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# Green power trading and GOs in Europe and Germany

Sino-German Energy Transition Project



# Imprint

The report “Green Power Trading and GOs in Europe and Germany” is a comprehensive introduction to the development of the GO market in Europe over time, include the description of the regulatory framework and historical development of the scheme as well as the explanation of the core functioning of GO markets in Europe, with a focus on Germany and the key characteristics of selected European markets. We also looked at specific countries to gain insights into the chances for mutual recognition on a case-by-case basis, also to develop a better understanding of what this implies for the role of the Chinese Green Electricity Certificate scheme and potential future interlinking with Europe. To conclude, we present key take-aways from the GO scheme given the status of the Chinese GEC market today.

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## Executive summary

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European Guarantees of Origin have been established to remunerate producers for the additional value that renewable power brings to consumers. While prices for certificates have historically fluctuated around 1 EUR/MWh, rising end-user demand, as well as a tight GO supply situation in 2022 have led to new record prices. In early December 2022, prices approached 10 EUR/MWh for the bulk Nordic hydro product. Since then, GOs trade above 5 EUR/MWh. Future developments are difficult to predict as both demand and supply growth will continue, and different attributes of GOs might be valued differently going forward. Going forward, regulatory developments will be decisive for the importance of the GO market. The success of the renewable energy expansion across Europe and the level of ambition in industrial decarbonisation, likely driven by stricter sustainability reporting standards, will determine the direction the market takes.

Overall, this report serves as a comprehensive guide to the Guarantees of Origin system in Europe, offering insights into its regulation, historical development, market dynamics, and examples of mutual recognition. It aims to inform and assist Chinese partners in understanding and potentially adopting similar systems in China's own Green Energy Certificate (GEC) trading initiatives and in their strive to promote international recognition of the scheme

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The following pages provide an in-depth analysis of the Guarantees of Origin (GO) system in Europe, with a deep dive on Germany, and some key insights for the development of the Chinese green energy certificate market. The report is structured into six chapters, each focusing on different aspects of the GO system.

**Chapter 1** introduces the European green power trade environment, highlighting GOs as the primary instrument. It defines GOs, outlines their purpose in the European Union (EU), and emphasizes the ongoing harmonization efforts across EU Member States. Additionally, it offers a brief overview of the Chinese green certificate market.

**Chapter 2** delves into the regulatory backbone of the GO system on the EU level, emphasizing the evolution of the Renewable Energy Directive (RED) and its role in establishing the legal framework for GOs. This chapter discusses key revisions to the RED and upcoming changes from 2023.

**Chapter 3** explores the functioning of the GO market at the EU level, focusing on the Association of Issuing Bodies (AIB) and their role in shaping the market. It explains how AIB rules govern certificate trading and impact trading volumes. The chapter also examines the drivers for demand and supply, as well as various forms of GO trade within the EU.

**Chapter 4** provides a detailed analysis of the German GO market, shedding light on market players and specific characteristics of the country. It also looks at specificities of other AIB markets, such as GO auctions in France, Dutch full disclosure, and the discussion around Norway's role, which all explain regional price differences and harmonization challenges.

**Chapter 5** addresses the complex issue of recognizing GOs between European countries and third countries. The report highlights regulatory and technical barriers that hinder the expansion of the GO system beyond EU borders. Several case studies, including Iceland's trade suspension, the UK's GO-like system (REGO), Serbia's onboarding to the AIB Hub, and Georgia's efforts to become part of the European GO system, illustrate the challenges and interactions involved in international recognition/recognition by the EU.

**Chapter 6** synthesizes the main findings from the previous chapters to provide key insights for Chinese partners. It concludes by offering a comparative perspective on the development of GOs in Europe in relation to the Chinese experience in the green power certificate market.

# 1 Introduction to green power trading in the EU

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In the introduction, we look at the overall green power trade environment, with GOs being the main instrument in Europe. Then, we define what GOs are and briefly describe what purpose they serve in the EU. We also mention the heterogeneity of the products, and lead into the next chapter underlining that harmonisation efforts across the Member States are underway. Additionally, a short overview of the Chinese green certificate market is presented.

## 1.1 GOs are key to renewable energy development in the EU

Guarantees of Origin (GOs) are a key component of the European Union's (EU) efforts to promote renewable energy and reduce greenhouse gas emissions. They play a crucial role in tracking and verifying the origin of electricity generated from renewable sources such as wind, solar, hydro, or biomass. After being generated, the energy producer registers the generation with a designated national authority. Once the electricity production is verified as renewable, the national authority issues GOs to the generator. GOs serve as a mechanism to provide transparency and ensure that consumers and businesses can choose electricity from renewable sources with confidence. Producers can choose to trade or transfer GOs separately from the electricity they represent. When a consumer or business buys green energy with GOs, the associated certificates are transferred to their name. This ensures that the electricity's renewable attributes are not double-counted.

Guarantees of Origin are an integral part of the EU's strategy to transition towards a more sustainable and renewable energy future in line with the Paris Agreement. GOs help the tracking of renewable electricity generation and compliance with the Renewable Energy Directive. At the same time, they also support the uptake of renewable energy through the price buyers are willing to pay for the certificates.

It is essential to recognize that Guarantees of Origin are not a one-size-fits-all instrument. Instead, they exhibit

significant heterogeneity due to variations in national regulations, energy mix, and market conditions across European Member States. This diversity in GO products can manifest in differences in tracking systems, certification processes, and the types of renewable sources covered. As a result, navigating Europe's green power trade landscape can be complex, with market participants needing to adapt to these variations and nuances. The heterogeneous nature of GOs underscores the importance of harmonization efforts to create a more unified and efficient European green energy market.

## 1.2 China's experience with Green Energy Certificates

In August 2023, China reformed its Green Energy Certificate (GEC) scheme. While initially, their main purpose was to reduce RES subsidy costs, they are now strengthened in their role domestically, and also with a view to promoting international recognition of the mechanism. Now, GECs are the main tool to prove renewable origin of power, and domestic RES generators are not allowed to issue I-RECs (international renewable energy certificates) anymore. This should lead to a wider acceptance of the mechanism, as additionality claims can be improved and double counting issues are addressed, and thus an uptake of their trade over time. With more unsubsidised RES becoming available over the next years, the importance of the scheme is likely to grow. However, regulatory uncertainties and issues with transparency and verification still need to be addressed.

## 2 Development of green power policy framework in the European Union

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Chapter 2 describes the regulatory backbone of the GO system on the EU level, focusing primarily on the development and changes introduced in recent versions of the Renewable Energy Directive. The legal framework for Guarantees of Origin in the EU is primarily established by the Renewable Energy Directive (RED), which was initially adopted in 2001 and has been subsequently revised, most notably in 2009, 2018 and will undergo another change from 2023.

### 2.1 The Clean Energy Package, a cornerstone of the European green energy policy

In 2015, the European Union published the Energy Union Strategy (COM/2015/080) which aims to provide the legal framework that ensures secure, sustainable, competitive, and affordable energy for all EU consumers. The Energy Union is comprised of five fundamental building blocks: Warranty of energy security, through diversification of energy sources as well as internal cooperation and solidarity; market integration, through adequate infrastructure and regulation that allow for energy to freely flow across Member States; improved energy efficiency, to reduce import dependence and lower emissions; climate action, to bring the continent in line with the commitments made under the Paris Agreement; and innovation, to support the breakthroughs needed to transition to a low-carbon economy.

In 2019, under the umbrella of the Energy Union Strategy, the Clean Energy Package was adopted. This package was a fundamental step towards the successful implementation of the Energy Union Strategy and envisaged the policy and regulatory framework to facilitate the transition away from fossil fuels. The package consists of eight laws that EU Member States had to transpose within one to two years into national law in the areas of energy performance for buildings, renewable energy deployment and buildout, energy efficiency measures, governance, regulation, and market design. Some of the most important milestones and measures foreseen in this package were a binding target to have 32% of RES in the EU energy mix by 2030, an increase

of 32.5% in energy efficiency, a requirement for all Member States to develop a 10-year national energy and a climate plan with a long-term view towards achieving climate neutrality by 2050, and the redesign of the electricity market to include flexible, market-based measures that better integrate the increasing share of RES in the system (European Union, 2019).

### 2.2 Electricity Market Directive & Regulation, preparing the electricity system for the needs of a low-carbon economy

The Electricity Market Directive and Electricity Market Regulation were cast as an integral part of the Clean Energy Directive. These pieces of legislation are the building blocks that aim to adjust the functioning of the electricity market in the European Union to the technological developments in the sector, the needs ushered by a growing share of renewables in the mix and transition the role of end users from passive consumers to active prosumers. A clear linkage between wholesale and retail markets is foreseen in the legislation, in order to unleash the potential of flexibility in electricity demand, steered by clear price signals that affect consumption behavior and incentivize system integration as well as efficient use of increased storage capacities found, for example, in growing EV fleets. This legislation sheds light on the importance of market-based, cross-border solutions and the deconstruction of legal and commercial barriers to achieve an efficient and swift deployment of RES across the EU. Furthermore, provisions are included that aim to empower consumers and foster competition between energy suppliers. These improved conditions for customers are targeted through requirements for suppliers to provide understandable energy bills, closer to real-time pricing mechanisms, removal of switching fees, and better and faster supplier switching. Additionally, the creation of local energy communities is encouraged, and it is recommended that bidding zones better reflect physical bottlenecks in the power grid in order to decentralize price

building mechanisms and increase efficiency of price signals according to the local conditions for consumption and production (European Union, 2019).

While GOs are not directly mentioned in the Electricity Market Regulation and Directive, the relevance of the certificates is further cemented through these documents: The power market is transitioning to an environment with an increasing number of market players and roles, where tracing power flows becomes challenging and the need for a system that effectively provides reliable information on the type and quality of electricity being consumed is of utmost importance. Furthermore, more active and aware consumers demand better information about the power they are supplied, and increasingly expect it to be green. With the aforementioned legislation providing the grounds for the functioning of the transition towards renewables, the subsequent section focuses on the specific provisions that outline the functioning and use of GOs across the EU and their trade with third-countries.

## 2.3 RED I, II, and III: regulating and promoting generation, production, and trade of green energy

In 2009, the European Commission passed the first version of the Renewable Energy Directive (2009/28/EC), commonly referred to as RED I. The directive established a framework to support the use of energy from renewable sources and set binding targets on the share of renewable energy in final energy consumption to be met by EU Member States by 2020. The target was set at 20% at EU level. Countries were expected to achieve somewhat higher or lower shares depending on their economic strength, but a mandatory minimum of 10% for all Member States was required. Regarding renewable energy, the main topics covered by RED I included statistical information flows, joint projects, administrative procedures, grid access and the topic of Guarantees of Origin (European Union, 2009).

The first time GOs were mentioned in EU legislation was in 2001 under Directive 2001/77/EC, where they were briefly mentioned in Article 5 as a means to provide certification for the type of energy being produced. One of the main differences at the time was that GOs were not conceived as a tradable asset and the Directive made a clear distinction

between GOs and exchangeable green certificates. Under RED I, more extensive legislation was devoted to GOs, which laid the foundation for the main functioning of GOs. A clear definition appeared, where they were described as “an electronic document that has the sole function of providing proof to a final customer that a given share or quantity of energy was produced from renewable sources”. In short, the certificates were envisaged as transferable assets that can be traded between holders independently of the physical transmission of electricity. In order to avoid double counting of green power, the separation between the GO market and the physical flow of electrons implies that if a green power producer sells the GO separately from the generated electricity, the power sold cannot longer be marketed as renewable energy to the final consumer. This architecture was devised to allow the growing market of green energy consumers to support the deployment of RES by paying a green premium. (European Union, 2009).

Under Article 15 of RED I, the constitutive rules of the GOs were laid down. There, it is mentioned that Member States can issue GOs, under the request of a green power, heat, or cooling supplier. A standard size of 1 MWh was set, and Member States were given the responsibility to supervise that double counting of GOs is avoided. To do so, GOs must be cancelled after their use and either the Member State itself or a designated body must supervise the issuance, transfer, and cancellation of GOs. On the commercial side, energy suppliers must prove the quantity of green energy in their mix through GOs, and when they transfer a GO, the same amount of green energy must be deducted from their energy mix. Article 15 also provides that if an energy supplier aims to market its energy as green, it can be required to publicly disclose information on the share of RES in its energy mix (European Union, 2009).

In 2014, the European Commission published a communication titled “A policy framework for climate and energy in the period from 2020 to 2030”. Under this framework, the Commission and the Council agreed on an EU-wide target of a 27% consumption of energy coming from RES, with the possibility for Member States to set more ambitious goals if they wished to. Afterwards, and in light of the recent negotiations under the Paris Agreement, the Parliament pushed to set a renewable energy consumption target of 32% until 2030. For this purpose, the 2018 revision, also known of as RED II, was cast as part of the Clean Energy Package (see Chapter 2.1 above) (European Union, 2019).

Under RED II, former article 15 on GOs was converted to article 19 and some of the provisions on GOs were adjusted. Member States were given the liberty to decide whether they want to issue GOs to energy producers that simultaneously receive financial aid from support schemes targeting the deployment of RES or not. In the newly drafted article, it is also mentioned that when a Member State grants an energy producer a support scheme, the economic value of GOs must be considered. For this purpose, the legislation foresees three possible avenues:

- when the support has been granted under a tender process,
- when the value of the GO is explicitly included in the financial support, or
- when the GOs are issued directly to the entity that sources the energy.

