	3.69	-	-
Romania	-0.56	-0.70	0.23	-4.03	-67.23	-
Slovenia	156.70	94.26	216.93	-1.86	-	-
Slovakia	0.55	-10.26	1.89	3.09	-	-
Finland	-5.36	4.54	-9.24	10.33	192.85	-
Sweden	7.27	25.34	6.44	2.55	6.62	-
UK	34.17	1.04	63.36	5.94	-	-
EU-28	**19.27**	**6.70**	**25.61**	**2.94**	**1.41**	**-**
EU-27	**18.20**	**7.60**	**23.60**	**2.74**	**1.41**	**-**

Table 19 RES-T consumption in the EU-28 in 2018 per technology. Source: Eurostat Energy Balances and Eurostat SHARES

Member State	RES-T [ktoe]	Bioethanol/ Bio-ETBE [ktoe]	Biodiesel [ktoe]	Renewable electricity [ktoe]	Other biofuels [ktoe]	Hydrogen [ktoe]
Belgium	521	113	365	42	0	0
Bulgaria	172	29	135	8	0	0
Czech Republic	353	61	247	45	0	0
Denmark	233	43	171	19	0	0
Germany	3037	748	1919	335	34	0
Estonia	18	5	12	1	0	0
Ireland	156	27	127	2	0	0
Greece	164	0	159	5	0	0
Spain	1809	154	1528	127	0	0
France	3657	586	2808	264	0	0
Croatia	38	0	27	11	0	0
Italy	1587	33	1217	337	0	0
Cyprus	9	0	9	0	0	0
Latvia	42	8	29	5	0	0
Lithuania	80	8	70	2	0	0
Luxembourg	126	10	113	3	0	0
Hungary	224	50	143	31	0	0
Malta	10	0	10	0	0	0
Netherlands	556	170	332	54	0	0
Austria	676	58	414	204	0	0
Poland	1001	173	740	88	0	0
Portugal	285	6	257	23	0	0
Romania	336	90	207	39	0	0
Slovenia	79	7	66	6	0	0
Slovakia	165	18	132	15	0	0
Finland	391	84	282	24	1	0
Sweden	1626	119	1245	144	118	0
UK	1414	387	900	127	-	0
EU-28	**18766**	**2987**	**13664**	**1961**	**154**	**0**
EU-27	**17352**	**2600**	**12765**	**1834**	**154**	**0**

In the following sections, bioethanol/bio-ETBE, biodiesel, renewable electricity in transport and other biofuels are described more in detail.

Bioethanol/Bio-ETBE

The EU-28 consumed a total of 2,987 ktoe bioethanol and bio-ETBE in 2018. The consumption fluctuated from 2010 to 2015 between 2,700 ktoe and 2,870 ktoe, dropped to 2,679 ktoe in 2016 and has been increasing since then. In absolute numbers, the biggest consumers in 2018 were Germany with 748 ktoe, France with 586 ktoe and the UK with 387 ktoe. Greece, Cyprus, and Malta reported no consumption. Besides the MS reporting no consumption, Croatia shows the largest negative deviation. The EU as a whole is below the aggregated NREAP trajectory, while two MS were on track with their NREAP indicative trajectories: Bulgaria continued to be on track with the actual consumption of 29 ktoe versus the planned amount of 25 ktoe; Belgium, the MS with the highest positive deviation, was also on track with its 2018 NREAP RES target with 113 ktoe actual deployment versus 76 ktoe planned consumption, which results mainly from consuming more than double the amount in

2017 in comparison to in 2016. The steep increase of biodiesel consumption in 2017 occurred after the blending mandate was adjusted from 4 to 8.5% on January 1st of 2017.[119]

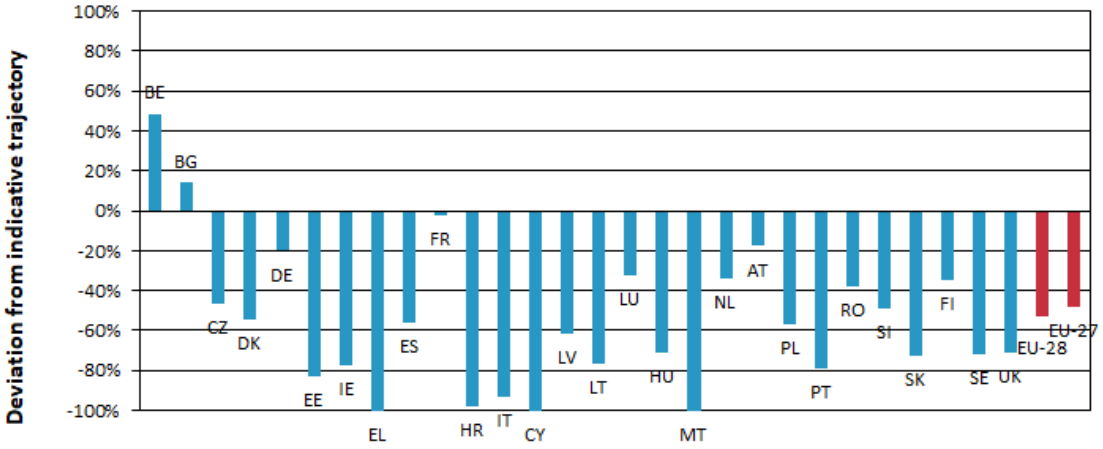

Figure 56. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative sectoral trajectory (NREAP) for bioethanol/bio-ETBE

Biodiesel

At EU-28 level, a total of 13,664 ktoe of biodiesel was consumed in 2018, thus biodiesel continued to be the largest contributor to the RES-T sector. However, much higher consumption was expected and therefore the EU as a whole lags behind the (aggregated) NREAP trajectory. Only seven MS were above their planned trajectory in 2018. A very large positive deviation is observed in Sweden, where 1,245 ktoe were reported as actual consumption versus 219 ktoe planned. Sweden was also the third largest consumer in absolute numbers, after France with 2,808 ktoe and Germany with 1,919 ktoe. Despite the high absolute number in Germany, it lagged behind its NREAP trajectory. The largest negative deviations can be observed in Croatia and in Estonia. Cyprus has the lowest contribution among all MS and thus lagged behind its plan, with 9 ktoe actual deployment versus 23 ktoe planned. Latvia, in which the consumption of biodiesel was low in the years 2016 and 2017 (below 3 ktoe), has substantially increased its consumption in 2018 (29 ktoe). Therefore, Latvia was on track in 2018. The steep increase of biodiesel consumption results from the updated biofuel blend mandatory, which was valid from 1 April 2018 to 31 December 2019, increasing the biodiesel blend content from at least 4.5% to 4.5-7%.[120]

[119] https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Biofuels%20Annual_The%20Hague_EU-28_7-15-2019.pdf

[120] Latvia Ministry of the Economy, 5th Progress report, https://ec.europa.eu/energy/sites/ener/files/documents/lv_-_tr_into_eng_-_5th_progress_report_red_for_2017_and_2018.pdf

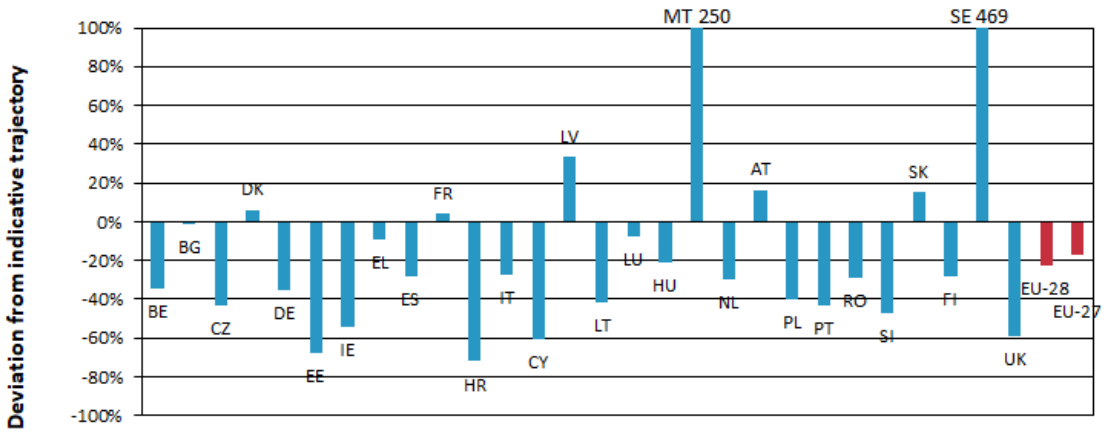

Figure 57. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative sectoral trajectory (NREAP) for biodiesel[121]

Renewable Electricity in Transport

Renewable electricity made the third-biggest contribution to the RES-T sector, following biodiesel and bioethanol/bio-ETBE, with 1,961 ktoe consumed in the EU-28 in 2018. This includes renewable electricity consumption in road, rail and all other transport modes. In absolute terms, the largest consumers were Italy (337 ktoe), Germany (335 ktoe), France (264 ktoe), Austria (204 ktoe) and Sweden (144 ktoe). Despite the high absolute values of the largest contributors, only Italy was on track with respect to its NREAP trajectory. The highest positive deviations can be observed in Poland and Belgium. Cyprus and Malta have reported no consumption although small amounts were planned. In general, consumption from renewable electricity increased slower than expected. As a result, only eight MS were on track with their plans, whereas on an aggregated EU-level consumption remains below the aggregated planned consumption. Nevertheless, as an increasing number of support programs are being prepared and available for electric mobility, growth rates are expected to rise steadily.

[121] Remarkable data deviation between data source Eurostat Energy Balances and data source Progress Reports can be observed in the following MS and all have higher values in Eurostat Energy Balances: Belgium, Germany, France, Italy, Hungary, Malta, the Netherlands, Austria, and Sweden. Except for Belgium and France, the other MS reported substantially lower biodiesel consumption in the 5th Progress Reports in comparison to the 4th Progress Reports, whereas the reported consumption with other biofuels was higher. Therefore, it is assumed that these MS have categorized these two energy sources differently in the 5th Progress Reports.
MT changed its NREAP in 2017 stating new targets for biofuels in transport for the year 2020. However, as the updated NREAP does not contain a sectoral trajectory and a specification, data from its previous NREAP is used.

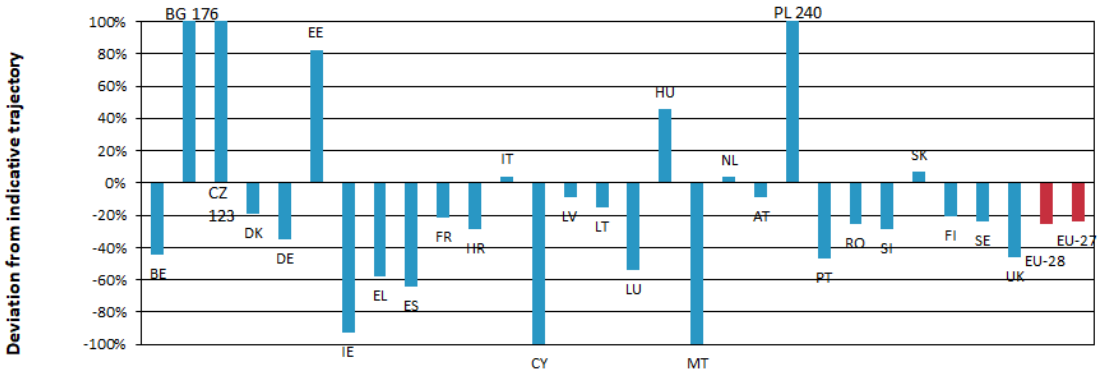

Figure 58. Deviation of actual 2018 deployment (Eurostat SHARES) from 2018 indicative sectoral trajectoriy (NREAP) for electricity in transport[122]

Other biofuels

The depolyment for this category includes biogas and other liquid biofuels (e.g. vegetable oils). Other biofuels consumption in the EU-28 has been increasing since 2010 and reached 154 ktoe in 2018. Fifteen MS had planned consumption in this category for 2018, of which only Sweden shows a positive deviation. This leads to a negative deviation at aggregated EU level. Consumption ranging between 0.02 ktoe and 118 ktoe was recorded in only seven MS, of which Luxemburg and Finland had not planned any consumption. Italy, Austria and Romania have all reported a consumption of less than 1 ktoe, which was much less than their NREAP trajectories (41 ktoe, 81 ktoe and 5 ktoe respectively). The most ambitious NREAP trajectories were set by France (110 ktoe) and Germany (106 ktoe), while no actual depolyment was reported by France and Germany's consumption only reached 34 ktoe.

[122] Latvia has reported 8.9 ktoe being consumed in 2018 in the Progress Report while 4.56 ktoe was recorded in Eurostat SHARES. Malta has reported 0.04 ktoe in the Progress Report while no consumption was recorded in 2018 according to Eurostat SHARES.

MT changed its NREAP in 2017 stating new targets for renewable electricity in transport for the year 2020. However, as the updated NREAP does not contain a sectoral trajectory, data from its previous NREAP is used.

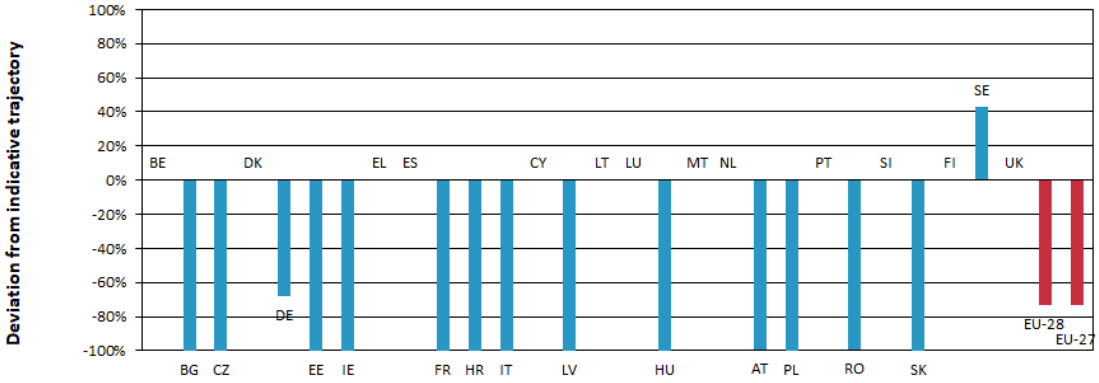

Figure 59. Deviation of actual 2018 deployment (Eurostat Energy Balances) from 2018 indicative sectoral trajectory (NREAP) for other biofuels[123]

Hydrogen

No Eurostat data is available for hydrogen from RES consumed in the transport sector. Also, all NREAPs indicative sectoral trajectories estimate zero deployment and all Progress Reports report zero consumption or provide no data. Therefore, an assessment of this technology is not performed.

[123] After the update of the Progress Report template in 2017 with a more detailed list of fuels, the reported values for some categories (such as "Other Biofuels" and "Biodiesel") in the 5th Progress Report are incontinous in comparison to the values from the previous Progress Reports. A noticeable inconsistency is observed in the following MS: Denmark, Germany, Estonia, Italy, Hungary, Malta, the Netherlands, Austria and Sweden. Except for Denmark and Estonia, the other MS reported substantially lower biodiesel consumption in the 5th Progress Reports in comparison to the 4th Progress Reports, whereas the reported consumption for other biofuels was higher. Therefore, it is assumed that these MS have categorized these two energy sources differently in the 5th Progress Reports. For Estonia, a new support program for other biofuels has been executed in 2018 and 3.3 ktoe consumption was reported in the Progress Report, whereas no consumption was recorded in the Eurostat Energy Balances.

APPENDIX B. IMPLEMENTED AND PLANNED POLICY MEASURES

In this Appendix, we present a detailed analysis of the MS policies and measures to identify:

1. The **progress of the MS in implementing the policies and measures** they committed to in their NREAP and in their Progress Report.

2. The progress of the MS in implementing policies and measures providing a sufficient **long-term security**.

For Question 1 we analysed:

- Whether or not the MS report in their 2019 Progress Report on the adoption of the planned measures they indicated in their NREAP and 1st, 2nd, 3rd and 4th Progress Reports.

- Whether they have maintained their existing policies.

- Whether they have reviewed the measures they planned to review.

For each of the sectors, an evaluation is made regarding whether a MS fulfilled their earlier commitments (yes/no/partially). This qualitative evaluation is based on the implementation of measures, not on the progress made in terms of renewables deployment and thus likeliness of target/trajectory achievement. The evaluation therefore deviates significantly from the assessment of target/trajectory progress. Reasons for not or only partially fulfilling earlier commitments can be manifold, e.g. the non-implementation, non-enforcement, change or cancellation of related policies or allocated budget. Some MS are already overshooting their binding overall 2020 RES targets as defined in the RES Directive and have reduced their policy commitments (e.g. Bulgaria, Czech Republic and Croatia).

For Question 2 we analysed:

- Whether MS provide information on whether and how support will be maintained in the coming years, e.g. by providing a schedule for the allocation of support over the coming years. Such schedules increase the planning certainty for investors.

- Whether or not MS have made retroactive changes to their support schemes.

The evaluation of the long-term security of the support instruments (high/low/moderate) reflects the continuity and reliability of support policies and budgets. In order to provide ‘moderate’ or ‘high’ long-term security of support, a clear schedule for the allocation of support at least until end of 2020 had to be provided. In addition, it is taken into consideration whether MS’ RES support framework has seen many regulatory changes in the past, which can impact regulatory and market stability. In cases where retroactive changes occurred, investor confidence and long-term security of support schemes is significantly undermined.

A.4 Assessment of RES Policies and Measures

Belgium

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

Belgium has fulfilled its commitments expressed in the NREAP and earlier Progress Reports in terms of policy support for RES-E. Tradable green certificates (GC) remain the key support mechanism, with slight differences in application and price levels between the regions.

Belgium distinguishes two levels of policy administration (federal and regional), with a strong autonomy to shape renewable energy policies at the level of the three regions: the Flemish region, the Walloon region and the Brussels-Capital Region. In general, renewable energy is a regional matter; only offshore wind and hydropower are governed by national regulations and are subject to the federal support schemes.[124] Other RES-E technologies are only eligible under the regional GC schemes or other support schemes.

Each of the regions operates their own GC scheme that obliges electricity suppliers to prove that a certain proportion (quota) of the electricity they supply was generated from RES. In Brussels, the number of certificates is proportional to electricity generated (in kWh) in proportion to the avoided total GHG emissions, i.e. one certificate is issued for every 217 kg of CO_2 saved. In Wallonia, the number of GC corresponds to the amount of electricity production multiplied by several factors, i.e. the kECO factor taking into consideration the investment amount of the RES plant and the kCO_2 factor taking into account the CO_2 emissions produced by the RES plant. Wind energy and solar energy plants are subject to an additional correction coefficient depending on the electricity price. In Flanders, the amount of electricity to be produced per certificate differs across technologies and is based on technology-specific banding factors that account for the specific technology costs and efficiencies for amortisation.

Besides the GC scheme, Flanders introduced a new auction-based support scheme for small and medium-sized wind projects (10-300 kW) in 2018. Its aim is the allocation of support to the most cost-efficient projects. The first tender round had a budget of 1.5 million Euros and 14 projects were awarded.[125] Moreover, all three regions have investment subsidies in place to promote renewable energy plants.

At the federal level, Belgium introduced a competitive tender procedure in May 2019 for the allocation of domain concessions for the construction and operation of electricity production installations in the sea areas under the jurisdiction of Belgium. This is to support the achievement of the proposed 4 GW of offshore wind energy in the Interfederal Energy Pact and to reduce support costs related to the electricity production from offshore wind.

- **Long-term security of support for RES-E: Moderate**

Overall, the long-term security of RES-E support is moderate. It has been subject to changes over the years.

[124] https://www.creg.be/sites/default/files/assets/Publications/Notes/Z1880NL.pdf
[125] https://www.bouwenwonen.net/artikel/14-nieuwe-windmolens-na-eerste-call-kleine-en-middelgrote-windturbines/44282

In Flanders, a revision of the certification scheme in 2013 reduced the support period to ten years and introduced technology-specific 'banding' (i.e. the amount of electricity to be produced for one certificate varies across technologies) to correct for differences in production costs. This aimed at reducing overcompensation by decreasing the level of support both in terms of duration and amount. At the same time, it reduced the surplus of GC on the market, which affected the value of the certificates and the stability of the investment climate for renewable energy[126]. As of 14 June 2015, the certification scheme in Flanders is also no longer eligible for installations with a capacity below 10kW. As of 2018, the quota in Flanders stood at 21.5%.[127]

In Wallonia, electricity suppliers were required to achieve a green certificate-level of 34% in 2016, which will gradually increase to 44.51% in 2030[128]. The Brussels Capital Region has summarised the continuation of their efforts in the Integrated Plan for Air, Climate and Energy (PACE), agreed in 2016. A key target in this plan is that Brussels will double its production of energy from RES and thereby achieve 849 GWh of renewable energy by 2020. The green certificate quota was 8.2% in 2016 and is set to gradually increase to 14% in 2025[129].

In October 2019, the Brussels government adopted its final version of the National Energy and Climate Plan, which outlines the renewable strategy up to 2030. The strategy continues to be based on the deployment of solar energy (photovoltaic and thermal) and heat pumps.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes (but below 2018 RES-H&C NREAP sectoral trajectory)**

The main elements of federal RES-H&C policy support have remained stable (i.e. tax deduction for investments). Eligible companies may reduce their taxable profit by a fixed percentage of their investment in renewable energy projects such as biogas, biomass and solar thermal generation. At the regional level, investment assistance for companies and natural persons are in place:

In the Brussels and Walloon region, investment support is available for solar water heaters and heat pumps installed in residential, industrial and service sector buildings. Moreover, investment aid to companies investing in heat pumps for the production of heat as well as biogas and biomass CHP and trigeneration plants for the production of heating, cooling and electricity are available.

In October 2016, the Brussels government adopted its renewable energy strategy, including a strong increase in the deployment of heat pumps. The 2017-2018 period mainly consisted of operationalising this strategy and mobilising the necessary funds. In October 2017, the GC scheme was amended to cover power produced from cogeneration units. The new renewable strategy up to 2030 still places a focus on the deployment of heat pumps.

The Flemish government adopted the concept paper Heat Plan 2020, successor to the Green Heat Action Plan, in June 2017. The Heat Plan 2020 contains various measures to fast-track the application of green heat in Flanders, including measures on heating networks, deep geothermal, biomass, heat pumps and solar boilers. This has already resulted in

[126] http://www.res-legal.eu/search-by-country/belgium/single/s/res-e/t/promotion/aid/flanders-quota-system-groenestroomcertificaten/lastp/107/; https://www.stibbe.com/en/news/2013/january/the-new-flemish-support-scheme-for-green-power-and-cogeneration-further-elaborated

[127] http://www.vreg.be/sites/default/files/document/mede-2017-04.pdf

[128] https://energie.wallonie.be/fr/le-quota-de-certificats-verts.html?IDC=9822&IDD=135925

[129] https://www.brugel.brussels/nl_BE/actualites/quotuminlevering-gsc-57

increased grants for solar boilers and heat pumps for households and SMEs. For example, investment support is provided for green heat produced by large-scale biomass installations (above 300 kW), geothermal projects and heat recovery of new incineration plants. Projects with a combination of high CO_2 savings and a low requested support percentage are first supported until the available budget is exhausted. Since 2018, the support scheme was opened up to all green heat technologies. Between 2013 and 2019, six calls were organised. In the beginning of 2019, the Flemish Government adopted additional legislation enabling a system of guarantees for origin for gas and heat/cold from RES to be set up. Additionally, as of 2019 investments in new heat pump boilers are eligible to receive a premium from the network operator. The premium amounted to around EUR 400 per home or residential unit and a maximum of 40% of the investment in 2019.

- **Long-term security of support for RES-H&C: Moderate**

Overall, the long-term security of RES-H&C support is moderately high. The overall budget for renewable heat in all of the Belgian regions decreased slightly in recent years. However, the national climate action plan 2030 foresees to increasingly use renewable heat towards 2030.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

In contrast to RES-E and RES-H&C, support for RES-T is primarily a federal competence. The main support scheme for RES-T is still a biofuel blending obligation. The mandatory blending share of sustainable biofuels amounted to 8.5 percent by energy content until March 2020. From April to December 2020 the mandatory blending share amounts to 9.9 percent, while from January 2021 onwards it is supposed to reach 9.55%.[130]

Moreover, biofuels are supported through tax regulations, namely a reduction of the excise tax for the share of biofuels contained in petrol and diesel products and produced by production units authorised by the Belgian Government.

Additionally, there are some regional support schemes for low-emission vehicles (electric, fuel cell). However, the support scheme in Flanders was discontinued by the end of 2019.

- **Long-term security of support for RES-T: Moderate**

There have been no major changes to the long-term support in RES-T policy since the last reporting period. However, the support scheme for low-emission vehicles in Flanders was discontinued.

[130] http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=2018050407&table_name=loi

Bulgaria

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Bulgaria has partially fulfilled its policy commitments in the RES-E sector. While legislation has changed frequently and unexpectedly in the past, Bulgaria is on track in comparison to its NREAP RES-E sectoral trajectory.

In line with the latest amendment of the Energy Act from 8th May 2018, the previous support scheme based on a feed-in tariff was replaced by a new support scheme relying on the payment of a premium to producers by the Electricity System Security Fund. The amendment affects existing installations over 1 MW that had previously received feed-in tariffs. No premium is envisaged for new plants for the production of electricity from RES, except for PV up to 30 kW and some biomass fired plants up to 5 MW. Since 1 July 2018, all producers of electricity from RES with a total installed capacity of at least 4 MW, and since 1 October 2019 remaining RES producers with a capacity between 1 MW and 4 MW are obliged to sell their energy on the market and not at preferential tariffs to Natsionalna Elektricheska Kompania EAD - NEK (National Electricity Company). As part of the new support scheme, RES producers receive premium contracts to offset the difference between the power exchange price and the long-term contracts they have with NEK and for the remaining term of this contract. Existing plants with a capacity of less than 1 MW and new plants installed on roofs or external walls or buildings with a total capacity of up to 30 kW continue to receive feed-in tariffs paid by NEK.

The generous FiT system entering into force in 2007 promoted exceptional growth in wind and PV capacities up to 2013. The installed wind capacities increased to 700 MW, utility-scale PV capacities to over 1,000 MW. However, after a sudden removal of feed-in tariffs and general backlash against renewables, investments came to a halt. This is except for an increase in biomass capacitiesfrom 23 MW to 158 MW in a year due to switching of existing conventional plants to biomass and some rehabilitated hydro power plants with 5.2 MW capacity. Despite the long-standing support scheme, small-scale RES capacities total 19.52 MW, barely 1.4% of total wind and PV capacities. The FIT level provided for the electricity of households is close to the final electricity price and do not provide proper incentives for small-scale investments. The introduction of an auction scheme is not envisaged by the Bulgarian government, unless it will be necessary for reaching 2030 goals (to be considered from 2025). Investments in PV plants have started without acquiring support - for self-consumption, and under corporate PPA.[131]

- **Long-term security of support for RES-E: Moderate**

Over the past years, multiple retroactive changes to Bulgaria's RES-E support policies have occurred, such as a 20% revenue tax on solar and wind power producers (which was later repealed), imposing full balancing responsibility and a special transmission network access price element on wind and PV producers and a 5% fee on all electricity producers. The 2018 amendment of the Energy Act introducing premium contracts for RES projects with existing long-term contracts with NEK is the most recent development in this respect. As of 1st July 2018, the statutory obligation of NEK to purchase the energy output of RES Producers with a capacity above 4 MW (reduced to 1 MW in 2019) under feed-in tariffs was terminated. RES producers who had previously benefitted from feed-in tariffs were instead offered to execute

[131] https://balkangreenenergynews.com/enery-bg-1-plans-to-build-400-mw-solar-power-plant-in-southern-bulgaria/, https://balkangreenenergynews.com/contract-signed-for-largest-self-consumption-pv-plant-in-bulgaria/

premium contracts with the Electricity System Security Fund for the remaining contract term. Moreover, the methodology for determining the premiums implies a significant risk for the RES producers, given that the reference market price and premiums for electricity are set annually by the regulator for the year ahead and do not necessarily match actual market values.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

RES-H&C in Bulgaria continues to be promoted through grants and loans from the Bulgarian Energy Efficiency Fund as well as through an exemption for building owners from property tax. Bulgaria is on track of its 2020 NREAP RES-H&C sectoral trajectory, with the sector having the greatest contribution to the achievement of the target share of energy from RES in gross final consumption.

The Bulgarian Energy Efficiency Fund offers financing grants for projects aiming at improving the energy efficiency of public, industrial and residential buildings. Eligibility criteria include a payback period of seven years and half of the project's benefits coming from energy savings. The fund contributes 10-25% in equity and recipients pay reduced interest rates of 4-7%/year, depending on a credit risk assessment and the type of project that is funded. Grant amounts are between BGN 30,000 – 3,000,000 (approx. € 15,338 – 1,533,800). A wide range of technologies are eligible, including aerothermal, geothermal, hydrothermal, solar thermal, biogas and biomass energy. A few smaller grant schemes were also in place in 2017, funding around €7 million in heat energy production projects for the built environment.

Moreover, a number of projects promoting the use of renewable energy in the RES-H&C sector were implemented in 2017 and 2018 under dedicated financing programmes. This includes two projects receiving grant assistance for energy generation for heating from wood waste and solar power with a total capacity of 588.77 kW under the Operational Programme Innovation and Competitiveness 2014-2020 and six projects receiving grants for cogeneration of energy for heating and cooling using biodegradable waste and sludges from water treatment plants under Operational Programme Environment 2014-2020.

The tax regulation mechanism provides that buildings with an energy certificate "C" or higher, put into service before 1990, are exempt of property tax for a period of seven years following the issuance of the certificate, or ten years if renewable energy is generated and used in the building. Buildings put into service after 1 January 1990 and before 1 January 2005 and certified with energy consumption class "C" and buildings put into service before 1 January 1990 and certified with energy consumption class "D" are tax exempted for a period of 3 years from the issuance of the certificate or 5 years if renewable energy is used.

The lion's share (88%) of renewable heating and cooling comes from biomass, burned mainly by households in traditional stoves (56%), which cannot be considered a progressive method of RES-H deployment. The above mentioned financing programs were successful in promoting heat pumps, providing 7.1% of RES-H in 2018. Biomass use increased by 121 ktoe between 2016 and 2018 resulting from the increase of CHP plants switching from coal to renewable waste and/or biomass. The Renewable Energy Act of Bulgaria sets out incentives for the construction of heat transmission networks (where the viability of renewable heat has been demonstrated), small decentralised heating and/or cooling systems and the connection of renewable heat plants to the heat transmission network.

- **Long-term security of support for RES-H&C: High**

Both the Bulgarian Energy Efficiency Fund and the tax regulation mechanism have existed for a considerable period, and there is no sign that Bulgaria's RES-H&C policy will change in the near future. Policies aiming at increasing biomass use in the heat sector have not been subject to sudden changes or retroactive measures. However, their effectiveness in terms of ensuring a growing share of biomass in the heating sector is questionable.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

RES-T in Bulgaria is mainly supported through a biofuel quota and tax incentives. As of 1st of March 2019, the fuel for petrol engines shall contain at least 9% bioethanol produced from biomass. Furthermore, as of 1st of April 2019, diesel fuel shall have a minimum of 6% biodiesel, with at least 1% biodiesel being biofuel of a new generation, i.e. made from wastes such as straw, algae, grape marc, animal manure, sludge. Previously, including in the reporting years of 2018 and 2019, a minimum biodiesel content of at least 6% for diesel engines and a minimum quota of 7% bioethanol content for petrol engines applied. The bioethanol quota rose to 8 percent in September 2018 and to 9 percent in March 2019[132]. In case of non-compliance, significant financial penalties of between BGN 50,000 (approx. € 25,564) and BGN 200,000 (approx. € 102,298) apply, including the prohibition of selling the respective fuels having been found to be uncompliant with the requirements.

With the amendment of the Energy from Renewable Sources Act (ZEVI) in November 2018, a 7% threshold for conventional (first-generation) biofuels was set, to be taken into account for achieving the mandatory 10% renewable energy in final consumption of energy in the transport sector. In addition, Bulgaria has implemented and submitted to the European Commission a national target for the consumption of advanced generation biofuels at a rate of 0.05% of the required share of renewable energy in all modes of transport. The target must be achieved by 2020. The amendment of ZEVI also expanded the scope to include requirements and procedures to detect and track raw materials for the production of new generation biofuels throughout the value chain. In addition to the quota, petrol with blended bioethanol (of 4-5%) is eligible for a reduced excise duty, as is gas oil blended with biodiesel. The reduced rate is applicable for two years and implies a reduction of around 10%.

Moreover, a total of 24 projects promoting the use of electric vehicles were financed under the National Trust Eco Fund in 2017 and 2018 amounting to a total grant amount of BGN 572,873 with project beneficiaries in the central government and municipalities. Electric vehicles are promoted through tax allowance: owners of vehicles are exempted from the annual circulation tax. Investment support is available only for public authorities: state and municipal institutions can receive purchase grants for vehicles used in public service activities (minibuses, cleaning, watering vehicles, etc.)

- **Long-term security of support for RES-T: High**

Biofuel quota targets have been laid down into law up until 2019 but will likely remain in place after this year. Bulgaria wishes to maintain the 7% maximum share of conventional biofuels by 2030 and quotas will be extended beyond 2020. The excise tax allowance is valid for 2 years and renewed biannually. According to the NECP, tax reliefs will be "considered" after 2020 as a financial incentive.

[132] https://www.fas.usda.gov/data/european-union-biofuel-mandates-eu-member-state-2020

Czech Republic

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**

The Czech Republic has partially fulfilled its policy commitments in the RES-E sector. Until 2014 electricity production from renewable energy sources was supported by two main instruments. Plant operators were free to choose between a guaranteed feed-in tariff or a fixed premium tariff (so-called green bonus) paid on top of the market price.[133] However, the Czech government discontinued the schemes for new renewable projects from 2014 onwards, with the exception of small hydropower (below 10 kW) and biomass, wind and geothermal energy projects of up to 100 kW that were put into operation before 31 December 2015.

Thus, since 2014there is no operational support for new installations of major RES-E technologies in the Czech Republic. This development is also visible in RES-E deployment/share, which has been stagnating since 2015[134, 135] (It must be noted that despite this development, the Czech Republic is above its 2020 RES-E target trajectory.). However, there are two schemes providing investment support. The Operational Programme Enterprise and Innovations for Competitiveness which is funded by the European Regional Development Fund provide investment grants for distributed renewable energy. The size of the grant can vary between approx. €10,000 and €4 million for biomass and biogas CHP plants as well as small hydropower (i.e. up to 10 MW) depending on the size of the company. The more employees, the lower the share of funded expenses. Moreover, the Operational Programme Environment supports the installation of rooftop and façade solar PV systems in public buildings.

Furthermore, the installation of PV systems in family houses as well as apartment buildings are promoted by the New Green Savings Programme which provides subsidies for homeowners and house builders (individuals and legal entities).

Additionally, it is planned to start a new scheme for operational support in 2021 which will be applied by an hourly green bonus, with a division into electricity plants, which will compete for the support in an auction. For sources up to 1 MW (6 MW for wind power) support will be provided in the form of a green bonus laid down in an ERO price decision and for sources above 1 MW, the support will be provided by means of auctions in the form of the ‘auction bonus’. The duration of the support will remain unchanged – over the lifetime (20 or 30 years).

Long-term security of support for RES-E: Moderate

Regarding existing installations, long-term security for investors is ensured by a threshold which specifies that the payback period should not exceed fifteen years and that the rate of return per unit of electricity produced is stable during the support period, except in the case of biomass projects.

However, the security of support for new installations is limited. Uncertainty arises from several abrupt policy changes in past years, such as the abolishment of RES tax holiday, a recycling fee for PV panels (so-called solar tax introduction), the non-transparent and

[133] http://www.res-legal.eu/search-by-country/czech-republic/

[134] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Share_of_energy_from_renewable_sources_in_gross_electricity_consumption,_2004-2018_(%25).png

[135] https://ec.europa.eu/eurostat/web/energy/data/shares

unclear support mechanism for historic RES, the revision mechanism on adequacy of the amount of the state-granted support to renewable energy projects, the 'system of dispatching management'. These changes create investment uncertainty and result in higher cost of capital for current and future renewable investment.

In addition, technical and legal obstacles to domestic energy generation from renewable resources persist with regard to grid connection and charges as well as the further development of hydropower plants in the country. Taking the aforementioned barriers into account, the planned market-based support schemes for RES will be crucial in ensuring the reestablishment of investment certainty, but also in improving the public image of renewables within the population that has suffered in the past. However, the legislative proposal of large-scale PV plants' exclusion from RES supported through auctions from 2021 was strongly criticised by RES associations in late 2018. Furthermore, the Chamber of RES highlighted the insufficient reflection of the new EU's requirements for the so-called energy communities and prosumers in the draft act and the fact that it does not guarantee any financial support for RES enshrined directly in law, which exacerbates predictability and increases the uncertainty of investors in RES.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

In the Czech Republic renewable heating is primarily supported through two subsidy programmes and a tax regulation mechanism. RES-H plant operators are eligible to receive support through the Operational Programmes (OP) funded by the ERDF.

Operators of biomass plants, biogas CHP, and solar thermal collectors in enterprises may receive subsidies through the Operational Programme Enterprise and Innovations for Competitiveness (OP PIK), while biomass boilers and solar thermal collectors in public buildings are also supported under a different Operational Programme, namely the Operational Programme Environment (OP ŽP).

In addition, the New Green Savings Programme promotes RES-H installations, i.e. solar thermal systems in households.

Besides the Operational Programmes, the Czech Republic also maintains a real estate tax exemption for renewable heating plants. Biogas, biomass, hydrothermal, geothermal and air-source heat pumps are eligible for this scheme. Direct combustion of biomass is not eligible, as are hydropower plants with an installed capacity of over 1 MW.[136]

- **Long-term security of support for RES-H&C: Moderate**

The Operational Programmes that are funded by the ERDF are specified for the period 2014-2020. Budgets after this period are specified as part of the NECP.

