ENTSO-E Position Paper

Views on a Future-Proof Market Design for Guarantees of Origin

July 2022

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ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 39 member TSOs, representing 35 countries, are responsible for the **secure and coordinated operation** of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level** and the **optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires **sector integration** and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources.

ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

Our values

ENTSO-E acts in **solidarity** as a community of TSOs united by a shared **responsibility.**

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by **optimising social welfare** in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and **innovative responses to prepare for the future** and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with **transparency** and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contributions

ENTSO-E supports the cooperation among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its **legally mandated tasks**, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in the **implementation and monitoring** of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

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Executive Summary

ENTSO-E believes that evolutions in the current Guarantee of Origin (GO) mechanism are needed to ensure an effective contribution to a fully decarbonised electricity system, in line with Europe's ambitions to speed up Renewable Energy Source (RES) development to reach 2050 climate neutrality.

The current system does not provide sufficient incentives for the development of RES and the consumption of green electricity at the right time and in the right geographical location. Therefore, ENTSO-E sees two major evolutions:

1. The **introduction of temporal matching**. By shifting the time window for matching production and consumption of green electricity from a yearly basis to hourly or 15-minute basis, we can achieve a 24/7 GO system, thus reflecting the real value of producing and consuming green electricity dynamically at each moment in time.

2. The **consideration of the available capacity between countries**. ENTSO-E advocates for the introduction of market boundaries and, therefore, locational-based pricing in the GO system. In addition to consuming green electricity at the right time, this would introduce an incentive for the development, production and consumption of RES at the efficient geographical location.

Furthermore, processes that involve the conversion of electricity into another energy carrier such as hydrogen as well as energy storage are expected to become more significant in a near future. In this context, GOs may play an important role in carrying the information on the energy origin and localisation and enabling both the demonstration of **the green origin of electricity** used in these processes as well as the certification of **green fuels** (and renewable fuels of non-biological origin) whenever relevant.

Finally, as both temporal matching and the localisation attribute require a significant evolution of the current voluntary GO market, **there is a need for legislative suppor**t. The ongoing legislative process on Renewable Energy Directive (RED) III creates the ideal opportunity for an ambitious step in improving the current GO system. ENTSO-E also acknowledges the complexity of introducing the physicality of the electric system and therefore **proposes a stepwise implementation which mimics the evolution of the wholesale electricity market**. Finally, the evolution pace towards the target model must be determined at the **national level**, based on a voluntary decision, and may therefore vary from country to country.

1 Existing Certification Scheme

GO is a certification scheme used to disclose green electricity purchases which provide evidence of the source of energy. This certification scheme was introduced in the European Union in 2001 (Directive 2001/77/EC, 2001 on renewable energy use in electricity generation) and further updated with Directive 2009/28/EC, 2009) to provide traceability, enabling consumers to choose green energy and giving the green characteristic an explicit value. Such a system is purely voluntary, and Member States have a certain degree of freedom when designing their GO regulation.

The current GO mechanism is structured around 3 families of stakeholders: issuing bodies, consumers and wholesales suppliers.

- The **issuing bodies** supervise the issuance, transfer and cancellation process in their jurisdiction, while logging it into a single GO register. They are independent of production, trade and supply activities. Such a role can be assigned to a TSO, a regulator, a market operator or a separate entity. The Association of Issuing Bodies (AIB) has developed a standardised system for the exchange of GO: the European Energy Certificate System;
- Through their consumption and because of the GO voluntary characteristic, **consumers** are pivotal to the GO system and influence both GO design and price formation; and
- As GOs can be transferred between market parties, some traders or **wholesale suppliers** are also active participants in the GO markets, either on a bilateral basis or through the GO marketplace.

The GO process consists of three specific phases: issuance, transfer and cancellation. Following the issuance of a GO by the issuing body, it may be transferred by market participants into the GO register. Such a register is completely separated from electricity physical flows. The Renewable Energy Directive (RED II) sets the lifetime of a GO to 12 months, to which another 6 months can be added for the cancellation step. If a GO is not cancelled by the end of this 18-month period, it expires and is removed from the registry and added to the national residual mix.

Figure 1 gives an overview of the issued, expired and cancelled GOs over the last few years.

