DEVELOPMENT OF THE GUARANTEES OF ORIGIN MARKET (2009-2017)

September 2018

REPORT

CONTENTS

List of abbreviations

AIB	Association of Issuing Bodies
CAGR	Compound Average Growth Rate
DSR	Demand Side Response
EC	European Commission
EECS	European Energy Certificate System
EEG	Germany's Renewable Energy Sources Act
EU	European Union
EVs	Electrical Vehicles
FiT	Feed-in Tariffs
GO(s)	Guarantee(s) of Origin
HPs	Heat Pumps
IRENA	International Renewable Energy Agency
MS	Member States
MW	Megawatt
RED II	Revised Renewable Energy Directive
REGO	Renewable Energy Guarantees of Origin – UK scheme for GOs
RES-E	Renewable Electricity Targets
TWh	Terawatt hours
UK	United Kingdom

Executive summary

This report aims to give continuity to the study of the Guarantees of Origin (GOs) market development in Europe. Annual reports have been done on request of RECS International since 2014 and this is the fifth report in the series, examining the market between 2009 and 2017.

Renewable production in our selected markets has reached record high levels in 2017 with 1183 terawatt hours (TWh) generated, a 3.65% growth from 2016 and a 4.2% Compound Average Growth Rate (CAGR) from 2013 [1].

At the same time, renewable electricity procurement has never been stronger; pushed mostly by corporate customers who aim to reach their sustainability targets while reducing costs, but also by small enterprises and residential customers also affected by the "green trend".

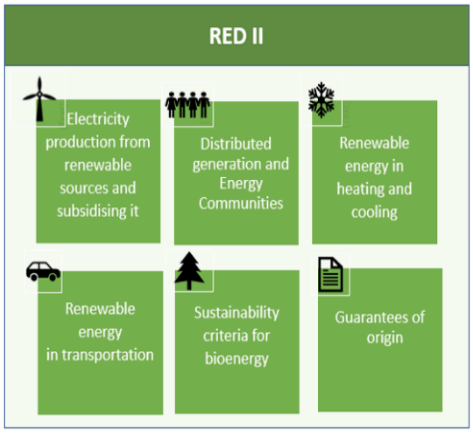
A new report by the International Renewable Energy Agency (IRENA) made the headlines earlier this year showing that companies actively procured 465 TWh of renewable electricity in 2017, "enough to power a country the size of France" [2].

2017 and 2018 are also milestone years for renewables in Europe with the first renewable projects going subsidy-free. In 2018, Vattenfall earned a contract to build a 700 megawatt (MW) offshore wind park in the Netherlands and will do without government premiums.

One year earlier, in Germany, nearly 1.5 MW of offshore wind capacity was awarded to utilities after a record low bid without subsidies [3][4]. Other examples of subsidy-free renewables start to appear also in the United Kingdom (8.2 MW, wind) and in Finland (50 MW, wind) [5][6].

In the political arena, the new Clean Energy Package for All Europeans presented by the European Commission in November 2016 is at the centre stage of the current regulatory commotion taking place within the European Union (EU). The package includes proposals amending existing energy market and climate change legislation, but it also consists of proposals for entirely new measures to facilitate energy transition, enhance competition and cooperation towards the creation of the Energy Union.

The Revised Renewable Energy Directive (RED II) covers several areas affecting rebewable generation and consumption: how to support it, the role of distributed generation and energy communities, renewable energy in heating, cooling and transportation, the sustainability criteria for bioenergy and it brings provisions on GOs.



Topics of revision in the Renewable directive [7]

Under this fast-changing environment, keeping track of the development of the GO market in Europe is essential, as it is the only way to reliably document renewable electricity products to consumers. This report will thus present how supply and demand of renewable electricity GOs in Europe have evolved so far, highlighting key trends in this development. More than that, the report aims to discuss the impacts that renewable supported generation has to the market, and to study how different countries are progressing to achieve their 2020 targets.

The report intends to answer four key questions:

1.How has the GO market evolved so far?

2.What trends can we recognise in the European market and what can we expect for the market in the short and medium terms?

3.How is the market affected by supported generation that is not entitled to certificates?

4.What conclusions can we draw from analysing country specific data in terms of renewable generation, consumption of renewable electricity and targets attainment?

GEOGRAPHICAL FOCUS AND DATA

The report studies 31 European countries, not only where the European Energy Certificate System (EECS) scheme is in place, but also where there are national Guarantees of Origin systems in operation or other certificate activity.

Markets analysed

The study considers renewable electricity production volumes from ENTSO-E [1], issuing and cancellation volumes of national GOs (from country reports) and of EECS-GOs from the Association of Issuing Bodies (AIB)'s statistics [8] and of national GOs (from country reports), and data on electricity production that is not eligible for certification due to support schemes (e.g. Feed-in tariffs).

The data used in this analysis by VaasaETT was prepared by Grexel Systems [9] on request of RECS International and updated retrospectively when necessary.

REPORT STRUCTURE

1. Guarantees of Origin Market Development 2009-2017:

This section analyses how issuing, cancellation, not certified production and available for certification volumes have evolved between 2009 and 2017. It focusses on the overall picture but also pays attention to country level development. Besides that, this part performs a simple forecast for the market in the short and medium terms and discusses market trends and the potential regulatory changes brought by the Clean Energy Package.

2. Supported vs Not Supported RES Production and Market Impact:

In this chapter, the report presents a short analysis and discussion about the volume of renewable generation receiving production support and hence not entitled to certificates.

3. Renewable Generation vs Consumption and 2020 RES-E Targets:

Here, the report focuses on comparing renewable generation and certified consumption in selected countries and discusses how these relates to 2020's Renewable Electricity (RES-E) targets. The goal of this section is to answer question 4 above and raise awareness of the importance of dual reporting.

KEY FINDINGS

1

The share of certified generation continues to grow. In 2017, issuing reached 709 TWh, a 1.84% increase from 2016. Austria, Finland, Norway, Spain, Sweden and Switzerland have large renewable productions and brought about 495 TWh of certificates into the market in 2017, 70% of the 2017's total issuing.

2

The increase in total issuing, however, was not as substantial as supported – not certified generation or available for certification. The largest growth came from generation that is not entitled to a GO, 5.72% between 2016 and 2017, mostly due to the supported volumes in Germany which increased 9% last year. In 2017, Germany held 75% of the supported-not certified capacity of the market. Croatia supported not certifiable generation also increased (54% between 2016 and 2017), but its renewable production is small, so didn't affect the overall market as much as Germany.

3

The share of idle capacity was still significant, 213 TWh in 2017. Although it has been decreasing in previous years, during 2017 it increased 3.07%. Apart from countries where there is not yet issuing in place (so available capacity is 100%), Czech Republic, Greece and Hungary still had over 50% of generation available for certification. Until 2016, Spain still had a considerable volume of idle generation as well, but in 2017 only 7.1% of renewable production was available for issuing, a considerable decrease from the 17% in 2016 and likely a result of the EECS membership acquired in 2016. Attention should also be given to the idle generation in the UK. The share of generation available for certification more than quadruplicated in 2017, a sign that issuing can't keep up with the new capacity in the country.

4

Cancellations continued the previous growing trend, reaching 637 TWh last year, a new record. The growth during 2017 has, however, been slower than previous years: only 5.28% compared to over 8% growth between 2015 and 2016. Countries in the lead according to volumes cancelled GOs in 2017 were Sweden, Germany and Spain. In 2017, cancellations surpassed local issuing in Austria, Belgium, Estonia, Germany, Ireland, Luxembourg, Netherlands and Sweden.