However, from a stakeholder perspective, the Czech Republic exhibits a lacking reliability of the general RES-H&C strategy and the support framework (see Appendix C on non-economic barriers for more details). The sector experienced frequent restrictive measures over the past years, leading to the financing institutions' substantial financial straits, ultimately impacting the installations' cash flows. The instable framework raises the financial

[136] http://www.res-legal.eu/search-by-country/czech-republic/tools-list/c/czech-republic/s/res-hc/t/promotion/sum/120/lpid/119/

costs for the development of RES-H&C installations in the MS and undermines investors' confidence in RES technologies.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

RES-T in the Czech Republic is stimulated through a biofuel quota scheme and tax exemptions. Contrary to some other MS, no trajectory has been established for the increase of biofuels in the energy mix. The minimum percentage of biofuel in petrol is 4.1%, whereas this is 6% for diesel. An amendment has been submitted that would introduce double counting for the period 2018-2020, which would ensure the Czech Republic to achieve their targets as specified in their NREAP. The total contribution of conventional biofuels to the RES target is limited to a maximum of 7% post 2020. The tax regulation mechanism allows the biofuels or the percentage of biofuel in the fuel to be exempt from consumption tax. However, the consumption tax for biofuels was already lower compared to regular petrol, varying from approx. €62 to €84 per 1,000 litres.

In addition, there are plans to foster electric mobility. The 'Memorandum on the Future of the Automotive Industry' and the 'Action Plan on the Future of the Automotive Industry in the Czech Republic' propose eleven measures to foster the development of electro mobility in the period of 2017-2025. For instance, accelerated depreciation or labelling of electro mobiles should also be introduced in the future. Various subsidy programs led by ministries (MPO, MŽP, MD) have incentivised either the direct purchase of alternative propulsion vehicles (incl. electric ones) or the infrastructure development. For instance, in December 2018, two new calls started to promote the purchase of electric vehicles (by companies and public institutions) and infrastructure (public sector).

- **Long-term security of support for RES-T: Moderate**

The Czech Republic's tax mechanism has been in place since 2003 and is not scheduled to change in the near future, the same applies to the biofuel quota scheme. However, as no trajectory has been established for the increase of biofuels in the energy mix and the implementation of measures proposed by the National Action Plan for Clean Mobility (2015) promoting e-mobility is considered slow and unsatisfactory, the long-term security of support is moderate.

Denmark

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

Denmark has fulfilled its commitments from the NREAP and previous Progress Reports in terms of RES-E policies. The main support scheme remains to be a feed-in premium which applies to wind, solar and hydro power as well as biogas and biomass. There are two types of premium payments in the premium scheme. Most installations receive a variable premium on top of the market price, where the sum may not exceed a certain technology-specific maximum. In some cases, for hydro and non-utility onshore wind power, a fixed premium is granted on top of the market price instead. As additional measures to the feed-in premium, net metering is available to RES-E plant owners and loans are granted for local initiatives to finance feasibility studies prior to the construction of wind energy plants.

While the level of premium payments has been set administratively in the past, also Denmark is moving to tendering schemes and will determine support levels for major RES-E technologies in a competitive process in the future. In line with this development, a tendering scheme was introduced for solar PV installations of more than 400 kWp in 2016 which was open for installations in Germany, too, and granted a fixed premium. Support schemes for photovoltaic installations ended in 2016 and were replaced in 2018 by a tendering scheme that has been extended to include the promotion of wind turbines. The first Danish multi-technology tender for onshore wind and solar PV was issued with a support budget of approximately DKK 250 million[137]. As a result, support – in form of premiums - was allocated to three wind projects with a total volume of 165 MW and three solar PV projects with a total of 101 MW. The average winning premium was 0.023 DKK per kWh, allocated over 20 years. The level for the support is approximately six times lower than the previously applicable support scheme for wind turbines. In 2019, another tender round with a budget of approximately DKK 579 million took place[138]. The successful bids comprise 135 MW of onshore wind and 136 MW of solar PV, distributed across seven projects. Similarly, the support scheme for wind onshore and offshore wind turbines has been closed for new plants. It was replaced by the multi-technology tenders for support in 2018.

Furthermore, Denmark is tendering offshore wind sites since 2015. The support scheme is a premium paid for 50,000 full load hours. First contracts for a total of 1.35 GW of offshore wind were signed in 2015 and 2016, of which 400 MW will be situated at Horns Rev, 600 MW at Kriegers Flak and 350 MW nearshore at Vesterhav. The new support scheme for the offshore wind farm Thor is a modified premium with symmetrical payments and based on a period of 20 years.

- **Long-term security of support for RES-E: High**

The long-term security regarding RES-E support in Denmark is high. The main policy support mechanisms for RES-E described in their NREAP and the 1st Progress Report are still in place or were closed and replaced by updated schemes for new plants that take into account new technology developments and learnings. No retroactive changes occurred. The policy-making supports long-term planning. Under the Energy Policy Agreement of June 2018, the Danish Parliament agreed to continue the multi-technology auctions and allocated a total budget of DKK 4.2 billion for 2020-2024 to them. In addition, support is also provided for testing large wind turbines with a special premium for 50,000 full-load hours.

Depending on the technology, support is provided for a fixed number of years or based on a defined number of full-load hours. In general, long-term support is granted (between 8 to 20 years).

To streamline procedures, the rules for connecting wind turbines and solar photovoltaics to the grid were standardized in Order No 1128 of 7 September 2018.

Furthermore, the administrative procedures for licensing offshore wind farms in Denmark have been simplified and are predictable for enterprises wishing to erect offshore wind farms. Through a "one-stop shop" procedure, all major permits for preliminary studies, construction and electricity production are now issued by the Danish Energy Agency (Energistyrelsen) and coordinated with other bodies. In a dialogue-based tendering model, tenderers of offshore wind farms can make proposals on the license conditions in order to make the conditions as transparent and favorable as possible. In addition, the Danish

[137] https://ens.dk/sites/ens.dk/files/Udbud_aktuelle/facts_on_the_result_of_the_technology_neutral_tender_2018.pdf
[138] https://ens.dk/en/our-services/current-tenders/technology-neutral-tenders

Energy Agency's advance preparation of licenses for preliminary surveys and the establishment considerably reduces the administrative burden on companies.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Denmark has fulfilled all the commitments adopted in their NREAP and previous Progress Reports in terms of RES-H&C policies. Renewable energy fuels are exempted from the energy tax on fuels for heating purposes. Furthermore, fossil fuels are taxed by their carbon content. Overall, renewable energy fuels have a significant tax advantage.

A further measure to increase the RES share in heating is the heat pump subscription offered between 2016 and 2020. This instrument provides a grant to enterprises that establish, maintain and operate heat pumps in households on subscription while households pay an initial one-off payment, a fixed monthly subscription fee and a price for heat. As the enterprises are responsible for the operation, they have a strong incentive to run the heat pumps at high efficiency.

Albeit a high connection share of households to district heating systems (64%), only 1.1% of heat originated from heat pumps in 2018[139]. Biomass is the dominating renewable energy carrier[140] followed by small shares of heat from solar thermal and waste. The energy savings initiative (in place until end of 2020) in Denmark obliges energy companies to realise energy savings each year through energy saving projects that could also comprise solar thermal installations in district heating plants.

Denmark has introduced a premium tariff for biogas for transport, processing and heat. In this scheme, 1.34-3.5€/GJ biogas are paid to consumers using biogas for heating purposes. Support in form of a price premium is paid for upgraded biogas that is fed into gas networks until 2020. The premium is annually adjusted, based on a transparent rule.

- **Long-term security of support for RES-H&C: High**

The tax exemptions have been in place since 1996, with no major changes. The adoption of additional measures such as the premium tariff for biogas and the new tax reductions for heating is an indication of long-term stability of support in this sector.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

Denmark has fulfilled the commitments adopted in their NREAP and previous Progress Reports in terms of RES-T policies. The main instrument is a biofuel quota which obliges importers and manufacturers of petrol or diesel to ensure that biofuels make up at least 5.75% of their total annual sale of fuel in Denmark. For 2020 the quota was increased to 7.6 percent. In 2021 the quota is set to decrease again to 5.75 percent. Furthermore, biofuels are exempt from the CO_2 tax and there is a premium for the use of biogas for transport.

[139] http://dx.doi.org/10.3390/en13061508
[140] https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2020/The-state-of-renewable-energies-in-Europe-2019.pdf

In addition, electric vehicles (EVs) were supported via research schemes and exemptions from the registration tax and the 'green ownership' tax until 2015. However, in 2015 the Danish government decided to repeal the tax exemption and to let the registration tax for EVs progressively rise over a five-year period (20% in 2016, 40% in 2017, etc.) to the same level as other cars[141]. This change let to a steep decline of EV sales, which again caused the government to revise its decision in 2017 and set the EVs registration tax at 20% until another 5,000 EVs will be registered[142]. Further, fuel cell vehicles were exempted from the registration tax until 1 January 2019.

- **Long-term security of support for RES-T: Moderate**

The biofuel quota was implemented as communicated. However, changes in the tax breaks for EVs in 2015 and 2017 have destabilised the Danish EV market and hamper its long-term planning security.

Germany

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

Germany has fulfilled its RES-E policy commitments. A market premium scheme remains to be the main instrument of support for electricity from renewable sources. For most installations, the award and the level of the market premium are determined through auctions. Small installations of up to 100 kW receive a fixed feed-in tariff instead of the premium.After the first renewable auction in Germany was held in April 2015 as part of the pilot auction scheme for ground-mounted solar PV, the broad shift from administratively-set support levels to renewable auctions followed in 2017. Since then, auctions have taken place with a high frequency. Most auction rounds are technology-specific auctions and either for solar PV, biomass, onshore or offshore wind. Also, other auction formats exist, such as joint auctions for solar PV and onshore wind, cross-border auctions for solar PV, technology-neutral innovation auctions.

In addition to the market premium scheme as the main RES-E support in Germany, there are a number of low interest loans, e.g. for stationary battery storage systems related to a PV installation. Furthermore, there is a special programme for offshore wind run by KfW[143], which provides financial support to up to 10 offshore wind parks with a total credit volume of €5 billion. There is also a tenant electricity surcharge in place since 2017. It supports small PV plants up to 100 kWp on residential buildings, if the electricity is supplied and consumed within the building itself. This support is lower than the feed-in tariff, but other factors like network charges, taxes etc. are avoided.

- **Long-term security of support for RES-E: High**

Despite multiple amendments to the EEG ("Erneuerbare-Energien-Gesetz", Renewable Energies Act) and debates on specific regulations like e.g. distance rules for onshore wind and te capacity cap for solar PV, the long-term stability of policies supporting the production of electricity from RES in Germany is generally high. Long-term targets for the share of RES-E in gross electricity consumption are defined early and up until 2050 in the EEG.

[141] https://www.dr.dk/nyheder/politik/ny-aftale-om-elbiler-skal-saette-gang-i-bilsalg

[142] https://electrek.co/2017/04/19/denmark-electric-vehicle-incentive/

[143] KfW-Sonderprogramm Offshore-Windenergie; https://www.kfw.de/inlandsfoerderung/Unternehmen/Energie-Umwelt/Finanzierungsangebote/Offshore-Windenergie-(273)/

Additionally, yearly deployment corridors and auction volumes per technology beyond 2020 provide long-term certainty for investors and potential degressions of tariffs for new installations were made transparent and timely announced.

Feed-in premiums for large installations and feed-in tariffs for small installations are paid for a period of twenty years and hedge against revenue risks resulting from fluctuating electricity prices.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Germany is fulfilling commitments regarding policies and support for the use of RES-H&C that were made in the NREAP and previous progress reports. The main programme to foster the use of RES for heating in 2017 and 2018 was the Market Incentive Programme ("Marktanreizprogramm", MAP), which contains two support instruments. The first instrument are investment grants for the installation of solar thermal energy, heat pumps and small biomass installations in existing buildings. The second instrument are low interest loans for the construction, expansion or purchase of installations for heat generation from renewable energy sources. It is a long-term and low interest loan with a fixed interest period of five or ten years including a repayment-free start-up period. In 2020, the MAP was extended and now also includes gas hybrid heating systems, which proportionally integrate renewable energies. In addition, in January 2020 the previous fixed-rate subsidy was changed to a graduated subsidy system, in which the share of RES determines the hight of the subsidy – 100% RES heating is subsidised with a grant covering 35% of investment costs, a hybrid heating system with natural gas and at least 25% RES share receives a grant for 30%, etc. - and the subsidy rates were increased by ten percentage points. In order to increase the replacement rate of oil heating systems, an "exchange premium" with a subsidy share of up to 45 percent has also been integrated.[144]

In the reporting period 2017 to 2018, a MAP support volume of €467 million triggered investments of around €2 billion, €392 million of the total support volume were used as investment grants for 108,100 renewable heating installations in residential buildings. Other parts of the support volume was used for low interest loans.

In addition to the MAP, regulatory requirements for the construction of new buildings are implemented to aim for a higher share of renewable sources. According to the Renewable Energy Heat Act (“Erneuerbare-Energie-Wärmegesetz”), owners of new buildings and buildings under renovation are obliged to use a particular share of heating and cooling produced from RES. Public buildings are also bound by this obligation and must be exemplary and demonstrate that climate policy objectives can be implemented in harmony with the cost-effectiveness and functionality of construction measures. The RES-quota varies according to the RES and whether it is a new building or a renovation of an existing building. For example, the obligations are fulfilled for new buildings if the heat demand is covered by 15% from solar thermal, or by 50% from installations using biomass or waste heat.

Furthermore, Germany supports district heating systems with the support programme District Heating Networks 4.0 (“Wärmenetze 4.0”). The scheme provides financial support for feasibility studies as well as the construction of innovative district heating systems with a predominant share of renewable energies and waste heat. The programme was revised in 2019 and will continue until 2030. In addition, it is planned to extend the programme with a

[144] https://www.erneuerbare-energien.de/EE/Navigation/DE/Foerderung/Marktanreizprogramm/marktanreizprogramm.html

heat grid transformation programme (according to the NECP). However, this has not yet been implemented.

- **Long-term security of support for RES-H&C: High**

The long-term security of support for RES-H&C is high. The MAP has been operating since 2000 and has already supported 1.8 million installations. The two support instruments of the MAP are expected to continue for the coming years. Also, other measures like the Heating Networks 4.0 have been extended and will continue well beyond 2020, e.g. until 2030.

Germany also adopted a national emission trading scheme which assigns gradually rising prices to emissions from the combustion of fuels for sectors not covered by the European emissions trading system, including heating and transport. Starting with a price of 25 €/t CO_2 in 2021, the price will gradually increase to 55 €/t CO_2 in 2025. This measure will provide further incentives to invest in RES-H&C.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

The main instrument to promote the use of renewable sources in transport is a greenhouse gas (GHG) reduction quota applicable to all fuels. The GHG reduction quota was implemented in 2015 to replace the biofuel production quota that had been in place since 2007. As part of the reform, tax reliefs for biofuels including biomethane have been terminated by the end of 2015.

The GHG reduction quota obliges suppliers to ensure that the GHG emissions of their average fuel mix (containing gasoline, diesel fuel and biofuels) remain below those of a reference values based on fossil fuels. As of 2017, GHG emissions had to be lower than the reference value by 4%. The percentage increased to 6% in 2020. The use of biofuels is one option for suppliers to follow the provisions.

Additionally, Germany has introduced a bonus (“Umweltbonus”) for the purchase of electric, plug-in and hydrogen passenger cars in 2016. Depending on the technology, buyers can receive a bonus of €1,500 or €2,000 from the state if the car manufacturer provides an additional bonus of €1,500 or €2,000. A total state budget of €600 million was available for this scheme until June 2019, with the aim to support the purchase of 300,000 cars. Until the end of August 2020, 25,7046applications have been made. In 2020, the bonuses were increased significantly to €7,500 and €9,000 respectively. Also, the scheme was extended until 2025.

Another indirect support mechanism is the vehicle tax exemption for electric cars up to 10 years (since first registration between 2011 and 2020) and the reduced tax rate (on income) for electric company cars. Compared to conventional vehicles, which are monthly taxed with 1% of the list price, this tax is only half for electric and hybrid vehicles. This reduction of the tax paid by the employee using the company car, started on 1 January 2019 and expires on 31 December 2021. From 2019 on, electric and gas-driven trucks are exempted from the highway tolls. For gas-driven trucks, the exemption phases out after 2020, whereas an official review process will decide on the toll of electric trucks.

Long-term security of support for RES-T: High

The long-term security of support for RES-T is high. The GHG reduction quota sets a clear path until 2020. The bonus for the purchase of electric, plug-in and hydrogen passenger cars is available until 2025. Additionally, the adopted national emission trading scheme, which also includes transport, will provide further incentives to invest in RES-T from 2021 onwards.

Estonia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

Estonia has fulfilled its earlier RES-E policy commitments. The original RES-E policy commitments, as defined in the NREAP, were:

- A feed-in tariff
- Certificate of origin
- Support for investment for the broader use of renewable energy sources for power production and support for investment in bioenergy production
- Diversification towards non-agricultural activity
- Support for investment in adding value to forestry products
- National Energy Technology Programme – ETP
- Development Plan for Enhancing the Use of Biomass and Bioenergy for the Period 2007 to 2013-R&D

The 1st Progress Report had a strong focus on measures related to electricity, but the following Progress Reports, on the other hand, set a stronger focus on measures that incentivized the use of RES in the other sectors. In those, measures to incentivize the production of electricity were not very prominent anymore.

The Energy Economy Development Plan for 2030 (ENMAK 2030) outlines the targets and vision for each sector until 2030. The 12-year premium tariff system for all renewable technologies has some caveats: support to electricity from wind energy will be suspended for the current calendar year as soon as a total of 600 GWh of electricity has received support. For biomass, only high-efficiency CHP plants are eligible. The premium is fixed at €0.0537 per kilowatt hour for all technologies, except CHP plants with a production capacity below 10 MW using waste, peat or oil shale retorting gas. They are eligible for a tariff amounting to €0.032 per kWh[145].

An additional auction-based support scheme was adopted in June 2018[146]. From 2019 onwards public tenders (reverse auctions) are organized to attain the set share of renewable electricity (17.6%) by 2020. The first tender for installations with a capacity between 50 kW – 1 MW was held in 2019-2020 and resulted in 17 bids with a weighted average price of €75.55 per MWh, which includes both the electricity market price and the premium.

Another substantial change implemented was that production devices with a capacity over 50 kW would not be eligible for the premium. A transition period was introduced for micro producers (up to 50 kW), who may receive support until late 2020 under the current scheme.

[145] Electricity Market Act (in Estonian): https://www.riigiteataja.ee/akt/130062017028 (26 June 2018)

[146] https://www.riigikogu.ee/tegevus/eelnoud/eelnou/469fc0ff-35d7-472a-b01a-3bc968dae72b/Elektrituruseaduse,%20energiamajanduse%20korralduse%20seaduse%20ja%20maagaasiseaduse%20muutmise%20seadus (26 June 2018)

After that, small-scale producers (up to 1 MW) must participate in tendering rounds in order to receive support. Support under the existing scheme is also available for those producers who have made significant investments into production devices before 2017.

Estonia has also concluded statistical transfer transactions with Luxembourg[147] and Malta[148] in order to help them to achieve their 2020 targets.

- **Long-term security of support for RES-E: High**

The long-term security of support is high. Changes have been adopted. However, a reliable plan and procedures for tendering rounds will still have to be developed to create a stable environment for investments. This is exemplified by the fact that initially the next tender was announced for 2021, but it was later brought forward to 2020.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Estonia has fulfilled its earlier RES-H&C policy commitments. The original policy commitments, as defined in the NREAP, covered RES-H&C only indirectly through:

- Support for investment in bioenergy production
- Diversification towards non-agricultural activity
- Support for investment in adding value to forestry products
- National Energy Technology Programme – ETP
- Development Plan for Enhancing the Use of Biomass and Bioenergy for the Period 2007 to 2013 – R&D

Over the past years, additional measures were introduced that had a specific focus on RES-H&C: The 2nd Progress Report set a stronger focus on incentives improving the use of RES in small residential buildings. The trend of measures addressing the building sector was further continued in the 3rd report and the 4th Progress Report mentioned measures to increase energy efficiency in district heating systems.

Three main investment subsidies for heating and cooling exist in Estonia:

1. Investment support for the renovation of apartments.[149]

2. Investment support for the renovation of heating systems for small residential houses.[150]

3. Investment support for the promotion of RE in welfare centres and child day care buildings.[151]

- **Long-term security of support for RES-H&C: Moderate**

The long-term security of support for RES-H&C is moderate as the availability of the funds vary, and they are dependent on financing from the EU Structural and Investment Funds as well as state budget. Unclarity may reverse the advances made in RES share in heating

[147] https://www.mkm.ee/en/news/estonia-and-luxembourg-signed-agreement-exchange-energy-statistics
[148] https://www.mkm.ee/en/news/estonia-will-sell-renewable-energy-statistics-malta
[149] https://www.riigiteataja.ee/akt/113042017004
[150] https://www.riigiteataja.ee/akt/114102016007
[151] https://www.riigiteataja.ee/akt/121112017003

especially, as a larger number of installations renovated within the first financing periods are up for renewal and fossil fuels (e.g. natural gas) are likely to be more competitive pricewise than RES.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

Estonia has fulfilled its earlier RES-T policy commitments. The original policy commitments, as defined in the NREAP, covered RES-T – partially indirectly – through the following measures:

- Support for investment in bioenergy production
- National Energy Technology Programme – ETP
- Development Plan for Enhancing the Use of Biomass and Bioenergy for the Period 2007 to 2013 – R&D

The first Progress Report introduced an electric mobility programme in Estonia and the third Progress Report also identified measures to facilitate the use of biomethane in the transport sector. There are three main support schemes in place for the promotion of RES in the transport sector:

1. Subsidy paid to create an infrastructure for biomethane petrol stations and to promote biomethane use in public transport systems in municipalities. Investment support is given to refuelling stations and local municipalities' public transport system[152].

2. Biomethane Market Development Support in order to support the producers of biomethane delivered to the end user as transport fuel. The amount of the subsidy is €100 per MWh, from which the average market price of natural gas of the current month will be deducted.[153]

3. Biofuel quota: As of 1 May 2018, a fuel supplier must have a proportion of at least 3.1% of biocomponent in the total energy quantity of petrol, diesel and biofuel released for consumption. As of 1 January 2019, the share of RES delivered to the market must be 6.4% and as of 1 January 2020, the requirement is 10%. All this is regulated through the Liquid Fuel Act (in Estonian: "Vedelkütuse seadus")[154].

- **Long-term security of support for RES-T: Moderate**

The quota obligation for fuel suppliers to deliver 10% of fuel from RES came into force in April 2020 and is legally binding until it is changed, hence a floor is created.

In February 2020, the Ministry of Economic Affairs and Communications sent a proposal for changes in legislation for consultation to other ministries and stakeholders[155]. The proposal includes transposition of the REDII and raising the quota obligation to 14% by 2030. The proposed list of renewable fuels to meet the quota is planned to include renewable electricity and renewable fuels of non-biological origin. An improved registry is also to be created to ensure reliability and transparency of the system.

[152] https://www.riigiteataja.ee/akt/112012018003 (26 June 2018)
[153] https://www.riigiteataja.ee/akt/115092017009 (26 June 2018)
[154] https://www.riigiteataja.ee/en/eli/ee/528062018005/consolide (28 August 2018)
[155] https://eelnoud.valitsus.ee/main/mount/docList/f1c8eac3-7791-46a8-b626-6db1d0b784ee

Ireland

Electricity

- **Fulfilment of earlier RES-E policy commitments: No**

Besides a solar PV pilot scheme launched in 2018, Ireland had no dedicated RES-E support scheme in place throughout the reporting period.

Until 2015, the main RES-E support instrument had been the Renewable Energy Feed-in Tariff (REFIT) schemes. However, they were discontinued at the end of December 2015. REFIT 1 was in place from 2007 to 2009 and provided feed-in-tariffs for a period of 15 years to target 1,450 MW of wind, hydro and biomass/landfill gas power plants. Support under REFIT 1 will end in 2027. REFIT 2 succeeded REFIT 1 in March 2012 and was in place until December 2015. It supported another 4,000 MW of the same technologies. Support under REFIT 2 will not be extended beyond December 2032. In addition, REFIT 3 supported 310 MW of biomass technologies including biomass combustion, co-firing and high-efficiency anaerobic digestion/biomass thermochemical CHP between February 2012 and December 2015. Support under REFIT 3 will cease at the end of December 2030.

In July 2018, a solar PV pilot scheme was launched providing subsidies for the purchase and installation of domestic solar PV and/or battery energy storage systems. Support is granted in the form of upfront investment aid to homeowners for eligible products. At its launch support payments amounted to € 700/kWp for solar PV systems of up to 4kWp and €1000 for installing battery storage systems (a necessity for schemes larger than 2kWp) to a maximum grant of € 3800. A revision of the scheme in December 2019 pays € 900/kWp for systems smaller than 2kWp; € 300/kWp for systems between 2-4kWp and a grant of € 600 for battery installation giving a maximum installation grant of € 3000. The change was made to reduce the oversizing of installations for grant maximising purposes. The scheme is expected to cease at the end of 2020. In its first year the scheme paid € 3.5 million in grants to 1500 domestic systems.

A new auction-based 'Renewable Energy Support Scheme'(RESS) providing feed-in premiums to waste/biomass/biogas based high efficiency CHP, solar PV and onshore/offshore wind projects was first announced in December 2019, targeted to deliver 30TWh of renewable electricity by 2030. A first auction round was conducted in April 2020 which is due to award in September 2020. The scheme is aimed at the non-domestic sector and is currently awaiting EU state aid approval.

- **Long-term security of support for RES-E: High**

The long-term security of support for RES-E in Ireland is high. While no comprehensive RES-E support scheme had been in place since 2015, a new auction-based support scheme, the earlier mentioned Renewable Electricity Support Scheme (RESS), was announced in December 2019 and launched in March 2020 with the aim to achieve 70% share of RES-E by 2030. It intends to allocate feed-in premiums for contracts of 14 to 16.5 years, depending on project delivery dates, and is open to non-domestic and community grid contracted solar PV, biomass/biogas and waste based high efficiency CHP, onshore and offshore wind projects.[156] A delayed first auction round (RESS 1) for the combined delivery of 1 TWh of clean energy was held at the beginning of 2020. The second auction was planned for 2020 awarding another 3 TWh. Additional auctions are scheduled for 2021,2023

[156] https://www.pv-magazine.com/2020/04/27/irelands-first-renewables-auction/

and 2025 allocating a further 3 TWh, 4 TWh and 2.5 TWh, respectively as per the table below taken from the RESS Design Paper. The scheme is administered by Eirgrid.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

Ireland has partially fulfilled the policy commitments as set out in its NREAP. Currently, Ireland has three main support schemes for RES-H&C in place: a € 1,200 grant to homeowners for the installation of solar thermal installations through the Better Energy Homes Scheme and a tax return to Irish companies of 100% of the purchase value of certain energy efficient equipment through the Accelerated Capital Allowance Scheme. Moreover, the Support Scheme Renewable Heat offers subsidies for the purchase of heat pumps.

The Better Energy Homes Scheme-Solar Water Heating Grant allows homeowners of dwellings built before 2011 to apply for a € 1,200 grant aid for the installation of a solar thermal installation. In addition, the Accelerated Capital Allowance Scheme supports companies' uptake of heat pumps (aerothermal, hydrothermal and geothermal) as well as solar thermal energy. In the year of purchase, companies can depreciate 100% of the purchase value of the equipment.

In 2019 the Better Energy Homes scheme was expanded to include grant aid in the form of home insulation grants, heat pump systems grants and heating controls grants. The grants reach from € 400 – 6,000.

In 2018, the Department of Communications, Climate Action and the Environment introduced the Support Scheme Renewable Heat (SSRH) for Non-Domestic Heat Users including commercial, industrial, agricultural enterprises, district heating schemes and public sector heat users. In the scheme's first phase in September 2018, ground, water or air source heat pumps were eligible for an installation grant (of up to 30% of installation costs). Following EU state aid approval, SSRH provided operational support for biomass boilers and anaerobic digestion high efficiency CHP systems as of June 2019. Eligible RES technologies are supported through a multi-annual (quarterly) payment for a period of up to 15 years on the basis of pre-determined tariffs. The scheme is not open to REFIT scheme projects. For the period up to 2027, a budget of € 300 million is foreseen for the roll-out of the scheme.

- **Long-term security of support for RES-H&C: Moderate**

Several support schemes promoting RES-H&C that were described in the NREAP ended due to budgetary constraints. These circumstances created uncertainty for potential investors. Ireland is currently not on track to meet its 2020 RES-H&C trajectory. However, the Better Energy Homes scheme operated by SEAI an expansion of the earlier 'Better Energy Homes Scheme-Solar Water Heating Grant' provides grant support for domestic heat pumps, insulation improvements and control system upgrades in addition to the solar thermal system support. The scheme is due to close at the end of 2020.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

Ireland's main support instrument for RES-T is a Biofuels Obligation Scheme (BOS), which has been in place since 2010. It obliges road transport fuel suppliers to include a certain

percentage of biofuels in their annual fuel sales. In 2018, the obligation stood at 8% by volume and was increased to 10% as of January 2019. In 2020, it will be further increased to 11%.[157] A public consultation on the development of the BOS for the period 2021 to 2030, including the implementation of the elements relating to renewable transport fuels in the recast RED, was launched in September 2019.[158]

Generally, one Biofuels Obligation Certificate is issued for each litre of biofuel. For biofuels produced from biodegradable waste, residue, non-food cellulosic material, ligno-cellulosic material or algae two certificates are allocated. In case of shortfall in the number of certificates at the end of the obligation period, a non-compliance fee applies, which is calculated as the number of certificates short multiplied with the price per litre of biofuel prescribed (currently € 0.45).

Furthermore, Ireland supports the uptake of electric mobility through a series of measures, including the construction of public charging points as well as grant schemes. In November 2018, funding of up to € 10 million was approved to support the development of a nationwide electric vehicle fast charging network. The Electric Vehicle Grant Scheme[159] provides grants of up to € 5000 per (battery or plug-in hybrid) electric vehicle purchased and registered in Ireland. Until the end of 2018, grant support was provided for the purchase of 4625 new vehicles. Additionally, electric vehicles are exempted from the Vehicle Registration Tax (VRT), which amounts to up to € 5000 for a battery electric vehicle, and benefit from the Accelerated Capital Allowance scheme (see above). Moreover, electric vehicle owners may benefit from cheaper tolls on toll roads. In 2018, the Electric Vehicle Home Charge Grant[160] was introduced to incentivize more electric vehicle owners to install chargers in their homes and more than 1000 grants were allocated under the scheme. In the same year, the Department of Transport Tourism and Sport introduced the Electric SPSV (eSPSV) Grant Scheme to support the uptake of electric vehicles in the country's small public service (SPSV) industries (i.e. taxies/hackneys/limousines). The scheme offers grants for the purchase of new and second-hand electric vehicles of up to € 7000 for battery electric vehicles and up to € 3500 for plug-in hybrid vehicles.[161] The scheme was continued in both 2019 and 2020, and furthermore the grant levels were also increased.[162]

- **Long-term security of support for RES-T: High**

The biofuel obligation has been in place since 2010. There have been no unexpected changes so far and the biofuel quota has been raised each year as planned, and is furthermore planned to be extended to 2030. The support for electric vehicles has been extended as well.

[157] https://www.dccae.gov.ie/documents/Biofuels%20Obligation%20Scheme%20Policy%20Statement.pdf
[158] https://www.dccae.gov.ie/en-ie/energy/consultations/Documents/44/consultations/Biofuels_Obligation_Scheme_Consultation.pdf
[159] https://www.gov.ie/en/service/electric-vehicle-grant-scheme/#:~:text=SEAI%20is%20offering%20grants%20of,purchased%20and%20registered%20in%20Ireland.&text=Grants%20are%20accessed%20via%20the,is%20available%20from%20the%20SEAI.
[160] https://www.seai.ie/grants/electric-vehicle-grants/electric-vehicle-home-charger-grant/#:~:text=A%20government%20funded%20support%20scheme,hand%20electric%20vehicle%20(EV).
[161] http://dttas.old.gov.ie/press-releases/2017/electric-spsv-grant-scheme
[162] https://www.nationaltransport.ie/wp-content/uploads/2019/12/eSPSV_Grant_Scheme_2020_-_Information_Guide.pdf

Greece

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Greece has partially fulfilled its policy commitments from their NREAP and previous Progress Reports. Since 2017, the main support scheme for RES-E installations above 1,000 kW in Greece are auctions. After the first pilot tender for solar PV already took place in 2016[163], the first regular tender of the new system was held in July 2018. A total of 277 MW of RES capacity has been awarded in three categories: solar PV up to 1 MW (53 MW), solar PV of 1 MW to 20 MW (53 MW) and wind power of 3 to 50 MW (171 MW). The average awarded prices of the categories ranged from 6.381 €ct/kWh for the second solar PV category, 6.953 €ct/kWh for wind power to 7.842 €ct/kWh for the first solar PV category.[164] Since the planned annual auction volume was set at 600 MW, an additional auction round was held in December 2018.

For 2018, two further auction formats were planned: a joint solar and wind power auction and an auction especially for wind and PV plants that are located at the south-east part of the island of Evvoia on the grounds of a dedicated grid interconnection. The purpose of this auction was to uplift RES congestion issues, with an end connection point at the Attica region. However, the auctions were postponed[165]. While the joint auction took place in 2019, the Evvoia auction has not taken place.

In addition, Greece has a net metering scheme in place for installations up to 500 kW (up to 1MW for energy communities and other entities of public benefit), which became effective mid-2015 and was amended in 2017 introducing virtual net metering.[166] Furthermore, a new tax regulation mechanism and grants are available under the 2016 Development Law. The tax regulation mechanism allows income tax reliefs to companies for CHP plants and RES plants. However, no direct investment grant is foreseen for RES-E plants, with the exemption of small hydro plants and high efficiency CHP RES plants. The minimum level of investment should amount to €50,000 - 500,000, depending on the size of the company. The level of support depends on the size of the companies and ranges from 30%-65% of eligible costs.

In January 2017, the Bill on Energy Communities was approved. The Bill enables citizens, local administration authorities, as well as private and public law entities to participate in the production, distribution and supply of energy. It should be underlined that Greece is the first MS that defines a clear legislative framework on energy communities.[167]

[163] http://www.res-legal.eu/search-by-country/greece/
[164] https://cleantechnica.com/2018/07/06/first-greek-renewable-energy-auction-awards-277-megawatts-for-wind-solar/
[165] In Greece, the Ministry of Environment and Energy publishes each year the timeline of (maximum) capacities of RES to be auctioned in each year up to 2020. Based on those maximum capacities, as well as the current status of the market (e.g. estimate of eligible and developed projects), the auctioneer (the Greek regulator RAE) calculates the auctioned volume for each respective auction. This can deviate from the amounts foreseen in the Ministerial Decree which can/should be regarded as the main framework, while RAE decided on the "details". Therefore, RAE sometimes decides to not conduct certain auctions which were actually foreseen in the Ministerial Decree (such as the joint auction in 2018). As RAE does not publish any reasons for not conducting these auctions, it can only be speculated if it is due to the market environment or simply due to internal capacity issues. Nevertheless, RAE tries to use the non-auctioned capacities in the next years (e.g. instead of only auctioning 400 MW in the joint auction in 2019, RAE used 200 MW of capacity from the auction in 2018 that did not occur, thus auctioning 600 MW in 2019). Furthermore, it should be noted that the December 2018 auction for large-scale PV was cancelled, since several projects that were prequalified did not submit any bid in the dynamic auction procedure. As it can be assumed that those projects merely prequalified to circumvent the 75%-rule (which ensures enough competition in the dynamic auction procedure), RAE decided to cancel the auction, as sufficient competition could not be ensured in the auction.
[166] http://www.ypeka.gr/LinkClick.aspx?fileticket=MMfrWK6%2f4ow%3d&tabid=555&language=el-GR
[167] http://www.ypeka.gr/Default.aspx?tabid=389&sni[524]=5377&language=el-GR

- **Long-term security of support for RES-E: High**

The long-term security of RES-E support in Greece is moderate. Between January 2017 and June 2018 no tenders have been held due to the outstanding approval by the European Commission. However, a specific timetable with the scheduled auctions was approved in April 2018 and has been updated annually since then.

High participation in recent RES auctions and the relevant new applications for production licenses during the last two years demonstrate a swift uptake for both new investors and projects in the Greek RES sector. Moreover, the liquidity and medium-term sustainability of the special RES account has been drastically improved and stable surplus is projected for the next years, while a buffer of € 70 million has been regulated in order to safeguard the account's sustainability.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Greece has fulfilled its earlier policy commitments regarding RES-H&C. The main support measures are subsidies and tax relief measures, which were introduced under the 2016 Development Law, together with an income tax relief.[168] Similar measures are applicable to RES-E and RES-T too.

The first tax regulation measure, based on law No. 2238/1994, provided for an income tax relief for natural and legal persons who have performed an energy upgrading of their building. Up to 10% of the project costs could be deduced from taxable income (up to a maximum of € 3,000). Eligible technologies were aerothermal, hydrothermal, geothermal and solar thermal energy as well as biogas and biomass plants. This tax relief is not active at present. The second tax regulation mechanism grants income tax reliefs to companies for CHP plants and RES-H&C plants. Their minimum level of investment should amount to € 50,000 - 500,000, depending on the size of the company. The level of support depends on the size of the companies and ranges from 30%-65% of eligible costs. The granted subsidies also range from € 50,000 – €500,000 and 30%-65% of eligible costs.

Additionally, the programme "Exsoikonomisi kat' oikon II" was introduced in March 2018. The programme builds upon the previous successful programme that was implemented during the previous programmatic period (2007-2013) and aims at realising energy efficiency measures in domestic residences in all administrative prefectures in Greece. Among others, the upgrading of H&C systems (installation of heat pumps, biomass plants and geothermal exploitation) as well as the installation of solar thermal installations and heat pumps for warm water are supported. Support is provided through the provision of grants and interest-free loans. The grant level is defined by each applicant's annual income (between 0%-70% of the total expenditure) while for the rest of the sum an interest-free loan is offered.[169] The programme received a great number of applications. Therefore, the Ministry of Environment and Energy announced the doubling of funds for the whole programme and beneficiaries will increase from 40,000-45,000 households to 90,000-95,000 households. The programme stopped receiving new applications in May 2018[170] but restarted in 2019 to fund more than 200,000 households.[171]

[168] http://www.res-legal.eu/search-by-country/greece/
[169] https://exoikonomisi.ypen.gr/welcome
[170] https://exoikonomisi.ypen.gr/-/prothesmia-epexergasias-kai-epanypoboles-aiteseon
[171] http://www.avgi.gr/article/10951/9378124/erchetai-to-2019-neo-programma-exoikonomese-kat-oikon-

- **Long-term security of support for RES-H&C: High**

The long-term security of RES-H&C support in Greece is high. Current support measures are scheduled to run until 2020 and follow ups are foreseen within the NECP.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

Greece has fulfilled its earlier RES-T policy commitments but is lagging behind its RES-T sectoral trajectory. The main support measure regarding RES-T in Greece is a biofuel quota. It obliges fuel suppliers to blend their fuel with 7% share of biofuel. Recently, a similar obligation for the blend of bioethanol to gasoline was introduced with the share to be set to 3.3% for 2020.

