

## **European renewable energy trade based on Guarantees of Origin (GOs) – concepts, critical issues, and recommendations for design**

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This paper was written in the context of the research project "Wissenschaftliche und fachliche Unterstützung des BMU bei der Diskussion der Fortentwicklung der EU-Politik zur Förderung der Erneuerbaren Energien" (FKZ UM07 41 604) of the German Federal Ministry for the Environment (BMU). The research question given by BMU was to examine the implications of unrestricted, mandatory GO trade, and to propose alternative design features how to organize GO trade.

## 1 Starting point: RE support in Europe

A mandatory European RE target 2020 of 20% renewable energy in the total energy system was agreed on by the European Council in March 2007. Effective and efficient RE support policies will be required to realise this target.

RES-E support in the EU-27 has to date been exclusively based on national policies, i.e. based on feed-in tariffs, quota systems and tax measures, driven in part by the indicative national targets as set by the Directive 2001/77/EC. In the 2005 Communication (COM (2005) 627) the EC assessed that national feed-in systems are typically more effective and efficient than quota systems. Present analysis shows that this result is still valid in 2007.

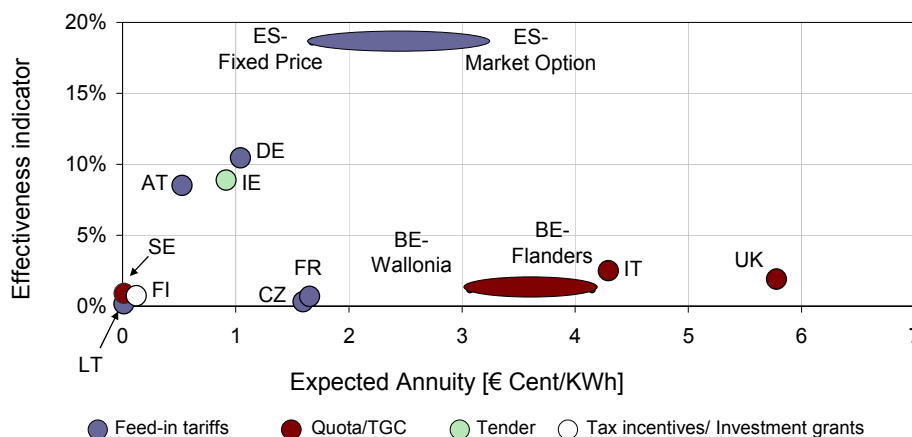


Figure 1 Historically observed efficiency of support for wind energy (COM (2005) 627)

In **Quota obligations based on Tradable Green Certificates (TGC)** the volume of RES-E generation is set by the government and the certificate price is determined by the market. Typically the support of least cost technology is stimulated by the system, but depending on the ambition level of the quota more expensive technologies may also be supported. Current quota obligations typically do not include technology specification; which leads to windfall profits for low to medium cost technologies and no stimulation of novel technologies. Therefore a technology banding is currently under discussion in the UK and a technology specific certification period has been introduced in Italy. In presently implemented quota systems high risks occur due to short term trading and electricity market responsibility of RES producers, resulting in high risk premiums. The effectiveness and efficiency of quota systems in Europe is so far rather low. A higher level of effectiveness and efficiencies can only be seen for the case of biomass electricity in Sweden.

In **Feed-in tariffs (FIT)/premium systems** the price is set by the government and the volume of RES-E generation is free. FIT and premium systems are typically characterised by a simultaneous support of all RES at their cost level. The regulative challenge consists of the correct determination of the right support level. Due to long term investment securities and a limited market responsibility of RES-E generators in fixed FIT low risk premiums occur in feed-in systems. The effectiveness and the efficiency of feed-in systems is typically high, e.g. Germany, Spain, Ireland. In some countries like France the effectiveness is limited due to high administrative barriers.

## 2 Concepts of European trade based on Guarantees of Origin (GOs)

### Rationale of European GO trade

Renewable energy potentials are distributed unevenly across Europe. The idea of European trade of GOs for European RE target compliance is to make RE sources in one country available for target compliance in the importing country, if this country provides financial support. Assuming flat rate 2020 targets for all Member States (" +13%"), a trading option could help MS with low RE potential to achieve their targets at lower societal cost. Potentially, this could lead to lower overall costs for reaching the European 2020 targets.

Guarantees of Origin (GOs) certify the green value of renewable energy. So far they have only been implemented for RES-E; the GO is issued upon the production of 1 kWh of renewable electricity. The aim of introducing a European-wide GO system is to establish a transparent standard for accounting of renewable energy that avoids double counting and double selling of RE.