5

If we consider the Compound Average Growth Rate (CAGR) for renewable production, issuing volumes, available generation and supported-not certified power, cancellations could surpass issuing volumes in 2024. Available volumes would disappear by 2023. This of course presumes that the available potential can be easily included into the GO system, what is not always the case.

6

At the same time, the European market is going through a fast moving shift in paradigm. The Clean Energy Package is at the centre stage of the current regulatory commotion taking place within the EU and many Member States (MSs) have stated a complete change in their power generation fleet with coal and nuclear decommission and bolder renewable targets. Besides that, demand response, battery storage, digitalisation and electrification trends are and will continue to transform the market. Consequently, the future supply and demand for certified electricity is likely to change by a degree beyond the one forecasted our simple CAGR projections.

7

The GO market is very dependent on production that receives support. If all supported production (both already certified, and production not entitled to certificates) would be suddenly removed from the GO market, we could expect a rapid surge in GO prices. On the other hand, in 2017 and 2018 we started to see the first renewable projects going subsidy-free. This is good news for the GO market and could indicate that this new capacity would be eventually certified where local system prevented issuing of supported production like in Germany.

8

Six markets were selected to see how each country is performing to achieve its 2020 targets. If we consider only the generation side, Austria, Norway, the Netherlands and Belgium fall short of their 2020 RES-E targets with the Netherlands being furthest away from its RES-E goal. The UK and Germany reached their targets in 2017.

9

On the other hand, if we take into consideration electricity consumption that is explicitly tracked by GOs or disclosed via support – as in the case of Germany – and the flow of attributes between countries, the overall picture changes drastically. In this case, Austria and Germany have reached their 2020's targets already in 2014 and the Netherlands, in 2015. Belgium's high cancellations volumes have enabled the country to stay above its 20.9% target since 2009 with a small setback in 2015. The UK, that had achieved its targets when we looked at renewable production in national electricity consumption, is still short of its goal.

10

Germany almost reached its 2020 targets in 2017 with renewable support system values alone. These volumes were responsible for 35% of the renewable consumption, certificates for 17%, more than enough to reach Germany's 38.7% RES-E target.

1

Guarantees of Origin Market Development 2009-2017

After a slower growth rate between 2015-16, renewable production picked up momentum again reaching 1183 TWh in 2017, a 3.65% growth during last year. When breaking down this generation into production volumes that receive a GO (EECS or national), volumes that can't be certified and the remaining volume available for certification, we see that the share of certified generation continues to grow. In 2017, issuing reached 709 TWh, a 1.84% increase from 2016. This increase, however, was not as substantial as available generation or supported – not certified. The latter increased 5.72% between 2016 and 2017. This is a result of different support systems in each market as it will be discussed in the next section.

Issuing

GOs are issued electronically for each MWh of electricity produced from renewable sources. Issuing volumes in this report contain both EECS-GOs and national GOs.

Supported - not certified

In some MS, the electricity disclosure system to end consumers already takes into account production that receives some form of support from the local government (e.g. Feed-in Tariffs, FiT). As a result, this volume is not entitled to a GO. Such practice takes place in Croatia, France, Germany, Ireland, Luxembourg, Portugal and Switzerland.

The share of idle capacity available for certification is still significant (213 TWh). Although it has been decreasing in previous years, during 2017 it increased 3.07%.

Cancellations continued the previously seen growing trend, reaching 637 TWh last year, a new record.

The growth during 2017 has, however, been slower than preceding years: only 5.28% compared to over 8% between 2015 and 2016. The cancelled volumes take into account only renewable sources.

Available for certification

This is the residual electricity that is not yet certified or under a support system that prevents certification.

Cancellation

It refers to the process of allocating the electricity attributes carried by a GO to an end consumer by removing the GO of the market to avoid use by another end user. Cancellation volumes are an indication of the market's appetite for renewable electricity.

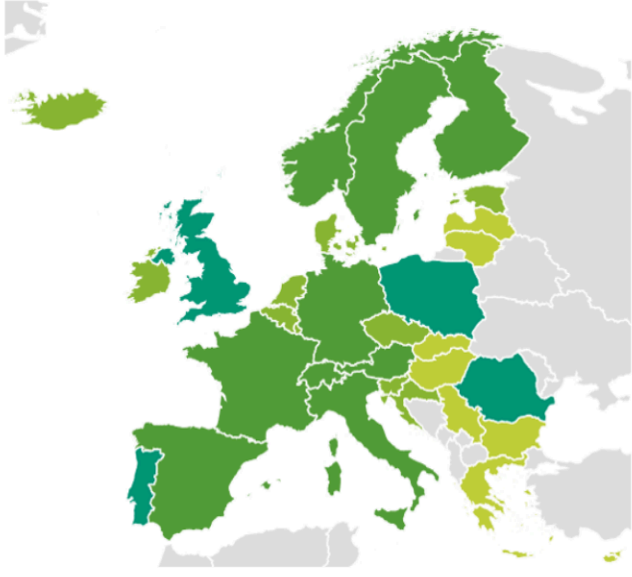
Market Development 2009-2017 [1], [8] - Grexel analysis [9]

COUNTRY CLUSTERS

Looking at the data at country level allows us to better understand what is happening at the market. This section divides countries into sub groups according to their EECS membership status and volume of renewable production. This assembly is similar to previous reports.

The European Energy Certificate System (EECS)

Developed by the AIB, EECS offers a harmonized framework to manage energy attribute certificates like GOs. The EECS rules ensure that the certificates are reliable and tradable between EECS members.



Group 1	**EECS countries with large renewable production** *Austria, Finland, France, Germany, Italy, Norway, Spain, Sweden, Switzerland*
Group 2	**EECS countries with small renewable production** *Belgium, Croatia, Czech Republic, Denmark, Estonia, Iceland, Ireland, Luxembourg, Netherlands, Slovenia*
Group 3	**Non-EECS countries with large renewable production** *Poland, Portugal, Romania, United Kingdom (UK)*
Group 4	**Non-EECS countries with small renewable production** *Bulgaria, Cyprus, Greece, Hungary, Latvia, Lithuania, Serbia, Slovakia*

Country groups [8]

As of the time of writing this report, there were 21 countries part of EECS provided by the AIB [10]. However, this study only considers 19 members: Cyprus is a member of EECS since 2014, but the membership is not active yet [10], so it is still part of Group 4 in this report.

Lithuania became a member in 2018 and in the next year's report it should be part of Group 2. According to the AIB, Greece and Serbia are in the process of acquiring an EECS membership as well and discussions are ongoing with Hungary, Latvia and Slovakia [11]. Thus, compared to 2016's report, there are no changes in the country clusters, but changes are expected in the next years.

GROUP 1

Countries in Group 1 are part of EECS and have large renewable generation. Besides that, these countries certify large shares of their production, with exception of Germany due to its support scheme not allowing the generation of a GO. In 2017, Germany only certified 7.6% of its renewable production. After Germany, France has the lowest share of issued generation, 31.7%.

The markets with the largest shares are **Austria** and **Sweden** with 100% followed by **Norway, Switzerland, Spain and Finland**, all above 87%. These 6 countries together brought about 495 TWh of certificates into the market in 2017, 70% of the total issuing in 2017.