In addition, also for RES-T there is a new tax regulation mechanism and subsidy available under the Development Law. The tax regulation mechanism grants income tax reliefs to companies for the production of sustainable biofuels which are not based on edible plants and are not subject to a supply obligation or blending eligible for support. There are minimum levels of investment to be eligible for support - € 50,000 – 500,000, depending on the size of the company – and the level of support depends on the size of the companies – 45%-65% of eligible costs. The granted subsidies range from € 50,000 – 500,000 and 45%-65% of eligible costs, too.

Furthermore, the ILUC Directive was transposed in June 2018, including biofuels from non-edible cultivations, biofuels for the aviation sector and electricity for the calculation of the RES-T share.[172] Additionally, since January 2019 bioethanol or bioethers from biological origin should be contained in all transport fuels. The percentage is set at 1% in 2019 and 3.3% from 2020 onwards.[173]

- **Long-term security of support for RES-T: Moderate**

The long-term security of support for RES-T in Greece is moderate. Even though the biofuel quota is scheduled to be in place until 2020, biofuel facilities do not operate at their full potential[174]. Moreover, infringement procedures and fines in case of non-compliance with biofuel quota obligations have only been introduced in 2016. As a result, RES-T share until now remains very low (4.1%).

Spain

Electricity

- **Fulfilment of earlier RES-E policy commitments: No**

Spain has not fulfilled its policy commitments expressed in the NREAP and earlier Progress Reports in terms of policy support for RES-E, as there were interruptions in support for new installations as well as retroactive changes for existing plants in between 2012 and 2015

[172] https://www.hellenicparliament.gr/Nomothetiko-Ergo/Anazitisi-Nomothetikou-Ergou?law_id=c3631fb9-579d-48e9-85dd-a8e400d4cb13
[173] https://www.hellenicparliament.gr/Nomothetiko-Ergo/Anazitisi-Nomothetikou-Ergou?law_id=c3631fb9-579d-48e9-85dd-a8e400d4cb13
[174] http://www.insider.gr/epiheiriseis/energeia/69510/hellastat-i-ellada-ysterei-se-viokaysima

The Royal Decree 413/2014 introduced new support schemes for RES-E to be awarded through a tendering process which were implemented from 2016 onwards. In the tenders of 2016 and 2017 8,737 MW of renewable energy capacity were awarded[175]. Eligible technologies included onshore wind energy, solar PV and biomass. Onshore wind was the technology awarded the largest capacity with 4,608 MW, followed by solar PV with 3,910 MW, biomass with 200 MW, and other RES with 19 MW. The installations awarded will be built without subsides: renewable operators have to rely on the market revenues. To hedge against market price fluctuations, some developers are seeking to establish bilateral long-term agreements through power purchase agreements (PPAs). For 2018, auctions were planned to take place for RES installations on the Balearic and Canary islands. However, these island-specific auctions were postponed and have not been implemented so far.

The Royal Decree-law 23/2020 has introduced a new auctions system for renewable energy, although auctions to be carried out under this new regulatory framework will only have effect on renewables deployment after 2020.

In addition, Spain has a self-consumption scheme for RES-E installations. Royal decree 244/2019 repealedroyal decree 900/2015, introducing a more favourable regulatory framework for self-consumption, establishes two possible modalities of self-consumption: “With Surplus” (with feed-in to the grid) and “Without Surplus” (without feed-in to the grid). Self-consumption is defined as consumption by one or more consumers of electricity from installations in proximity of the consumption associated with it. The renewable self-consumed electricity will be exempt from all charges (both on capacity and generation levels) and tolls. Surpluses and deficits of generators associated with self-consumption will be treated in the same way as all other generators or consumers. Simplified compensation mechanisms between deficits and surpluses of self-consumers may be developed for installations below 100 kW.

- **Long-term security of support for RES-E: Moderate**

The 2013 introduction of the new support scheme for RES-E based on the "reasonable return on investment" principle, which also applies to existing plants retroactively, followed a period of retroactive cuts in exisiting RES-E support and the absence of any support scheme for RES-E for new installationsbetween 2012 and 2015. The retroactive changes created a very high level of insecurity for RES-E investors in Spain.

The reasonable return is revised every six years, which introduces uncertainty in the level of support renewable operators receive through the lifetime of their assets. For the regulatory period 2013-2019, the return was defined as the yield of a 10-year government bond plus a spread of 300 basis points, which resulted in an annual return of approximately 7.5%. In addition, the reasonable return is highly sensitive on the used techno-economic parameters, such as the investment, for example. From 2020, the regulator (CNMC) suggested a change in the calculation methodology to a WACC-based model, i.e. one taking into account the weighted average cost of capital, which would result in a return 7.1%. The change will probably favour investors since the yields on government debt have fallen significantly: from around a 4.5% rate in 2013 to around 1.6% in November 2018.[176]

[175] 4th Spanish Progress Report, p. 35 and http://www.minetad.gob.es/en-US/GabinetePrensa/NotasPrensa/2018/Paginas/identificacion-proyectos-renovables20180423.aspx
[176] S&P Gobal, 2018, Spain's energy regulator pushes for WACC-based model for renewables market, available from: https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/110218-spains-energy-regulator-pushes-for-wacc-based-model-for-renewables-market

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

Spain has reached its 2018 RES-H&C NREAP sectoral trajectory. Currently, there is no financial support system for RES-H&C in Spain. However, it must be noted that in some cases RES-H&C is already competitive to conventional solutions in Spain. This is the case for example for biomass in industry and solar heating in the residential sector.[177]

New buildings or buildings undergoing major renovation with demand for warm sanitary water must satisfy some of this demand through solar thermal installations. The requirement varies between 30% and 70% of the total warm sanitary water demand of the building. The requirement can be lowered or bypassed if the supply of warm sanitary water is covered by other RES or CHP. In the past, a budget was available for the financial support for large RES thermal plants to supply warm water and air conditioning to buildings through separate programmes: BIOMCASA, SOLCASA, GEOTCASA. The programmes financed up to 80% of the project investment cost for projects with a cap of € 3 million per project. A total budget of € 17 million was available and was exhausted in October 2017.[178]

- **Long-term security of support for RES-H&C: Moderate**

Spain does not have a financial support scheme for RES-H&C anymore. RES technologies for H&C are already competitive in many cases in Spain. Still, Spain has a good chance of meeting its 2020 RES-H&C NREAP trajectory.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partial**

As in many other MS, the main policy instrument for RES-T in Spain is a biofuel quota. With the target to fulfil the obligation under the RES Directive to supply 10% of road transport energy needs from RES by 2020, Spain obliges fuel suppliers to ensure a 6% share of biofuels in their annual fuel sales in 2018. The biofuel share will rise to 8.5% in 2020. Changes to the quota system were implemented in 2015, ending the transitional period on biofuel sustainability.

Furthermore, Spain currently offers grants and tax reductions to support the uptake of electric vehicles.

Grants under the Plan to Promote Sustainable Mobility with Alternative Energy Vehicles (Plan MOVEA) cover electric vehicles, plug-in hybrids or extended range and are worth between € 1,100 and € 15,000. According to the Government's estimates, the aid of the 2017 MOVEA Plan will encourage the acquisition of 1,800 electric cars and vans and 230 electric motorcycles[179]. Regarding tax reductions, city councils (e.g. Madrid, Barcelona, Zaragoza, Valencia) are reducing the annual circulation tax (ownership tax) for electric and fuel-efficient vehicles by 75%.

[177] http://www.iea.org/publications/freepublications/publication/IDR_Spain2015.pdf p. 131
[178] http://www.idae.es/en/ahorra-energia/renovables-de-uso-domestico/git-programme
[179] Spain National Action Framework for Alternative Energy in Transport

- **Long-term security of support for RES-T: Moderate**

The objectives for penetration of biofuels have been significantly reduced in 2013, but the annual biofuel quota is set until 2020.

France

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2018 RES-E NREAP sectoral trajectory)**

France fulfilled its RES-E policy commitments but missed its sectoral trajectory of 24% for 2018, reaching an actual RES-E share of 21%.

France's main support measure in the past has been a feed-in tariff (tarif d´achat), whereby the level of support was either legally defined or determined through tendering procedures (includes biomethane injection to the grid). In order to comply with EU state aid guidelines, it was replaced for larger installations by the so-called compensation mechanism (complément de rémunération) in 2015. This premium tariff scheme is open for solar PV, onshore wind, geothermal, biomass and biogas as well as hydro power. The tender specifications are technology specific and depend on the output of the installation.

In addition to the feed-in tariff and premium schemes, France grants deductions of the income tax to natural persons as well as reduced value-added tax for the purchase of RES-E technology for buildings. Eligible technologies are wind and solar energy as well as hydropower and biomass. The level of deduction is technology-specific.

The Act of 24 February 2017 also reintroduced a reduction on the grid connection by means of tariff reductions (implementing rules laid down in a Decree of 30 November 2017 and entered into force on 4 December 2017). Installations of less than 5 MW receive a discount on connection costs of up to 40%. The greater the capacity of the installation, the smaller the reduction, meaning connection costs are reduced for small installations, effectively removing a cost barrier.

Beyond 2018, the guarantees of origin for electricity generated by renewable electricity installations have benefited from a support scheme (in the form of a purchase obligation or feed-in premium) and have been auctioned by the State in accordance with Article L.314-14-1 of the Energy Code, since September 2019. This is aimed to stop consumers from double counting the value of the renewable share of electricity and the auction revenue will reduce the cost of support for renewable electricity borne by the local authorities.

- **Long-term security of support for RES-E: High**

In its Law on the Energy Transition for Green Growth (Loi de transition énergétique pour la croissance verte), France has set out a target of 40% renewable energies in the total electricity production for 2030. This target and related measures assure the long-term security of support for RES-E in France.

Planning security up to 2028 is ensured by technology-specific volumes which are defined in the four-year frameworks of the Multiannual Energy Plan for the period between 2018 and 2023 and 2024 – 2028 (Programmation pluriannuelle de l'énergie). Until 2023, France plans

to have the following capacities installed: 24.1 GW of onshore wind, 2.4 GW of offshore wind, 20.1 GW of solar PV, 0.8 GW of biomass and 25.7 GW of hydro power plants[180].

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes (but below 2018 RES-H&C NREAP sectoral trajectory)**

The main support instruments are an Energy Transition Tax Credit, reduced VAT rates and a zero-rate eco-loan. With these three measures, the French government aims to have wood-fired heating installed in up to 11.3 million dwellings by 2028, heat pumps in 8.8 million dwellings by 2028 and solar thermal equipment in 4 million dwellings by 2020.

The income tax deduction is the same as for RES-E and amounts up to 30% of hardware costs. The reduced VAT of 5.5% (regular VAT is 20%) rate applies to biomass boilers, heat pumps, fireplace inserts and wood-burning stoves in individual housing units as well as in buildings. The zero-rate eco-loan (éco-prêt à taux zéro) applies to biomass heating and solar thermal energy. The loan amounts up to € 30,000 and reimbursement within 15 years.

In addition, France provides investment support in form of a subsidy for RES-H&C through the Heat Fund. The programme has been set up in 2008 and is currently budgeted until 2028. Over the period 2009-2018, ADEME committed € 2.16 billion in support to almost 4,813 measures, generating a total investment amount of € 6.7 billion and production of 2.37 Mtoe/year (approximately 27.5 TWh/year). Eligible technologies are biomass, geothermal energy, heat pumps and solar thermal energy. The sectors concerned are collective housing, agriculture and industry.

- **Long-term security of support for RES-H&C: High**

The long-term security of RES-H&C support in France is high. Support measures have been set in a transparent manner and well in advance. The Multiannual Energy Plan sets out support until 2028. The annual budget of the heat fund was increased from € 258 million in 2018 to € 350 million in 2020. As another example, the 2019 Finance Act extended the eco-loan scheme for three years (until 31st December 2021). In connection with this extension, the eco-loan was made more practical and was radically simplified, making it easy to understand for households, businesses and banks.

Additionally, France aims to achieve a 15% reduction in energy consumption of buildings by 2023 and renovate half of the 1.5 million uninsulated dwellings inhabited by low-income owner-occupiers over a period of 5 years starting from 2020. Indeed, from 2020 onwards, ADEME will set up a campaign to promote a fivefold increase in renewable and recovered heating and cooling supplied by district heating networks by 2030, as compared to 2012 to local authorities of more than 10,000 inhabitants. Lastly, Article 184 of Act No 2018-1317 of 28 December 2018 on the 2019 budget simplifies the conditions for granting the interest-free eco-loan for loan offers made from 1 July 2019.

[180] https://www.ecologique-solidaire.gouv.fr/sites/default/files/20200422%20Programmation%20pluriannuelle%20de%20l%27e%CC%81nergie.pdf

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

As in many other MS, RES-T is supported through a biofuel quota in France. Fuel suppliers are obliged to ensure a 10% share of biofuels in gasoline and 8% in diesel. In France, the biofuel obligation is linked to a tax on polluting activities called TGAP (Taxe Générale sur les Activités Polluantes). Fuel suppliers are subject to increased tax rates in case they violate the biofuel obligations.

The "aid for the acquisition of clean vehicles" provides financial supports for the purchase of clean vehicles to private individuals and companies. In the first half of 2019 support was provided for 27,956 passenger cars and light commercial vehicles, totalling over € 166 million, which corresponds to an 11.4% year-on-year increase compared to 2018.

- **Long-term security of support for RES-T: High**

The long-term security of RES-T support in France is high. The biofuel quota has been set up in 2015 and there are RES-T targets for 2030. In addition, the current Multiannual Energy Plan sets concrete targets for the incorporation of advanced biofuels by 2023: 3.4% for petrol, 2.3% for diesel[181].

Croatia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Croatia has partially fulfilled its policy commitments for RES-E expressed in its NREAP and earlier Progress Reports. The country has formally implemented a support scheme for RES-E in January 2016, comprising a premium tariff for installations above 30 kW and a guaranteed feed-in tariff for installations below 30 kW, both of which are allocated through tenders. However, the scheme has not been operational yet due to regulatory delays and change of government. Moreover, RES-E projects are supported through financial incentives, such as low-interest loans.

The premium and feed-in tariffs were introduced with the entering into force of the Law on Renewable Energy Sources and Highly-Efficient Cogeneration (RES Act) in 2016. According to the law, support is open to all RES-E technologies and will be disbursed by the Croatian Energy Market Operator (HROTE) over a period of 12 years to bidders who have been successful in auctions. The first auction for supporting 88 MW RES-E has been announced on 29 of July, aiming to support small-size projects (PV, hydro (both up to the size of 0.5 MW), biogas and biomass (up to the size of 2 MW). Upon the success of the first auction and approval by the EC, auctions for supporting large-scale installations will also be launched. Participation in the auction requires fulfilling certain eligibility criteria. These include the requirement to be registered in the national registry of renewable projects, having a building permit (except for building integrated plants producing for self-consumption) and , the acquisition of a connection permit. Moreover, bidders need to submit a bid bond in the amount of HRK 50 (approximately € 7) per kW of the planned capacity. The eligibility criteria

[181] https://www.ecologique-solidaire.gouv.fr/sites/default/files/20200422%20Programmation%20pluriannuelle%20de%20l%27e%CC%81nergie.pdf

are the same for all domestic and foreign companies. However, the tender announcement is available only in Croatian.

Throughout the reporting period, the support scheme was not operational, as most of the by-laws necessary to enforce the RES Act were adopted only several years after the publication of the RES Act. At the end of December 2018, the Government adopted the first major by-law, i.e. the Decree on the Support for Electricity Production from Renewable Energy Sources and Highly efficient Cogeneration, which was followed by the regulations setting up the registry for renewable producers, conditions for acquiring the privileged producer status and setting the quotas (the maximum installed capacity allowed to connect the network until 2030) for different technologies in May 2020. The quotas reflect the energy policy goal of Croatia laid down in its energy strategy, aiming to raise renewables' share to 36.4% by 2030 and to reach a diversified electricity mix by technology and size, to facilitate system integration and deployment of more expensive technologies with good perspectives (e.g. geothermal).

Croatia also provides financial incentives such as low-interest loans to RES-E projects through the Environmental Protection and Energy Efficiency Fund as well as HBOR's Environmental Protection Programme.

- **Long-term security of support for RES-E: Moderate**

As stated above, Croatia has not had an operational RES-E support scheme in place since 2016 due to an incomplete regulatory framework. The missing regulations have been put in place by now, but the starting date of the auction is highly uncertain.

The changes in the regulatory framework with the RES Act have introduced some retroactive changes which can negatively affect the operation of RES-E projects. This is particularly related to the grid balancing charges which have been imposed on all renewable energy projects larger than 50 kW (Article 46/7). These charges are partial contribution to balancing costs from intermittent RES producers, paid by the RES producers to the HROTE, operator of the ECO Balance Group. Balancing responsibility (planning RES production and bearing full financial responsibility for deviation from schedule) lies with the operator of the ECO Balance Group.

Recent progress related to the marketability of renewable generation and reducing balancing costs include the launching of an intra-day electricity market, continuous reduction of supplier's obligation to take over total RES generation and setting up the ECO balance group operated by HROTE, all of which contribute to the sustainable integration of intermittent renewables. Supported RES-E enjoys priority dispatch, but it can be curtailed without compensation in case of possible disruption of the operational security of the system.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: No (but above 2018 RES-H&C NREAP sectoral trajectory)**

Croatia currently has no coherent support scheme for RES-H&C in place. Even though the NREAP of 2013 foresees an increase in RES cogeneration (mostly using biogas) and the implementation of a dedicated support scheme, the government has not yet enacted the required regulatory framework to establish such a scheme. Renewable heat consumption (36.5% of all H&C) is dominated by biomass (96%) almost entirely attributable to household heating with wood in conventional stoves. More advanced renewable technologies, such as geothermal, solar, biogas and heat pumps contribute with only 1% each.

Small grants are available for small-scale RES heat investments. Households, small- and medium-sized companies, non-profit organisations, public institutions and authorities can receive grants from the Environmental Protection and Energy Efficiency Fund to use renewable sources for heating purposes. Local and regional authorities, utilities, companies and small businesses are also supported by the Croatian Bank for Reconstruction and Development.

Grants for farmers for RES heat investments are also made available by the Agency for Agriculture, Fisheries and Rural Development.

- **Long-term security of support for RES-H&C: Low**

The new Law on Renewable Energy Sources and Highly-Efficient Cogeneration does not address RES-H&C. However, heating may be supported through the financial support provided for electricity produced in cogeneration plants, but there is no direct financial support for the heating part of cogeneration. The lack of a dedicated support scheme creates considerable uncertainty about the future prospect of RES-H&C in Croatia.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partial**

RES-T in Croatia is mainly promoted through a biofuel quota obligation. In addition, purchase incentives for electric and hybrid vehicles and tax incentives for the use of biofuels apply.

The Biofuel Act obliges the Croatian State to adopt an Energy Action Plan and submit annual reports on placing biofuels on the market (Art. 7 and 8 Biofuel Act). The latest National Biofuel Action Plan was adopted in the year 2010 and obliges distributors of diesel fuel and gasoline to place a biofuel share of 10% on the market by 2020. In 2018 and 2019, the applicable biofuel share amounted to 7.8% and 9.0% respectively. The low share of RES-T achieved despite the relatively high biofuel quota was due to the improper enforcement of suppliers' compliance; the fining system did not function properly for several years.

In the NREAP from 2013, Croatia announced financial support for the purchase of electric vehicles. While this measure was introduced in 2014 through the Environmental Protection and Energy Efficiency Fund, the support was provided in a limited amount and on a year to year basis without necessary stability and long-term prospect. Furthermore, in 2016 and 2017, the financial support was fully absent. In 2018, the purchase incentive for electric and hybrid vehicles has been introduced again.[182] The scheme has been functioning since then, but the support available per car is relatively high, while the total budget is small, leading to the total depletion of offered support within an hour. The total annual budget for natural persons is capped at 12 million Croatian Kuna (approx. € 1.6 million). The maximum subsidy per car for electric vehicles is 80 000 Croatian Kuna (approx. € 10,800).

Finally, biofuels are exempted from the excise duty according to the Excise Duty Act.

[182] http://www.energetika-net.com/vijesti/elektromobilnost/krecu-poticaji-za-elektricna-vozila-26780

- **Long-term security of support for RES-T: Moderate**

There is considerable uncertainty about the long-term prospect of the support scheme for electric vehicles and the ability of the Croatian authorities to effectively enforce the Biofuels Obligation. Moreover, no biofuel quotas are defined beyond 2020.

Italy

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

In the period 2017-18, RES-E in Italy has been promoted through VAT- and real estate tax deductions and net-metering. Until January 2018, RES-E was also promoted through feed-in tariffs and premiums.

Under the premium tariff scheme (Ritiro dedicato), RES-E plant operators could decide between selling electricity at market prices or receive a guaranteed minimum price (i.e. a feed-in tariff) plus an annual adjustment in case market prices were higher than the guaranteed minimum price. The applicable market prices currently vary according to the region (i.e. North, South). For all RES installations already benefiting from other schemes and for all plants above 1 MW, premium payments apply. Installations with an installed capacity higher than 5 MW had to compete in an auctioning process to receive support. In March 2018, the Ministry for Economic Development approved a draft of the Renewable Energy Ministerial Decree ("Decreto FER 2019") governing support schemes for renewable energies from 2019 to 2021, which entered into force in August 2019 and is primarily based on the allocation of premium payments via auctions.

As part of the net-metering scheme, RES-E installations up to 500 kW can directly market their electricity through Italy's framework for self-consumption ("Scambio sul Posto"), which allows eligible prosumers to offset electricity fed into the grid with the energy taken from the grid. Net-metering can be combined with tax deductions. The balance is calculated annually and prosumers receive a compensation if more electricity was exported than taken from the grid. In addition to net-metering, PV and wind energy plants are eligible to receive a reduced VAT of 10% (instead of 20%). Moreover, buildings equipped with renewable energy installation can benefit from a reduction in the municipality real estate tax (Budget Act of 2008).

- **Long-term security of support for RES-E: High**

The feed-in tariff and premium schemes in Italy provide support for a period of 15 to 30 years, depending on the type of RES, but this support scheme only remained in force until January 2018. Despite this, installation rates of RES have remained high, indicating that investor confidence has remained relatively stable. Moreover, a new auction-based support scheme for all major RES technologies for the three-year period 2019-2021 has been implemented. Overall support investments are set to amount to up to € 5.8 billion per year and expected to provide support to 8 GW of RES installations.[183]

[183] https://www.ashurst.com/en/news-and-insights/insights/new-italian-incentives-for-renewables-fer-2019/

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

RES-H&C in Italy is promoted through a price-based incentive scheme for small RES-H&C installations and a tax regulation mechanism. Since 2016, small RES-H sources such as heat pumps (aerothermal, geothermal, hydrothermal), biomass with capacities up to 2000 kW and solar thermal with a surface up to 2500 m^2 are eligible for financial support through the Conto Termico for a period of up to five years. The support level varies and depends on the type of the plant, source, capacity and location of the installation and can between 40% and 65% of the investment cost. Financial support is provided annually or upfront in case the level of eligible support does not exceed € 5,000. Both private and public bodies can make use of the scheme. For the private sector, a total support cap of € 700 million and for public entities a € 200 million cap applies. The scheme has an annual budget of € 900 million. In 2017 and 2018, € 290 million have been disbursed. The projects contracted in 2018 activated more than € 400 million of investments and resulted in more than 1,500 GWh of thermal energy from renewable sources.

In addition, Italy maintains a tax regulation system that allows for a 50-85% tax deduction for expenses related to energetic refurbishments of buildings and installation of RES-H&C technologies such as solar thermal installations, high-efficiency heat pumps, low-enthalpy geothermal systems, biomass-fired boilers and heat-pump water heaters. The tax deduction of 65% cannot exceed € 100,000, the tax deduction of 85% is limited to € 136,000.[184] Tax reductions cannot be combined with Conto Termico. In the period 2017-18, over € 7 billion in investments have benefitted from tax exemptions.

A separate € 460 million loan fund for renewable heating technologies which had been available through the so-called “Kyoto fund” was available until 2017. The budget of the Kyoto fund has been topped up with € 188 million to run until June 2018.[185]

- **Long-term security of support for RES-H&C: Moderate**

Italy’s pricing scheme for RES-H&C grants incentives for a period varying between two and five years. At this point, it is uncertain if there will be new incentives for RES-H&C installations once the support cap is reached. Tax incentives for RES-H&C mainly apply around the start of the renovation process. However there is no certainty of support after initial investments have been made. Moreover, the tax regulation mechanism has been prolonged. In 2020 a new tax incentive has been issued with a 110% tax break/deduction for cooling systems.

[184] http://www.acs.enea.it

[185] https://www.cdp.it/progetti/tutti-i-progetti/fondo-kyoto-un-anno-in-piu-per-interventi-di-efficientamento-energetico-nelle-scuole.kl

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

The main instrument to increase the RES-T share in Italy is a quota system for biofuels. Since 2018, transport fuel suppliers are requested to additionally fulfil a quota for advanced biofuels. Eligible biofuels are defined as those fuels derived from biomass in the form of gas (bio-methane, bio-hydrogen) or as liquids (bioethanol, biodiesel). Advanced biofuels are biofuels that are exclusively produced from raw materials such as agricultural and industrial wastes residues, ligno-cellulosic materials, cellulosic materials and algae as listed in the respective law (Annex 3, DM 02.03.2018).

In 2017, a 6.5% quota and in 2018, a 7% quota for biofuels applied, of which 0.6% had to be met by advanced biofuels. The biofuel quota is set to increase to 9% and will be valid at least until 2022. The advanced biofuel quota will increase annually from 2018 onwards and amount to 1.85% as of 2022. Obligated parties (i.e. fuel suppliers) demonstrate compliance by providing a number of biofuel certificates (CICs) to the Ministry of Environment. One CIC represents 10 Gcal of fuel energy content or 5 Gcal of advanced biofuel which stems from specified raw materials. In addition, 75% of the advanced fuel obligation must be met through the release for consumption of advanced biomethane and the remaining 25% through other advanced biofuels.

In 2018, a new biomethane decree ("decreto biometano") was introduced as a support system involving the simplified sale of certificates ("Certificato Immissione in Consume") to GSE for ten years at a defined price. The price GSE pays is defined as the monthly weighted average price for natural gas on the market reduced by 5%. Italy earmarked € 4.7 billion for biofuel incentives until 2022. Biomethane and biofuels plants can ask for these incentives if they enter into operation before the end of 2022.[186] Furthermore, for producers of advanced biofuels other than biomethane, a value of € 375 per recognised CIC is available.[187]

As of 2015, Italy exempts owners of electric vehicles from ownership tax for a period of five years, whereby a reduced rate of 25% compared to that of petrol cars is paid. A focus is also put on fuel cell transport, with an aim of having 290,000 fuel cell vehicles by 2030, which will be stimulated by the construction of hydrogen fuelling stations starting in 2020.

Moreover, Legislative Decree No 257/2016 lays down measures to deploy infrastructure for alternative fuels. For example, it sets out that by the end of 2020 an appropriate number of accessible electric vehicles charging points will be put in place. When replacing their fleets, public bodies must also ensure that at least 25% of the new vehicles are eco-friendly. Finally, municipalities have to equip at least 20% of the parking spaces with charging points.

- **Long-term security of support for RES-T: High**

There are some indications of future changes to Italy's RES-T policy. In 2021, the provisions of the Climate Decree will become effective again. The Decree provides for additional funds amounting to € 180 million euros that are directed at municipalities affected by EU infringement proceedings for Italy's failure to comply with its obligations under the EU Directive on air quality.

Between 2020 and the end of 2021, a set of incentives for eco-friendly vehicles amounting to € 70 million will be introduced. The vehicles benefitting from the incentives are divided into

[186] https://www.rinnovabili.it/econormativa/decreto-biometano/
[187] https://www.gse.it/servizi-per-te/rinnovabili-per-i-trasporti/biocarburanti/incentivi

two categories depending on their level of CO_2 emissions: from 0 to 20 g/km and from 21 to 70 g/km. For the first category, the bonus amounts to between € 4,000 and € 6,000 (the latter amount if a more polluting vehicle is scrapped). For the second category, the bonus amounts to between € 1,500 and € 2,500. Additionally, a further tax to discourage the use of polluting vehicles with CO_2 emission levels between 161 g/km and over 250 g/km has been introduced. Between March 2019 and December 2021, the additional tax ranges from € 1,000 to € 2,500 for each car purchased. Finally, from 1 January 2021, incentives of € 1,500 will be available for each car scrapped and € 500 for each motorcycle scrapped, in case they rely on fossil fuels.

The biofuel quota scheme has targeted shares defined until 2022 and is expected to be maintained beyond 2022. No public data is available about the price of biofuel certificates, but there seems to be a reasonable stability of prices at around € 300/CIC. The biofuel certificates will be granted for a period of 20 years.[188]

Cyprus

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Cyprus has partially fulfilled its commitments expressed in their NREAP and previous Progress Reports. Electricity from RES is promoted through a subsidy and two net metering schemes. Regarding the access of RES-E, the principle of non-discrimination is applied, while priority is to be given to RES used in the grid.

In June 2014, Cyprus introduced a net-metering scheme for PV installations up to 3 kW in the residential sector and 10 kW-500 kW in the private sector until a maximum capacity was reached. As of January 2016, the programme was extended to installations with a capacity up to 5 kW and widened to biomass and biogas technologies in 2017. Vulnerable consumers were the initial target group of the programme with a reserved capacity of 1.2 MW. Additionally, 8.8 MW are available to all consumers and 13 MW for installations in non-residential sites. Furthermore, Cyprus supported the installation of 40 MW of solar PV for self-consumption in commercial and industrial establishments as well as off-grid solar PV systems.[189] In June 2018, Cyprus announced a new net metering / net billing scheme for PV installations up to 10 kW (up to 20 MW installed), while 5 MW are reserved for residential consumers and 15 MW for non-residential consumers. Solar PV, biogas or biomass systems in commercial, industrial and public administration sites are eligible for installations from 10 kW to 10 MW (up to 40 MW installed).[190]

Cyprus provides in addition to the net-metering scheme also a 900 €/kW subsidy for the purchase and installation of PV up to 3 kW, within a limit of 1.2 MW of total installed capacity, for vulnerable social groups that will operate under a net-metering scheme.[191] [192]

In 2009, Cyprus launched its first conventional feed-in tariffs scheme which ended in October 2012. Since August 2017 a new support scheme called “Support Scheme for RES electricity production by plants that will be finally integrated in the competitive electricity market” was introduced which covers photovoltaic, wind energy, biomass, concentrated

[188] https://www.mwe.com/en/thought-leadership/publications/2018/04/italy-biofuel-incentives-in-the-transport-sector
[189] http://www.mcit.gov.cy/mcit/EnergySe.nsf/All/B3F78CDCA3517FF1C225811A0034C8EE?OpenDocument
[190] Enerdata (2019): Renewable Energy Support Policies in Europe
[191] Enerdata (2019): Renewable Energy Support Policies in Europe
[192] http://www.res-legal.eu/search-by-country/cyprus/tools-list/c/cyprus/s/res-e/t/promotion/sum/116/lpid/115/

solar power (CSP) and wave energy for a duration of 12 months only. After this time, the power plants must sell their production directly on the competitive electricity market.[193] The scheme ended in July 2018.[194] Since then, no support scheme is in place for RES-E technologies other than solar PV and bioenergy.

- **Long-term security of support for RES-E: Moderate**

The long-term security of RES-E support in Cyprus is moderate. Net-metering schemes with a certain budget and capacity cap are introduced on a yearly basis for solar PV installations. Beyond that, future RES-E installations are expected to generate their revenues purely at the electricity market. In 2017, the Cyprus Energy Regulatory Authority issued a binding timeline concerning the operation of a competitive electricity market ("net pool" Day Ahead Market).

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

In Cyprus, RES-H&C is supported through two grant schemes. The first one offers an investment grant for solar water heaters for residential buildings as well as enterprises, which applies to new installations as well as the replacement of old installations. The grant scheme has been in place for several years now, while the budget is determined on a regular basis. In its latest round, which started in September 2017 and ended in January 2018, a total budget of € 600,000 was available and more than 1,900 applications were submitted.[195]

The second scheme is called "Energy Upgrading of Domestic Residences" and focuses on the energy upgrading of domestic residences. Total budget amounts to € 8 million and among others it provided grants for the purchase and installation of certain RES-H&C technologies (solar thermal, geothermal, hydrothermal and aerothermal heat pumps). The scheme was open from April 2018 to June 2018 and 931 applications were submitted.[196]

In addition to supporting RES-H&C through grants, Cyprus has integrated a number of provisions on the energy performance of buildings, e.g. the Decree on the Energy Efficiency of Buildings and the 'Save & Upgrade' plan for residential buildings. Furthermore, Cyprus ensures the exemplary role of public authorities and has implemented the Directive on the energy performance of buildings and public procurement procedures.[197]

- **Long-term security of support for RES-H&C: Moderate**

As with other support measures in Cyprus, the RES-H&C support schemes ended in 2018. Furthermore, the second grant scheme stopped accepting new applications due to increased interest and as the applications already covered more than 80% of the foreseen budget in May 2018.[198] No reliable information on continuation of the two schemes in and beyond 2018 has been identified. However, despite the moderate long-term security of support, the solar thermal sector is very developed in Cyprus. Grant schemes were introduced only to give an extra push to the mature sector.

[193] Enerdata (2019): Renewable Energy Support Policies in Europe
[194] http://www.mcit.gov.cy/mcit/EnergySe.nsf/All/9BDC1EE5AA2223CAC22582B700274F54?OpenDocument
[195] http://www.mcit.gov.cy/mcit/energyse.nsf/All/EF436A08BDC0BE34C2258209003F0EB4?OpenDocument
[196] http://www.mcit.gov.cy/mcit/sit/sit.nsf/f465c263fb66a34dc2258163002de955/4a13730ab22e88d6c225825500380f1b?OpenDocument
[197] http://www.res-legal.eu/search-by-country/cyprus/tools-list/c/cyprus/s/res-hc/t/policy/sum/116/lpid/115/
[198] http://www.mcit.gov.cy/mcit/sit/sit.nsf/All/918EC77AC914AD99C225829D003E781A?OpenDocument

Transport

- **Fulfilment of earlier RES-T policy commitments: Partial**

Cyprus obliges fuel suppliers to replace conventional transport fuels with biofuels at a level of 2.4% on energy content of all transport fuels.[199] The biofuel quota can be seen as rather low, incomparison to the target of 10%. No additional measures are taken regarding RES-T.

- **Long-term security of support for RES-T: Moderate**

There have been no abrupt changes in RES-T policy of Cyprus. However, the tax exemption on biofuels was revoked in 2011. A support scheme concerning the deployment of electric vehicles was announced in June 2018, but no further details are known.

Latvia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Latvia has partially met its commitments on policy support for RES-E according to its NREAP and previous Progress Reports.

Electricity generation from RES-E is supported by a complex support system based on a feed-in tariff. This support system also includes elements of a quota and tendering system. Due to a lack of transparency in implementation and high costs for the consumer, the existing technology-neutral support system has been suspended since 2011 and closed for new plants until 1 January 2020. On 19 February 2020 Parliamentary Commission of Inquiry presented and Parliament published a final assessment report on the feed-in tariff system in Latvia[200]. The commission concluded that the system was poorly managed and advised Ministry of Economics to create new legal norms to annul current support system. The new norm should not influence the existing installations and the ones that have already initiated construction of new plants. Due to COVID-19 further discussions on RES support system have been postponed. Since January 2020 new RES permissions haven't been issued.

In addition to an evaluation and revision of the state support mechanisms for power generation, strict monitoring and control of subsidised power generators has been carried out in recent years as well as the introduction of a limited timeframe for the implementation of RES projects. Furthermore, subsidised companies that received financial support through electricity generation from RES or CHP plants under the existing feed-in tariff, had to pay a tax from January 2014 to December 2017.

The Regulator Board Resolution No.1/7, approved on 27 March 2018, introduced a new version of the "System Connection Rules for Electricity System Participants" which creates simplified requirements for the connection of micro-generators (up to 11.1 kW). The draft agreement is intended to provide a simplified procedure for connecting micro-generators to electricity generation systems for own consumption. In addition, an amendment to the Electricity Market Act was adopted in January 2020, which eliminates the need for the Ministry of Economy to approve the installation of micro-generators. This simplification in the

[199] https://epure.org/media/1369/overview-of-the-biofuel-policies-and-markets-across-the-eu-28-final.pdf
[200] https://likumi.lv/ta/id/313019-parlamentaras-izmeklesanas-komisijas-par-oik-atbalsta-ieviesanas-merkiem-ietekmi-kriterijiem-atbalsta-sanemsanai-atbalsta-intensitati-eiropas-komisijas-2017-gada-24-aprila-lemumu-lieta-sa43140-2015nn-un-par-nodarito-kaitejumu-un-tiesibu-aizsardzibas-instituciju-ricibu-galazinojums

administrative procedure is intended to help people who want to generate electricity from RES for their own consumption to overcome administrative barriers. Since 1 April 2020 households no longer have to pay the variable share of the electricity mandatory procurement component for the amount of electricity generated by them.[201]

The system for measuring net electricity consumption was evaluated in 2018, and work was started on improving the grid system and developing additional solutions to promote own consumption of electricity.

Work on the NECP began in 2018, identifying, among other things, obstacles to the further development of wind energy in the Latvian electricity market. According to the final NECP, Latvia expects new wind and solar PV capacities. Based on the Latvia's electricity transmission networks, the increase of 800 MW would be acceptable. However, NECP does not address the creation of any new RES support policy.

- **Long-term security of support for RES-E: Low**

The access of renewable energy installations to the grid is subject to general energy legislation. Electricity from RES is not given priority at present. The transition to the new main support system for RES-E has not yet been successful and there have been retroactive policy changes.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

The Latvian gas market has been fully liberalised since 2017. In addition, the Cabinet of Ministers adopted new regulations on "Requirements for the injection of biomethane and liquefied natural gas into the natural gas transmission network" ("Prasības biometāna un gāzveida stāvoklī pārvērstas sašķidrinātās dabasgāzes ievadīšanai un transportēšanai dabasgāzes pārvades pārvades un sadales sistēmā")[202] in September 2016. These regulations provide an opportunity for the renewable energy industry to participate in the supply and sale of gas using the existing Latvian gas pipeline infrastructure. However, this is associated with high costs for the renewable energy producer, as Latvia does not have any plant that can produce biomethane at present.