GOs are not yet defined as tradable green certificates (TGC) in directive 2001/77/EC. This could be changed in the new RE framework directive, however. If GOs are used as vehicle for trade, the trade is not bound to the physical trade of electricity, which is hampered by missing interconnector capacities and other physical restrictions. However, juridical issues regarding possible conflicts of a GO trade system with the EU Directive 2003/54/EC may arise<sup>1</sup>.

### GO trade concepts under discussion

The European Commission is currently considering introducing harmonized GO trade on European level. The trade mechanism shall coexist with national support schemes. There are different concepts under discussion.

- *Should trade be **mandatory or voluntary**?*

Under a mandatory trade regime, all MS are obliged to open their RE markets for trade. This maximizes trading volume and flexibility. On the other hand, MS cannot protect their domestic support schemes against potential cost increases and other negative impacts of trade. In a voluntary system, MS could decide themselves if they want to reach their targets by domestic production or by allowing trade.

- *Trade by **Member States or private parties**?*

GO trade could be organized (1) solely between governments or (2) by including private parties, i.e. RE producers and utilities obliged to buy RE under a quota obligation. The decision on this issue would have strong implications for GO market dynamics and the target compliance of MS. In case (1), MS would decide on the volumes they trade. The harmonized European GO price would apply only to these volumes. In case (2), exports would be driven by RE producers thriving to maximize their profit. Thus all (new) RE generated in Europe would be affected by the GO price. The export volumes would be defined by the GO price, not the government.

- *Which **trade restrictions** shall apply?*

Imports and exports influence the overall cost and efficiency of national support schemes. In an unrestricted private GO market, MS have no control of the import and export volumes to and from their countries. To limit the effects of trade on national

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<sup>1</sup> sprl Kuhbier. law firm: „Short legal evaluation concerning the introduction of a mandatory Trade mechanism in EU 27 for Renewable energy in relation to European rules on internal market for electricity and European principles of free exchange of goods, proportionality and subsidiarity“; to be published end of October 2007

support schemes, even proponents of harmonized GO trade like RECS International (see below) suggest some trade restrictions. Questions arise to what percentage and by which means trade can be restricted, and if restrictions may only apply to imports or also to exports.

- *GO trade of **RES-E**, or also **RES-H**?*

So far, GOs are only issued for renewable electricity. In principle, one could also introduce GOs for renewable heat. The challenge is how to implement a central GO registry for decentralized RES-H technologies like biomass heating systems, solar collectors or heat pumps, which comprise about 75% of the overall European RES-H potential<sup>2</sup>. Another relevant issue for RES-H trade is that no European heat networks exist so far. While the trade of GOs for RES-E would be supported by some physical trade of electricity, the GO trade of RES-H would not be complemented by the physical exchange of heat.

- *The **RECS concept** for an internal market*

In July 2007, RECS International presented a memo outlining a GO trade system “to enable renewable electricity trade and imports to be accounted for national targets”<sup>3</sup>. This memo is the most concrete concept for GO trade by private parties currently discussed on the European level (despite its draft character, which is stressed by the memo itself). For this reason, it is mentioned here.

The RECS concept suggests a number of market rules:

- Member States will be allowed to introduce minimum and maximum volumes for import for compliance
- Only imports of new power (after a specified reference year, e.g. 2010) will be accepted for compliance
- Exports must be subtracted from the target automatically
- Only renewable energy which has not been financially supported through the main support scheme in the country of origin should qualify for international trade for target compliance
- Imported RE will be supported under the domestic support scheme

In addition, RECS proposes the auction of import rights to regulate the import to countries with feed-in tariff/premium support schemes (see Figure 2) and prevent uncontrolled import. The auction revenues shall reduce the support costs paid by consumers. The system requires that feed-in tariffs (FIT) are translated to premiums (excluding the value of electricity).

The RECS memo only outlines regulations and implications of GO trade for import, not for export.