Additionally, a maximum expiry of 18 months after the issuance date was established for Member States to ensure that all GOs are cancelled in due time. RED II also introduced some exceptions to simplify bureaucratic requirements for installations under 50kW, and to provide relief from the obligation of demonstrating the sourcing of green power through GOs in case the electricity producer is not given GOs due to a decision of the Member State. Also, paragraph 11 was added stating that a Member State cannot recognize GOs from third countries unless the EU has concluded an agreement of mutual recognition of GOs and there is direct import or export of energy with the respective country. Finally, the recast signaled that the Commission would assess options to adopt a Pan-European energy green label, and that GOs shall serve as a tool to provide the information required for this labeling system (European Union, 2018).

In 2020, the European Green Deal was announced. Member States agreed on the necessity to accelerate the transition to a low-carbon economy, and an emission reduction goal of 55% by 2030 was set to align with a decarbonization path to reach carbon neutrality by 2050. For this purpose, in 2021, the Fit-for 55 policy package was launched, aimed at aligning the policy framework with the climate objectives of the EU. As part of Fit-for-55, the ambition regarding the share of RES in European energy consumption by 2030 had to be adjusted upwards. A new target of 42.5-45% was agreed after the REPowerEU plan, launched in response to the EU's energy crisis due to Russia's invasion of Ukraine,

pushed for more energy independence through increased RES build-out. Between 2021 and 2023, trilogue negotiations took place culminating in the issuance of an agreement on the new provisions to be envisaged as part of the revamped RED, which would allow to achieve this new objective. The agreement lays down the foundation of RED III, and also comprises a wide set of restructuring measures in different sectors.

During the negotiations, one fundamental provision of Article 19 was discussed. Namely, that Member States have the right to not issue GOs to energy producers that already benefit from a support scheme. In the adopted text from September 2023, the EU decided not to apply the changes in Article 19 that would have obliged a Member State to issue a GO for every MWh of green power generated, regardless of whether that electricity has been produced under a subsidy scheme or not. This came as a surprise since it would have been an important measure to improve reporting and transparency of the use of green electricity. Additionally, changes were made allowing for GOs to be smaller than 1 MWh when appropriate, and energy communities were given the same simplified bureaucratic exemptions that small installations under 50kW enjoy when they apply for GO issuance (THEMA Consulting Group, 2023).



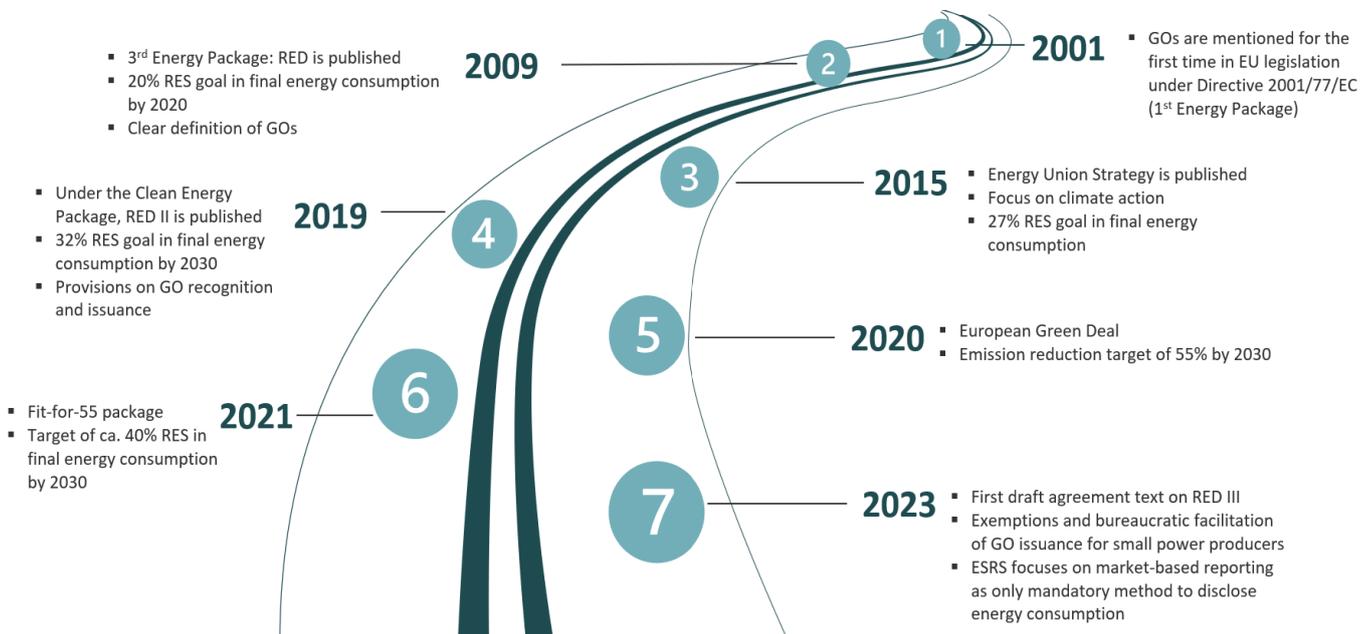


Figure 1: Development of the GO Legal Framework in the EU

Given the rise in the use and popularity of green gases, changes in paragraph 8 of Article 19 are also foreseen in the latest legal text. Here, an obligation for suppliers of gaseous renewable fuels to demonstrate to final consumers the share or quantity of RES in their mix is envisaged. Additionally, an exception to this obligation is made for:

- non-tracked commercial offers for which the supplier uses residual energy mix, and
- in the case, the MS does not issue GO to the producers that receive help from a support scheme.

How this works is also further specified in two delegated acts adopted by the EU Commission in February 2023 (conditions for RFNBO label and life-cycle emission calculation methodology).

In the future, the establishment of an EU-wide green label, for which GOs would constitute a fundamental tool, forms part of envisaged regulatory measures going forward. In 2025, the GO market will undergo a review aimed at checking the supply-demand balance and undertaking measures that could potentially be required to adjust structural deficiencies. (EFRAG, 2023)

# 3 Functioning of the GO market in the European Union

Chapter 3 discusses the functioning of the GO market at the EU level. On the other side of the legal and regulatory framework are the AIB (Association of Issuing Bodies) and the rules connected to the market functioning. The rules of the GO trading body govern how the certificates are traded across the EU, and are central to how the markets are set up. This also directly affects the development of trading volumes. Continuing from there, we present the main drivers for demand and supply developments, and the different forms of GO trade that exist on the continent, such as national auctions, trading on exchanges that becomes more prevalent, OTC transactions and, of course, PPAs.

## 3.1 GO regulating body AIB and the EECS rules

Guarantees of Origin are electronic certificates that certify the origin of a unit of energy produced from renewable sources. These certificates provide information about the energy source used (e.g., wind, solar, hydro, biomass) and the location of generation. Guarantees of Origin (GOs) were established to enable consumers to support renewable energy in the absence of a direct link between producers and consumers on the grid (or pipeline). These Energy Attribute Certificates, known as Guarantees of Origin (GOs) in Europe, represent attributes such as generation technology, production time, and location for one megawatt-hour (MWh) of energy.

GOs are managed through a book & claim accounting system by the AIB and each national issuing registry, where renewable energy producers record the attributes of their generation when injecting energy into the grid. These certificates, containing the recorded attributes, are then transferred to consumers via the market. Consumers use GOs to prove they have paid for a specific unit of energy. GOs can be traded either bundled with energy or separately (unbundled). Consumers can acquire GOs from producers, market brokers, suppliers offering green tariffs, or through national GO auctions.

It can thus be transferred independently of the energy it

relates to and traded across borders. Every GO features a unique ID-number, the location, type, capacity and age of the installation where the energy was produced, in addition to the period (currently year) the energy was generated. To avoid double counting, GOs that are exported from country A to country B are not included in the national disclosure mix of country A. The GO also has to show whether the installation has benefited from investment support under a national support scheme. However, there is no specification on the maximum information that can be added, leaving room for including further distinguishing features on the certificate. Once the GO is used for disclosure purposes by the final consumer, it is cancelled in the national registry and made unavailable for trading.

The AIB established the European Energy Certificate System (EECS) with the aim of providing a uniform platform for European Green Certificates. This system is adopted by more than 20 countries in collaboration with the AIB, ensuring that all certificates conform to both EU regulations and relevant national laws. Furthermore, it offers users a recognized, dependable, secure, and interoperable framework within which to operate. The majority of GO transactions occur within the EECS, and any market participant seeking to engage in EU transactions through the AIB is required to adhere to these market standards.

Each of the 28 member countries of the AIB, the European organisation operating the European Energy Certificate System, has its own authority responsible for issuing, verifying and cancelling GOs. Trading of certificates usually happens via brokers, that do not become part of the trade but only act as neutral facilitators, retailers or portfolio companies that buy GOs, keep inventories and sell them on to buyers. They also often increase the value of a certificate by repackaging bulk products, e.g. Nordic hydro power, into premium products that possess certain distinguishing local or environmental features, identified through ecolabels. These often relate to additionality criteria, i.e. if a certificate helps to fund the build-out or upgrading of an existing plant. Large power producers with the means to build a dedicated sales team for GOs also often decide to do that job themselves to cover their promised green deliveries

and increase their sales volumes. Since there are no rigid guidelines for the organisation of the GO market in each member country, the regulation of GOs between countries is handled differently. In some countries, e.g. Norway, every producer of renewable energies has the right to receive certificates for its production. Other countries have restrictions related to renewable energy sources that receive state support. Germany and France, among others, exclude RES that are part of their feed-in premium scheme from receiving GOs. Auctions similar to the French system have also been in use in Croatia, Italy, Luxembourg, Hungary, Poland, Portugal and Slovakia.

While the EU Commission has used reform measures to increasingly foster the harmonisation of the market, and has thereby managed to improve liquidity and transparency, it remains difficult for end-users to understand the value of GOs and compare different products. The fractured market structure and the heterogeneity of the products make it difficult to identify the market price of GOs. Bulk products, typically certificates supplied in large quantities, such as Nordic hydro EACs, are treated as a reference price when analysing price developments of GOs.

The growing volumes of wind and solar could lead to that standard shifting in the coming years and wind or solar GOs becoming the new reference products. The additional sustainability characteristics of new power generation lead to more attractiveness for RES certificates in the market. The power plants that fulfill specific environmental standards typically seek to receive ecolabels, e.g. from 'Bra Miljöval' or 'EPD', that make them more valuable to sell. Sometimes, demand for GOs from specific areas also leads to them enjoying a premium over the rest of the market (cf. Dutch wind certificates with high domestic appeal due to regulatory particularities).

### 3.1.1 Sustainability reporting and GOs

#### Current frameworks and recent developments

Following up on its more ambitious climate targets, the EU is actively developing and enacting more stringent sustainability reporting regulations and legal frameworks to ensure that the private sector plays its part in reaching these objectives. They exist to improve the flow of information throughout the EU regarding what are considered sustainable practices, but they also serve to hold large companies operating in the EU accountable and

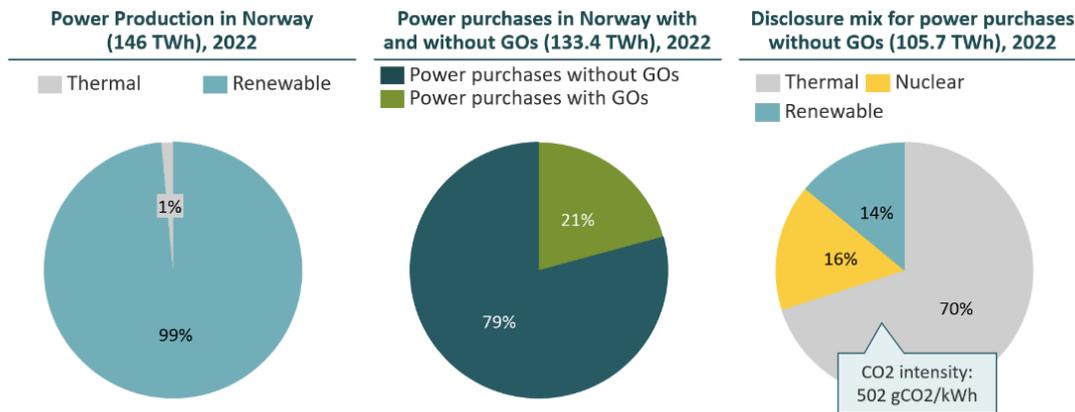
combat the widespread practice of greenwashing. It refers to organisations disseminating misleading information to portray themselves as more environmentally responsible and clean than they truly are. In fact, in an assessment about environmental claims, the Commission found that over half of the "green" claims contained vague or misleading information.

Two pivotal legislative documents underpin these efforts. The first is the EU Taxonomy Regulation for Sustainable Finance, which outlines the fundamental conditions that an economic activity must satisfy to be deemed environmentally sustainable. The second is the Corporate Sustainability Reporting Directive (CSRD), which further standardises the sustainability information disclosed by companies, ensuring that stakeholders and investors can assess the environmental and social impact of these companies. It came into effect in the EU in January 2023 and is set to apply in Norway from January 2024.

In July 2023, the EU also adopted the European Sustainability Reporting Standards (ESRS), which specify the reporting requirements outlined in the CSRD. In other words, the CSRD delineates what should be reported, whereas the ESRS outlines how it should be reported. In 2015, the widely embraced GHG Protocol brought the GO scheme to the forefront by introducing dual reporting for Scope 2 emissions, encompassing indirect emissions from electricity, steam, heating, and cooling. It mandates companies to report both location-based emissions and market-based emissions factors.

Location-based reporting involves calculating emissions based on the average emission factors of the local electricity grid. The market-based emission reporting standard on the other hand, constitutes a carbon accounting methodology where companies utilise purchased renewable energy, facilitated by GOs or other EACs, to demonstrate emissions reductions and achieve their science-based targets (SBTs).