Nevertheless, Latvia supports renewable heat with various fiscal measures, such as:

- Investment support for the installation of new thermal power plants from renewable energy sources in district heating and fuel switch projects.
- Investment support for the replacement of fossil sources by renewable energy in public buildings, apartment buildings and industrial plants.
- VAT reduction for suppliers of biomass and biogas for households.
- VAT reduction for suppliers of district heating for households.
- Excise duties reduction when biogas is used for heating.

[201] https://www.em.gov.lv/en/news/27970-conditions-for-net-system-users-have-been-simplified

[202] https://likumi.lv/ta/id/285189-prasibas-biometana-un-gazveida-stavokli-parverstas-saskidrinatas-dabasgazes-ievadisanai-un-transportesanai-dabasgazes-parvades

- **Long-term security of support for RES-H&C: Moderate**

The Latvian government's main focus in terms of heating and cooling is on energy efficiency and investment in district heating rather than renewable energy. There is only one policy that promotes the development, installation and use of RES in the H&C sector:

- The obligation to consider the use of renewable heating and cooling systems in new and renovated buildings.

Therefore, the developments in recent years show a rather negative picture regarding the long-term security of support for RES-H&C in Latvia. Although the Latvian gas market is liberalised and a legal framework for the introduction of biomethane into the gas network has been developed, there is still no clear vision of a future support system.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partial**

The Latvian RES-T share was only 4.73% in 2018 while the sectoral trajectory was set at 7.2% for 2018.

Biofuels are the most important RES used in the transport sector in Latvia, however both the "Biofuel Production and Use in Latvia (2003-2010)" program and the national support programme "Aid for Biofuel Production" ended in 2010. On 21 July 2017 the Latvian government approved the conceptual report "On the Use of Renewable Energy Resources in the Transport Sector"[203]. Since 25 April 2017 the “Alternative Fuels Development Plan“[204] is in force as well as the “Electromobility development plan“. The mandatory blending quota of 4.5% – 7% biofuel in fossil fuel is the main instrument in force for RES-T support in Latvia.[205] In addition, excise taxes payable by companies processing, holding, receiving or dispatching energy products are reduced for fuels blended with biofuels.

In addition to the support of biofuels, several measures regarding electric mobility have been adapted in recent years. These included grants for plug-in hybrids and electric cars[206], as well as subsidies for development of e-mobility charging infrastructure.[207] In 2014 grants for 174 electric cars with overall budget € 4.7 million were approved. In 2018 the first 70 fast charging stations were built on Latvia’s main roads (currently 82). At the same time, control and monitoring system for electric vehicle charging infrastructure is being developed. The overall budget of the project is € 8.3 million. Until 1 April 2018, 427 electric vehicles have been registered in Latvia (1,053 in 2020).

- **Long-term security of support for RES-T: Moderate**

Although some measures to develop a charging infrastructure are underway and subsidies for electric cars were available for a short period of time, there is a lack of clear medium to long-term support for both biofuel and electric cars. The mandatory blending rate of 4.5%-7% biofuel offers some security.

[203] https://likumi.lv/ta/id/292398-par-konceptualo-zinojumu-par-atjaunojamo-energoresursu-izmantosanu-transporta-sektora

[204] https://likumi.lv/doc.php?id=290393

[205] https://likumi.lv/ta/id/296656

[206] http://varam.gov.lv/lat/darbibas_veidi/KPFI/?doc=17874

[207] http://www.e-transports.org/index.php/jaunumi/203-turpinas-elektrisko-transportlidzeklu-uzlades-tikla-izveidosana-3

Latest projections for the RES-T sector have been presented in the NECP. Business as usual projections (in NECP without measures (WEM) projections) shows that the level of the estimated targets will not be reached. Moreover, due to the unclear RES policy for new capacities since 2011 and reduction of the current support, the ambition to introduce biogas (biomethane) use in transport and RES electricity until 2030 seems massive.

Lithuania

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2018 RES-E NREAP sectoral trajectory)**

Lithuania has fulfilled its policy commitments expressed in its NREAP and earlier Progress Reports. The main support instrument for RES-E in Lithuania in the reporting period is a sliding feed-in premium. For installations with a capacity of up to 10 kW, support payments are administratively set. Installations above 10 kW have to successfully bid in technology-specific auctions to receive premium payments. Except for electricity generated from geothermal power technologies, all renewable electricity generating technologies were eligible for this support scheme. The Law on Energy from Renewable Sources introduced caps for sliding feed-in premium payments for each eligible technology until 2020: 500 MW for wind power, 10 MW for solar PV (except small-scale solar PV up to 30 kW), 128 MW for hydro power plants and 105 MW for biogas and biomass power plants.[208] However, since these support caps had already been reached in 2015, no tenders have been organized since then and the support scheme is closed for new plants. A new support scheme implementing technology-neutral tenders for fixed feed-in premiums is in place since 2019. The first auction took place in September 2019, and the winners received support to generate up to 0.3 TWh of electricity.

Lithuania also supports RES-E through a number of subsidy programmes. The Lithuanian Environmental Investment Fund (LEIF) supports inter alia RES-E projects with the exception of geothermal energy in the form of interest subsidies and soft loans. The maximum subsidy is € 200,000 and cannot exceed 80% of total project expenses. Moreover, the Climate Change Special Program allocates at least 40% of its resources for promoting the use of RES, including for RES-E technologies, in the form of loans and investment grants. Finally, Lithuania promotes the uptake of RES production in the industry sector with its 'Renewable energy sources for industry LT+' programme which provides investment grants to industrial companies who successfully participated in a tender. The programme is financed through EU Structural Funds and started in 2016. Until December, 90 enterprises had received subsidies and over € 21 million of funding had been allocated. In addition to these subsidies, RES-E in Lithuania also benefits from an exemption from excise duty.

Furthermore, solar, wind and biomass installations below 10 kW (operated by individuals) and 100 kW (operated by legal persons) respectively are eligible for net metering. In this scheme, the self-generating customers are relieved from paying a Public Service Obligation levy for the self-generated and consumed amount of electricity. However, fees for the use of the electricity grid set by the National Commission for Energy Control and Prices (NCC) apply.

[208] https://www.e-tar.lt/portal/lt/legalActEditions/TAR.FC7AB69BE291?faces-redirect=true

In 2018 Lithuania decided on an ambitious renewable self-consumer subsidy programme to meet the goals stated in the National Energy Independence Strategy ratified in 2018. According to it, the share of RE prosumers should reach 2% by 2020, 30% by 2030 and 50% by 2050.[209] To reach these goals, Lithuania has already allocated € 11.5 millions of funding and has made available an additional € 18 million of funding between 2020-2021, which will be provided by the national budget and EU funds. The prosumers can use the subsidy in three different forms: to partially cover the cost of infrastructure, to lease or to rent the infrastructure from the state. Besides, Lithuania simplified the procedures to join the electricity system, as it is now operated by one state-owned company – AB ESO – who controls the surplus/shortage of electricity within the system. As a result, the number of prosumers has increased 8 times in the past three years and this is expected to continue.[210] It should be pointed, that solar plants may not combine prosuming with other subsidies.

- **Long-term security of support for RES-E: High**

In Lithuania, RES-E support measures are set in a transparent manner and administrative changes are communicated upfront. The National Energy Independence Strategy, adopted in 2018, sets specific RES-E targets for 2020, 2030 as well as an indicative trajectory for 2050. Lithuania's planned RES-E trajectory for 2020 is 23% of final electricity consumption.[211] By developing wind potentials, renewable electricity is expected to reach 45% of final electricity consumption by 2030 and 80% by 2050. The new strategy and planned corresponding support measures, such as a new auction-based support scheme for RES-E, implemented in 2019, provide positive signals for the future of RES-E in Lithuania. Between 2020 and 2022, three auctions for the allocation of support to generate up to 0.7 TWh of electricity are planned.[212] The government has committed up to € 146 million over 12 years to the winners of these auctions under the country's Renewable Energy Act.[213]

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Lithuania has fulfilled earlier policy commitments. RES-H&C is supported through a range of support measures, including feed-in tariffs for biogas injected into the natural gas system, priority purchase of heat produced from RES, loans and investment grants as well as tax exemptions.

According to the Law on Energy from Renewable Sources, biogas produced and injected into the natural gas system is purchased at the feed-in tariffs set by the National Commission for Energy Control and Prices (NCC). The feed-in tariff amounts to between 2.6 and 7.2 €ct/kWh, depending on the RES source and the size of the plant. In addition, Lithuania promotes the priority purchase of heat produced from RES by requiring heat suppliers to purchase all heat from RES produced by independent producers. Moreover, the purchased heat from RES has to meet environmental and quality requirements as well as standards for the security of supply.

Besides that, Lithuania promotes small-scale biofuel cogeneration through investment grants. The scheme applies to new biofuel-based high-efficiency cogeneration units (with an

[209] https://enmin.lrv.lt/uploads/enmin/documents/files/ENMIN_gaminantys_vartotojai_vizija.pdf
[210] http://lvpa.lt/upload/files/Saules%20energetikos%20seminaras/Gaminantys%20vartotojai_%20Ka%20jau%20pasiekeme%20ir%20kas%20toliau.pdf
[211] https://ec.europa.eu/lithuania/news/europos-komisija-patvirtina-param%C4%85-elektros-energijos-gamybai-i%C5%A1-atsinaujinan%C4%8Di%C5%B3j%C5%B3-energijos_lt
[212] https://inovacijos.lt/lt/naujiena/investuotojai-pasirenge-sparciai-investuoti-i-atsinaujinancios-energetikos-pletra-be-valstybes-paramos
[213] http://taiyangnews.info/markets/bidders-seek-e0mwh-market-premium-in-lithuania-auction/

electrical power of up to 5 MW and a rated thermal input not exceeding 20 MW) in district heating systems (except in Vilnius and Kaunas). Lithuania also provides investment aid for the modernisation of fossil-fueled boilers in houses and installing heat-generating installations that use RES. In addition, the Climate Change Special Program allocates at least 40% of its resources for promoting the use of RES, including for RES-H&C technologies, in the form of loans and investment grants.

Finally, there are exemptions from the Environmental Pollution Tax for biogas and biomass plants for all emissions they generate.

- **Long-term security of support for RES-H&C: High**

The long-term security of support for RES-H&C in Lithuania is high. Key support measures run until 2020 and beyond. The New National Energy Independence Strategy was adopted in June 2018 and sets RES targets for 2020, 2030 as well as indicative targets for 2050 for the RES share in total final energy consumption – 23%, 45% and 80% of final energy consumption respectively.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

In Lithuania, RES-T is promoted through biofuel quota obligations as well as tax exemptions.

Lithuania obliges fuel suppliers to fulfil a biofuel quota. Petrol must contain at least 5% of biofuels while for diesel the share is set to at least 7% of biofuels. Moreover, RES-T is promoted by a subsidy on raw materials for biofuel production accompanied by exemptions from excise tax for biofuels used in the transport sector and from environmental pollution tax for biofuel used in vehicles.

- **Long-term security of support for RES-T: High**

No end dates are reported for the current support measures for RES-T in Lithuania and there are no indications of changes in the future. In 2020, a new support scheme for electric vehicles was announced. As part of this scheme, individuals are eligible for up to € 4,000 compensation when purchasing a new electric vehicle or € 2,000 if purchasing a used one. Even though this subsidy programme will end in less than a year, it is a big leap promoting electric vehicles in Lithuania.[214]

Luxembourg

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2018 RES-E NREAP sectoral trajectory)**

The main RES-E support instruments in Luxembourg are feed-in-tariffs and sliding feed-in premiums on top of the market price. Eligible technologies are wind and solar energy, biogas, biomass as well as hydro power. Geothermal energy is not supported. The total available budget for RES-E support in 2016-2020 is approximately € 150 million.

[214] https://www.apva.lt/kvietimas-pagal-priemone-elektromobiliu-isigijimo-fiziniams-asmenims-skatinimas/

To comply with EU State Aid Guidelines, Luxembourg amended its support for RES-E installations larger 500 kW (3 MW for wind power plants) in June 2016. These installations are granted a premium on top of the wholesale market price instead of a feed-in-tariff. Moreover, Luxembourg launched a tender scheme for solar PV exceeding 500 kW in 2018.

In addition to the feed-in-tariff and premium scheme, Luxembourg supports RES-E installations through four different types of investment grants. The grants apply to different applicants. The first grant (Régime d'aides pour la promotion de l'utilisation rationnelle de l'énergie et la mise en valeur des énergies renouvelables) supports solar PV installations of up to 30 kWp with up to 20% of investment costs and a maximum of 500 €/kWp for natural persons, non-profit associations, and private and public real estate developers other than the state.

The second grant (Régime d'aide à la protection de l'environnement et à l'utilisation rationnelle des ressources naturelles) is directed at natural persons and companies and supports all RES-E technologies with up to 45% of the additional investment costs of renewable energy as compared to non-renewable sources. The third grant (Régime d'aide en faveur des classes moyennes) is especially directed at companies and covers up to 40% of investment costs of RES installations.The fourth grant (Fonds pour la protection de l´environnement) especially supports municipalities in their investment of solar PV installations with up to 50% of investments costs.

In 2017, Luxembourg was the first MS to sign agreements for statistical transfers, namely with Lithuania and Estonia. The agreements stipulate that Luxembourg will be provided statistic transfers for the period 2018 - 2020 in order to meet its 2020 RES target.

- **Long-term security of support for RES-E: High**

The long-term security of support for RES-E in Luxembourg is high. Despite several amendments of the feed-in-tariff, RES-E support in Luxembourg is stable.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

In Luxembourg, RES-H&C is supported by different types of investment grants. Eligible technologies are heat pumps, geothermal energy, biomass and solar thermal energy. The granted support ranges from 25% to 50% of investment costs.

- **Long-term security of support for RES-H&C: High**

The long-term security of support for RES-H&C in Luxembourg is high. New support conditions have been introduced in 2013 and are scheduled to be in place until 2020. Moreover, a continuation of support post 2020 is envisaged to comply with NREAP planning for that period.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

Luxembourg has fulfilled its earlier RES-T policy commitments. As many other MS, Luxembourg supports RES-T by means of a biofuel quota system. For 2018, biofuels must

make up at least 5.7% of the annual sale of petrol and diesel fuel companies. If the quota is missed, a pollution tax must be paid.

The building of a charging infrastructure is mentioned in the NREAP and the latest Progress Report states that by 2018 the first 277 public charging stations had been installed. 800 public charging stations are to be built until 2020.

- **Long-term security of support for RES-T: High**

The biofuel quota is in place and no end date has been reported.

Apart from biofuels, e-mobility is another key pillar for meeting future RES-T targets and obligations. Here Luxembourg set ambitious targets and new policies are on the way as prescribed in the NREAP.

Moreover, measures to facilitate public transport serve as third pillar for the decarbonisation of transport sector which, in turn, reduces the use of fossil fuels and consequently leads to an increase of RES-T shares.

Hungary

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Since January 2017 the main support scheme for RES-E in Hungary (METÀR) is split in four sub-schemes. Installations between 50 to 500 kW are supported by feed-in-tariff. Installations between 500 kW and 1 MW receive a green premium on the wholesale market price, for which they can apply directly. Installations larger than 1 MW need to successfully take part in a tender to receive the premium. Eligible technologies are biogas, biomass, hydro power, solar and geothermal energy. In theory wind energy is also eligible for the tender, however building wind plants is practically banned by regulation, setting non-feasible technical conditions for their installation and siting.

However, per government decree the eligible amount was set to 0 MW until 2018. In 2018 support for 652 GWh was expected to be distributed with a total support volume of around € 20 million. So called 'brown premium' can also be acquired by existing biomass and biogas plants after their subsidy period ends. This makes up the difference between their costs and the wholesale electricity market price, or the price of their inputs and the price of fossil fuels that could replace their renewable fuels, in order to sustain renewable generation.

Due to the very intense interest in supports under the renewed feed-in tariff and administrative green premium systems (available for plants between 0.5 and 1 MW), no new applications for FIT can be submitted since April 2018, and no applications are accepted for green premium since May 2019.[215] The budget available for these categories has been reallocated under the auction scheme, where installations can participate from 0.3 MW size.

The first tender for the larger installations took place between 4 November 2019 to 2 December 2019, for the support of 200 GWh renewable generation, with a maximum budget of € 2.8 million, (HUF 1 billion) of which the HEA envisages to pay HUF 229 million per year as a support for the winning projects, as a result of the competitive bidding process.

[215] Ministerial Decree, 62/2016

Investment grants are also allocated to renewable installations (besides H&C and energy efficiency) using EU Funds.

Additionally, Hungary introduced a net metering scheme in 2007 (operating since 2008) which is still in place and applies to RES-E installations below 50 kW.

- **Long-term security of support for RES-E: Moderate**

Hungary replaced its previous support scheme in 2017 with the introduction of a tariff, a premium and a tender scheme for larger installations. A ministerial decree specified the total budget to be allocated to all categories under the new support system during its validity period (2017 – 2026). Each year, HUF 1 bln was to be allocated for new support payments under the FIT, HUF 0.5 bln for green premium without tender, and HUF 1 bln for plants participating in competitive bidding. The relatively generous FIT and administratively set FIP levels attracted a large number of applicants, which would have resulted in the depletion of budgets for several years and long queuing of applicants. Therefore, these amounts have been reallocated under the budget set for the auction scheme, and no applications for FIT and FIP under 1 MW are accepted until the end of the support scheme period (2026). Therefore, smaller plants also need to participate in competitive bidding (above 0.3 MW) to have access to support.

The transition to this new system was slow and the new METÁR is not an overarching law, but rather consists of individual elements specified e.g. in the law on electricity several governmental, ministerial and energy regulatory authority decrees are combined. This fragmentation in various types of legal instruments also characterised the previous regulatory framework before METÁR and provides an easy mechanism to reverse policy direction. A typical example is the impediment of wind power's expansion per governmental decree in 2016. The complexity and fragmentation of the regulatory framework results in a lack of transparency and leaves the system exposed to the risk of sudden changes.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

In Hungary, RES-H&C is supported through grants and loans provided by the Environment and Energy Efficiency Operational Programme (EEEOP) and the Economic Development and Innovation Operative Programme (EDIOP). The support of RES-H&C is closely connected to building modernisation and energy efficiency measures for public, parochial and residential buildings, and small and medium-sized enterprises. Between 2017 and 2022, around € 1.1 billion are to be allocated for the enhancement of energy efficiency and the application of RES. However, this number might overstate the impact of the programmes, as a large part of grants and loans is taken by energy efficiency improvements, such as replacing inefficient gas boilers or insulation the building, without any direct link to renewable energy usage.

Implementation of the support scheme for renewable district heating is controversial. There is increased rate of return applied by the Hungarian Energy and Public Utility Regulatory Authority when setting the tariff for district heat (DH) generated by renewable energy, but other elements of price regulation (eg. annual tariff setting, ex-post profit cap) as well as administrative barriers of relevant operative programme discourage producers and suppliers from implementing renewable DH projects.

The overall target set for RES H&C in the NREAP is reached, but the lion's share of the increase comes from the change in statistical measurement of biomass use, under which the

previous numbers were revised to reflect data on the demand side (consumption) instead of the supply side (sales of firewood). The sharp increase in renewable district heating envisioned by the NREAP didn't come true.

- **Long-term security of support for RES-H&C: Moderate**

RES-H&C's long-term security of support in Hungary is moderate. The above mentioned schemes run from 2014 to 2020 and provide calls for applications supporting RES-H&C installations on a first-come-first-served basis besides RES-E and energy efficiency investments. However, the scheme is not considered stable by investors and experts - for instance, the tendering procedures are incomprehensible and not transparent - and a clear strategy for the diversification of resource use is missing.

The NECP includes measures using funds from the GINOP and VEKOP, the operative programs financing projects in Middle-Hungary, as well as loans provided by the Hungarian Development Bank for the refurbishment of buildings, including renewable heating and cooling systems until 2030.

Project implementation is lagging because of highly bureaucratic procedures. The involvement of a central state-owned counterparty (National Institute of Development) into all DH projects aimed at renewable heat generation leads to increased bureaucracy and red tape, slowing down project implementation.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

As in many other EU MS, the main support measure for RES-T in Hungary is a biofuel obligation. The quota is set for a period of three to four years. For the period of 2014 to 2018, Hungary obliges fuel suppliers to mix a biofuel share of 4.9% into their fuels. In 2019 and 2020, the quota will rise to 6.4%. From 2020 the quota was increased to an overall 8.2%, within which a separate 6.1% obligation was set for bioethanol in order to increase the probability of reaching the RES-T target.

Despite the quota share being low in the reporting period, Hungary is on track to meet its 2020 RES-T target due to the applicable methodology which allows for double accounting of certain biofuels.

Electromobility is also promoted through investment grant and tax allowances.

- **Long-term security of support for RES-T: High**

Hungary has not made significant changes in RES-T policy in 2017 and 2018. The mandatory biofuel quotas are set in advance for a period of three to four years. However, the biofuel obligation was increased in 2020, and the promotion of electric mobility is now handled as a priority by the government. The Hungarian NECP specifies a 14% RES-T target for 2030, ensuring a 7% share for first-generation biofuels and 3,5% for advanced biofuels, biofuels produced from renewable waste and biogas. The remainder is planned to be reached by using renewable electricity in transport.

Malta

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Malta has partially fulfilled its NREAP commitments. Malta has two support schemes, an administratively set feed-in-tariff for small PV installations and a tender based feed-in-premium scheme for larger PV and wind plants. Solar PV installations below 1 MWp are eligible for the feed-in-tariff between 0.1405 €/kWh and 0.155 €/kWh, depending on their size.

The tender scheme aims at auctioning 50 MW of solar PV capacity with three tenders. The first was held in October 2017, a second in October 2018 and the third in May 2020.[216] In June 2020 Malta also held a new 5 MW technology neutral tender for installations between 400 kWp and less than 1000 kWp, which was open to all RES-E technologies.[217] While the auction is in theory technology-neutral the size restriction limit the possible technologies significantly.

Long-term security of support for RES-E: Moderate

Feed-in tariffs are available only until the annual target capacity of 4.2 MWp is reached for installations of 1 kWp to 40 kWp and 8 MWp for installations of 40 kWp to 1 MWp.

No tender schedule beyond the 2020 auction is published yet.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

Malta has made some progress in adopting new RES-H&C measures. The government continues to support the deployment of solar water heaters (SWHs) with an investment grant scheme. In addition, a similar grant scheme for heat pumps was introduced in 2017. Yet, Malta has still not adopted measures for the promotion of CHP that it committed to in its NREAP.

- **Long-term security of support for RES-H&C: Moderate**

Long-term planning security is limited, as support schemes are extended only on a yearly basis. As a result, it is unclear for investors whether there will be support available in the mid-term future.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

In the past, a biofuel quota has been Malta's main policy measure regarding RES-T. Introduced in 2011, the biofuel content level is set to gradually increase from 1.5% in 2011 to 10% in 2020.

Introduced in January 2017, a new grant scheme is set to incentivise the purchase of Battery Electric Vehicles (BEV), Range Extender Electric Vehicles and Plug-in Hybrid Electric Vehicles, Battery Electric Quadricycles, Electric Motor Scooters and Cycles as well as Pedelecs (Electric Assisted bicycles). The scheme has varying conditions. E.g., for private

[216] https://energy.gov.mt/en/tenders/Pages/INVITATION-TO-BID-(ITB)-FOR-FINANCIAL-SUPPORT-FOR-ELECTRICITY-FROM-SOLAR-PHOTOVOLTAIC-INSTALLATIONS-WITH-CAPACITY-0521-5607.aspx

[217] https://energy.gov.mt/en/tenders/Pages/INVITATION-TO-BID-(ITB)-FOR-FINANCIAL-SUPPORT-FOR-ELECTRICITY-FROM-RENEWABLE-SOURCES-OF-ENERGY--WITH-CAPACITY-BETWEEN-400kW.aspx

individuals registering a new or used electric vehicle the grant amounts to € 5,000. For registering a new electric vehicle and de-registering a vehicle with internal combustion engine which is at least ten years old, € 8,000 are granted. The scheme will be reviewed from time to time to respond to changing conditions. First adjustments already took place in July 2017. Alongside the promotion of electric vehicles, Malta aims to increase the number of public charging points.

- **Long-term security of support for RES-T: Moderate**

The biofuel quota, introduced in 2011, set out predefined required biofuel levels up to 2020.

The conditions of the investment grant for electric vehicles, on the other side, are subject to continuous change, which might affect the effectiveness of the scheme.

Netherlands

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2018 RES-E NREAP sectoral trajectory)**

The Netherlands have strengthened their commitments expressed in the NREAP in terms of policy support for RES-E, predominantly by increasing the available budget for RES support. Nevertheless, they have not reached their RES-E NREAP sectoral trajectory.

The most important policy for RES promotion is the SDE+ (Stimulation of Sustainable Energy Production) under which producers receive a feed-in premium. The SDE+ promotes RES used for electricity, renewable gas and heating purposes (CHP). Support is paid for a period of 8 to 15 years depending on the technology. In the years 2017 and 2018 the total budget was € 12 billion annually, which was split in two auction rounds of € 6 billion each year. This presents another sharp budget increase, to the already increased budget of € 9 billion in 2016. However, budgets in spring of 2017 and 2018 were not fully utilized. Budget for the two auction rounds in 2019 was reduced to € 5 billion each. The spring round in 2020 has a budget of € 4 billion.

Per fall round 2020, the SDE-scheme will change focus from energy production to CO_2-reduction. In this altered scheme (called SDE++) energy production technologies will compete with be industrial decarbonisation technologies. In the first SDE++-round (which was postponed to November 2020) a budget of € 5 billion is available.

Solar PV dominated all auction rounds from 2017 onwards, with over 8 GW of capacity being awarded in 2017 and 2018. At the same time, budget claims from onshore wind decreased significantly due to licensing and siting issues. This resulted in awarding only 65 MW in 2018 and over € 2 billion of auction revenue remaining unused.

Additional efforts have been made concerning offshore wind energy, including the adoption of the Offshore Wind Energy Act (Wet windenergie op zee) in 2015. This act enables permits to be granted for offshore sites for wind energy by means of tendering procedures under a separate budget, leading to record low and even zero subsidy bids. However, many permits for offshore wind that were issued when the NREAP was published were retracted to develop a more coordinated national approach for offshore wind. This caused the actual growth of offshore wind to be significantly lower than expected in 2018. Recent auctions for

offshore wind will result in additional capacity to come online, but most of these new offshore wind parks will come online after 2020.

Furthermore, fiscal support measures are implemented. The EIA (investment subsidy) scheme's deductible percentage dropped in 2017 to 55% and in 2018 to 54.5%. In 2019 it was further reduced to 45% with an available budget of € 147 million.

- **Long-term security of support for RES-E: Moderate**

The SDE+ will be replaced by the SDE++ in fall 2020. The SDE++ no longer focuses solely on the production of RES, but on the avoidance of CO_2 emissions, allowing industrial decarbonisation technologies to compete for SDE++-budget. In the altered scheme, technologies will no longer be ranked on base amounts (expressed in €/kWh), but on subsidy-intensity (expressed in €/tCO_2 avoided). Per 2020 fall-round, five categories are eligible for support: renewable electricity generation, renewable heat (CHP), renewable gas (biomass), CO_2 reducing heat (geothermal, e-boilers, heat-pumps) and CO_2 reducing production (CCS and hydrogen electrolysis). SDE++ subsidy is awarded over a period of 12 or 15 years. The indicative budget of the SDE++ support in 2030 highlights the transition away from the focus of support for RES-E generation to avoidance of CO_2 emissions, with only a fifth of the total budget.[218] The Ministry of Economic Affairs is planning to end SDE++-support for RES-E per 2025.[219]

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: No**

The Netherlands have strengthened the existing elements of RES-H&C policy support but are expected to miss their RES-H&C NREAP sectoral trajectory. The main Dutch RES support scheme, the SDE+, covers renewable heat (biomass, geothermal, solar) since 2012.

Additionally, since 2016 the investment subsidy for sustainable energy ISDE exists. Through ISDE, the Dutch government aims to promote the heating of homes and offices by means of sustainable heat. Private individuals and business users can therefore obtain a subsidy via the ISDE on the purchase of solar boilers, heat pumps, biomass boilers and pellet stoves. ISDE runs until 31 December 2020. The budget for 2019 was € 160 million and € 100 million for 2020.

- **Long-term security of support for RES-H&C: High**

The SDE+ is replaced by the SDE++ in 2020, focusing no longer solely on the production of sustainable energy, but on the reduction of CO_2 emissions. The introduction of industrial decarbonisation technologies (including electric boilers, heat pumps and residual waste heat) extends the number of RES-H&C technologies within the scheme.

In addition, the ISDE programme is expected to extend to 2030 but will no longer support pellet stoves and biomass boilers. Heat pumps and solar-boilers are only supported for buildings for which the building permit has been obtained before July 2018. [220]

Transport

[218] Ministerie van Economische Zaken en Klimaat (2019), Kamerbrief Verbreding van de SDE+ naar de SDE++ 26 april 2019
[219] Klimaatakkoord (2018), Afspraken voor elektriciteit, https://www.klimaatakkoord.nl/elektriciteit
[220] Ministerie van Economische Zaken en Klimaat (2019), Kabinetsreactie beleidsevaluatie Investeringssubsidie Duurzame Energie (ISDE), november 2019

- **Fulfilment of earlier RES-T policy commitments: Yes**

The Netherlands fulfilled their policy commitments in the RES-T sector. A biofuel quota exists as main instrument. The quota was raised from 7.75% in 2017 to 8.5% in 2018. The target in 2020 is 16.4%. The actual deployment in 2018 was 8.9 %, which means that the target was accomplished.[221]

Furthermore, there are tax credits for biofuel and hydrogen related RES-T investments. The energy investment allowance (EIA) supports investments into biofuels and the environmental investment allowance (MIA) which offers private companies tax deductions on certain environmental investments such as hydrogen passenger cars or buses. MIA's budget amounted to € 99 million in 2018.

- **Long-term security of support for RES-T: Moderate**

There have been no abrupt changes in RES-T policy since the First Progress Report. As the NREAP announced in 2010, the quota is increasing more steeply in the 2015-2020 period.

There are also plans for additional RES-T measures after 2020 that are mentioned in the Dutch Climate Agreement. These include zero-emission zones for city-logistics in 30-40 larger municipalities, 30% CO_2-reduction in rural areas and continental transport, only allowing electric vehicles as new passenger cars in 2030 and the stimulation of FCEV for passenger cars and heavy transport with the aim to realise, by 2025, 50 hydrogen fuel stations, 15,000 passenger cars and 3,000 heavy transport vehicles.[222]

Austria

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

Austria has fulfilled its policy commitments for RES-E expressed in its NREAP and earlier Progress Reports. RES-E continues to be primarily promoted through technology-specific feed-in tariffs, which have been in place since the introduction of the Green Electricity Act in 2012 (Ökostromgesetz 2012, ÖSG 2012) and related regulations. Technology-specific feed-in-tariffs exist for solar PV (7.67 €ct/kWh in 2019) biomass and biogas (tariff varies depending on specific source used in power plants), geothermal (7.22 €ct/kWh), onshore wind (8.12 €ct/kWh in 2019) and hydropower with a capacity of up to 2 MW (depending on the amount of electricity fed into the grid up to 10.2 €ct/kWh in 2019).

In addition to feed-in tariffs, investment support may be provided to small and medium-sized hydro plants (up to € 50 million), PV on buildings with a capacity of up to 200 kW and battery storage systems (up to € 250 per kWp), off-grid installations for self-consumption (up to € 1.5 million), small PV installations with a capacity of up to 5 kWp in private households (up to € 300 per kWp) and PV installations in the agricultural and forestry sector with a capacity of up to 100 kW (up to € 375 per kWp).

- **Long-term security of support for RES-E: High**

The continuation of the feed-in-tariff Austria ensures long-term security of its RES-E support. The level of support can be updated (for new installations) on a yearly basis and the annual

[221] Nederlandse Emissieautoriteit (2019), Rapportage Energie voor Vervoer in Nederland 2018
[222] https://www.klimaatakkoord.nl/mobiliteit/documenten/publicaties/2019/06/28/klimaatakkoord-hoofdstuk-mobiliteit

budget for new installations is € 50 million (reduced each year by € 1 million), which is further broken down by technology. Additional budgets for wind power (€ 30 million in 2017 and € 15 million in 2018) and small hydropower plants (annual budget raised to € 2.5 million) were introduced in 2017. Furthermore, a one-off special quota for follow-up tariffs has been introduced for biogas plants that have reached the end or their default supporting period and where operation became non-viable as part of an amendment to the Green Electricity Act in July 2017.

In addition, Austria's energy and climate strategy for 2030 "mission2030" establishes ambitious targets for the further uptake of RES-E towards 2030 and reconfirms a continuation of support post 2020. Additional support is planned, e.g. for rooftop solar PV in the "100,000 rooftop PV and storage program", and a (major) revision of the current Green Electricity Act.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

After limited progress in adopting RES-H&C measures in the past, Austria has made significant efforts to increase policy support for RES-H&C in recent years. RES-H&C is promoted through various investment support instruments, primarily on the level of individual federal states.

The environmental support scheme (Umweltförderungen) provides investment grants to e.g., district heating based on renewables, solar thermal energy, heat pumps and building renovations. The support is applicable to companies, municipalities as well as households. An integral part of the environmental support scheme is, e.g., a building renovation offensive that provides support for thermal renovation measures and installation of renewable energies as heating systems for private and commercial building owners.

Other measures regarding RES-H&C are mostly implemented through provincial measures by the federal states. This, for example, applies to the EU Directive on the energy performance of buildings (2010/31), which has, to a large extent, been implemented on state level. Provincial measures include subsidies for biomass heating of residential buildings, for thermal solar panels, for heat pumps and for biomass district heating systems.

In addition, *klimaaktiv*, a climate protection initiative by the Austrian Ministry for Agriculture, Forestry, Environment and Water Management that started in 2004, provides information, consultation, trainings and offers standards with regard to RES-H&C.[223]

- **Long-term security of support for RES-H&C: High**

The environmental support scheme (Umweltförderungen) provides significant and reliable support for RES-H&C of around € 100 million per year. Regional support schemes constitute the second main pillar of RES-H&C. The system is mature and is assumed to be stable.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

Austria has maintained its existing policies and implemented planned policies with regard to RES-T. The main policy measure is a biofuel quota introduced in 2009. In addition, tax

[223] https://www.klimaaktiv.at/ueber-uns.html

incentives for the use of biofuels and investment support for the conversion to alternative drive systems are in place.

The biofuel obligation is laid down in the national fuel regulation (Kraftstoffverordnung 2012) and obliges companies selling fuel on the market to annually substitute 5.75% of fossil fuels with biofuels. In 2018, an amendment of national regulation was undertaken to transpose the ILUC Directive, which sets a 10% biofuel share for 2020, into national law.

In addition, several measures to support the conversion to alternative drive systems and the uptake of electric mobility have been implemented. The environmental support scheme (Umweltförderungen) offers financial support also for RES-T by providing investment grants to undertakings, associations and municipalities for purchasing electric vehicles, electric motorcycles and scooters and electric bicycles as well as charging infrastructure. Moreover, the climate protection initiative, klimaaktiv mobil, provides investment support inter alia to companies, and municipalities for the deployment of environmental-friendly vehicles, electric mobility, cycling and mobility management and charging stations. Between 2007 and 2018, klimaaktiv mobil projects (fleet retrofitting, measures to promote cycling and climate-friendly mobility management) received a total of € 122.4 million in funding. Moreover, in 2017 and 2018, the Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology organized two tenders each offering € 500,000 for the implementation of e-mobility projects on awareness-raising activities and acceleration of market entry under the 'E-mobility in practice' support programme.

- **Long-term security of support for RES-T: High**

There have been no unexpected changes in the main elements of RES-T policy and additionally implemented measures draw a positive picture for the security of Austria's RES-T support.

Poland

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes (but below 2018 RES-E NREAP sectoral trajectory)**

Poland has fulfilled its RES-E policy commitments from the NREAP and previous Progress Reports. However, the country is below its 2018 RES-E NREAP sectoral trajectory.

The RES Act from July 2016 introduced an auction system. It replaced the quota obligation, which in combination with a certificate trading scheme has previously been the main RES-E support scheme in Poland. Within the new scheme, auctions are separately held for installations with a capacity below 1 MW and for those that are larger than 1 MW. The winners are entitled for a 15-year period to receive a sliding premium to obtain the price bid during the auction. Once awarded, a project will have to produce its first power within 48 months for onshore wind parks, 120 months for offshore wind parks.

Additionally, since the 2nd half of 2018, small biogas and hydro plants of up to 500 kW and between 0.5 and 1 MW are eligible for feed-in tariff (FiT) and feed-in premium (FiP), respectively. Poland also supports prosumers by allowing them to exchange the surplus of energy produced under favourable conditions for gaps in energy production. Furthermore, under the obligation imposed by the Act to prioritise renewable energy generators, the small (up to 5MW) and micro (up to 50 kW) capacity generators could, respectively, pay only 50%

of the connection costs or connect to the grid at no cost.[224] Similarly, producers of electricity from RES are exempt from the tax on the sale and consumption of electricity.

The efforts have been supported by the introduction of incentives for small consumers to invest in solar panels, which is expected to annually increase the solar capacity of Poland by 200 MW.[225] Similarly, since 2019, residential solar energy projects (2 kW- 10 kW) have been granted rebates through the "Mój Prąd" (My Electricity) Priority Programme (PP) with a total budget of about PLN 1 bln (€ 235 m).[226]

- **Long-term security of support for RES-E: Moderate**

The long-term security of support for RES-E installations in Poland is moderate. While the majority of auctions rounds since their start in December 2016 has been successful, also some auctions rounds have been cancelled. Between 2016 and 2018, 23 auctions were announced, out of which 19 took place. Of these 19 auction rounds, 11 were concluded while the other eight could not be resolved due to a lack of valid offers. Additional uncertainty regarding the availability of support comes from the fact that no timetable with targeted volumes, dates or technologies is available.

Furthermore, a minimum distance requirement of ten times the turbine height between new onshore wind parks and settlements as well as regulation increasing real estate taxes for onshore wind installations effectively froze the development of this sector since 2016. As a result, a substantial decline in onshore wind deployment was visible in the past years, despite many well-developed and fully permitted wind projects. However, small changes to these rules, i.e. extending the validity of building permits issued before the 10h law until 2021 and more favourable taxation of onshore wind installations, were put in place in June 2018, and the following wind auctions led to very competitive prices. The distance requirement for new installations, however, remains in place and is the major barrier against onshore renewable energy development in Poland.The recent push towards creating a complex legislation[227] for offshore wind energy and a plan for international initiative on the Baltic Basin[228] promoting cooperation on offshore, are already bearing fruit as the Offshore Programme of the Polish Energy Group assumes the construction of two offshore wind farms with a total capacity of up to 2.5 GW by 2030, and another one with a capacity of 0.9 GW after 2030. In January 2020, the Regional Director for Environmental Protection in Gdańsk issued a decision on environmental conditions for Baltica 2 and Baltica 3, with a total capacity of up to 2,500 MW. Other energy conglomerates, including PKN Orlen which intends to build offshore wind farms with a total capacity of 1,200 MW are also joining the race[229].