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<sup>2</sup> PROGRESS 2007; <http://www.res-progress.eu/>

<sup>3</sup> RECS International: Memo – Concept for an Internal Market RES-E. 17.07.2007

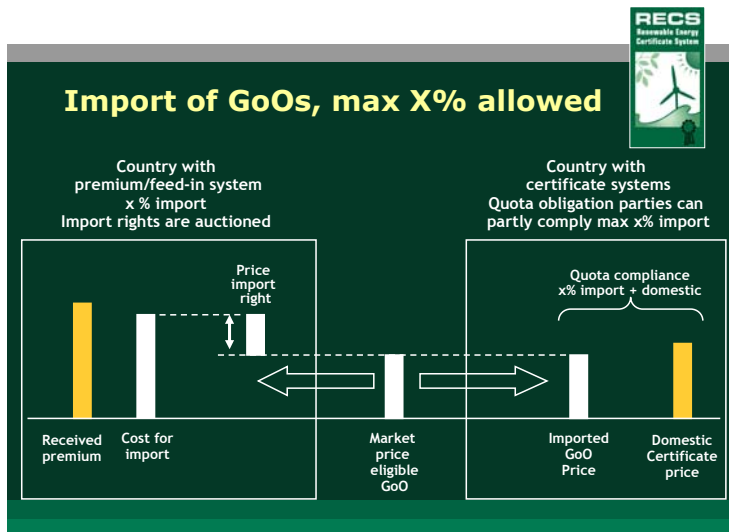


Figure 2 RECS proposal for Import of GOs (RECS International 2007)

### 3 Critical issues of unrestricted mandatory GO trade by private parties

At first glance, unrestricted mandatory GO trade does not seem to affect the functioning of national support schemes. However, negative interference with existing support schemes that would offset the expected positive effects of trade can be expected.

#### “Cherry-picking” between support schemes

If exports are not restricted, RES-E producers are free to sell their RES-E under the domestic support scheme or their GOs under the support scheme of another MS. If producers can choose the support system which pays the highest support every year, they undermine the long term concept of most European support systems (both FIT/premium and quota systems). This would lead to windfall profits for the RES-E producer and destabilize the support systems. It would also complicate target counting and compliance: the same RES-E plant would count for the target of one country in one year and the target of another country in the next year.

⇒ The import/export of GOs would require a long term commitment to deliver the produced RE, e.g. until 2020 or for the full support period of the support scheme.

#### Technology unspecific trade would lead to windfall profits

The discussed GO concepts do not mention any technology specification of GO trade. A uniform European GO price for all RES-E would be set by the marginal price of the most expensive technology sold (analogous to current quota systems). If the marginal price is set by a medium or high cost technology, this would lead to windfall profits for low cost technologies (this is one reason the UK government is considering technology banding for the UK ROCs market). These windfall profits could offset the potential efficiency gains of European trade.

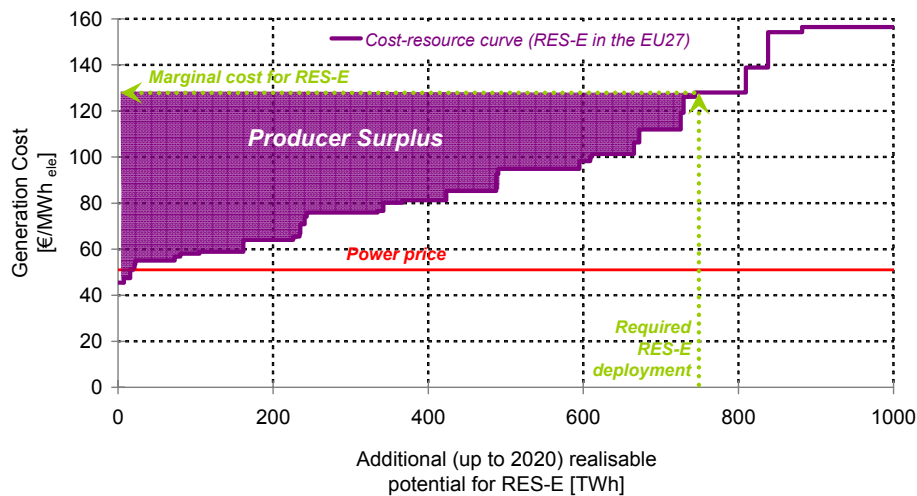


Figure 3 Possible producer surpluses arising from technology neutral GO trade

In this context, Figure 3 illustrates the possible producer surpluses arising from a technology neutral support scheme. This depiction plots in a schematic way a cost-resource curve of the additional realisable potential for renewable electricity in the EU-27, where the whole basket of available RE technologies is clustered into several bands, indicated by their marginal generation cost and the corresponding realisable future potential. Thereby, several low-cost options such as biowaste incineration, biomass cofiring or most preferable sites for wind onshore form the left part of the merit order curve, followed by moderate RES-E options – e.g. wind onshore at moderate sites, wind offshore, small-scale hydropower or large-scale biomass plants. On the margin with regard to the required additional RES-E deployment up to 2020 large-scale agricultural biogas and medium-range biomass plants appear in this simplified depiction. Consequently, in case of technology neutral support as appearing under a mandatory GO trading scheme, tremendously high producer profits can be expected as indicated by the violet area in Figure 3.