Consequently, companies can claim zero market-based GHG emissions by procuring sufficient GOs to match their annual energy consumption. This approach is designed to bolster the demand for renewable energy and encourage investments in new renewable production. The significance of GOs has gained further recognition, with the ESRS designating the market-based method as the sole mandatory approach for disclosing energy consumption. It stipulates that companies must provide proof of renewable energy utilisation through "contractual agreements" such as GOs.



**Figure 2: Norwegian RES production and disclosure mix in 2022**  
Source: THEMA Green Values report (SEP 23)

As a result, Guarantees of Origin have become a primary means of verifying renewable energy consumption in alignment with the EU Taxonomy. A surge in demand for GOs, particularly those produced in 2024, can thus be anticipated, with the higher GO price levels currently observed on the market serving as a first indicator of a more sustained demand uptick.

### Problems and debates surrounding market-based accounting and GOs

While the EU framework increasingly supports GOs, it has not escaped criticism, particularly regarding its legitimacy in the context of sustainability. Certain industry representatives in Norway have raised concerns about the use of GOs, accusing it of being a form of greenwashing (e.g. Norsk Industri, December 2022). The crux of the issue lies in the traceability of electricity: Once electricity generated from renewable sources enters the grid, it becomes impossible to determine whether the electricity consumed at any given point is renewable or not, or where it comes from. Thus, the GO trading market transcends grid boundaries, enabling GOs to be procured from any country within the scheme, regardless of the existence of grid connections between the producer and the consumer.

As articulated by stakeholders participating in the Scope 2 Guidance Stakeholder Survey during the GHG Protocol Update Process, there is a genuine concern that this flexibility may result in reported emissions reductions by organisations not accurately reflecting actual emissions reductions in the atmosphere.

This disparity is further underscored by the case of Norway. With ca. 99% of its electricity sourced from renewables, Norwegian residents and industry regard their power consumption as green, negating the need for GO certification. In fact, as Figure 2. shows, only 21% of power purchases in Norway in 2022 involved GOs. However, without certification, Norwegian suppliers can't officially confirm the renewable source of their energy. This means they must report a "grey" energy mix to consumers, which consists of just 14% renewables and a substantial 70% thermal energy, quite different from Norway's actual energy mix, leading to a high carbon intensity in the actual disclosure mix.

A second point of contention revolves around the concept of additionality. Some studies cast doubt on whether corporate purchases of GOs stimulate additional renewable energy generation. Consequently, reported emissions reductions may not be truly "additional," potentially causing organisations to mistakenly claim emission reductions and overstate their climate mitigation efforts. Furthermore, this may lead to double claiming if some organisations apply market-based accounting while others rely on location-based accounting for quantifying the emissions from their renewable energy consumption. Another argument against the use of GOs pertains to the accounting period of market-based carbon reporting, which typically occurs annually. Companies that purchase solar GOs but primarily consume electricity during night-time hours when solar generation is minimal can still assert a 100% renewable energy profile. This discrepancy means that their energy consumption does not align with the timing of solar generation, thereby challenging the accuracy of their renewable energy claims.

### Possible future developments

As a result of the many criticisms, some market participants advocate for the ban of dual accounting for Scope 2 emissions, while others simply emphasise the need for a revised framework that addresses the issues and leverages the advantages. One proposed change involves mandating companies to demonstrate additionality for any GOs they claim. This requirement would ensure that organisations cannot engage in greenwashing.

Another proposal revolves around adapting to the physical constraints of the power grid to enhance accuracy. This adaptation includes addressing geographical constraints, such as limiting the markets for GOs to specific grid regions or bidding zones.

Another aspect is increasing time granularity by introducing hourly matching, which aligns the production of renewable energy and the consumption of energy and GOs more effectively. Such measures could significantly enhance transparency and the credibility of sustainability claims.

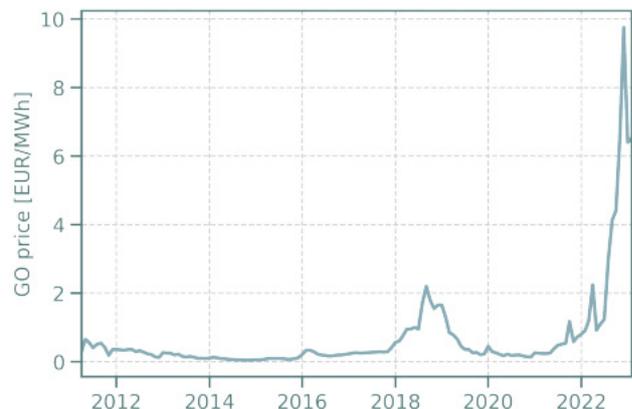
On the framework side of things, there is still some uncertainty regarding the direction in which GOs are heading. Currently, the GHG Protocol is undergoing a review process, and it is anticipated that the updated rules will be published in 2025. This process is still in its early stages, and the survey results received so far have shown a wide range of opinions. Consequently, it is still at a too early stage to identify concrete trends. However, one widely supported point is the need for harmonisation with policy, regulation, and governance to reduce confusion and simplify reporting. Therefore, we can anticipate that the updated rules will align with the approach set forth by the EU. Considering the recent adoption of the ESRS, it is not unlikely that there will be a strong incentive to move towards market-based emission reporting as the only valid method. Additionally, there have been proposals to require location-based reporting only in cases where the market-based method is not possible.

## 3.2 Historic price developments

The GO market received particular interest in 2018, when GO prices were rising up to above 2 EUR/MWh, compared to prior long-term price levels of below 0.3 EUR/MWh. This situation was mainly due to a temporary lack of GOs following the extremely dry summer of 2018, creating

temporary scarcity. Since then, GOs have seen prices drop to very low levels in 2020 at below 0.2 EUR/MWh, followed by an upturn and new GO price records set from mid-2022.

While there was a technology premium for wind and PV over hydro GO supply in years with abundant hydro production, prices for European wind, solar PV and biomass GOs moved more or less in unison with bulk hydro prices since March 2022. Furthermore, some local sourcing policies of large industrials lead to price differences for GO issuance in areas with dense demand centres. This, however, remains removed from markets and is mostly prevalent in OTC trades or factored into PPA contracts.



**Figure 3: GO prices peaked over the last year**  
Source: THEMA Green Values report (FEB 23)

Hydro, wind, PV and biomass prices rose from ca. 0.8 to 1.1 EUR/MWh at the beginning of the year for the Cal-21 contract and ca. 2 EUR/MWh for the Cal-22 contract to almost 10 EUR/MWh in late November to early December 2022. Since then, the Cal-23 contract fell again to levels around 5-6 EUR/MWh in August 2023.

## 3.3 Supply and demand drivers

### 3.3.1 Supply

Norway, Sweden, the Netherlands and France currently issue the largest share of Guarantees of Origin, generating about than 50% of all certificates in 2021 and for the months up to November 2022. While Norway remains the largest supplier, the country's share has steadily declined over the last years, mainly due to wind power, solar PV and biomass additions to the scheme across Europe and the addition of new AIB member states. Nonetheless, Nordic hydropower

still constitutes the main form of power in the scheme, making up the majority of the 40-50% of all GO supplied by hydropower. Wind and solar PV add another 25-30%. In 2022, 810 million certificates (equivalent to 810 TWh) were granted based on the date of production, while 862 million certificates were issued based on the date of the transaction.

Looking at the main trends responsible for market growth in the past, the supply of GO is set to increase further:

**Renewable generation increases in Europe:** Many countries have ambitious climate goals, with increasing shares of wind, PV, and bio generation.

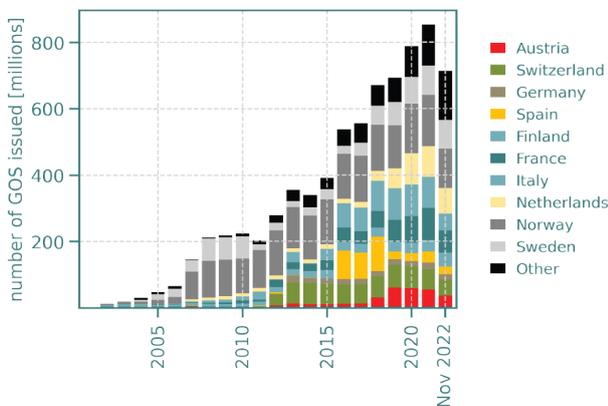
**Older assets dropping out of feed-in systems become eligible for GO:** Renewable generation’s subsidy periods begin to expire, which makes them eligible for GOs issuance in certain states. The national regulation prevents GOs from being freely traded in Croatia, France, Germany, Ireland, Luxembourg and Portugal when issued to generation receiving state support. In French GO auctions, held since September 2019, GOs from subsidised power production were included for the first time. According to trading data from the AIB (2023), supply of GOs reached 854 TWh in 2021. In comparison, total EU power generation from renewable energy for 2021 reached more than 1000 TWh. Thus, taking into account the ca. 140 TWh of Norwegian hydro production, the renewables generation that was ineligible for GOs is believed to lie around 300 TWh.

That signifies a large potential for GOs from existing generation to enter the market, especially from German RES producers. These are now beginning to enter the GO

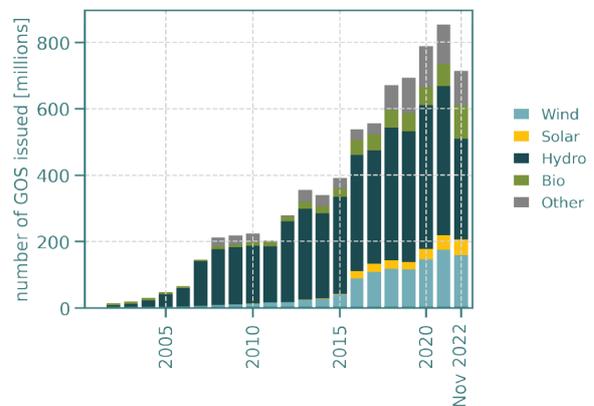
market after their 20-year feed-in tariff is phased out. More and more early wind and solar PV generation from Germany can thus be expected to generate GOs in the next decade. According to EEG rules, volumes receiving a feed-in premium can enter and exit the support scheme on a monthly basis depending on market prices. Especially during times of high market prices, as seen in the last year, a large number of (temporary) exits from the market premium scheme can be observed. Still, subsidy-free facilities only account for ca. 17% of total German RES capacity as of February 2023.

**New countries join the GO scheme and the AIB:** In February 2023, there are 28 member countries in the AIB. Bulgaria is formally applying for membership while several other states (e.g. several Balkan countries, Ukraine) have also shown interest in implementing a compatible system for GO trading. Recent new additions to the Association have mainly consisted of net exporters of GO, thus increasing the supply more than demand for certificates for the time being. Western Balkan countries are also currently preparing a scheme to introduce regional GOs as a step to trade green certificates with the EU and to prepare AIB accession going forward.

**New GO supply will be committed in PPA:** Companies signing PPA will want to also receive the corresponding GOs of the plant they sign the contract for. This keeps new certificates from entering the market and reduces GO supply that can be freely traded. In parallel, demand is also reduced by the same size. This might become an issue for liquidity when trading GOs in the future, if the PPA market becomes very dominant.



(a) Supply by country.



(b) Supply by source.

Figure 4: GO supply from AIB database

Source: AIB

### 3.3.2 Demand developments

Historically, there has been a supply surplus in the market for GOs, but this surplus has decreased over the years despite an increase in RES generation. In certain years, e.g. 2018 or last year (2022), low hydro output leads to demand exceeding supply causing spikes in certificate prices. As GOs are mainly an accounting system, the development of demand does not fluctuate according to economic or sector-specific trends. If the certificate scheme continues to grow, it could encompass the entirety of energy demand going forward, with green gases, heating and cooling being added to the power-centered mechanism. The actors on the market pursue specific targets and act voluntarily, up until today.

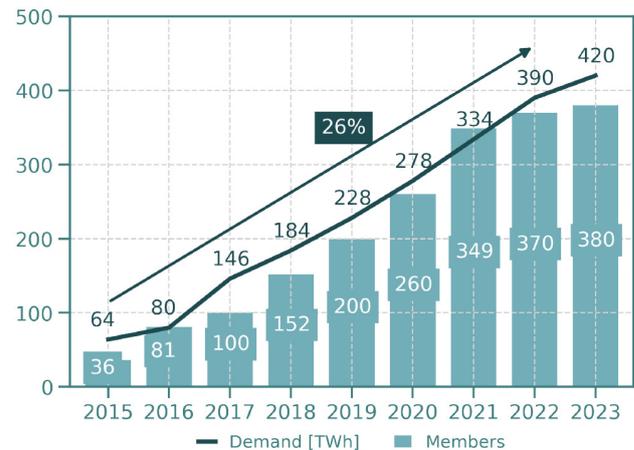
That is why it is very difficult to make an outlook about timing of certain developments, as companies often keep their strategies hidden from the public eye, and market moves can only be explained retroactively. On a country level, Germany is the largest consumer of GOs in Europe. Therefore, it pays off to understand what is happening in the country in particular (see Chapter 4). The general increase in consumption is a result of both new forms of electricity consumers, e.g. electric vehicles and data centers, industry electrification and more stringent global sustainability reporting initiatives increasing demand from the corporate sector. For example, the Carbon Disclosure Project, the Science-based Targets Initiative, the Greenhouse Gas Protocol and the CSR Directive are all contributors to the increase in demand of GOs from businesses.

Fit-for-55 provisions and green investment guidelines set by the EU Sustainable Finance taxonomy could also become an important factor for future demand increases for green power. Strict green sourcing standards will likely lead to companies pushing for decarbonisation along their value chain, culminating in a much stronger push to show clean power supply. The tendency to use certain initiatives for greenwashing must be counteracted, which has recently also featured high on lawmakers' agendas.