Until 2016, **Spain** still had a considerable volume of idle generation, but in 2017 only 7.1% of renewable production was available for issuing, a considerable decrease from the 17% in 2016. It is likely to be a result of the EECS membership acquired in 2016.

FOCUS

Germany's Regional GOs

Germany's Renewable Energy Sources Act (EEG) is one of the key parts of Germany's successful energy transition. The act has been amended in 2009, 2012, 2014 and 2017. With the 2017 amendment of the EEG, Germany launched a Regional Guarantees of Origin system. The Regional GO aims to give German consumers the opportunity of linking their consumption to a supported plant in their region (defined by a 50 km radius), something that was not possible until now because disclosure of supported generation was merely statistical [13].

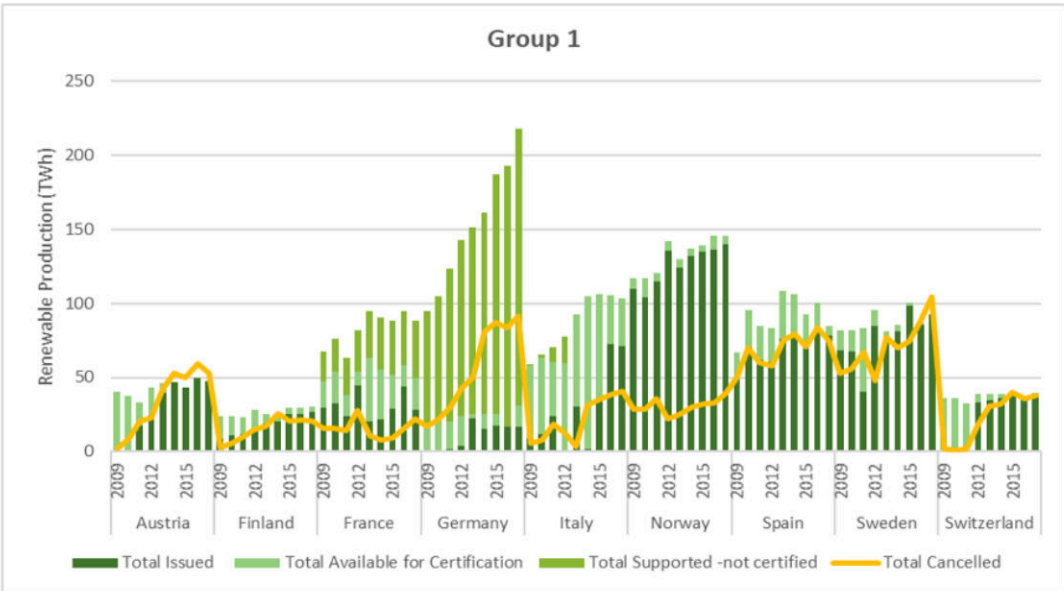
Regional GOs should be a competently different system than EECS-GOs and not traded internationally. The registry for Regional GOs should be operational in 2019 [13].

It is likely too early to speculate what effects the Regional GOs will have in the market, but some possibilities are discussed in Markets Trends section below.

Italy and **France**, on the other hand, still have high shares of available generation and while shares appeared to be decreasing after 2013-14, in 2017 they increased.

Cancellation volumes in countries of Group 1 are high compared to their issued generation, with exception of **Norway**. In 2017, cancellations surpassed local issuing in **Austria, Germany** and **Sweden**.

In Group 1, **Germany's** and **France's** renewable policy prevents supported production from receiving a GO. While France's supported generation has decreased in 2017, Germany's increased substantially (Δ16-17 was 9%, CAGR2014-2017 was 11.5%). In 2017, Germany held 75% of the supported not certified capacity of the market.



Group 1 Market Development 2009-2017 [1], [8] - Grexel analysis [9]

GROUP 2

Countries in Group 2 are part of EECS and have a renewable production of maximum 20 TWh. **Denmark** surpassed this threshold in 2017 with 20.6 TWh of renewable power, but if moved to Group 1 it would clearly be an outlier. **Denmark, Iceland, Estonia and the Netherlands** certify at least 79% of their renewable production. On the other hand, issuing only represents 19.5% of the **Croatian** generation, nevertheless an improvement from 15% in 2016. In this group, **Croatia**, **Ireland** and **Luxembourg** have renewable support schemes that do not issue GOs for supported generation. Even though these volumes are small compared to the countries in Group 1, they have increased in 2017 as most markets with similar policies. In **Croatia**, the increase was 54% in 2017.

While EECS membership and a small production keeps the countries in this group together, there are extreme differences within the group regarding cancellation volumes. The **Netherlands** continues to surpass its previous cancellation records, showing that demand for renewable power is stronger than ever in the country. **Belgium**, that had increased cancellations in 2016 after a continuous decline in previous years, falls again to lower levels in 2017. **Denmark's** demand for renewable power has been strikingly low for a Nordic market, between 2015 and 2016 cancellations decreased 42% and further declined 20% in 2017. **Ireland** was another market that saw cancellations decrease last year (-26%). **Iceland's** renewable consumption increased during 2017, but is still negligible compared to the country's issuing. On the other hand, **Luxembourg's** small issuing (due to the country's geographical constrains the local renewable capacity is very small) is not a barrier for the local consumers to purchase renewable power from abroad.

Group 2 Market Development 2009-2017 [1], [8] - Grexel analysis [9]

GROUP 3

Poland, Portugal, Romania and the **UK** are non-EECS members with a renewable production over 20 TWh. Together, Group 3 countries generated more than 185 TWh of renewable power in 2017.

Attention should be paid to the **UK**, where renewable production has been growing fast and most of it is certified by national GOs (called Renewable Energy Guarantees of Origin, REGO [12]). In 2017 Renewable generation grew 39% and issuance 18%. The country will bring a significant number of certificates to the EECS-GOs market, should Ofgem become a member of the system in the next years [11]. On the other hand, the share of generation available for certification more than quadruplicated in 2017, a sign that issuing can't keep up with the new capacity. Finally, the figure underneath shows that cancellations have regained momentum and increased 15% from 2016 levels,but still lower than issuing.

Other countries in this group have not as remarkable performance. **Portugal** which has a support scheme that prevents the production from getting a GO, used to be part of EECS in the past, but after REN's resignation in 2015 issuing and cancellations ceased. It is possible that the new Portuguese competent body, DGEG, will become a member of EECS in the future, but negotiations with the AIB are still ongoing [11].

According to the AIB, talks with responsible bodies in **Poland** also continue. The country has a growing renewable generation and a national system for GOs, although data on issuing and cancellations was not available. Finally, **Romania** has a legislation in place for electricity disclosure since the President Order (41/2004) of December 2004 and a national GO system since a law from 2010 linking GOs with disclosure [13], however there is no data that GOs were issued in Romania since then.

Group 3 Market Development 2009-2017 [1], [8] - Grexel analysis [9]

GROUP 4

Group 4 contains the remaining countries in this study. They are characterised by lower levels of renewable generation and in 2017 they were not part of EECS.