### Technology unspecific trade would destabilize feed-in systems and prevent technologic innovation

A technology neutral GO system would also conflict with technology specific FIT support systems. The philosophy of feed-in tariffs/premiums is to support each technology on its own cost level based on assumed local production costs; this also allows development of innovative technologies with high initial costs. Assuming a medium European GO price, the feed-in premiums would be lower than the harmonized GO price for low cost technologies, and higher for high cost technologies (at least if tariffs are designed efficiently). As a result, low cost technologies like wind would have a high incentive to export from a FIT country; high cost technologies would have a high incentive to import to a FIT country (see Figure 4). Without any technology specific regulation, FIT systems would thus be destabilized by trade: the overall support costs required to comply with a FIT country's target would rise. This would endanger the public acceptance of the support system.

Furthermore, a technology neutral GO system does not support the development of innovative technologies, since it favours established, low-cost technologies. Thus, necessary RE innovations might not be realised early enough to reach the 2020 targets.

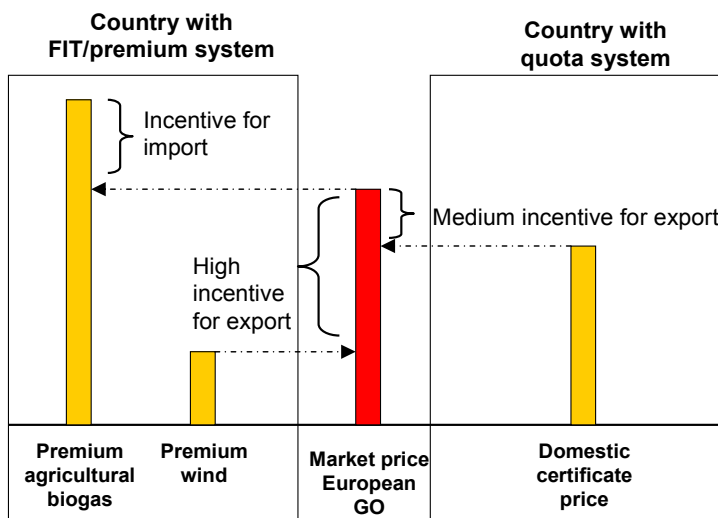


Figure 4 Export from FIT and quota countries

### **Unrestricted, technology unspecific trade would increase the overall costs for European consumers to achieve the European 2020 targets**

The key motivation for creating GO trade is the idea of more competition among RES producers and increased market liquidity compared to present national TGC systems. Furthermore, additional low cost potentials may be tapped where these are available. However, these potential cost advantages of unrestricted GO trade would most probably be offset by significant windfall profits due to high marginal prices for RES technologies and due to high risk premiums as currently observed in most technology neutral quota systems (e.g. BE, IT and UK). In particular the mid to long term need for currently less advanced and therefore more costly technologies would lead to high prices in technology neutral certificate markets, since prices would be set by these technologies. An unrestricted mandatory trade system would affect the price of all new RES generation in Europe by setting *one* standard GO price in Europe and would therefore be very similar to a harmonised quota system. The research project OPTRES calculated for the case of renewable electricity (RES-E) that a harmonised quota system leads to 50% higher consumer costs to reach the required RES-E share than well adjusted national policy regimes.

Clearly, the described windfall profits and risk premiums could be reduced by introducing long term arrangements, technology specifications, and the justifiable trade restrictions into the trade design.

### **Exporting countries would cross-subsidize importing countries**

No matter if overall costs increase or not, the European GO trade by private parties will lead to an inherent cost shift between Member States. RE producers in net exporting countries would sell (part of) their low-cost RE production to other MS, where they receive higher support payments. As a consequence, the national RE target of the exporting country would have to be achieved with higher cost RE. The consumer costs for national target compliance increase. In the net importing country, the consumer costs decrease, due to the import of low cost RES-E production.

⇒ The net exporting countries would lose their low-cost RE potential and cross-subsidize net importing countries, which could endanger their own target achievement.