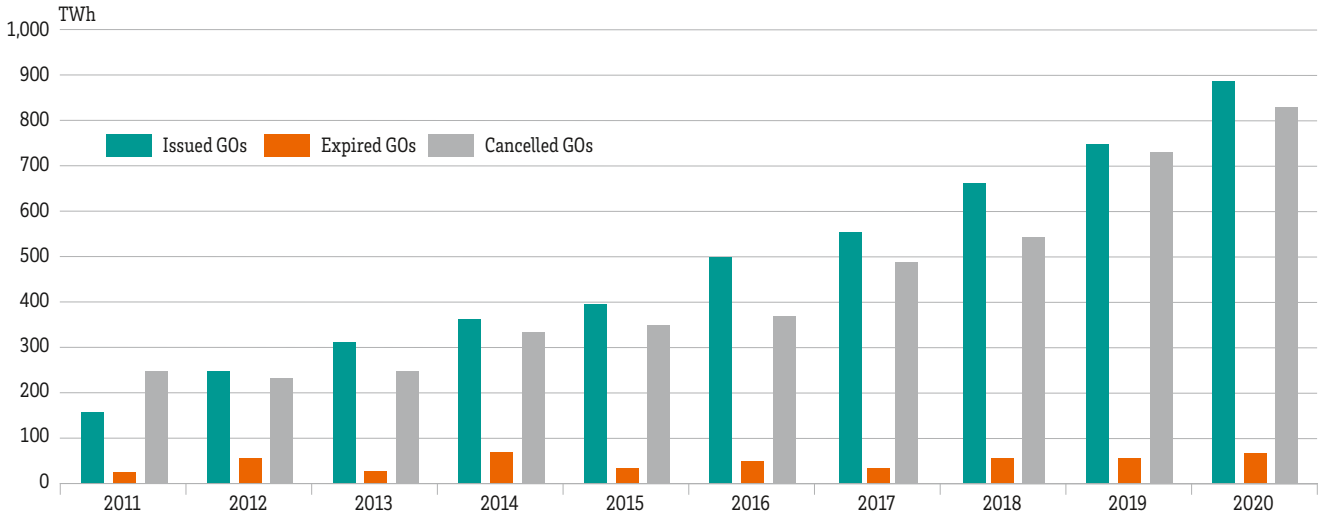

Figure 1: Vverview of the issued, expired and cancelled GOs from 2011 – 2020. Source: Association of Issuing Bodies, February 2021

ENTSO-E identifies **2 major limitations of the existing certification scheme** and, in the following sections of this position paper, proposes concrete improvements to **increase the GO system's credibility and commercial value while supporting Europe's RES ambitions**.

2 Temporal Matching and 24/7 GOs

Temporal matching is defined by the Eurelectric taskforce[1] as *'Matching a given volume of electricity demand with an equivalent volume of RES-E that is generated (injected) at the same time, validated by meter/grid data and energy attribute certificates with a time stamp of one hour or less, where possible.'*

ENTSO-E believes **that temporal matching is a necessary evolution to the GO certification scheme** as the current mechanism:

- **Does not demonstrate the green consumption** of a GO buyer, because of the 18-month GO's validity period. Indeed, a GO buyer may theoretically match its consumption with certified production on an annual average basis while still being dependent on production from fossil fuel in practice. This is illustrated in the graph below, representing Google's 2019 data center electricity consumption and showing that only 68% of it is carbon free if hourly temporal matching is considered, whereas it becomes 100 % carbon free on a yearly basis. (see figure 2)
- **Sends wrong price signals** to both GO buyers and RES developers as the GO price does not fluctuate as a function of the effective volume of RES energy produced at a specific moment in time.

Enforcing the temporal matching in the GO mechanism would therefore **facilitate the implementation of RES targets** set by the EU due to the **more accurate price signals** which reflect in real time the available generation mix and **provide additional financial revenues** to RES developers.

Furthermore, matching energy consumption with carbon-free generation within the same granular period **provides more accurate information about a company's carbon footprint**. This information allows companies to take better decisions, aligned to their own decarbonisation ambitions.

Finally, ENTSO-E welcomes the numerous and recent reflections initiated by market parties on the GO scheme. The evolution towards a GO's hourly granularity appears to be supported by a high majority of these. However, ENTSO-E believes that **the granularity target should be set to 15 minutes**, in line with the target imbalance settlement period in Europe.