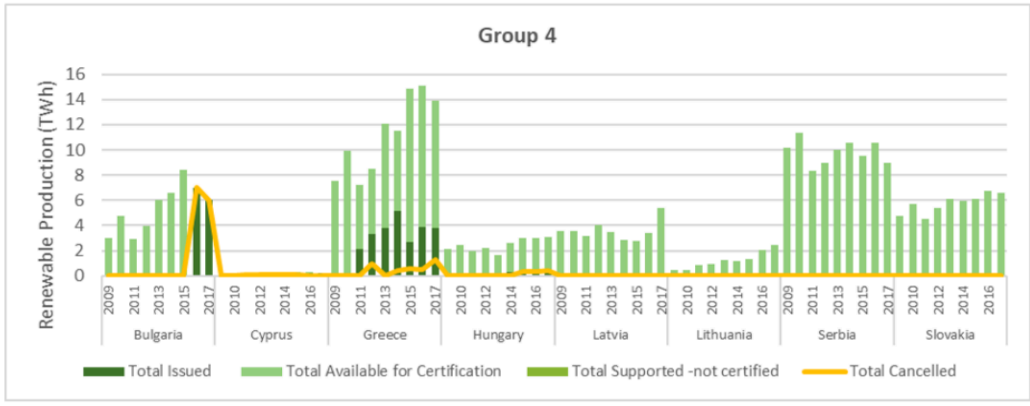
Although their renewable power is small, there has been a lot of movement concerning EECS membership in these markets in the past years. In 2018, **Lithuania** became a member of EECS (in next report it should be part of Group 2), **Greece** and **Serbia** should also become members in 2019 [11]. According to the AIB, **Hungary**, **Latvia** and **Slovakia** are also engaged in negotiations to join EECS. Finally, as mentioned above, **Cyprus** is already an EECS member, but the membership is not active yet. Together, they could bring about 4.3 TWh of certificates to the market based on the amounts of national GOs they issued in 2017. The largest issuer in this group is **Bulgaria** with about 6 TWh in 2017, but there is no ongoing discussion about the country joining EECS.

Cancellations in this group are very low or non-existent, possibly a result of electricity disclosure legislation and practice being setup only recently or not yet in place.

MARKET TRENDS

This section performs a simple forecast exercise using the Compound Annual Growth Rate (CAGR) to illustrate a possible market scenario up to 2025. Besides that, the report briefly discusses market trends and the potential regulatory changes brought by the Clean Energy Package.

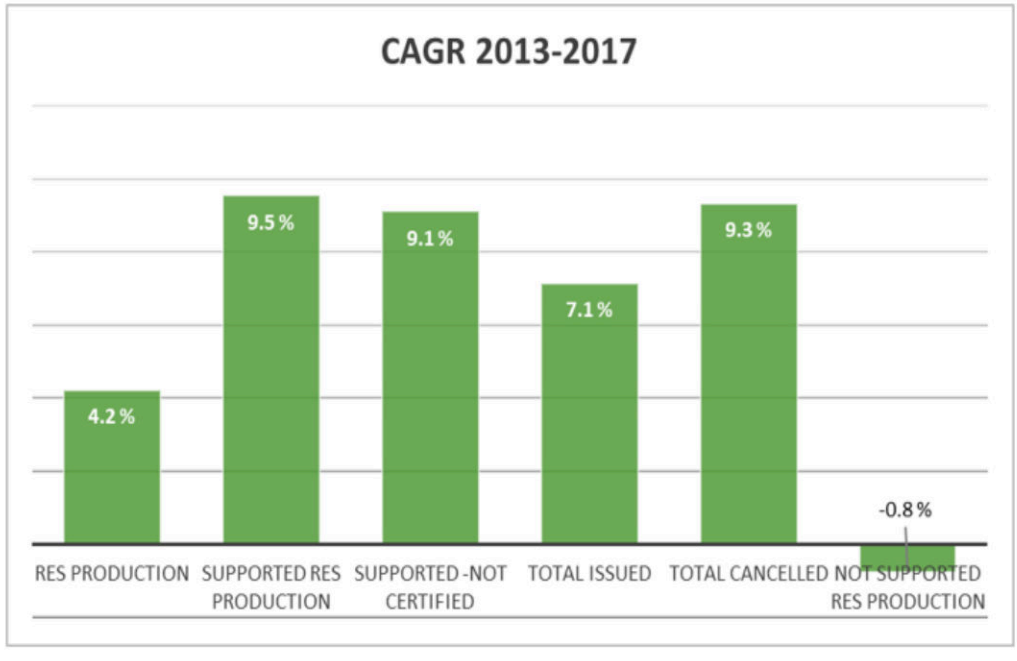
CAGR is a useful method to measure growth over several periods of time allowing to take into account the compound effect between the years. For example, it was argued above that between years 2016 and 2017 issued grew only 1.84%, well below supported-no certified production and total renewable generation.



Group 4 Market Development 2009-2017 [1], [8] - Grexel analysis [9]

However, if we take CAGR for period between 2013-2017, issuing increased 7.1%. In fact, we see that between 2013 and 2017 cancellations increased more than renewable production, supported - not certified generation or issuing. Thus, in a longer time interval the market is becoming short.

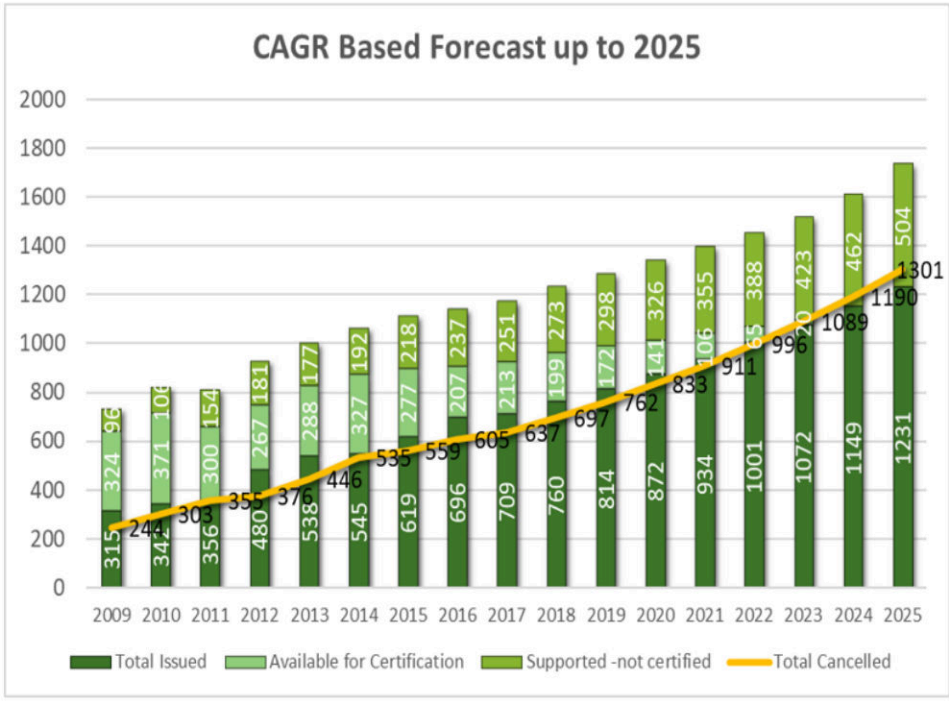
By projecting this trend up to 2025, we see that cancellations could surpass issuing volumes in 2024 (cancellations: 1190 TWh vs issuing: 1149 TWh). This is further than the projections made in the last report, when cancellations surpassed issuing already in 2019. This difference is not only due to the addition of 2017 volumes to the database but also due to corrections in the data retrospectively.