This effect would be aggravated by the physical RE integration costs borne by the exporting country (see below). The consumer cost shift sends a problematic political message: Countries that import RES-E instead of increasing their own RES-E share are awarded a cost advantage. There would also be benefits for the exporting countries (local added value, etc.), but mainly for their private industries, not for consumers. If the exporting country would be allowed to auction export rights, also costs for consumers could be controlled.

### **Physical integration challenges**

Even though GO trade does not require the physical trade of electricity, the generated electricity still needs to be integrated into the power system of the exporting country. Depending on the characteristics of the power system, necessary integration efforts range from the direct grid connection of generators, via network reinforcement to potential construction of new lines. As the building of new transmission lines has lead times in the range of 15 years, in many cases export volumes are restricted by limited interconnector capacities. Currently, only 40% of cross-border transfers of electricity between European countries are totally guaranteed<sup>4</sup>.

Depending on the MS, grid integration costs are partly or fully paid by the consumers. In case of exporting RES-E, these indirect support costs are not paid by the importing country.

### **Conclusions regarding unrestricted trade**

An unrestricted, mandatory GO trading system would destabilize existing effective support schemes. Negative impacts would occur especially for feed-in tariff systems, due to structural conflicts of a technology neutral certificate system with the technology specific FIT concept. There is a risk that overall costs for society to achieve European RE targets would increase significantly due to high windfall profits. Furthermore, a mandatory, unrestricted system would lead to a "sell out" of cheap potentials in the exporting countries and a cross-subsidizing of importing Member States.

## **4 Required design features for an efficient GO trading system**

The efficiency of European GO trade would depend on the design features of the trading system. The analysis shows that there are many unknown factors and issues to solve. If GO trade is introduced, we therefore recommend it on a voluntary basis, and under clear limits and efficiency requirements.

We propose certain minimum design features:

### **⇒ Make trade voluntary**

In order to limit potential negative interference of trade with existing well functioning support systems a voluntary trade system is recommended. A voluntary system would also strongly increase the acceptance of Member States.

### **⇒ Restrict trade**

The trade system should set (or allow MS to set) limits for maximum import and export, in order to preserve the functioning of domestic support schemes.

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<sup>4</sup> ETSO: Survey on firmness of cross-border access in Europe, May 2007



An additional option would be to restrict trade to RE production additional to target compliance. The European Commission plans to introduce interim targets (2012, 2014, 2016) with reporting obligations for MS. Based on these interim reporting, the export volumes of a MS could be restricted to the RE production additional to the interim target. This mechanism would assure that exporting countries would not miss their targets themselves (and cross-subsidize other countries). Furthermore, it would give MS an additional incentive to comply with their interim targets. A disadvantage would be that only few countries would gain experience with trade.

⇒ **Long term contracts**

The import/export of GOs should require a long term commitment to buy/deliver the produced RE. A contract for the full support period of the support scheme under which support is granted would be favourable. Alternatively, one could think of a fixed period, e.g. 15 years. Through such long term contracts, risk premiums for RE producers would be considerably reduced, and MS could control their target compliance.

⇒ **Introduce technology specification**

European GO trade would require some kind of technology specification to be efficient. The design of an efficient mechanism needs further analysis. Options are a European wide technology banding, or technology specific import/export rights.

⇒ **Define eligibility for import**

RE that is not eligible for support in the country with RE potential should not be eligible for support in another country. Otherwise, the importing country could attract RE production already cost competitive and thus not supported in the country of production (e.g. hydro power). or force that country to produce RE in a way that is not acceptable for other reason (e.g. unsustainable biomass plants).

⇒ **Start with regional trade in common power markets**

In order to avoid possible distortions of conventional as well as renewable power markets, start trading in regional markets with a common power system, e.g. central Europe, Nordic market. If trade is introduced between countries with separated power systems this may have negative impacts on the efficiency of the overall energy market.

⇒ **Introduce system integration premium**

To cover the cost of physical RE system integration (e.g. grid reinforcement), the importing country could pay a premium of x ct/kWh to the exporting country. To estimate the cost balance between local cost and benefits would need further analysis.

**Further issues to investigate**

There are further relevant issues to investigate which have not been discussed here, e.g.

- The auction design for import and export rights; such auctions will create additional risks and transaction costs.
- Restriction of market power of large players, and market access to small players
- Local benefits (and local burden) of RE are separated from financial support; what are the implications for public acceptance?
- Should the value of domestic secondary support (tax credits etc.) be reflected in the GO trade?

In any case, the design and implications of GO trade for RES-H will require further analysis.