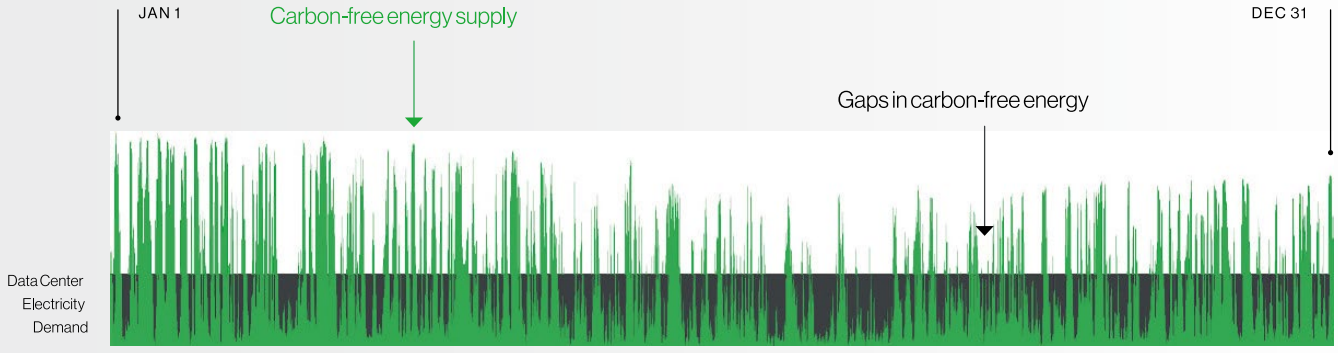

Figure 2: Hourly carbon-free energy performance at an example data center. Source: Google White Paper (2020)

1 FINAL-A-Timely-Match-compressed.cleaned.pdf (eurelectric.org)

3 Inclusion of locational dimension into the GO System

ENTSO-E supports the introduction of temporal matching into the GO system as a first step towards a more efficient GO mechanism, but also argues that **additional improvements are required**.

In this manner, ENTSO-E identifies that the **absence of a locational dimension** is currently **causing negative side effects** as large-scale RES deployment may be installed in areas without the consideration of effectively available transmission capacities between geographical areas. **ENTSO-E therefore recommends including a locational dimension to GOs**. The determination of the appropriate geographical granularity (being at level of national border or more granular (e.g., bidding zone borders)) should be left to the NRA of each Member State and requires further investigation to properly reflect national specificities.

Furthermore, it is important to carefully assess the impacts on other sectors such as hydrogen[2]. In fact, processes that involve the conversion of one energy carrier into another (e.g., hydrogen, etc.) as well as energy storage are expected to become more significant in the near future. In such a context, GOs will play the important role of carrying the information on the energy origin and localisation and will allow both the demonstration of the **green origin of electricity** used in these processes and the **certification of green fuels** (and renewable fuels of non-biological origin) whenever relevant.

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2 In some countries there may be merits in designing a GO system incentivising location of electrolysers close to RES production to reduce the need for costly grid reinforcements. While in other countries, this could trigger a need to develop new hydrogen transport infrastructure whereas it could be more efficient from a system point of view to reinforce the electricity grid instead. The development of the locational dimension of GO Markets should balance these perspectives.

4 How can Markets support the Transition?

Adding the physical location in the definition of the GO is not sufficient to effectively consider the physics of the electric system. To consider the limited capacity between countries, **a mechanism limiting the volume of GO traded between geographical areas should be introduced**. In this section, ENTSO-E details what such a mechanism could look like and highlights the resulting challenges.

4.1 A target model for the exchange of GOs between zones

ENTSO-E believes that the GO target model should be based on the **ex-post** implicit allocation of cross border capacity between countries. Hence, ENTSO-E does not advocate for the introduction of a 'green electricity' market in parallel to the 'grey electricity' market but rather **promotes the trade of certificates as green attributes after the delivery of the existing electricity markets**.

The time resolution of such a GO market is equal to the country's imbalance settlement period. The geographical attribute can be used to demonstrate **that energy was consumed in the same geographical location or that it could have been physically exchanged with its neighboring countries**. It may also serve as a basis for national energy statistics and a precise carbon footprint calculation.

The geographical dimension of a GO is **limited to** a specific geographical **level**. As such, a parallel can be made with existing mechanisms that calculate exchange capacities in the grid. Furthermore, it allows a **price setting within each relevant GO market area**. Depending on specific system needs and national preferences, situations may arise whereby market boundaries must be revised to better reflect the physical situation of the grid.

To ensure a credible **price formation** of GOs while guaranteeing non-discriminatory access to all market participants, there should be a **single auction for each market time unit** for the relevant geographical resolution setting a price for each Imbalance Settlement Period. A parallel system to the wholesale electricity market, and more specifically to the Single Day Ahead Market Coupling (SDAC), can be done in combination with the introduction of hedging products such as existing long-term transmission rights.