As an indicator for the continuing strong uptake of green power sourcing, the RES demand seen in the RE100 group, an initiative for businesses who want to commit to use 100% renewable energy, has grown steadily over the last decade to more than 420 TWh globally in early 2023, championing a compound annual growth rate of over 20% over the time horizon. While RE100 encourages its members to either source renewable energy directly via on-site generation or

long-term agreements (PPAs), unbundled energy attribute certificates (EACs) like GOs account for 40% of the energy sourcing of RE100 members.

In Europe, 127 companies documented that they were sourcing 51 TWh of renewable electricity, with ca. 10 TWh coming from PPAs, about 20 TWh from unbundled GOs and the remainder purchased through contracts with suppliers such as green electricity tariffs, which can, but do not necessarily, include Guarantees of Origin.



**Figure 5: RE100 electricity demand has almost doubled in the last 5 years**

Source: RE100 annual report (2022) and website

In December 2022, the organisation agreed on more strict technical criteria for EAC sourcing in Europe: AIB membership as the market boundary for Europe (which would e.g. currently exclude Poland), accept physical cross-market procurement under certain conditions (e.g. Ireland excluded, despite being an AIB member, as it does not have a grid connection to the Single Market) and a 15-year commissioning or repowering date limit for plants supplying power to the organisation's members unless they meet certain criteria, e.g. self-generation or PPAs with direct line to consumption.

## 3.4 Go-to-market paths for GOs

Guarantees of Origin are issued to producers of renewable energy. They can then be sold either bundled, connected to the energy produced, or unbundled, i.e. separated, from it. For buyers, there are four key options to obtain the certificates, once they are registered in the AIB database. Intermediaries such as brokers, energy exchanges or in some

cases national governments are often key actors to match GO suppliers with offtakers. The paths are explained in more detail below.

### 3.4.1 OTC Transactions

Historically, over-the-counter trades of GOs were the predominant way of trading GOs. Bilateral agreements between large-scale energy producers, or via intermediaries that often facilitate the exchange of the renewable energy certificates for smaller players, in similar fashion to aggregators. Recently, platforms, e.g. Montel's Marketplace or Becour's Marbly, have started to facilitate trades and make them more transparent. Standardized contracts help to improve the transaction costs of GOs.

OTC trading offers more flexibility and confidentiality than trading on centralized exchanges, but it also places a greater responsibility on the involved parties to ensure the legitimacy and compliance of the traded certificates. They are also subject to national regulations that market participants have to adhere to. Under OTC transactions, GOs can be bought in one-time transactions or longer-term supply contracts, which presents a stronger commitment but can also help to hedge future price developments.

### 3.4.2 National auctions

National auctions have been introduced in several AIB member states, and are mainly used to subsidize RES support schemes. They present a tool to allow the issuance of GOs for RES generation receiving state support, and have been implemented in several countries across Europe, e.g. France, Italy, Luxembourg, Portugal or Hungary. As the state receives the auction income, it is essentially subtracted from the subsidy, and thus the GO does not entail a double subsidy for RES generators. A more detailed description of the French auction system can be found in Chapter 4.2.3. National auctions are also an important tool to increase transparency about GO prices and price differences in each country.

### 3.4.3 PPAs

With the European Union pushing for a more central role for Corporate Power Purchase Agreements, e.g. in its latest Renewable Energy Directive (REDIII), the connected, or "bundled" GOs become an important part of the contract negotiations. As higher shares of RES projects are expected to be financed under the use PPAs in the future, the role of GOs for the contract pricing becomes more important. The direct connection of sold electricity and the connected GOs could lead to a scarcer supply available in the market. This becomes a necessity for corporates, helping them to achieve their sustainability and renewable energy targets, as GOs can be used to prove the renewable attributes of their energy consumption.

### 3.4.4 Exchange Trading

Most recently, energy exchanges have started to trade 2<sup>nd</sup> use GOs, i.e. certificates not directly coming from producers but being resold. EPEX Spot, the European Power Exchange (part of EEX, the European Energy Exchange), has started spot auctions in 2022 in order to provide more visibility and transparency for the certificates. Every month, GOs from countries that are following the EECs are traded on the exchange across European countries, promoting the cross-border exchange of GOs. The exchange trades both generic GOs and specific technologies that will be organised under a single pay-as-clear auction (EPEX SPOT, 2022).

# 4 Deep dive into the German GO market and particularities of selected European markets

In Chapter 4, we delve into the details of the German GO market and focus on market players and specificities of the country. This is contrasted with stand-out characteristics in other AIB markets that can explain some of the price differences and difficulties in the ongoing harmonisation of the green power market on a European level: GO auctions in France (also as an example for Italy, and Portugal), Dutch full disclosure and rules fostering local GO demand, and the role of Norway as a large exporter with simmering political discussions of potentially exiting the AIB.

## 4.1 The GO market in Germany, governed by a high demand for GOs

In Germany, the functioning of the GO market, is ruled by the Renewable Energies Act 2023 (EEG, 2023) and by the Ordinance on Certificates of Origin and Regional Certificates of Origin for Electricity from Renewable Energies (HkRNDV, 2018). In paragraph 79, the EEG 2023 outlines a definition for GOs in accordance with European law and appoints the Federal Environmental Agency (Umweltbundesamt – UBA) as the regulatory and supervisory body in charge of dealing with the topics relative to GOs. The HkRNDV regulates the administrative procedures relative to the issuance, transfer, cancellation, expiry, recognition, and import of GOs, as well as the obligations of the parties involved in the activities

revolving around the use and trade of these certificates (UBA, 2012).

According to the provisions envisaged in the EEG, the UBA is responsible for administrating and overseeing the issuance, transfer, recognition, and cancellation of GOs. Additionally, the UBA manages the electronic data bank registry of GOs (Herkunftsnachweisregister), where issuance, recognition, transfer, and cancellation of GOs are registered. The UBA is also given the freedom of undertaking measures to prevent greenwashing, if reasonable doubt regarding the rightful use of GOs should arise. Additionally, the EEG provides that, under German legislation, GOs are not recognized or treated as securities or any other type of financial instrument (UBA, 2012).

If an energy producer wishes to receive GOs from the UBA, they must first open an account at the HKNR. Once this has been done, the UBA verifies the data provided by the energy producer, and their account is activated. Only when an energy producer has an active account at the HKNR, they are enabled to register a given RES-generating asset to receive the corresponding GOs. As seen in Chapter 3, GOs are traded in several different fashions, which implies that there are a variety of actors involved in this commercial procedure. Therefore, not only energy producers may be registered in the HKNR, but also service providers (entities appointed by account holders to exercise functions on their behalf), power retailers, environmental verifiers, brokers and traders (UBA, 2020).

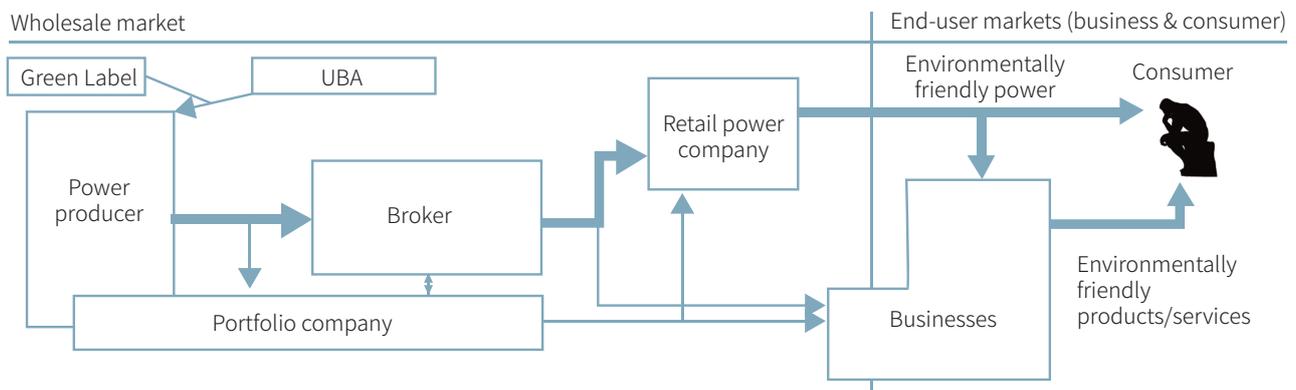


Figure 6: How GOs are traded: Buyers, sellers, and intermediaries  
Source: Oslo Economics

Environmental verifiers, or in a more institutionalized role, ecolabels, are central to the German GO market, since market participants often look for high quality GOs, that provide comprehensive information about the environmental attributes of a generating asset (Oslo Economics, 2018). The basic information contained in a GO includes the description of the issuing body, the identification number of the generating asset in the HKNR, and the description of the type of generation. At the request of the producer, a GO may contain more extensive information on the power's quality features. These refer to additional details regarding the way the power is produced, such as additionality (newly built assets), proximity to consumption, information on the use of proceeds from GOs, and environmental impact (i.e., biodiversity, animal protection measures, etc.).

For these attributes to be included in the GOs by the UBA, the HkRNDV requires an environmental verifier to accredit the veracity of this information (UBA, 2020). A variety of ecolabels have been developed to standardize the certification of certain criteria that are important for consumers who are willing to pay a premium to ensure a certain level of quality in the power they purchase. Some of the most popular ecolabels in Germany are: TÜV SÜD, Energie Vision e.V., Grüner Strom Label e.V., Verein für umweltgerechte Energie VUE, TÜV Nord Cert, und Verband der Technischen Überwachungs-Vereine. One of the most important environmental attributes that can be certified is the so-called "optional coupling". This means, that the electricity supplier has a contract directly with the RES power generator where the procurement of power and GOs are bundled (TÜV Süd, 2019). This measure aims to avoid greenwashing from possible double accounting practices (see Chapter 5 for more information).

In Germany, green electricity producers can opt to sell their energy with or without the use of governmental financial support. For this purpose, two different schemes are envisaged in the EEG. The first one is the feed-in tariff system. This system consists of a fixed payment that is ensured to RES-producers for each MWh of power fed into the grid. The second one is the payment of a market premium. Under this scheme, the energy producers take part in a tender process where they submit a bid with the minimum working price required to operate the generating asset. For each tender, the German government foresees a maximum amount of generating capacity to be subsidized. The bids with the lowest working price asked (cent/kWh) are used to fill the tender volume. If a power producer is

awarded with support, when the average market prices lie below the working price submitted in the bid, the power producer receives a top-up from the state that offsets the price difference. This market premium is different for every power producer since bids are submitted independently from each other. The EEG foresees a maximum support time of 20 years for assets that are registered under the first or the second type of scheme. The third option for power producers is a purely merchant-based route-to-market. In other words, the generating assets do not benefit from any kind of financial support from the state but are free to sell their energy on the wholesale power market or via PPAs (EEG, 2023).

The cashflows transferred to energy producers to support the buildout of RES under the EEG used to be taken from a specific EEG-levy paid by power consumers via their electricity bills. It was phased out in July 2022 and the support scheme is now financed by the government.

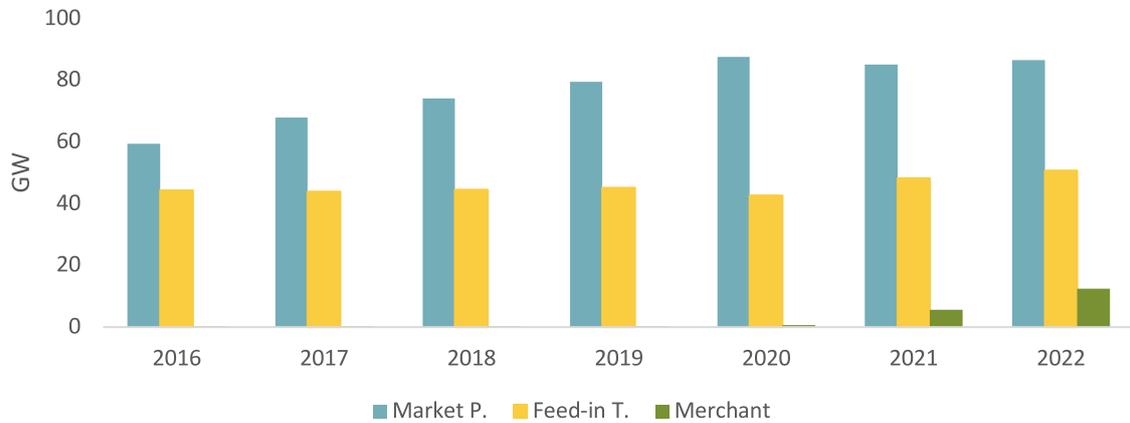
One of the main provisions that characterises the German GO legislation and shapes the European GO market interactions (as it is handled differently in other countries) is that GOs shall only be issued for power which is commercially sold and does not benefit from any of the two support schemes (feed-in tariff or market premium) under the EEG (UBA, 2018).

The progressive decline of RES investment costs which enables for merchant-based projects, together with an aging fleet that exits the 20-year support duration, have increased the percentage of installed capacity that does not receive financial support under the EEG and, therefore, is allowed to be issued GOs (see Figure 7). However, the installed capacity that is registered under one of the two support schemes of the EEG continues to be overwhelmingly higher than that of merchant assets, given that the incentive to leave the scheme is not too intense in the absence of an earnings cap (as is the case for two-sided CfDs). As of 2022, 137.3 GW of installed RES capacity benefited from a support scheme, and just 12.4 GW did not (Arbeitsgruppe Erneuerbare Energien - Statistik, 2023). This means that only 8.2% of the renewable fleet in Germany is in the position to receive GOs.