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes (but below 2018 RES-H&C NREAP sectoral trajectory)**

[224] https://www.econstor.eu/bitstream/10419/213024/1/1687860874.pdf
[225] https://uk.reuters.com/article/us-poland-energy-solar/poland-to-invest-in-solar-panels-as-power-prices-rise-idUKKCN1QE19K, Sprawozdanie okresowe za lata 2017-2018 dotyczące postępu w promowaniu i wykorzystaniu energii ze źródeł odnawialnych w Polsce (przygotowane na podstawie art. 127 ust. 2 ustawy o odnawialnych źródłach energii)
[226] https://www.pv-magazine.com/2019/07/23/poland-launches-235-million-solar-rebate-program/, Sprawozdanie okresowe za lata 2017-2018 dotyczące postępu w promowaniu i wykorzystaniu energii ze źródeł odnawialnych w Polsce (przygotowane na podstawie art. 127 ust. 2 ustawy o odnawialnych źródłach energii)
[227] https://biznesalert.pl/offshore-ustawa-logistyka-lancuch-dostaw-oze-farmy-wiatrowe-ekg-2020-energetyka/
[228] https://portalkomunalny.pl/polska-chce-zapropnowac-miedzynarodowa-inicjatywe-dotyczaca-offshore-na-baltyku-409277/
[229] https://biznesalert.pl/offshore-ustawa-logistyka-lancuch-dostaw-oze-farmy-wiatrowe-ekg-2020-energetyka/

Poland achieved limited progress in terms of fulfilment of its RES-H&C commitments (14.8% in 2018, compared to 14.6% in 2017), yet remains below the NREAP trajectory of 15.7% for 2018.

Available investment support programmes (subsidies and loans) in Poland appear as one of the main instruments. In total, four main subsidy schemes are available through the State Development Bank (Bank Gospodarstwa Krajowego) and the National Fund for Environmental Protection and Water Management. The latter include Prosumer programme (€ 200 million for 2014-2022), which supports heat installations for biomass, heat pumps and solar thermal collectors up to 300 kWt. The funding is also available to RES-E installations. Furthermore, a low interest loan programme, RES Stork, targets an annual renewable heat generation of 990,000 GJ and earmarks PLN 570 million (€ 132.7 million), to be divided among RES-E and RES-H&C installations in the years 2015-2023. The targeted technologies include biogas (40 kWe-2 MWe), biomass (300 kWt-20 MWt), geothermal (5 MWt-20 MWt), aerothermal (40 kWe-3 MWe), hydrothermal (30 kWt-5 MWe), and solar (40 kWp-1 MWp) collectors. Similarly, all but geothermal RES are eligible to receive loans through "Efficient Heating and Cooling systems" programme with a budget of PLN 3,000 million (€ 699 million) over the 2015-2023 implementation period. Poland has also been set to promote renewable district heating through the "Cieplo z OZE" scheme, which supports solar thermal units (over 2 MW) and geothermal and biomass installations for projects that cover at least 10% of the district heating demand.

The latest RES-H&C policy, introduced in 2017, is the obligation of purchasing heat generated from RES for heat-trading entities or district heating utilities, provided it is offered at a price no higher than the average price of heat from other sources supplying the network. In general, all technologies are eligible for support. No specific target has been set and an impact assessment of the measure is not available.

In addition, the use of coal is set to be banned in 11 of 16 Polish regions starting from 2022 through the introduction of emission standards for heating appliances in single-family homes.

- **Long-term security of support for RES-H&C: Moderate**

In the light of a missing overarching strategy for RES-H&C, it is uncertain how and in what form support will be maintained in the coming years. The obligation of purchasing renewably generated heat is a new policy and an assessment of its stability cannot be made at this point. Since the bulk of support for RES-H&C is investment aid, potential modifications do not pose a risk to existing installations.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

As in other Member States, the main instrument for reaching the RES-T target in Poland is a quota system for biofuels, introduced in 2008. As the biofuel quota is the only substantial RES-T commitment in the Polish NREAP and its Progress Reports, Poland has fulfilled its RES-T policy commitments. However, Poland was significantly below its RES-T target trajectory in 2018 (5.6% achieved compared to 9.1% as trajectory). The quota levels are updated every three years for a 6-year period by the Council of Ministers. For 2017 the level

was set at 7.1%, while the level for 2018 and 2019 is set to 7.5% and 8.0% respectively. The target for 2020 is 8.5%.[230]

The Progress Report also mentions subsidies for the implementation of activities related to the production of biocomponents, liquid biofuels or other renewable fuels for transport, which exists since 2013.

- **Long-term security of support for RES-T: Moderate**

Although the quota system is an established policy instrument, it has not led to the envisaged RES-T shares as the sectoral share of energy from renewable sources for transport is significantly lower than for -H&C and -E. This might be bacause the scheme is favouring large consortia and chambers of commerce instead of smaller entities and individual users. Also, the mechanism for double counting of biocomponents produced from the feedstocks referred to in Annex IX of the ILUC Directive for implementing the National Indicative Target was applied in Poland for this first time in 2018.

Portugal

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Portugal has partially fulfilled its earlier RES-E policy commitments. RES-E plants registered until November 2012 are promoted through a feed-in tariff for a period of between 12 and 25 years. Moreover, a dedicated remuneration regime for new small production installations, came into force in 2015.

Under the feed-in tariffs for plants registered until the end of 2012, Decree-Law no. 35/2013 of 28 February foresees that non-hydro plants continue to receive a guaranteed tariff for an additional period of five years after the end of the initial 15-year period. For wind plants more specifically, Decree-Law 35/2013 provides for the additional option to choose an alternative remuneration regime for an additional period of five or seven years after the end of the guaranteed remuneration period, if they commit to contribute to the social and economic sustainability of the power system via compensation payments. This remuneration regime depends on the market value with minimum and maximum thresholds.

In 2015, Portugal introduced a new regime for the promotion of RES-E through Small Production Units (UPPs), which can have an installed capacity of up to 250 kW, and Self-Consumption Units (UPACs), which can have an installed capacity of up to 1 MW. These UPPs receive a feed-in tariff through a reversed auctioning scheme that was capped at a reference tariff of 9.5 €cts/kWh between 2015 and 2019. Electricity producers bid by proposing discounts to this reference tariff. Depending on the source, bidding started at a fixed percentage of this reference tariff. The reference value was reduced to 4.5 €cts/kWh in 2020 for all sources. As for UPACs, they can sell the surplus electricity to the grid at the previous month's average market price with a 10% discount.

In June 2019, a new auction-based RES-E support scheme for the allocation of grid capacity at specific sites was launched. Successful bidders receive a 15-year contract under two payment modalities: a feed-in tariff bid at a percentage discount from a pre-determined reference price and a contract allowing producers to sell power at market prices and bid on a

[230] https://www.ure.gov.pl/pl/urzad/informacje-ogolne/aktualnosci/7017,Wysokosc-Narodowych-Celow-Wskaznikowych-ustalona-na-lata-2017-2020.html

capacity payment to the power system. Since then, two auctions have been organized. The first solar PV auction in July 2019 allocated 0.86 GW at a weighted average bid price of 20.32 €/MWh for feed-in tariffs and 0.29 GW at market prices. A second round allocating 700 MW of solar PV as well as for any combination of solar PV with battery energy storage and CSP has started in June 2020 based on market prices modality and it is still ongoing.

- **Long-term security of support for RES-E: High**

The non-existence of a RES-E support scheme for new large installations between end of 2012 and mid-2019 created significant investment insecurities. However, the new RES-E support scheme in place since June 2019 and the organization of two auctions since then have improved investment conditions (for solar PV installations) significantly. Moreover, the 2015 scheme for UPPs and UPACs provides some stability for small installations, although significant changes were introduced in 2020 for the reference tariff of UPPs. An annual cap of 20 MW for small-scale units per year provides an outlook for investors. In its 5th Progress Report, Portugal also states to promote ocean renewable energies and to increase wind power production via over-equipment and repowering.

In November 2018, the preliminary results of Portuguese National Carbon Roadmap for 2050 (RNC2050) were launched, including targets from to 2030 to 2050, which underline the government ambition to reach carbon neutrally in 2050. The targets are supported by trajectories for the different economy sectors. In June 2019, the Portuguese National Carbon Roadmap for 2050 (RNC2050) was published, including targets from to 2030 to 2050, which underline the government ambition to reach carbon neutrally in 2050. The RNC2050 specifies that 46% of the final energy consumption is to come from RES by 2030 and this value may reach 86% in 2050.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

Portugal has partially fulfilled its earlier RES-H&C policy commitments. Throughout the reporting period, no continuous support scheme for RES-H&C was in place. However, there are sporadic calls for investment support for solar thermal installations and Portugal is already above its RES-H&C NREAP sectoral trajectory for 2018 as well as the 2020 target. The RES-H&C share stood at 41.2% in 2018, while the target trajectory was 31.1%.

In Portugal, RES-H&C is supported through the Energy Efficiency Fund (FEE). The fund provides a subsidy to investments in solar thermal installations for heating water in the residential and service sectors. However, the calls for applications are sporadic. After a call in the second half of 2016 with a total budget in 2016 of € 1.1 million, the latest call was in 2018. The call from June 2018 included support of up to € 2,500 for new solar thermal heating installations. No additional calls for 2019 had been put forward.

- **Long-term security of support for RES-H&C: Low**

The long-term security for RES-H&C support is low and future calls as part of the FEE are unknown. More generally, support in the heating and cooling sector rather focuses on energy efficiency measures rather than on RES deployment (e.g. the Environmental Fund). An exception to this was the 2018 call from Innovation Support Fund targeting low enthalpy geothermal sources for H&C and water heating. In its 5th Progress Report, Portugal states its ambition to promote the acquisition and renovation of heating and cooling systems based on RES. Also, RNC2050 specifies that 41% of the sector's energy consumption is to come from

RES by 2030 and this value may reach 66% in 2050. However, measures to support these ambitions are currently lacking.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partial**

Portugal has partially fulfilled its earlier RES-T policy commitments. Currently, Portugal has two main RES-T support schemes in place: an exemption from the Petrol Product Tax for small producers of biofuels (PPDs) and a biofuel quota for companies supplying fuels for consumption. The biofuel quota for 2017 and 2018 stood at 9%. The value was set at 7% for 2019 and 10% for the 2020. PPDs are fully exempt from the Petrol Product Tax up to a volume of 40,000 t/year. In 2016 Portugal also established sustainability criteria for the production and use of biofuels and bioliquids.

Moreover, the Electrical Mobility Programme (Mobi-E) was revitalised in 2015 with the aim of improving the countries' charging infrastructure. In March 2017, a call was opened for replacing 100 old charging stations. By the end of 2017 a new call was open for the acquisition of 202 new charging stations. In addition, new investments in public transport are being made with the support of EU funds or funding from the Environmental Funding (Fundo Ambiental). This relates primarily to the acquisition of 300 electric buses for the two biggest metropolitan areas in Lisbon and Porto and the expansion of the Lisbon and Porto Subways.

- **Long-term security of support for RES-T: Moderate**

Portugal's biofuel quota is established until 2020, but the value for 2019 was set at 7%, which is lower than the 2020 10% target. The Electrical Mobility Programme is also expected to run until 2020. The RNC2050 specifies that more than 35% of the transport sector energy consumption is to come from RES by 2030 and 90% in 2050. However, further measures to support these ambitions are currently lacking.

Romania

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Romania has partially fulfilled its earlier RES-E policy commitments having completed the process of transposing the RES Directive in 2012 and reforming the existing quota system. However, support to RES-E has been subject to significant changes over the years and as of 2017 no comprehensive support scheme for new RES-E installations is in place. To reintroduce support for RES-E installations, the Government is considering a new support scheme, a Contract for Difference (CfD) mechanism, and has contracted EBRD to provide support.[231]

Romania's main RES-E support scheme for existing installations continues to be a green tradable certificate quota system with minimum and maximum prices (currently between € 29.4 and € 35 per green certificate-'GC') that covers onshore wind, solar PV, geothermal, biogas, biomass and hydropower projects, the latter only up to 10 MW. Due to the oversupply of green certificates on the market, those are always traded at the minimum price

[231] EBRD Call for Proposals, Support for Implementation of Contracts for Difference in Romania, https://www.ebrd.com/work-with-us/procurement/pn-82708.html?fbclid=IwAR1lksGGhdk27F297OjOISXv8jQ3sRAlNUOX4YqlOYGHY0-UvHjya5AXBF8

(which is not indexed by inflation). Both electricity suppliers and producers are required to meet the quotas, which are determined by the Romanian Energy Regulatory Authority (ANRE) on an annual basis. If a supplier or a producer (based on the electricity sales to end consumer) fails to meet the quota prescribed by ANRE, a penalty applies in the form of the missing certificates having to be purchased at € 70 per certificate. The number of green certificates allocated to producers for each 1 MWh supplied is between 0.5 and 6 certificates depending on the type of renewable energy source used and the date when the plant was accredited. Generators are able to benefit from green certificates for a period of 15 years.

The green certificates scheme was revised in 2017 and 2018 to improve the trade of green certificates. The main changes to the scheme included an extension of the validity period of green certificates, from only 12 months until the end of the scheme period on 31 March 2032.[232] Moreover, the issuance of a share of the initial number of green certificates had been suspended for some technologies in the time from 1 July 2013 to 31 March 2017 which had led to the reduction of issued green certificates by one certificate for hydropower and wind energy and by two certificates for solar. In 2018, it was decided that suspended certificates for solar will be issued starting in 1 January 2021 and until 31 December 2030. For hydro power and wind, suspended certificates were issued again from 1 January 2018 and until 31 December 2025 (instead of December 31, 2020), thereby prolonging the period over which producers would need to recover their deferred green certificates.[233] Other changes including a reduction of penalties in case of non-compliance with purchase obligations, a decrease in the maximum threshold price of GCs from € 55 to € 35 per MWh and the decision to ban private agreements for the sale and purchase of GCs and centralizing the trading of GCs.

Since 1 January 2017, the quota system can no longer be accessed by new installations, so there is no dedicated RES-E support scheme for new installations in place. However, the quota system is still valid for installations commissioned before 2017, who can benefit from it until the end of the support scheme period, 31 March 2032.

- **Long-term security of support for RES-E: Low**

Romania's quota support system for RES-E was reformed in 2017 and 2018, partially providing greater long-term certainty to investors by extending the validity of green certificates until March 2032. However, the Romanian Government - under pressure of rising electricity bills – reduced the issuance of green certificates per RES production for some technologies and also postponed the issuance of part of the green certificates from 2013 to 2017. This development unsettled investors as the legislation largely failed to redress the significant market distortions that Romania had already created (i.e. oversupply, drastically reduced returns, expired green certificates which were not monetized) and further weakened the obligation to purchase GCs imposed on energy suppliers and producers. Moreover, the non-existence of a dedicated support scheme for new installations poses a major impediment to the long-term security for RES generators.

In late December 2018, Romania drastically increased the level of taxation for all energy companies from 0.1% to 2% of their turnover.[234] This significantly impacted renewable energy generators' already severely diminished profits.

[232] Law 220/2008, Article 3(3^3) b, as amended by EGO 24/2017.
[233] Law 220/2008, Article 6(2^2), as amended by EGO 24/2017.
[234] EGO 114/2018.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

The main measure supporting RES-H&C in Romania is the Green Home Programme. A relaunch of this programme, Green Home Plus will be implemented in June 2020 with a total allocated budget of € 100 million. House owners can receive a grant of up to 60% of the total investment costs and a maximum of € 15,000 for implementing measures to install solar panels and heat pumps among others.

In April 2017, a new support scheme (Government Decision no. 216/2017) for less exploited energy resources was implemented. It also targets RES RES-H&C, since it focuses on the development of new capacities and refurbishment of existing capacities for production of electricity and/or thermal energy from biomass, biogas and geothermal energy and to increase production capacities from these sources by 60 MW until 2023. The scheme's budget is approx. € 100 million[235] with each successful applicant being eligible to receive up to € 15 million but not exceeding 45% of total eligible expenses. Higher thresholds apply for small- and medium-sized enterprises and investments located in assisted areas (under Article 107(3)(a) TFEU). It is expected that 58.53 MW will be eligible to receive financing.[236]

Moreover, several RES-H&C programmes including for replacing or complementing classical heating systems have been introduced. The subsidy programme Termoficare coordinated by the Regional Development Ministry was extended mid-2019 to cover investments carried out until the end of 2027.[237] It provides support to investments in the district heating system on local level through co-financing from the state budget. Funding amounts to € 83 million. In addition, the relaunched Regional Development Programme 2014-2020 (Measure 4 "Improving Energy Efficiency and Security of Supply", Action 4.2. Making use of RES) supports inter alia investments in installations for the production of electricity and/or heat through the use of RES. The total financial allocation for the period 2014-2020 is € 263 million.

The prosumer concept was introduced in the regulatory framework in July 2018. Households will be able to receive non-repayable financing that would cover up to 90% of the total value of the PV system.[238] The financing is not to exceed RON 20 000 (approx. € 4,125). The financial support from the Solar Green House Programme is granted by the Environmental Agency and Regional Development Ministry and amounts to € 135 million. It will be aimed at installing photovoltaic systems for individual households, for the production of electricity and heat from 100% green sources. However, mainly due to administrative barriers, implementation and financing of these projects will only start in June 2020.

- **Long-term security of support for RES-H&C: Moderate**

Several subsidy programmes are in place to promote the use of RES-H&C. The programmes, however, are not launched systematically and the uptake of these programmes is not sufficient to cover investment needs. Furthermore, due to administrative barriers, funds for the allocation period 2014-2020 have not been used yet. However, for the 2021-2027 period, several financing programmes for RES-H&C with significant budgets have been announced[239], such as the Sustainable Development Programme (EU and

[235] GD 216/2017, Article 13.
[236] Romanian Government, Study on the Implementation of the Reforms Programme and Country Specific Targets, October 2019, https://sgg.gov.ro/new/wp-content/uploads/2019/12/RAPORT.pdf.
[237] EGO 53/2019.
[238] Rooftop as well as ground-mounted PV systems with a minimum capacity of 3kW and a maximum of 27kW are eligible for financing.
[239] National Energy-Climate Plans (NECP), 2021-2030, April 2020. The amounts mentioned are still under negotiation.

central budget funds) intending to allocate € 571.42 million to the energy sector (including RES-H&C).

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

RES-T in Romania is promoted by a quota system, i.e. fuel retailers are obliged to ensure that biofuels subject to certain sustainability criteria make up a prescribed percentage of their annual sales in petrol and diesel. As of 2016 the applicable blending quota for biodiesel stood at 6.5%. As of 1 January 2019, the blending quota for bioethanol was increased from 4.5% (applicable until December 2018) to 8% (Emergency Ordinance 80/2018), while the blending quota for biodiesel remains at 6.5%. In case of non-compliance, penalties between RON 30,000 (approx. € 6,250) and RON 70,000 (approx. € 14,450) apply. Besides fulfilling the prescribed biofuel quota, fuel retailers are obliged to meet reduction targets for greenhouse gas emissions. By 31 December 2020, fuel retailers have to reduce the greenhouse gas emissions of one unit of fossil fuel over its whole lifecycle by up to 10%, with a minimum of 6%, compared to the standard amount of greenhouse gas emissions of one unit of fossil fuels utilised in 2010. By 31 December 2017, an interim reduction target of 4% had to be complied with.

Moreover, the National Car Fleet Renewal Incentive Programme funded from the Environmental Fund provides financial support for the purchase of electric or hybrid vehicles. For the period of 2017 and 2018, a total of € 3.7 million was used for this purpose. Rabla Plus, the new phase of the Car Fleet Renewal programme, saw the Romanian Ministry of Environment raising the premium for the purchase of electric cars to €10,000 in 2017. Currently, the premium stands at € 9,300 for electric cars and € 4,130 for hybrid cars (only hybrid cars with an external supply source and emitting less than 50 g/km CO_2 emissions). In 2019, a total of 1256 cars (both pure electric and hybrid) were acquired through the Rabla Plus Programme.[240]

The European Commission has granted a € 53 million budget for 2020 to 2025 as part of the European Green Deal with the aim to stimulate investments into recharging stations for hybrid and battery electric motor vehicles in Romania. It will cover urban, sub-urban and rural areas and aims to develop a network of recharging stations that will cover the entire country. The beneficiaries will be selected through an open and transparent tender procedure and the support will be awarded in the form of grants.[241]

- **Long-term security of support for RES-T: Moderate**

The long-term prospect of support for RES-T in Romania is stable. A minor change to the legislation stipulates that mandatory values for biofuels set forth for gas and diesel sold at gas stations can be reduced by half if biofuels obtained from waste are used. Although the support system is stable in the sense that it has been in place for a long time, stakeholders report that the level of support remains insufficient to ensure the development of the sector.

[240] Romanian Government, Study on the Implementation of the Reforms Programme and Country Specific Targets, October 2019, https://sgg.gov.ro/new/wp-content/uploads/2019/12/RAPORT.pdf.

[241] European Commission, Newsroom, State aid: Commission approves €53 million public support scheme for charging stations for low emission vehicles in Romania, February 10, 2020 available at: https://ec.europa.eu/commission/presscorner/detail/en/IP_20_224.

Slovenia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partially**

Slovenia has fulfilled most of its policy commitments from the NREAP and earlier progress reports. Since the amendment of the Energy Act in 2014 RES-E support in Slovenia is tendered in an annual auction for all installations above 500 kW. RES-E installations of up to 500 kW are free to choose between a feed-in tariff and a feed-in premium. Eligible technologies for both schemes are hydro power, wind, solar and geothermal energy as well as biomass and biogas plants.

The amended support scheme only came into effect in October 2016. In the period of March 2014 to October 2016 no tender has been held. Since then five tenders with a budget of € 10 million each were held. Based on this budget 285 projects with an installed capacity of 326 MW were selected. Among the selected technologies wind power is the most prominent with 62 project totalling 215 MW, followed by solar with 71 projects totalling 23.6 MW and hydro power with 56 projects totalling 14.9 MW. However, siting issues question the realization of some of the wind projects, of which only a small share has been implemented so far. Although, spatial planning was in the focus of the regulation from the beginning, no clear policy orientation is available specifying those areas in the country where siting of renewable plants would be feasible, taking into account the aspects of nature protection, cultural heritage and residents of settlements.

In addition to the feed-in tariff and premium scheme, Slovenia's Environmental Fund (Eco Fund) provides investment support for renewable energy projects in form of low interest loans and grants. Support is provided for smaller RES-E generation facilities including wind, solar, biomass and small hydro power plants up to 10 MW. Two calls for the construction of such projects were held in 2017 with a total of € 4 million of interest free loans. An additional call with € 10 million of non-refundable funds was published in 2019 to co-finance the purchase and setting up of solar installations between 2019 and 2022. The granted loan is installation-specific and depends on several factors, like the amount of eligible costs, type of investment, evaluation of environmental criteria, etc. Loans are provided for up to 15 years. In the beginning of July 2018, the Slovenian government revised the budget of Eco Fund for 2018: The Fund provided up to € 15 million in subsidies for the purchase of wood biomass boilers and heat pumps in 2018. Additional € 50 million in lending was secured to finance environmental protection projects of individuals, companies, and local communities in 2018.

Furthermore, Slovenia offers annual net metering for RES-E installations. The scheme was adopted in 2015, entered into force in 2016 and was amended in 2019. Following the amendment, the decree no longer limits the total net power of installations of self-supply connected annually. Three types of net metering are available. First individual self-supply, secondly self-supply of apartment buildings, and third self-supply of energy communities with regard to the supply of energy from renewable source. Net metering is limited to 0.8 times the connecting power at the consumption metering point. However, the connecting power of a community self-supply installation may not exceed by 0.8 times the total connecting power at the consumption metering points included in included in each self-supply community. This rule replaces the previous 11 kVA limit on the size of installations. The new regulation allows for the third-party ownership of these RES-E systems.

- **Long-term security of support for RES-E: High**

The interruption of support from 2014 to 2016 had a significant influence on RES-E development, leaving Slovenia behind target trajectory and decreasing the trust in security of support. After the approval by the European Commission, the new scheme is set to run until 2025 leading to a positive outlook for RES-E support. Although the government has not published a long-term auction schedule indicating the respective budgets available over the validity period of the support scheme, yearly planning works more or less predictably for developers to be able to plan their investments. Siting issues threaten the realization of some of the supported wind installations.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Slovenia has fulfilled its RES-H&C policy commitments. The Eco Fund, Slovenia's public Environmental Fund, also provides support to RES-H&C in the form of low-interest loans as well as investment grants. Support is provided for single-family and two-family houses as well as multi-apartment buildings, and for projects by companies and local communities. In 2017 and 2018 one public call for single- and two-family houses was published each, with € 16 million and € 44.5 million respectively. The Climate Change Fund provided € 20 million of the support in 2018. Support was allocated for the installations of solar heating systems, wood biomass combustion installations (WBCI) and heat pumps, both for central heating, and for the connection of a buildings to district heating using RES. In an additional programme € 3 million were made available as non-refundable funds for the replacement of old combustion plants in multi-apartment buildings with RES-H&C.

In addition, the RES-E premium scheme is also available to (biomass) CHP units and thus indirectly also provides support to renewable heating.

- **Long-term security of support for RES-H&C: High**

The Environmental Fund continues to operate and provides long-term security for RES-H&C investments. In July 2018, the Slovenian government revised the budget of Eco Fund for 2018. Hence, it could provide up to € 15 million (€ 5 million more than before) in subsidies for the purchase of wood biomass boilers and heat pumps in 2018. The Eco Fund also continued to provide further support in the form of loans: Additional € 50 million in lending has been secured to finance environmental protection projects of individuals, companies, and local communities in 2018.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

Slovenia's main support measure for RES-T is a biofuel quota and reduced excise tax for biofuel. Fuel suppliers are obliged to incorporate a certain percentage of biofuels in their total fuel sales. For 2018, the biofuel share was set to 7.5%. It increased to 8.4% in 2019 and will be set to 10% in 2020. In addition, biofuels are exempt from the excise duty tax.

Furthermore, the Eco Fund also applies to RES-T, providing low-interest rates as well as investment grants for RES-T projects, such as investments in environment-friendly vehicles for road transport and electric vehicle charging stations located in protected natural areas and Natura 2000 areas.

- **Long-term security of support for RES-T: High**

The long-term security for RES-T in Slovenia is high. Biofuel rates are set well in advance and additional support schemes are ongoing and transparent.

Slovakia

Electricity

- **Fulfilment of earlier RES-E policy commitments: Partial**

Slovakia has slowed down the implementation of the RES-E support measures that were specified in the NREAP. This is also reflected in the installed capacity figures which show that major expansion of renewable capacities took place in 2010-11, since when only very moderate additions were observed and the share of RES-E consumption has actually decreased compared to 2014. The main support scheme, a feed-in tariff scheme introduced in 2010, is still in place for installations which previously received support, whereas the transition to a planned tender scheme has been introduced by the new RES Act in 2019. Furthermore, the first auction was announced but referring to the COVID19 pandemic it was postponed indefinitely. The new government will conceivably revise the present auction scheme. Based on the law applicable before 1 January 2019, the feed-in tariff scheme supported wind (≤15 MW), solar (restricted to installations <30 kW since 2013), hydropower, biomass, biogas and geothermal energy (last four up to and including 5 MW). The scheme was reviewed in July 2013, resulting in lower feed-in tariffs for newly constructed plants. As of 1 January 2019, the feed-in tariff will apply only to RES-E installations, i.e. hydropower, geothermal, biogas, landfill gas or gas from sewage treatment plant gas (except for solar or wind plants), with an installed capacity up to 500 kW included, and high-efficiency CHP up to and including 1 MW. The FIT will also apply to reconstructed or modernised CHP facilities, if their installed capacity before the reconstruction or modernisation was lower than 125 MW.

In addition, in December 2013, DSOs announced a connection moratorium for installations above 30 kW (so-called 'Freeze Status') and as a result of it any new RES supported by feed-in tariff could not be connected to the grid. Next to the moratorium the so called G-Component (G-charge) was introduced in 2014, retroactively decreasing the expected renumeration of RES-E producers. The G-Component is a payment for grid access applicable through an agreement between the plant and the DSO. The fee is quite high and paid only by domestic producers (imported energy is not charged). Thesepersistent barriers also caused the decrease of RES in the Slovak final energy consumption in 2016. The amendment and reform of the "Support of Renewable Energy Sources and High Efficiency Combined Heat and Power" Act RES Act (No. 309/2018 Coll.) overcame this impasse to some extent. The Ministry of Economy annually determines a limited connection capacity to be allocated to RES-E installations, amounting to around 20 MW per year, divided between plants to be built under the FIT system and plants generating renewable electricity for self-consumption (Local Energy Source scheme).

Given that Slovakia has exceeded its capacity targets specified in NREAP for solar power, a tender system for the construction of solar and wind plants has been postponed from the originally planned period of implementation (2013-2014). The introduction of feed-in premium support for 15 years (premium level to be defined in the tender scheme) for RES-E installations exceeding 500 kW of capacity became a part of the reform, which entered into force on 1 January 2019. Furthermore, as of 1 January 2019, the so-called Local Energy Source (up to and including the capacity of 500 kW) promoting self-consumption was introduced, providing preferential access to the network for RES-E plants installed behind

the meter without any additional support, but allowing plants to save the connection and grid usage fees. These plants are allowed to sell their excess electricity corresponding to maximum 10% of their production capacity. The RES-E capacity allowed to connect to the grid under the Local Energy Source scheme is set annually.

As a result of the aforementioned legislative changes, the long-prevailing connection moratorium was overcome, however, only limited capacities were connected to the grid so far due to the above-mentioned maximum allowed capacities. The operators of small-scale RES installations up to 10 kW are eligible for a simplified authorisation procedure.

Small-scale renewable systems can receive investment grants in form of vouchers under the Green Households project scheme up to 10 kW capacity, relying on resources the European Regional Development Fund (ERDF) and electricity generated from renewable energy sources is exempt from excise tax in Slovakia.

- **Long-term security of support for RES-E: High**

The revised "Support of Renewable Energy Sources and High Efficiency Combined Heat and Power" act guarantees feed-in tariffs for RES-E installations for 15 years. Long-term support remains guaranteed for existing plants.

Since 1 January 2019, new large-scale wind or PV plants (over 500 kW) are not eligible for the feed-in tariff. RES installations exceeding 500 kW of installed capacity will be supported solely by a feed-in premium set by auctions, of which the first one was postponed due to the COVID19 pandemic. The reannouncement and the future scheduling of auctions is unclear, while some currently unknown modifications are expected in the tender design.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Partial**

Slovakia has only partially fulfilled its commitments for RES-H&C expressed in the NREAP. In 2010 the target of 7.6% was exceeded (the actual rate was 7.9%) but according to the latest data from 2018, the actual rate (10.6%) doesn't reach the planned target of 13.3%. Four different schemes provide support for RES-H&C between 2016 and 2020. First, households are supported in the installation of biomass boilers, solar panels and heat pumps. The national Green Households scheme had € 45 million available until 2018. The total available support for the scheme is € 115 million between 2016 and 2022. Second, support is also provided for the renovation of district heating pipes. Third, support is provided for the installation of RES-H&C in public buildings. Fourth, support is provided for the construction of aerothermal, hydrothermal, or geothermal energy using heat pumps as well as the production of biogas from landfill gas and sewage treatment.

- **Long-term security of support for RES-H&C: High**

Four separate support schemes were running between 2016 and 2020. Without identifying any specified measures, the National Energy and Climate Plan for 2021 to 2030 envisages support for efficient district heating systems fuelled by renewable sources, multi-fuel systems, heat pumps, and the utilization of waste heat form industrial sources.

Transport

- **Fulfilment of earlier RES-T policy commitments: Partial**

Slovakia's main support instrument for RES-T remains in place, the 'Compulsory blending of bio-components into motor fuels'. According to the amendment of the RES Act (No. 181/2017 Coll.) that came into force in August 2017, the biofuel reference values and the minimum biofuel content by volume are defined from 2017 up to 2030. The biofuel quota in terms of energy content was 5.8% in 2018 and is set to increase to 7.6% in 2020. Furthermore, any legal and natural person will be obliged to place on the market motor fuels with at least 8.2% biofuel content in the period of 2022-2030. It should already be kept in mind that the total contribution of conventional biofuels to the RES target would be limited to a maximum of 7% post 2020, hence advanced biofuels and renewables-based e-mobility should play an increasing role. In 2018, Slovakia reached a RES-T share of 7% and thus failed to reach its NREAP interim RES-T trajectory of 8.3% for this year. The 2020 RES-T target is set at 10%.

Since 2011, petrol and diesel with legally defined minimum contents of biogenic material are subject to reduced excise duties. Moreover, mineral oil from biogenic material only is exempt from mineral oil tax. In addition, Slovakia is supporting the production of biofuels from energy crops since 2014 through a rural development programme that supports the acquisition of technologies for the extraction and processing of woody biomass fuel.

- **Long-term security of support for RES-T: High**

Slovakia's rural development programme regarding the support of technologies for woody biomass fuel runs until 2020. Biofuel quotas have been laid down into law until 2030. The Draft of the Action Plan on Electromobility Development was developed by the Ministry of Economy (MH SR), and sixteen measures promoting further development of electromobility were introduced with a short-term focus on the period of 2018-2020. In late 2019, the support scheme was changed, the amount of subsidy provided to fully electric and plug-in hybrid vehicles was raised in order to accelerate the deployment of electric cars.

Finland

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

Finland fulfilled its RES-E policy commitments. The main support instrument in 2017 and 2018 remained to be a technology specific-feed-in premium. By the end of 2018, the former administratively set premium tariff was replaced by a technology-neutral feed-in premium, which is to be determined by a competitive auction process.

The old feed-in-premium scheme pays out a variable premium on top of the wholesale market price for a period of twelve years. Caps on the total support volume vary per technology. They are 2,500 MW for wind power, 19 MW for biogas and 150 MW for energy from wood fuel. No other RES-E technologies were included in the scheme and the total budgets allocated to the years 2017 and 2018 were € 226 and € 250 million, respectively. The scheme closed on 1 November 2017 for new wind power plants and on 1 January 2019 for biogas and wood fuel power plants. It will close for forest chip power plants on 1 February 2021.

The new, technology neutral RES-E support scheme was also open for wind, solar, wave, biogas and wood fuel power. The scheme was a combination of a sliding and fixed premium, depending on whether the market price is below € 30/MWh or not. The annual amount of electricity tendered was 1.4 TWh, and the auctioning was technology neutral, meaning that

no capacities have been allocated per technology. The tendering round was complete in from 15 November to 31 December 2018. The tender results were published in March 2019, with an average price of € 2.5 per MWh and a total of 1.36 TWh of annual RES-E production.[242]

Capital investments subsidies, or "energy aid", for RES-E generation technologies (§3, §5 Decree No. 1098/2017) continues to be provided for RES-E plants. Eligible projects need to either promote the production or use of renewable energy, promote energy savings or increase the efficiency of energy generation or use, or otherwise promote the transition towards a low-carbon energy system. At least 25 % of the project financing must come from non-governmental funds. Total investment subsidies amounted to € 66.99 million in 2017 and € 53.81 million in 2018.

A new law is banning the use of coal for electricity or heat generation from 2029 onwards. Additionally investment aid may be granted to investment projects that promote the phase-out of coal energy by the end of 2025 and that promote the production or use of renewable energy, promote energy savings or increase the efficiency of energy generation or use (Decree 129/2020, 5 §)

For residential building renovation projects between 2020-2022 a subsidy is provided, if measures are taken to improve energy efficiency and intelligent and flexible energy consumption. Aid may be granted to the community owning the residential building and the owner of the detached house. (Decree 1341/2019, 1 §; 5 §)

Long-term security of support for RES-E: Moderate

The new technology neutral tendering scheme provides the possibility for all technologies to receive a feed-in-premium. However, the separately scheduled increase in property tax for renewable energy projects may harm investor confidence and was met with opposition. No second round of the scheme has been announced and there is no long or medium-term auction schedule. This means for the meantime the Finnish support system is based solely on investment subsidies.

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Finland generated around 7767ktoe and 7904ktoe of RES-H&C energy in 2017 and 2018 respectively, of which over 7000ktoe came from solid biomass. With these numbers it overshoot it NREAP target, which only amounted to 6860ktoe in 2018. Around 90% of this is generated in CHPs, meaning that support for electricity indirectly also supports heating and cooling in Finland. Moreover, investment support exists for the construction of production facilities using renewable energies through the so-called "energy aid".

Another important element of Finland's RES-H&C policy is fuel taxation on heating fuels. Finland applies a tax to the fuel based on the energy and carbon content. The tax was increased annually between 2015 and 2019. Excise duty on liquid heating fuels was raised in 2018 to align with the €62/tCO_2 applicable in the transport sector.

[242] https://energiavirasto.fi/tiedote/-/asset_publisher/uusiutuvan-energian-tarjouskilpailusta-tukea-seitsemalle-hankkeelle-hyvaksyttyjen-tarjousten-keskihinta-2-5-euroa-mwh

Total annual estimated support in the RES-H&C sector in Finland amounted to € 4.72 and € 6.94 million in 2017 and 2018, respectively. These amounts were predominantly spent on investment subsidies.

- **Long-term security of support for RES-H&C: Moderate**

No significant changes are expected in Finland's RES-H&C policy, although there is quite some uncertainty around the available funds for schemes since these are directly funded from the state budget and are not projected for the coming years.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

In Finland, the main support scheme for RES-T is a quota system. This system obliges fuel suppliers to blend in a certain percentage of biofuels in the company's total fuel sales. In 2020, the required percentage needs to be 20%. However, when biofuel is produced from waste, residues or inedible cellulose or lignocelluloses, its energy content is double-counted when determining the final amount of biofuels in the total fuel sales. Biofuels are also indirectly supported through tax incentives based on energy content and carbon dioxide emissions.