Furthermore, developing the design of a GO-market inspired by the market structure of Day-Ahead (DA) markets provides a straightforward solution to defining the cross-country capacities available for the GO-market. Indeed, re-using cross zonal capacity from the DA capacity allocation process has several advantages:

- At this time, the highest cross-border volumes are traded in the DA electricity markets, and the DA markets also set the price reference. Typically, the DA timeframe leads to the highest electricity exchanges;
- Re-using the result from existing processes avoid the introduction of new TSO processes. There exists a clear transparency framework around these processes;
- It aligns the concepts of bidding zones for electricity with pricing zones for GOs; and
- Such a model is compatible with the voluntary dimension of the GO mechanism.

4.2 How to get there?

One of the prerequisites to achieving the GO target model is a **mature and liquid GO market**. Until this is achieved, a **stepwise approach** will have to be taken – much in line with the evolution of the wholesale electricity market. Beginning with the implementation of the target model directly would certainly introduce complexities beyond what can be considered efficient at this stage.

Examining today's situation, where there is only a limited volume of 24/7 GOs and the consideration of the location is not harmonised, a first step would be the **increase in volume of 24/7 GOs**.

Furthermore, it is important to introduce the **notion of location as soon as possible** in the transition towards the target model. Making this key addition when the market is already well developed would present significant challenges and would hamper the further development of the 24/7 GO market.

Taking the parallel with the electricity wholesale market, the allocation of capacity between countries for GO trading can start with a simple, explicit first-come-first-served process, developing into an implicit market coupling. Several steps and milestones can be defined to evolve from a first-come-first-served to an explicit allocation and finally an implicit market, each of them requiring new levels of liquidity and demand for capacity between countries.

4.3 Technical impact

Moving towards a scheme with time and locational stamping would require **more elaborate processes** as the current GO issuing period is now one month. At first, it will increase the technical complexity required to handle the mere quantity of data (number of transactions, access and treatment of metering data…) which is necessary for matching generation and consumption on a quarter-hourly basis.

Then, the introduction of granular certificates will also require **a faster and more frequent execution of issuing, transferring and cancelling the certificates**. A daily (ex-post) implementation would converge the processes of the physical delivery of electricity and the transaction of GOs, giving portfolio managers an additional incentive to match electricity consumption to the expected renewable generation.

The implementation of 24/7 GOs would also **increase the performance and reliability requirements** for exact granular tracking. This might include a validation of transactions between countries depending on the available capacity between those countries.

Moreover, the increasing complexity requires a **clear definition of roles and responsibilities** (i. e., issuance and cancellation of certificates, market facilitation, allocation of capacity between countries…). Due to the number of entities involved, additional requirements on standardised processes and common interfaces might also be relevant. **ENTSO-E recommends specifically considering such an increasing level of complexity in the national regulatory frameworks when allocating the aforementioned roles.**

Finally, **the impact on market parties (plant owners, suppliers) should not be underestimated**. They need to get dedicated measurement data to determine how much they may sell and buy; in addition, specific processes to establish more frequent GO trading will also be required. Granular certificates leading to different prices per quarter hour will trigger the need for portfolio optimisation via steerable assets such as hydro generation, load shifting and potentially storages. If the system enables ex-ante transactions, generators and suppliers will additionally require predictions for their portfolios and an ex-post calculation of actual demand and supply, and balancing of deviations.

4.4 Legislative impact

Although the GO system is today a voluntary system, it does provide an additional revenue stream for RES developers and, in turn, incentives the further development of RES sources. Transitioning towards temporal matching would introduce more price sensitivity and thus provide better temporal incentives.

ENTSO-E believes it would be suboptimal to implement the temporal matching solution in parallel to the existing mechanism as it introduces the risk of double counting while hampering the development of the temporal matching solution. Therefore, ENTSO-E **calls for an overall shift of yearly matching to temporal matching, driven by a change in legislation**. The ongoing work on RED III provides the ideal opportunity to move forward with the necessary transition.

Abbreviations

AIB	Association of Issuing Bodies
ENTSO-E	European Network for Transmission System Operators in Electricity
GO	Guarantee of Origin
RES	Renewable Energy Source
RED	Renewable Energy Directive
SDAC	Single Day Ahead Market Coupling
TSO	Transmission System Operator

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