It is worth mentioning that the EEG foresees the possibility for producing assets to opt in and out of the supporting scheme on a monthly basis. Having this option is beneficial for power producers as it permits them to choose the type of route-to-market that better accommodates the asset in relation to the power market price curve fluctuations.

This means that, for instance in periods of exceptionally high power prices, like those seen last year as result of the energy crisis, the amount of green power installed capacity

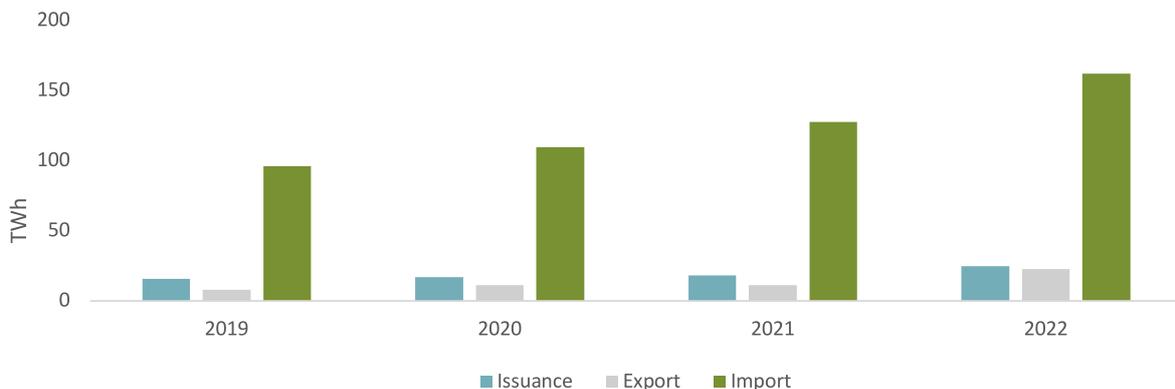
that receives GOs might increase, as assets opt out from the support scheme to benefit from these windfall revenues.



**Figure 7: Installed RES Capacity in Germany according to its Route-to-Market (GW)**  
 Source: THEMA's calculations with data from the BMWK and the Netztransparenzportal

Low issuance levels rooted in the mismatch between total green energy generation and green power enabled to receive these certificates are reflected in low supply levels of GOs in the market. This, together with the high demand for green power from environmentally aware consumers and industrial off-takers that need to adhere to increasingly strict green accounting standards, make it necessary for Germany to import GOs from neighboring markets to make up for the supply-demand disparity. It is important to remember that Germany is the biggest European economy and has the highest power consumption volumes in the region. These large consumption volumes in combination with the above-mentioned supply-demand mismatch, make Germany the number one net-importer of GOs, with a total net imported volume of 138.9 TWh in 2022. Followed by the Netherlands with 25.2 TWh and Ireland with 18.5 TWh (AIB, 2023a).

For Germany to import GOs from other countries and satisfy its demand for green power, these certificates must first pass through a recognition process carried out by the UBA. To be recognized, a GO must fulfill the minimum requirements envisaged in the Directive 2009/28/EG of the EU (see Chapter 2). Additionally, §36 and §37 from the HkrNDV establish that GOs in Germany can only be recognized for their import if the certificate has been issued by: i) a Member State of the EU, ii) a signatory state to the Agreement on the European Economic Area, iii) a signatory party to the Agreement to Found the Energy Community or iv) Switzerland. In line with this, the UBA is also the body responsible for dealing with ministries or bodies from other MS and third states in matters related to GOs. The matter of recognition of GOs is central to its trade and therefore Chapter 5 is devoted to further delving into this topic.



**Figure 8: GO Transaction Volumes in Germany (TWh)**  
 Source: THEMA's calculations with data from the BMWK and the Netztransparenzportal

## 4.2 GO markets across Europe strongly influenced by regional conditions

Varying geographical, economic, legal, and political stances among AIB members have led to a certain degree of heterogeneity in the European GO context. Country-specific regulation starkly influences the market behaviour. Examples of this are, for example, issuance restrictions in Germany that cause low local GO supply, or full disclosure requirements in the Netherlands that bolster demand. Furthermore, countries with a high percentage of green power generation in their electricity mix, like Norway or Iceland, have a high supply of GOs, which allows them to export them to other markets (THEMA Consulting Group, 2023).

The fashion in which these GOs flow into the market may also vary. In countries like Greece, Denmark, Germany, and the Netherlands, brokers have appeared as the actors that facilitate the transactions between generators and suppliers in an OTC-dominated scheme (see Chapter 3). In contrast, other AIB members such as Croatia, France, Hungary, Portugal, and Italy carry out auctions to sell the GO volumes corresponding to the green electricity that receives financial aid from a support scheme (Mrkaljevic, 2022). The revenues stemming from the auctioned GO volumes serve as vehicle to recover part of the expenditures incurred through the support schemes.

The entities that are responsible for the execution and clearing of the auctions take different legal forms, as well. In Italy, for example, the Energy Services Manager (Gestore dei Servizi Energetici), a stock company wholly owned by the Italian Ministry of Economy and Finance, takes over both, trading and clearing responsibilities. In Croatia, CROPEX Ltd. acts as a trading venue and central counterparty, and is equally owned by the Croatian Energy Market Operator Ltd. and the Croatian Transmission System Operator Plc. (HOPS). In France, the European Energy Exchange (EEX), mainly owned by the German Stock Exchange (Deutsche Börse AG), is entrusted with the responsibility of performing the auctions; and its clearing house, the European Commodity Clearing (ECC) serves as the central counterparty for these transactions.

In this section, we will delve into selected examples of stand-out characteristics in some European markets. The aim is to shed light on key differences that exemplify the challenges

faced in the harmonization efforts of the GO market on a European level.

### 4.2.1 Norway

Bolstering deployment of renewable energy sources across Europe has led to an increase on the share that wind and solar assets have in the total GO market, currently accounting for ca. 30% of the issued volumes. However, Nordic hydro still supplies the highest portion of GOs with a market share of ca. 45% (AIB, 2023a). Norway is the largest supplier of GOs in Europe thanks to a combination of a high share of RES (mainly hydro) generation in its mix and a comparably low demand for GOs in the local market. In Norway, 98% of the power generation comes from renewable sources. The high share of total green power in the total generation volumes creates a perception that one is only able to source green electricity in Norway. This perception would be right under a location-based approach but not under market-based emission reporting. This difference in accounting approaches leads to a low consumer demand for power explicitly marked as green. This is manifested in just 19% of the power purchased being covered by GOs, which translates to a Norwegian residual power mix constituted by 62% thermal, 23% nuclear and only 15% renewable energy (Tuset, 2020). Norway's large share in the GO market makes its GOs a price anchor across Europe. Since most of the power generation in Norway comes from hydro sources, bulk GO prices in Europe are strongly influenced by weather conditions in Norway. Higher precipitation rates mean higher water reserve levels and run-of-the-river volumes that lead to more hydropower production and GO issuance. In turn, higher GO supply levels put pressure on certificate prices.

Dry years have the contrary effect, triggering increases in prices. Historically, there has been a technology-related premium for wind- and PV- over hydro-GOs. This is especially true for years with abundant hydro production. However, prices for European wind, solar PV, and biomass GOs moved in unison with bulk hydro prices since March 2022 (THEMA Consulting Group, 2023).

There are divided opinions among market players as well as in the different political spheres as to what should be the accounting approach used to measure Scope 2 emissions (emissions coming from energy sourcing) in Norway. Some market players, like aluminium and power producer Hydro (formerly: Norsk Hydro), advocate to use the location-based

reporting standards accepted by the international GHG protocol (Moestue, 2021). This framework allows companies to report their Scope 2 emissions based on the type of energy that is fed into the grid. Hydro argues that customers that only accept GO-linked power have a poor understanding of the market since these GOs do not necessarily effectuate an increase in green electricity production. In line with this, the battery producer Freyr, as well as some other industry representatives, advocates for the withdrawal of Norway from the AIB. This is founded on the grounds that, according to Freyr, the market-based approach allows a competitor operating its production plant with coal-fueled thermal power to use GOs to depict a clean image of their production (see Figure 2). Freyr also supports the view that a location-based (instead of a market-based) emission accounting approach should be used in Norway and that there should not be a requirement in the country to buy GOs to prove green electricity consumption (Moestue, 2022). Other market participants, like the industrial company Yara have accepted the market-based accounting system based on GOs and are in favor of keeping it (Moestue, 2021). Politically, there have also been controversies regarding the type of accounting that should be implemented and whether Norway should or should not remain a member of the AIB. It is essential to closely follow the political developments in Norway on this regard, since a withdrawal from the AIB market would cause a substantial plunge in GO supply, trigger high prices, and perhaps regulatory adaptations.

#### 4.2.2 The Netherlands

GOs are primarily focused on the certification of electricity generated by RES. However, their use is not limited to this type of assets. With the aim of creating a level playing field and improving transparency, the GO certification approach has progressively been extended to track non-renewable power production. This concept is known as full disclosure and has been implemented in countries like the Netherlands and Austria. The idea is rather straightforward: it consists of a requirement to document and certify every MWh generated regardless of the type of power produced. This rule has a direct impact on consumer choice, as households and commercial off-takers now have to actively decide on the type of power they purchase, beyond green electrons and residual mix (Svendsen Moe, 2020).

Austria and the Netherlands have implemented similar but not identical regulations in this regard. The main difference is that in Austria, physical power delivery and GO supply

and must be performed by the power supplier, while rules in the Netherlands allow for any market participant to be a GO supplier, independent of the physical flow of electrons. This means that consumers can source their power and GOs from different market players, which fosters a higher degree of flexibility and increased consumer choice.

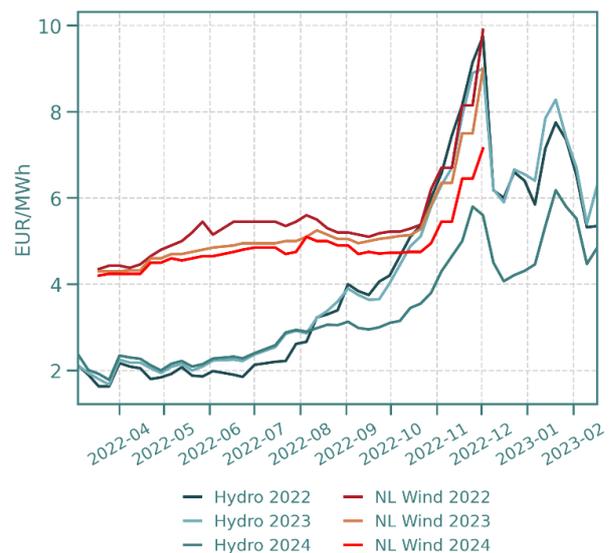


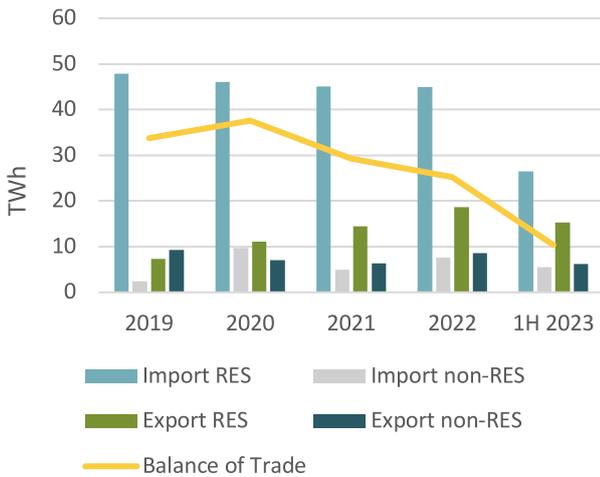
Figure 9: GO prices for bulk hydro and Dutch wind for Cal-22 to Cal-25.

Source: THEMA Green Values report (SEP 23)

In the Netherlands, non-renewable power production is tracked through certificates of origin (COs). The requirement of power suppliers to track the totality of the power they produce with GOs and COs has been in place since January 2020. In contrast to power suppliers, power producers are only encouraged to certify the electricity they generate, but not legally required to do so (RECS, 2022).

The historical technology premium observed in Figure 9 is rooted in the local Dutch regulatory requirements of full disclosure and local sourcing policies of large industrials. These conditions boost the demand for GOs in the Netherlands, which is reflected in usually higher price levels.

An interesting fact about the effects of full disclosure rules in the Netherlands is that the increase in demand was primarily covered by local GOs, since the net import of GOs has declined after the introduction of these rules in 2020 (as shown in Figure 10). This can be seen as a success of the Dutch government in implementing rules that bolster green power generation in the country (RECS International, 2022).



**Figure 10: External trades on Dutch registry (in TWh)**  
Source: AIB (2023)

The implementation of full disclosure has also influenced other markets. In 2019, the Netherlands exported 5.4 TWh of COs to Austria which were reduced to 3.2 and 2.8 in 2020 and 2021, respectively (RECS International, 2022).

CertiQ used to be appointed as the issuing body for both, GOs and COs in the electricity markets. However, in January 2023 CertiQ merged with Vertogas – the equivalent of CertiQ for green gases certification – and created VertiCer, a one-stop-shop for both power and gas green certificates. The merger of these two companies was undertaken with the aim of achieving a greater GO market integration in the Netherlands. Having a single institution that deals with all types of GOs allows for a swifter steering of the GO market. In addition to certification of power and gases, including hydrogen, VertiCer is planning to launch COs for carbon capture and storage facilities. VertiCer is a company jointly owned by Dutch electricity TSO Tennet and gas TSO Gasunie, both state-owned companies (VertiCer, 2023).