Excise duty on liquid fuels was raised on 1 January 2017. The carbon dioxide tax on liquid transport fuels was € 62/tCO_2 in 2017 and 2018 as opposed to the previous € 58 tCO_2

The expansion Finland's electric car charging and gas station networks is being promote in a special investment scheme supporting infrastructure investments running from 2018 to 2021. A first tender round was held in October 2018 with a budget of € 3 million. A second round was held in September 2019 and a third is planned in 2020. Additionally, grants for the construction of electric vehicle charging infrastructure in residential property is available. A total of € 5.3 million has been reserved for grants in 2020.[243] Furthermore, a purchase subsidy for electric cars was introduced at the start of 2018. For the period 2018–2021, people who are either buying a new electric car or signing a long-term lease agreement for an electric car may receive a € 2,000 purchase subsidy from the Finnish government.[244]

Long-term security of support for RES-T: High

There are no significant changes expected to Finland's RES-T policy. The biofuel quota scheme has set targets until 2030.

Sweden

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

Sweden has fulfilled its RES-E policy commitments. The main policy support for RES-E in Sweden continues to be an electricity certificate system, which was introduced in May 2003.[245] It consists of quota obligations for electricity suppliers in combination with a

[243] https://www.ara.fi/latausinfra-avustus
[244] https://www.traficom.fi/en/services/purchase-subsidy-electric-cars
[245] Enerdata (2019): Renewable Energy Support Policies in Europe

common electricity certificate market with Norway, which started in January 2012. Electricity suppliers as well as energy-intensive industries and consumers withRES self-consumption or electricity imports from Norway are obliged to purchase certificates for the RES electricity they sell/consume. The annual amount of certificates needed is set by the quota and was at 27% of the sold/consumed electricity for 2018. For 2019 the quota was risen to 30.5% and decreased in 2020 to 28.8%. The certificate price was at SEK 152 (~€ 15) per MWh (June 2018). It has shown a decline since 2010, where the certificate price was above SEK 300 (~€ 30).[246] The certificates are handed out to producers of renewable energy by the Swedish state for a maximum of 15 years and are tradeable.[247] Eligible technologies/renewable energy sources are biofuels, geothermal energy, solar energy, hydropower, wind power and wave energy.

The aim of the joint system with Norway is to increase RES-E production from new installations by 28.4 TWh from 2012 to 2020, of which Sweden agreed to finance 15.2 TWh[248, 249], and by further 18 TWh by 2030. The achievement of this goal is ensured by the annually setting/adjustment of the quota. Energy suppliers are allowed to purchase green certificates in Sweden and Norway in order to meet their national requirements.[250]

Since 1 January 2015, Sweden power producers from hydro and wind, as well as micro-scale RES producers of solar, geothermal energy and biomass plants can ask for a tax credit of SEK 0.6/kWh (€ 6.26c/kWh) for the excess power fed into the grid.[251] Sweden also provides investment grants for solar PV of up to 30% of investment costs[252]. The limit of the investment grant is set to SEK 1.2 million (~€ 116,000) per installation and a total budget of SEK 1423 million (~€ 139 million) is available for the 2017-2019 period.[253]

- **Long-term security of support for RES-E: High**

The security of support for RES-E in Sweden is high when looking at the durability of the support scheme. Policies in place are stable from a regulatory perspective and have long planning periods. Investment grants for solar PV are in place since 2009 and planned until 2020. The Electricity Certificate System as the main instrument was introduced in 2003 and is expected to run at least until 2045. However, the quota obligation differs year by year[254], but will be gradually increased to reach the targets.[255]

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

Sweden supports renewable energies in the heating and cooling sector mainly by tax exemptions for renewable heating solutions and investment grants for biogas. Heat pumps, solar thermal energy as well as biogas and biomass receive exemptions from the energy, carbon and the nitrogen oxides (NO_x) tax. In addition, income tax reductions for RES-H&C works on households are granted. Furthermore, Sweden provides investment grants to

[246] https://cesar.energimyndigheten.se/WebPartPages/AveragePricePage.aspx
[247] http://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-20111200-om-elcertifikat_sfs-2011-1200
[248] http://www.energimyndigheten.se/en/sustainability/the-electricity-certificate-system/
[249] https://energimyndigheten.a-w2m.se/Home.mvc?ResourceId=5676
[250] Enerdata (2019): Renewable Energy Support Policies in Europe
[251] Enerdata (2019): Renewable Energy Support Policies in Europe
[252] http://www.energimyndigheten.se/fornybart/solenergi/solceller/stod-till-solceller/investeringsstod/
[253] https://www.lagboken.se/Lagboken/lagar-och-forordningar/lagar-och-forordningar/naringsliv/Statligt-stod/d_432161-forordning-2009_689-om-statligt-stod-till-solceller
[254] http://www.res-legal.eu/search-by-country/sweden/single/s/res-e/t/promotion/aid/quota-system-1/lastp/199/
[255] Draft NECP: https://www.government.se/48ee21/contentassets/e731726022cd4e0b8ffa0f8229893115/swedens-draft-integrated-national-energy-and-climate-plan

biogas projects. Producers of heat are also obliged to pay a tax according to their NO_x emissions, which heat producers using renewable energies do not have to pay.[256]

- **Long-term security of support for RES-H&C: High**

The long-term security of support for RES-H&C in Sweden is high. Tax exemptions have been in place since 2009 and 2010 respectively and have no end date. The investment grants for biogas are provided until 2020. However, it is to be noted that the decrease of the price of electricity certificates has an impact on the viability of combined heat and power plants in Sweden. Decreasing revenues from the sale of electricity impair the potential to produce heat at a competitive price, as explained in Appendix C.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes**

Sweden has fulfilled its policy commitments regarding RES-T and in fact, has already overachieved compared to the level of its 2020 RES-T target. The main instrument regarding RES-T in Sweden continues to be tax exemptions for biofuels as well as a biofuel quote in petrol- and diesel fuels.[257] Sweden raises energy and carbon dioxide taxes on fossil fuels. Biofuels receive deductions for these taxes, ranging up to 100% for the energy tax, depending on the type of biofuel, and 100% of the carbon dioxide tax.[258] On 1 July 2018, a reduction obligation was introduced and since then biofuels classed as low-blend diesel or petrol are subjected to full carbon dioxide tax and energy tax.

Additionally, Sweden promotes electric vehicles. In 2012 the *super green car premium* was introduced. The scheme provides investment grants for passenger cars with very low greenhouse gas emissions (<50 gCO_2/km), covering up to 35% of the additional costs of such a car, which are estimated at 100,000 to 150,000 SEK.[259] Furthermore, there is a similar premium granted for electric buses since 2016, ranging from 200,000 to 700,000 SEK per bus, depending on the transport capacity of the bus.[260]

In addition to existing measures, Sweden has introduced a reduction obligation for fuel suppliers in April 2018[261], which obliges the companies to reduce greenhouse gas emissions from gasoline and diesel by 40% in 2030. Sweden has introduced a bonus-malus system for new light vehicles (passenger cars, light trucks and light buses) in July 2018, which replaces the super green car premium for any new passenger car. Depending on the level of a vehicle's emissions, the vehicle tax will be decreased or increased.[262]

- **Long-term security of support for RES-T: High**

The security of support for RES-T in Sweden is very good. The main support measure for RES-T, a tax exemption on the energy and carbon tax, has no reported end date. Additional

[256] http://www.res-legal.eu/search-by-country/sweden/tools-list/c/sweden/s/res-hc/t/promotion/sum/200/lpid/199/
[257] http://www.res-legal.eu/search-by-country/sweden/summary/c/sweden/s/res-t/sum/200/lpid/199/
[258] http://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-2010598-om-hallbarhetskriterier-for_sfs-2010-598
[259] https://www.transportstyrelsen.se/sv/vagtrafik/Miljo/Klimat/Miljobilar1/supermiljobilspremie1/#13999 and http://ec.europa.eu/growth/tools-databases/tris/en/index.cfm/search/?trisaction=search.detail&year=2017&num=597&dLang=EN
[260] http://www.energimyndigheten.se/klimat--miljo/fossilfria-transporter/elbusspremie/ and http://ec.europa.eu/growth/tools-databases/tris/lv/index.cfm/search/?trisaction=search.detail&year=2016&num=311&dLang=EN
[261] http://www.energimyndigheten.se/fornybart/hallbarhetskriterier/reduktionsplikt/ and https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/forordning-2018195-om-reduktion-av_sfs-2018-195
[262] https://www.regeringen.se/artiklar/2017/09/bonus-malus-och-branslebytet/ and https://www.government.se/press-releases/2017/05/bonusmalus-system-for-new-vehicles/

programs have transparent end dates. In addition, Sweden emphasized its long-term target by announcing plans to ban the sale of new petrol and diesel cars by 2030.[263]

United Kingdom

Electricity

- **Fulfilment of earlier RES-E policy commitments: Yes**

The UK has fulfilled its commitments expressed in its NREAP in terms of policy support for RES-E The main support scheme is a Contract for Difference (CfD) scheme, which was launched in 2014 to replace Renewable Obligations (RO).

Three CfD allocation rounds have so far been successfully completed in 2015, 2017 and 2019 awarding over 11 GW of capacity. The first tender was divided into two separate auction "pots". The first auction "pot" included established technologies: onshore wind, solar PV, waste energy, hydro power and landfill and sewage gas; while the second auction "pot" was allocated between less established technologies: offshore wind, wave and tidal energy, advanced conversion technologies, anaerobic digestion, geothermal and dedicated biomass with CHP. The second and third allocation rounds 2017 and 2019 respectively, were reserved for less established technologies of the second "pot". The third round also included remote island wind installation above 5 MW. The available support budget determines the volume of the allocation/auction rounds. The annual budget for the first allocation round is £ 325 million (2012 prices), £ 295 million (2012 prices) for the second round and £ 65 million (2012 prices) for the third round.[264] The auctions resulted in a 65% price drop for offshore wind between 2015 and 2019. The next auction in expected to take place in 2021. The CfD is provided for a duration of 15 years.

Alongside the CfD, a feed-in tariff (FIT) is provided to support households, communities and small businesses investing in projects up to 5 MW, covering the following technologies: solar PV, wind, CHP, hydro, anaerobic digestion. However, the FIT was closed to new applications in April 2019, with a grace period for certain projects until 2022.[265] It will be replaced by the Smart Export Guarantee (SEG), which provides projects up to 5 MW or 50kW for micro CHP the right to be paid for electricity that they export to the grid. The SEG tariffs are set by the electricity suppliers. The SEG is open to solar PV, wind, micro CHP, hydro and anaerobic digestion plants.[266]

- **Long-term security of support for RES-E: Moderate**

The transition towards the new main RES-E support scheme (CfD) has been successful, without abrupt or retroactive changes in policy. The CfD budget is determined per allocation round and made public upfront for the next allocation round. However, the available budget for of further future rounds is unknown, which leaves investors with uncertainty regarding the availability of support in the medium to long term. The FiT scheme for projects up to 5MW was closed in April 2019 and was preplaced by the smart Smart Export Guarantee in January 2020.

[263] https://www.ren21.net/wp-content/uploads/2019/05/gsr_2020_full_report_en.pdf

[264] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/757810/Contracts_for_Difference__CfD__Draft_Budget_Notice_for_the_third_allocation_round__2019.pdf

[265] https://www.ofgem.gov.uk/environmental-programmes/ FIT/applicants

[266] https://www.ofgem.gov.uk/environmental-programmes/smart-export-guarantee-seg/about-smart-export-guarantee-seg

Heating and Cooling

- **Fulfilment of earlier RES-H&C policy commitments: Yes**

The United Kingdom has fulfilled its policy commitment. The main RES-H&C support scheme is the Renewable Heat Incentive (RHI). It is a support scheme that provides premium payments per kWh of produced renewable heat. The RHI distinguishes between domestic and non-domestic production. The scheme was amended in 2018 to allow for third party finance providers in the domestic section of the scheme. Non-domestic installations receive support for 20 years, while domestic installations receive support only for seven years. Eligible technologies covered under the RHI scheme are biomass boilers and stoves, biomass CHP, biogas and biomethane injection, heat pumps (air, ground and water source), deep geothermal and solar thermal. In addition, a District Heating Loan Fund exists in Scotland.

The Nearly Zero Energy Buildings in Northern Ireland is set be implemented by 31st December 2020 and requires all new buildings to be nearly zero energy buildings. It has been in place for public sector buildings already since 31st December 2019. Compliance is achieved by meeting a Target Emission Rate.

Furthermore, the Heat Network Investment Project (HNIP) was launched in the UK in 2018. It is a £1 billion target investment project in the development of heat networks and the government has provided funding for up to £ 320 million of loans and grants over a period of three years.

Long-term security of support for RES-H&C: Moderate

The Non-Domestic RHI is currently only funded for new accreditations until March 31st 2021 while the Domestic RHI has been extended until March 31st 2022. It is unclear if the schemes are to be funded further or replaced, creating uncertainty in the medium and long term.

Transport

- **Fulfilment of earlier RES-T policy commitments: Yes (but below 2018 RES-T NREAP sectoral trajectory)**

The Renewable Transport Fuel Obligations Order (RTFO), establishing an obligation system for biofuels, is the main instrument for RES-T support in the United Kingdom.[267] The RFTO has been established in 2008 and most recently amended by the Renewable Transport Fuels and Greenhouse Gas Emissions Regulations in 2018.[268] Under the RTFO, fuel suppliers supplying above 450,000 liters/year of transport and non-road mobile machinery fuel in the UK must be able to show that a percentage of the fuel they supply comes from renewable and sustainable sources. The recent changes to the RTFO more than doubled the obligation level from 4.75% in 2017-18 to 9.75% in 2020, and furthermore introduced annual targets up to 2032. A separate sub-target for so called “development fuels” (advanced waste or residue based biofuels excluding segregated oils and fats such as used cooking oil and tallow, and renewable fuels of non-biological origin) effective from 0.1% in

[267] https://www.gov.uk/guidance/renewable-transport-fuels-obligation
[268] https://www.legislation.gov.uk/ukdsi/2018/9780111164242

2019 to 2.8% in 2032 and a cap for crop-based biofuels are also set.[269] In addition, renewable aviation fuels are also eligible in the RTFO from April 2018.

The UK Department for Transport has run several competitions to promote the deployment of advanced biofuels in the UK. These include the Advanced Biofuels Competition Demonstration (ABCD) in 2014-2017[270], and the Future Fuels for Flight and Freight (F4C)[271] in 2017 in 2017-2020. A total of £ 47 million was made available. In addition to the support of biofuels through the RTFO, several measures and investment funds regarding electric and hydrogen mobility have been introduced in recent years, aiming at behavioural change of end consumers and the improvement of available charging infrastructure.

- **Long-term security of support for RES-T: High**

The RTFO is a well-established policy instrument and secures long-term incentives to increase RES-T shares, as the obligation is set until 2032. The outlook of the support for electric and hydrogen mobility is positive and several ongoing schemes aim to improve the charging infrastructure across the UK.

[269] This is set at 4% in 2018, reducing to 3% in 2026 and 2% in 2032.
[270] https://www.gov.uk/government/speeches/advanced-biofuels-demonstration-competition
[271] https://www.gov.uk/government/publications/future-fuels-for-flight-and-freight-competition-feasibility-study

APPENDIX C. ANALYSIS OF NON-ECONOMIC BARRIERS AND PROGRESS ASSESSMENT OF SPECIFIC ISSUES

The analysis in this appendix provides an overview regarding non-economic RES barriers and corresponding incentives to overcome these. The scope of the analysis covers several and diverse elements. On the one hand, the analysis focuses on non-economic RES barriers and the current status of overcoming these. Here, we assess issues along five main topics:

- Administration
- Building and planning
- Information
- Grid integration
- Support schemes

On the other hand, the analysis assess the progress made regarding specific issues. Among other things, these issues include the following topics:

- Procedures to facilitate grid access for renewables (measures to ensure transmission & distribution of electricity produced from RES sources and rules for bearing and sharing of costs relating to grid connection) (cf. Art. 16 (2), (3), (4), (5), (6) RES Directive).
- Level of transparency and coordination among involved authorities in charge of authorisation procedures, including the existence of a single administrative body responsible for processing authorisation, certification and licensing applications and providing assistance to applicants, and progress achieved (cf. Art. 13 (1), 22 (3 a) RES Directive).
- Availability of information & assistance (cf. Art. 14 RES Directive).
- Time limits for delivering authorisations (cf. Art. 13 (1), 22 (3 b) RES Directive).
- Application of renewable energy obligations in buildings (appropriate measures to increase the RES share in the building sector and developing a district heating infrastructure to accommodate the development of RES-H&C, if needed) (cf. Art. 13 (4), 16 (11) RES Directive).
- Functioning of the system of guarantees of origin for electricity and heating and cooling from RES and the measures taken to ensure the reliability and protection against fraud of the system.

The analyses are performed per Member state and completed by an EU-wide summary overview on the status and progress regarding the implementation of legal indicators from the RES Directive.

Summary overview

This section provides a complementing overview of the implementation status of several legal indicators emphasized in the RES Directive as well as the progress made within the last years. As Table 20 below depicts, the status of implementation of legal indicators from the RES Directive has been rather mixed by the end of 2018. This holds for the comparison of indicators as well as the comparison of MS.

Overall, a large share of the relevant measures in the REDI have been successfully implemented across the Member States. These measures include, amongst others: facilitated procedures for small-scale projects, requirements on system operators to provide cost estimates and other necessary information, requirements on the distribution of costs of grid development and grid connection of renewable energy, consideration of RES-E in the national network development plan, and the existence of support schemes promoting the use of renewable energy. Table 21, showing the change of implementation status from the fourth progress reports of Member States in 2016 to the fifth progress reports in 2018, highlights the overall positive development. While the status of indicators only changed to a small extent, these changes were all positive.

However, also some barriers remain. While progress has already been made in the past, administrative procedures across all sectors can be even further streamlined in many Member States. Also, authorisation procedures could be further simplified, and the time required for processing permits could be reduced. For the electricity sector requirements in terms of spatial and environmental planning complicate the developments in some Member States. For the heating and cooling sector, the barriers are mainly due to shortcomings related to the capacities of the district heating networks, while the transport sector mainly sees barriers arising from the lack of adequate infrastructure electric vehicles and some policy changes in the field of biofuels creating market uncertainty. The integration of the increasing RES capacities in the grid is also a persisting challenge for the majority of the Member States. The barriers mainly arise from high cost of grid connection as well as from the lack of predictability and transparency of the grid connection procedures.

Table 20. Overview of the status of the EU28 Member States on the implementation of legal indicators from the RES Directive by the end of 2018

Table 21. Overview of development of the status of the EU28 Member States on the implementation of legal indicators from the RES Directive from 2016 to 2018

Belgium

Assessment of barriers

Administration

Status: Administrative procedures depend on regional and federal aspects in Belgium. Thus, information on support schemes is not centrally available. Yet, there are efforts to improve administrative coordination, for example an environmental permit became effective in Flanders on 23 February 2017, integrating the former separate building and environmental permit and streamline the advisory and decision-making powers in the permit procedure. In Wallonia, Pax Eolienica aims to simplify administrative procedures for wind developers. The coordination for onshore grid reinforcements (Ventilus and Boucle du Hainaut) requires political cooperation on all administrative levels (federal, regional, local) to ensure the tight timeline and the different regional permits for Ventilus. And there is a new planned royal decree concerning the conditions and the procedure for allocating domain concessions for the construction and operation of offshore wind installations.

Main barriers:

- Different administrative bodies are responsible for issues connected to RES development.
- Lack of political unity on energy policy – NECP Belgium.
- Aeronautical constraints for wind energy installations.

Building and planning

Status: The building and planning procedures depend on regional regulations as well. In the past, insufficiently developed district heating networks hindered the building of RES-H&C installations. Recently, there have been efforts to improve the situation. For example, Warmtenetwerk Vlaanderen and the Vlaams Energieagentschap joined forces to set up a joint inventory of existing and planned heating networks in the Flemish region including customers, share of green heat and residual heat.

In Flanders, new buildings and extensively refurbished buildings must meet legal requirements for RES and there is the obligation to use a certain amount of RES in public buildings. The Flemish government is also taking up an exemplary function in installing solar PV on its governmental buildings as part of its real estate strategy.

Main barriers:

- Underdeveloped district heating networks.
- Difficult grid connection for onshore wind installations due to spatial planning.

Information

Status: While information is scattered due to the complex structure of federal, regional and local responsibilities, there are efforts to improve information issues. The Flemish region, Walloon region and the Brussels-Capital region have jointly set up a harmonised system to

train and certify reliable and well-qualified installers (https://www.rescert.be/nl) for certain renewable installations.

Main barriers:

- Information on support schemes is not centrally available but spread out between national and regional sources.
- Insufficient information on grid connection.

Grid integration

Status: RES has priority dispatch unless grid security is at stake and federal and regional regulators are currently working with TSOs and DSOs to strengthen network access for RES. There are grid usage fees in Flanders and Wallonia, but not in the Brussels Capital Region.

Main barriers:

- Several planning authorities need to come in agreement during the permitting process.
- Injection tariffs for the connection to the distribution grid affect the profitability of RES plants.

Support schemes

Status: Support schemes promoting the use of RES in Belgium have developed over time. There has been renegotiation of certificate pricing for offshore wind after recent cost developments in the neighbouring countries. Offshore wind sites will be competitively tendered in the future. The Flemish government adopted a legislation in spring 2019 that facilitates setting up a guarantee of origin system for gas and heating/cooling from renewable sources ("green gas" and "green warmte").

Main barriers:

- Uncertain and inefficient support scheme for RES-H&C.
- Uncertainty of the support mechanism for RES-E.

Assessment of progress made regarding specific issues - Belgium

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	No
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes (Wallonia)
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	In progress
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	In progress
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	No
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Bulgaria

Assessment of barriers

Administration

Status: In the past, the development of RES has been impeded by certain barriers related to administrative issues, e.g. non-harmonized administrative procedures, but this has been improved to some extent recently. For example, the Agency for Sustainable Energy Development (AUER) administers an Information Platform for Interoperability of Spatial Data and Services in relation to RES. The Agency also uses a web-based system for registering and processing applications, which allows the one-stop-shop registration of documents and applications, automatic distribution of document, etc. In addition, the number of documents required to be submitted in administrative proceedings has been reduced. As of 2018, a possibility was provided for the submission of electronic applications via the single information and services web portal of the KEVR, which has lowered the administrative burden of submitting and reviewing the requisite documents. Still, stakeholders claim that addressing the complex formalities of administrative licensing, as well as harmonizing administrative procedures would be needed[272]. E.g. the administrative procedures and connection processes for distributed generation facilities are characterized by high differences according to the DSOs and municipalities as regards the necessary steps, validity of permits and approvals, fees payable, and the coordination with other authorities. The creation of one-stop shop system and streamlining of administrative procedures at the municipal would be needed to mitigate delays related to permitting. DSOs are entitled to reject the connection of small RES-E plants to the grid for energy security reasons and can require financial contribution to grid enforcement from investors. However, no clear and transparent rules are available to govern this process.[273]*Main barriers*:

Non-harmonized and non-standardized administrative procedures.

Building and planning

Status: Minor issues related to building and planning exist in Bulgaria. Ecological restraints relate to possible disturbances and collisions of migrating birds with wind power plants,

[272] NECP of Bulgaria, 1.3.iii.

[273] https://csd.bg/fileadmin/user_upload/publications_library/files/2018_07/DECENTRALISATION_ENG.pdf

especially on protected territories and NATURA 2000 sites in the North East of the country. For example, one of the largest migration routes in Europe, Via Pontica in Eastern Bulgaria, also exhibits the country's highest wind resources. NGOs and civil society organizations initiating court proceedings and filing complaints inter alia related to these restraints constitute effective bottlenecks in the planning process of wind power projects and can lead to significant delays. Territories with good RES-E potential (especially wind and small hydro) often overlap with environmentally protected areas and environmental impact assessments require thorough analysis, making the authorization process lengthy and expensive. Moreover, RES development is obstructed by reasonable agricultural restraints, such as pressure to preserve the most fertile land for farming and prevent any further increase in land rents driven by solar investors seeking more land. However, this barrier has become less severe more recently, as enough "low-grade" non-arable land has become available for solar PV developers. Outdated district heating systems with inefficient installations and high network losses make district heating less competitive compared to individual heating solutions, limiting the opportunity of RES-H deployment at larger scale.

Main barriers:

- Ecological considerations require thorough environmental authorization making the procedure lengthy and expensive, often deterring investors.Court proceedings and complaints by NGOs and civil society organizations inter alia related to the ecological restraints can lead to significant delays in implementation.
- Outdated district heating system making larger scale RES-H deployment less competitive compared to individual heating systems

Information

Status: The general public attitude towards RES-E is negatively biased due to the price increases following the RES-E boom in 2011-2012, partially due to the high share of energy poverty in the country. This is also reflected in the media. Information campaigns, awareness raising activities promoting prosumership and collective RES ownership, which could help mitigate the problem, are missing.

Information barriers for RES in Bulgaria relate to a difficult access to public information during the site selection process and a lack of transparency during decision-making processes. For example, RES-E installations have suffered from non-transparent decisions related to the grid connection process. However, more recently, some improvements were achieved in this respect. The regulator amended its Ordinance 6 of 2014 concerning grid connection rules in September 2019, which together with the amendments to the Spatial Development Act allows grid companies to provide all necessary information related to grid connection to RES producers.[274] The grid connection process is simplified administratively and sets stricter time limits for administration.

Main barriers:

- Negative attitude of the the public and the media towards RES.
- Lack of transparency and public discussion during decision-making process

Grid integration

Status: RES-E have suffered from discrimination in grid access and dispatch due to non-transparent decisions by the relevant authorities. This has led to disadvantageous

[274] https://balkangreenenergynews.com/bulgaria-changes-grid-connection-rules-for-new-res-producers-cms-sofia/

curtailment measures for renewables and the implementation of grid access fees for wind and solar PV plants which affects project's profitability. However, in 2017 and 2018, Elektrorazpredelenie Sever AD did not issue any orders imposing restrictions on the production of electricity from RES except in the cases of planned outages, which were limited in number and affected a small number of producers. Grid connection procedures for small-scale installations require higher transparency.

Main barriers:

- Discrimination of RES producers due to (high) grid access fees imposed on wind & PV capacities.
- Grid access fee for wind and PV plants affects project's profitability.
- Lack of clear rules and transparent processes of grid connection in case of small-scale RES-E plants.
- Outdated district heating system limits the possibility to deploy RES-E at larger scale.

Support schemes

Status: Significant barriers related to support scheme issues exist. Especially the development of RES-E in Bulgaria has suffered from multiple retroactive changes to support policies over the past years. For example, as of 1 July 2018, the statutory obligation of NEK to purchase the energy output of RES Producers under feed-in tariffs was terminated and replaced by a feed-in premium scheme. The premium is paid over an annual forecasted market price determined by the regulator (EWRC), based on forward contracts for the respective period on the national energy exchange. This introduces further uncertainties for RES-E project holders.[275] Frequent changes to support policies have resulted in a lack of investor confidence which is reflected in insufficient access to financing. Balancing costs to be paid by investors is one of the highest in Europe, although it decreased recently (from above 18 EUR/MWh to around 10 ERU/MWh). The fee was formerly influenced by abuse of dominance by the incumbent National Electricity Company[276]. Joining of Bulgaria to the Single Intraday Coupling (SIDC) can lower the costs. On the other hand, it is mandatory for producers to trade their electricity on the power exchange (IBEX), which is entitled to set out its own trading rules (in spite of its monopoly position). Abolishing the possibility to trade products with non-standard delivery periods, including long-term trading, limits the possibility for RES-E producers to engage in transactions ensuring longer-term price stability. Insufficient supportcan also be observed for RES-T and to a lesser degree for RES-H&C. For example, no dedicated incentives are in place to support the purchase of electric vehicles for households and companies (only exemption from circular tax is in place and green plates will be introduced from 10.2020).

Main barriers:

- Lack of investor confidence due frequent and retroactive changes to support schemes.
- Lack of RES-E support scheme for new installations.
- Lack of incentives to promote the purchase of electric vehiclesby households and companies.

[275] https://tbk.bg/en/compensation-with-premiums-of-renewable-energy-sources-power-producers/

[276] http://competitionlawblog.kluwercompetitionlaw.com/2020/01/07/the-bulgarian-national-electricity-company-sanctioned-for-abuse-of-dominance-on-the-market-of-balancing-energy-of-renewables/

- Uncertainties related to the EWRC's methodology for determining premiums with respect to the determination of forecasted market prices.
- Electricity trading rules ignore specifics of renewable energy generation.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	No
	Evaluation of progress? (Art. 22 (1) e))	No
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	Yes
	Online application available?	Yes
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	Yes
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	(Information not provided)

Czech Republic

Assessment of barriers

Administration

Status: Some administrative issues persist, such as delays in project realisation due to non-unified permitting procedures.

Main barriers:

- Owners of PV installations exceeding 10 kW are obliged to be registered as entrepreneurs
- Non-unified administrative procedures causing delays
- Burden of bureaucracy in license obtainment
- Cuts of production due to reactive power compensation for installations above 100 kW
- Energy Regulatory Office's delays not penalised

Building and planning

Status: There is no unified approach of buildings offices towards approving photovoltaic systems in the Czech Republic. Despite a methodological recommendation of the Ministry of Regional Development (MMR ČR), the land use planning and construction of buildings regulations differs considerably.

Main barriers:

- Diverse interpretations of the building code and related regulations
- Too strict PV prohibitions in historical and landscape areas
- No integration of hydropower plants in spatial planning
- Too restrictive planning documents of Regions on the construction of new RES plants
- Arbitrary decision-making of officials in case of wind power projects

Information

Status: Barriers still exist in a variety of different communication and transparency problems, which lead to a negative image of RES and leave support for RES unsatisfactory and unpredictable.

Main barriers:

- Insufficient professional capacity and lack of communication
- Unsatisfactory explanation for connection rejection
- Unpredictability of DSO's decision
- Negative image of RES (especially PV)
- No transparency and unclear support mechanism for historic RES

Grid integration

Status: Issues regarding grid integration arise from insufficient distribution grid capacity as well as a lack of transparency in related decisions and lead to uncertainty in RES development. Projects face the risk of being denied grid access. Additionally, these decisions are not made transparent.

Main barriers:

- Limited transparency of DSO's Decision
- Ossified electricity tariff regime of the regulator
- Slow development of electric vehicle infrastructure
- No transparency in the DSO's grid access decision
- Difficulties to connect decentralised RES to the grid, due to grid instability of the grid operator

Support schemes

Status: Several issues regarding support schemes persist in the different RES sectors. While missing operational support for new installations represents the greatest challenge regarding RES-E, additional restrictive measures such as a recycling fee for PV panels, a levy on electricity from solar radiation (so-called solar tax) and the cancellation of RES-E tax exemption complicate RES development in the Czech Republic.

Main barriers:

- Support for renewable energy abolished since 2014
- Risk of the return investment control (so-called Revision Mechanism)
- Frequent restrictive measures increase financing costs in RES sectors

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	No
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	In planning
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	(Information not provided)
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Denmark

Assessment of barriers

Administration

Status: Administrative procedures in Denmark have been improved in recent years. The introduction of a one-stop shop for offshore wind turbines simplified the administrative burden for the approval of offshore wind farms in Denmark. Coordination between all relevant authorities within the licensing process is handled by the Danish Energy Agency. Licenses are prepared in advance by the Danish Energy Agency and can be issued once the EIA of the winning tenderer for the project has been approved. Moreover, Denmark uses a dialogue-based tendering model which makes allows tenderers to make suggestion regarding the terms of the licenses. As a result, the license conditions can be considered transparent.

To facilitate preliminary investigations prior to the erection of wind turbines, a guarantee fund has been set up covering initial project planning costs for wind onshore and solar photovoltaic plants.

Main barriers:

- Non are known.

Building and planning

Status: In Denmark, renewable energy sources for heating purposes are exempt from tax obligations. The use of biogas for heating purposes is also tax-exempt and supported by a direct premium tariff. In 2013 a ban on the installation of boilers fired by oil or natural gas in new buildings was introduced. The promotion of RES-E infrastructure in Denmark takes place at local level. The Danish Ministry of Energy, Supply and Climate encourages local authorities to support projects that promote the use of district heating. The majority of district heating systems is owned by municipalities and consumer cooperatives. As there is nomandatory renewable energy share for district heating, the use of renewables depend on the support of the local consumers and the respective economic benefits. Currently fossil fuels (co-firing with biomass) cover about 40% of the supply.

Main barriers:

- Extension of legal requirements for RES in new buildings.
- RES share is regulated through the product environmental footprint, there is no direct mandatory RES share in district heating (a missing driver).

Information

Status: Denmark promotes the development, installation and use of RES with two types of training programmes for RES installers: the quality assurance programme for installers of solar thermal, PV and biofuel systems and the heat pump programme for the installation of heat pumps. In addition, vocational training for specific professions covers all requirements of the European RES Directive.

Grid integration

Status: The Danish legislation implements the priority of RES connection to the grid. As a result, the access of RES-E shall be granted on a non-discriminatory basis. Priority shall be given to renewable energy sources with regard to the use of the grid.

With an electrified energy system and increasing electricity supply based on wind power, it is important to have sufficient flexibility in the system. Thus, the high share of fluctuating renewable energy in combination with low flexibility in the system could endanger grid stability.

Denmark plans to roll out smart metering and flexible billing, as an approach to mitigate flexibility issues, before the end of 2020. However, its potential is limited[277]. In addition, a new financial regulation of electricity grid operators gives companies a high degree of flexibility using their funds to increase efficiency in operation and investment.

Cross-sector integration such as integration of wind power into a district heating system at the local level increases flexibility of a system and reduces the risk of grid congestions. Due

[277] https://doi.org/10.1016/j.enpol.2017.05.009

to the given structure in district heating systems (no regulation on third party access) and the existing tendering scheme (wind power) this integration is still in its infancies.

Finally, exporting to and importing electricity from other countries becomes increasingly important and several projects connecting with foreign countries have been approved to mitigate bottlenecks. However, although the interconnection capacities are high in relation to the level of consumption, bottleneck in transmission grid in neighbouring countries still limit the exchange of electricity.

Main barriers:

- Lacking grid development in Germany causing lock-in of wind in the northern part of Europe.
- The high amount of fluctuating wind power jeopardizes grid stability.
- Low level of sector coupling (PtH) due to high electrical heating taxes (will be reduced in 2021).

Support schemes

Status: Support schemes to promote the use of renewable energy sources in Denmark are primarily based on a feed-in premium for wind and solar installations, which are awarded through tenders, and net metering for electricity producers who are entitled to use all or part of the electricity generated for their own needs without paying public service obligations.

The support scheme based on a tender process is more attractive for large project developers and less for small communities and energy initiatives, which in turn could negatively affect the acceptance of onshore wind power projects.[278][279] However, to overcome this potential negative impact, the government has introduced additional support schemes that guarantee a compensation payment for the devaluation of residential properties and a right to purchase shares of a local wind turbine project[280].

Main barriers:

- None are known.

[278] http://dx.doi.org/10.3390/en13061508
[279] http://dx.doi.org/10.1016/j.enpol.2017.05.009
[280] https://www.renews.biz/56512/denmark-changes-compensation-scheme-for-renewables/

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	Yes
	Online application available?	Yes
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	Yes
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes (but no targets are set)
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes (for electricity)
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Germany

Assessment of barriers

Administration

Status: There has been continuous improvement regarding administrative issues in recent years, e.g. through technical support of bidders in the auction process, formal errors could be minimised. However, for small plants e.g. rooftop PV administration processes e.g. approval from distribution grid operators are still slow-moving in some regions.To ease administration and bundle reporting obligations, a comprehensive database of all master data of the electricity and gas market (“Marktstammdatenregister”) has been developed.

Some issues remain for heating and cooling, as the complex and not fully aligned regulatory framework for energy efficient buildings increases complexity and hinders effective policy implementation. There are three legal documents, which currently regulate the issue of energy efficiency of buildings: Energy Saving Act ("Energieeinsparungsgesetz", EnEG), Renewable Energies Heat Act ("Erneuerbare-Energien-Wärmegesetzes", EEWärmeG) and Energy Saving Ordinance ("Energieeinsparverordnung", EnEV). Some provisions in these regulations which concern energy efficiency in the building sector, including the use of renewable energy technologies such as heat pumps and solar thermal, are not fully aligned, which increases complexity and hinders effective policy implementation.However, efforts are made to streamline these provisions. The Building Energy Act ("Gebäudeenergiegesetz", GEG), coming into force in November 2020, creates a new, uniform and coordinated set of rules for the energy requirements of new buildings, existing buildings and the use of renewable energies for the heating and cooling of buildings. To this end, the separate sets of rules on energy efficiency in buildings (EnEG, EnEV) and on the use of heat from renewable energies (EEWärmeG) have been merged and standardized.

In addition, specific barriers to the development of geothermal power hamper the projects’ implementation and thus pose risks for investors. Geothermal projects require permits from the water and mining authorities. The time necessary for obtaining these permits can differ greatly from region to region, making it difficult for operators to have any planning certainty. In addition, water and mining rights are handled differently in different federal states, making it difficult for project developers to exchange experiences about projects. The long time to process applications hampers a fast project implementation.

Furthermore, the administrative requirements for offshore wind energy projects are high and stricter than in many other countries. This relates to the large number of documents (e.g. preliminary studies of the areas) that must be collected and the level of technical details that must be addressed before commissioning the offshore wind farm.[281]

Also, under the current regulatory framework, for electricity produced in renewable energy sources and consumed on site, 40% of Renewable Energy Surcharge (EEG-Umlage) must be paid. This rule is effective from 2017 and applies only to newly installed renewable energy facilities. Renewable energy installations of less than 10 kW as well as off-grid installations are exempted from the EEG-Umlage. This is moreover hindering the roll-out of storage systems and batteries as they need to pay twice for the surcharge at feed-in and feed-out. Also sector coupling technologies like power to gas are hindered by this double burden.[282]

Main barriers:

- Lengthy and inconsistent permitting procedures for geothermal projects
- Complex administrative procedures for offshore wind

Building and planning

Status: Some issues regarding building and planning persist for RES-E as well as RES-H&C. Renewable energy obligations on buildings induce unnecessary competition among RES technologies. The obligation to cover a minimum of 15% of heat demand with solar thermal installations (instead of high-efficiency building or heat pump installation) according to the renewable heat law (EEWärmeG), could induce a competition of rooftop usage between solar PV and solar thermal technologies.

Regarding RES-E, issues persist for the onshore wind development which currently faces challenges due to acceptance issues, delays in the land-use planning, emerging minimum distance rules on state level and lawsuits against wind projects, among them a few against existing wind power plants. There has been a slump in the deployment of onshore wind which started in the middle of 2018 and continues until today, with a series of auctions heavily undersubscribed.