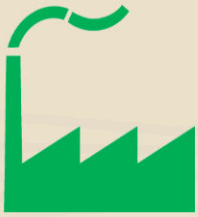
Compound Annual Growth Rate [1], [8] - Grexel analysis [9]

Available volumes would disappear by 2023. This of course presumes that the available potential can be easily included into the GO system, what is not always the case. As discussed previously, although the share of idle capacity has been decreasing in previous years, during 2017 it increased 3.07%.

Besides that, this projection does not take into account recent developments in capacity investments, the regulatory issues in the horizon with the Clean Energy Package and how these can impact the certificate market. These factors together are and will continue to transform the European energy panorama and consequently the supply and demand for certified electricity by a degree beyond our simple CAGR projections.



CAGR Based forecast up to 2025 [1], [8] - Grexel analysis [9]



A wave of **coal decommissioning** has hit Europe in recent years. To give a few examples, **France** plans to phase out coal by 2021 and **Sweden's** last coal plant is due to close in 2022. **Austria, Ireland, Italy** and **the UK** will phase out coal by 2025 and **Austria** is considering accelerating its phase out by moving it to 2020. **Finland** announced that it will phase out coal power by 2029, one year ahead of schedule. **Denmark, the Netherlands** and **Portugal** aim at 2030. Early this year **Spain** saw a heated debate regarding coal decommissioning after the local government opposed to the closure of local coal capacity, but the energy regulator (CNMC) rejected the government's position and said that the "Spanish system could easily absorb the closure of as much as 3 GW of coal-fired capacity by 2020 (or one third of existing capacity) without it materially affecting the system's balance." According to them, Spain has idle gas generation and overcapacity in general [14], [15], [16].

Nuclear capacity is targeted as well. In **Sweden**, nuclear plant owners are closing down some reactors due to financial difficulties, at least 1600 MW will be closed. After the Fukushima disaster, the **German** government decided to close its nuclear plants; many have been shut down already: the Grafenrheinfeld closure in 2016, for example, reduced the nuclear generation by 7.3%. Until 2022 we can expect an additional decommissioning of 7,602.3 MW capacity in Germany [17], [18]. At the end of 2017, **Belgium** pledged to nuclear phase-out by 2025 [19]. In **France**, the nuclear debate is something of a hot potato: The Act on Energy Transition for Green Growth (2015) set a cap for installed nuclear capacity and aimed to reduce it by 50% until 2030 [20], but the current government dropped this target in 2017. President Macron announced that he doesn't aim to phase out nuclear but to cut carbon emissions by shutting down coal-fired production. Macron declared he would be rational in making decisions on the future of existing nuclear plants, basing his choices on the rule of the French Nuclear Safety Authority (ASN) and on the potential lifespan extension of French reactors that are due in 2020-21 [21].

Regarding renewables, many markets across Europe have already pledged to **renewable targets post 2020,** and in many cases, intentions are not shy. **Austria** has vowed to reach 100% renewables by 2025, **Sweden** aims for 100% renewable power by 2030 and **Denmark** by 2050. In **Germany**, the target is at least 80% renewable power by 2050.

Accompanying extended renewable targets, we also see changes in **renewable support policies** that supplement these goals and aid renewable development. **Austria**, for example, passed a new amendment to the Green Energy Act (Ökostromgesetz) including additional subsidies for small scale photovoltaic systems, energy storage, wind power and small hydropower. **Germany's** shift away from traditional FiT schemes has resulted in "EEG 2017" and an auction-based support system [22]. **Denmark** decided to end its Public Service Obligation (PSO) scheme in 2022 [23] and possibly will replace it by a German style auction FiT as well. In **Italy,** we can expect technology neutrality in the years to come: according to the latest version of the National Energy Strategy, the government would rather adopt a neutral approach between technologies what can be understood as leaving new renewable projects without support to compete in the market [24].

Changes in consumption patterns are also seen across the continent and **demand side response (DSR)** gains more and more importance. ENTSO-E foresees that in a distributed generation scenario by 2040, DSR could add over 44 GW capacity, all focus markets combined. Another 190 GW could potentially come from battery storage [25]. Besides that, as mentioned above, **renewable electricity procurement has never been stronger** ; pushed mostly by corporate customers who aim to reach their sustainability targets while reducing costs, but also by small enterprises and residential customers also affected by the "green trend". Moreover, the fall in the cost of renewable energy technologies, especially solar panels, crafted the term "**prosumers**" in Europe, that is, residential and commercial institutions that produce and consume energy. Aided by policies that allow feeding to the grid excess renewable generation, prosumers are an essential part of future energy systems.

Further **electrification trends** with Electrical Vehicles (EVs) and Heat Pumps (HP) could push the electricity consumption to new levels impacting the demand for green certified power considerably. ENTSO-E foresees that close to 35 million HP could be installed in the 31 markets of this analysis by 2040. Besides that, about 80 million new EVs could be circulating by then in ENTSO-E distributed Generation scenario [25]. Hand in hand with the electrification of the sectors of the society, we see the **digitalisation** trend intensifying, **smart grid** developing and Europe becoming more and more interconnected so that the **Energy Union** could be around the corner.

FOCUS

GO provisions in the Clean Energy Package's Revised Renewable Energy Directive (RED II)

The current RES Directive sets binding renewable targets for each MS up to 2020. Individual targets for MS differ from 10% to 49%. In total they amount to an EU share of at least 20% of renewable energy sources in final energy consumption by 2020. According to the European Commission (EC)'s 2015 progress report, most MSs are on track to meet their targets, but additional measures are needed in some countries specially to continue the progress towards the next target of 2030 [32].

On June 27, the Council and Parliament reached a final compromise on the RED II proposal aiming at fortifying these targets and helping EU reach a cleaner and more sustainable energy future. RED II covers several areas affecting renewable generation and consumption: how to support it, the role of distributed generation and energy communities, renewable energy in heating, cooling and transportation, sustainability criteria for bioenergy and finally, Article 19 brings provisions on GOs. The revised legislation reinforces the GO system recognising that the GO is a valuable instrument for Europe's electricity consumers and mandates that disclosure is done with GOs and the remaining of the electricity being disclosed according to the residual mix supported volumes, except if the MS decide to not issue GOs for supported generation. Disclosure would be made easier if GOs were to be issued for all sources of electricity, but the final text leaves this decision up to the MS. Moreover, the Directive recommends a harmonised deadline for cancellation (still not in line with RE-DISS) and according to Article 19, MS shall not recognise GOs issued by a third country not in an agreement with the EU.

During the course of the trialogue, stakeholders' opinions have been diverging on two topics more than on any other: GOs for supported generation and how to ensure that the GOs do not overcompensate renewable producers that receive financial support.

According to the text, from 2021 when the legislation enters into force, MS may decide not to issue a GO to a producer that receives financial support from a support scheme and "*shall ensure that when a producer receives financial support from a support scheme for the production of energy from renewable sources, the market value of the guarantee of origin for the same production is* ***appropriately taken into account in the relevant support scheme***". And this is the case when support is grated in tendering or via green certificates, or when GOs are issued directly to a consumer or supplier "*who buys the renewable energy either in a competitive setting or in a long-term corporate renewables power purchase agreement*". While the initial proposal suggested auctioning GOs for production that receives support, the final compromise listened to severe criticism form market players [34] and removed the auction suggestion leaving up to each MS how to appropriately take into account the value of the GO. One suggestion is that the GO value could be taken into account by issuing a GO to the produces and cancelling it immediately. Next, the Parliament should adopt the compromise text in October and subsequently the Council should adopt a similar text[35].