### 4.2.3 France

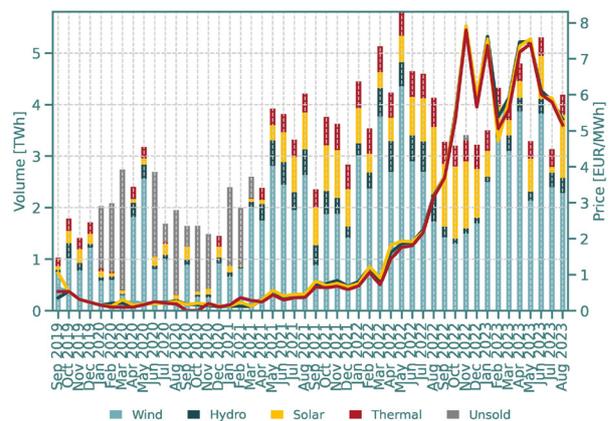
In 2013, Italy was the first country in Europe to introduce a GO auctioning system, followed by France a few years later. In 2019, the EEX was appointed by the French Ministry for an Ecological and Solidary Transition to operate the National Registry of GOs and to carry out the related auctions. Both, merchant assets and assets that are under a support scheme under French legislation can auction their GOs through this scheme. The EEX enables buyers to order GOs from a specific region, technology, and production device. The auctions take place on a monthly-basis and simultaneously for all

types of generating technologies. The quantity of GOs that is auctioned is determined by the French State and auction participants must first open an account in the French registry to be able to participate in the auctions (EPEX SPOT, 2022).

Before auctions take place, the EEX publishes a list of the GOs available to be purchased based on the government’s issuances in the previous month. Buyers have a time-window of seven days to place their orders and adjust their trading limits. Participants that wish to take part in the auctions must fulfil certain requirements:

- Be an account holder on the registry of GO operated by EEX,
- Accept the GO Auction General Terms and Conditions and adhere to the corresponding Access/Trading Agreement,
- Be a member of ECC and sign a clearing contract, and
- Pay the annual auction registration fee.

The results from the auction are published within two days after the auction. After that, the EEX delivers the GOs through the correspondent accounts in the National Registry of Guarantees of Origin. It is important to note that in 2021, the auctions were reformed to adhere to RED II provisions meaning an obligatory monthly disclosure, voluntary full disclosure, the promotion of regional GOs and the priority of auctioned certificates to subsidized producers.



**Figure 11: Auction results for GOs in France**  
Source: EEX

Auctions have the benefit of creating a transparent trading environment that also allows for a price development analysis. French auction data is shown in Figure 11. The

graph depicts the 2020 price slump also seen in the OTC market with GO prices in all categories hovering around 20 cents/MWh. In 2021, monthly reporting periods were introduced. Reflecting the trend on exchanges and OTC trades, prices slowly increased before skyrocketing in 2022 due to factors described in Chapter 3.2. Prices went up from close to 10 cents/MWh in the auctions for December 2020 GOs to over 50 cents/MWh for the volumes issued in February 2021 and crossed 2 EUR/MWh for all technologies in the April 22 auction held in July 2022. Since then, auction results shot up to levels between 6 to 8 EUR/MWh. Also, sold volumes more than doubled from an average of 1.3 TWh per monthly auction in 2020 to 3.9 TWh for the GOs auctioned in 2022. As shown in Figure 11, the August 2023 auction for May 2023 resulted in GO prices of just above 5 EUR/MWh across the technologies, down from a peak of almost 8 EUR/MWh in November 2022 (EEX, 2023).

The EEX and the French GO registry play an increasingly important role in the European GO market. Since September 2022, the European Power Exchange Spot (EPEX SPOT), a member of the EEX group headquartered in France, has also been holding monthly pan-European GO auctions.

The market design allows entities that are part of the EECS to participate in anonymous auctions. Bidders may select the features of the GOs they wish to source in terms of

generating asset (Hydro, Solar, or Wind), issuing country, and subsidy regime. This scheme allows for a certain degree of freedom for market players to select the type of GO, while leaving room for liquidity through standardization. Additionally, participants are enabled select specific production months or larger production periods, according to their necessities. The auction is limited to the secondary market, thus comprising solely trading of previously emitted GOs. The aim of the EEX is to promote exchange-based spot auctions with clear rules that allow to harmonize the currently fragmented GO market, whilst providing price transparency, and support the integration of an overarching and functional pan-European market (EPEX SPOT, 2022).

In EEX's 2023 pan-European auctions, 116 GWh were traded in January for the March-December 2022 period, with prices clocking in at ca. 8 EUR/MWh for wind, solar and hydro. In the February auction, volumes fell by 60% to 46 GWh, with prices also decreasing to below 6 EUR/MWh. Interestingly, in both auctions, hydro prices achieved higher prices than the other technologies. The price increase in hydro GOs can be explained by dry conditions across Europe in 2022, since hydro power generators had forecasted to receive a higher amount of GOs that now need to be sourced through other means to fulfil long-term contractual obligations.

# 5 Mutual recognition with third countries; framework, experiences, and lessons learned

In Chapter 5, we delve into the issues revolving around the recognition of GOs between European countries and third countries. The issue of recognition is central to onboard other countries into the GO system. However, regulatory, and technical barriers constrain the full roll-out of the GO system beyond EU borders. To provide clearer picture of the interactions that shape the recognition of GOs, we will analyse Iceland's recent trade suspension case, the decoupling of the UK GO-like system (REGO), from the AIB system, the onboarding of Serbia to the AIB Hub and the efforts of Georgia to put in place a compatible registry with the goal of eventually become part of the broader European GO system.

## 5.1 General provisions on green power trade with 3<sup>rd</sup> countries

Recognition rules for GOs are outlined on a European Union level in the Renewable Energies Directive (see Chapter 2.3). Additionally, Member States are bound to local legislature that governs the recognition of GOs and transposes EU law in the national territory (see Chapter 4.1 for the case of Germany). According to the EU juridic approach, when a new directive is launched, MSs generally have a period of two years to adopt the corresponding piece of legislation. A clear example of how EU legislation influences local GO recognition rules can be observed in the changes made to the German HkRNDV before and after RED II came into force.

The 2018 version of the HkRNDV section 36 on GO recognition reads:

*"... the register administration shall recognise a guarantee of origin for electricity from renewable energy sources issued in European Union Member States, other States in the European Economic Area, Contracting Parties to the Energy Community Treaty or Switzerland if there is no good reason to doubt the accuracy, reliability or veracity of the guarantee of origin..."*

In 2021, RED II was launched and paragraph 11 was added to Article 19:

*"Member States shall not recognise guarantees of origins issued by a third country except where the Union has concluded an agreement with that third country on mutual recognition of guarantees of origin issued in the Union and compatible guarantees of origin systems established in that third country, and only where there is direct import or export of energy..."*

The current version of the HkRNDV section 36 was then adjusted to:

*"...the registry administration shall recognise a guarantee of origin for electricity from renewable energy sources from member states of the European Union, from other signatory states to the Agreement on the European Economic Area or from third countries at the request of the registry administrator if the European Union has concluded an agreement with that third country on the mutual recognition of guarantees of origin issued in the European Union and only where there is direct import or export of energy if there is no good reason to doubt the accuracy, reliability or veracity of the guarantee of origin..."*

This indicates that in order to recognize guarantees of origin, current EU legislation on GOs requires third countries to a) be part of the European Economic Area or b) have concluded an agreement on mutual recognition of GOs with the EU and have direct import or export of energy. Examples of countries that would fall under some of these categories are Norway, a member of the European Economic Area and Switzerland, a member of the single market that has concluded a bilateral agreement that allows entities in the Member States to trade GOs with Swiss counterparties.

While European legislation is clear in this respect, in order to understand the broader interactions of the EU in terms of recognition of GOs, there are practical examples worth delving into. In this chapter we will examine the cases of: Iceland, a member of the European Economic Area (EEA) with no direct connection to the EU power grid; the UK, a previous Member State with its own GO system; and Serbia

and Georgia, third countries and Contracting Parties to the Energy Community, with and without full membership to the AIB, respectively.

## 5.2 Case Studies: Iceland, the UK, Serbia and Georgia

### 5.2.1 Iceland

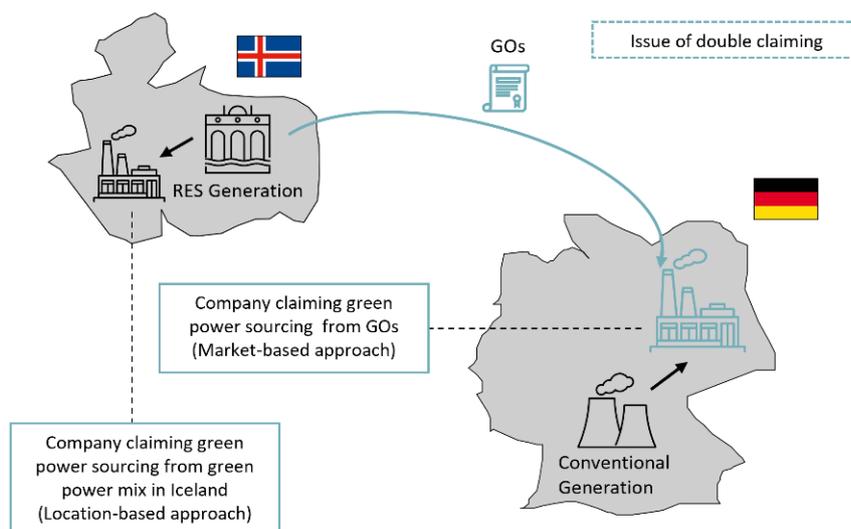
Iceland has been a member of the European Economic Area since the EEA agreement came into force in 1994. As a member of the EEA and the AIB, Iceland is part of the GO system to a full extent. Iceland's case is comparable to Norway's (see Chapter 4.2.1) in the sense that both countries have a high percentage of green power generation in the country, are members of the EEA, and full members of the AIB, the only difference being that Iceland is not connected to the European grid infrastructure.

Iceland has had a generation mix of virtually 100% renewable power since many years now and its grid is not physically interconnected with mainland Europe. This means that under the location-based accounting approach of the GHG protocol, any consumption of electricity in Iceland, at any given time, will be accounted as entirely carbon-free. However, under the market-based approach this is not necessarily the case.

In 2021, Iceland reported 13.7 TWh of green power consumption while only cancelling 3.6 TWh of nationally issued- and 0.15 TWh of imported GOs (Dalfest, 2023). This

discrepancy led the AIB to start an investigation on the matter in November 2022 and implement a ban on the export of Icelandic GOs on the grounds of possible double-counting practices. The AIB referred to Article 19 of the RED and the governing statutes of the EECs to undertake the trading restrictions of Icelandic GOs. When this ban came into force, the German regulatory and issuing body, the UBA, also halted the recognition of Icelandic GOs. The investigation carried out by the AIB in cooperation with the National Energy Authority of Iceland, Orkustofnun, concluded that the difference in GO-cancellation and green power consumption figures is derived from a case of double claiming, not double counting and the export restriction from the AIB was lifted under the conditionality that further investigation proceedings on the matter were undertaken. The UBA lifted the trade ban without any sort of conditionality some weeks after the AIB.

In the GO context, there are conceptual and regulatory differences between the double counting of GOs and the double claiming of GOs. Double recognition refers to the issue that arises from using two different accounting approaches for green power consumption (see Figure 12) (World Resources Institute, 2015). This means that while companies in country A claim green power consumption using the location-based accounting approach (GHG Protocol) that looks at the local power mix to calculate the percentage of green electricity consumed, companies in country B may claim green power consumption based on the market-based approach, which looks at the GOs that power producers from country A exported to country B.



**Figure 12: Illustration of potential double claiming of Icelandic GOs**  
Source: THEMA Green Values report (SEP 23)

In contrast to double claiming, double counting is a practice that is contained only within the market-based accounting approach and is derived from irregularities occurring inside it. This issue of double counting arises when the same GO, issued for one only MWh, is cancelled two (or more) times. From a regulatory point of view, neither the EECS nor the RED explicitly mention the issue of double recognition. Double counting, however, is ruled out by both regulatory frameworks.

In July 2022, the Accounting Directive of the EU was amended by the Corporate Sustainability Reporting Directive. The amendment requires companies to include a dedicated section of their management report where they explicitly state the company's impacts on sustainability matters. This information must be reported in accordance with the European Sustainability Reporting Standards (ESRS), which were adopted in July 2023. The ESRS now explicitly mention that both, the location-based and the market-based approach, must be reported. The adoption of this regulation favours a move toward a more transparent GO market and aims to increase the legitimacy of GOs through the avoidance of double claiming (EFRAG, 2023).

The adoption of the ESRS has already started to have visible impacts. In Norway, Norsk Hydro, a company that historically has resisted adopting the market-based approach, closed a 15-year PPA deal with Statkraft to source GOs. Similar developments could be expected in Iceland going forward.

### 5.2.2 The UK

In 2005, the Renewable Energy Guarantees of Origin (REGO) scheme went online in the UK. This GO-equivalent system is a web-based registry that provides evidence of electricity produced from RES and was introduced as part of the European Union Directive to promote the use of renewable energy sources (EU Directive 2001/77/EC). Ofgem, the UK's Gas and Electricity Authority, is the designated issuing and regulating body for REGOs (OFGEM, 2005).

Before Brexit, GOs and REGOs were traded freely between the UK and the rest of the EU's MSs. Since the UK was never part of the AIB, in order to trade GOs and REGOs they used to "import" and "export" these green certificates through the Ex-Domain Cancellation (EDC) mechanism (AIB, 2023b). This mechanism allows the trade of GOs for third countries and AIB members that have a technical impediment to

accessing the AIB hub. In essence, ex-domain cancellations are cancellations that take place in one country for their use in another.