Main barriers:

- Long and complex adoption of wind priority areas in regional land-use plans
- Height and distance restriction rules for onshore wind
- Arable land restrictions for free standing solar PV installations
- Restriction to build wind turbines in the proximity of radar areas

Information

Status: There are no significant issues regarding information. For all RES technologies comprehensive information is available.

[281] Source: re-frame.eu

[282] https://www.re-frame.eu/index.php?id=66

Main barriers:

- Anti-wind movement negatively impacts the public perception of onshore wind
- No atlas on deep geothermal datasets available

Grid integration

Status: Delayed transmission grid expansion is hindering a more progressive RES-E expansion. As grid expansion could not keep up with RES development in past years and partial grid congestions persist, annual limits for onshore wind capacity additions have been defined for the so-called grid expansion area ("Netzsausbaugebiet") in Northern Germany.

Other reasons for the slow grid expansion are acceptance issues as well as complex and interlinked responsibilities between the central government and federal states. The decision to install underground cables for power transmission from North to South of Germany has caused further delays in the development of the grid due to the higher technical challenges and longer time needed for placing underground cables compared to standard overhead powerlines.

Main barriers:

- Volume caps for wind energy due to the lack of grid capacity in North Germany
- Lengthy grid expansion and authorisation processes

Support schemes

Status: Some issues related to RES support schemes persist. The shift to RES auctions for large installations caused unforeseen challenges regarding onshore wind development. The announced change of the support mechanism towards auctions led to a peak in wind projecting and capacity additions at the end of the old administrative support scheme which resulted in a depleted wind project pipeline and missing bid volume from 2018 onwards. In addition, preferential rules for energy community projects that existed in 2017 might lead to lower realisation rates for the onshore wind auction rounds of that year. The special rules for energy community projects were partly abolished in 2018.

Regarding RES-T, the insufficient support of fuels from RES hinders further development.

Main barriers:

- Too low remuneration for most biomass technologies

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	Yes
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	No
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Estonia

Assessment of barriers

Administration

Status: Onshore and offshore wind development has been hampered by the fact that Estonian Defence Forces do not allow any new wind parks in the height ranges where wind developments are economically feasible. Recently it has been decided that new investments shall be made in radar systems to allow development of wind projects in North-East Estonia[283] and the government also decided to start planning and environmental assessment procedure on three offshore wind sites in Western Estonia.[284]

Main barriers:

- Administrative process is lengthy and without national level guidance on procedures.
- Estonian Defence Forces restricting development due to national security and distortions to radar systems.
- Difficult planning procedures for wind projects due to conflicting positions of different ministries and overlap between energy, climate and environmental goals.
- Renewable energy developers are required to carry all the costs related to site development, including research used as basis for the environmental impact assessments and full costs of building grid connection infrastructure and obtaining a permit.

Building and planning

Status: Heat produced from RES sources, though competitively priced, is not prioritised in Estonia. However, if possible, heat produced from RES and CHP plants should be preferred.

[283] https://www.mkm.ee/et/uudised/valitsus-investeerib-kirde-eesti-taastuvenergia-arengusse
[284] https://majandus24.postimees.ee/6854201/valitsus-andis-hoogu-liivi-lahe-kolme-meretuulepargi-sunnile

Further legislative and policy steps are underway to support the development of specific regulatory measures for the growth of RES is ongoing and new draft amendments are expected.[285]

Main barriers:

- Lack of incentives to build plants using renewable energy, instead of fossil fuels, for heat production in the future.

Information

Status: A certification system for RES installers has been put into place.[286] Very few certificates, if any have been issued to installers and certification is not required to carry out the installation. Cooperation between all relevant actors needs to be improved to improve uptake of certification and to increase consumer's knowledge of the possibility to request certified installation.

Main barriers:

- Lack of technical training and expertise.

Grid integration

Status: Due to the steep rise in PV projects the distribution grid operators are not able to provide grid connection during the time periods specified in legislation. Due to legislative ambiguity they are allowed to exceed time limits and a normal time period for obtaining a grid connection offer could be extended from 30 days to three years.

Main barriers:

- For the injection of biomethane into the natural gas grid, developers are required to bear all costs associated with the connection.
- Grid development plans are not transparent and reliable and impede the development of RES projects.
- Electricity distribution grid operators have not allocated adequate resources to deal with increased requests for the grid connection of PV systems.

Support schemes

Status: Unclearly motivated changes in the support schemes have created booms in building PV systems and developers have found loopholes in the regulation to comply with still existing support schemes. This has created unnecessary administrative burden that the grid operators are unable to cope with, thus creating negative reactions in project developers.

Main barriers:

- Legislative change of support scheme – unclarity about post-2020 programming and development pace until 2030 regarding different technologies.

[285] http://www.res-legal.eu/search-by-country/estonia/summary/c/estonia/s/res-hc/sum/124/lpid/123/
[286] http://www.res-legal.eu/search-by-country/estonia/summary/c/estonia/s/res-hc/sum/124/lpid/123/

- Uncertainty about future support schemes.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	(No information provided)
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	No
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	(No information provided)
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Ireland

Assessment of barriers

Administration

Status: There are no significant administrative issues for RES-H&C and RES-T. However, regarding RES-E lengthy delays for grid connection might occur, especially for wind projects.

Main barriers:

- Lengthy delays of grid connection.

Building and planning

Status: The new spatial planning requirements, introduced by the target model for the electricity market and the delayed revision of the Wind Development Planning Guidelines are perceived as challenges for the sector. For example, developers will be not be allowed to build wind installations in a distance of 1.5 to 2 km from other wind farms, thus decisively limiting suitable locations for the future. In the RES-H&C sector, the central barrier related to the building and planning framework pertains to an insufficient district heating network.

Main barriers:

- Target model for electricity market induces spatial planning issues.
- Wind development planning guidelines delayed.
- Lack of district heating networks.

Information

Status: There are no significant information issues in Ireland.

Grid integration

Status: Identified grid issues include the lengthy grid access procedure and the associated high costs. Until March 2018, the gate model, a group connection approach, applied, which allowed a better grid development forecast for grid operators, but at the same time decisively lengthened the access period for installations. However, with the new connection procedure, which entered into force in March 2018, grid access procedures have improved. As part of the so-called "Enduring Connection Procedure 1" (ECP-1), grid connection is processed in more frequent "yearly batches" thus aiming at accelerating grid connection for existing and new RES plants[287]. The batch process allows projects to connect as part of a sub-group, which lowers the connection costs for individual projects, as these costs are shared among the sub-group. The second stage of the ECP (ECP-2) is planned for 2020.

Main barriers:

- Lengthy grid access process for RES plants and related high grid connection cost.
- Grid connection delays.

Support schemes

Status: The dominant issue related to the support scheme in Ireland for RES-E involve the delayed implementation of the RESS and the associated uncertainty of the future support level for wind projects, mainly offshore wind, through the introduction of multi-technology auctions.

Main barriers:

- Closure of RES H&C support scheme at the end of 2020.
- Delays in the introduction of the new RES-E support scheme.
- Uncertainty of future support levels certain technologies in future support scheme.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	(No information provided)
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes

[287] https://www.cru.ie/wp-content/uploads/2017/04/CRU18058-ECP-1-decision-FINAL-27.03.2018.pdf

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	(No information provided)
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes (for electricity)
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Greece

Assessment of barriers

Administration

Status: Administrative procedures are still impeded by long waiting periods for specific licenses such as the electricity generation license.

Main barriers:

- Licensing process takes long.
- Administrative procedures for biomass and biogas plants are slow.
- Complexity of Greek electricity market discourages new entrants and ongoing implementation.
- No equal treatment of RES among the Greek regions.

Building and planning

Status: The dominant issue regarding the support schemes for RES-E remains the lack of a long-term energy planning. However, it should be noted that Greece has published a draft of its "National Energy and Climate Plan" in November 2018, where many stakeholders have responded to the public consultation.[288] The current biggest concern for RES investors is the unclarity about the future funding of the Special Account for RES, which allocates the RES support to the project owners. In fact, the electricity supplier's fee, imposed on all electricity retailers and representing a considerable input for the Special Account for RES, shall be gradually abolished by 2020. Moreover, the building and planning processes are affected by conflicts between RES-E projects and environmental concerns.

Main barriers:

- Introduction of stricter guidelines amending the spatial planning framework may hinder the development of RES.
- Lack of spatial planning taking into consideration the potential of the RES-H&C.

Information

Status: There are no significant issues regarding information. However, most information is only available in Greek, which might be considered a barrier for international investors. Also, there is a lack of information on the biomass potential for biofuels.

Main barriers:

- Lack of reliable information sources on available biomass feedstock.

[288] http://www.opengov.gr/minenv/?p=9704

Grid integration

Status: RES projects have to deal with high grid connection costs, a lack of transparency in the connection process as well limited grid capacities leading to lengthy grid connection procedures.

Main barriers:

- Low prospects for biomethane deployment due to strong focus on natural gas.
- Lack of internal coordination with the Hellenic Electricity Distribution Network Operator (HEDNO) leads to delays in the grid of PV plants.
- Grid congestion in certain areas due to lacking interconnections, especially with regard to the non-interconnected islands.
- High grid connections costs in areas with congested grid.
- Congested grid for biomass and biogas plants.

Support schemes

Status: The automatic volume adjustment[289] in the RES-E auctions could be viewed as barrier for investors, as a significant number of bids is always cut off. The measure ensures competition within individual auction rounds but comes at the price of low awarded volumes over time (and thus potentially missing the RES targets) and of low incentives to develop projects and participate in the auctions in the mid- and long-term. In addition, being cut off an auction might lead to the need for developers to review their projects and having to repeat the licensing procedure. Due to fact that there are considerable delays for the re-issue of the licenses and permits, this might further delay the realisation of basically mature projects that would have been awarded under the initially auctioned volumes (without the volume adjustment). Furthermore, if a project surpasses the auctioned volume, the next one in the ranking (with a higher bid price) is selected if it fits in the remaining volume. This increases support cost expenditures and has occurred in almost all auction rounds[290].

In the RES-H&C sector, limited amount of support for biomass provided through the investment law constitutes a barrier.

Main barriers:

- Low awarded volumes in RES-E auctions due to automatic volume adjustment.
- Lack of sufficient support for small biomass.

[289] The initially auctioned volume is adjusted downward based on the submitted bid volume until a certain threshold of oversubscription (40%; in 2018: 75%) is reached.

[290] http://aures2project.eu/wp-content/uploads/2020/03/AURES_II_case_study_Greece.pdf

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	Yes
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	Yes
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	No

Spain

Assessment of barriers

Administration

Status: Despite measures with the aim to simplify and speed up processes, e.g. optimizing the overall time of processing files by simultaneous environmental and technical assessment of dossiers, a variety of different administrative issues persist in Spain. Long environmental impact assessments as well as complex and lengthy administrative procedures carried out prior to approval make the administrative process inefficient. Training programs for developers on the environmental impact assessment and for staff involved in processing dossiers are carried out in order to improve processes in the future.

Main barriers:

- Long environmental impact assessment (EIA) previous to authorization.
- Complexity of administrative procedures.
- Delays in administrative procedures for grid connection.

Building and planning

Status: For new buildings and buildings undergoing major renovation, a certain percentage of the hot sanitary water demand must be met by solar thermal systems. These requirements can be lowered or bypassed by using other RES or CHP. However, there is still a lack of demand for solar thermal systems due to missing financing programmes and the non-existence of a RES-H&C strategy.

Main barriers:

- Missing strategy for the development of RES-H&C.
- Lack of demand for solar thermal installations due to economic downturn & crisis in the housing sector.

Information

Status: Further informational campaigns and training programmes could be helpful in order to raise awareness for RES-H&C technologies and improve the lack of transparency and coordination between stakeholders.

Main barriers:

- Misinformation on the role of RES in the imbalance between the electricity system's regulated costs and revenues.
- Lack of transparency and coordination between stakeholders.
- Lack of transparency and neutrality in the energy audits.
- Lack of awareness towards RES-H&C technologies.
- Lack of quantitative data on the installed capacities for RES-H&C installations.

Grid integration

Status: Royal decree law 15/2018 exempts RES-E from charges and simplifies the procedures for RES-E on self-consumption. RES-E operators are entitled to grid connection, priority dispatch against the grid operator. A grid operator is also entitled to an expansion of the grid if the expansion is necessary to connect his plant to the grid. Nevertheless, restrictions of priority access and dispatch for RES-E remain a main barrier, followed by high connection costs and a lack of grid infrastructure.

Main barriers:

- Restrictions of priority access and dispatch for RES-E.
- High connection costs.
- Lack of grid infrastructure.
- Lack of interconnection capacities with EU transmission grid and (strong) delay in their build up.
- Heterogeneity of DSO technical requirements complicates project development.

Support schemes

Status: Support schemes promoting the use of RES in Spain have developed over time, but they have been heavily restricted or even abolished in 2012.*Main barriers:*

- Deep review of the support schemes including retroactive changes for existing plants introduces uncertainty and reduces credibility of sustainability of support schemes in Spain.
- Excessive tax regime.
- Lack of promotion programmes and bad functioning of the (few) existing ones.

- Insufficient targets for biofuels in the transport sector.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	No
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

France

Assessment of barriers

Administration

Status: Administrative procedures are not centralised meaning multi-level (national and regional) administrative procedures lead to additional costs. No timeframe is dictated by law for administrative steps either, meaning these procedures are also lengthy. This is the case for example, when trying to get the authorization "installation classified for the protection of the environment" (ICPE) for wind energy installations, in which case the process has been reported to take up to 18 months. Furthermore, there is a lack of coordination between the competent authorities involved in planning and permitting procedures (DDT and DREAL). As an example, whereas the building permit can be refused after one year of time, the acquisition of the ICPE authorisation can take more than 18 months.

In terms of administrative barriers for RES-H&C, the complexity of application procedures is also a major factor hindering potential projects. These includes requirements for project size, type of project developer, maximum investment constraints, compliance with community rules and the price spread between heat produced from RES as compared to conventional energy sources.

Main barriers:

- Lengthy administrative procedures.
- Energy sector not properly unbundled, which results in vested interests.

Building and planning

Status: In France, the regional territories classified as favourable for wind energy development in the Regional Wind Plans (Schéma Régional Éolien - SRE) are very limited meaning that in some cases, the wind energy objectives defined in the Regional Wind Plans cannot even be met. In the case of wind energy projects, territorial planning implies that

projects need to meet planning requirements and be compatible with the territory areas identified as part of the Regional Wind Plans.

In addition, the legal framework for wind energy contains many requirements linked to aviation and military safety as well as weather radars. As a result, wind energy projects need to stay clear of radar vicinity, height ceiling of fly-zones as well as training flight zones. In the case of military radars, difficulties blocking projects include:

- The strict application of the requirements by the administration, regardless of the distance between the installation and the radar.
- The fact some military radars may be inactive.
- The definition of tactical and training flight areas which are not based on any regulatory framework.

Due to these military constraints, it remains difficult for wind energy developers to install wind turbines with a mast higher than 150 meters, although the newest technologies allow for more performant wind turbines reaching 180 meters height, leading to the installation of obsolete cost-ineffective technology.

Main barriers:

- Numerous restrictions due to aviation and military safety.
- Appeals for the construction of new wind farms.

Information

Status: There are no significant barriers regarding information in France.

Grid integration

Status: In general, grid operators charge RES producers in France for a large part of the grid development costs necessary for their connection to the grid (e.g. including the reinforcement of transformer sub-stations or the replacement of existing electric lines). This situation is due to the uncertain legal definition which determines which grid development works shall be borne by the grid operator and which costs shall be borne by the producers.

The French electricity market is strongly dominated by a single player still (EDF), limiting the liberalisation and diversification of the energy market. As a result, independent power producers are only able to financially benefit from the market in a limited way. Most of the renewable energy projects are connected to the distribution system operator Enedis (former EDF). The grid connection costs are formulated in a technical and financial proposal (PTF) by Enedis (or non-nationalized distributors). However, Enedis does not provide any transparency on costs and duration of connection proposals, in particular regarding the detail of the grid connection breakdown and its duration. The latter is set to three years, the last year being renewable for one year with the possibility for the grid operator to change the agreement terms. Finally, the grid access contracts with Enedis are not in line with the EU directive on non-discriminatory access to the grid.

Main barriers:

- Dominance of the historical single electricity provider (EDF).

- Lack of transparency regarding grid operators.
- Shortcomings of the regional grid connection plans for renewable energies.

Support schemes

Status: Wind, solar and hydro energy installations with an installed capacity over 100 kW are subject to a flat-rate tax on network businesses called IFER (Imposition Forfaitaire sur les Entreprises de Réseau), set to € 7,400 per MW for 2017. Initially the amount of the tax was set for all energies at € 2,900 per MW. In 2011, it was increased exclusively for solar and onshore wind installations to € 7,210 per MW (not for conventional electricity production plants). As a result, this tax represents a high and unfair burden for solar and wind project developers, compared to other sources of renewable energy.

Regarding renewable heat consumption, there are shortcomings in the design of the existing support schemes too. Knowing that in France, the main share of renewable heat consumption comes from low capacity installations, the Heat Fund and the tendering processes of the French energy regulatory authority, are not geared do not cater for low capacity installations. Calls for tenders of the regulatory authority focus on issuing tenders for large heat production capacities, with the capacity to deal with complex administrative procedures. As for the Heat Fund, only communities, collective housings as well as businesses in the industry, service or agricultural sectors are eligible with a high output threshold applying to them. Moreover, the Heat Fund is not sufficiently adjusted to the specificities and capacities of certain technologies and the ceilings for eligible investments are not adjusted according to the size of the installation. The project applying for financial support from the Heat Fund must first comply with the scoring model set for the support scheme, depending on the type of project developer, the size of the installation etc. The project shall also meet productivity and competitiveness requirements as well as maximum investment constraints. In addition, the project is subject to adjustments regarding the compliance with Community rules and the price spread between the heat produced from renewable energy sources and the heat produced from conventional energy sources.

In the French RES-T sector, progress is hindered by issues related to the support schemes, such as the lack of regulatory stability and visibility of support policies in the long term. In fact, while the production of biofuels was originally vigorously encouraged, current debates rather discuss their limitation. This lack of visibility is all the more critical since investors of first-generation biofuels are the same as those of second-generation biofuels, and the means of production for the first generation have not yet been amortised. Investors who had bad experiences from the unstable support policy for first generation biofuels may be more reluctant to invest in the second-generation fuels. Furthermore, the freeze of the biodiesel share in conventional diesel at 7% has been hindering the overall deployment of RES technologies in the transport sector.

Following the 'Yellow Vest' movement that started as a result of a projected hike in the carbon tax, the Carbon Tax will be frozen in France at 44,6 €/t of CO_2 and fossil fuel energy remaining cheaper compared to RES. This will affect negatively heating networks, which will seen as less competitive, and the consumer appeal for electric vehicles.

Main barriers:

- Unfair taxation burden on wind and solar power projects.
- Heat fund geared towards large projects when main consumption of renewable heat comes from small scale producers.

- Lack of regulatory stability and visibility of support policies in the long term on biofuels, substantiated by the Carbon Tax freeze.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	(Information not provided)
	One-stop-shop? (Art. 22 (3) a))	Yes
	Online application available?	Yes
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	No (in progress)
Information issues	Information & assistance available to all relevant actors? (Art. 14)	(Information not provided)
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Croatia

Assessment of barriers

Administration

Status: The high and often insufficiently transparent costs of the administrative procedures are a barrier. They are particularly caused by a high number of required permits and authorities involved, and high costs related to the environmental impact studies, especially for small hydro installations. The latter is due to the fact that the many of the potential sites with good renewable resource potential are under Natura 2000 protection. In addition, procedures are perceived as being overly complex, without a one-stop-shop or an online application procedure in place. For example, as the PV segment has just started to develop and the administrative procedures have not yet been streamlined, the installment of a rooftop PV might be preceeded by over one-year long administrative procedure. Even in case of large-scale plants, the number of permits and authorizations to be collected might be over 50, sometimes requiring repeating some steps due to the expiry of already acquired permits.

In the RES-H&C sector, the numerous administrative procedures and permits required for CHP installations are also seen as an obstacle, creating substantial project delays and additional costs.

Main barriers:

- Poor implementation of overly complex and lengthy administrative procedures for RES-E, high level of red tape.
- Expensive and insufficiently transparent costs of administrative procedures.
- Complex and poorly executed administrative procedures for RES-H&C.

Building and planning

Status: The poor identification and inclusion of favorable locations in the spatial panning is perceived as a major roadblock for RES-E deployment. Another barrier is the lack of reliable and uniform data on RES-potential, particularly for small hydropower, leading to investment uncertainties, sometimes also leading to cases of corruption. Moreover, the lack of district heating infrastructure is a central obstacle for the development of the RES-H&C sector, while the operators of existing large DH systems do not have incentives to reduce the use of fossil energy in favor of renewable energy sources.

Main barriers:

- Suitable locations for RES-E projects poorly integrated into spatial and environmental planning.
- Lack of reliable and uniform data on RES-E potential, particularly for small hydropower.
- Unclear conditions for the selection of RES-E plant sites creates opportunities for corruption.
- District heating infrastructure is of limited coverage and inefficient.
- No clear perspectives for introducing and increasing the share of renewable energy sources in district heating systems.

Information

Status: The insufficient communication between the government and the market stakeholders is a persistent obstacle for all RES sectors. Generally, stakeholders indicate a top-down decision-making by the government without considering feedback received in consultation processes with stakeholders. The lack of proper communication between developers, the local community and the decision-makers is one of the reasons for the negative public perception also reflected by the media. Furthermore, information for the RES-H&C sector is often not publicly available. Moreover, the narrow and often negative public discourse towards RES-E development and district heating has adverse effects on the growth of the sectors.

Main barriers:

- Narrow and often negative public discourse towards RES-E in the media.
- Negative public perception about district heating and renewable energy (especially wind and hydro).
- Insufficient communication between social partners, stakeholders and the government, local communities and developers.

Grid integration

Status: The deep cost approach for grid connection is seen as an important barrier by stakeholders, creating substantial additional costs for developers and especially affecting smaller RES projects. High costs might incur for renewable producers (especially wind plant developers) in case of remote locations, substantially increasing project costs. Other

obstacles relate to insufficiently transparent and enforceable grid development plans and non-transparent grid connection costs. The grid operator is not obliged to expand the grid in order to enable a RES-E plant to be connected[291]. There is alsoa lack of support for the injection of biomethane into the gas grid.

Main barriers:

- High connection costs that reflect the limited grid capacities (deep connection cost charging).
- Insufficiently transparent and enforceable grid development plans.
- Non-transparent grid connection costs.
- Lack of support for the injection of biomethane into the gas grid.

Support schemes

Status: The main barriers relate to a lack of support for RES-H&C. A very high share of renewable heat which is counted towards the RES-H&C target of Croatia comes from household biomass heating, the amount of which is highly uncertain (depending on fuel prices and winter temperature) and is difficult to trace. RES H&C is supported mainly at the local level, providing relatively small amounts on a first-come-first-served basis and are occasional. At the same time, efficient gas boilers are heavily subsidized, delaying or even reversing the process of switching from fossil fuels to renewables.

The previous feed-in tariff support scheme for RES-E was officially abolished with the adoption of the RES Act in 2016 and the new support scheme has been made operational only from mid 2020. So far, small-sized projects can be initiated under the new support scheme based on auctions. There is a debate among experts whether large-scale wind and solar projects still need support (projects have been recently launched without requiring support, especially by HEP, the large state-owned company of Croatia[292]), but investors argue that the fix revenue increase security and therefore help the bankability of projects, also decreasing the cost of capital and thus the cost of projects as well. The upcoming auctions for larger installations will reveal current technology prices.

In the transport sector, the financial purchase incentive scheme for hybrid and electric vehicles has been subject to suspension and reintroduction in the past, creating significant uncertainty in terms of its long-term stability. Due to the relatively small budget and high subsidy per car, the offered budget is usually depleted in a short period of time (within an hour). Because acquiring the grant does not entail the obligation of effectively buying the cars (the subsidy has to be paid back in case of non-purchase), the effectiveness of the support scheme is very low, only about half of the grants allocated are turned to new electric vehicles.

Moreover, the lack of a legal framework for advanced biofuels is in important barrier in the transport sector.

[291] http://www.res-legal.eu/search-by-country/croatia/single/s/res-e/t/gridaccess/aid/connection-to-the-grid-14/lastp/359/
[292] https://balkangreenenergynews.com/solvis-plans-to-build-50-mw-solar-power-plant-in-northern-croatia/, https://balkangreenenergynews.com/hep-starts-building-croatias-biggest-solar-power-plant/, https://balkangreenenergynews.com/vis-island-turning-self-sufficient-as-heps-3-5-mw-solar-plant-starts-trial-run/, https://renewablesnow.com/news/korlat-wind-farm-joins-croatias-power-market-during-trial-run-698526/

Main barriers:

- Lack of coherent support scheme for RES-H&C.
- Calls for investors to allocate support for renewable heating systems are rare, resources are limited and allocated on a first-come-first-served basis.
- Incoherence of different support schemes: Subsidization of efficient gas boilers mean competition for renewables.
- High amount of support per car and low budget offered infrequently for supporting hybrid and electric vehicles, without obligation to purchase.
- Lack of legal framework for advanced biofuels.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Italy

Assessment of barriers

Administration

Status: Administrative processes are impeded by a lack of harmonised procedures for spatial planning, lengthy processes, also due to many involved authorities. The administrative regulation is extensive and fragmented between local, regional and national level. The shared regulatory competency at different levels of government causes confusion. Consequences are uncertainty of durations and of outcomes of approval processes. Some positive aspects relate to maximum time limits for administrative procedures of 90 days (instead of the previous 90-180 days), a simplified authorisation procedure for small plants and a one-stop shop single authorisation procedure for large plants.

Moreover, the legal framework for RES-H&C often lacks clear and harmonised references so that the interpretation of rules differs depending on the regions. This is a particular problem in case of geothermal installations.

Main barriers:

- Lack of harmonised administrative procedures for spatial planning.
- Incorrect application of legal provisions regarding building licenses and permits.
- Complexity of the legal framework.
- Long waiting times between the submission of application for support and the granting of support.
- Multi-level administrative regulation lengthens administrative procedures.

Building and planning

Status: There is a lack of regulation for district heating and, which creates uncertainty and additional costs.

Main barriers:

- Lack of regulation for district heating.
- Bureaucratic delays hinder the expansion of district heating in Italy.
- Inconsistent RES H&C legislation dealing with environmental aspects.

Information

Status: The lack of information in the RES-H&C is a relevant issue, as consumers are unaware of RES-H&C as an energy solution. Moreover, information is scarce regarding the granting of permits or how to request funding. The lack of information on suitable support measures and fiscal benefits to promote biofuels is also a relevant issue for RES-T sector. Moreover, electric vehicles suffer from a lack of incentives and insufficient charging infrastructure.

Main barriers:

- Lack of knowledge on RES-T funding opportunities.
- Lack of information on the use of RES for heating purposes.

Grid integration

Status: Grid issues relate to the long and unclear grid connection procedures due to a lack of standards and high costs for balancing out volatile electricity.

Main barriers:

- Uncertain regulations and procedures for grid connection.
- Low degree of standardisation resulting in long waiting times.
- High costs for the imbalance of production forecasts.

Support schemes

Status: The dominant support scheme issues in the reporting period involved the lack of long-term visibility and attractiveness of the main support scheme for RES-E. The relevant legislation for support schemes frequently changed and these reforms were often delayed, which created investor uncertainty. As of August 2019, a new support scheme for all major RES-E technologies has been implemented with a one-year delay. In the RES-T sector, the deployment of a widespread charging infrastructure lacks behind and support in this area is not sufficient.

Main barriers:

- Lack of long-term visibility and attractiveness of main support scheme for RES-E in reporting period.
- Lack of adequate support and charging infrastructure for RES-T.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	Yes
	Online application available?	No
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	Yes
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	In progress
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes (pilot projects)
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	Yes
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Cyprus

Assessment of barriers

Administration

Status: The development of RES technologies in Cyprus is mainly hindered by substantial administrative barriers which are related too long and complex permitting procedures and the involvement of many authorities. As a result, the permitting procedures cost time and money, e.g. a 100 kW PV plant can last up to 15 months and an average-sized wind park can take more than 20 months without guarantee of approval. In addition, the administrative fees levied by each authority significantly increases project costs. All these aspects undermine the confidence of investors in Cyprus.

Main barriers:

- High cost of administrative procedures.
- Bureaucracy lengthens administrative procedures.

Building and planning

Status: No significant issues are known.

Information

Status: The development of RES in Cyprus is mainly hindered by serious barriers dealing with information issues. Due to the splitting of responsibilities among several energy agencies and ministries, there is a lack of communication and cooperation between the various administrative institutions.

Main barriers:

- Lack of coordination between agencies and Ministries.

Grid integration

Status: No significant issues are known. However, as Cyprus is an isolated system, it will become increasingly difficult to integrate rising shares of variable renewables into the power system.

Support schemes

Status: The unreliability of the general RES strategy & support scheme remains a fundamental barrier in the RES development in Cyprus. This can be attributed to the delays in the energy efficiency support scheme's announcement. It finally entered into force in 2018 under the name "Energy Upgrading of Enterprises". The delay curbed investors' enthusiasm, as they were unsure when the support scheme would be finally implemented. Barriers dealing with support scheme issues have affected the development of RES-T in Cyprus since they were first reported in 2014. This is mainly due to the lack of support to counterbalance the high production costs of biofuels. In fact, biodiesel's stringent criteria increase the costs of producing biofuels locally. For example, used fried oils recycled as biodiesel should come from non-genetically modified crops. As a result, most used fried oil collectors prefer to export their used fried oil to Greece, where their sales are more profitable. Meanwhile, Cyprus imports biodiesel from other non-EU countries.

Main barriers:

- Unreliable RES-E strategy.
- Insufficient support to biomass.
- Limited access to finance for new PV projects.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No (in planning)
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No (in planning)
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes (for electricity)
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Latvia

Assessment of barriers

Administration

Status: The existing support system to apply online for permits is closed for new applications. In January 2020 an amendment to the Electricity Market Act was adopted in order to eliminate the need for the Ministry of Economy to approve the installation of micro-generators. This simplification in the administrative procedure is intended to stimulate the generation of RES-E for self-consumption.

Main barriers:

- Negative influence of local decision makers on RES development projects. Municipalities can reject the RES projects in their territory (e.g. on 29 March 2020 municipality of Tukums took an official decision to reject investments of 100-150 million EUR for a new wind farm in their municipality).
- Inhabitants have very strong opinion and negative influence on the RES development projects, especially for large wind and biogas projects.
- No special planning rules and/or guidelines for wind farm projects.

Building and planning

Status: Latvia currently has only two policies that promote the development, installation and use of RES. One is a certification system for RES installers and the other is the obligation to consider the use of renewable heating and cooling systems in new and renovated buildings.

Main barriers:

- Lack of territorial plans for RES-E development.
- Lack of a certification system for RES installers.

- Lack of guidelines and methodology to assess the use of renewable heating and cooling systems in new and renovated buildings.

- Strong opposition of the centralised district heating companies to install renewable heating sources in renovated buildings, e.g. municipality can reject the permit to install a new RES source for heating.

- Legislation lacks to define the minimum efficiency requirements for the use of renewable energy sources.

Information

Status: RES installers in Latvia must have a construction management certificate in order to provide services. Training programmes for RES installers should therefore be regulated by law.

Main barriers:

- Lack of training programmes for RES installers.

- Scarce information about the self-generation opportunities for households.

Grid integration

Status: In Latvia, access of renewable energy installations to the grid is subject to general energy legislation, which does not give priority to renewable electricity. There is currently no specific legislation regarding the connection of RES heating appliances to the heat transmission grid and consequently no priority for the connection of heat generators from renewable energy sources. At present, there are only two policies that promote the installation and use of RE equipment.

Main barriers:

- Unbalanced and unknown distribution of costs for grid connection.

- Currently households are allowed to use the net electricity system and be exempted from the payments of the RES electricity mandatory procurement component. RES electricity produced onsite by legal entities and not consumed can be delivered to the national grid and traded for the fee of the national electricity production costs or if net metering system is applied legal entities (including municipalities and governmental institutions) should pay for services of distribution system and RES mandatory procurement components.

Support schemes

Status: The Latvian RES-E generation is stimulated through a complex support system which is based on a feed-in tariff with elements of a quota system and tenders. Due to concerns about corruption and a lack of transparency of the system, it is currently on hold and closed for new plants until 2020. Through strict monitoring of subsidised electricity producers, tighter controls and a limited timeframe for the implementation of RE projects, Latvia is trying to overcome existing barriers.

Main barriers:

- Lack of long-term predictability of the national RES policy.
- Absence of a general strategy and legal framework for developing RES.
- Moratorium or additional quotas for RES-E producers.
- Absence of policy instruments and long-term strategy for biofuels since 2011.
- Slow development of e-mobility due to the lack of permanent support scheme for hybrid and electric cars.
- Missing a long-term and low-interest investment funding scheme.
- No early stage funding for feasibility studies.
- Cheap fossil fuel (gas). Many RES projects are not economically viable. Lack of understanding of socio-economic benefits using local resources (local jobs, support of local economy etc.).

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Building and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	(Information not provided)
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	(Yes) Support scheme on hold and closed for new plants.
	Retroactive measures affecting the support scheme for RES?	Partly
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Lithuania

Assessment of barriers

Administration

Status: Stakeholders report a long and laborious coordination between ministries due to scattered RES competencies. For example, the Ministry of Education is responsible for the policymaking in the field of education and dissemination of information, however, renewable energy is not among its priorities. Ministry of Energy is responsible for RES policy-making and general administration, but it has no dedicated budget for education and information dissemination measures. The establishment of the Lithuanian Energy Agency (see below) has partly addressed the unclear competences in the field of information dissemination related to renewable energy.

Main barriers:

- RES related competencies are scattered among different Ministries.

Building and planning

Status: Barriers in building and planning mainly relate to restrictions for onshore wind power development in sanitary protection zones and near air surveillance radars. In addition, hydropower development is highly limited due to strict environmental requirements. As of June 2018, the Lithuanian Energy Agency was established by Law No XIII-1451 with the responsibility to carry out surveys in Lithuania's territorial seas and its exclusive economic zone in the Baltic Sea for the development and operation of RES installations.

Main barriers:

- Limitations for onshore wind farms by sanitary protection zones.
- Limitation of wind power development near air surveillance radars.
- Hydropower development virtually stopped due to strict environmental requirements.

Information

Status: The scattered competencies on the dissemination of renewable energy related information (see above) create significant barriers, particularly in the nascent RES-T sector. However, as of June 2018, the newly established Lithuanian Energy Agency is tasked with carrying out educational activities on the practical opportunities and benefits of developing and using RES. The institution also administers the process of training for the certification of specialists installing RES installations and carries out RES-related promotion and publicity activities.

Main barriers:

- General lack of dissemination of information in the field of renewable energy.

Grid integration

Status: The main barriers relate to costly grid connection, an insufficient infrastructure for electric vehicles and an obsolete electricity grid infrastructure. According to Law No XIIII-604 adopted in July 2017, distribution network operators are now required to elaborate a 10-year distribution network development, upgrade, modernisation and investment plan, which shall be based, inter alia, on network optimisation opportunities.

Main barriers:

- Costly grid connection.
- Insufficient infrastructure for electric vehicles.

Support schemes

Status: In the reporting period, RES-E installations above 10 kW (operated by individuals) and above 30 kW (operated by legal entities) were unable to access the previous support scheme, as no tenders had been organized since 2015. Technology-neutral tenders under

the new RES-E support scheme have, however, been organized since the second half of 2019. As a result, between 2015 and 2019, RES-E investments were subject to high risks and uncertainty.

Solar plants and their installation in or near individual houses were able to receive subsidies from 2018. However, to meet the 2030 and 2050 targets, the highest electricity production potential is estimated to come from wind power. Hence, the lack of support schemes has been a significant barrier.

Main barriers:

- No tenders for RES-E (excluding solar energy) have taken place between 2015 and 2019, when a new support scheme was implemented, resulting in a standstill for RES deployment.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Luxembourg

Assessment of barriers

Administration

Status: There are no significant barriers for RES regarding administration in Luxembourg. Former problems regarding the complexity of the RES-H&C support scheme were solved thanks to the introduction of so-called energy advisors by the Luxembourgian energy agency “Myenergy”, supporting applicants in their submission of applications for support schemes

Building and planning

Status: A central barrier in the field of building and planning relates to the lack of transparency on the eligibility criteria for wind power plants. officially published. This is seen as a strong burden for other potential wind power producers as the accessibility of potential spaces is limited and administrative procedures might take longer.

Main barriers:

- Eligibility criteria for wind power plants not transparent to the public.

Information

Status: The main barrier affecting information issues is the lack of awareness and communication regarding the most adapted RES technologies. The current thermal regulation imposes the use of RES in buildings. However, all types of RES are not necessarily adapted to Luxembourg. In detail, people are not sufficiently informed about the poor profitability of solar thermal systems in Luxembourg, so that the uptake of this technology is poor.

Main barriers:

- Lack of information and communication regarding most adapted RES-H&C facilities.

Grid integration

Status: There are no significant grid issues affecting a major share of RES installations in Luxembourg.

Main barriers:

- Grid connection problems might lead to high grid connection costs in individual cases.

Support schemes

Status: The dominant issues related to the support schemes in Luxembourg for RES-E over the analysed five years involved the non-existence of sectoral plans for the development of RES, which especially hindered the growth of the wind, solar and biomass sectors. These plans amongst others provide an overview of the suitable wind turbine sites in Luxembourg, both from an economic and from an eligibility perspective. They were developed recently by the Ministry of Sustainability in cooperation with the largest wind power producer (SEO). However, these plans are not officially published yet, and therefore not accessible to the public. Improvements to the last report have been made through the introduction of a support mechanism in the form of a tendering procedure for larger solar PV installations in 2018.

The central RES-H&C barriers related to the Luxembourgish support scheme include uncertainties concerning the future promotion of solar thermal energy. There are ongoing discussions on the substitution of solar thermal installations through the use of PV for the heating of boilers. It might therefore be the case that solar thermal installations will be less used in the future, which leads to an increased skepticism regarding the use of this technology.

The main challenge for RES-T in Luxembourg is the insufficiency of support schemes for biofuels. Even though the official national strategy aims at a focus on biofuels, the support policy implemented for biofuels is rather limited. First, the existing support scheme solely consists in the definition of biofuel quota to be fulfilled by oil companies selling gasoline or diesel for transport purposes, whereas other MS provide additional support measures for biofuels, such as reduced energy tax rates. On the other hand, the government of Luxembourg has pronounced itself against first generation biofuels and plans not only to limit

their maximum incorporation rate, but also to condition their support upon social and ecological criteria. According to the government, first generation biofuels have proven not to meet the requirements of sustainable development. Instead, the government has committed itself to supporting the development of second-generation biofuels.