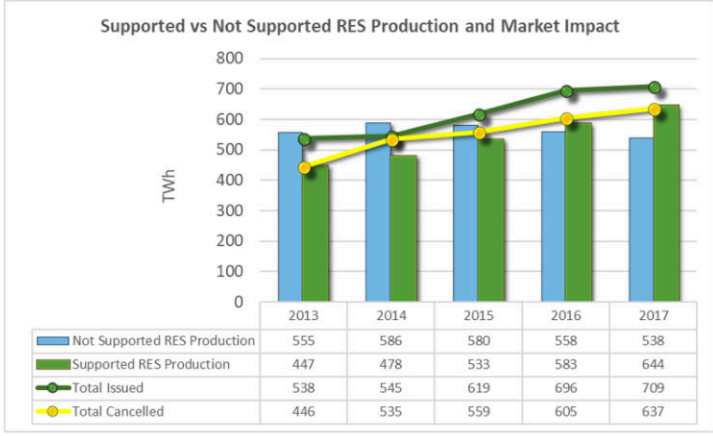
*text of Renewable Energy Directive (REDII) as of June 21st, 2018 [33]

2

Supported vs Not Supported RES Production and Market Impact

So far, this study has looked at renewable generation as a sum of issued volumes, production that is idle and thus available for certification plus generation that is not allowed a certificate. Another way to understand the total renewable production is to divide it into *Supported* and *Not Supported* generation.

Supported production refers to renewable generation that receives some kind of government aid, usually by means of FiT and in can be certified or not. This is what we do in this section to understand how the GO market is dependent on supported generation.



	2013	2014	2015	2016	2017
Not Supported RES Production	555	586	580	558	538
Supported RES Production	447	478	533	583	644
Total Issued	538	545	619	696	709
Total Cancelled	446	535	559	605	637

Supported vs Not Supported RES Production and Market Impact [9] - Grexel analysis [9]

The previous figure shows that Not Supported production has remained rather stable through the years. Supported generation, on the other hand, as expected, has been increasing since 2013. In 2017, it reached 644 TWh. The figure also shows that issued volumes are well above Not Supported production values and have been since 2015. This means that the difference comes from production that is supported and issued. Cancellations levels have beenlike this since 2015 as high as supported generation, if not above it.

Besides that, as seen below, the split between the supported production that is not certifiable versus the remaining supported production available or certified) has been somewhat stable through the years. Note that, as mentioned in chapter 1, Germany holds 75% of the supported not certified capacity of the market.

Thus, if *all* supported production (both already certified, and production not entitled certificates) would suddenly be removed from the GO market, we could expect a rapid surge in GO prices.

Supported (Certified or Available) vs Supported - Not Certifiable RES Production [9] - Grexel analysis [9]

Conversely, if *all* supported production would be allowed a certificate, prices would most probably drop close to zero because of a strong oversupply.

Besides that, assuming that all German supported generation would receive a Regional GO (see chapter 1), German consumers could potentially reduce their demand for foreign GOs if they have higher willingness to pay for local German power, now available to them under the regional scheme.

FOCUS

First subsidy-free projects

In the past couple of years, the cost of generating renewable energy from wind and solar has been decreasing at a rapid pace. So much so, that news of the first subsidy-free renewable energy projects have emerged. Earlier this year, a 700 MW offshore wind park in the Netherlands was awarded without any guarantees for electricity price from the government.

In 2017, in Germany, nearly 1.5 MW of offshore wind capacity was awarded to utilities after a record low bid without subsidies [3], [4]. Other examples of subsidy-free renewables have also appeared in the United Kingdom (8.2 MW, wind and a 10 MW solar) and in Finland (50 MW, wind)[5], [6],[25].

RECS International interviewed Esther Veldkamp from Vattenfall, the utility responsible for the 700 MW wind farm in the Dutch sea. Ms. Veldkamp said that the strong demand for renewable power we see today, both from households, small and large corporations were a significant factor in the tender [26]. GOs naturally play a key role in here being the channel of this consumer voice. As Ms Veldkamp stated, other factors also influenced Vattenfall decision, such as the company's ambition to become fossil-free in the near future, the particularities of the site, the mentioned decreasing costs of renewable technologies and the company's renewed expertise in portfolio management [26].

In this project case, the Dutch government is covering the costs of connecting to the grid as well, what also aids to the project's business case [27]. The above mentioned German windfarms also benefited from ready-defined sites, in addition to grid connection, which eases the burden of finding a site and applying for permits.These are not insignificant costs even though utilities are the ones taking most of the risk burden. Whatever the case, even *nearly* subsidy-free renewable energy projects were still a few years ago a distant dream. Now they are reality.

3

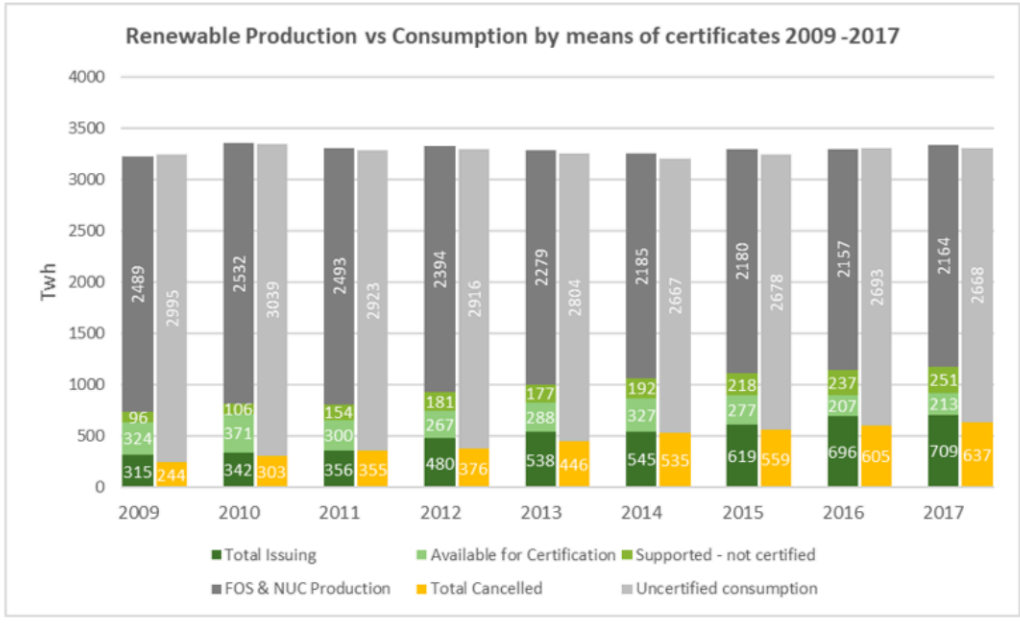
Renewable Generation vs Consumption and 2020's RES-E Targets

This chapter focusses on comparing renewable generation and consumption in selected countries and on discussing how each country is performing to achieve its 2020 targets.

The goal of this section is to answer the forth key question in this study "*What conclusions can we draw from analysing country specific data in terms of renewable generation, consumption of renewable electricity and targets attainment?*". Also, this section should raise awareness of the importance of dual reporting.