As the UK and the EU single market started to decouple in 2021 in response to Brexit, the EU ceased to accept REGOs as a valid certificate to disclose renewable energy consumption. In March 2022, the British Department for Business, Energy and Industrial Strategy published a Consultation on the Removal of Scheme Cost Exemptions for Green Imported Electricity and the Recognition of EU Guarantees of Origin. Following the Consultation, a decision was made to stop UK recognition of EU Guarantees of Origin on the 1st of April 2023 (THEMA Consulting Group, 2023).

The UK imported around 69 TWh of EU GOs for the 2020-21 compliance period. The large demand for imports led to sharp price increases after the announcement of the halt in GO recognition in the UK, with REGOs trading at almost 14 GBP/MWh in September 2023. The squeeze in supply provoked by the stop of GO recognition means a 40% supply cut in green power certificates, according to industry estimates (Greenfact, 2021).

In the UK, GOs used to have two main purposes. On the one hand, the standard purpose of electricity mix disclosure, and on the other the so-called green import exemptions. The UK has two different support schemes, the Feed-in Tariff, and the Contracts for Difference (CfD). Both schemes are financed by a levy paid by power suppliers that varies according to the amount of electricity they supply. The green import exemption comprised a relief from the levy-related payment obligations under this scheme, under the condition that the electricity supplied had been imported from the EU and marked as green through GOs. The above-mentioned Consultation also led to the removal of green import exemptions from April 1<sup>st</sup>, 2023, onward (THEMA Consulting Group, 2023).

Overall, the UK falls into the category of a third country with direct physical flow of power with the EU, which had a mutual recognition agreement of the green power certificates system and transitioned away from it as it stopped being an EU/EEA member.

### 5.2.3 Serbia and Georgia

The Energy Community is an international organization that aims to create a bridge between the EU and its neighbouring

countries. The organisation was founded in 2006 through the Treaty establishing the Energy Community, with the objective of extending the EU internal energy market rules and principles on the basis of a legally binding framework.

The main goals of the Energy Community are i) establishing a regulatory and market framework to attract investment in the power sector, ii) creating an integrated market allowing cross-border trade and integration with the EU market, iii) enhancing security of supply, iv) improve the environmental situation in regards with energy supply, v) developing competition and economies of scale.

The Energy Community has nine contracting parties: Albania, Bosnia and Herzegovina, Kosovo\*, North Macedonia, Georgia, Moldova, Montenegro, Serbia, and Ukraine. From these countries, we will shed light on Serbia and Georgia, with the aim of showcasing the interactions of Contracting Parties of the Energy Community countries outside the EEA that strive to interconnect their GO system with the EU single market.

Serbia's GO system has made significant developments in the past years. In 2011, the country's national system was disbanded, and it started to put in place an EECS-compatible GO system. In order to comply with Article 15 of RED I, Grexel, a subsidiary of the EEX, has been working together with EMS, the Serbian Issuing Body, since then. Grexel is also operating the Serbian registry since 2017 (Grexel, 2020).

Serbia started trading with AIB countries before getting its full membership through the EDC mechanism (see UK case).

Since its full admission to the AIB, Serbia has been able to trade through the main AIB Hub for GOs without being an EU member, member of the EEA, or part of the single market. The Serbian GO balance of trade has slowly shifted toward green numbers. According to AIB data, they imported 84, 176, and 11 GWh of GOs between 2020 and 2022. Currently, in 2023, their balance has remained positive with 2.6 TWh of net exported GOs (AIB, 2023a).

At the time Serbia joined the AIB, there were other CPs of the Energy Community aiming to joining the GO market. However, the introduction of RED II changed the legal dispositions, making it harder for those countries to follow Serbia's steps. Serbia remained part of the market through a bilateral agreement with the EU (Energy Community Secretariat, 2021).

In response to this situation, and since the CPs had already taken the first steps to set up a GO system through the transposition of RED I into their national legislation, the Energy Community brought forward the idea of creating a regional GO system for contracting parties, that would help them to save costs, encourage a harmonized development process, and enable bilateral trade of GOs among CPs.

In 2022, Georgia became the first CP to start using the regional electronic registry developed under the Energy Community. Just like in Serbia, Grexel is the designated body to administrate the GO registry. Under this project, Albania, two entities in Bosnia and Herzegovina, Kosovo\*, North Macedonia, Moldova, Montenegro and Ukraine have created registries ready to go-live and plan to use Grexel as a service provider (Energy Community, 2022). While these GOs are not recognized in the EU system, the regional registry is fully compatible with the EU system and in the case the regulation would allow for CP of the Energy Community to trade with full members of the AIB, the import and export of GOs would be feasible from a technical point of view. According to the Energy Community, there are two further stages previewed for the project that are envisaged in a Memorandum of Understanding signed between the Energy Community and the AIB. First, if a CP becomes a member of the AIB, and its register is added to the AIB hub, it will be able to trade with both members of the Energy Community and with members of the AIB. Second, it is expected that eventually, all members of the Energy Community will join the AIB. If Georgia were to join the AIB Hub, it would be the first country outside the EEA and without grid interconnectivity with the EU in place to form part of the European GO system. While there are no concrete plans or agreements that are underway to fully onboard CPs as full members of the AIB, it is worth following the developments of these markets, as they would set the tone for other third countries that could be interested in following suit.

#### 5.2.4 What are the implications of 3<sup>rd</sup> country GO handling?

When it comes to Iceland, it shows that the adoption of European standards can facilitate the inclusion in the common system. But potential deviations from the standard practices could have consequences for common recognition going forward.

Based on UK's case, a third country can recognize GOs in their accountancy if they wish to and can "import" them through the AIB without being an AIB member. This import is done through the Ex-Domain Cancellation (EDC) mechanism. Although in small quantities, some non-AIB countries, like the USA, Poland, Malta import GOs through the EDC mechanism several countries do. The UK continued to recognize Ex-domain cancellations even after the EU stopped recognizing ex-domain cancellations of REGOs for their accountancy in the EU. One could think that this would also work the other way around, given willingness on the EU-side to accept mutual recognition, which would certainly have to fulfil certain quality standards in line with the EECS.

- The cases of the UK and the CP of the Energy community also show that it is possible to have a GO-like system that mutually recognizes and allows for ex-domain cancellations without having to use GOs, specifically.
- The difference in how Serbia got into the AIB and Georgia did not, after the launching of the RED II, sets a precedent for a rather opposed political sentiment in the EU to not move toward integrating other markets in the EU.

In Chapter 6, we collect and present the main findings of previous chapters to try to distill key insights for the Chinese partners. To conclude, we put the development of GOs in Europe in perspective of the Chinese experience.

# 6 Conclusions and main take-aways for Chinese partners

## 6.1 The future role of GOs depends on the development of the regulatory framework

Besides supply and demand developments of GOs, policy changes are the main drivers of price levels and will determine the importance of the certificate in the coming years. With the recent move towards more market-based support systems and merchant RES projects, the significance of the scheme to value the renewable origin of energy could gain more importance, not just for electricity, but also for green gases as sector coupling progresses. Full disclosure mechanisms, shorter balancing periods for GO supply or a move to certify 24/7 use of renewables by corporates could give impetus to increasingly higher price levels on GO markets. The EU Commission is working on harmonising the approach in its Member States, also to enable more support for signing PPAs across the bloc in the future.

In the latest iteration of the EU's Renewable Energy Directive, the EU kept the option for Member States not to issue GOs for already subsidised RES generation. This came as a surprise to some market actors but is likely due to German opposition to remove the rule as of now, since the country strictly opposes issuing GOs to subsidised projects. In addition, provisions were included to strengthen PPAs, with PPA sellers now implored to always make associated GOs available to the buyer. Another change comes with regards to a GO's temporal dimension: changes were made allowing for GOs to also be issued in shares smaller than 1 MWh when appropriate as the EU opens up to Member States giving GOs a closer to real time timestamp, where appropriate.

At the same time, the EU is actively developing and enacting more stringent sustainability reporting regulations and legal frameworks to ensure that the private sector plays its part in reaching these objectives. Guarantees of Origin have become a primary means of verifying renewable energy consumption in alignment with the EU's Sustainable Finance Taxonomy. From 2024, the new European Sustainability Reporting Standards will likely lead to increased demand for GOs

from larger businesses that need to comply with the new standards.

Still, due to double claiming practices, the GO market has not escaped criticism, particularly when it comes to its legitimacy in a sustainability context. The discussion in Iceland provides evidence for that. A Commission review of the market by June 2025 will give more guidance to the future direction and role of Guarantees of Origin.

## 6.2 Main take-aways for China and its Green Energy Certificate Market

From 2017, Green Energy Certificates (GEC) were used in China to promote green characteristics of renewable electricity. As reforms have been announced in August 2023 and with the power sector now also moving towards a more market-oriented system, lingering issues surrounding the use of Chinese GECs could be tackled. Until now, customers often hesitated to buy GECs due to lacking additionality, transparency and verification, as well as fears of double counting as they were often issued by subsidised RES generation. With more unsubsidised RES generation expected to become available in the market in the near future, low traded volumes could soon be a thing of the past. Furthermore, the issue of competition with international renewable energy certificates (e.g. I-RECs, TIGRs) seems to have been tackled with the government stating that GECs are the main tool to prove RES consumption. Still, wider access for independent verification is necessary to prove this as underlying databases for the issuance of GECs and I-RECs/ other certificates are not checked against each other. Still, trade has to be enabled for GECs to become an interesting vehicle to show green credentials going forward. Static prices instead of a functioning market, and restricted transactions would continue to hamper the market. Therefore, rules will have to be strengthened and clarified further. (Hove & Xie, 2023)

A looming issue that remains is that of changing practices in Europe and the US: the recognition of China's green

certificate system might face challenges if new practices, such as time and geographical matching of renewable energy supply, soon become commonly used in Europe and North America. While China is on a fast-paced path towards liberalisation of the power market, there are still hurdles to overcome that would allow the country to follow the changing practices in more advanced markets in the short-to medium term. For example, there is no unified power market with hourly pricing, and transmission bottlenecks hamper interregional trading.

A good practice to ensure improvements to the GEC scheme would be to take note of the reforms that the EU carried out

in order for GOs to become more important over time. At first, the instrument was seen as completely voluntary, with no obligation for buyers to purchase or generators to issue them. Over time, the outlined reforms have led to a firming of demand for GOs, while it was at the same time ensured that on the supply-side, independent verification bodies were established. Currently, it seems that the bundling of GOs to PPAs has priority, while the issue of double claiming also received attention and is likely to be improved under the ESRS, and further depends on the outcome of the case that led to the ban of Icelandic GOs in spring 2023. A verdict in that case could have important implications for the future functioning of the European GO market.

**Table 1: Comparison of Europe's GO system and China's GECs**



<b>Standardisation and transparency</b>	Europe's GO scheme follows clear, transparent standards: from general regulation in the RED III, to Member States' implementation of the rule and EECS's detailed standards	China could benefit from developing clear and standardized criteria for issuing and trading green energy certificates. The reforms announced in August 2023 represent a first step.
<b>Verification and certification</b>	Certification of the RES generation's origin is at the core of the GO system. The AIB and national registries ensure the verification. Independent 3 <sup>rd</sup> parties are often responsible to label GOs.	Giving independent verifiers access to the system is key to ensuring consumer trust. China can learn from European best practices in this category.
<b>Cross-border trading</b>	Europe's GO scheme allows for cross-border trading of certificates, which enhances market liquidity. This is a continuing process, driven by the REDII and REDIII regulations that push for more harmonisation across EU Member States.	China has begun to open up to inter-regional trading. However, certain aspects of the market design still represent barriers to facilitate a more liquid market where also secondary certificates can be traded.
<b>Demand-side</b>	Europe has slowly begun to transform the voluntary market, driven by consumer pull, to a market where some consumption will be required to show green origin of power demand	Mostly international companies rely on the purchase of GECs. More pull can be created over time, when the market matures.
<b>Double-Counting</b>	To prevent double counting, when GOs are exported from one country (A) to another (B), they are excluded from country A's national disclosure mix. After being employed for consumer disclosure, GOs are cancelled in the national registry, rendering them unavailable for further trade.	China has taken significant steps to address double counting issues, which had been a point of concern for potential customers, such as the discontinuation of I-RECs for domestic generators to reduce the risk of double selling on international markets. Trust that these issues are now overcome needs to be built for increased international recognition going forward.

### 6.3 Potential mutual recognition of the European and Chinese green power certificate markets

Given that the changes in the Chinese GEC market are recent, and international players first have to collect experiences with the new rules, it is difficult to judge the effect on mutual recognition in the future, e.g. with Europe's GO scheme. Improvements in independent monitoring and verification will surely play a large role, as well as an orientation towards practices used in more advanced green energy certificate schemes in Europe, the UK or the US. As the Chinese government has proclaimed the aim to set international standards for mutual recognition, this could become the focus going forward.

To ensure mutual recognition, learning from the policy developments from 2009 until 2023 in the Renewable Energy Directive is an important aspect. Furthermore, orientating the Chinese GECs towards fulfilling standards that correspond with the EECS rules would surely go a long way to making European legislators more susceptible to approving mutual recognition. Based on the case of Iceland, it could be deduced that countries that wish to have a GO system that is compatible with the EU GO system and pursue to avoid legitimacy concerns should implement regulations for companies that comprise mandatory disclosure of GHG using the market-based reporting approach under the GHG protocol for scope 2 emissions. (As scope 2 emissions are not a part of CBAM as of now, electricity consumption's impact on the emission intensity of the encompassed products would also not apply.)

A good indicator was the stance of the European Parliament in negotiations regarding the latest iteration of the Renewable Energy Directive. There, lawmakers proposed to open the scheme to third-country mutual recognition. However, this motion has not been implemented in the final version. Still, it shows that there is openness for future developments in this sphere.