Main barriers:

- Lack of sectoral plan for the development of renewable energies.
- Insufficient support scheme for biofuels.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	(Information not provided)
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	No
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	(Information not provided)
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	No
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	(No information provided)

Hungary

Assessment of barriers

Administration

Status: As far as administrative issues are concerned, the involvement of a large number of authorities in the administrative process, the complexity of procedures leading to the long licencing times for RES-E installations while sometimes not leaving enough time for applications, as well as high and often varying administrative costs are the central barriers to sectoral growth. The rush for support before the phase out of the previous FIT scheme ended up in long application procedures and bottlenecks in administration, which was coupled with repeatedly extended deadlines for the correction of applications and project implementation due to the lobby power of developers, many of which were acquiring support for projects with speculative purposes.

The reallocation of budgets from the below 1 MW size category to the auction scheme could not be foreseen by developers and broke the continuity of support provision for small sized plants, especially those under 0.3 MW. On the other hand, the step can be regarded as a reasonable step to handle the excess demand for support by changing the system of lengthy queueing with competitive allocation.

The implementation of the pilot auction was successful, resulting in high savings of the support costs, and was administered effectively. Although a relatively high share of the submitted applications were disqualified (30%) due to improper submission, improvements

might be expected in further rounds due to the experience gained in the pilot auction. However, the change in HUF/EUR exchange rate since the bidding procedure might endanger the realization of some of the winning projects.

For RES-H&C, the unduly centralized and bureacratized project management, duration of the licencing process for new installations as well as the high number of involved authorities further increasing project lead times through long administrative procedures.

Main barriers:

- Large number of involved authorities slow down permitting procedures.
- The administrative procedures related to the support scheme is not well-prepared for regulatory changes and the authorities are not straightforward in setting deadlines.
- Break in the continuity of support provision for plants under 0.3 MW.
- Unreasonable and varying cost of administrative procedures.

Building and planning

Status: Building and planning issues arose from the introduction of technical and spatial restrictions hindering the development of wind onshore projects as of September 2016. Lack of risk mitigation instruments for geothermal drilling make bankability and project finance worse for RES DH projects. Planning process in case of biomass (or waste to energy) heating plants is aggravated by public resistance of local communities because of environmental worries.

Main barriers:

- Special technical and spatial restrictions hinder the development of wind power.
- Lack of state guarantee for geothermal drilling risks.

Information

Status: The main information issues are the lack of transparency about future funding e.g. in the support schemes for RES-E and RES-H&C as well as a generally uncoordinated policy design. RES DH projects are delayed by complicated and bureaucratized information exchange between centralized project management and local actors (beneficiaries) responsible for planning and implementing the project.

Main barriers:

- Well-founded arguments raised by stakeholders are often disregarded during policy-formulation. Uncoordinated policy design.
- Planning uncertainty under new METÁR support scheme, including the lack of auction schedule for the upcoming years, and the reallocation of support budgets among the sub-schemes of METÁR.

Grid integration

Status: Grid issues involve the limited integration possibilities of intermittent RES-E capacities, the lack of potential connection points and the semi-deep approach for the grid connection, resulting in high costs for developers. Lack of potential connection points force many developers to finance their own grid connection, including the costs of building the necessary substation, the ownership of which is transferred automatically to the DSOs.

Main barriers:

- Uncertainty about grid distribution fees.
- Insufficient incentives for DSOs for grid extension.
- Limited integration possibilities for intermittent and decentralised RES-E capacity.
- Lack of clear allocation rule for limited grid connection points.
- Inconsistent national regulatory framework for energy storage solutions.

Support schemes

Status: With the entering into force in January 2017 of the new renumeration scheme METÁR, Hungary overcame the largest uncertainty of the previous progress report. However, serious barriers persist, such as the de facto banning of wind power plants by regulation. The first tender was launched in September 2019 and was quite successful in decreasing support costs.

Regarding the support scheme for RES H&C, dominant issues comprise the insufficient support scheme availability and the unpredictable launch of support programmes, resulting in an unsteady development of demand in Hungary.

Main barriers:

- The development of wind technology is banned by restrictive rules related to technical conditions and siting.
- Insufficient and unstandardized soft loan and investment programmes for RES H&C projects.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	Yes
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	Yes
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Malta

Assessment of barriers

Administration

Status: There are no large administrative barriers in Malta.

Main barriers:

- State aid rule complicate the FiT application procedure.

Building and planning

Status: The main issue regarding building and planning in Malta is around the competition of scarce space. Malta is a very small and densely populated state. Spatial planning, thus, considers devoting areas to RES, but often clashes with other planning needs. As there is not much space available on the island, the cost of land is extremely high so that there is a huge financial burden for large-scale RES installations in Malta.

Main barriers:

- Planning conflicts due to space limitations.

Information

Status: The main issue around information is the lack of transparency around future tender dates of the support scheme.

Main barriers:

- No long-term tender schedules for wind are published.

Grid integration

Status: Malta is currently assessing the cost of upgrading their distribution network, to cope with increasing shares for solar PV installations. (Please note that Malta has no transmission network, but only a distribution network)

Main barriers:

- Sporadic occurrence of grid connection problems.

Support schemes

Status: The main issue around the support schemes in Malta is the lack of a long-term support, which is applicable to both the RES-H&C and the RES-T sector as well as the lack of a long-term tender schedule for RES-E. The current tender so far only held three auctions for PV installations. No tender dates beyond 2020 are published yet.

The major challenge for RES-T in Malta over the last five years involves the lack of long-term security of support. The main support measure in the transport sector for RES is a biofuel substitution obligation. However, there are no specific support measures for 2nd generation biofuels. Due to the limited availability of space, the biomass cultivation potential is extremely low in Malta. Also, despite a certain potential for e-mobility resulting from short average distances and one of the highest vehicle rates per capita, this technology is not sufficiently promoted, so that the uptake of electric vehicles is hindered.

Main barriers:

- No long-term support security for RES-H&C.
- No long-term tender schedule for RES-E.
- No long-term support for RES-T.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	No
	Evaluation of progress? (Art. 22 (1) e))	No
	Transparency and coordination among involved authorities?	(Information not provided)
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	Yes
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	N/A
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	N/A (legislation defined; no request for QOO received yet)
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	N/A

Netherlands

Assessment of barriers

Administration

Status: The Environmental Act, which is due to enter into force in 2021 aims to speed up spatial planning and packages plans and permits to reduce costs.

Main barriers:

- Onshore wind interference with military and civil aviation radars.

Building and planning

Status: The main barrier for building and planning for RES-E, especially for onshore wind generation, is often only the insufficient consideration in local spatial planning, which leads to issues with not enough wind projects being approved.

Main barriers:

- RES often insufficiently considered in local spatial planning. With the instalment of 30 RES-regions (Regional Energy Strategies) this barrier should (partly) have been removed, as development of sufficient electricity generation capacity towards 2030 was one of their main tasks.

Information

Status: A training shortage of qualified technicians for the installations of RES plants reported in 2018 may seriously impact further sectoral development.

Main barriers:

- Technicians working in e-grid need extensive training and certification because of working in hazardous environments.
- Activities expanding and reinforcing the e-grid is planned in waves. This makes that technicians and mechanics decide to work in other sectors or niches.
- Ageing of the workforce: on average over 70% of the mechanics and technicians working in grid-development are older than 40 years.

Grid integration

Status: Issues regarding potential overcapacities of planned solar PV installations stem from the non-harmonized development of the grid and the SDE+ support framework.

Main barriers:

- Insufficient grid capacity for planned PV installations.
- Overcapacities in neighbouring countries may led to curtailment of RES plants in the Netherlands.

- Renewable electricity projects applying for SDE+ should from 2019 onwards demonstrate with a transport indication that there is sufficient capacity in the electricity grid to distribute the generated electricity.

Support schemes

Status: Developers are faced with high pre-financing costs, as the SDE+ support scheme is an operational support. The upcoming switch to SDE++ comes with a temporary increase in uncertainty around future levels of funding and competition in-between technologies.

Main barriers:

- The transition from SDE+ to SDE++ with a new methodology and support for decarbonisation technologies leads to increased competition for energy production technologies.

- Costs for grid connection are part of the SDE+-application. Depending on the location and current development status of the grid, connection and reinforcement costs can become a significant part of the business case of energy production technologies. Potentially, this can make business cases become less interesting.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	(Information not provided)
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	Yes
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	(Information not provided)
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues:	Grid usage fee?	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Austria

Assessment of barriers

Administration

Status: A lack of harmonised guidelines and regulations between the federal states (e.g. regarding the water and conservations laws) are seen as a barrier. Other barriers relate to long lead times for the authorisation process of RES installations and the high number of involved authorities.

Main barriers:

- Long and complicated administrative procedures.
- Lack of harmonized planning guidelines and calls for proposals.

Building and planning

Status: The length of grid development approval procedures, the local fragmentation of regulations as well as the unharmonized regional processes regarding the participation of local citizens in the grid development process are perceived as barriers. This results in longer lead times and higher realisation costs for RES projects. Other barriers relate to increasingly strict environmental impact assessments and the implementation of the water framework directive complicating the development of hydropower plants as well restrictions on the development of wind power installations. Finally, there is a lack of incentives for the development of district heating.

Main barriers:

- Increasingly strict environmental impact assessment.
- Implementation of the water framework directive complicates the development of hydropower plants.
- Suitable wind areas and the implementation of the Habitat Directive considerably limit the installation of wind power plants.
- Refurbishment requirements insufficiently encourage district heating development.

Information

Status: Main information barriers relate to an occasional public resistance towards RES project development as well as a distorted perception of government support.

Main barriers:

- Occasional resistance towards RES project development.
- Distorted perception of government support.

Grid integration

Status: Main barriers relate to a slow grid development and the existence of grid connection issues as well as the discrimination of domestic RE producers due to applicable net grid services fees (so-called G-component). Moreover, self-consumption is constrained by fees on the consumer side as well restrictions by local DSOs on multi-party PV presuming.

Main barriers:

- Slow grid development.
- Discrimination of domestic RE producers by net grid services fees (G-component).
- Grid connection issues.
- Multi-party PV prosuming hindered by local DSOs – but here a new regulation is under planning, part of the new Green Electricity Act (“Erneuerbaren-Ausbau-Gesetz (EAG)”) that is aimed to be approved by 2021.

Support schemes

Status: The dominant issues related to the support scheme in Austria for RES-E involved uncertainty regarding the reform of the Green Electricity Act until its entry into force in 2017 and the current restriction of the yearly support volumes for RES projects, leading partly to long waiting times for new projects.

In the RES-H&C sector, barriers relate to insufficient incentives for the switch from oil-fired boilers to renewable solutions, such as wood pellet boilers, insufficient promotion to feed biomethane into the national gas grid, as well as the lack of RES support in industrial solutions. Yet, Austria still remains a frontrunner in the field of RES-H&C in Europe.

In the RES-T sector, the main support scheme barriers involve the degradation of the admixing quota from E10 to E5 and insufficient incentives for the switch from combustion engines to electricity solutions.

Main barriers:

- Difficult economic operation for small hydro power plants.
- Lack of federal strategies in accordance with 100% RES target.
- Lack of RES support in industrial processes.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	No (in planning)
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Poland

Assessment of barriers

Administration

Status: There are no significant administrative issues for RES-H&C and RES-T in Poland. RES-E issues relate to complicated and lengthy permitting procedures, especially in case of installation's capacity or environmental impact changes.

Main barriers:

- Complicated environmental permitting procedure.
- Lengthy administrative procedures.
- Imprecise and discretionary pre-qualification rules which include price criterion in the first place.

Building and planning

Status: Again, the main issues occur for RES-E and are connected to building restrictions that make wind onshore installations almost impossible.

Main barriers:

- Spatial restrictions affect the construction of new wind power plants.
- Lack of local spatial development plans.
- Lack of adequate network infrastructure.

Information

Status: The lack of information is a relevant concern, especially, with regard to the availability of appropriate support schemes and relevant technical requirements. Furthermore, there is limited information on fiscal benefits, infrastructure, and RES incentives for consumers.

Main barriers:

- Lack of knowledge and awareness among consumers.
- Lack of comprehensive information on support schemes (including, inter alia, dates, volumes, technologies, as well as the fact that numerous public institutions are responsible for different programmes.).

Grid integration

Status: Main grid barriers result from the old grid that causes additional costs and risks for investors.

Main barriers:

- Limited grid capacity limit access of new RES producers.
- Mandatory advance payment for grid connection without certainty on grid connection point.

Support schemes

Status: There are persisting issues regarding support schemes in all sectors, although to different degrees. For RES-E, the main challenge is no long-term planning of the auction volumes. For RES-H&C also, a missing long-term vision is a problem. Additionally, the

investment support does not provide sufficient incentive for greater RES-H&C development. Similarly, for RES-T support scheme for charging stations is dedicated only to entrepreneurs, not natural persons.

Main barriers:

- RES-E: no long-term plan regarding the volumes of energy or shares of particular technologies.
- RES-H&C: lack of an effective support scheme.
- RES-T: lack of meaningful support schemes.
- Unfavourable support scheme for prosumers – i.e. lengthy payback period and complicated procedures related to signing of new contacts with the electricity provider in the "My Electricity" PP.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	Yes
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	No
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	Yes
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Portugal

Assessment of barriers

Administration

Status: The main barriers relate to long, complex authorisation procedures due to several involved authorities that are not coordinated, and legislation being spread over numerous legal sources. A service portal ("SERUP") has been set up to overcome this problem but it failed to provide a one-stop-shop. In particular, the portal does not sufficiently address licensing processes and project developers need to contact each involved entity separately. As a consequence, administrative procedures e.g. related to environmental licensing, are time-consuming and expensive, and it is not always possible to comply with the referred deadlines. In its 5th Progress Report, Portugal states its ambition to implement a one-stop shop for licensing. In addition, there is a lack of an a priori spatial compatibility assessment, e.g. with Municipal Master Plans and other Land Use Management instruments which leads to land use conflicts for certain RES projects.

Main barriers:

- Lengthy and expensive licencing and permitting processes.
- Lack of spatial compatibility assessment leads to land use conflicts for certain RES projects.

Building and planning

Status: Building and planning issues are connected to burdensome environmental licensing requirements. As a result, obtaining building permits is demanding and time-consuming, requiring the delivery of a set of information that has to be already approved in previous EIA processes and production licensing. Moreover, certification schemes for RES-H&C installers? are lacking.

Main barriers:

- Lack of certification schemes for RES-H&C installers?.
- Lengthy and expensive environmental permitting process.

Information

Status: The availability of information on RES-H&C technologies is insufficient. In particular, there is a lack of awareness of RES-H&C technologies and their benefits. This barrier is particularly relevant for biomass and its related lack of diffusion. In its 5th progress report, Portugal states its intention to promote information and awareness campaigns to foster a better use of biomass. There is also little transparent information on the real costs of RES support, more generally. Which gave rise to a situation where different stakeholders giving different figures, without the Government or competent authorities clarifying the situation by giving official figures.

Main barriers:

- Insufficient information on RES-H&C technologies.
- Few transparent information on the real costs of RES support.

Grid integration

Status: Limited interconnection capacity between France, Spain and Portugal has prevented the export of RES-E from the Iberian Peninsula to Central Europe. This has indirectly limited the development of RES-E projects in Portugal, since oversupply of RES-E in Portugal cannot be exported to other countries, which increases the risk of electricity blackouts and the difficulty to manage variable RES-E sources. However, progress has been made more recently with the doubling of interconnection capacity between France and Spain in 2015 and the singing of an agreement to increase interconnection capacity between Spain, France and Portugal. The related grid expansion process has secured grant funding from the Connection Europe Facility.

Major barriers in the RES-H&C sector relate to a difficult integration of RES-H&C installations in the refurbishment of existing buildings in urban areas. In the RES-T sector, a major barrier for the uptake of electric vehicles relates to the insufficient development of charging infrastructure and the lack of a regulatory framework supporting the use of biogas

and hydrogen vehicles. In its 5th progress report, Portugal states its ambition to promote green hydrogen in various ways, e.g. supporting the production and consumption of green hydrogen and developing a green hydrogen infrastructure.

Main barriers:

- Lack of interconnector capacity between France, Spain and Portugal.
- Difficult integration of RES-H&C facilities in the refurbishment of existing buildings in urban areas.
- Lack of regulatory framework supporting the use of biogas and hydrogen vehicles.
- Insufficient charging infrastructure.

Support schemes

Status: In the RES-E sector, the main barrier relates to the non-existence of a dedicated support scheme for large new installations since November 2012. With the introduction of solar PV auctions since 2019, this barrier has been partly removed. In the RES-H&C sector, the central barrier is a lack of an effective RES-H&C strategy. Both the Green Growth Commitment and the Green Tax Reform have failed to propose new measures for the RES-H&C sector. More generally, there is a large unexploited biomass potential partly untapped due to issues including but not limited to the unavailability of support, e.g. related to territorial (i.e. most forest areas privately owned) and climatic issues (i.e. high fire risks during summer). In its 5th progress report, Portugal states its intention to promote the generation of biomass-based energy on a local scale.

Main barriers:

- Lack of support scheme for new RES-E installations between 2012 and 2019.
- Lack of support scheme for RES-H&C.
- Largely unexploited biomass potential.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	(not mentioned)
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Facilitated procedures for small-scale projects?	No
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes (partially)
	Certification schemes for installers? (Art. 14 (3))	No (in planning)
Grid issues	Grid usage fee?	No
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	No
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Romania

Assessment of barriers

Administration

Status: Administrative issues persist in Romania. There are inconsistent licensing procedures among the regions and procedures generally take longer than in most other MS. Several authorities are involved in the authorisation process and the key authorities do not collaborate with the aim to ease processes. The long administrative procedures lead to higher project costs and hinders access to financing.

Main barriers:

- Long administrative procedures.
- Lack of coordination between authorities.
- Inconsistent licensing procedures.

Building and planning

Status: The Ministry of Environment has assessed and indicated geographical locations suitable for exploitation of energy from RES. However, RES-E installations are concentrated in regions with higher yield (higher solar radiation / higher wind speed) which poses threats to the stability of the grid.

Persisting building and planning issues are mainly relevant for RES-H&C installations. Here, the issues arise from poorly maintained district heating network. The resulting high energy losses prevent the good utilisation of district heating grids. Additionally, the building regulations do not create effective incentives for investments in RES-H&C. In many cases, energy efficiency measures are preferred to implementing RES.

Main barriers:

- Insignificant funding available for RES-H&C.
- Long (and delayed) administrative process to receive financing.

Information

Status: More informational campaigns and training programs could be useful. Currently, there is a lack of qualified installers and craftsmen for biogas power plants, which hamper the development of a lasting industry sector.

Main barriers:

- Limited informational campaigns.
- Lack of qualified installers and craftsmen for biogas power plants.

Grid integration

Status: RES-E have guaranteed grid access and there is RES-priority in dispatch. Additionally, a plan for the reinforcement of transmission and distribution of electricity grid was drafted by the TSO for the period of 2018-2027. However, significant barriers remain. Grid issues are relevant mainly at distribution grid level and comprise insufficient grid development as well as high connection costs. Due to insufficient regulation, the utilisation of RES-E by prosumers was impossible, too. The high grid connection costs RES installations have to pay makes a significant amount of RES projects unfeasible. In addition, geographically preferential areas for RES-E are congested areas and the TSO therefore does not provide grid access to new projects; or if new projects are allowed, high connection costs are imposed, as RES-E installations are to pay for grid strengthening.

Furthermore, there is a lack of coordination between key authorities (for example, the National Energy-Climate Plans refers an installed capacity of RES by 2030 which is much higher than what the TSO foresees connecting to the grid).

Main barriers:

- High grid connection costs.
- Delays in grid extension.

Support schemes

Status: There are severe issues regarding RES support in Romania. RES-E installations are suffering from low green certificate prices which are caused by an oversupply of certificates. Furthermore, the penalty applicable to suppliers/ consumers who do not meet their mandatory purchase obligations was decreased from € 110 to € 70 /GC. In addition, there currently is no support scheme for new large-scale RES-E installations. However, the government is considering implementing a new support scheme (Contract for Difference).

RES-H&C support schemes lack sufficient funding and entail long administrative procedures to get the funding. Regarding RES-T, there are no financial incentives for fuel retailers to purchase biodiesel and bioethanol and there are no financial support measures for biomethane in Romania, neither in form of a support scheme nor as a tax exemption

Main barriers:

- Oversupply of Green Certificates.
- Lack of transparency regarding trade of Green Certificates.
- Frequent amendments to Renewable Energy Law.
- Lack of funding for RES-H&C.
- Missing financial incentives for the use of biodiesel.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes (but only for operational assets)
	Retroactive measures affecting the support scheme for RES?	Yes
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	No (national green certificates)
	measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	N/A

Slovenia

Assessment of barriers

Administration

Status: The administrative barriers related to permitting of small renewable plants were alleviated in the spring of 2020. Solar installations mounted on buildings up to 1 MW and wind plants up to 50 kW, located next to existing structures can be installed without building permit if they meet certain rules regarding their size and distance from other buildings. Administration related to grid connection is a lengthy procedure, due to lack of sufficient resources of grid companies. Large projects face difficulties in accessing environmental and building permits due to constraints related the protection of environment, cultural heritage and lack of conciliation of stakeholder interests.

Main barriers:

- Lengthy administrative procedures.
- Difficult RES-integration process in spatial and environmental planning.

Building and planning

Status: Mandatory minimum renewable energy consumption shares are prescribed for nearly zero energy buildings (50%). The National Energy and Climate Plan of Slovenia sets the requirement for district heating systems to increase the share of renewables and surplus heat by 1% each year.

Siting problems of wind farms persist and delay the implementation of projects which gained support in the RES-E auctions. The Ministry of the Environment and Spatial Planning has started to elaborate national zoning plans to enable the implementation of the projects.

Main barriers:

- Siting problems of wind farms and hydro power plants deter investors leading to lower interest in RES-E auctions.
- Large CHP units providing district heating are mainly coal-based and do not meet the requirement of high efficiency by EED.

Information

Status: Although no long-term auction schedule is published, tenders are foreseen by investors. Eco fund provides financing continuously from an increased annual budget. No retroactive changes have happened in Slovenia. There is a need for a well-prepared dialogue between stakeholders of large RES-E projects.

Main barriers:

- Negative public perception of wind energy projects.
- Lack of clear policy orientation/zoning maps helping to resolve the siting problems for renewable energy projects.

Grid integration

Status: Lack of available capacities and inadequate network strength delays renewable grid integration especially in remote areas. No proper incentives are provided by the government to grid operators to reinforce the grid and facilitate grid connection of renewables. Grid connection takes a long time due to the administrative bottlenecks of grid operators; procedures are slow, which results in queueing. Steps are taken by the authorities to motivate grid operators to map the points where connection possibilities exist.

The procedure was simplified for smaller installations, but there is a need for increasing the flexibility of local grids to integrate PV systems and heat pumps. It is possible for smaller installations can be connected bind the meter, making it possible to avoid paying the network fee for electricity consumption in addition to receiving feed in premium. This measure encourages self-consumption on-site.

Main barriers:

- Technical problems with connection in remote areas due to inadequate network strength and capacity.
- Slow network connection due to lack of resources of grid operators.
- Low system flexibility hindering the integration of RES-E instalments in buildings (heat pumps and PV systems).
- Lack of incentives for network operators to reinforce the grid and facilitate grid connection of RES-E plants.

Support schemes

Status: The dominant issues related to the support scheme in Slovenia for RES-E has been the lack of mid- and long-term political RES targets as well as the unstable support framework, particularly for solar PV. Regarding the mid- and long-term goals, the Slovenian government has presented the Energy Concept for Slovenia 2050, and the National Energy and Climate Plan. Yet, these documents mainly outline a broad strategy. Concrete measures are were taken in 2016 with the start of the new support scheme, which was amended in 2019 and after being greenlighted by the European Commission is set to run until 2025. To this end, stakeholders remain sceptical about the Concept's impact in achieving 2020 targets. The stability of the support framework has improved significantly in the last years, auctions are announced each year and adequate support budget is made available. However, siting issues remain a severe issue in case of larger installations discouraging developers to engage in wind and hydro investments. The Eco Fund provides increased resources facilitating the deployment of small energy installations successfully, the allocation of grants has become more predictable in the last years: funds are continuously available instead of the former stop-and-go system.

Although the mandatory share of biofuels has been increased to 10% from 2020, raising the possibility to approach the 2020 RES-T target, unclear regulatory environment causes uncertainties in future support of biofuel use. However, the government supports the development e-mobility.

Main barriers:

- In spite of more predictable and stable support system, realization of projects is low due to lack of proper spatial planning and interest reconciliation.
- Transport target is likely to be missed due to the uncertainty related to the non-supportive regulatory environment for first generation biofuels in the EU, and the slow development of advanced biofuels.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	Yes
	Cooperation between institutions/streamlining of permit procedures?	No
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Slovakia

Assessment of barriers

Administration

Status: There is one responsible authority for small-scale renewable energy support, operators of RES installations up to 10 kW are eligible for a simplified authorisation procedure and can apply online for support. The procedure can be regarded as a one-shop-stop system, it is transparent and effective. Administrative procedures for larger installations are regarded to be complicated and lengthy, especially concerning grid connection.

Main barriers:

- Administrative procedures related to grid connection differ substantially across different regions of the country and are perceived as overcomplicated and lengthy by market participants.

Building and planning

Status: The national plan for increasing the number of nearly zero-energy buildings prescribes that renewable sources should provide at least a 50% reduction of primary energy use in buildings.

Installation of ground-mounted PV systems were banned in 2011, allowing only small-scale rooftop systems to be built for 6 years. Since 2019, the Local Source and the auction schemes make it possible to develop installations with larger capacities again. Regarding siting decisions, agricultural land is regarded as non-supported areas in case of PV installations, while no criteria are set for wind plants. Siting is also made difficult by the fact that no grid connection is ensured for the winners in the auction.

Main barriers:

- No clear conditions are set up regarding the siting of large-scale renewable plants.
- No guarantee of grid connection is incorporated in the current version of the auction scheme.

Information

Status: Most of the relevant information related to renewable energy support is publicly available, although information for households could be improved to be more user-friendly.

System operators are obliged to set up plans for grid development. This plan is published by the TSO, but no information is available on the plans and available connection points of DSOs.

Main barriers:

- No information on available connection points for RES-E plants.

- No published auction schedule is available regarding the timing of auctions in the next years. For the first auction, a 30 MW capacity limit was determined, but no information on the maximum support budget was provided.

- There is no information on when the pilot auction will be held, after being postponed in early 2020.

Grid integration

Status: The main barrier dealing with grid issues is the highly controversial 'G-Component' (a payment for access and connection to the distribution system, or grid fee) which was introduced in 2014 and is applicable through the grid connection agreement between the plant operator and the competent DSO. Although the Constitutional Court stated that the producers which have not signed a contract for accessing the distribution network are not obliged to pay the tariff, the G-component is still in place, and the latest version of the RES Act makes it obligatory to sign such a contract with the DSO and pay the fee for grid access.

In addition to the fee for grid access, a grid connection fee also applies to RES-E installations, the level of which can be considered rather high (around 100,000 EUR/MW) even in cases where no major grid development is needed.

Regional DSOs imposed a connection moratorium for new RES plants in 2013. The moratorium was in force for six years during which only small-scale rooftop PV installations could be connected to the network. This, so-called “Freeze Status” was partially overcome with the revision of the RES act in 2018 and its entry into force in 1 January 2019. The new RES Act defined a certain volume of grid connection capacity dedicated for local sources and renewable-based generators supported under FiT but these capacities haven’t been realized yet due to administrative and technical difficulties delaying the installation.

Main barriers:

- Difficulty of getting grid connection licence depends on the respective DSO and can differ significantly across the country’s regions. The related administrative and technical conditions are complex, making the process time consuming and complicated.

- The high grid connection and grid access charges impose a heavy burden on RES-E investors. The grid connection fee does not reflect the costs of connection.

Support schemes

Status: The provision of support under the Green Households scheme works effectively, without any barriers and complications, and can be regarded successful.

Main barriers over the past five years involve the expected reduction of the RES support, the instability of the regulatory framework for RES, caused by the continuous restrictive changes in the conditions. The reform of the RES Act (No. 309/2018 Coll.) in 2018 stabilized the situation. It designated competitive auctions as the procedure for the allocation of supported capacities but left the scheme for already existing installations untouched.

The system of Guarantees of Origin precludes the simultaneous provision of GOs and feed-in tariff or feed-in premium to RES-E producers.

Main barriers:

- The first renewable capacity auction was postponed by the new government due to the COVID19 pandemic and there is no information on the expected time of re-announcement. The auction's planned schedule (frequency), budget, and other procedural rules like technical baskets, financial guarantees etc. are expected to change.
- The energy policy of the country gives priority to the nuclear power plant (to be commissioned soon) over renewable installations, reflected in the limited availability of grid-connection points and high grid-related fees for RES-E plants.
- According to the current prospects winning on an auction does not mean automatic grid connection permission so this can raise a problem after a successful bid.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	No
	One-stop-shop? (Art. 22 (3) a))	Yes
	Online application available?	No
	Maximum time limit for administrative procedures?	Yes
	Automatic permission after deadline passed? (Art. 22 (3) b))	Yes
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	Yes
	Obligation to use RES in public buildings? (Art. 13 (5))	Yes
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	Yes
	RES-priority in dispatch? (Art. 16 (1))	Yes
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes
	measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Finland

Assessment of barriers

Administration

Status: The main administrative issue is the lack of harmonized administrative procedures for RES-H&C among municipalities. However, measures have been taken to increase the harmonisation of some of the administrative procedures in question.

Main barriers:

- Lack of harmonised administrative procedures for building permits among municipalities.

Building and planning

Status: Building and planning issues in Finland are mainly restricted to RES-H&C and the transport sector. The main barrier for RES-E is the long assessment procedures of wind projects with Finnish defence forces regarding radar surveillance interference.

The main challenges for RES-T particularly until 2017 involve the lack of an appropriate infrastructure for e-mobility as well as for biodiesel and biogas. Since 2018, support for transport infrastructure investments and the use of biogas in the transport sector are available, which will likely reduce the barrier in the coming years.

Main barriers:

- Long assessment procedures due to insufficient expertise and resources on a municipal level.
- Grid access to the district heating network is often limited.
- Lack of an appropriate infrastructure for e-mobility as well as for biodiesel and biogas.

Information

Status: Information campaigns and simpler procedures have helped to improve the access to information on small-scale RES-E.

Main barriers:

- The lack of harmonised admirative procedures for building permits among municipalities make it more difficult to provide information centrally.

Grid integration

Status: The central barrier related to the building and planning issues for RES-H&C over the last years involves the limited access to district heating networks for all RES-H&C technologies, which represents a challenge for project developers, all the more since grid access varies depending on the individual attitude by local grid operators. However, grid access has slightly improved over the years, as shown by the heat map for 2017 and 2018. Grid issues are caused by overloaded grids that require costly reinforcement.

Main barriers:

- Different processes for grid access permits.
- Limited grid access affects project development.
- Lack of transparency of grid connection costs.
- Unsubstantial appeals by third parties leading to delays or higher project costs in project development.

Support schemes

Status: The continuation of the tendering scheme is currently uncertain, no second round has been announced yet. The Finnish support system is based on discretionary investment subsidies.

Main barriers:

- Limited scope of energy investment aid.

- Uncertainty about the continuation of the tendering scheme.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	No
	Certification schemes for installers? (Art. 14 (3))	Yes
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	No
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes (for electricity)
	measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

Sweden

Assessment of barriers

Administration

Status: A number of simplifications regarding the handling of photovoltaic cell investment aid have been implemented in recent years. The application forms have been simplified, information concerning the aid has been made available, e-applications have been facilitated, the requirement for follow-up has been abolished, and the dialogue between the government agencies which administer the aid has been improved. In northern Sweden, power generating resources are mostly owned and operated by large utilities, which somehow limits reaping socio-economic benefits at the local level, because as a consequence, local acceptance is limited and municipalities are reluctant to provide permits for wind power projects.[293]

Main barriers:

- Complicated administrative procedures for small hydro due to a broad interpretation of the European Water Directive.
- Right of Swedish Armed Forces to withdraw permissions and dismantle wind turbines creates significant insecurity.
- Environmental certificate criteria is discriminating district heating.
- In some regions, limited local social acceptance.[294]

Building and planning

[293] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jan/IRENA_Sweden_Innovative_power_2020.pdf
[294] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jan/IRENA_Sweden_Innovative_power_2020.pdf

Status: In January 2015 changes were made to the Planning and Building Act in order to make the process relating to the Planning and Building act simpler and more efficient, introducing a standard procedure. The simplified procedure, with fewer sub-steps, is intended to allow more planning proposals to be processed.

Onshore wind power projects are seriously blocked by the Swedish Army which considers about 50% of Sweden's land area as non-fitting for wind power investments.

Main barriers:

- Military resistance to wind turbines.
- Municipal veto against the establishment of larger wind projects.

Information

Status: There are no large barriers regarding information.

Main barriers:

- Small wind turbines do not meet the legal requirements.

Grid integration

Status: Micro-scale producers of electricity are exempt from electricity grid fees. The exemption only applies if the electricity consumer has used more electricity from the electricity grid than has been fed in, Larger producers of (renewable) energy pay the grid fees.

Main barriers:

- Differences in level of grid tariffs discriminate RES producers in Northern Sweden.
- Insufficient grid infrastructure in Sweden.
- Insufficient transmission capacity in Sweden as well as to neighbouring countries.
- Usage of heat pumps instead of district heating lowers the efficiency of district heating.

Support schemes

Status: There continues to be problems with the quota scheme. It is not able to balance out low electricity prices, as the certificate prices are also low due to an oversupply of green certificates. This situation potentially hinders RES investments.

Main barriers:

- High exposure to market risks of RES investors due to the Certificate System, leading to uncertainties for investors.
- Low price of electricity and of Green Certificates put business model of CHP plants at risk.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	Yes
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	No
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	No
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	No
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	No
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	Yes
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	No
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	No
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	No
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	Yes
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	No
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	No
	Shallow cost structure? (Art. 16 (5) and (6))	No
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	No

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	No
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	No
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes (for electricity)
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

United Kingdom

Assessment of barriers

Administration

Status: Slow pace of planning and limited knowledge of local authorities of RES-H&C technologies are two of the main administrative barriers.

Main barriers:

- Slow pace of planning procedures.
- Local authorities do not have knowledge of new RES-H&C technologies.

Building and planning

Status: The UK was lagging behind in the creation of the necessary RES-T infrastructure for refuelling and charging stations, a situation which has improved significantly with newly introduced polices. The number of EV charging points in the UK is more than 32,000 in over 11,500 locations as of July 2020.

Main barriers:

- Spatial planning leads to delays in RES realisation.

Information

Status: Northern Ireland was plagued by too little cooperation between the industry and government stakeholders, although the situation improved in the last couple of years slightly.

Main barriers:

- Little interaction between industry and government stakeholders.
- Lack of communication between DSO and TSO.

Grid integration

Status: Several barriers apply only to certain regions such as the insufficient grid capacity in Wales or and issues between resulting from unharmonized technical practices between local DSOs.

Main barriers:

- Increasing cost of grid connection.
- Unharmonized technical practices between DSOs.
- Insufficient grid capacity in Wales.

Support schemes

Status: The dominant issue regarding the support scheme in the UK is the lack of a long-term schedule of the CfD auctions, creating significant uncertainty in the medium and long-term for RES-E producers. However, as the UK leaves the EU, the ongoing discussion on the conformity of the British CfD model with the state aid guidelines is no longer perceived as an issue by stakeholders and project developers perceive the regained future national competency in this field as a higher planning security.

Main barriers:

- Lack of long-term support schedule beyond the fourth CfD round in 2021.
- Unreliable support scheme for RES-H&C.

Assessment of progress made regarding specific issues

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
Administrative Issues	Overall assessment of administrative procedures?	Yes
	Evaluation of progress? (Art. 22 (1) e))	Yes
	Transparency and coordination among involved authorities?	(Information not provided)
	One-stop-shop? (Art. 22 (3) a))	No
	Online application available?	Yes
	Maximum time limit for administrative procedures?	No
	Automatic permission after deadline passed? (Art. 22 (3) b))	No
	Cooperation between institutions/streamlining of permit procedures?	Yes
	Facilitated procedures for small-scale projects?	Yes
Barriers and planning issues	Legal framework foreseeing geographical locations for RES in land-use planning and district heating? (Art. 22 (3) c))	Yes
	District heating network using RES? (Art. 13 (3) and (4); Art. 16 (11))	Yes

Topic	Indicators	Addressed in 5th or previous progress reports? (Yes/No/)
	Min. legal requirements for RES in new buildings? (Art. 13 (4))	No
	Obligation to use RES in public buildings? (Art. 13 (5))	No
Information issues	Information & assistance available to all relevant actors? (Art. 14)	(Information not provided)
	Certification schemes for installers? (Art. 14 (3))	No
Grid issues	Grid usage fee?	Yes
	Connection rights equally treating all power plants? (Art. 16 (1), (6), (7))	Yes
	Mandatory grid development plan from TSOs analysing the needs for grid reinforcement?	Yes
	Incentives accelerating, facilitating or unifying the grid connection requirements created by the government? (Art. 16 (1))	Yes
	Priority of RES connection to the grid? (Art. 16 (1))	No
	RES-priority in dispatch? (Art. 16 (1))	No
	Clear legal obligation for the system operator to reinforce the grid?	No
	Legal framework on the duties of the system operator to provide cost estimates and other necessary information? (Art. 16 (3) (5))	Yes
	Grid interconnection and interoperability with other MS? (Art. 16 (3) (5))	Yes
	Shallow cost structure? (Art. 16 (5) and (6))	Yes
	Legal framework regulating the distribution of costs of grid development and grid connection of RES? (Art. 16 (5)(6))	Yes
	Incentives promoting flexibility measures besides grid capacity expansion to accommodate RES? (Art. 16 (1))	Yes
	Framework on curtailment, responsible bodies, rights and duties of affected stakeholders and compensation systems? (Art. 16 (1))	Yes
	RES-E considered in national network development plan?	Yes
Support scheme issues	Support scheme promoting the use of RES? (Art. 3 (3))	Yes
	Retroactive measures affecting the support scheme for RES?	No
	Functioning system of guarantees of origin for electricity and heating and cooling from RES?	Yes (for electricity)
	Measures taken to ensure the reliability and protection against fraud of the system of guarantees of origin?	Yes

APPENDIX D. LITERATURE REFERENCES

In this chapter the full references are provided for the literature as referred to in Chapter 3.

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