The figure that follows compares production and consumption. On the left bar renewable production is broken down into the same 3 categories we used in chapter 1: volume issued, volume available for certification and volumes that are not entitled to a GO; the remaining in grey represents fossil and nuclear generation according to ENTSO-E's figures.

On the right bar, the graph shows consumption volumes also according to ENTSO-E data but distinguishing between the amount that is certified (cancelled) and the remaining that is uncertified. The cancelled volumes take into account only renewable sources, but it is important to remember that many domains issue GOs also for fossil and nuclear production.



Renewable Production vs. Consumption by means of certificates 2009-2017[1], [8] - Grexel analysis [9]

It is easy to see that renewable generation levels are much higher than renewable consumption by means of certificates. Renewable electricity targets (RES-E) in Europe are set on electricity use, not production and yet, available statistics mostly ignore the consumption side when reporting countries' progress. EUROSTAT, for example, has data on the share of electricity from renewable energy sources defining it as "the ratio between electricity *produced* from renewable energy sources and *gross national electricity consumption"* as stipulated in the Renewable Energy Directive 2009/28/EC [26].

Member states usually have no method to monitor the choice being made by their consumers, at least in large scale.

CASE STUDIES

Below, we look at some country examples. We selected countries from different groups that have different renewable production levels and consumption patterns: **Austria** has implemented "full disclosure", i.e. local suppliers are obliged to cancel GOs for the entire volume of their electricity sales, regardless of technology; **Germany**, as discussed, has a large share of supported - not certified production and also high shares of GO cancellations

compared to local issuing; **Norway** is the largest issuer of EECS-GOs in volume; **The Netherlands** and **Belgium,** from country group 2, demand a lot of GOs from abroad and have opposite consumption trends - Belgium's renewable consumption has been decreasing while Netherland's demand for renewable power continues to grow; the **United Kingdom,** from group 3, has a growing renewable generation certified with local REGOs.

The graphs that follow compare the renewable generation divided into the usual categories (issued, available for certificate and when applicable supported – not certified) with consumption values (grey and yellow background) and with the 2020 renewable electricity consumption targets as reported in the National Action Plans [27]. Consumption is divided into 2 categories as well: renewable consumption by means of GO cancellations or by means of tracking via support (Germany's case) and other consumption. It is important to remember that RES attributes may also reside on the grey area (through uncertified production, i.e. residual mix), but they are not explicitly tracked as renewable consumption and only implicitly allocated to consumers.

We can see that if we consider only the generation side, all 6 countries still fall short of their 2020 RES-E targets, except for the **UK** and **Germany** that reached their goals in 2017.

Last year,Germany had 40.5% of renewable production in national electricity consumption

compared with a 38.7% RES-E target and the UK had 36% of renewable generation in its total consumption compared with a 31% target. Among the selected countries, **the Netherlands** is the furthest away from its 37% RES-E goal. On the other hand, if we take into consideration electricity consumption that is explicit tracked by GOs or disclosed via support – Germany case – and the flow of attributes between countries, the overall picture changes drastically. In this case, **Austria** and **Germany** have reached their 2020's targets already in 2014. However, should they aim at reaching their 2030 targets announced (100% and 80%, respectively), cancellations should continue to grow.

The Netherlands achieved its targets already in 2015. **Belgium's** high cancellations volumes have enabled the country to stay above the country's 20.9% target since 2009 with a small setback in 2015, an impressive result for a small country.

We also see that Germany almost reached the 2020's targets in 2017 with renewable consumption tracked via support values alone. These volumes were responsible for 35% of the renewable consumption, certificates for 17%, more than enough to reach Germany's 38.7% RES-E target. The **UK**, that had achieved its targets when we looked at renewable production in national electricity consumption, is still short of its goal if we observe the certified consumption. Given the high volumes of REGOs issued, the UK could easily reach the 2020's targets in this case as well, but REGOS are being issued but not cancelled in the country.

Renewable Production vs. Consumption 2009-2017 and 2020 RES targets [1], [8], [28] - Grexel analysis [9]

REFERENCES

[1] ENTSO-E, “ENTSO-E Monthly Domestic Values,” [Online]. Available: https://www.entsoe.eu/data/statistics/Pages/monthly_domestic_values.aspx.

[2] IRENA, “Corporate Sourcing of Renewable Energy: Market and Industry Trends - REmade Index 2018.,” International Renewable Energy Agency, Abu Dhabi, 2018.

[3] GTM, “More ‘Subsidy-Free’ Offshore Wind Emerges in Europe,” Green Tech Media, 05 April 2018. [Online]. Available: https://www.greentechmedia.com/articles/read/what-it-takes-to-get-subsidy-free-offshore-wind#gs.XvZheCk. [Accessed 31 Juy 2018].

[4] CLEW, “Operators to build offshore wind farms without support payments,” Clean Energy Wire, 19 April 2017. [Online]. Available: https://www.cleanenergywire.org/news/operators-build-offshore-wind-farms-without-support-payments. [Accessed 31 July 2018].

[5] BG, “Construction to begin on 'UK's first subsidy free wind farm',” Business Green, 22 May 2018. [Online]. Available: https://www.businessgreen.com/bg/news/3032689/construction-to-begin-on-uks-first-subsidy-free-wind-farm.
[Accessed 31 July 2018].

[6] R. Now, “TuuliWatti to build 21-MW zero-subsidy wind farm in Finland,” Renewables Now, 25 May 2018. [Online]. Available: https://renewablesnow.com/news/tuuliwatti-to-build-21-mw-zero-subsidy-wind-farm-in-finland-613913/. [Accessed 31 July 2018].

[7] VaasaETT et al., “Report of energy system outlook and scenario definition. D1.2 H2020 PLANET Project,” 2018.

[8] AIB, “Market Information - Annual Statistics 2018 Q1,” 2018. [Online]. Available: https://www.aib-net.org/aib_activity_statistics. [Accessed 23 July 2018].

[9] “Grexel Systems,” [Online]. Available: https://www.grexel.com/.

[10] AIB, “AIB Members,” Association of Issuing Bodies, [Online]. Available: https://www.aib-net.org/web/portal/facts/aib_members/aib_members1. [Accessed 25 July 2018].

[11] AIB, “AIB Newsletter,” 16 July 2018. [Online]. Available: https://www.aib-net.org/documents/103816/6316854/AIB_Newsletter+29+%2816July2018%29/8049068d-2a10-cccc-21d5-efcdca8efd93. [Accessed 25 July 2018].

[12] “Renewable Energy Guarantees Origin (REGO),” OFGEM, [Online]. Available: https://www.ofgem.gov.uk/environmental-programmes/rego. [Accessed 25 July 2018].

[13] RE-DISS, “Country profiles: Romania,” 05 August 2015. [Online]. Available: http://www.reliable-disclosure.org/upload/192-V04_template_RE-DISSII_Country_Profile_Romania_2015_v1.pdf. [Accessed 25 July 2018].

[14] E. B. Coal, “Overview: National coal phase-out Status as of March 2018,” March 2018. [Online]. Available: https://beyond-coal.eu/wp-content/uploads/2018/03/Overview-of-national-coal-phase-out-announcements-Europe-Beyond-Coal-March-2018.pdf. [Accessed 31 July 2018].