Looking at the observations from Chapter 5, it can also be pointed out that the adoption of GO standards of third-countries, e.g. Georgia, and them potentially being allowed to trade in the European GO market should give the Chinese side a perspective of the opportunities going forward. While the large geographical distance and transparency issues need

to be considered, also when it comes to interest from the demand side for GECs in other markets, the doors to mutual recognition are not closed given the willingness to reform the Chinese market further and to tackle the issues described above. However, the current political climate and recent signals, e.g. when it comes to allowing the participation of Serbia vs. Georgia or other EC CPs in the AIB's GO market show that the willingness to open up to mutual recognition of the Chinese and European green energy certificate schemes could be a very long and cumbersome process. Another aspect to consider is the trend towards temporal and especially geographical matching. It could effectively put a stop to ambitions to trade across the markets if GOs will only be seen as valid to use in their region of origin, or if grid connection and the possibility of physical transfers need to be substantiated. However, if the target is for the AIB countries to recognise the carbon impact of GECs used for products manufactured in China, this would remain a possibility. Ensuring transparency, independent verification and the abolishment of double counting, as described above, will be the main determinants of the EU accepting GECs in sustainability claims going forward.

## Annex

# Overview of Green Certificate Development in China

(Prepared by EPPEI and CREEI)

## Historical of Green Certificates

In January 2017, three pivotal government authorities – the National Development and Reform Commission, the Ministry of Finance, and the National Energy Administration—collaboratively released the “Notice on the Trial Implementation of the Renewable Energy Green Electricity Certificate Issuance and Voluntary Subscription Transaction System” (NDRC Energy [2017] No. 132). This document introduced the experimental distribution of renewable energy green electricity certificates and voluntary subscriptions at a national level. It designated the National Renewable Energy Information Management Centre for the issuance of these green certificates, principally tailored for onshore wind energy and centralized photovoltaic projects that benefited from national fiscal incentives. The primary mode of transaction is through voluntary subscriptions, with the revenue from green certificates primarily allocated to counterbalance national financial subsidies. Subsequently, once the green certificate is transacted, the correlated electricity volume would no longer avail of such subsidies.<sup>1</sup>

In January 2019, the National Development and Reform Commission and the National Energy Administration jointly issued the “Notice on Actively Promoting Subsidy-Free Grid Parity Projects for Wind and Photovoltaic Power Generation” (NDRC Energy [2019] No. 19), advocating for subsidy-exempt and competitively-priced grid parity projects to secure fair compensation via green certificate trading. It elucidated that wind and photovoltaic power projects offering grid parity (or at competitive rates) could secure green certificates

aligned with the national renewable energy green electricity certificate management framework and policies, deriving revenue through their sale.<sup>2</sup>

In August 2021, the above two authorities released a response pertaining to the “Pilot Work Plan for Green Electricity Trading”, a plan aimed at forwarding the green electricity trading pilot schemes. This underscored the congruence between green electricity trading and the green certificate system. Subsequently, the National Renewable Energy Information Management Centre was entrusted to dispense green certificates en masse to the Beijing and Guangzhou power trading centers, which would then orchestrate green certificate deals and transfers amongst market players in adherence to pertinent national protocols.<sup>3</sup>

## Current Status and Trends in Green Certificate Trading

With the advent of the green certificate regimen, China has basically created a robust and efficacious framework for green certificate distribution and commerce. As of year-end 2022, 59.54 million green certificates had been distributed, with roughly 10.31 million being transacted. This has raised a notable societal awareness for green electricity consumption.

In 2022 alone, national green certificate trading touched an impressive 4.5177 million certificates. The Beijing Power Trading Center accounted for 1.4543 million certificates (equivalent to 1.454 billion kWh) at an average price of

1 “Notice on the Trial Implementation of the Renewable Energy Green Electricity Certificate Issuance and Voluntary Subscription Transaction System (NDRC Energy [2017] No. 132),” issued by the National Development and Reform Commission, Ministry of Finance, and National Energy Administration on 18th January 2017. You can find the document at [https://www.ndrc.gov.cn/xxgk/zcfb/tz/201702/t20170203\\_962895.html?code=&state=123](https://www.ndrc.gov.cn/xxgk/zcfb/tz/201702/t20170203_962895.html?code=&state=123).

2 “Notice on Actively Promoting Subsidy-Free Grid Parity Projects for Wind and Photovoltaic Power Generation (NDRC Energy [2019] No. 19), issued by the National Development and Reform Commission, National Energy Administration, 7th of January, 2019, available at [http://www.nea.gov.cn/2019-01/10/c\\_137731320.htm](http://www.nea.gov.cn/2019-01/10/c_137731320.htm).

3 “Response to the Pilot Work Plan for Green Electricity Trading”, issued by the National Development and Reform Commission and the National Energy Administration in September 2021, available at <https://www.163.com/dy/article/GJLGVCI00511CVT1.html>.

¥28.10 per certificate (reflecting a premium of ¥0.028 per kWh). Meanwhile, the Guangzhou Power Trading Center saw the trading of 185,600 certificates (equivalent to 186 million kWh) at an average rate of ¥33.24 per certificate (with a premium of ¥0.033 per kWh). The National Renewable Energy Information Management Center traded 2.8778 million certificates (equivalent to 2.878 billion kWh) at an average of ¥32.08 per certificate (reflecting a premium of ¥0.032 per kWh).

Geographically, 31 Chinese provinces (regions and municipalities), including Jiangsu, Shanghai, Guangdong, Beijing, and Xinjiang, witnessed market players acquiring green certificates. Notably, Jiangsu acquired 1.4222 million certificates, followed by Shanghai with 1.1889 million, Guangdong at 438,200, Beijing with 350,100, and Xinjiang securing 301,000. Other provinces such as Fujian, Guizhou, and Shandong each acquired in excess of 100,000 certificates. Moreover, provinces like Zhejiang, Liaoning, and Jiangxi each accounted for over 50,000 certificates. On the lower spectrum, Hubei, Chongqing, along with 8 other provinces (or municipalities) acquired in excess of 10,000 certificates, while places like Tianjin, Ningxia, and 12 other provinces (or municipalities) settled for figures below 10,000 certificates.

As of the end of July 2023, China's accumulated green certificate trading volume approximated 46.2 million certificates, with the issuance of green electricity certificates for renewable sources surpassing 120 million. Leading the charge in cumulative sales were provinces like Hebei, Jilin, and Jiangsu, each boasting sales exceeding 3 million certificates. Remarkably, the green certificate trading volume in the initial seven months of the present year has already surpassed the entire trading volume recorded in 2022.

## Challenges in Green Certificate Development

Although the green certificate system has initially propelled a greater awareness of green electricity consumption in society, several challenges still linger. These include the limited reach of green certificate issuance and trading, the relatively modest scale of green certificate trading, and the

imperative to broaden the applicability of green certificates.

- By the end of 2022, the collective green certificate trading volume across the nation amounted to 10.31 million certificates, equivalent to 10.31 billion kWh. Given that China's entire renewable energy generation in 2022 hit 2.7 trillion kWh, this signifies that green certificate trading volume only represented a mere 0.4% of 2022's total renewable energy output.
- Regarding consumption, the uptake of green certificates by users remains low. With China's electricity consumption for 2022 totaling 8.6 trillion kWh, green certificate consumption only made up about 0.1% of that figure.
- The green certificate market, though operational, still sees modest trading volumes. By 2022's end, around 59.54 million green certificates had been distributed. Yet, the trading volume only amounted to 17.3% of the total number of issued certificates.

## Interpretation of the Latest Policy Measures

In July 2023, the National Development and Reform Commission, the Ministry of Finance, and the National Energy Administration jointly issued the "Notice on Achieving Full Coverage of Renewable Energy Green Electricity Certificates to Promote Renewable Energy Electricity Consumption" (NDRC Energy [2023] No. 1044, a.k.a. Document No. 1044 for brevity). This document deploys key measures to improve the renewable energy green electricity certificate system and promote renewable energy electricity consumption. It marks a significant upgrade to the existing green certificate system in China, ushering in a new era of green certificates with milestone significance.<sup>4</sup>

- **Authority:** Document No. 1044 distinctly vests the National Energy Administration with the mandate to oversee the green certificate domain. By harmonizing the contributions of diverse stakeholders, this measure reinforces the certificate's significance, aligning it with

<sup>4</sup> "Notice on Achieving Full Coverage of Renewable Energy Green Electricity Certificates to Promote Renewable Energy Electricity Consumption" (NDRC Energy [2023] No. 1044), issued by the National Development and Reform Commission, Ministry of Finance, National Energy Administration, 25 July 2023, available at [http://zfxgk.nea.gov.cn/2023-01/04/c\\_1310691552.htm](http://zfxgk.nea.gov.cn/2023-01/04/c_1310691552.htm).

broader objectives like enhancing green electricity uptake, fostering renewable energy growth, and attaining dual carbon targets.

- **Uniqueness:** A key provision in the document dictates that green certificates are the sole attestations of China's renewable energy electricity environmental attributes. Additionally, these certificates stand as the only authentication for delineating renewable energy electricity production and consumption. To ensure the uniqueness of green certificates, it explicitly states that the electricity quantity corresponding to a green certificate cannot be claimed by other certificates with similar attributes in the electricity sector.
- **Universality:** The document accentuates the foundational role of green certificates – from facilitating green electricity trading and certifying green power consumption to calculating renewable energy electricity uptake. Furthermore, efforts are underway to amalgamate green certificates with China's national carbon emissions trading scheme and global green consumption and carbon offset frameworks.

Document No. 1044 lays out clear provisions for the issuance of green certificates across various renewable energy categories. Firstly, the document broadens the parameters for the issuance of green certificates. Previously limited to onshore wind power and centralized photovoltaic initiatives, it now encompasses all vetted and recognized renewable energy generation projects. This includes national wind power (spanning distributed wind, offshore wind), solar energy (spanning distributed photovoltaic and solar thermal), conventional hydropower, biomass, geothermal, and oceanic energy. This broadening of scope aims for comprehensive coverage in the issuance of green certificates. Secondly, specific criteria for distinct categories are detailed. Green certificates are both issued and made tradable for wind, solar, biomass, and geothermal energy initiatives. Such tradable certificates validate the consumption of renewable energy electricity and can be exchanged for compensation through green certificate and green electricity trades between power producers and consumers. For extant conventional hydropower projects, tradable certificates are not currently available. Instead, corresponding green certificates are directly and freely linked with electricity sales. However, post January 1, 2023, newly inaugurated market-oriented conventional hydropower projects will receive tradable green certificates. This tradable issuance

scope can be dynamically recalibrated based on renewable energy production and consumption patterns, ensuring equilibrium between supply and demand. Thirdly, the origination of issuance data is clarified. Primarily, green certificate issuance relies on data from grid firms and power trade entities. This data undergoes validation via the power producers or project owners. In instances where grid firms or power trade entities (which produce electricity for self-consumption) cannot provide requisite electricity data, the onus falls on the power producer or project owner to furnish the essential information for green certificate issuance. Fourthly, the procedure is standardized. Power producers or project owners must expediently finalize their project details via the National Renewable Energy Project Information Management Platform. This initiative fosters streamlined, national management of renewable energy data.

To further activate the green certificate trading market and expand the trading scale, Document No. 1044 also defines meticulous criteria for green certificate trading platforms, methodologies, and benefits. Firstly, the scope of green certificate trading platforms is expanded. The platform now includes not just the former China Green Power Certificate Trading Platform, but also the Beijing and Guangzhou Power Trading Centers. There are plans to incorporate additional nationally-recognized platforms, based on future requirements. Both buyers and sellers have the autonomy to select their preferred platform. Secondly, trading methodologies for green certificates are demarcated. Trading can occur through bilateral negotiations, listings, or centralized bidding. Bilateral negotiations are characterized by mutual agreement on certificate quantity and pricing, culminating in a single transfer contract and completing the delivery of green certificate through the green certificate trading platform. Listings involve sellers advertising certificate details including the quantity and price of green certificate on the green certificate trading platform, with buyers finalizing transactions by accepting these listings. Centralized bidding mandates both parties to submit their trading intentions pre-deadline, with market forces determining transaction dynamics. Currently, tradable certificates are limited to a single transaction. Thirdly, the allocation of green certificate benefits is clarified. For projects no longer qualifying for central governmental subsidies (including grid-parity (low-price) projects, those voluntarily relinquishing central government subsidies, projects with expired central government subsidies, and fully market-oriented conventional hydropower projects commissioned after January 1, 2023), the benefits are retained by the power

producer or project owner without trading restrictions. However, for projects still qualifying for central government subsidies, subject to national regulations, if they are part of the state's guaranteed purchase, green certificate benefits are offset equally against central government subsidies or belong to the state. If they are part of market-oriented transactions, green certificate benefits are deducted when central government subsidies are paid. At the same time, projects qualifying for central government subsidies are urged to adopt centralized bidding promptly.

Presently, China's renewable energy output largely remains confined to domestic green certificate applications. To ensure alignment with China's Nationally Determined Contributions (NDCs), a fusion between international green consumption and carbon offset systems with domestic certificates is paramount. Strengthening the development and adoption of international standards for green certificate issuance and trading will bolster its global resonance.<sup>5</sup>

In light of these revised green certificate policies, a significant upsurge in issuance and trading volumes is anticipated. References

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5 Zhao Zenghai, "Enhancing the green certification system to promote the development of economically underdeveloped regions through wind and solar energy projects," Energy Development and Policy, 9 August 2023, available at [https://mp.weixin.qq.com/s/2ia4Z5XAXJ7taUNVAZs\\_NA](https://mp.weixin.qq.com/s/2ia4Z5XAXJ7taUNVAZs_NA).

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