[15] EURACTIV, “Finland confirms coal exit ahead of schedule in 2029,” EURACTIV, 12 April 2018. [Online]. Available: https://www.euractiv.com/section/energy/news/finland-confirms-coal-exit-ahead-of-schedule-in-2029/. [Accessed 31 July 2018].

[16] EnergyPost, “Spain’s energy regulator rejects government plan to prop up coal,” EnergyPost, by Gerard Wynn, Paolo Coghe and Carlota Ruiz-Bautista , 29 January 2018. [Online]. Available: http://energypost.eu/spains-energy-regulator-rejects-government-plan-prop-coal/. [Accessed 31 April 2018].

[17] Bundesnetzagentur, “Publications - Monitoring report 2016,” [Online]. Available: https://www.bundesnetzagentur.de/EN/General/Bundesnetzagentur/Publications/publications_node.html. [Accessed 31 July 2018].

[18] Bundesnetzagentur, “Power plant closure notifications,” Bundesnetzagentur, [Online]. Available: https://www.bundesnetzagentur.de/EN/Areas/Energy/Companies/SecurityOfSupply/GeneratingCapacity/List_of_closure_notifications/List_of_closure_notifications_node.html. [Accessed 31 March 2017].

[19] B. Times, “Brussels Government approves Energy Pact,” Brussels Times, 14 December 2017. [Online]. Available: http://www.brusselstimes.com/brussels/9809/brussels-government-approves-energy-pact. [Accessed 31 July 2018].

[20] LSE, “Law no. 2015-992 on Energy Transition for Green Growth (Energy Transition Law),” The London School of Economics and Political Science and Grantham Research Institute on Climate Change and the Environment, [Online]. Available: http://www.lse.ac.uk/GranthamInstitute/law/law-n-2015-992-on-energy-transition-for-green-growth-energy-transition-law/. [Accessed 31 July 2018].

[21] Reuters, “Nuclear, renewables to help French CO2 reduction goals, Macron says,” Reuters, 17 December 2017. [Online]. Available: https://www.reuters.com/article/us-france-macron-nuclear/nuclear-renewables-to-help-french-co2-reduction-goals-macron-says-idUSKBN1EB0TZ.
[Accessed 31 Juy 2018].

[22] IEA, “ 2017 Amendment of the Renewable Energy Sources Act (EEG 2017),” International Energy Agency, 27 September 2016. [Online]. Available: https://www.iea.org/policiesandmeasures/pams/germany/name-158567-en.php?s=dHlwZT1yZSZzdGF0dXM9T2s,&return=PG5hdiBpZD0iYnJlYWRjcnVtYiI-PGEgaHJlZj0iLyI-SG9tZTwvYT4gJnJhcXVvOyA8YSBocmVmPSIvcG9saWNpZXNhbmRtZWFzdXJlcy8iPlBvbGljaWVzIGFuZCBNZWFzdXJlczwvYT4gJnJhc.
[Accessed 31 July 2018].

[23] R. Now, “Denmark changing renewables support mechanisms,” Renewables Now, 21 November 2017. [Online]. Available: https://renewablesnow.com/news/denmark-changing-renewables-support-mechanisms-547666/. [Accessed 31 Juy 2018].

[24] M. o. E. Development, “Italy's National Energy Strategy 2017 (the Strategy),” 2017. [Online]. Available: http://www.sviluppoeconomico.gov.it/index.php/en/news/2037432-national-energy-strategy. [Accessed 31 July 2018].

[25] ENTSO-E, “TYNDP 2018,” [Online]. Available: https://tyndp.entsoe.eu/tyndp2018/. [Accessed 31 July 2018].

[26] EUROSTAT, “Statistics explanined - Share of energy from renewable sources - electricity,” EUROSTAT, [Online]. Available: http://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics#Share_of_energy_from_renewable_sources_-_electricity.
[Accessed 07 May 2018].

[27] E. Commission, “National action plans,” [Online]. Available: https://ec.europa.eu/energy/en/topics/renewable-energy/national-action-plans. [Accessed 2018 August 2018].

[28] Anesco, “Case Study - Clayhill – the UK’s first subsidy-free solar farm,” Anesco, [Online]. Available: https://anesco.co.uk/clayhill-uks-first-subsidy-free-solar-farm/.
[Accessed 31 July 2018].

[29] C. Brief, “Q&A: What does ‘subsidy-free’ renewables actually mean?,” 27 March 2018. [Online]. Available: https://www.carbonbrief.org/what-does-subsidy-free-renewables-actually-mean. [Accessed 27 March 2018].

[30] A. -. A. o. I. Bodies, “European Residual Mixes - Results of the calculation of Residual Mixes for the calendar year 2017,” 11 July 2018. [Online]. Available: https://www.aib-net.org/facts/european_residual_mix.
[Accessed 31 July 2018].

[31] E. Commission, “Renewable energy progress report,” 2015. [Online]. Available: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0293.

[32] E. Commission, “Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources - Analysis of the final compromise text with a view to agreement,” 21 June 2018. [Online]. Available: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:ST_10308_2018_INIT&rid=1. [Accessed 01 August 2018].

[33] A. e. al., “Joint statement on Guarantees of Origin,” 12 February 2018. [Online]. Available: https://www.aib-net.org/documents/103816/-/-/83ee2b9e-cd82-ec8f-1253-370daa72935d.

[34] ICIS, “ICIS Power Perspective: Council and Parliament agreed on issuance of Guarantees of Origin to supported RES electricity,” 06 July 2018. [Online]. Available: https://www.icis.com/resources/news/2018/07/06/10238685/icis-power-perspective-council-and-parliament-agreed-on-issuance-of-guarantees-of-origin-to-support/. [Accessed 01 August 2018].

[35] R. International, “Interview: GO important factor in subsidy free tender Nuon,” 19 April 2018. [Online]. Available: http://www.recs.org/news/interview--go-important-factor-in-subsidy-free-tender-nuon. [Accessed 31 July 2018].

ABOUT

Authors

Analysis:

Leticia David (key author)

Design and communication:

Konstantinos Kanellos

About VaasaETT:

VaasaETT is a research and advisory consultancy dedicated to customer behaviour and competitive market dynamics in the energy industry. Founded in 2007, we advise our clients based on in-depth market monitoring and extensive research in the fields of consumer choice, engagement, satisfaction, innovativeness, image and brand, price elasticity, demand response and smart grids in liberalised and close-to-liberalization markets. Our in-depth knowledge and understanding of consumer related issues is built on accumulated 20 years of experience with energy consumer behaviour and psychology. Our research is heavily used by utilities, vendors, national regulators and renowned international institutions such as the European Commission and IEA. In addition, VaasaETT is a joint-founder of the Smart Energy Demand Coalition (see: sedc-coalition.eu), a non-profit membership-controlled organization of approximately 60 of the world's leading players in this field. The SEDC is headquartered in Brussels and works with both the EU institutions as well as industry representatives to promote and enhance demand respond across the EU.

About RECS International:

RECS International is a non-profit organization striving for an open pan-European renewable energy market, facilitated by commonly accepted and harmonized tracking systems. RECS International represent the market players, from generators, traders, wholesalers, suppliers and consumers, in a constant dialogue with national legislative bodies and European policy makers to further develop a standardized pan-European electricity tracking system. RECS International has worked since 2001 to improve and simplify the system of tracked electricity, the certificates used in that system and the claims consumers can make after their certificate purchases.

Acknowledgements

The data used in this report was provided by Grexel Systems on request of RECS International.